

MFB-1000



MFB-1000
Multi-Function Expansion Card
for the
Tandy 1000 and other
Compatible Computers

User's Manual
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1. INTRODUCTION

Thank you for purchasing the MFB-1000 Multi-function expansion board. Using state of the art technology, we have been able to provide the most flexible, reliable, and cost effective expansion board available for your Tandy 1000 or other compatible computer.

The MFB-1000 features:

- 128K bytes Random Access Memory (RAM)
- Direct Memory Access (DMA) Controller
- An RS-232C serial communications interface (configurable as COM1 or COM2)
- A real-time clock/calendar with battery backup
- Clock Driver Software

Options include:

- 256K RAM
- 512K RAM

Before installing the MFB-1000 in your computer, you should take the time to read and understand this manual. Also, it would be helpful to spend a few minutes familiarizing yourself with the location of the components on the board.

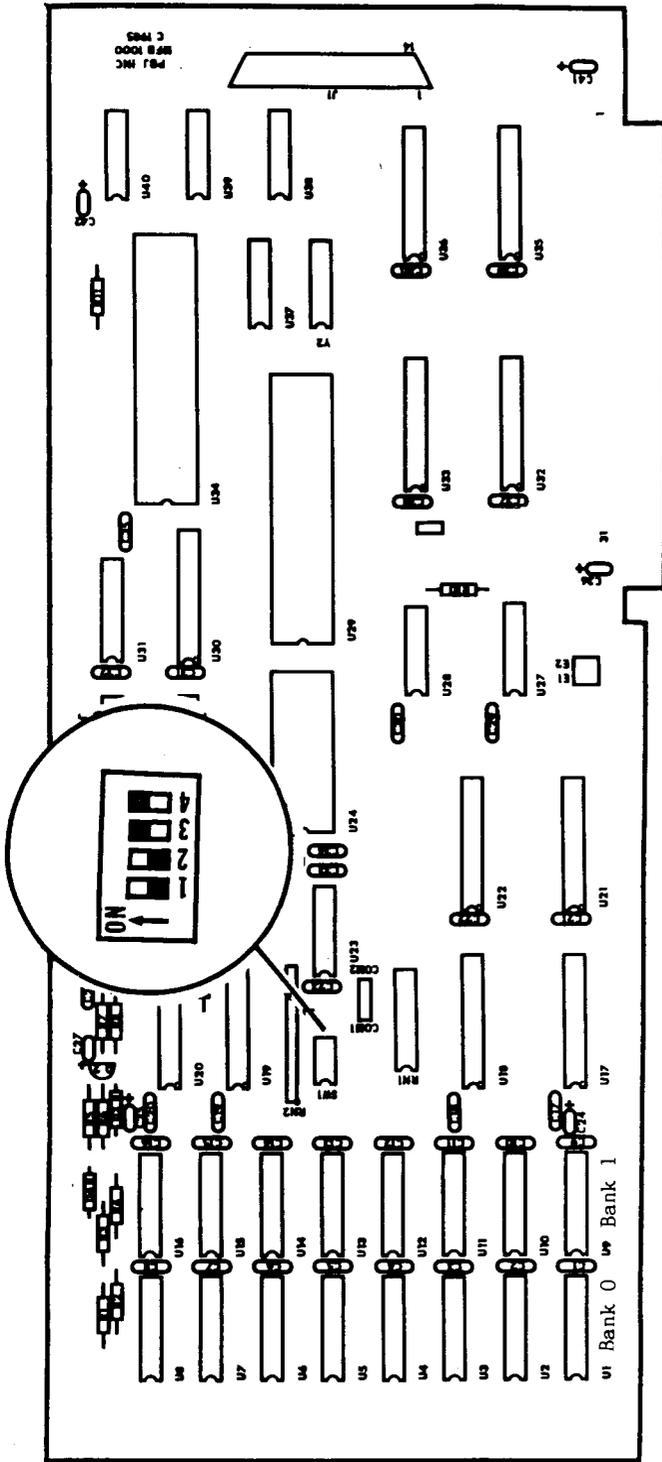
2. MEMORY CONFIGURATION DIP SWITCH

The Memory Configuration DIP switch must be set to correspond to the correct amount and type of RAM installed on your board. Although these switches have been preset at the factory for the amount of memory included, you should verify their settings before installing the board in your computer. Figure 1 illustrates the location of the DIP switch on the MFB-1000.

In most cases, the MFB-1000 will be the only memory expansion board installed in the Tandy 1000. If this is so, S1 of the DIP switch must be set to the OFF position. If multiple memory expansion cards are installed in the Tandy 1000, or the MFB-1000 is to be used with other compatible machines such as the Tandy 1200 or IBM PC, S1 must be ON. See section 2.2 for further information.

DIP switches S2, S3, and S4 are used to configure the installed memory. The type of memory devices installed on the board determines the position of S2. This switch should be set to OFF for 64K devices, and ON for 256K devices. It is important to note that RAM device types cannot be mixed. That is, both memory banks must be populated with devices of equal capacity.

The two individual memory banks may be enabled or disabled by S3 and S4. Bank 0 is enabled or disabled by S4, and S3 enables or disables Bank 1. The location of the memory banks on the MFB-1000 is shown in Figure 1. Note that Bank 0 must be populated with RAM and enabled before Bank 1 can be utilized. Also, if your board is populated with 64K devices, both banks must be enabled since the Tandy 1000 requires that memory expansion be in increments of 128K. The proper settings of the DIP switches for various memory configurations is shown in Table 1.



| Installed Memory | S1 | S2 | S3 | S4 | Remarks |
|------------------|-----|-----|-----|-----|--------------|
| OK | ON | — | OFF | OFF | DMA disabled |
| OK | OFF | — | OFF | OFF | DMA enabled |
| 128K | OFF | OFF | ON | ON | DMA enabled |
| 256K | OFF | ON | OFF | ON | DMA enabled |
| 512K | OFF | ON | ON | ON | DMA enabled |

Table 1. - Memory Configuration DIP Switch Settings

2.1 ADDING ADDITIONAL MEMORY

The MFB-1000 is normally supplied with 128K of RAM, and can accommodate up to 512K, increasing the total system memory of the Tandy 1000 to to 640K while using only one expansion slot.

If you purchased the MFB-1000 with only 128K of RAM, you can upgrade to either 256K or 512K at any time by simply removing the existing 64K devices and replacing them with 256K DRAMs. If you have a 256K board, you need only add an additional bank of 256K devices to bring the total system memory to 640K. In either case, the Memory Configuration DIP Switch must be reconfigured.

RAM Upgrade Kits for 256K (part # MFB-256) and 512K (part # MFB-512) may be ordered from PBJ, Inc. Contact PBJ, Inc. for prices. It is important to note that DRAM chips are extremely sensitive to static discharge and mishandling. If you have any doubts as to your ability to perform an upgrade, you should contact your dealer or PBJ, Inc. for assistance.

2.2 USE IN THE TANDY 1200 AND OTHER COMPATIBLES

The MFB-1000 may be used in other IBM compatible machines such as the Tandy 1200. However, before the MFB-1000 memory can be used in these computers, memory on the main board must be brought up to 256K. In addition, the DMA controller located on the MFB-1000 must be disabled to avoid conflict with the DMA controller on the main system board. This is accomplished by setting the Memory Configuration DIP Switch S1 to the ON position. Additionally, three components must be removed from the MFB-1000 to avoid any contention problems. Referring to Figure 1, identify and remove the following components:

| Designation | Part Number |
|-------------|-------------|
| U29 | 8237A-5 |
| U31 | 74LS670 |
| U33 | 74LS373 |

2.3 USING MULTIPLE MEMORY EXPANSION CARDS

Although rarely necessary, it is possible to use the MFB-1000 along with other memory expansion cards. When fully populated with 512K of RAM, the MFB-1000 will bring total memory up to 640K, the maximum memory recognized by DOS. However, there are a few application programs which will recognize and use additional memory above the 640K DOS limit.

If you are using the MFB-1000 in conjunction with the Tandy 256K Memory Expansion Board, the Tandy board must be brought up to 256K and installed as memory board #1. See the instruction manual included with the Tandy Memory Expansion Board for instructions on how to do this. After installing the Tandy card, the MFB-1000 should be installed as memory board #2. In this mode, the MFB-1000 operates as it would in the Tandy 1200, or other IBM compatible machines. See the preceding section for instructions on how to configure the MFB-1000 for operation in this mode.

3. INSTALLING THE MFB-1000

Before you install the MFB-1000 in your computer, you should visually inspect the board and verify that the configuration switches are correctly set. These switches have been preset at the factory for the memory options ordered. Refer to Fig. 1 to identify the actual location of the DIP switch on the board and then confirm the switch settings according to Table 1.

* * * CAUTION * * *

Some components on the MFB-1000 are sensitive to static discharge. Permanent damage to these components may result from improper handling of the board. Always make sure power is OFF before inserting or removing any board from your computer.

The following describes the procedure for installation of the MFB-1000 in the Tandy 1000. Installation of the board in different computers should be substantially the same.

1. Disconnect power from the computer by removing the AC power cord from its receptacle. Turn all other peripheral equipment OFF.
2. Disconnect the keyboard from the main unit. Place the keyboard aside so that it is not accidentally damaged.
3. Remove the two (2) Phillips screws located on the front of the main unit. Then, remove the cover by sliding it forward.
4. The MFB-1000 can be installed in any of the three expansion receptacles in your computer. Select an open expansion slot and locate the chassis cover plate corresponding to the selected slot.
5. Using a flat blade screwdriver, remove the screw which secures the cover plate to the rear panel. Save the bracket retaining screw for use in securing the MFB-1000.
6. Align the MFB-1000 with the expansion slot you have selected. Applying even pressure, guide the card edge connector until it is firmly seated in the expansion slot connector. Also, be sure that the retaining bracket is properly aligned.
7. Use the retaining screw removed in step 5 to secure the MFB-1000 bracket to the chassis.
8. Replace the cover by carefully sliding it toward the rear of the system unit. Install the two Phillips screws that you removed in step 1.
9. Connect the keyboard plug to the receptacle on the front of the system unit.
10. The installation is now complete. Apply power to the system unit and video monitor. Immediately, the available memory in your system will be displayed.

3.1 TESTING THE INSTALLED MEMORY

After applying power to the computer, the available memory in the system will be displayed, and then tested. You should verify that the available memory displayed by the computer agrees with the actual memory installed on your MFB-1000. Refer to Table 2 for the amount of memory available to the system for various MFB-1000 memory configurations.

If the correct memory size is not displayed, or errors occur during the power-up memory test, it is likely that the memory configuration switches are not properly set. Remove the cover from the system unit case and make sure that the board is properly installed in the expansion slot. Then check that the memory switches are properly configured. If you continue to experience difficulty, contact your dealer or PBJ, Inc. for additional assistance.

| MFB-1000 MEMORY | POWER-UP MEMORY DISPLAY |
|-----------------|-------------------------|
| 128K | MEMORY SIZE = 256K |
| 256K | MEMORY SIZE = 384K |
| 512K | MEMORY SIZE = 640K |

Table 2. - Power-Up Memory Display

4. SERIAL COMMUNICATIONS ADAPTER

The MFB-1000 is supplied with an IBM compatible serial communications port which may be used to connect your computer to a printer, modem, or other device which requires an RS-232C interface.

Your computer's operating system provides support for two (2) serial communication adaptors, identified as COM1 and COM2. The MFB-1000 is shipped with its serial port configured as COM1. If you already have another serial communications adapter or internal modem in your system addressed as COM1, you must reconfigure the MFB-1000 serial port as COM2 to avoid conflicts. Information required to configure the serial port as COM2 may be found in section 4.2.

4.1 USING THE SERIAL PORT

The serial communications channel on the MFB-1000 is software programmable and must be initialized for the correct baud rate, number of data bits, parity, and number of stop bits before it can be used. This procedure will normally be accomplished by any software which uses the serial port but can also be performed with the DOS MODE command. As an example, the following command will configure the serial port for 4800 baud, no parity, eight data bits, and one stop bit:

```
MODE COM1:4800,N,8,1
```

This command may be placed into an AUTOEXEC.BAT file so that the port will be automatically configured when the system is first booted up. Refer to your DOS manual for additional information on the usage of the MODE command.

The MFB-1000 Serial port is configured as a DTE type (Data Terminal Equipment) interface with a male DB25 connector. Refer to Table 3 for a description of the signals.

| J1 Pin# | Signal Description | Direction |
|---------|---------------------------|-----------|
| 1 | Chassis Ground | --- |
| 2 | TX (Transmit Data) | output |
| 3 | RX (Receive Data) | input |
| 4 | RTS (Request To Send) | output |
| 5 | CTS (Clear To Send) | input |
| 6 | DSR (Data Set Ready) | output |
| 7 | SG (Signal Ground) | --- |
| 8 | DCD (Carrier Detect) | input |
| 20 | DTR (Data Terminal Ready) | output |
| 22 | RI (Ring Indicator) | input |

Table 3. - Serial Port Pin Designations

4.2 CONFIGURING THE SERIAL PORT AS COM2

To configure the serial communications port as COM2, you must move two (2) jumpers on the MFB-1000. Refer to Figure 1 and locate the jumper labeled COM1/COM2. This jumper is located near the DIP switch, to the left of center on the board. Move this jumper from the position labeled COM1 to COM2. Next, at the Interrupt Jumper Block, which is located immediately to the left of the edge connector, move the jumper from E1 to the position labeled E2.

5. CLOCK/CALENDAR

The MFB-1000 is supplied with a clock/calendar that maintains accurate time and date information even when your computer is turned off. Once the software (supplied with your board) is installed into DOS, the time and date will be automatically obtained from the board each time you boot the system.

The lithium battery used to power the MFB-1000 clock circuit should last for one year, although the replacement interval will depend upon how often the computer is in use. The battery can be easily replaced by slightly lifting the battery retaining clip and then sliding the battery out of the holder. Be careful not to damage the retaining clip by lifting it too far. The clip is used to complete the electrical circuit to the positive side of the battery. A replacement battery may be obtained from PBJ, Inc. or from any retail electronic outlet. The replacement battery should be a Panasonic #CR-2025 or equivalent. Note that if you replace the battery, you will have to reset the clock/calendar to the correct date and time.

5.1 CLOCK DRIVER SOFTWARE

The disk supplied with the MFB-1000 contains software which will allow you to obtain maximum benefit from the Clock/Calendar hardware. The file CLOCK.SYS is a user installable device driver which is loaded by DOS when the system is booted up. To install the clock device driver, perform the following steps:

1. Copy CLOCK.SYS and CONFIG.SYS to your system boot disk.
2. If you have only a single drive, place the Clock Driver diskette in the drive and enter the command:

```
A>COPY A:*. * B:
```

Follow the prompts issued by your computer for exchange of the source and destination disks.

3. If you already have a CONFIG.SYS on your boot disk, do not copy CONFIG.SYS from the Clock Driver. Instead, add the following line to your existing CONFIG.SYS using any text editor:

```
device = clock.sys
```

4. Reboot your system and enter the date and time using the DOS DATE and TIME commands. The installation is now complete.

5.2 CLOCK HARDWARE DESCRIPTION

The Clock/Calendar circuit on the MFB-1000 is based on the National Semiconductor MM58167 clock circuit. The device is I/O mapped at address 2C0H through 2DFH. A brief description of the clock registers is shown in Table 4. For additional information, refer to the data sheet for the MM58167, available from National Semiconductor.

| I/O Address | Register Description |
|-------------|---------------------------------|
| 2C0 | Counter - 1/1000 of second |
| 2C1 | Counter - 1/100 and 1/10 second |
| 2C2 | Counter - seconds (0-60) |
| 2C3 | Counter - minutes (0-60) |
| 2C4 | Counter - hours (0-23) |
| 2C5 | Counter - day of week (1-7) |
| 2C6 | Counter - day of month (1-31) |
| 2C7 | Counter - month (1-12) |
| 2C8 | RAM |
| 2C9 | RAM |
| 2CA | RAM |
| 2CB | RAM |
| 2CC | RAM |
| 2CD | RAM |
| 2CE | RAM |
| 2CF | RAM |
| 2D0 | Interrupt Status Register |
| 2D1 | Interrupt Control Register |
| 2D2 | Counter Reset |
| 2D3 | RAM Reset |
| 2D4 | Status Bit |
| 2D5 | GO Command |
| 2D6 | Standby Interrupt |
| 2D7 - 2DE | Reserved |
| 2DF | Test Mode |

Table 4. - MM58167 Register Descriptions

SERVICE/REPAIR PROCEDURES

If your MFB-1000 should ever require repair, contact your dealer first. In most cases he will be able to service the board. If you have to return the board to the factory, follow these steps to ensure rapid turnaround:

1. Call PBJ, Inc. and ask for a service technician. He will discuss the problem with you and may be able to provide a solution over the phone. If the board must be returned, he will provide you with specific shipping information and a return authorization number.
2. If the board is covered under warranty, there will be no charge for parts or labor and return shipping costs will be paid by PBJ, Inc. Please include a copy of your original purchase receipt as proof of warranty coverage.

NOTE: Dealer or user installed parts (such as RAM chips) are not covered under this warranty. We will not replace any of these components unless you specifically authorize us to do so. Any parts and labor charges incurred due to defective user installed parts will be billed COD.

3. If the board is not covered under the warranty, all parts and labor charges will be billed COD.
 - A. The minimum service charge is \$35. Charges are based on a rate of \$25/hr labor plus the cost of any replaced parts.
 - B. If the repair cost is estimated to be over \$50, you will be contacted for authorization before any work is performed.
4. Please include the following information with the product returned for repair:
 - A. A brief description of the problem.
 - B. Your phone number in case we must contact you for additional information or for repair cost authorization.
 - C. Your return shipping address for UPS delivery. UPS cannot deliver to Post Office boxes.

LIMITED WARRANTY

PBJ, Inc. warrants to the original purchaser of the product described herein that said product is free from defect in material and workmanship for a period of 90 days from date of purchase.

If this product should require repair during the warranty period, it should be returned, postpaid, to PBJ, Inc. along with proof of purchase. PBJ, Inc. will, at it's option, repair or replace the product free of charge. PBJ, Inc. reserves the right, however, to determine which items are within warranty where customer negligence, misuse, or abuse are in question, or where the product has been subject to unauthorized alterations, modifications, and/or repairs.

UNDER NO CIRCUMSTANCES WILL PBJ, INC. BE LIABLE FOR DAMAGES ARISING FROM THE USE OF, OR INABILITY TO USE ITS PRODUCTS.

Some states do not allow the limitation or exclusion of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives the purchaser specific legal rights, and the purchaser may have other rights which may vary from state to state.

This limited warranty applies to hardware items only.