TECMAR

*jr*Captain

INSTALLATION MANUAL

Limited Warranty

Tecmar, Inc. ('Tecmar') warrants to the **original purchaser** that boards and cables manufactured by Tecmar will be free from defects in materials and workmanship for one year from the date of delivery to purchaser. Tecmar warrants to the **original purchaser** that disc controllers and drives, terminals, printers, and any other non-board item not bearing a Tecmar label will be free from defects in materials and workmanship for a period of ninety days from the date of delivery to purchaser. Tecmar warrants to the **original purchaser** that the media for software will be free from defects in materials and will be readable by the computer system for a period of ninety days from the date of delivery to purchaser. The software is thoroughly tested and thought to be functional when released; at Tecmar's sole option, Tecmar may endeavor to correct any serious problems discovered in the software.

Under the above warranty, Tecmar will, at its option, either repair or replace a non-conforming or defective product, or return to purchaser the purchase price. Tecmar shall have no obligation hereunder if the product has been misused, carelessly handled, defaced (including unauthorized repairs made or attempted by others), modified or altered. The product must be returned with proof of purchase in its original (or other adequate packaging) to the point of purchase or, by prior arrangements with Tecmar, to Tecmar. Claims must be made in accordance with the provisions of this paragraph within the applicable warranty period or they will be barred.

Tecmar reserves the ultimate authority to determine what constitutes warranty repair. If it is determined that the product is not under warranty, it will be repaired using Tecmar's standard rates for parts and labor. Tecmar will use its best efforts to repair the product within three days after receipt thereof. Tecmar shall not be responsible, however, for delays caused by shipping of non-availability of replacement components or other similar or dissimilar causes, events or conditions beyond its reasonable control.

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Keep your original sales receipt for the product with this warranty statement.
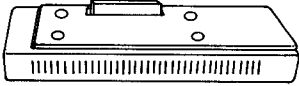
PRODUCT _____

SERIAL   DATE OF
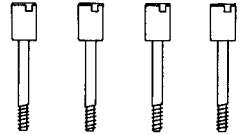NUMBER _____   PURCHASE _____

WHERE
PURCHASED _____

Your IBM PC*jr* should be set up before installing *jr*Captain. Refer to your IBM Guide to Operations to perform this task.
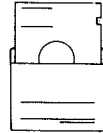
This carton contains the following:

- *jr*Captain

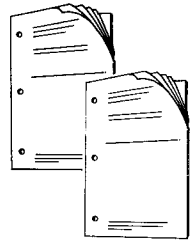- *jr*Captain Power Transformer and Cable

- Four Mounting Screws

- Treasure Chest Software

- *jr*Captain Installation Manual

- Treasure Chest Users Manual

- Treasure Chest Technical Reference

If any items are missing or damaged, notify your place of purchase.

Lay the four mounting screws aside. You will use them later to attach the *jr*Captain to the IBM PC*jr*.

1

FCC Required Instructions to IBM *PCjr* User

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the operating instructions, reference manuals, and the service manual, may cause interference to radio or television reception. It has been tested and found to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a residential installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by a the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems".

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

READ THIS FIRST !

This manual gives instructions for installing Tecmar's *jr*Captain on your IBM PC*jr*. It also tells you how to add memory to the *jr*Captain. In order that you can start at the right place for what you are trying to do, read the statements below. Select the one that most nearly matches the options you have purchased and take the appropriate action.

1. If your IBM PC*jr* has not been set up at this time, do so before installing *jr*Captain. Your computer must have:
   - One disk drive
   - 128K bytes of RAM

2. You have purchased a *jr*Captain and want to install it on your IBM PC*jr*.

   Yes Go to Section 1.

   No Go to question 2.

3. You have a *jr*Captain installed on your IBM PC*jr* and you have purchased memory to add to your board.

   Yes Go to Section 2.

   No Go to question 3.

4. You have purchased a *jr*Captain and additional memory and wish to install the memory on the board and then install the board on the IBM P*Cjr*.

   Yes Go to Section 2.

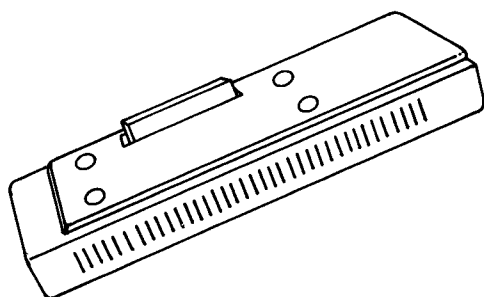   **No** Reconsider what you have purchased. Go to question 1.

Contents

Section 1.
*jr*Captain Installation

Contents

Tools Required

- Medium-size, flat-blade screwdriver.
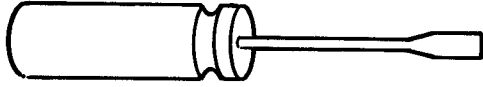
Installation Instructions
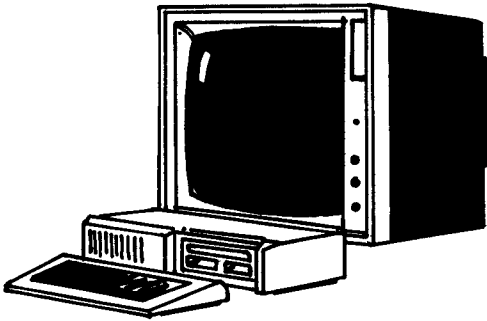
1. Turn your IBM PCjr power off.

   Warning: After turning your IBM PCjr power off, allow five minutes for cooling to take place before removing the option attachment cover.

2. Turn power off on everything attached to your IBM PCjr (printers, television, etc.).

3. Unplug your IBM PCjr and your display or television power cords from the wall outlets.

4. Face the front of the computer system. In order to install the *jr*Captain you must first remove the option attachment cover on the right hand side of the computer sytem.
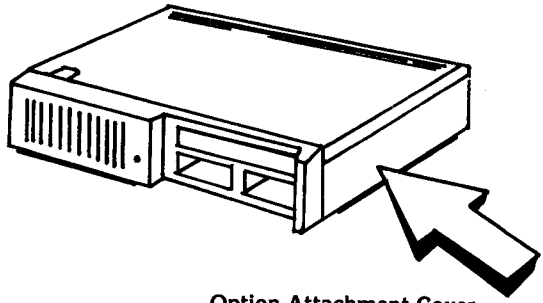
Option Attachment Cover

5. Remove the option attachment cover by gently pulling until it snaps out of place.

Attachment Slot

Mounting Pins

Option Attachment Cover
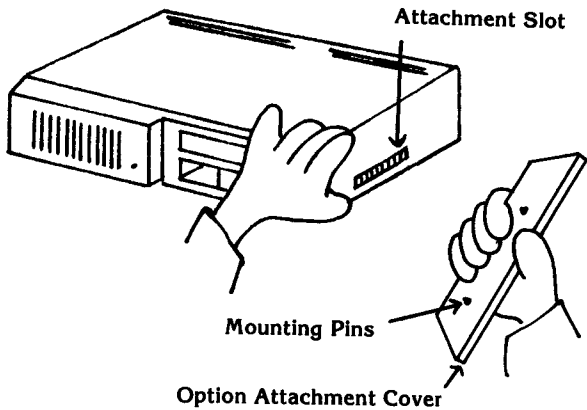
6. The option attachment cover should be put aside. You will attach it to the side of the installed *jr*Captain in step 10.

7. You have purchased the *jr*Captain with the memory configuration you desired already installed and the board switch set as shipped for each memory configuration.

    If you purchased *jr*Captain with OK bytes of RAM, the switch settings on the board should be as follows:

OK bytes	ON ▮▮▮▮▮▮▮▮

    If you purchased *jr*Captain with 64K bytes of RAM, the switch settings on the board should be as follows:

64K bytes	ON ▯▮▮▮▮▮▮▮

    If you purchased *jr*Captain with 128K bytes of RAM, the switch settings on the board should be as follows:

128K bytes	ON ▯▯▮▮▮▮▮▮
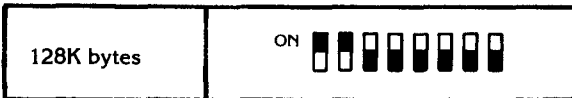
    Note: Section 2 of this manual contains instructions for installing additional memory on your *jr*Captain.

Pick up the *jr*Captain. Hold it as shown in the picture.

Slot

Attachment Connector
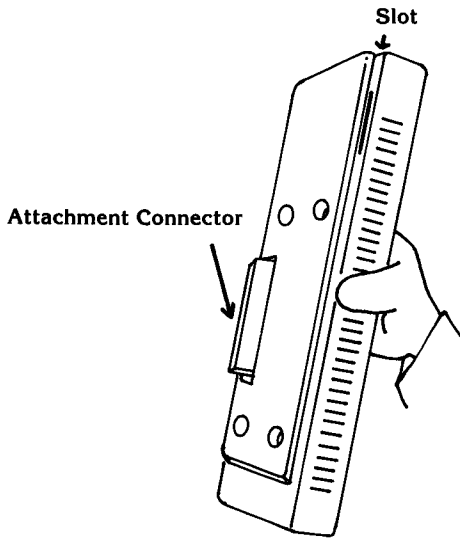
*jr*Captain

8. Locate the attachment slot on the right side of the IBM PC*jr*. Plug the attachment connector of the *jr*Captain into the attachment slot at the side of the IBM PC*jr*.

Attachment Slot

*jr*Captain

13
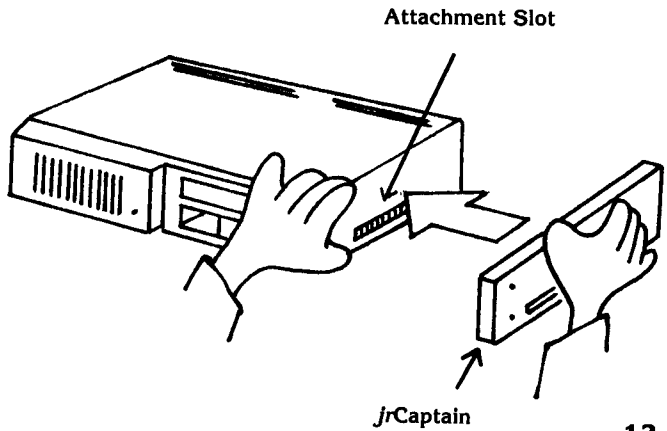
9. Is the *jr*Captain firmly in place and evenly lined up with the side of the IBM PC*jr*?

    Yes - go to step 10.

    No - go to step 8.

10. Secure the *jr*Captain to the side of the IBM PC*jr* using the four mounting screws you put aside. Reinstall the option attachment cover by pressing it firmly into the mounting holes of the *jr*Captain.

Mounting Holes

*jr*Captain

Mounting Screws
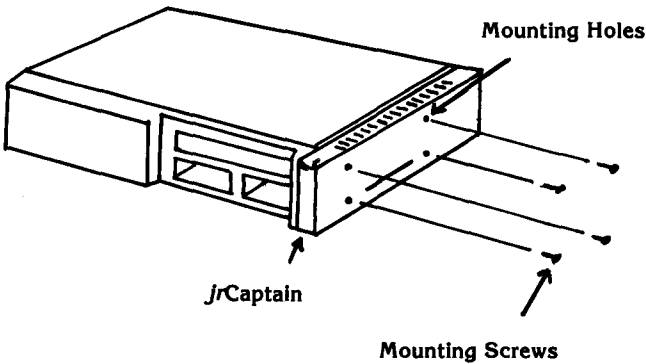
11. Turn your IBM PC*jr* so the back is toward you.

12. Look at the back of the *jr*Captain. Find the Power Jack and the Graphics Printer Socket.

Power Jack

Graphics Printer Socket
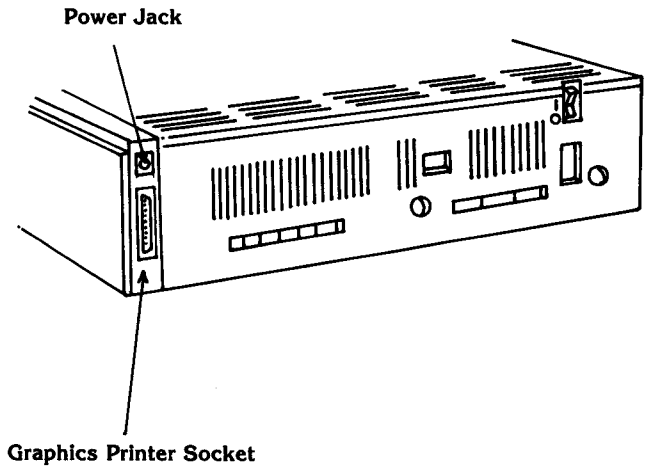
13. Do you have a printer?

    Yes - go to step 14.

    No - go to step 15.

14. Plug the cable coming from your printer into the graphics printer socket on the back of the *jr*Captain.
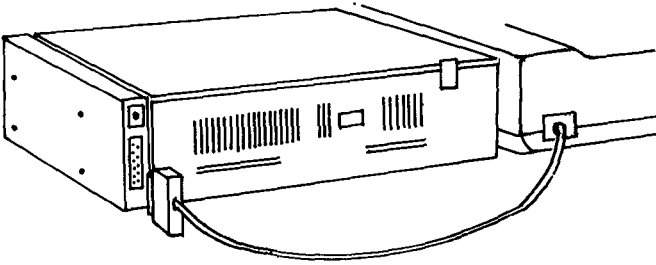
Printer Cable

Note: You must use a shielded cable to connect your printer to the computer in order to comply with FCC regulations.

15. Pick up the *jr*Captain's power transformer. Place the power transformer box on the table or desk near the IBM PC*jr*.

16. Plug the power cable from the power transformer into the *jr*Captain at the Power Jack.

16

17. Plug the *jr*Captain power transformer into a grounded outlet.

Grounded Outlet

Printer Cable   Power Transformer   Grounded Outlet
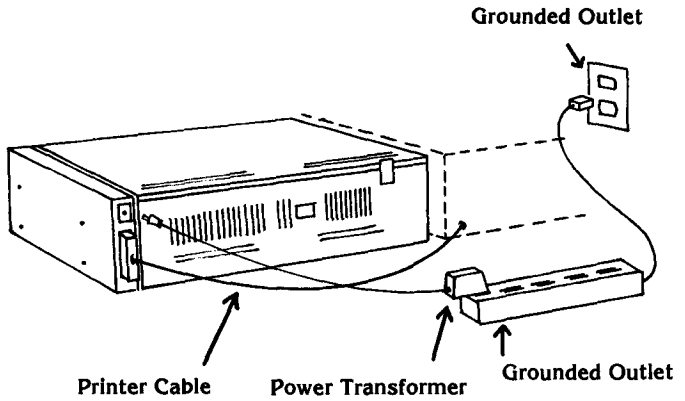
CAUTION:
Connect the power transformer to a properly grounded outlet.

18. Turn your IBM PC*jr* to the desired position for use.

19. Does your *jr*Captain have memory on it?

    Yes - Go to step 20.

    No - This completes the installation.

20. Insert the DOS disk in your disk drive and turn your computer on. Make sure DOS is ready and A > is displayed.

21. Treasure Chest diskette A has one file that must be copied onto your DOS boot disk:

    CONPCJR.EXE

Note: This file is a program which **must** be run to enable the expanded memory. It **has to** be run once with all options needed at the time you turn on or reset your computer. The Software Configuration section in this manual contains a full explanation of the program and its options.

22. Refer to your DOS manual for instructions on copying files. Copy the CONPCJR file onto your DOS boot disk.

23. The CONPCJR (Configure the PCjr) file is a program that must be run each time you reset your computer. CONPCJR makes the expanded memory recognizable to your computer.

24. Because the program must be run each time you reset the computer, put the single line:

    CONPCJR

    as the very first entry in an AUTOEXEC.BAT file on your DOS disk.

    Note: Refer to your DOS manual for instructions on setting up an AUTOEXEC.BAT file. Refer to pages 46-49 for additional options for CONPC-JR.

25. Once you have put the CONPCJR in an AUTOEXEC.BAT file, reset your computer.

26. Your computer with expanded memory is ready for use. **Remember, you can only add one** *jr***Captain to the IBM PC***jr***.** The Tecmar *jr*Cadet can be purchased to increase memory to the maximum amount the IBM PC*jr* will recognize. The *jr*Cadet attaches to the *jr*Captain for increased memory.

Note: The program, 'CHKDSK' (Used to check a disk), may not recognize the memory as it has been set up and may produce incorrect results for the amount of available memory. It is suggested that you ignore that line of the output of the CHKDSK program.

Section 2.
Tecmar *jr*Captain
Memory Expansion
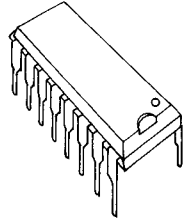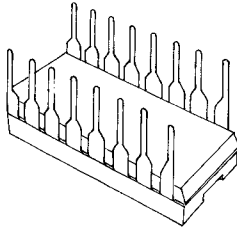
This section contains instructions for adding memory to the *jr*Captain.

Contents

Tools Required

- Medium-size, flat-blade screwdriver.
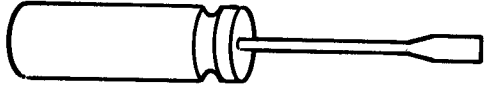
Installation Instructions
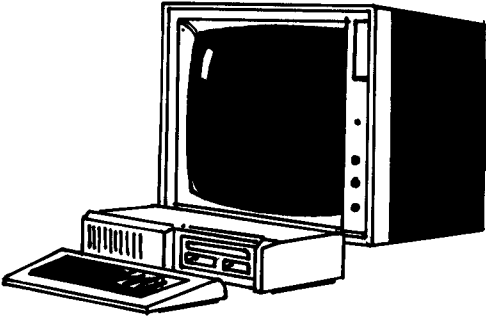
1. Turn your IBM PC*jr* power off.

    Warning: After turning your IBM PC*jr* power off, allow five minutes for cooling to take place before removing the option attachment cover.

2. Turn power off on everything attached to your IBM PC*jr* (printers, television, etc.).

3. Unplug your IBM PC*jr* and your display or television power cords from the wall outlet.

4. The RAM chips must be installed on the _jr_Captain board inside the _jr_Captain.

5. In order to get to the board, the _jr_Captain will have to be removed and taken apart.

6. Find the option attachment cover.
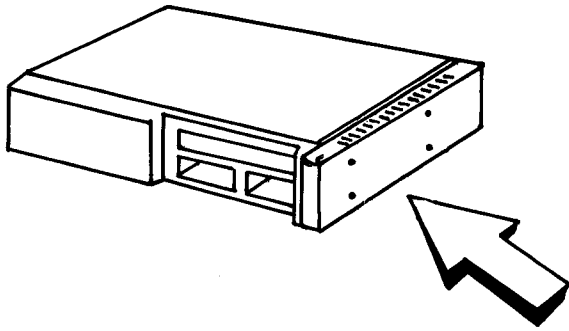
Option Attachment Cover

7. Gently pull on the option attachment cover until it snaps out of place.

*Jr*Captain

Mounting Pins

Option Attachment Cover
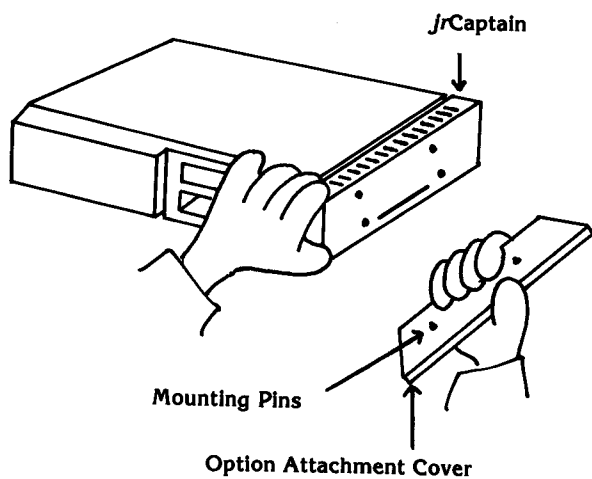
8. Put the option attachment cover aside.

9. Remove the four mounting screws that secure the *jr*Captain to the side of the IBM PC*jr*.

*jr*Captain

Mounting Screws
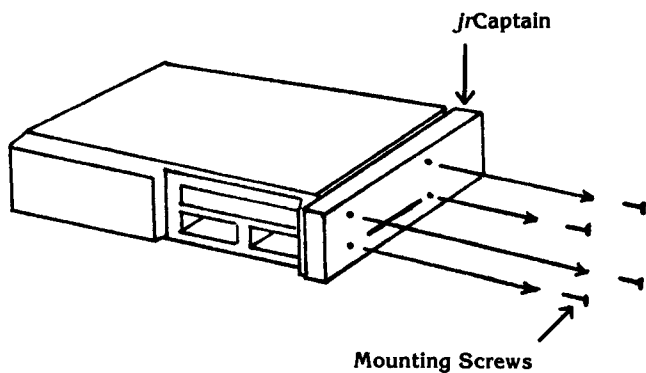
10. Gently pull the *jr*Captain from the IBM PC*jr* attachment slot.

27

11. Hold the *jr*Captain as shown below. Find the labeled parts on your *jr*Captain.

jrCaptain

Attachment Connector
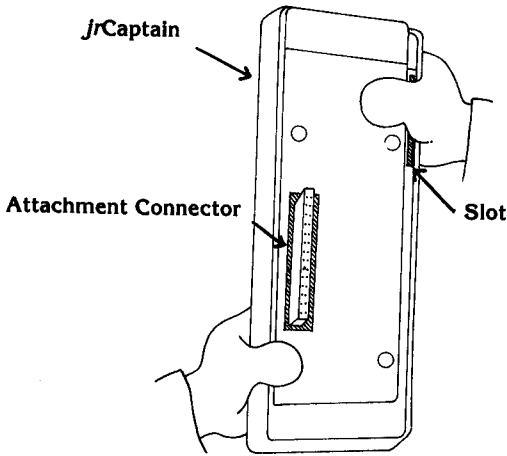
Slot

12. Insert a screw driver at the slot just under the *jr*Captain cover *(insert only about ¼ " of the screwdriver tip)* and gently pry upward.

Slot

Attachment Connector
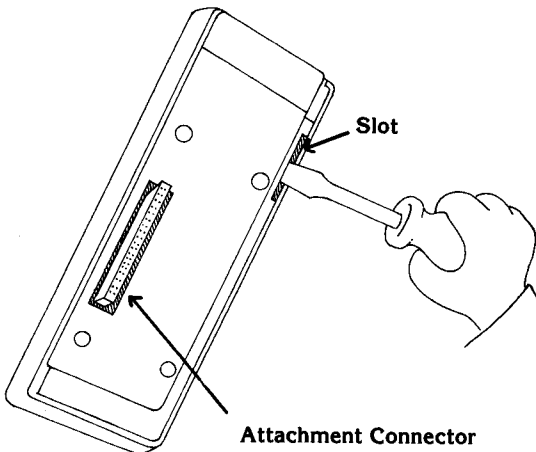
13. The *jr*Captain comes apart in the three pieces shown below.
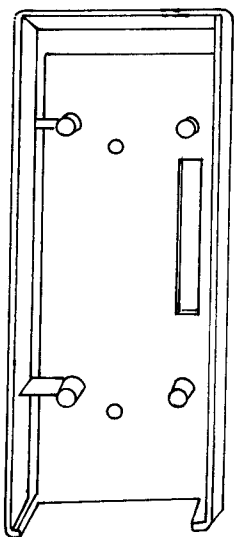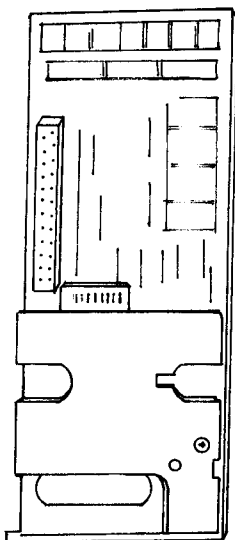
| *jr*Captain Box | *jr*Captain Board | *jr*Captain Cover |
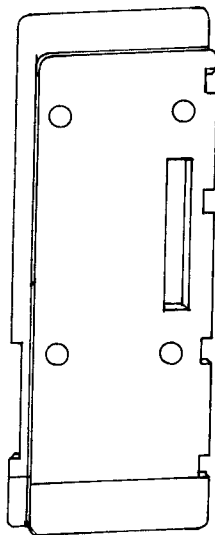
14. Pick up the *jr*Captain board and place it component side up **in the same position** as shown below. Put the *jr*Captain box and cover aside.

Attachment
connector
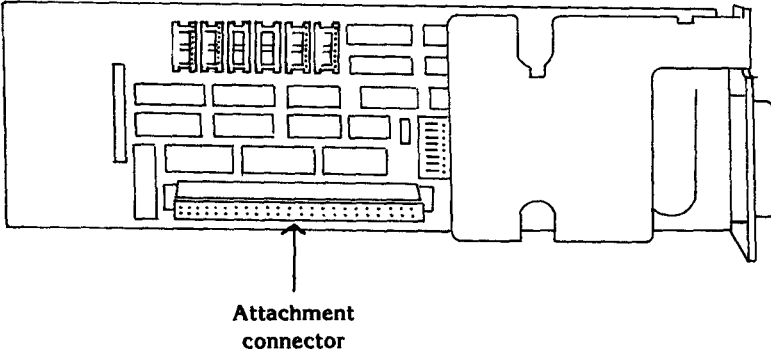
Component Side of
*jr*Captain Board

15. Look at the diagram below. Find the banks and the RAM chip sockets on your *jr*Captain board.
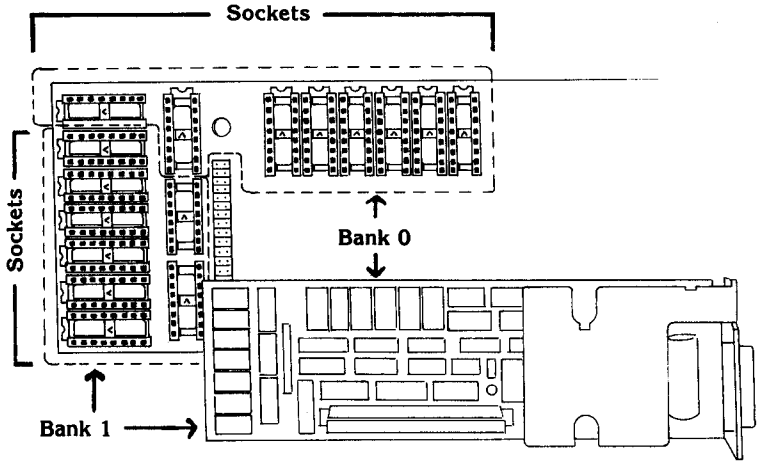
Note: Each socket has eight rows of dots that represent the holes where the pins of the RAM chips will be inserted.

16. Each of the RAM chips must be installed in a socket of a memory bank. When a bank's eight sockets are filled with RAM chips, 64K bytes or 256K bytes of memory have been installed depending on the setting of jumper 4.

    You may install either 64K byte RAM chips to a maximum of 128K bytes if jumper 4 is jumpered or 256K byte RAM chips to a maximum of 512K bytes if jumper 4 is not jumpered.

17. The RAM chip has eight sets of pins. You **MUST** know the location of Pin 1 to correctly install the RAM chip. Find the markings for Pin 1 shown below on one of your RAM chips.

Pin 1
Marks

Pins
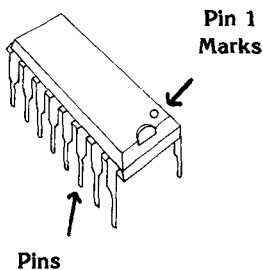
Your particular chip
may have only one of the marks.

18. There is a printed outline on the *jr*Captain board at each socket position to indicate the position of Pin 1 of the socket once the RAM chips have been installed.

Printing on Board
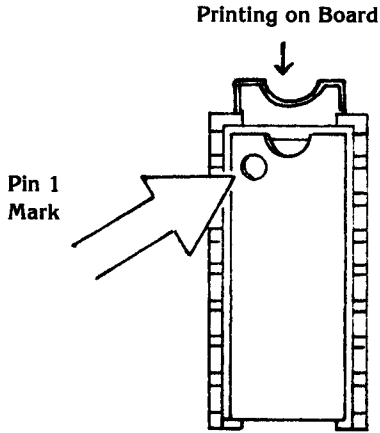
Pin 1
Mark

Serious damage will result if you install the chips backwards.

19. If you have your board component side up with the attachment connector at the bottom, when the RAM chips are installed:

- Pin 1 should be at the top of the RAM chips that are installed vertically.

- Pin 1 should be to the left of the RAM chips installed horizontally.

20. To install the RAM chips:

- In the table on the following page, find the amount of memory that you are adding.

- Insert the RAM chips as directed below in the sockets of the *memory* banks on your *jr*Captain board.

- Gently press the pins of the RAM chips into the pin holes of each socket of the bank you are filling.

- Make certain that each of the pins of the RAM chip fits into a pin hole of the socket.

- Be sure that each RAM chip fits snugly in the socket of the bank.

- If you bend a pin or miss a socket plug, pull the RAM chip out, straighten pins, and reinsert.

Note: If you are using 256K RAM chips, jumper 4 should not be jumpered (see Page 56).

*jr*Captain Board
(Using 64K RAM Chips)

Current *jr*Captain Memory	Memory To Be Added	Action To Take
OK bytes	64K bytes	Fill Bank 0
OK bytes	128K bytes	Fill Banks 0 and 1
64K bytes	64K bytes	(Bank 0 should already be filled) Fill Bank 1

*jr*Captain Board
(Using 256K RAM Chips)

Current *jr*Captain Memory	Memory To Be Added	Action To Take
OK bytes	256K bytes	Fill Bank 0
OK bytes	512K bytes	Fill Banks 0 and 1
256K bytes	256K bytes	(Bank 0 should already be filled) Fill Bank 1

21.   It is easy to put the *jr*Captain back together. Pick up the *jr*Captain cover and the *jr*Captain board. Place the board on the cover component side up. Be sure that the attachment connector is in the right place. Align the four mounting screw holes. Press the two pieces together at the holes until they snap into place.

Mounting
Screw Holes

Attachment
Connector

Attachment
Slot

← *jr*Captain Cover
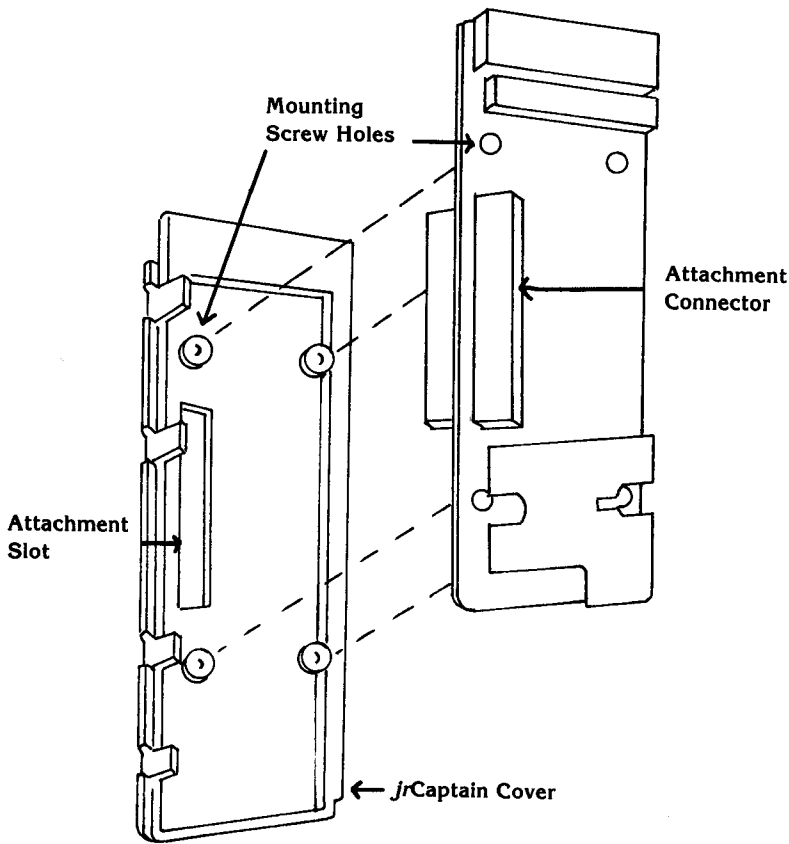
22.   Snap the *jr*Captain box onto the board. Make sure the attachment slot is aligned correctly with the attachment connector.

Attachment connector

*jr*Captain Cover

*jr*Captain Board
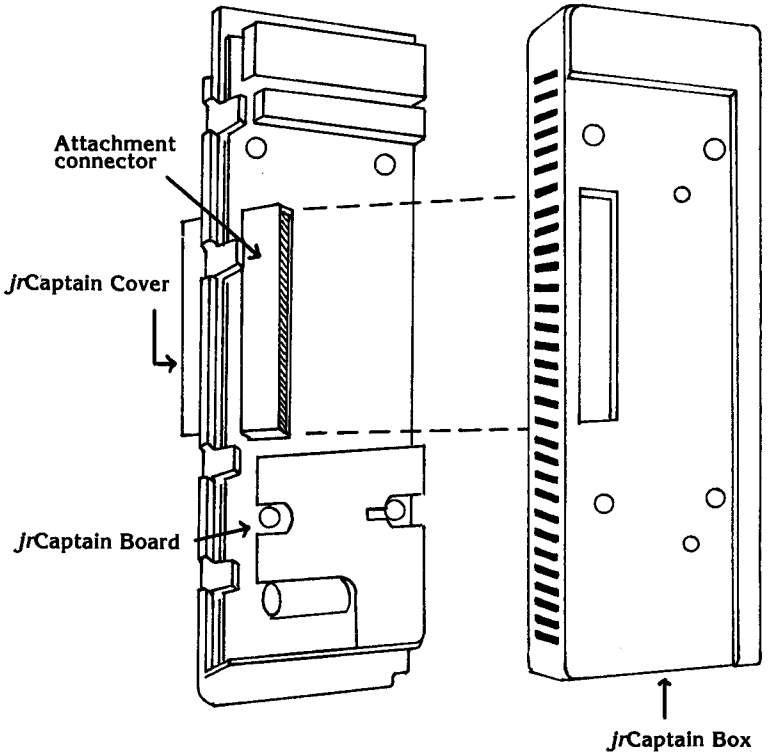
*jr*Captain Box

23.   Go to step 8 in Section 1 of this manual to reinstall the *jr*Captain.

Section 3.
*jr*Captain Technical Reference

This technical reference section is here for your information as it is needed. You do not have to read this section to use the *jr*Captain.

Contents

Software Configuration

Recognition of Expanded Memory

When the IBM PCjr is running MS-DOS, DOS will not automatically recognize more than 128K bytes of memory. The problem exists because the IBM PCjr uses up to the last 32K bytes of the first 128K bytes of memory for the video screen buffer. Additional memory is placed after the first 128K bytes and therefore, after the video screen buffer. Alas, the screen buffer proves too hard a problem to overcome and the additional memory is left abandoned and unused.

MS-DOS	OK bytes
IBM memory	
video screen buffer	
additional memory	128K bytes
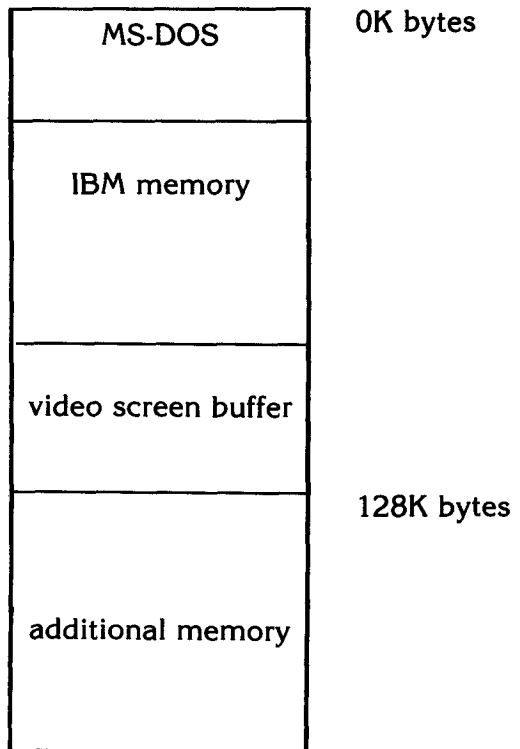
A program has been developed to allow the additional memory to be used. It exists on your Treasure Chest diskette A. The program is stored in a file called

CONPCJR.EXE

This file must be copied onto your DOS boot diskette. The single line,

CONPCJR

must be placed as the first line in an AUTOEXEC.BAT file to cause the program to be executed whenever DOS is booted.

Note: This program must not be run directly. It must be run from the AUTOEXEC.BAT file. It also must be the very first entry in the AUTOEXEC.BAT file.

Video Memory Configuration

The above scheme segments memory into 2 parts; the usable IBM memory somewhere below 128K bytes and the additional memory above 128K bytes. Sometimes, programs find it useful to have a large amount of continuous memory.

The video screen buffer takes up 16K bytes of memory if only alphanumeric mode is being used and 32K bytes of memory if graphics mode is used. If only alphanumeric mode is being used, the video screen buffer may be moved to any 16K byte boundary in the first 128K bytes of memory. If graphics mode is used, the video screen buffer may be moved to any 32K byte boundary in the first 128K bytes of memory.

The first 128K bytes of memory are divided into 8 pages, each containing 16K bytes. The pages are numbered from 0 to 7.

Video Memory Pages

page 0	0K bytes
	16K bytes
page 1	
	32K bytes
page 2	
	48K bytes
page 3	
	64K bytes
page 4	
	80K bytes
page 5	
	96K bytes
page 6	
	112K bytes
page 7	
	128K bytes

If you are using only alphanumeric mode, the video screen buffer will take up one page. If you are using graphics mode, the video screen buffer will take up two pages.

As you may wish to use graphics mode at some point while using the IBM PCjr, CONPCJR automatically reserves two pages for the video screen buffer. The pages reserved by default are 6 and 7.

You may specify which pages you wish CONPC-JR to reserve. You specify which alphanumeric page you wish to reserve and the appropriate adjacent page will also be reserved to make up the graphics screen buffer. Since the graphics screen buffer must start on a 32K byte boundary, the next page is reserved if the alphanumeric page number is even, otherwise the previous page is reserved.

To specify the page number for CONPCJR to reserve, you should use the following line.

CONPCJR — Pn

where n is the page number you wish to reserve. Page n will be reserved for the alphanumeric screen buffer. The extra page reserved to make up the video screen buffer will be n + 1 if n is even or n − 1 if n is odd. This page is only used when you go into graphics mode.

Pages 0 and 1 may not be reserved as DOS uses them. If you know that you will never go into Graphics mode, you may make CONPCJR reserve only the alphanumeric screen buffer. Only 16K bytes of memory will be reserved for the screen buffer, thus giving you an extra 16K bytes of usable memory.

To reserve only the alphanumeric screen buffer, use the following line:

CONPCJR — A — Pn

where n is the page number you wish to reserve for the alphanumeric screen buffer. No other pages are reserved. Only the page that you specified is reserved for the alphanumeric screen buffer.

Reserving only alphanumeric memory is not recommended for the novice user. You might use a program that uses graphics mode and confused results will occur.

An example will show the area of memory reserved. The line,

    CONPCJR — P2

will reserve page 2 for the alphanumeric screen buffer. Page 3 will also be reserved to make up the graphics screen buffer if graphics mode is ever used.

DOS	0K bytes
usable IBM memory	
	64K bytes
reserved to make up graphics screen buffer	
	80K bytes
alphanumeric screen buffer	
	96K bytes
usable IBM memory	
	128K bytes
expansion memory	
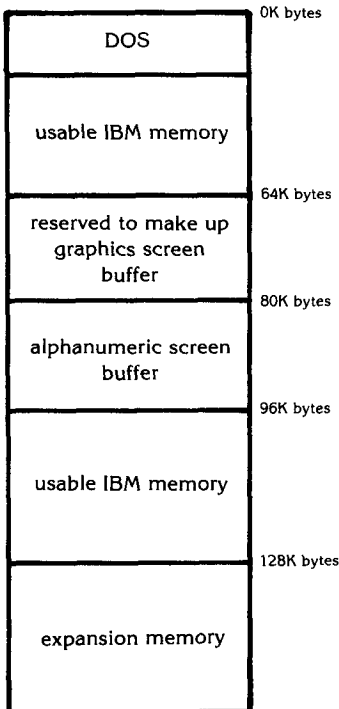
Configuring Disk Drives

PCjr is configured to recognize only one disk drive. There are times when it is useful to configure PCjr to recognize more than one drive. An example is when using the Treasure Chest program MEMDISK. MEMDISK will simulate a second drive in memory but it is necessary to configure the PCjr to know about two drives. To configure the PCjr to have more than 1 drive, place the line

CONPCJR – Dn

as the first line of the AUTOEXEC.BAT file where n is replaced by the number of drives you wish to configure for the IBM PCjr. By placing the line

CONPCJR – D2

as the first line of the AUTOEXEC.BAT file, the PCjr will come up recognizing 2 drives.

You may use any or all of the options for CON-PCJR simultaneously, the line

CONPCJR – A – P2 – D2

will reserve page 2 as the alphanumeric screen buffer. No graphics memory will be reserved. The PCjr will come up recognizing 2 drives.

Jumpers

Jumper Blocks

Tecmar uses two kinds of jumper blocks. Either one or both may be found on a board.

One kind of jumper block is a plastic rectangle with small holes on the top surface. Positions in this type of jumper block are connected by placing a preformed U-shaped wire in two adjacent holes. The two holes represent one position of the jumper block.
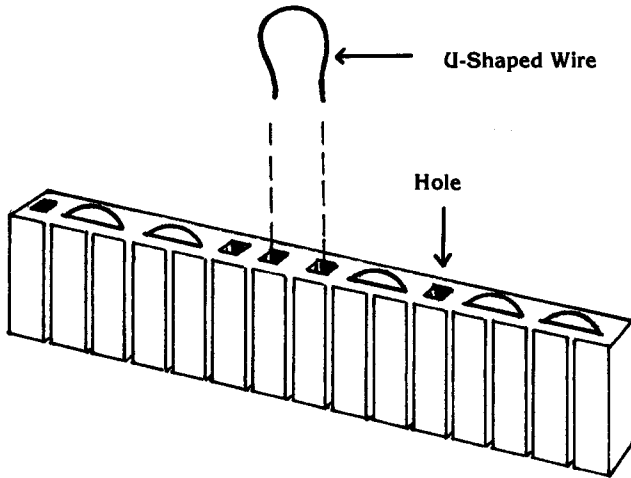
To disconnect a position, remove the U-shaped piece of wire with a pair of tweezers or needle-nose pliers.

The other kind of jumper block is a plastic
block with perpendicular wire pins protruding
from its top surface. Positions in this type of
jumper block are connected by placing a
plastic cap over two adjacent pins. The two pins
represent one position on the jumper block.
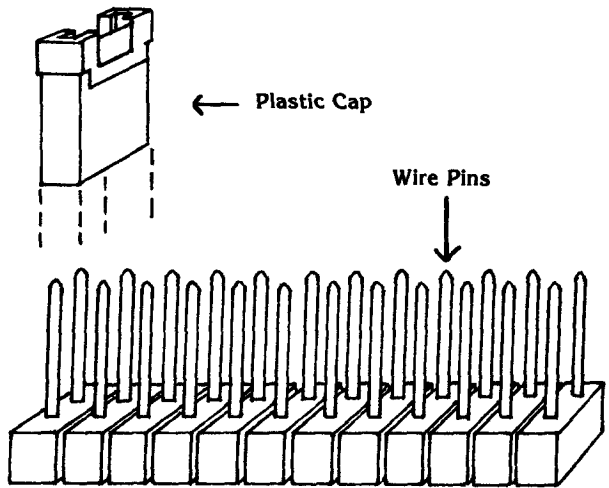
To disconnect a position, remove the plastic
cap by hand or with a pair of tweezers or
needle-nose pliers.

When the U-shaped wire or plastic cap is in place, a connection has been made and that position is jumpered. In the diagrams below, Jumper Block JPR1 is jumpered in positions A and C and Jumper Block JPR5 is jumpered in position B.

JPR1

A   B   C   D   E   F

Jumpered

JPR5

B
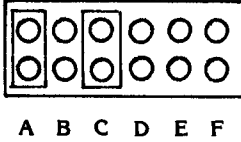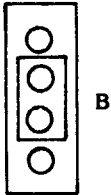
Note: The jumper blocks shown above are examples only. They do not appear on your *jr*Captain board.

The *jr*Captain's Jumpers Blocks

Jumper 1

Exists for engineering purposes only. This block is always jumpered.

Jumper 2

Jumper 2 selects the I/O address port that addresses the parallel port and the time of day chip.

When jumpered in the high position,
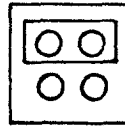
the printer port is addressed through addresses 378, 379, and 37A. The time of day is addressed through addresses 37D and 37F. When Jumper 2 is jumpered in the high position, the printer port address is referred to as LPT1, while the time of day port address is referred to as TIME1.

When jumpered in the low position,
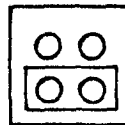
the printer port is addressed through addresses 278, 279, and 27A. The time of day is addressed through addresses 27D and 27F. When Jumper 2 is jumpered in the low position, the printer port address is referred to as LPT2, while the time of day port address is referred to as TIME2.

More specific information about Jumper 2 can be found in the I/O Configuration discussion in this section.

Jumper 3

Jumper 3 selects the interrupt line on which an interrupt may be generated from the time of day chip.

If jumper 3 is not jumpered,
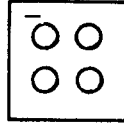
no interrupt is generated.

If jumper 3 is jumpered in the high position,
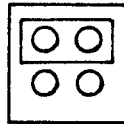
an interrupt may be generated on IRQ1.

If jumper 3 is jumpered in the low position,
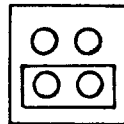
an interrupt may be generated on IRQ2.

Jumper4

Jumper 4 selects the kind of RAM chips that are to be installed and used on the *jr*Captain Board. Jumper 4 is jumpered as shipped.

If jumper 4 is jumpered,
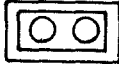
64K byte RAM chips can be installed and used with the *jr*Captain.

If jumper 4 is not jumpered,

256K byte RAM chips can be installed and used with the *jr*Captain,

More specific information about jumper 4 can be found in the Memory Configuration Section.

I/O Configuration

As mentioned previously, the I/O addresses us-
ed to address the parallel port and time of day
chip may be selected by jumper 2.

When jumper 2 is jumpered in the high posi-
tion, the following applies.

Address	Function	Read/ Write	None
888 Dec (378 Hex)	Printer Data	R/W	
889 Dec (379 Hex)	Printer Status	R	LPT1
890 Dec (37A Hex)	Printer Control	R/W	
893 Dec (37D Hex)	Clock Address latch	W	TIME1
895 Dec (37F Hex)	Clock data	R/W	

When jumper 2 is jumpered in the low position,
the following applies.

Address	Function	Read/ Write	None
632 Dec (278 Hex)	Printer Data	R/W	
633 Dec (279 Hex)	Printer Status	R	LPT2
634 Dec (27A Hex)	Printer Control	R/W	
637 Dec (27D Hex)	Clock Address latch	W	TIME2
639 Dec (27F Hex)	Clock data	R/W	

In this manual, most examples assume that the
*jr*Captain board is configured as TIME1 and
LPT1. If an example contains the board ad-
dressed differently, use the corresponding ad-
dresses.

Memory Configuration

jrCaptain

The jrCaptain may not be installed unless the IBM PCjr has the IBM 64K byte expansion board installed, bringing the total amount of memory on the IBM PCjr to 128K bytes. Memory on the jrCaptain will be placed in physical memory starting at 128K bytes.

The jrCaptain has two banks of RAM. The banks may each contain 64K bytes of memory or 256K bytes of memory depending on the setting of jumper 4. Each bank consists of eight sockets, each of which must be filled with RAM chips to enable the particular bank. Each bank of memory is also placed in a specific address range in physical memory.

There is a switch module on the board consisting of eight switches. The first switch on the switch module enables the first bank of memory while the second switch enables the second bank of memory.

Each bank of memory may be independently enabled or disabled. Since each bank of memory is associated with a particular physical address range, it is possible to configure memory such that memory is not continuous For example, disabling bank 0 and enabling bank 1 will cause a gap to exist where bank 0 should have been.

*jr*Cadet

For further expansion, Tecmar provides a companion to the *jr*Captain, the *jr*Cadet. The *jr*Cadet is a separate board which plugs into the IBM PC*jr*. You must have a *jr*Captain before installing a *jr*Cadet.

The *jr*Cadet has 6 banks of RAM. Each bank may contain 64K bytes of memory. The total memory capacity of the *jr*Cadet is 384K bytes.

On the *jr*Captain board, the first two switches enabled the two banks of memory on the *jr*Captain board. The other 6 switches each enable a bank of memory on the *jr*Cadet board.

Again, each bank of memory on the *jr*Cadet has a physical address range associated with it. Also each bank of memory on the *jr*Cadet may be independently enabled or disabled by setting or resetting the corresponding switch on the *jr*Captain.

Configuration

Remember that if jumper 4 is set, each bank of memory on the *jr*Captain contains 64K bytes of memory. If jumper 4 is not set, each bank of memory contains 256K bytes of memory. **Jumper 4 does not affect the banks of memory on the *jr*Cadet board.** Each bank of memory on the *jr*Cadet board always contains 64K bytes of memory.

The chart on the next page describes the function of each switch on the *jr*Captain board in combination with the state of jumper 4. The amount of memory enabled by the switch along with the address where the memory resides in physical memory is given.

Note: By using 256K RAM chips instead of 64K RAM chips, it is possible to have more than 640K bytes of memory on the IBM PC*jr*. It is, however, not advisable to add more than 832K bytes of memory to the IBM PC*jr*. The physical addresses corresponding to memory above 832K bytes may be used by the cartridge ROM and ROM BIOS.

| SW1 | Selected Bank | JPR4 Setting | |
		Jumpered	Unjumpered
1	*jr*Captain Bank 0	64K 20000-2FFFF	256K 20000-5FFFF
2	*jr*Captain Bank 1	64K 30000-3FFFF	256K 60000-9FFFF
3	*jr*Cadet Bank 0	64K 40000-4FFFF	64K A0000-AFFFF
4	*jr*Cadet Bank 1	64K 50000-5FFFF	64K B0000-B7FFF (32 KBytes usable only)
5	*jr*Cadet Bank 2	64K 60000-6FFFF	64K C0000-CFFFF
6	*jr*Cadet Bank 3	64K 70000-7FFFF	(has no effect)
7	*jr*Cadet Bank 4	64K 80000-8FFFF	(has no effect)
8	*jr*Cadet Bank 5	64K 90000-9FFFF	(has no effect)

The Parallel Printer Port

The printer port on the *jr*Captain has a parallel interface which allows it to be easily used with an IBM printer or an EPSON MX80 or RX80. It is directly compatible with the parallel port provided for the IBM PC and may be accessed using IBM software. It may also be used as a general parallel port for input and output.

There are three I/O addresses associated with the parallel printer port. Depending on how jumper 2 is jumpered, the addresses are 378, 379 and 37A or, 278, 279 and 27A. For description here, we will assume that jumper 2 has been jumpered in the high position so that the addresses used are 378, 379 and 37A.

I/O Address 378 (printer data)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
D7	D6	D5	D4	D3	D2	D1	D0

The eight bit value written to this port address appears on the eight data pins of the parallel printer port. If this port is read, the last value that was written to this port is returned.

I/O Address 379 (printer status)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
BUSY	ACK	PE	SEL	ERROR	Unused	Unused	Unused

This port address is read only and may not be written to. The value read is the current value of the above pins.

I/O Address 37A (printer control)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unused	Unused	Unused	INTERRUPT ENABLE	SELECT INPUT	INIT.	AUTO FEED	STROBE

This port address may be written to set the value of any of the above pins. You may also read the port address to get the current value of the above pins.

Parallel Port Pin Out

The parallel port has 12 buffered output pins which are latched and can be written to or read from at any time. There are 5 steady state input pins which may be read at any time. The other 8 pins are unused.

The pin out of the parallel port is given below.

Pin	Signal Name	Description
1	– STROBE	Strobe
2	D0	Data bit 0
3	D1	Data bit 1
4	D2	Data bit 2
5	D3	Data bit 3
6	D4	Data bit 4
7	D5	Data bit 5
8	D6	Data bit 6
9	D7	Data biy 7
10	– ACK	Acknowledge
11	+ BUSY	Busy
12	+ PE	Parity enable
13	+ SEL	Select
14	– AUTOFEED	Automatic feed
15	ERROR	Error
16	– INIT	Initialize
17	SELINP	Select input
18	GROUND	Unused
19	GROUND	Unused
20	GROUND	Unused
21	GROUND	Unused
22	GROUND	Unused
23	GROUND	Unused
24	GROUND	Unused
25	GROUND	Unused

The Time Of Day Chip

The time of day chip keeps track of the current time and date. Because it is powered by it's own battery, it will still remember the time when the *jr*Captain is turned off. The chip may also be used to cause an interrupt when the current time and date match a previously set time and date.

There are two I/O addresses associated with the time of day chip. Depending on how jumper 2 is jumpered, the addresses are 37D and 37F or the addresses 27D and 27F. For description here, we will assume that jumper 2 has been jumpered to the high position so the addresses used are 37D and 37F.

Replacing Your Battery

The battery for the clock/calendar on your *jr*Captain may need to be replaced once each year. Return your *jr*Captain to your dealer or to Tecmar for a replacement.

The battery must be replaced by a factory trained technician.

I/O Addresses

There are 22 registers inside the time of day chip. Each of the registers is 8 bits wide. There are 16 read/write registers, 2 read/only registers and 4 write/only registers. They are described in the following chart.

Address	Access	Function
0	R/W	Thousandth second counter
1	R/W	Tenth and hundredth second counter
2	R/W	Second counter
3	R/W	Minute counter
4	R/W	Hour counter
5	R/W	Day of the week counter
6	R/W	Day of the month counter
7	R/W	Month counter
8	R/W	Thousandth second latch
9	R/W	Tenth and hundredth second latch
10	R/W	Second latch
11	R/W	Minute latch
12	R/W	Hour latch
13	R/W	Day of the week latch
14	R/W	Day of the month latch
15	R/W	Month latch
16	R	Interrupt status register
17	W	Interrupt control register
18	W	Counter reset
19	W	Latch reset
20	R	Rollover bit
21	W	Go register

To read or write to one of the 22 registers in the time of day chip, first write the value of it's address to I/O address 37D. The address will be a number between 0 and 21. Then, by reading or writing to I/O address 37F, you will read or write the corresponding register in the time of day chip.

Counters and Latches

All of the values for the counter or latch registers in the time of day chip are encoded in BCD or binary coded decimal. In BCD, an 8 bit byte is divided into 2 nibbles, each of which is 4 bits in length. Each nibble may contain a value between 0 and 9. These two numbers are put together to form the decimal number. For example, the decimal number 27 is represented by the BCD binary number 0010 0111. The high order nibble is the 2 and the low order nibble is the 7. This number is 27 in hexadecimal or 39 in decimal. Thus the decimal number 27 when converted to BCD becomes the decimal number 39.

The thousandths of second register contains a value from 0 to 9. The tenth and hundredth of second register contains a value from 0 to 99. The second register and minute registers contain a value from 0 to 59. The hour register uses the 24 hour clock. Midnight is represented by 0 while 11 p.m. is represented by 23. The day of the week register contains a value from 1 to 7. Sunday is represented by 1 while Saturday is represented by 7. The day of the month register contains a value from 1 to 31. The month register contains a value between 1 and 12. January is represented by 1 while December is represented by 12. Remember that these values are stored in BCD.

Interrupt Control Register

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
month	week	day	hour	minute	second	tenth of second	latch alarm

By setting any one of the bits from 1 to 7, you may cause an interrupt to be generated when the corresponding counter rolls over to it's minimum value. If more than one bit has been set, the lowest order bit takes effect. Note that the board must be jumpered for interrupts in order for the interrupt to be generated.

If bit 0 is set, an interrupt will be generated when the values of each of the counter registers match the corresponding values of each of the latch registers.

Interrupt Status Register

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
month	week	day	hour	minute	second	tenth of second	latch alarm

This register is used to determine the source of an interrupt. When an event occurs that would trigger an interrupt, the corresponding bit will be set in this register. Reading this register will clear it.

Note that the interrupt status register will contain valid information whether or not the board has been jumpered for interrupts. This allows you to use a board that has not been jumpered for interrupts as a timer. Rather than having an interrupt routine, you must poll the interrupt status register until one of the bits is set.

Counter Reset Register

You may set all the counter registers to their minimum values by writing a hexadecimal FF to this register.

Latch Reset Register

All the latch registers may be set to their minimum values by writing a hexadecimal FF to this register.

Rollover Bit Register

This register is set to 1 anytime any of the counters change their value. As the thousandths second counter is set every thousandth of a second, this register is set to 1 at that rate. Reading this register will clear it.

Before reading the counters, you should read the rollover bit register to clear it. Read all the counter registers you wish to read and then read the rollover bit register again. If the rollover bit register has been set, you must go through this operation again.

The reason that the above procedure should be followed is that should the time of day chip be in the process of updating the counters while you are reading them, you may get some of the old values and some of the new values. This could result in an incorrect time.

Go Register

If a 1 is written to this register, the thousandths second counter and the tenth and hundredth second counter is reset. The purpose of this register is to allow you to set the other counter registers, wait until the thousandth second counter and the tenth and hundredths second counter should be zero and then setting this register to 1.

The reason for setting the time in this way is that it may take a longer time to set the thousandths second counter and the tenth and hundredth second counter than it takes for those counters to update. Using the above procedure allows the time to be set very quickly.

Appendix A:
Specifications

Memory Capacity: 0K byte to 512K bytes

Parallel Printer Port
I/O Address: Jumper selectable be-
                    tween the addresses 378,
                    379, 37A and the ad-
                    dresses 278, 279, 27A.

Clock/Calendar   Jumper selectable between
I/O Address: the addresses 37D and
                    37F and the addresses
                    27D and 27F.

Load: 1 TTL load/bus line max.

RAM Chips: Intel   4164-20   or
                    equivalent (or 256K bytes).

Battery Life: Approximately one year.

Power: (with 128K bytes)
                    800 mA @ +5V max

Appendix B:
*jr*Captain Power Requirements

The *jr*Captain contains its own on-board power supply. A power transformer with a wall plug is connected to side of the *jr*Captain.

The *jr*Captain on-board power supply produces +5 Volts dc.

Shown below are the current power requirements for *jr*Captain with 0, 1 and 2 banks of memory.

*jr*Captain Banks of Power

0	630 mA
1	750 mA
2	780 mA

Appendix C:
Block Diagram Description

1. **Data buffer:** A bidirectional buffer transfers data between the IBM data lines and the RAM and I/O sections on the board.

2. **Memory control:** This section controls the selection, refresh and address timing of the 128K bytes of RAM. Using the settings of the switches, this section determines which 64K byte sections of memory will be addressed. The refresh provides the signals to the memory necessary to maintain the integrity of the memory. It is user transparent.

3. **128K bytes RAM:** An array of RAM modules providing 128K bytes by 8 bits.

4. **I/O select logic:** When the address is correct, this section selects one of the I/O sections for I/O read or write operations.

5. **Time of day clock:** The real-time clock is
    made up of an address latch, the clock
    itself (MM58167) and the battery for stand-
    by power.

6. **Parallel printer port:** The printer port is
    completely compatible with all IBM soft-
    ware and is meant to connect to an IBM,
    EPSON, or equivalent printer. The parallel
    printer port is available through connector
    P1.
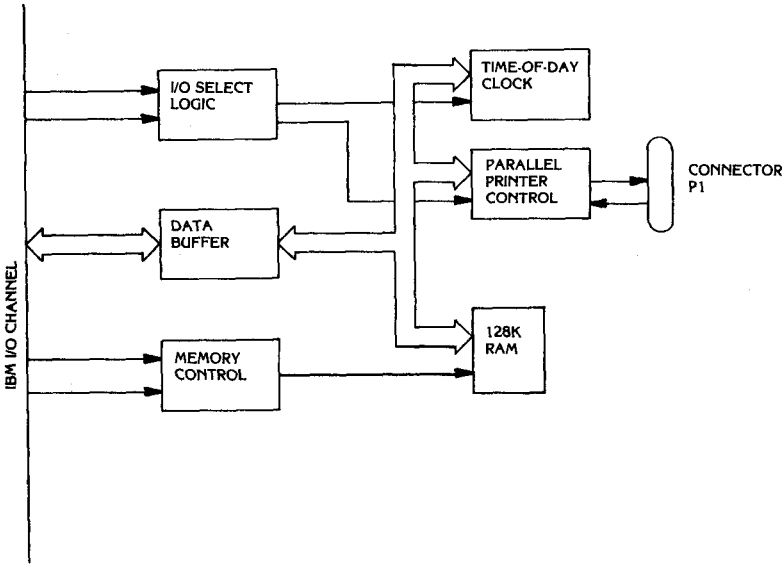
Product Comment Form

*jr*Captain   20502

Your comments are a vital tool in assisting us in our efforts to continue the improvement of PC-Mate products and the accompanying manuals.

Suggestions may be used or distributed by Tecmar in any form it believes appropriate without any obligation whatever. This does not limit your use of the information that you originate and supply to Tecmar.

Comments:

Name _____

Address _____

City _____   State _____

Zip Code _____

TECMAR

Addendum for Tecmar *jr*Captain
Installation Manual Rev. 1.3
January 23, 1985

Memory Expansion for Tecmar *jr*Captain

You can buy the Tecmar *jr*Captain with either 0K bytes or 128K bytes of memory.

Tecmar ships the 0K *jr*Captain with two banks of empty sockets where you can install either 64K or 256K RAM chips. You can expand this version of the *jr*Captain by filling either or both banks with memory chips. Instructions for doing this can be found in Section 2, "Tecmar *jr*Captain Memory Expansion," of your *jr*Captain **Installation Manual.**

Tecmar ships the 128K *jr*Captain with two banks of 64K RAM chips soldered to the board. Soldering the memory chips increases the effectiveness of board connections and improves the performance and reliability of your *jr*Captain. **You cannot remove chips that have been soldered into your board.** These RAM chips are permanent and cannot be replaced by any others.