AJS Technology

RamCram
64K Memory System

For Use with DELTA 1000* Systems

AJS Technology.com

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FOR WARRANTY SERVICE OR ASSISTANCE IT IS RECOMMENDED THAT THIS PRODUCT BE RETURNED TO AJS TECHNOLOGY.

AJS Technology

RamCram USERS MANUAL   8/85

TABLE OF CONTENTS

Chapter 1: INTRODUCTION TO THE RamCram 64K MEMORY SYSTEM

1-1 RamCram FEATURE SUMMARY

--> EXPANDS DELTA MEMORY TO MAXIMUM POSSIBLE
--> FAST & EASY REMOTE SAVE / LOAD OF DATA FILE & O.S.
--> ELIMINATES UP TO 7 BOARDS (depending on configuration)
--> PROVIDES FULL REMOTE CONTROL OF DELTA (START,STOP,RESET,ETC.)
--> USER FRIENDLY MENU-DRIVEN OPERATION
--> BUILT-IN DIAGNOSTICS AND STATUS L.E.D.s
--> SIMPLE 3-WIRE RS232 CONNECTION TO YOUR PC
--> WORKS WITH ANY PC (requires standard communication software)
--> ELIMINATES CASSETTE RECORDER
--> WORKS WITH EPROM OR RAM BASED OPERATING SYSTEMS
--> ALLOWS ARCHIVAL OF SEVERAL DATA FILES TO ONE FLOPPY DISK
--> 2 YEAR WARRANTY, 5 YEAR IF EXTENDED WARRANTY OPTION PURCHASED

1-2 PRODUCT DESCRIPTION

The RamCram is an intelligent memory plug-in board for use with DELTA
1000 energy management systems. It boosts data file and operating
system memory to the maximum amount that the DELTA 1000 is capable of
handling: ideal for software intensive applications such as CIL and
card access. It also provides the ability to remotely start, stop,
load, and save O.S. and data file using any personal computer. Typical
save and load times of less than 1 minute are achieved. The cassette
recorder, if used, is completely eliminated, thus increasing
reliability. The RamCram, which is compatible with both the W1000 and
W1017 versions of the DELTA, greatly enhances your system without any
sacrifice.

In addition to the RamCram intelligent memory board, all that is needed
is your personal computer (with serial port) and any communication
software package which uses the popular XMODEM protocol. A simple 3
wire RS232 cable (which is provided) is the only thing needed for
interfacing the RamCram to your PC. Telephone modems can be used if you
desire control from a remote building or city.

Easy to use menu driven selections guide the user through the
convenient process of backing up and reloading of both data file and
operating system. Archival is now simplified since several data files
may be saved on one floppy (easily duplicated for extra protection) as
opposed to one data file per floppy disk. Password protection is
provided which the user can change at any time.

RamCram SYSTEM BLOCK DIAGRAM

Delta 1000 card cage

RamCram Memory Board

gold plated edge connectors

common bus

OTHER CARDS
THAT ARE USED
WITH THE DELTA

RamCram
MAIN
MEMORY

RamCram
INTELLIGENT
CONTROLLER

plug

plug

RS232 CABLE
TO YOUR PC

5 wire cable for TTY switch control

8/85

1-2
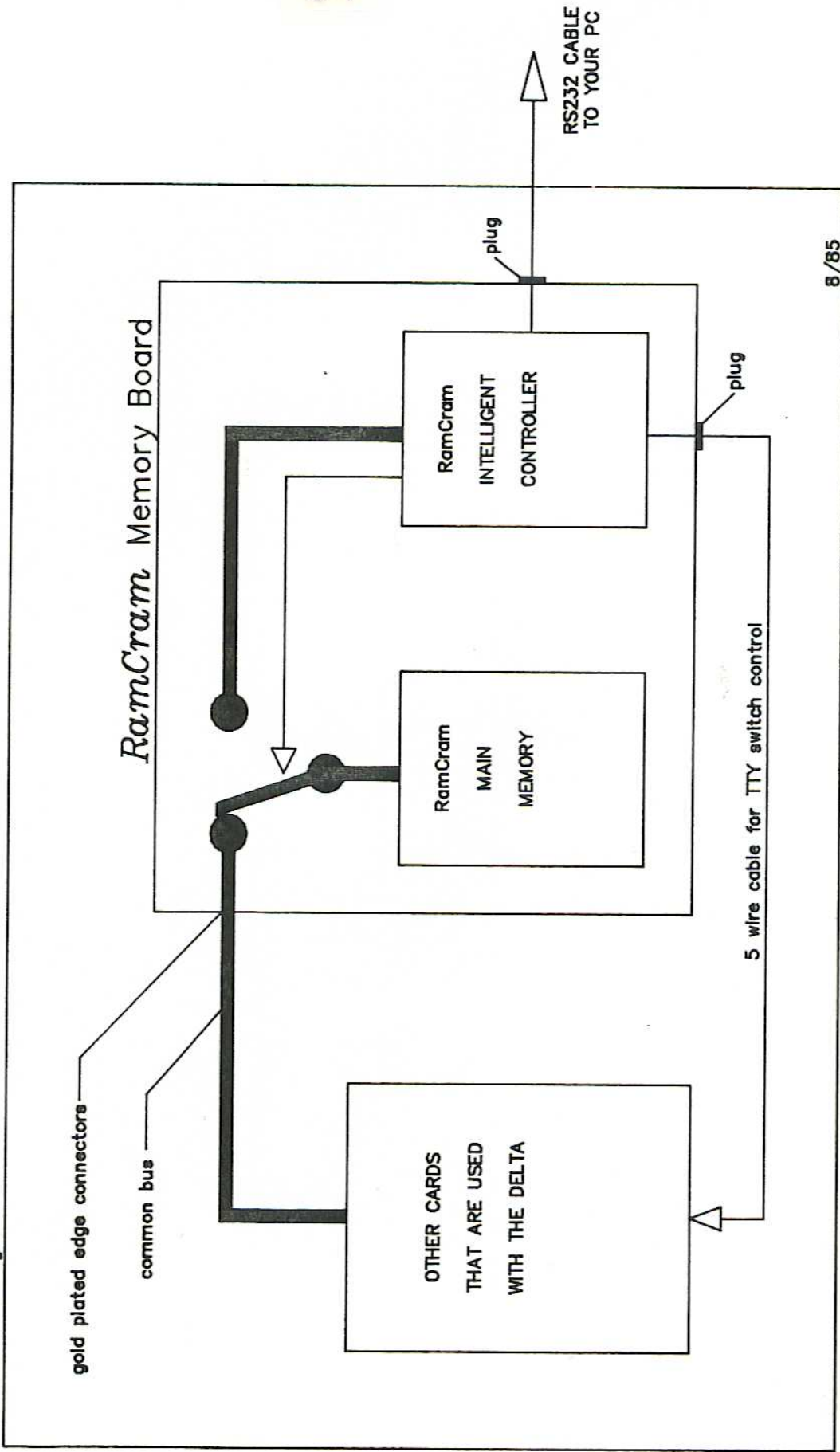
FIGURE 1-1 RamCram BLOCK DIAGRAM

1-3 WARRANTY

The RamCram is fully guaranteed, parts and labor, for a period of two (2) years from date of shipment. For an additional 10% of purchase price, the warranty can be extended for three (3) additional years for a total of five (5) years. We will, at our option, repair or replace the board during this period. AJS Technology is committed to keeping spare boards in stock for emergency replacement if needed.

1-4 DIAGNOSTICS

Comprehensive built in diagnostic software (automatically invoked when powered up or reset) help pinpoint problems that might exist with both the RamCram's main memory and intelligent controller. All diagnostics are menu driven for ease of use with the results displayed on your personal computer as well as on the L.E.D.s located on the RamCram. Besides diagnostic results, these L.E.D.s indicate the current status of the RamCram, such as the DELTA being on-line/off-line, loading, and saving of files. Main memory chips are field replacable 64K x 1 dynamic RAM chips: the same kind used in most PCs.

1-5 TECHNICAL INFORMATION

The RamCram contains 64K words (128K bytes) of memory. The upper half of memory (32K) can be disabled in 2K increments via onboard DIP switches (16 total). This feature allows several options:

1. allow the operating system and data file to run on the RamCram (most switches enabled) or
2. allow the operating system to run on the existing EPROM board if you have one (all revisions compatible - even latest 1200) while data file runs on the RamCram (switches disabled)
3. eliminate "boot" PROM board by transferring data to RamCram (last switch on as well as those in item 1).

The RamCram data file area (or lower half) of memory can be disabled with just one common jumper block (this will normally be enabled).

The RamCram occupies one memory slot and eliminates the need for all other RAM cards. If your system is loaded with 5 RAM boards and you currently use the disk loader, up to 7 boards could be eliminated: 5 RAM boards, 1 PROM board, and 1 EIA board that is used with the disk loader. In addition, the disk drive itself would not be needed any longer. This greatly simplifies the system and the amount of potential service required.

The communication baud rate between your personal computer and the RamCram is DIP switch selectable from 300 to 19,200 baud. Since XMODEM protocol (straight binary also provided) is used for file transfer, extremely fast data file load and save times of less than 1 minute are achieved, depending on data file size and baud rate used.   XMODEM

protocol provides block error checking and retransmission if an error
occurs during file transfer (both load and save). You may actually
disconnect and reconnect the RS232 cable during a transfer and the
RamCram system will recover! In addition, the RamCram does a checksum
on the entire file after it is completely loaded. The user is advised
if there are any errors. This "dual" checksum method practically
eliminates any possibility of undetected transmission errors.

Your existing data file and operating system (not necessary if EPROM
based O.S.) is easily transferred to the RamCram in its entirity
without any software changes. Simply plug in the RamCram, load your
data file and O.S. as you normally would, then let your personal
computer "capture" this information to its disk. That's it!

A reset switch is provided on the RamCram board although it will
seldomly, if ever, be used. The RamCram controls the DELTA through a 5
wire cable which is attached to the TTY board (the one with the 4
switches on it). The other end plugs into the RamCram. If the cable
is unplugged, you may still control the DELTA using the 4 switches.
When it is plugged in, the RamCram has control of the switches and
their actual position is ignored. This feature allows reverting back
to direct local control (old method of flipping switches) of the DELTA
without having to use your PC if desired.

The customer can interface the RamCram to his PC in three different
configurations. The first method is to simply connect the RS232 cable
supplied with the RamCram to the PC's serial port. This allows the
user to save and load his data file and operating system (O.S.) at
rates of up to 9600 baud. The second method of interfacing is to
connect the PC via modems over telephone lines to save and load files,
halt, restart, or reset the DELTA from a remote location. Saving or
loading files is limited to the baud rate of the modems. See Appendix
H for more information on this configuration.

The third configuration is a combination of the first two. The RamCram
is connected to the PC's serial port with the RS232 cable supplied, and
a terminal (or a second PC) is connected through modems over telephone
lines to the PC's second serial port. This allows the user to operate
the RamCram either on site with the DELTA, or from a remote location,
such as another building or from home. Saving and loading files can be
made at up to 9600 baud, regardless of the modem baud rate. A software
package to support this comfiguration is available from AJS Technology.
See Appendix I for more information on this configuration.

Chapter 2: RamCram INSTALLATION

In order to insure that the RamCram Memory System is installed properly
and that the user gain proper familiarity with it's use, the RamCram
will be installed in stages. In this chapter we will use the RamCram
to replace the standard Random Access Memory (RAM) boards presently
installed in your DELTA. Do not concern yourself about modifying the
TTY board at this point. Please read all of this chapter before
beginning.

HANDLING PRECAUTIONS

The RamCram has been carefully designed to give years of trouble free
service, but like most computer equipment, it contains MOS devices that
can be damaged by static electricity if improperly handled. Please
observe the following rules when handling the RamCram or any other
board used in your DELTA 1000 CPU:

  1. Handle boards only when necessary.

  2. Hold the board only by the edges.

  3. Make sure that you are grounded before you handle the board by
     touching a grounded object such as a power supply case etc..
     Use an antistatic wrist strap if necessary.

  4. When working on the board (setting switches etc.), work only
     on conductive surfaces, if possible. Set the board on a conductive
     plastic bag if necessary.

  5. Store any boards removed from system in a conductive plastic
     bag or other static proof container.

2-1 DETERMINE YOUR DELTA CONFIGURATION.

The DELTA 1000 (here after referred to as DELTA) can be either of two
different models, the W1000 or the W1017. A W1081 is hardware identical
to a W1017, so refer to W1017 instructions to install your RamCram if
you have a W1081. It is important that you know which model you have
in order to install the RamCram properly. There are several ways to
tell which model you have, but the easiest is to look at the card cage.
The W1000 has 27 slots numbered right to left, while the W1017 has 14
slots numbered left to right. If you have a W1000 model DELTA you must
determine if your Operating System (to be referred to as O.S.) is
permanently stored on an EPROM board (EPROM BASED), or must be loaded
into RAM boards (RAM BASED). All W1017's have EPROM based O.S.

MAIN MEMORY CHIPS
NUMBERS REPRESENT BIT NUMBERS

0	1	2	3	4	5	6	7

8	9	1 0	1 1	1 2	1 3	1 4	1 5

MEMORY ADDRESS
ENABLE SWITCHES

S1   S2

DATA FILE JUMPER
BLOCK

RIBBON CABLE CONNECTOR

TTY BOARD CONNECTOR

DIAGNOSTIC LED'S

1   2   3

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7/85
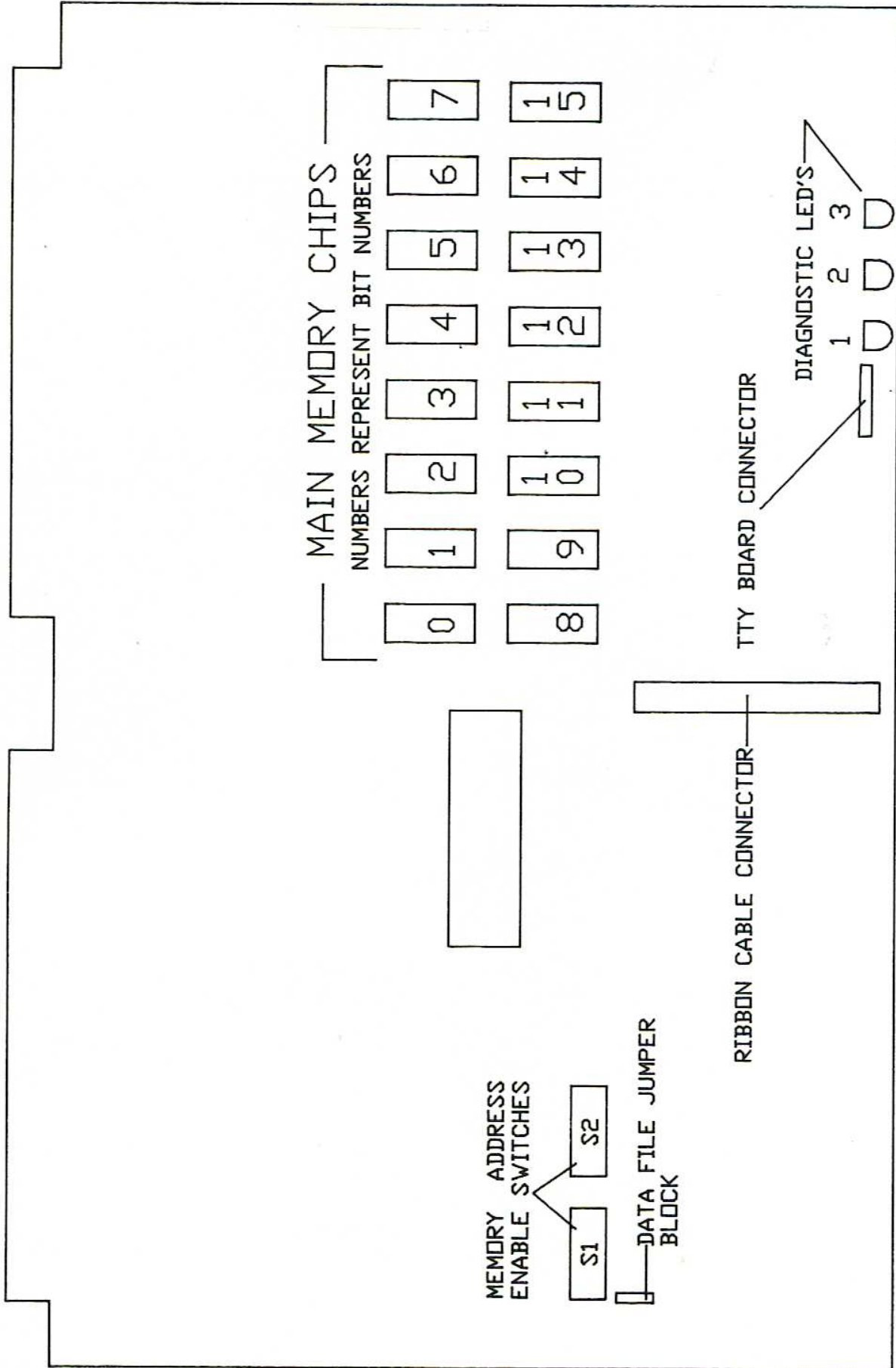
RamCram MAIN BOARD

FIGURE 2-1

2-2 MAKING A NEW DATA FILE BACKUP

There are two old methods of loading and saving the data file (and
O.S.) used with the DELTA: cassette tape, or Techtran Disk. By
whichever method you are using, at this time make a current backup of
your data file. It is also a good idea to make a second backup.

2-3 SETTING SWITCHES ON THE RamCram

In order for the RamCram to work properly in the DELTA, the memory
enable switches must be properly set according to your O.S.
configuration. First, remove the control board (the small board that
sits on top of the main board). Refering to figure 2-1, locate the
memory enable dip switches on the main memory board. Set them
according to the following configurations:

  1. W1017 - EPROM based O.S. - all switches OFF.

  2. W1000 - EPROM based O.S. - all switches OFF.

  3. W1000 - RAM based O.S. - switches S1-1, S1-2, S1-3, S1-4 & S2-8
             OFF, all other switches ON.

Make sure the data file jumper block is installed (see figure 2-1).

Next, replace the control board on to the main memory board making sure
that both ends of the ribbon cable that connects between the two boards
are firmly seated.

Although the RamCram will not be connected to the PC in this chapter,
it is recommended that if you know what baud rate you will be
communicating at, you should set the baud rate dip switches on the
RamCram control board at this time. Refer to Appendix B.

2-4 REMOVING EXISTING RAM BOARDS FROM DELTA.

Before removing memory boards from the DELTA make sure that you have an
up to date data file, made on your present loading system. Refer to
section 2-2.

Turn the DELTA power supply(s) OFF:

 * If you have a W1017 there is only one power supply.

 * If you have a W1000, there are two power supplies. Turn the top
   supply OFF first, and then the bottom. Make sure both supplies
   are off.

Remove the retaining bar across the front of your card cage if installed.

* If you have a W1017, remove any RAM boards from slots 1 or 2.

* If you have a W1000 with RAM based O.S., remove any RAM boards from slots 27, 25, 23, 21 or 11.

* If you have a W1000 with EPROM based O.S., remove any boards from slots 27, 25, 23, 21 or 11. Examine each board to see if it is your EPROM board. Plug this board back into slot 23 of your DELTA.

CAUTION! Do not plug the EPROM board into a wrong slot, or upside down. Permanent damage may occur!

Store all removed RAM boards in conductive plastic bags, or other static proof containers.

2-5 INSTALLING THE RamCram

See figure 3-1 for orientation of RamCram.

* If you have a W1017, plug the RamCram assembly (main memory board plus control board) into slot number 1. CAUTION! This is the far left slot.

* If you have a W1000, the RamCram assembly (main memory board plus control board) can be plugged into any of slots 27, 25, 23 or 21, however it is recommended that you use slot 27. CAUTION! This is the far left slot.

CAUTION! Damage may result if you plug the RamCram into a wrong slot. Warranty does not cover damage as a result of installation error.

Turn the power to your DELTA on:

* If you have a W1017, there is only one power supply; turn it on.

* If you have a W1000 turn the bottom power supply on first, then the top. Make sure both supplies are on.

At this point the RamCram should be in the self initialization and diagnostics mode. This is indicated by LED 3 (bottom) blinking. If LED 3 does not blink, toggle the reset switch on the RamCram control board. If LED 3 still does not blink refer to Appendix F (diagnostics). The initialization takes approximately 30 seconds. When initialization is complete all 3 LED'S will be on. This indicates that the RamCram has passed it's diagnostic tests that are initiated on power up. If all 3 LED's are not on, then refer to Appendix G. After the RamCram has passed it's self initialization routine, you are ready to load the data file (and O.S. if the DELTA is not EPROM based).

2-6 RESET SWITCH

When you toggle the reset switch on the RamCram control board, the RamCram goes through initialization and diagnostic routines that include the following procedures:

1. Orderly halting of the DELTA. (This requires modification of of the TTY board, which will be described in chapter 5.)

2. Test main memory (non-destructive). (LED 3 blinks).

3. Test control memory. (RAM and EPROM)

4. Reinitialize password to (AJS RC).

5. Transfer control of the main memory to the DELTA.

This initialization and diagnostic testing will take approximately 30 seconds (if no errors occur).

CAUTION! If you reset the RamCram while the DELTA is running, and you have not modified your TTY board (see section 5-1), its like "jumping off of a moving bus". This may or may not cause errors in the DELTA O.S. or data file. Therefore, make sure that the DELTA is halted by using the TTY board switches before resetting the RamCram, if you have not made the TTY board modifications.

2-7 LOADING DATA FILE (AND O.S.)

Using your present saving/loading system (cassette or Techtran), load your data file as you normally do. If you have a W1000 with RAM based O.S., also load the O.S. at this time. Start your DELTA as you normally would; that is, toggle the switches on your TTY board in the following sequence:

1. All switches down.

2. Toggle switch 3 (up then down)

3. Switch 2 up.

4. Switch 1 up.

5. Switch 4 up.

Your DELTA should now be running. This is indicated by lights on channel boards (W1017 slots 10-14, W1000 slots 1-10) blinking. Also the 2nd LED (from the top) on the TTY board should be on. The 3rd light should be off. If not, halt the DELTA (all switches down) and repeat the loading and starting procedure. If you still have problems, double

check the switch positions on the RamCram board as described in section 2-3. Do not unplug board with power on. Try loading and starting again. If you still experience trouble please call AJS Technology for assistance.

This completes the first phase of your RamCram installation.

Chapter 3: INTERFACING THE RamCram TO YOUR PERSONAL COMPUTER

Now that you have the RamCram working in the DELTA as a memory board, we will go on to the next phase of the RamCram installation: interfacing the RamCram to your personal computer (hereafter referred to as a PC). Do not proceed with the installation outlined in this chapter until you have completed the initial installation as outlined in chapter 2.

3-1 MINIMUM PC REQUIREMENTS.

Since the PC will be used to communicate with the RamCram to allow the user to access the RamCram menu driven software, and to save and load data file and O.S., we must set minimum requirements that the PC must meet. They are:

1. A minimum of 1 disk drive for saving/loading data file or O.S.

2. A minimum of 1 RS232 serial communications port.

3. Keyboard / CRT or terminal for user interface to PC.

4. Any "off the shelf" or public domain communication software that allows the PC to communicate with the RamCram. Software must include X-Modem protocol file transfer capability.

Any PC that meets the above requirements can be used. This includes the IBM PC and compatibles (recommended), Apple, CPM systems, etc.

3-2 SETTING THE BAUD RATE ON THE RamCram.

Before setting the baud rate on the RamCram, determine what your PC's highest baud rate is. For the IBM PC and compatibles the maximum available baud rate is 9600 baud. If you are using a computer other than an IBM PC or compatible, check your users manual to determine it's maximum baud rate.

Also, if you are adding an extender cable to the EIA cable supplied (longer than about 50 feet), you may not be able to operate at maximum baud rate.

After determining your maximum baud rate available on your PC, refer to Appendix B and set the RamCram baud rate switches to match that of your PC.

DELTA 1000 CARD CAGE

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7/85

PERSONAL COMPUTER (PC)
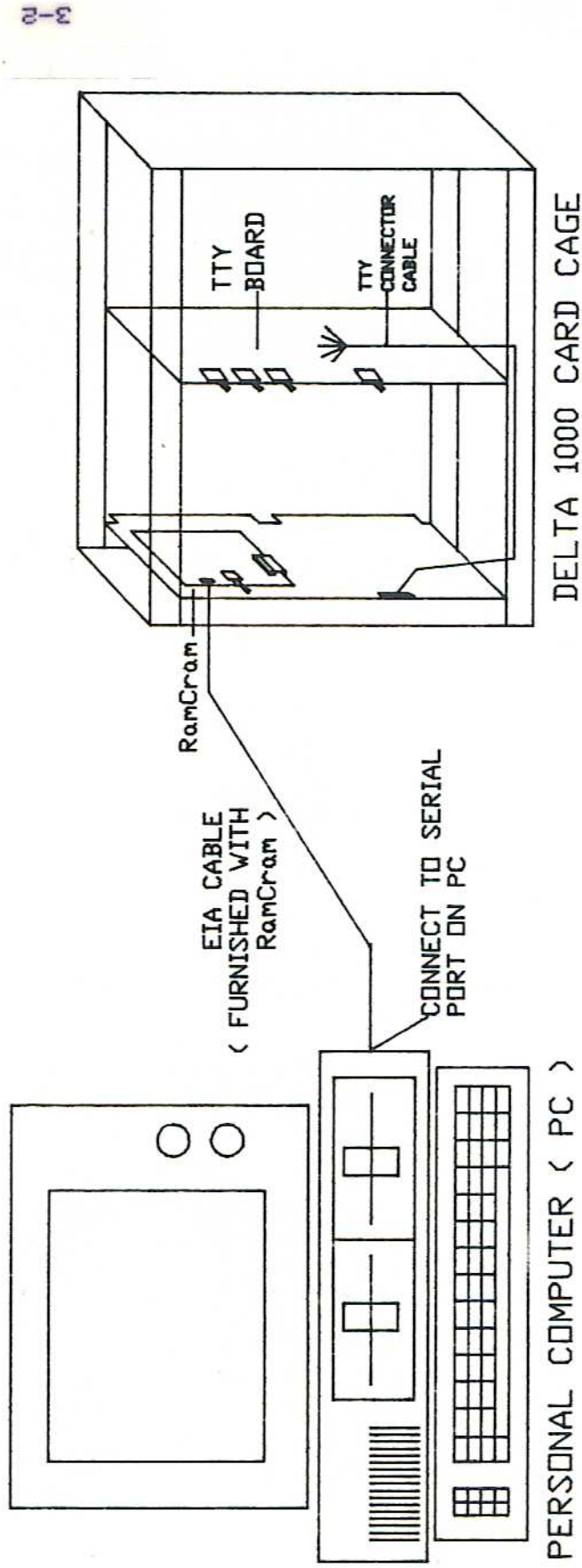
FIGURE 3-1   RamCram / PC INTERFACE - BASIC CONFIGURATION

3-3 CONNECTING THE RamCram TO YOUR PC.

Locate the RS232 cable supplied with the RamCram. Connect the end with
the 5 pin connector to the RamCram control board. Refer to figure 3-1
connect the other end (with the DB25 connector) to your PC's serial
port. Refer to Appendix C for cable pin out. If your PC has a male
serial port jack, it may be necessary to install a "gender reverser" in
line with your cable. Also, be sure that the plug wiring is compatible
with your PC. It may be necessary to reverse pins 2 and 3. Some
computers may require that pin 4 be jumpered to pin 5, and pin 6 be
jumpered to pin 20. Refer to your computer's manual.

3-4 RUN AND SET UP YOUR PC COMMUNICATIONS SOFTWARE.

Refer to your communication software manual for instructions on how to
start it up. Take time to become familiar with its operation. Once
you have started your communication software, you must then set the
communication parameters. Set your communications port (serial port)
baud rate to match that which you set on the RamCram control board.
Also set communications parameters as follows:

  8 DATA BITS, NO PARITY, 1 STOP BIT

Be sure that it is set up for the proper port, if you have more than
one port. Also, be sure that the baud rate matches the baud rate set
on the RamCram.

3-5 TEST INITIAL COMMUNICATIONS TO RamCram.

Now that you have the RamCram connected to the PC and the
communications software running, you will test to see that everything
is working properly together.

Hit the "/" (slash) key on your keyboard. If everything is connected
properly, the RamCram will respond with:

  ENTER PASSWORD:

If you see this message on your screen, then the second phase of the
RamCram installation is complete. If you did not get the above message
on your screen, recheck the cable requirements of your PC's serial port
with that listed in Appendix C. Next, check the communication
parameters that you set in section 3-4. Finally, check to make sure
that you are on the correct serial port, if you have more than one. If
all of the above fails, please contact AJS Technology for assistance.

Before proceeding with the next phase of the installation, which
continues in chapter 5, please become familiar with the RamCram
software as outlined in the next chapter (chapter 4).

Chapter 4: USING THE RamCram

Now that you have installed the RamCram in the DELTA (chapter 2), and have interfaced it to the PC (chapter 3), you can now familiarize yourself with the RamCram software. Please take the time to read the whole chapter, particularly sections 4-6 and 4-7 which deal with saving and loading the data file and O.S.. This chapter will also serve as a reference guide for future RamCram operation.

4-1 SIGNING ON THE RamCram

To use the RamCram, you must first sign on with a password. The reason for having a password is so that unauthorized users cannot gain access to your system and tamper with the DELTA. To sign on, first hit the "/" (slash) key. The RamCram will respond with:

 ENTER PASSWORD:

Now enter your six character password followed by (RET). If this is the first time that you have signed on the RamCram, or if you have not changed the password as outlined in section 4-11, the password is:

 AJS(space)RC (RET)

Notice that all letters are capitalized and the fourth character is the "space" character, formed by hitting the space bar on your keyboard. When you type in the password, it is not displayed on your screen. If you enter an incorrect password (followed by (RET)), you will see the following on your display:

 *** ILLEGAL PASSWORD : try again
 ENTER PASSWORD:

Try entering your password again, remembering that the password must be exactly six characters, followed by (RET). If you make a mistake while entering your password, hit the (/) key. The RamCram will redisplay:

 ENTER PASSWORD:

See section 4-11 if you wish to change your password. If you have forgotten your old password, see Appendix J for taking control of the DELTA away from the RamCram. Halt the DELTA using the TTY board switches. Now, toggle the reset switch on the RamCram control board. This will cause the RamCram to reinitialize, and will reset the password to the default password (AJS RC). Your O.S. and data file will not be destroyed since the memory tests that are performed during initialization are non-destructive.

Once you have entered the correct password, then the RamCram will
display the header followed by the MAIN MENU:


```
****************************************
**                                    **
**    A J S   T E C H N O L O G Y     **
**    ----------------------------    **
**    RamCram - 64k Memory System     **
**    ----------------------------    **
**    Copyright 1985  Version 1.0     **
**                                    **
****************************************
```


```
M A I N   M E N U
1. Diagnostics
2. Load data to RamCram
3. Save data from RamCram
4. Access memory
5. Start CPU
6. Halt CPU
7. Change password
8. TTY board switch control
9. Sign off

ENTER CHOICE:
```


4-2 CHOOSING AN ITEM FROM THE MENU

To choose an item from a menu, simply enter the number corresponding to
the item that you wish to choose and hit <RET>. The RamCram will then
either display the next menu or you will be at the function that you
desire, in which case the RamCram will either execute the command or
you will be asked to input further data. If you enter a character
other than a number shown on the menu, followed by <RET> then the
following error message will be displayed:

```
 *** ERROR : Please try again  (hit </> to abort)
 ENTER CHOICE:
```

At this time, simply reenter your choice, or if you hit </> you will
be returned to the previous menu.

4-2.1 CHOOSING AN INCORRECT ITEM

If you choose an incorrect item, then simply hit the </> (slash) key.
This will return you to the previous menu. Also, hitting <RET> without
first entering a number will bring you to the previous menu. If you
have entered the wrong item number, but have not entered <RET>, you can
hit the backspace key (or ctrl-H) and reenter the correct number.

4-2.2 The <RET> Key

In this chapter, and on the RamCram display, the <RET> symbol is used
to refer to the carriage return key on your keyboard. It may be labled
RET, CR, RETURN, ENTER, <--' (as on the IBM PC), etc.

4-2.3 The </> Key

The </> (slash) key is your universal abort key. It will terminate
just about any function. When you are at a particular menu waiting to
choose an item, hitting the </> key will return you to the previous
menu (unless you are at the MAIN MENU, in which case the MAIN MENU will
be displayed again). If the RamCram is executing some function that you
wish to abort, then hitting </> will terminate that function.

4-2.4 HALT CAUTION MESSAGE

When you choose a function that requires that the DELTA be halted, the
RamCram will display the following message:

```
    ***************** CAUTION *****************
    **    This  procedure requires  halting    **
    **    of the CPU. When you are finished,    **
    **    return to MAIN MENU and start CPU.    **
    *******************************************
```

  Hit <RET> to continue, or </> to return to menu

If you have not yet modified the TTY board, you must, at this time,
halt the DELTA using the switches on the TTY board (switch 4 down,
switch 2 down, switch 1 down) before hitting <RET>.

If you have modified the TTY board, hitting <RET> will halt the DELTA
for you automatically.

4-2.5 Automatic Sign Off if Menu Item not Chosen

The RamCram has a built in automatic sign off feature that signs you
off when the RamCram is displaying any menu and you have not chosen an
item from that menu within the last 5 minutes. This will protect the
DELTA from tampering by unauthorized users in case you forget to sign
off. If you are automatically signed off, simply sign back on using the
procedure shown in section 4-1.

4-3 STATUS LED'S

There are three LED's on the RamCram main memory board. Each light has
a different meaning depending on the function that the RamCram is
executing at the time. There are 4 modes that the LED's can operate
in as described below:

1. Normal Mode: If you are not loading, saving, or running memory
    diagnostics, the LED's will be in the following mode:

    LED 1   ON = No errors have been found in any previous main memory
                  test since the RamCram was last powered up or reset.

            OFF = An error was found during a previous main memory
                  test.

    LED 2   ON = No errors have been found in any previous control
                  board test since the RamCram was last powered up or
                  reset.

            OFF = An error was found during a previous control board
                  test.

    LED 3   ON = DELTA has control of main memory.

            OFF = RamCram has control of main memory.

2. Main Memory Test Mode: This mode is valid only while the main
memory test is being executed. This mode is also valid for testing
partial main memory.

    LED 1 OFF   (ON after the first successful test pass and no
                  previous or subsequent errors).

    LED 2 OFF

    LED 3 Blinking   (shows that memory test is taking place)

Once the main memory test has ended, the LED's will revert to the
"Normal mode". If a memory error was encountered during this test
or any previous test, LED 1 will not light in the normal mode until
the reset switch on the RamCram control board has been toggled.

RamCram Penetration Menu

MAIN MENU

1. Diagnostics	(4—5)
2. Load data to RamCram	(4—6)
3. Save data from RamCram	(4—7)
4. Access memory	(4—8)
5. Start CPU	(4—9)
6. Halt CPU	(4—10)
7. Change password	(4—11)
8. TTY board switch control	(4—12)
9. Sign off	(4—13)

1. Test main memory RAM	(4—5.1)
2. Test control board RAM	(4—5.2)
3. Test control board firmware	(4—5.3)
4. Calculate OS checksum	(4—5.4)
5. Return to main menu	

1. Test all RAM once	(4—5.1.1)
2. Test all RAM continuously	(4—5.1.2)
3. Test partial RAM	(4—5.1.3)
4. Return to main menu	

1. Binary load	(4—6.1)
2. X—Modem protocol load	(4—6.2)
3. Return to main menu	

1. Save OS	(4—7.1)
2. Save data file	(4—7.1)
3. Return to main menu	

1. Binary save	(4—7.1)
2. X—Modem protocol save	(4—7.2)
3. Return to main menu	

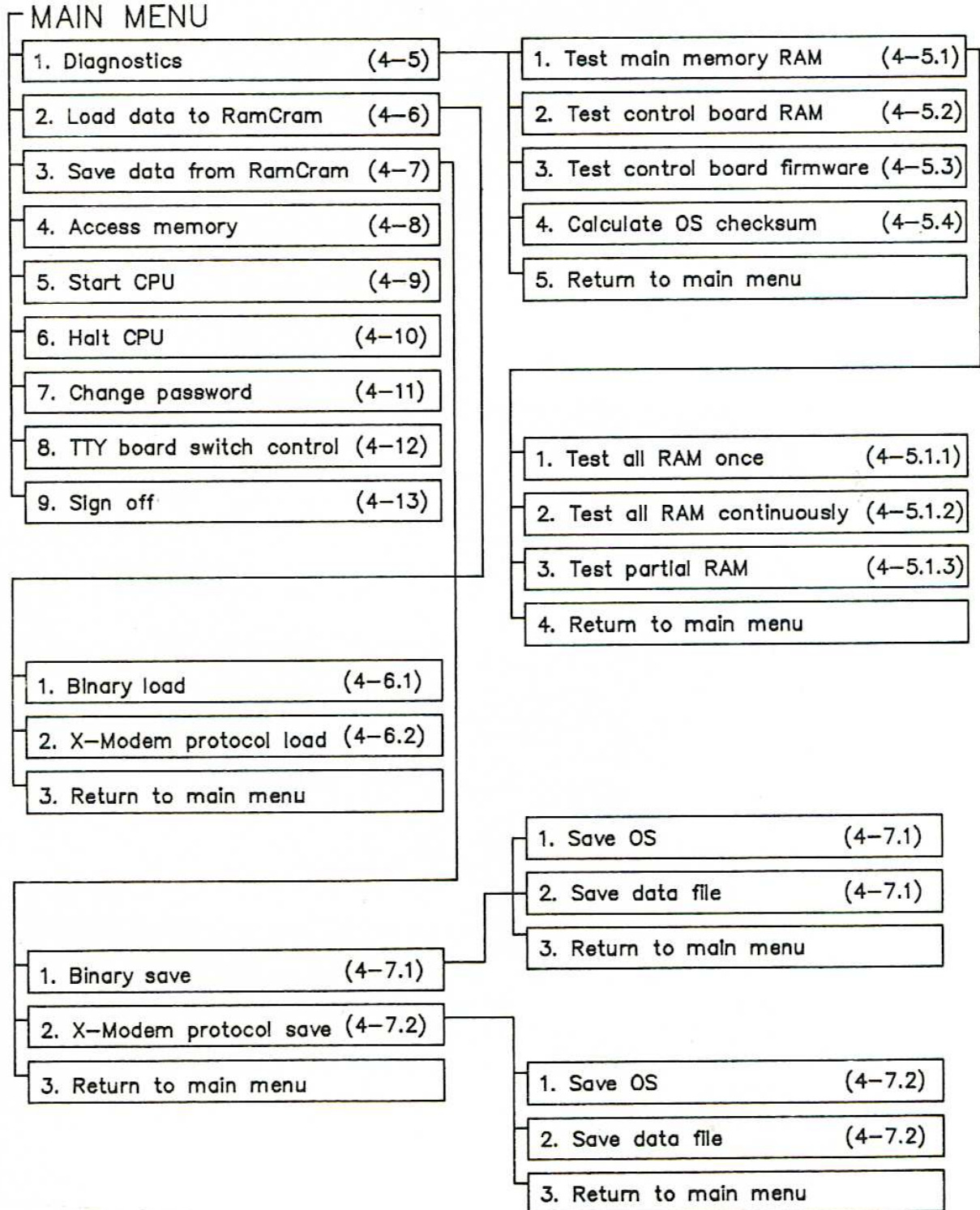|	
1. Save OS	(4—7.2)
2. Save data file	(4—7.2)
3. Return to main menu	

FIGURE 4—1

3. Load Data to RamCram Mode: The LED's are in this mode only
   while the RamCram is loading a file from the PC. The LED's have
   the following meaning:

   LED 1 Blinking (indicating data being received)

   LED 2 OFF

   LED 3 OFF

   Once the data has been loaded to the RamCram (or time out occurs),
   the LED's will revert to the "Normal Mode".

4. Save Data from RamCram Mode: The LED's are in this mode only
   while the RamCram is transmitting data to the PC. The LED's have
   the following meaning:

   LED 1 OFF

   LED 2 Blinking (indicating that the RamCram is transmitting data)

   LED 3 OFF

   Once the data has been saved from the RamCram (or time out
   occurs), the LED's will revert to the "Normal Mode".

4-4 RamCram MENU PENETRATION

Figure 4-1 shows the RamCram penetration menu. To choose a particular
function listed in the menu, choose the menu number corresponding to
that function and keep selecting items in subsequent menus until you
have reached the function that you desire. For example, if the MAIN
MENU was displayed and you wanted to "Test control board RAM", you
would enter 1 (RET) (to choose Diagnostics) and then enter 2 (RET) to
choose "Test control board RAM". Each function is described in the
section as shown on figure 4-1.

4-5 DIAGNOSTICS

Diagnostics have been provided to help you isolate and correct problems
with the RamCram memory should they occur. They allow you to test main
memory board RAM, control board RAM, control board firmware (EPROM),
and calculate a checksum on the O.S. portion of main memory RAM
(checksum not valid if your DELTA has EPROM based O.S.).

4-5.1 Test Main Memory RAM

The main memory is the memory that the DELTA uses for data file and
O.S.. If a problem is suspected with main memory, these tests will
determine if there is an error and where the error occurs so that the
defective memory chips can be replaced. When a test of the main memory

is initiated, the RamCram will display an error message if an error occurs showing the location of the error, and what the error was. The RamCram will also turn off LED 1 on the main memory board. See Appendix F to interpret any error message that might occur.

The main memory can be tested in three different ways:

1) Test all memory once

2) Test all memory continuously

3) Test partial memory (once)

Once you choose the test that you want, the RamCram will display the "Halt" caution message (see section 4-2.4).

4-5.1.1 Test All Memory Once

This test will determine if there are any "hard" bit failures. The test takes approximately 30 seconds to complete. If you want to terminate this test before it is complete, hit </> to abort. See Appendix F to interpret error messages.

4-5.1.2 Test All Memory Continuously

Some memory errors are intermittent in nature and are hard to detect, especially if the test is run only once. Therefore this test, which performs an added test for "weak" memory cells, has been included to exhaustively check your memory; it will run until you wish to terminate it. To abort this test hit </>.

After the "Halt" caution message is displayed, then you will see the following on the display:

 ** WARNING! This test will destroy your O.S. and data file.
 Hit <RET> to continue (</> to abort)

If you want to execute this test, then hit <RET>, which will display the next message:

 Select Static test delay time (0 to 9 minutes)
 ENTER CHOICE:

This will cause the memory test to pause for the time that you select in order to test for weak memory cells that bleed down after they have been written into. These weak memory cells may not show up as defective with the rapid write / read sequence of a standard memory test.

After each pass of the test, the RamCram will display the number of
passes (in hexadecimal) that have been completed so far, and the
total number of errors (in hexadecimal) that have occurred since the
test was started. The display will look like this:

 Pass = 0023   Total errors = 0000

Refer to Appendix F to interpret error messages.

4-5.1.3 Test Partial Memory Once

This test is used to detect "hard" bit failures in a range of memory
that you specify. After you see the "Halt" caution message, the
RamCram will display:

 ENTER START ADDRESS:

At this time, enter a 4 digit hexadecimal number corresponding to the
memory address that you wish to start the test at, and hit <RET>. The
RamCram will then display :

 ENTER END ADDRESS:

after which you enter a 4 digit hexadecimal number that is equal to the
memory address that you wish the test to end at. The RamCram will then
execute the test on the specified memory range and return you to the
"Test main memory RAM" menu. If you hit </> as a response to either
address, then you will be returned to that menu. If you enter a
character other than 0 through 9, A through F, <RET>, or </>, you will
hear a BEEP from the terminal. If you make a mistake while entering
either address, simply keep entering the correct value before you hit
<RET>. The RamCram will accept only the last four hexadecimal digits.
For example in the following display

 ENTER START ADDRESS : 35C3500

only the last four digits entered - 3500 - would be accepted as the
starting address.

See Appendix F to interpret any error messages.

4-5.2 TEST CONTROL BOARD RAM

The RamCram control board contains a small amount of RAM which it uses
for scratchpad. This memory, however, is inaccessible to the DELTA.
This test will test the control RAM once, and if there are no errors,
you will see the following display:

 Control board RAM passed diagnostics

Refer to Appendix F to interpret any error messages.

4-5.3 TEST CONTROL BOARD FIRMWARE

The firmware is the Eraseable Programmable Read Only Memory (EPROM)
that contains the software for the RamCram and is located on the
control board. The firmware is tested by calculating a checksum on the
EPROM and comparing it with a stored value that the checksum should be.
If the actual checksum is equal to the stored value then you will see
on the display:

 Control board firmware verifies

If the actual checksum is not equal to the stored value then an error
occurs, and you will see on the display:

 *** ERROR : Control board firmware does not verify

If you should see this message, please contact AJS Technology for
further assistance.

4-5.4 CALCULATE O.S. CHECKSUM

This function can be used to see if the code in your O.S. is changing.
Please note, however, that this function is not valid if you have EPROM
based O.S.. Once you have loaded the O.S. into the RamCram you can
execute this function and after the "Halt" caution message is displayed
you will see on the display:

 OPERATING SYSTEM (not valid if EPROM based)...
 Calculated checksum: HHHH

Where HHHH is a four digit hexadecimal number representing the
calculated checksum. Record this number, and if at a later date you
suspect that there is a problem with the O.S., initiate this function
again to calculate a new checksum and compare it with your previously
recorded value.

4-6 LOAD DATA TO RamCram

You will choose this function when you need to load the data file or
O.S. from the PC to the RamCram main memory. After selecting this
function, the RamCram will display the next menu requiring that you
choose whether you want to load your file using binary protocol or
X-Modem protocol. See Appendix E for differences between X-Modem and
binary protocol. When you save a file from the RamCram to the PC, the
file contains information telling whether it is data file or O.S..
Therefore, when you load data to the RamCram, the RamCram knows what
kind of file it is and stores it in the appropriate location.

4-6.1 Binary Load (X-Modem load is recommended - see 4-6.2)

Once you choose the binary load protocol, you will see the "Halt"
caution message" (see section 4-2.4) followed by:

 BINARY PROTOCOL: LOAD OS or DATAFILE
 Send data to RamCram when ready

At this time, from your communications software in your PC , choose the
file you wish to send to the RamCram and start transmitting it.
While the file is being received by the RamCram LED 1 on the main
memory board will blink indicating that data is being received. When
the file transfer is complete, the RamCram will calculate a checksum
from the data it has received. The RamCram will display:

 ... Verifying checksum

There will be a slight pause while the RamCram is calculating. If the
checksum is good the following message is displayed:

 ... Load verifies

If the checksum is not good, the RamCram will display the following:

 *** LOAD ERROR : Checksum did not verify

If the transmission between the PC and the RamCram is broken, the
RamCram will loose data, time out and display the following
message:

 *** LOAD ERROR : File short

The RamCram will not remain in the "load data" mode if data is not
transmitted. If no data is received by the RamCram within about 30
seconds, you will see the "file short" message above and the RamCram
will return to the "Load data to RamCram" menu. Also, if no data has
been sent, hitting </> or <ctrl-X> will terminate the load data to
RamCram and you will see:

 *** File load cancelled

Once the file transfer is complete or aborted, all LED's on the main
memory board will return to the "normal mode".

4-6.2 X-Modem Load   (Recommended)

Once you choose the X-Modem load protocol, you will see the "Halt"
caution message" (see section 4-2.4) followed by:

 X-MODEM PROTOCOL: LOAD OS or DATAFILE
 Send data to RamCram when ready

At this time, from your communications software, choose the file you
wish to transfer to the RamCram and start transmitting it. Be sure to
specify X-Modem protocol. While the file is being received by the
RamCram, LED 1 on the main memory board will blink indicating that data
is being received. When the file transfer is complete, the RamCram
will calculate a checksum from the data it has received and will
display the following message:

 ... Verifying checksum

There will be a slight pause while the RamCram is calculating. If the
checksum is good, the following message is displayed:

 ... Load verifies

If the checksum is not good, the RamCram will display :

 *** LOAD ERROR : Checksum did not verify

The RamCram will not remain in the "Load data" mode if data is not
transmitted. In other words, if no data is received by the RamCram
within about 30 seconds, you will see the following message:

 *** File load cancelled

The RamCram will return to the "Load data to RamCram" menu. To
terminate the load before the file is finished transmitting, hit
<ctrl-X>, or terminate the load from your communications program and
you will see the above message. Once the file transfer is complete,
all LED's on the main memory board will return to the "normal mode".

4-7 SAVE DATA FROM RamCram

This function is used to save the O.S. or data file from the RamCram to
a disk in the PC. After selecting this function, the RamCram will
display the next menu which will ask if you wish to save the file using
binary or X-Modem protocol (X-Modem is recommended). See Appendix E for
a description of the difference between these two protocols. After you
choose the protocol you want, the RamCram will display the next menu,
asking if you want to save data file or O.S.. Since the process of
saving data file is identical to the process of saving O.S. they will
not be described separately. After you have chosen between saving data
file or O.S., the "Halt" caution message is displayed on the screen
(see section 4-2.4), and there is a short pause while the RamCram
calculates a checksum on the file that you are about to save.

4-7.1 Binary Save   (X-Modem is recommended see 4-7.2)

When the RamCram is ready to transfer its file, then the following is
displayed on the screen:

```
 BINARY PROTOCOL : SAVE OS                           (or SAVE DATA FILE)
 RamCram ready to send : open your file
 ( After data transfer is completed, close file and hit (RET) )
```

At this time, through your PC's communication software, open a file
that will be used to receive the O.S. or data file. After the file is
open, hit (RET) again. This will tell the RamCram that the PC is ready
to receive a file, and the RamCram will start transmitting. While the
file is being transferred, LED 2 on the RamCram board will blink,
indicating that data is being transmitted. (Note: It is recommended
that you use X-Modem protocol to transfer files, instead of the binary
protocol. See Appendix E for a description of the differences between
binary and X-Modem protocols).

When all of the data has been transmitted (LED 2 is no longer
blinking), close the file you are saving your data on (through your
communications software) and hit (RET). This will return you to the
"Binary save O.S. or data file" menu. To abort the file saving
process, hit (/) or (ctrl-X).

4-7.2 X-Modem Save   (Recommended)

When the RamCram is ready to transfer its file, the following is
displayed on the screen:

```
 X-MODEM PROTOCOL : SAVE OS                           (or SAVE DATA FILE)
 RamCram ready to send : open your file
```

At this time, through your PC's communication software, open a file
that will be used to receive the O.S. or data file. Make sure that you
specify X-Modem operation. When you open your file and start
communications, the PC will tell the RamCram that the PC is ready to
receive a file, and the RamCram will start transmitting. While the
file is being transferred, LED 2 on the RamCram will blink, indicating
that data is being transmitted.

When all of the data has been transmitted (LED 2 is no longer
blinking), your communications software will close your file for you.
The RamCram will return you to the "X-Modem save O.S. or data file"
menu. To abort the file saving process hit (ctrl-X).

4-8 ACCESS MEMORY

WARNING!! Do NOT change the contents of data file or O.S. memory
locations. Doing so may result in faulty operation of the DELTA! Only
qualified personnel should use the access memory function.

The "Access Memory" command will allow you to examine and / or replace
the contents of main memory. When you choose this function, you will
see the "Halt" caution message (see section 4-2.4) if the RamCram has
not already halted the DELTA. Then the following is displayed:

 ACCESS MEMORY
 ENTER ADDRESS (</> to abort):

Enter the four digit hexadecimal address of the memory location that
you wish to examine or replace followed by <RET>. The RamCram will
then display the address that you have requested along with the
contents of that address in the following format:

 AAAA:HHHH

Where AAAA is the address that you have entered, and
      HHHH is the contents of memory at that address.

If you want to replace the memory contents at that address (see warning
at top), then enter the four digit hexadecimal value that you want to
replace it with and hit <RET>. Hitting <RET> changes the contents of
this location and advances you to the next memory location, which is
displayed on the line directly below the previous address. To examine
an address, but not replace it, hit <RET> or <,> (comma) without
entering a value. To stop examining memory, hit </>. This will cause
the RamCram to display:

 ENTER ADDRESS (</> to abort):

At this time, if you wish to examine another memory location, then
follow the procedure outlined above. If you want to discontinue
accessing memory, then hit </> and you will be returned to the MAIN
MENU.

While entering a four digit hexadecimal value such as the address or
the memory replacement value, if you enter any character other than 0
through 9 or A through F, <RET>, or </> you will hear a BEEP from the
terminal. If you make a mistake while entering either the address or
the replacement value, simply keep entering the correct value before
you hit <RET>. The RamCram will accept only the last four hexadecimal
digits. For example in the following display

 ENTER ADDRESS (</> to abort):35C3500 <RET>

only the last four digits - 3500 - will be accepted as the address.

4-9 START CPU

This command accomplishes two functions. First, it will give the DELTA
control of the main memory (see figure 1-1). The second function
requires that the TTY board modification be made (see section 5-1). If
the modification has been made, then the RamCram has control of the
switches on the TTY board. It will automatically initiate the
following sequence to start the DELTA:

 Toggle switch 3 (UP then DOWN)

 Switch 2 UP

 Switch 1 UP

 Switch 4 UP (enable watchdog timer)

When this command is chosen, you will see the following on your
display:

 ...Restarting CPU

Then the RamCram will return to the MAIN MENU. The LED's on the
RamCram will revert to the "Normal mode" (LED 3 will turn ON). See
section 4-3 for interpretation of LED's.

4-10 HALT CPU

This command also accomplishes two separate functions. First, if you
have made the TTY board modifications, the DELTA will be brought to an
orderly halt by controlling the switches on the TTY board in the
following sequence:

 Switch 4 DOWN (disable watchdog timer)

 Switch 2 DOWN

 Switch 1 DOWN

 Toggle switch 3 (UP then DOWN)

Then the RamCram control board is given control of the main memory. If
you have not made the TTY board modification and you issue this command
without first halting the DELTA by manually throwing the switches on
the TTY board in the sequence as shown above, you will prevent the
DELTA from coming to an orderly HALT. When you select this command,
and the DELTA is not already HALTED, you will see the "Halt" caution
message (see section 4-2.4), followed by :

 ...Halting CPU

After a slight pause, you will be returned to the MAIN MENU, and LED 3 will turn OFF (see section 4-3 for interpreting LED's).

4-11 CHANGE PASSWORD

This function will allow you to change the password from the default password "AJS RC". Your new password must consist of any combination of exactly six displayable characters [A-Z (upper or lower case), 0-9, @, #, $, (space), etc.]. Please note, however, that if you reset the RamCram by toggling the reset switch on the control board, that the password will revert to the default password (AJS RC).

When you choose "Change password" from the MAIN MENU, the RamCram will display on the screen:

 ENTER NEW PASSWORD:

At this time you can enter your new password. Remember that it must be exactly six characters, followed by (RET). If you make a mistake, hit (/) and you will return to the MAIN MENU. If you enter more or less than six characters, the RamCram will display:

 *** ERROR : Must be exactly 6 characters ((/) to abort)
 ENTER NEW PASSWORD:

Reenter your new password, or hit (/) to revert to the MAIN MENU.

4-12 TTY BOARD SWITCH CONTROL

This function is valid, only if you have made the modifications to the TTY board as outlined in section 5-1. It allows you to control each switch on the TTY board individually from the PC. When you choose this function from the MAIN MENU, the following is displayed:

 TTY BOARD SWITCH CONTROL
 STATUS: 1U 2U 3D 4U
 ENTER CHOICE:

The status line shows you that switches 1,2,&4 are up (U), and switch 3 is down (D). If you want to change the position of any switch, enter the switch number followed by "U" for up or "D" for down (do not hit (RET)). The RamCram will send the command to the switch you have chosen and update the status on the screen. The following example shows the screen display after successively throwing switches 4, 2, and 1 down, and toggling switch 3 (up then down):

```
TTY BOARD SWITCH CONTROL
STATUS:            1U 2U 3D 4U
ENTER CHOICE:4D    1U 2U 3D 4D
ENTER CHOICE:2D    1U 2D 3D 4D
ENTER CHOICE:1D    1D 2D 3D 4D
ENTER CHOICE:3U    1D 2D 3U 4D
ENTER CHOICE:3D    1D 2D 3D 4D
```

To terminate the TTY BOARD SWITCH CONTROL function, hit (/) or (RET),
and you will be returned to the MAIN MENU.

4-13 SIGN OFF

By selecting this function, you will sign off of the RamCram. This
gives added "security" when the system is not attended. To reaccess
the RamCram, sign on using the procedure outlined in section 4-1.

Chapter 5: DELTA HARDWARE

In this chapter we will complete the basic installation of the RamCram which includes modifying the TTY board, and removing other unused boards. Please review the handling precautions at the beginning of chapter 2 before proceding.

At this time, save your data file, using the techniques described in chapter 4 section 4-7. Note, however that you will have to halt the DELTA using the switches on the TTY board. You will see the following message:

```
****************** CAUTION ******************
**    This  procedure requires  halting   **
**    of the CPU. When you are finished,   **
**    return to MAIN MENU and start CPU.   **
*********************************************
```

When you receive the above message, throw switch 4 down first, then switch 2 down, then switch 1 down <u>before</u> hitting the (RET) key to continue.

Also, refering to chapter 4 section 4-7, save your O.S. if your W1000 has RAM based O.S.

5-1 TTY BOARD MODIFICATION.

The DELTA TTY board controls halting, restarting and resetting of the DELTA. Therefore in order to fully utilize the RamCram's capabilities you must make a few modifications to the TTY board. The modifications that follow will in no way alter the functions or capabilities of your DELTA. In fact, if for any reason you wish to replace the RamCram with your original RAM boards, the TTY board will function as it did before the modification. If you do not wish to modify your TTY board at this time refer to each function in chapter 4 to see which ones will not work without TTY modifications.

Modification of the TTY board should be done by a qualified technician who is familiar with the techniques described herein.

Before you start, be sure you have the following parts and tools:

    1. 3 resistors - supplied with RamCram.

    2. TTY interface cable - supplied with RamCram.

    3. Soldering iron and solder, 30 watt or less.

    4. X-ACTO knife or other sharp cutting tool.

    5. Felt tip pen.

FIGURE 5-1   TTY BOARD MODIFICATION

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LEGEND

▲ RESISTOR OR WIRE TACK POINT

① WIRE NUMBER CORRESPONDING TO CONNECTOR PIN NUMBER

X TRACE CUT POINT

A. CUT TRACES (3) WHERE SHOWN

B. SOLDER RESISTORS (3) ACROSS CUT TRACES

C. TACK CABLE WIRES WHERE SHOWN

PLUG CONNECTOR TO RamCram
< PIN 5 NOT USED >
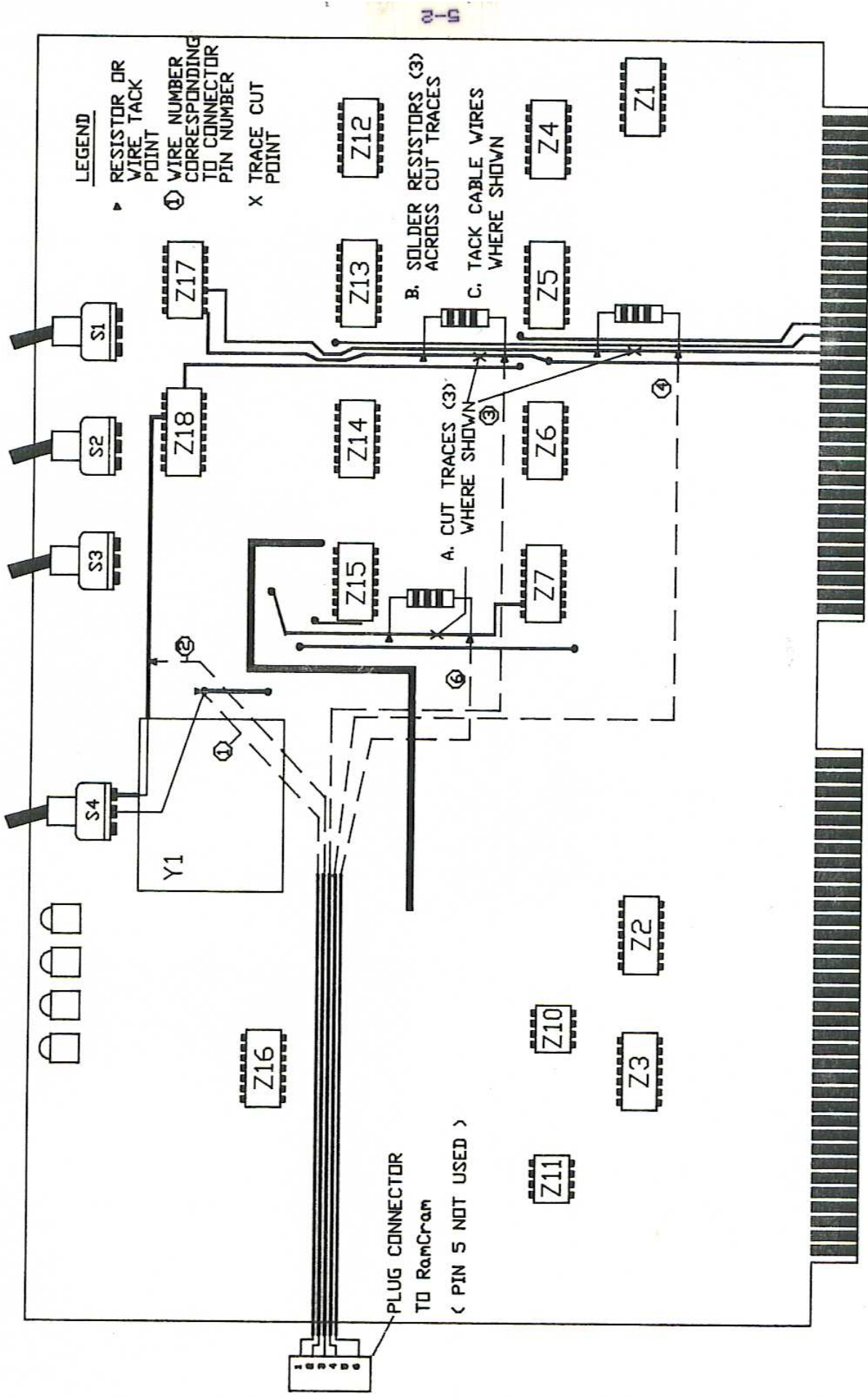
Now we will proceed with the TTY board modification. Carefully follow
each step outlined below.

1. Turn the DELTA power supply(s) off (see section 2-4).

2. Remove the TTY board (W1017 - slot 8, W1000 - slot 13). The TTY
   board has 4 switches and 4 LED's.

3. Refer to figure 5-1. Locate the traces marked with "X" that must
   be cut. Carefully mark these traces with your felt tip pen on
   the TTY board.

4. With your X-ACTO knife or other sharp tool, carefully cut the
   traces you have marked. Do not cut the adjacent traces.

5. Solder a resistor (supplied with the RamCram) across the cut
   trace. Be carefull not to bridge solder between adjacent traces.
   Repeat this step for the other 2 cut traces.

6. Solder the appropriate cable wires to the end of the resistors
   marked. Refer to figure 5-1. Again be careful to avoid solder
   bridges.

7. Solder the last two wires (labled 1 & 2) to the traces shown in
   figure 5-1.

8. Carefully recheck your work. Look for solder bridges, cold
   solder joints and broken cable wires.

9. After you have completed the above modifications and you have
   checked your work, plug the TTY board back into the DELTA - W1017
   slot 8, W1000 slot 13.

Plug the cable from the TTY board that you just added into the RamCram.
See figure 2-1. Throw switch 4 (watchdog timer) on the TTY board DOWN.

Turn on the power to your DELTA:

 * If you have a W1017 there is only one power supply. Turn it on.

 * If you have a W1000 turn on the bottom supply first, then the top.
   Make sure both power supplies are on.

The RamCram will initialize as described in section 2-5. After
initialization is complete, sign on the RamCram as described in section
4-1.

From the MAIN MENU, select TTY board switch control (number 8). Command
switch 2UP (2U) then 1 UP (1U) and look at LED 1; it should be ON. Now
command switch 4 UP (4U). At this time LED 1 should be blinking, which
indicates that the watchdog timer control is working properly. If LED
1 does not operate as described above, then recheck the control cable
wiring to the TTY board.

Load the copy of the data file (and O.S. if you have a W1000 with RAM based O.S.) that you made earlier by using the " Load data to RamCram " command described in section 4.6.

Issue the "Start CPU" command as described in section 4-9. The DELTA should start scanning and LED 2 (located on the TTY board) should be on.

If your DELTA is not running, unplug the cable to the TTY board from the RamCram. Try starting the DELTA with the switches on the TTY board. If the DELTA runs, recheck all of your modifications to the TTY board and check for broken wires on your cable. If the DELTA still does not run, try reloading your data file (and O.S.) and issue the "Start CPU" command again. Finally, power down your DELTA and recheck the modifications that you made to the TTY board. Check for solder bridges, cold solder joints and broken wires. If all of the above attempts fail, contact AJS Technology for assistance.

5-2 ELIMINATING OTHER UNUSED BOARDS FROM YOUR DELTA.

By using the RamCram memory system, you can eliminate the following boards:

  1) RAM boards - (which were elimated in chapter 2)

  2) PROM board - (if you have RAM based O.S.)

  3) The EIA board connected to your Techtram disk (if you have one).

5-3 REMOVING BOOT PROM BOARD. (Optional)

If you have a W1017, or a W1000 with EPROM based O.S. go to section 5-6.

Before you can remove the boot PROM board, you must transfer it's program code over to the RamCram. If you are using an IBM PC or IBM compatible computer use the "Load data to RamCram" command (see section 4-6) and load the file "PROMXFER" located on the floppy disk (included with your RamCram). If you are not using an IBM PC or IBM compatible computer, you must enter the program listed in Appendix K into memory using the "access memory" command. See section 4-8 for details on accessing memory.

Once the program is loaded, make sure all 4 TTY board switches are down, unplug the TTY control cable from the RamCram (if installed), then throw switch 2 UP, then switch 1 UP. This will start the PROMXFER program to run. When the program is finished running, the lights on the TTY board will be in the following state:

    LED1 = ON

    LED2 = OFF

    LED3 = ON

    LED4 = ON

The contents of the Boot PROM are now located in the RamCram memory. Next, reload your O.S. using your OLD loading system (Techtran disk or cassette). Then, using the "Save Data RamCram" command, save your operating system to your PC (see section 4-7). You now have your O.S. and boot PROM code saved as one common file.

Next, turn off your DELTA power supplies. Turn off the top supply first then the bottom, make sure both power supplies are off. Remove your PROM board form slot 12, and store it in a conductive plastic bag or other static proof container. Remove the RamCram from the DELTA, and turn switch S2-8 on the main memory board ON. See figure 2-1. Reinsert the RamCram into the same slot in the DELTA from which it was removed. Before turning on the power supplies, see section 5-4. Turn on the DELTA power supplies, by turning the bottom supply on first, then the top. Make sure both supplies are on.

Wait for the RamCram initialization to complete. Then using the "Load data to RamCram" command, load in the copy of the O.S. file that you just made. See section 4-6 for details on loading a file. Next, using the "Load data to RamCram" command, load in the copy of your most recent data file that you saved in section 5-1. Or you may load your data file using your OLD method (Techtran disk or cassette), then using "Save data from RamCram", save the data file to to the PC (be sure to issue the "Halt CPU" command first). Make sure that the cable from the TTY board is plugged into the RamCram and use the "Start CPU" command to restart your DELTA. If you have not made the TTY board modification, start your DELTA using the switches on the TTY board.

5-4 REMOVING UNUSED EIA BOARD.

Skip this section if you do not use the Techtran disk system for loading and saving data file or O.S.. Otherwise, be sure that you have made a current data file and O.S. backup on your PC as described in section 4-7.

If you were using a Techtran disk, you have an EIA board that is no longer needed. The EIA board is connected to the Techtran disk via a cable that plugs directly into the board. If you have a W1017 it will be plugged into slot 14. If you have a W1000 it will be plugged into

slot 1. Make sure your DELTA power supply(s) is off. Remove the EIA
board and store it in a conductive plastic bag or other static proof
container, and store your Techtran disk drive in a safe location.

5-5 SAVING INITIALIZED O.S. (RAM based O.S. only)

If you have not loaded your O.S. and data file into the DELTA, do so at
this time. Choose "Start CPU" from the MAIN MENU to transfer control
of the main memory to the DELTA (this will start the DELTA if you have
modified the TTY board). If you have not modified your TTY board
as outlined in section 5-1, then start the DELTA by using the switches
on the TTY board (the DELTA cannot be restarted by manually flipping
switches without first selecting "Start CPU"). After the DELTA starts
running, then choose "Save data from RamCram" from the MAIN MENU and
make a backup of your O.S.. Use this "initialized" copy of O.S.
whenever you need to reload the O.S. into the DELTA. Also, make
another copy of the O.S. at this time to use as a backup.

5-6 OTHER CONFIGURATIONS

This concludes the basic installation of the RamCram. If you wish to
operate the RamCram over telephone lines (but no local operation)
refer to Appendix H. If you desire both local operation AND remote
operation over telephone lines, then see Appendix I for information on
this subject.

Appendix A: MEMORY ADDRESS SWITCH SETTINGS

			O.S. CONFIGURATION	
SWITCH	2K ADDRESS BLOCK	EPROM BASED O.S.	RAM BASED O.S. — WITH PROM BOARD	RAM BASED O.S. — PROM BOARD REMOVED
S1-1	8000H — 87FFH	OFF	OFF	OFF
S1-2	8800H — 8FFFH	OFF	OFF	OFF
S1-3	9000H — 97FFH	OFF	OFF	OFF
S1-4	9800H — 9FFFH	OFF	OFF	OFF
S1-5	A000H — A7FFH	OFF	ON	ON
S1-6	A800H — AFFFH	OFF	ON	ON
S1-7	B000H — B7FFH	OFF	ON	ON
S1-8	B800H — BFFFH	OFF	ON	ON
S2-1	C000H — C7FFH	OFF	ON	ON
S2-2	C800H — CFFFH	OFF	ON	ON
S2-3	D000H — D7FFH	OFF	ON	ON
S2-4	D800H — DFFFH	OFF	ON	ON
S2-5	E000H — E7FFH	OFF	ON	ON
S2-6	E800H — EFFFH	OFF	ON	ON
S2-7	F000H — F7FFH	OFF	ON	ON
S2-8	F800H — FFFFH	OFF	OFF	ON

Refer to figure 2-1 to locate switches S1 and S2.

Appendix B: BAUD RATE SWITCH SETTINGS

Refer to figure B-1 and locate the baud rate dip switch. Set the desired baud rate according to the chart below.

	---------SWITCH---------			
BAUD RATE	1	2	3	4
50	ON	ON	ON	ON
75	ON	ON	ON	OFF
110	ON	ON	OFF	ON
134.5	ON	ON	OFF	OFF
150	ON	OFF	ON	ON
300	ON	OFF	ON	OFF
600	ON	OFF	OFF	ON
1200	ON	OFF	OFF	OFF
1800	OFF	ON	ON	ON
2000	OFF	ON	ON	OFF
2400	OFF	ON	OFF	ON
3600	OFF	ON	OFF	OFF
4800	OFF	OFF	ON	ON
7200	OFF	OFF	ON	OFF
9600	OFF	OFF	OFF	ON
19200	OFF	OFF	OFF	OFF

BAUD RATE
DIP SWITCH

EPROM

RAM

RIBBON CABLE
CONNECTOR

RS232 CONNECTOR

RESET SWITCH

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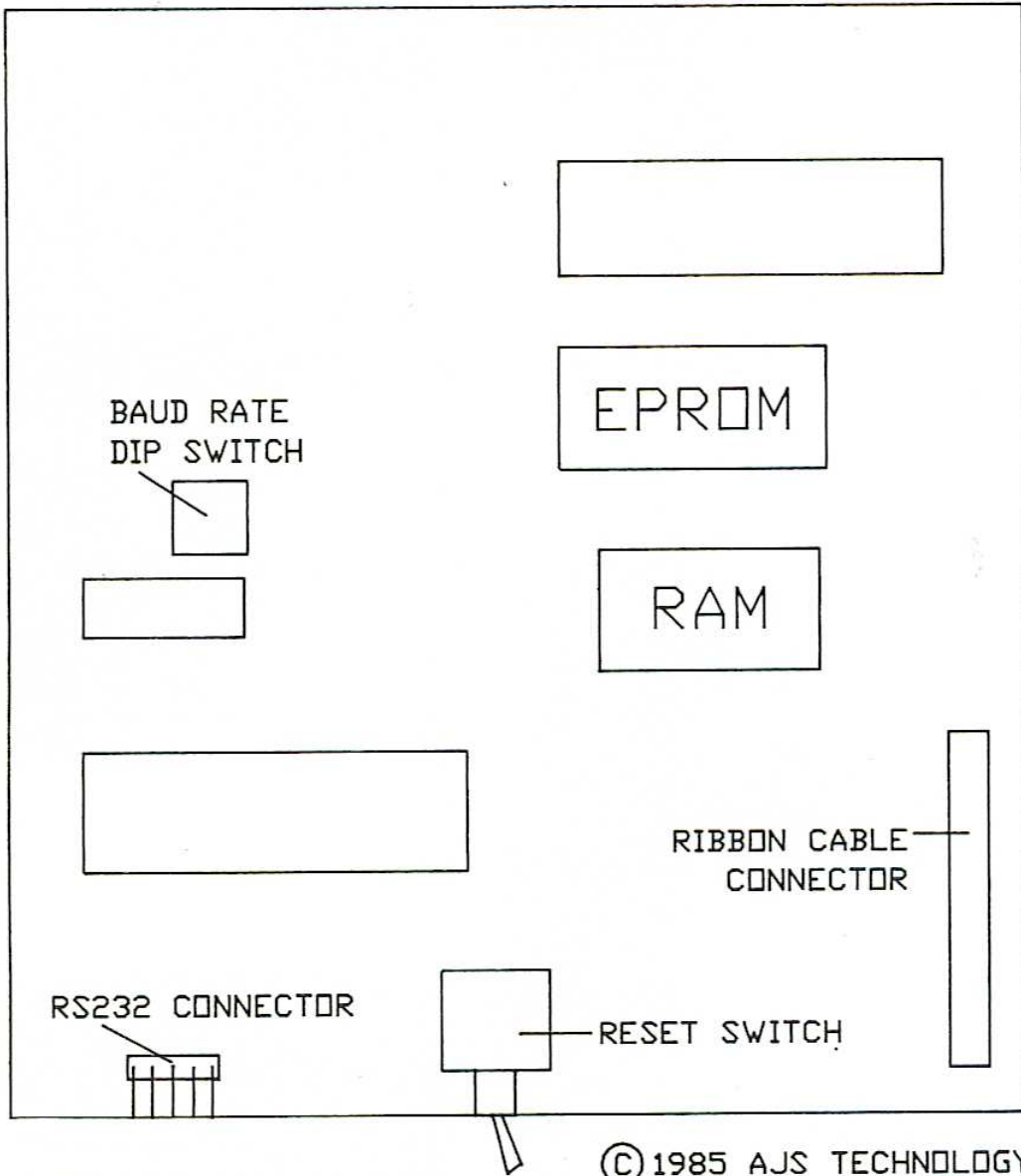
FIGURE B-1   CONTROL BOARD   7/85

APPENDIX C:

RS232 CABLE - RamCram to IBM PC (25 pin)

RamCram   RS232 Female Plug (25 pin)

(top pin) 1 (not used)

          2 ----->---------TXD--------->------- 3

          3 --------------COM---------------- 7

          4 -----<---------RXD---------<------- 2

          5 (not used)

RS232 CABLE - RamCram to IBM PC (9 pin)

RamCram   RS232 Female Plug (9 pin)

(top pin) 1 (not used)

          2 ----->---------TXD--------->------- 2

          3 --------------COM---------------- 5

          4 -----<---------RXD---------<------- 3

          5 (not used)

RS232 CABLE - RamCram to SmartChannel IBM PC (9 pin)
(Gateway via Port 4 of AJS SmartChannel)

RamCram   RS232 Male Plug (9 pin)

(top pin) 1 (not used)

          2 ----->---------TXD--------->------- 3

          3 --------------COM---------------- 5

          4 -----<---------RXD---------<------- 2

          5 (not used)

Appendix D: RS232 CABLE - RamCram TO MODEM

          RamCram   RS232 MALE PLUG

(top pin) 1 ----)----------DTR---------->---- 20

          2 ----)----------TXD---------->---- 2

          3 --------------COM-------------- 7

          4 ----<----------RXD----------<---- 3

          5 ----<----------CD-----------<---- 8

     RS232 CONNECTOR PINOUT FOR USE WITH HAYES MODEM OR COMPATIBLE

Appendix E: X-MODEM VS. BINARY PROTOCOL

There are two methods available on the RamCram that can be used for
loading data to the RamCram or saving data from the RamCram: binary
protocol and X-Modem protocol. When saving a file from the RamCram
using binary protocol or X-Modem protocol, the RamCram calculates the
checksum of the O.S. or datafile (whichever is to be transferred), and
then sends the starting address, the number of bytes to be transferred,
the calculated checksum, and the contents of memory that is to be
saved. When loading a file to the RamCram by either protocol, the
stored checksum is saved and a new checksum is calculated after the
file transfer is complete, and if the two match, then the RamCram will
display that the load verifies. Files made by either method are
compatible; that is, a file saved on the PC using binary protocol can
be loaded to the RamCram using X-Modem and vice versa. The following is
a description of both protocols.

BINARY PROTOCOL

This protocol is provided for customers who do not have X-Modem
protocol available with their communication software or for custom
applications. The RamCram sends data to the PC in a constant stream and
the PC's communication program will capture this information as it is
received and store it for later use. The PC will not check to see that
the information that is received is correct, or that the correct number
of bytes have been sent. If data is lost or altered during
transmission this incorrect information is stored on your disk. If it
is loaded back into the RamCram, you will have a defective data file or
O.S., as indicated by a "Load Error" message. Binary protocol is not
recommended, especially not for transferring files over telephone
lines. X-modem is a superior protocol and thus is recommended over
Binary protocol.

X-MODEM PROTOCOL

This protocol is available on almost every communications software
package. When a file is transmitted using X-Modem, the sending
computer - whether it is the RamCram or the PC - will send a block of
data 128 bytes long plus a checksum of that block. The receiving
computer will calculate a checksum on the block of data and compare it
to the one that was sent. If the checksums match then the receiving
computer will store the block away (in memory on the RamCram or on the
disk for the PC) and request that the next block be sent. If the
checksums do not match then the receiving computer will request that
the data be retransmitted up to 8 times while looking for a match.
This "error checking" method of transferring files combined with
automatic RamCram checksum verification assures you of data integrity.

Appendix F: DIAGNOSTICS

Included with the RamCram software are RAM diagnostic routines (1's, O's, walking 1's, patterns, static bleed down and uniqueness). These diagnostics will allow you to thoroughly test any RAM that you suspect is not operating properly, and determine where the problem is and correct it. A knowledge of the hexadecimal numbering system is required to interpret the results. If you are not familiar with the hexadecimal numbering system, almost any computer primer book will include a section on this subject.

When the RamCram is reset or just powered up, LED 3 will blink. If not, try toggling the reset switch again. If LED 3 still does not blink, check to see if RAM errors are occuring as described below by viewing your PC display (see chapter 3). If there is no display, contact AJS Technology for assistance.

This appendix is divided into two sections: main memory diagnostics, and control memory diagnostics.

MAIN MEMORY DIAGNOSTICS

The main memory is tested by writing certain test bytes into a particular memory location, and reading them back to see if they have changed. If a memory location performs the test with no errors, then the test proceeds to the next memory location, and continues until all memory addresses have been tested.

While running diagnostics on the main memory (see section 4-5.1), if an error occurs, the RamCram will display the following:

```
 *** Main memory RAM error at:AAAA    Should be:SSSS    Actual:BBBB
```

where:

   AAAA is the 4 digit hexadecimal address of the memory location where
         the error occurred;

   SSSS is the 4 digit hexadecimal value of the "test word" that was
         written into the memory location that is being tested;

   BBBB is the 4 digit hexadecimal value that was read back from the
         memory location under test.

The RamCram's main memory is made up of 16 memory chips that are 64k by 1 bit wide, which gives 64k of 16 bit words. To determine where the error occurred you must know what bit was in error. Then the chip corresponding to that bit can be replaced. To determine the location of the error, you have to convert both the "should be" value and the "actual" value from hexadecimal to binary. For example, if you were running the main memory diagnostics and you saw the following:

```
*** Main memory RAM error at:35FC    Should be:AAAA    Actual:AA8A
```

then you would convert both AAAA and AA8A to their binary values:

```
                    1111 1100 0000 0000
                    5432 1098 7654 3210 - bit number (15 on left, 0 on right)
    AAAA (hex) = 1010 1010 1010 1010 (binary)
    AA8A (hex) = 1010 1010 1000 1010 (binary)
```

If we compare each bit we note that all bits are equal, except the
sixth bit from the right. This is where the error occurred. If we
number each bit, starting from the right from 0 to 15 then we see that
bit number 5 is the bad bit. Now that we know which bit is bad, we can
determine which memory chip on the main memory board this corresponds
to. If you refer to drawing 2-1 you will see which memory chip
contains which bit.

If you have a memory chip that is totally defective, you will see a
constant display of error messages; each address of memory will display
an error message. This type of error can be detected by selecting
"Test all RAM once" from the "MAIN MEMORY RAM DIAGNOSTICS" menu. If
you encounter this type of error, you can hit (/) (slash) to abort
the test and, using the method described above, locate the defective
memory chip and replace it.

Some errors are not so easy to locate. If a particular memory chip has
a "weak" memory cell, it may not show up as being defective by running
the memory test only once. Sometimes several passes of the memory test
must be made before an error will occur. For this reason you have the
option to run the memory test continuously, until you desire to
terminate it (hit (/) to abort the test).

If you determine that you have a bad main memory chip, replace it with
either a type 4164 or with a chip with the exact same part number that
is stamped on the chip that you are replacing. Your electronics parts
supplier should be able to assist you with this.

CONTROL MEMORY DIAGNOSTICS

The control RAM test is similar to the main memory test. However,
there is only one RAM chip on the control board. If the control RAM
test encounters an error then you will see the following message:

```
 *** CONTROL RAM ERROR *** at: AAAA
```

where AAAA is memory address where the error occurred.

If the control RAM test reveals a defective control RAM chip, then
refer to figure B-1 to determine the exact chip to replace. Replace
with a type 6116 part number only. Your electronics parts supplier
should be able to assist you with this.

If you suspect your control board EPROM is bad, refer to section 4-5.3.

Appendix G: DIAGNOSTIC LED SUMMARY

NORMAL MODE   (not loading, saving, or diagnostics)

LED1   ON = Good main memory   OFF = Main memory failure

LED2   ON = Good control memory   OFF = Control memory failure

LED3   ON = DELTA controls main   OFF = RamCram controls main
           memory   memory

MAIN MEMORY TESTING

LED1   ON = Completed 1 pass and   OFF = Still in 1st pass of test
           no main memory errors   or bad main memory.
           have been found since
           RamCram was last reset
           or powered up.

LED2   (Always off)

LED3   Blinking

LOADING DATA TO RamCram

LED1   Blinks while receiving data

LED2   (Always off)

LED3   (Always off)

SAVING DATA FROM RamCram

LED1   (Always off)

LED2   Blinks while sending data

LED3   (Always off)

Refer to section 4-3 for a more complete description of LED operation

Appendix H: OPERATING FROM A REMOTE LOCATION
(NO LOCAL OPERATION)

In a day to day operation, the user may wish to be able to load/save
his datafile and O.S., or to restart the DELTA from a remote location,
such as from another building, home, etc. In order to do this you will
need to configure the RamCram and PC as shown in figure H-1. In
addition to the equipment described in chapters 2,3 and 5, you will
need the following:

 2 modems (for communicating over phone lines)
 1 RS232 cable (to connect your PC to a modem)

Since your PC will be communicating with the RamCram over telephone
lines, the speed at which you load and save your files will be limited
by the speed of your modems. Refer to Appendix B and set the baud rate
on the RamCram control board to match that of your modems. Also, refer
to Appendix D for cable requirements. When you set the communication
parameters from your communications software, set for 8 bits, no
parity, and 1 stop bit.

When you transfer a file over telephone lines, use only the X-Modem
protocol - do not use binary protocol.

*** IMPORTANT ***
Using this configuration requires that you modify your DELTA TTY board
as outlined in section 5-1. Loading and saving the data file or O.S.
requires that you have the ability to start and halt the DELTA, which
is achieved by the TTY board modification.

MODEMS FURNISHED BY OWNER

EIA CABLE
(FURNISHED
WITH RamCram)

TELEPHONE
LINE

MODEM

MODEM

RamCram

TTY
BOARD

TTY
CONNECTOR
CABLE

DELTA 1000 CARD CAGE

EIA CABLE
(FURNISHED BY
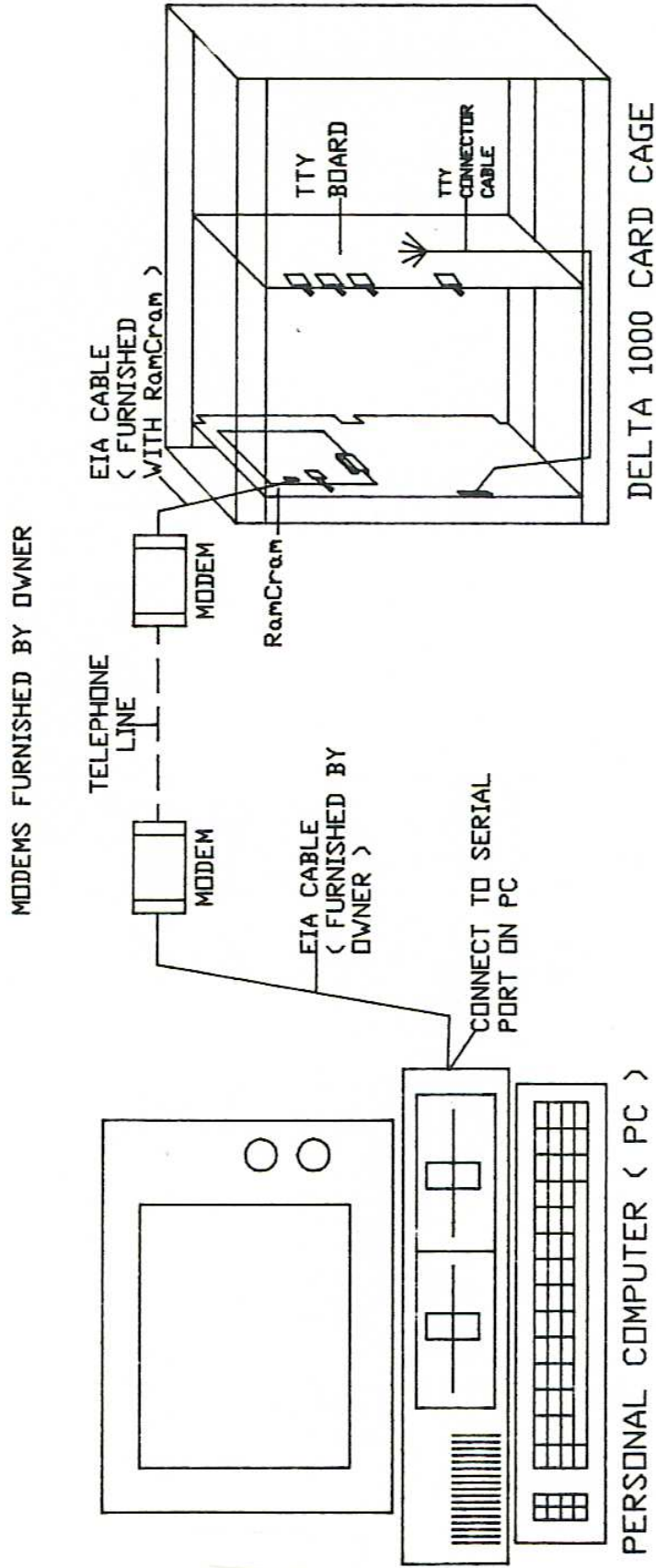OWNER)

CONNECT TO SERIAL
PORT ON PC

PERSONAL COMPUTER (PC)

FIGURE H-1 RamCram / PC INTERFACE - REMOTE OPERATION

H-2

OPERATING FROM BOTH LOCAL AND REMOTE LOCATIONS
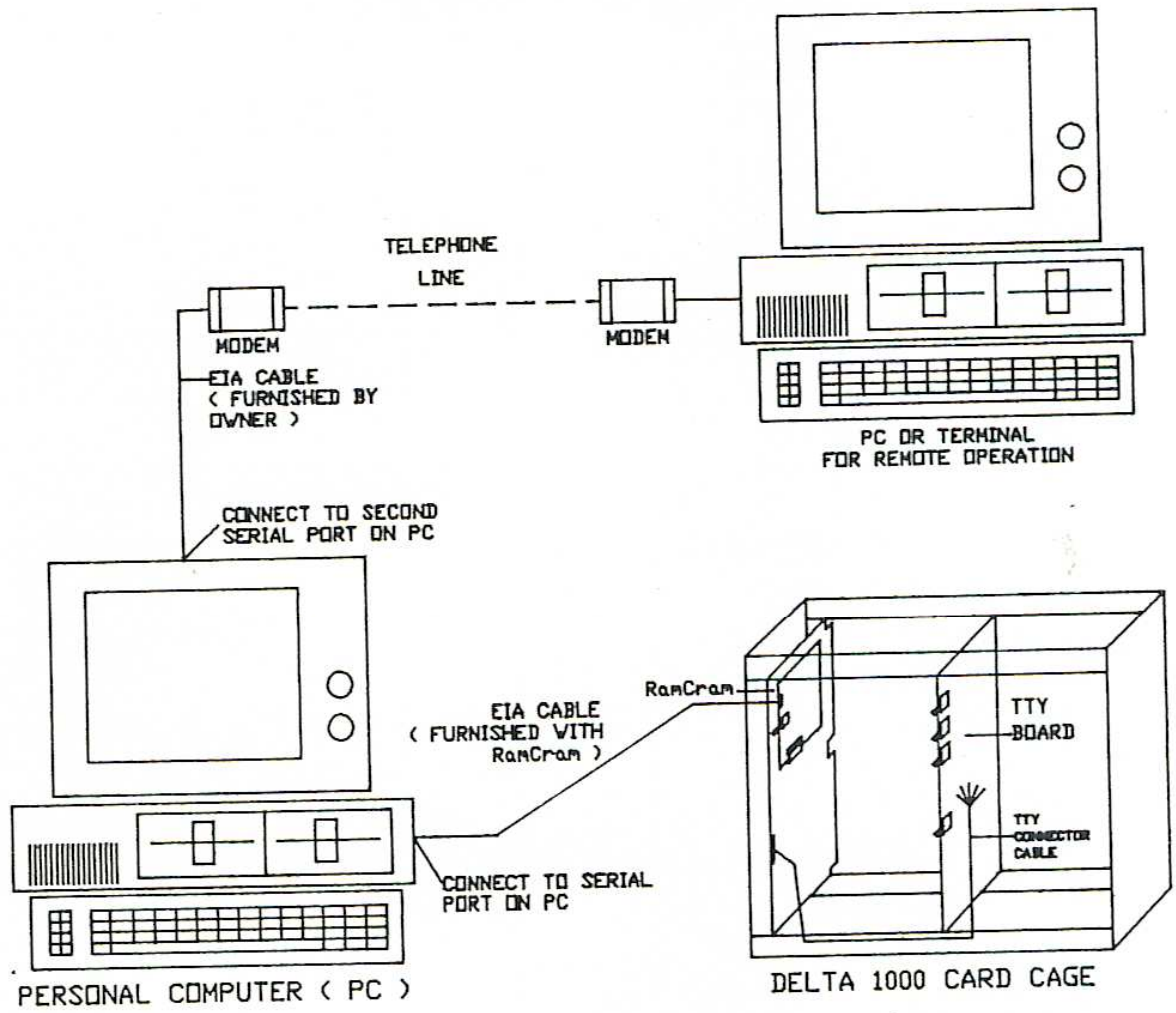(Requires optional software available from AJS Technology)

This configuration gives the most flexability by operating the RamCram
on a day to day basis from a PC located near the DELTA, allowing files
to be transferred at the maximum speed of the serial port connected to
the RamCram.   The user can also communicate with the RamCram from a
remote location, such as another building or from home, to load or
restart the DELTA.   Even though the user may be at a remote location,
files are transferred at maximum speed, because the files are actually
stored by the PC located on site with the DELTA, and all file transfers
are made locally.   Figure I-1 shows this configuration.   Available from
AJS Technology is a communications program that can be used with an IBM
PC or compatible computer to support this configuration.   This
configuration requires the following equipment, in addition to that
described in chapters 2,3, and 5:

2 modems (for communicating over telephone lines)
2 RS232 cables (to connect modems to PC and remote terminal)
1 Terminal (for remote operation)

The terminal can be a dedicated terminal such as a CRT, or it can be a
PC running the proper communications software.

*** IMPORTANT ***
This configuration requires that you modify the TTY board as described
in section 5-1 in order to remotely start and halt the DELTA for saving
and loading files.

TELEPHONE
LINE

MODEM

MODEM

PC OR TERMINAL
FOR REMOTE OPERATION

EIA CABLE
(FURNISHED BY
OWNER)

CONNECT TO SECOND
SERIAL PORT ON PC

RamCram

EIA CABLE
(FURNISHED WITH
RamCram)

TTY
BOARD

TTY
CONNECTOR
CABLE

CONNECT TO SERIAL
PORT ON PC

PERSONAL COMPUTER (PC)

DELTA 1000 CARD CAGE

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7/85

FIGURE I-1 RamcRam / PC INTERFACE – LOCAL AND REMOTE OPERATION

Appendix J: TTY BOARD SWITCH CONTROL FROM RamCram.

The RamCram controls the switches on the TTY board in the following manner:

1. TTY board switches 1, 2, and 3 are overridden when the TTY control cable is plugged in. When the cable is unplugged, these switches will function in their normal manner.

2. TTY board switch 4 is wired in parallel with the RamCram control of that switch. The watchdog timer can be enabled by either throwing switch 4 on the TTY board UP, or commanding that switch UP from the "TTY BOARD SWITCH CONTROL" function from the MAIN MENU. To enable automatic operation of switch 4 from the RamCram, leave switch 4 on the TTY board in the DOWN position.

3. To remove the TTY control cable while the DELTA is running*, use the "TTY BOARD SWITCH CONTROL" function to examine the status of the TTY board switches. Then put the switches on the TTY board in the same position as that listed on the display. FAILURE TO DO SO BEFORE UNPLUGGING THE CABLE COULD CAUSE THE DELTA TO CRASH, WHICH COULD CAUSE ERRORS IN YOUR DATAFILE OR O.S..

4. To plug the TTY control cable into the RamCram while the DELTA is running, first use the "TTY BOARD SWITCH CONTROL" function and command the switches to the same position as their current state on the TTY board. FAILURE TO DO SO BEFORE PLUGGING THE CABLE IN COULD CAUSE THE DELTA TO CRASH, WHICH COULD CAUSE ERRORS IN YOUR DATAFILE OR O.S..

   * Normal operation of the RamCram should never require that you unplug the TTY switch control cable from the RamCram.

Appendix K: PROM TRANSFER ROUTINE LISTING

This is the listing in machine language used in the DELTA to transfer the contents of the PROM board to the RamCram main memory.   Refer to section 5-3 for more information.

ADDRESS	CONTENTS
F7F0	0E00
F7F1	8D08
F7F2	8300
F7F3	A300
F7F4	7905
F7F5	21FB
F7F6	0F00
F7F7	0000
F7F8	0000
F7F9	0000
F7FA	F800

Also fill memory locations from D000 to F7EF with 3083.