



**MegaPlus II**  
**Memory Expansion and I/O Card**  
for the  
**IBM Personal Computer,**  
**IBM PC-XT, and**  
**Other PC-Compatible Systems**

User's Manual  
August, 1983

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## SECTION 1

# INTRODUCING THE MEGAPLUS II

The AST Research MegaPlus II™ board is a versatile and powerful memory expansion and data I/O accessory for your IBM Personal Computer (PC) family. The generous range of the expansion memory size, the real time Clock with battery backup, and the RS-232 asynchronous Serial communications port (all standard), along with the optional Second Serial port, Parallel printer port, and Game adapter port make the MegaPlus II board the ultimate in expansion hardware.

Depending on the options selected, the MegaPlus II board supplies up to 512KB (kilobytes) of additional Random Access Memory (RAM). With this larger storage capacity you can run any PC-compatible applications software requiring additional memory and expand the capacity of some of your existing programs, such as spreadsheet models.

As a bonus, AST Research gives you two valuable utility programs: SuperDrive™, a disk emulation program allowing you to use part of your memory as a superfast "electronic disk drive"; and SuperSpool™, an intelligent print spooler allowing you to output files to a printer without tying up your PC. These utilities are discussed in the *SuperPak User's Manual*.

Your MegaPlus II board is available with 64, 128, 192, 256, 384, or 512 kilobytes of RAM memory. If you prefer, you can start off small and install AST Research memory upgrade kits and the MegaPak piggyback board as you need more memory space.

### Standard features

- A real-time Clock-Calendar with battery backup so that you don't have to enter the time and date every time you start your system. The battery power is only used when your system is turned off.



- An RS-232C Serial interface to be used with a modem, serial printer, remote display terminal, other serial device, or as an asynchronous communications port to another computer or peripheral operating under separate asynchronous communications software control. (Note: a current loop teletype interface is not supported.)
- Up to 256K of RAM memory, available in 64K increments.
- The SuperPak™ utility diskette containing SuperDrive™, SuperSpool™, clock software, and the RAMCLEAR memory initialization utility program.

#### NOTE

For information on the SuperPak utilities, see your *SuperPak User's Manual*.

### **Available options**

- A Parallel printer port to be used for connecting a parallel printer to the PC.
- A Second RS-232C Serial port (serial #2, configurable as DTE or DCE).
- The MegaPak™, providing 128K or 256K of additional memory, which brings the MegaPlus II board total to 384K or 512K bytes.
- A Game adapter port which can be used with an IBM-compatible joystick.

These options may be purchased onboard, or installed by the user at a later date. (Upgrade kits are available from your dealer.)

## 1.1 Compatibility

The MegaPlus II is completely compatible with all existing IBM PC types. It is also compatible with the Compaq and other IBM look-alikes. The three existing IBM PC models are defined in this manual as follows:

1. The **PC-1** is the original IBM Personal Computer. The system board contains 64K of memory. The system's maximum memory capacity is 640K. System board switches, however, recognize a maximum of 544K.
2. The **PC-2** is the newer, updated version of the PC-1. The system board *must* be fully populated with 256K of memory before utilizing any expansion board memory. If your PC-2 is *not* fully populated, then the AST Research Memory Upgrade Kit (P/N MP-009) can be used for this purpose. The maximum memory capacity of this system is 640K.
3. The **PC-XT** comes standard with 128K of memory. The system board is expandable to 256K. Unlike the PC-2, the system board does *not* have to be fully populated before using expansion board memory; you may, however, use the AST Research Memory Upgrade Kit (P/N MP-009) on your system board, if desired. The XT computer automatically recognizes memory up to a maximum of 640K.

The XT comes with a standard serial port configured as COM1. Your MegaPlus II board comes with a standard serial port that should be reconfigured as COM2 to avoid addressing conflicts with COM1. Section 3 of this manual contains the necessary reconfiguration instructions.

## 1.2 Non-PC-DOS Operation

All references to operating system commands in this manual assume operation under PC-DOS. The MegaPlus II board's hardware is completely IBM-compatible and will function properly under other IBM-approved operating system software. Of course, configuring the I/O ports under another operating system requires the use of commands specific to that operating system. See your operating system manual for the appropriate command syntax.

## 1.3 MegaPlus II Board Layout

Figure 1-1 shows the MegaPlus II board layout with major features labeled.

## 1.4 This Manual

If you are familiar with the memory and I/O capabilities that the MegaPlus II board provides, and you have a 64K PC-1 system with no current I/O options (other than the printer port on an IBM Monochrome Adapter), all you have to do is to set the PC system switches for the amount of memory your system will have with your MegaPlus II board installed and you're set to go. However, we strongly recommend that you thumb through this manual at your leisure, and read up on the SuperPak software utilities.

If you have other I/O capability in your present system, you may want to scan the appropriate chapters of this manual. This might save you some headaches later on. If you have problems, you should certainly go back and read the appropriate chapter for some helpful hints, and to clarify the conditions necessary for your memory and/or I/O option to function properly.

### NOTE

**BE SURE TO FILL OUT YOUR  
WARRANTY CARD AND MAIL IT IN.**

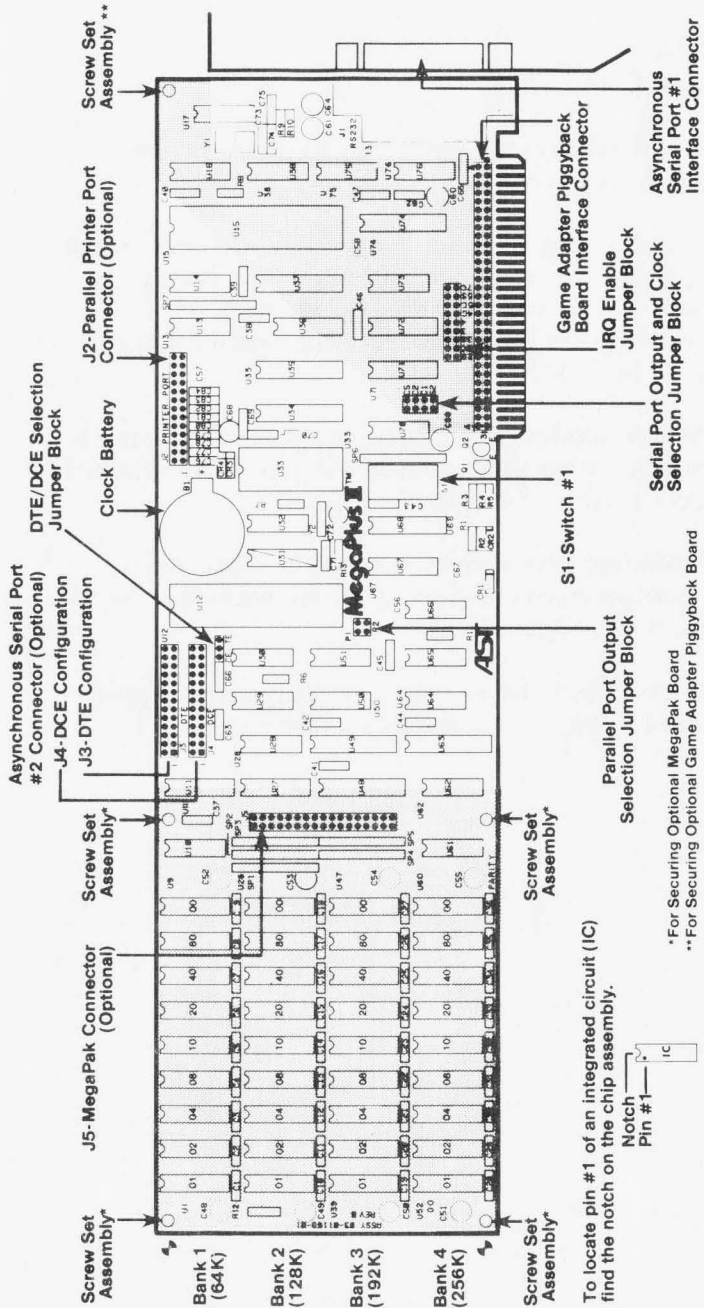


Figure 1-1. MegaPlus II Board Layout

### 1.4.1 Syntax Conventions

The following conventions are used in this manual to present command statement formats:

1. A syntax element written in **uppercase letters or special symbols other than brackets, braces, or ellipses** is a keyword and must be entered exactly as shown. Keywords can be entered in any combination of upper- and lowercase letters.
2. **Square brackets** ( [ ] ) indicate an optional term which is included or omitted at the user's discretion. The brackets are not part of the input.
3. **Lowercase letters** represent user-defined parameters. These parameters must satisfy the conditions specified in the command description.
4. Pressing the **Enter** key is not necessary unless explicitly stated in this manual (usually with the notation "`<enter>`").

## SECTION 2

# MEGAPLUS II MEMORY CONFIGURATION

In order to use the memory on your MegaPlus II board, you must properly configure both the MegaPlus II board and the PC system board. Section 2.2 covers configuration of the switches on the MegaPlus II board. Section 2.3 describes configuration of the PC system board switches. The system board configuration process varies, depending on whether you have a PC-1, PC-2, or PC-XT. Section 2.4 covers the installation of other memory expansion boards in your PC along with the MegaPlus II.

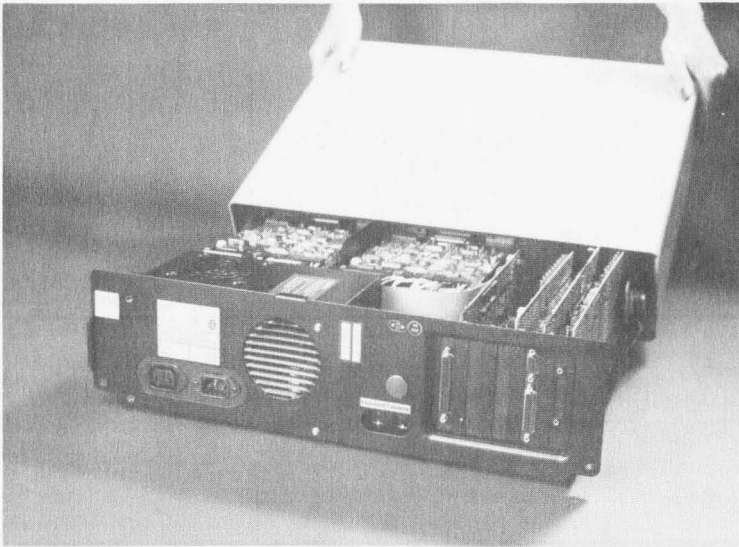
### 2.1 Removing the PC System Unit Cover

It takes only a few minutes to remove the cover from the PC and install the MegaPlus II board into one of the empty slots in your PC's system board. This manual has all of the necessary instructions. Instructions for removing the cover and setting the switches on your system board are also contained in your *IBM Personal Computer Guide to Operations*.

#### CAUTION

**Be sure that the power switch is off and the A.C. cord is removed from the system unit. Turn off any other equipment connected to the computer. Installing any component while the power is on can permanently damage your computer and its components.**

**STEP 1.** Looking at the system unit from the rear, find the mounting screws in the back panel. (There are two screws, found in the lower corners, in the PC-1. There are four, one in each corner, in the PC-2 and PC-XT.) Remove the screws, using a flathead screwdriver or a hex wrench.



**Figure 2-1. Removing System Unit Cover**

**STEP 2.** Slide the system unit cover towards the front. When the cover will go no further, carefully tilt it upwards and remove it from the system. See Figure 2-1.

## **2.2 MegaPlus II Memory Switch Settings**

Switch #1 (refer to Figure 1-1) on the MegaPlus II board controls two different functions related to the memory on the board. The two functions which must be configured are:

1. The starting address of the MegaPlus II board
2. Parity checking (enabled or disabled)

These functions are controlled by setting various positions of Switch #1. The following two sections describe these switch settings for the MegaPlus II board.

## 2.2.1 MegaPlus II Starting Memory Address

The MegaPlus II board must be properly configured to indicate the amount of memory installed below it or, in other words, what its starting address should be. Positions 1 through 4 of Switch #1 are used to set the MegaPlus II board's starting address. Figure 2-2 shows the MegaPlus II's starting address settings.

Depending on the type of PC that you have, you will use one of the following three settings for the MegaPlus II board's starting address.

**PC-1:** When installing the MegaPlus II board in a PC-1, configure the MegaPlus II's starting address to the 64K setting in Figure 2-2.

**PC-2:** When installing the MegaPlus II board in a PC-2, a Compaq, or other compatible system with a 256K system board, configure the MegaPlus II's starting address to the 256K setting in Figure 2-2.

### MegaPlus II Starting Memory Address

Starting Address	S1	S2	S3	S4	Maximum Usable RAM On MegaPlus II
64K (:10000)	ON	ON	ON	OFF	512K
128K (:20000)	ON	ON	OFF	ON	512K
192K (:30000)	ON	ON	OFF	OFF	448K
256K (:40000)	ON	OFF	ON	ON	384K
320K (:50000)	ON	OFF	ON	OFF	320K
384K (:60000)	ON	OFF	OFF	ON	256K
448K (:70000)	ON	OFF	OFF	OFF	192K
512K (:80000)	OFF	ON	ON	ON	128K
576K (:90000)	OFF	ON	ON	OFF	64K

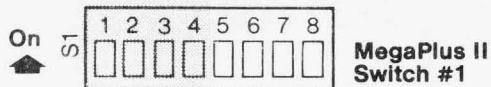


Figure 2-2. Starting Address Settings



**PC-XT:** When installing the MegaPlus II board in a PC-XT, configure the MegaPlus II's starting address to the setting in Figure 2-2 which corresponds to the amount of memory installed on the PC-XT system board.

Notice that the MegaPlus II automatically begins limiting the amount of usable memory on the board when its starting address is configured at 192K or higher. The MegaPlus II board can be addressed only within the first 640K of the PC, and its starting address can be no higher than 576K. This is to prevent conflicts between memory on the MegaPlus II and areas reserved for the monochrome and color display boards.

### 2.2.2 Parity Check Enable

Position 7 of Switch #1 on your MegaPlus II board can be set to enable full parity error checking. In order to ensure the highest possible data integrity, it is recommended that the parity check function of the board always be enabled by leaving this switch ON. If, however, you have a particular application in which you wish to disable parity checking, then you can do so by turning position 7 OFF. See Figure 2-3 for the location of this position.

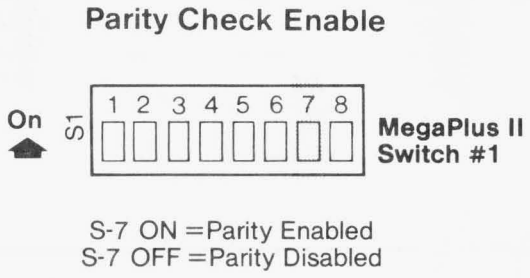


Figure 2-3. Parity Check Enable Setting

## 2.3 PC System Board Switch Configuration


The PC-1 and PC-2 must be told the exact amount of total memory installed in the system. This is done by configuring switches on the system board. The switch settings for these two PC models are described below in Sections 2.3.1 and 2.3.2. The PC-XT is slightly different; its switch settings are described in Section 2.3.3. You may also want to refer to the appropriate *IBM Guide to Operations* manual for your particular PC model.


### 2.3.1 PC-1 System Board Switch Settings

Figure 2-4 should be used if you are installing your MegaPlus II board in a PC-1. To determine the correct system board switch setting, add together the amount of memory on the system board (64K) and the amount of memory on the MegaPlus II. Set the PC-1 system board Switch #2 to the corresponding total from Figure 2-4.

**Total Memory Installed in PC-1**

Total Memory	S1	S2	S3	S4
64K	ON	ON	ON	ON
128K	ON	OFF	ON	ON
192K	ON	ON	OFF	ON
256K	ON	OFF	OFF	ON
320K	ON	ON	ON	OFF
384K	ON	OFF	ON	OFF
448K	ON	ON	OFF	OFF
512K	ON	OFF	OFF	OFF
544K	OFF	OFF	OFF	OFF



On 

1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**PC-1 System Board  
Switch #2**

Figure 2-4. PC-1 System Board Switch Settings

Notice that the system board switches for the PC-1 have a maximum setting of 544K, even though you may install up to 640K in the computer. Many "canned" application programs available for the PC get "confused" when the switches are set for 544K; we recommend that if you have more than 512K installed in your PC-1, that you use a setting of 512K. The excess beyond that setting is still usable by SuperDrive and SuperSpool, as well as certain other programs.

If your PC-1 is equipped with the IBM Expansion Unit and has the new ROM BIOS installed, then you can address a full 640K, and you should use the switch settings for the PC-2 (see Figure 2-5).

### 2.3.2 PC-2 System Board Switch Settings

Figure 2-5 should be used if you are installing your MegaPlus II board in a PC-2. To determine the correct system board switch setting, add together the amount of memory on the system board

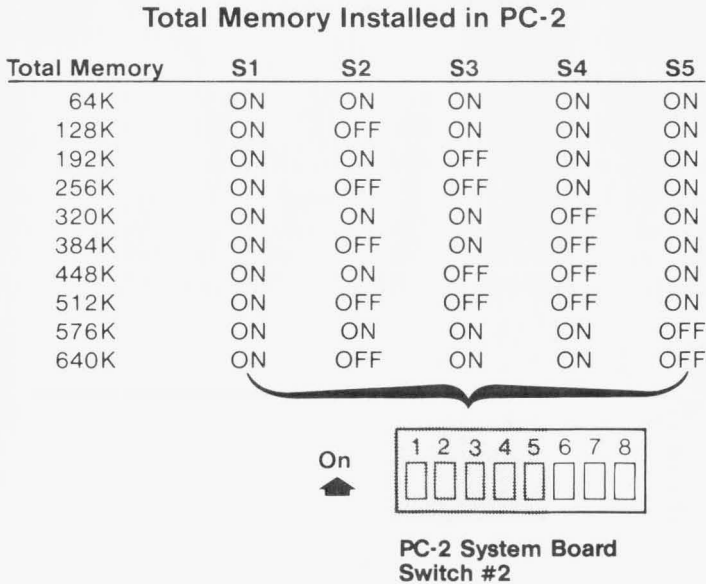


Figure 2-5. PC-2 System Board Switch Settings

and the amount of memory on the MegaPlus II. Use the appropriate total from Figure 2-5. Please note that when you include memory on the MegaPlus II in this total, that your system board *must* be fully populated with 256K. If your PC-2 system board does not contain 256K, do not include the MegaPlus II memory in the total system memory. Please refer to Section 1.1 of this manual for further clarification on this.

### 2.3.3 PC-XT System Board Switch Settings

The PC-XT differs from the PC-1 and PC-2 in how its system board switches are configured. In the PC-XT, the system board switch tells the computer *only* the amount of memory installed on the system board, and does not include any memory which may be installed on an expansion board such as the MegaPlus II. The PC-XT will automatically recognize the expansion board memory, and will include this memory in the total system memory, up to a maximum of 640K. Furthermore, it is *not* required that you fully populate the PC-XT system board before you can use the memory on an expansion board. Using Figure 2-6, configure the system board switches for the amount of memory on the XT system board (128K in a stock PC-XT).

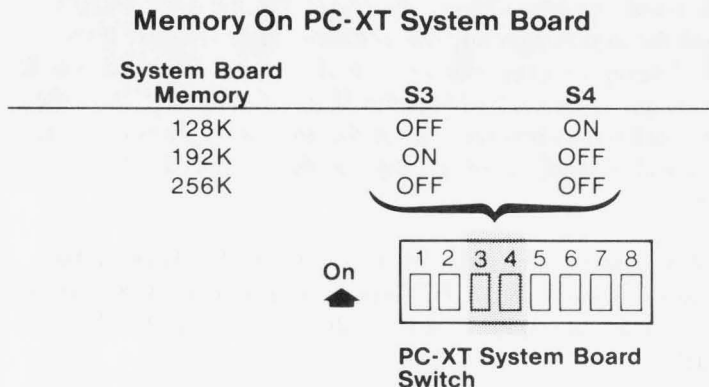


Figure 2-6. PC-XT System Board Switch Settings

## 2.4 Installing Multiple Memory Boards

The advanced design characteristics of your MegaPlus II board make it compatible with most other expansion boards available for the IBM PC. However, when more than one board is installed, you must pay particular attention to how each board is configured in order to prevent conflicts between them.

When installing multiple memory boards, you must first determine where each board is to reside in the PC's memory area. Your MegaPlus II board can usually be installed either "above" or "below" the address space occupied by another board.

### 2.4.1 Installing a Board "Below" the MegaPlus II

If another memory board is to be addressed "below" the MegaPlus II, then you should follow the procedure listed below.

**STEP 1.** Following the instructions supplied with the other board, configure it to reside immediately "above" the memory on the PC system board.

**STEP 2.** If there are any unused rows of memory sockets on the other board, the unused rows *must* be disabled so that they will not conflict with the MegaPlus II. Refer again to the other board's manual for information on how to disable these sockets. If the unused memory sockets cannot be disabled, you should address the other board "above" the MegaPlus II (see Section 2.4.2). If the other board has switch settings for the amount of memory on it, then it will probably automatically disable any unused memory sockets.

**STEP 3.** Add the amount of memory on the other board to the amount of memory on the PC's system board, and set the starting address of the MegaPlus II at this value, as per Figure 2-2 of this manual.

**STEP 4.** Set the PC system board switches for the total amount of memory on the system board, the MegaPlus II, and the other board.

### 2.4.2 Installing a Board “Above” the MegaPlus II

If another memory board is to be addressed “above” the MegaPlus II, your MegaPlus II *must* contain either 256K or 512K. You should then follow these steps:

**STEP 1.** Referring to Figure 2-2, configure your MegaPlus II board so that its starting address corresponds to the amount of memory on the PC system board.

**STEP 2.** Following the instructions supplied with it, configure the other memory board to see “below” it the total of the PC system board memory added to that on the MegaPlus II. If necessary, also configure this board for the amount of memory installed on it.

**STEP 3.** Set the PC system board switches for the total amount of memory including the system board, the MegaPlus II, and the other board.

### 2.5 Installing Additional Memory on the MegaPlus II

A MegaPlus II board that is configured with less than its 256K maximum memory (without the MegaPak option) can be upgraded at any time by installing additional 64K RAM sets, such as AST Research’s Memory Upgrade Kit P/N MP-009. The correct type of chip to be used is 64K dynamic memory, 200-nanosecond access time, pin #1 not used, +5 Volt only. The following memory chips are compatible with the MegaPlus II or the PC and PC-XT system board:

- Fujitsu MB8264-20
- Hitachi HM4864P-3
- Micron Technology MT4264-3 or MT4264-20
- Mitsubishi M5K4164NS-20
- Motorola MCM6665AL-20 or MCM6665AP-20
- NEC (Nippon Electric Corp.) D4164D-2 or D4164C-2
- OKI M3764-20RS
- Texas Instruments TMS4164-20NLJ

There are five steps to follow when adding memory to the MegaPlus II board.

**STEP 1.** Shut off the power to the PC and remove the MegaPlus II board from the system unit.

**STEP 2.** Install each additional set of nine 64K memory chips in the next consecutive empty bank on the board. For example, referring to Figure 1-1, if your MegaPlus II board has 64K on it now, it contains memory in Bank 1. If you are adding 128K to the MegaPlus II, you will install two sets of 64K chips, one each in Banks 2 and 3. Inspect the installation of the new chips very carefully, paying particular attention to possible bent legs.

**STEP 3.** Referring to the appropriate figure for your PC-1 or PC-2, set Switch #2 on the system board to the new total amount of memory installed in the PC. This step is unnecessary with the PC-XT.

**STEP 4.** Reinstall the MegaPlus II board in the system unit, and power up the PC. Because there is now additional memory in the PC, the powerup diagnostics will take longer to run. If all goes well, the system should operate normally and show the correct new total amount of memory when you run CHKDSK. If you get an error, recheck the installation of the new chips and the switch settings on both the system board and the MegaPlus II. If everything appears to be properly installed and configured, and you still get an error, then proceed to Section 2.6 for help in troubleshooting the problem.

## 2.6 Troubleshooting Memory Problems

The most common indication of a memory problem in the PC is a **PARITY CHECK 2** message on powerup. This message is preceded by a four-digit number, followed by the error code for a memory problem (**201**). For example, you might get an error of **4020 201** on powerup, followed by the **PARITY CHECK 2** message. The four-digit number can sometimes be used to isolate the problem to a specific memory chip.

The first digit of the four-digit value tells us in which 64K bank the error is occurring. Using the example above, **4020** tells us that the error is occurring in Bank 4 of the PC; since the banks are numbered beginning at zero, **4020** is actually the fifth bank in the system. If you have a PC-1, this error code would be pointing to Bank 4 of the MegaPlus II; Bank 0 is on the system board, followed by Banks 1 through 8 on a 512K MegaPlus II.

If you have a PC-2, don't confuse the bank numbering scheme used in Figure 1-1 with the bank indicated by the PC's error code. In the PC-2, error codes falling on Banks 0 through 3 are on the system board, followed by Banks 4 through 9 on a 384K MegaPlus II. Therefore, the error code in a PC-2 must be translated into the "real" bank number on the MegaPlus II by subtracting 3 from the first digit: **4020** falls on Bank 1 of the MegaPlus II when installed in a PC-2.

The second digit, a zero in the **4020** example, should be ignored. The third and fourth digits, **20**, tell us which bit is failing in the 8-bit data byte. Referring to Figure 1-1, notice that in Bank 1, each of the nine memory chip sockets contains a two-digit value; the sixth chip from the left edge of the board corresponds to a value of **20**, so that would be the failing location for an error code of **4020** in a PC-2. In a PC-1, the problem would be in the sixth chip from the left edge of the board in Bank 4 of the MegaPlus II.

Once you have determined the chip that you believe to be causing the problem, you should replace it with a spare chip and see if the error is corrected. If no spare chip is available, you could try exchanging the suspect chip with another one in the same bank which is not failing. If the error then moves to the new socket, you definitely have a bad chip. If the error persists at the original socket, you may have a problem with the board; contact your dealer for assistance.

If the third and fourth digits of the error code do not match any of the values indicated in Figure 1-1, you may be experiencing errors with more than one memory chip. This could be due to incorrect switch settings, multiple bad memory chips, or even something as simple as a dirty gold edge connector. If you are unable to remedy the problem, contact your dealer for assistance.



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## SECTION 3

# SERIAL ASYNCHRONOUS COMMUNICATION

Your MegaPlus II board can have one or two asynchronous communication ports. Serial #1 is standard, and serial #2 is optional.

The serial port is also known as an async (asynchronous) port or an RS-232C interface. Its purpose is to handle nonsynchronous serial data transmission between your PC and a modem, a serial printer, or other serial device. This is a two-way communications link. Data transmissions across the link take place in a serial fashion (one bit after another). Multiple wires are installed between either end of the communications link. Your PC serial port and the port on the remote serial device use these wires to signal one another. This allows data transmissions in either direction to be controlled properly.

### NOTE

An extensive discussion on wiring RS-232 interfaces is presented in Appendix E.

The IBM PC allows up to two serial communication ports, called **COM1** and **COM2**. Your MegaPlus II board's serial port #1 can be set up as either COM1 or COM2. COM1 is the default (factory) setting. The factory default setting for the optional serial port #2 is COM2.

To use a communications line, you must make sure the asynchronous communications parameters (baud rate, parity, data bits, and stop bits) are properly set. This is done using the MODE command under PC-DOS or the OPEN command under BASICA. Consult the appropriate IBM manual for details. A MegaPlus II board serial port is fully compatible with the parameter ranges specified by the MODE or OPEN command (baud rate, parity, data

bits, and stop bits). Often, the remote device also has parameters that need to be set. Consult your manual or dealer for the best match of parameter settings.

If you change devices, be sure and change your MODE line parameter settings accordingly.

### **3.1 Setting Up Serial Port #1**

Serial port #1 has a DB25P (plug- or male-type) connector (**J1** in Figure 1-1) that extends through the mounting bracket of your MegaPlus II board.

**If your present system has no other serial port**, the MegaPlus II board's serial port #1 and the optional serial port #2 are ready for use as shipped. There is no need to alter any of the settings on the MegaPlus II board. You may skip ahead to Section 3.11, "Programming the Serial Port". If, however, you already have a serial port in your system, you must make several simple changes to the jumpers on your MegaPlus II board.

### **3.2 If Your System Already Has a Serial Port**

This discussion applies only to systems which will have more than one serial port, in which the currently installed port is COM1. If your present system has a serial port (for example, an IBM Asynchronous Communication Adapter or the PC-XT with its standard serial board) you shouldn't have a MegaPlus II board with the "S" option as this would bring the total number of serial ports up to three. The operating system supports only two serial ports: your present serial port and the MegaPlus II board's standard serial #1.

There are two jumpers that must be moved to change the address of your MegaPlus II board's serial port #1 from COM1 to COM2. (Jumpers are pairs of wire pins that are connected or "jumped" with small, plastic-coated blocks to complete an electrical circuit.) The process is quick and easy, and can be performed without special tools.

### **Moving the First Jumper**

Place your MegaPlus II board so that the mounting bracket is towards the right, and find the four jumper pin pairs near U71 (see Figure 1-1 for clarification). Find the third jumper from the top. Immediately to its right is the designation **C1**. That stands for COM1. Immediately above C1 are a pair of pins with the designation **C2** (for COM2). Move the jumper from C1 to C2. Once you have done this, you are ready to move the second jumper.

### **Moving the Second Jumper**

Locate the jumper block designated as "IRQ Enable Jumper Block" in Figure 1-1. The jumper positions are labeled above the pins with the designations 2S, 2C, 3S, 3, 4, 4C, 5C, 5S, and 7C. As shipped, a jumper should be on position 4 (the IRQ line for COM1). To reconfigure your serial port #1 as COM2, you must move this jumper from position 4 to position 3 (not 3S). Your MegaPlus II board's serial port #1 is now configured as COM2.

## **3.3 RS-232 Connector Pin List for Serial Port #1**

In order to attach your PC's serial port to another serial device, you must use a multiwire cable with the proper type (male or female) of connectors at either end. In addition, you must make sure that the proper signals are being exchanged by your PC's serial port and the remote device's serial port. This is simply a matter of matching output lines to input lines and vice versa. For example, the pin which outputs data on the PC side of the link should be wired to the pin which receives data on the other side of the link. This is discussed in more detail in Appendix A and covered extensively in Appendix E.

The table below lists the signal configuration used by serial port #1 on your MegaPlus II board. This arrangement is known as DTE (for data terminal equipment). Use this information to make up the proper cable for your particular serial communication environment. Make sure that pins 5, 6, and 8 (CTS, DSR, and DCD, respectively) of the DB25P (J1) connector are correctly wired to the proper incoming signals. (See Appendix E.) The PC needs to "see" these signals in order to control communications. Note that only some of the 25 pins are used to wire the interface. You don't need to wire the unused pins. Appendix A has specific examples of interfaces that are cabled properly.

If you are using several remote devices, which require different cabling arrangements, consider using adapter plugs to handle the line signal routing. That way you can use the same extension cable for all of your devices and simply change the adapter plug when you change device.

#### Serial Port #1 as a DTE Interface

RS232C Name	J1 Pin#	Signal Name	Signal Direction
AA	1	(Chassis Ground)	Common
BA	2	TxD (Transmit Data)	Output
BB	3	RxD (Receive Data)	Input
CA	4	RTS (Request to Send)	Output
CB	5	CTS (Clear to Send)	Input
CC	6	DSR (Data Set Ready)	Input
AB	7	SG (Signal Ground)	Common
CF	8	DCD (Data Carrier Detect)	Input
CD	20	DTR (Data Terminal Ready)	Output
CE	22	RI (Ring Indicator)	Input

#### NOTE

AST Research serial ports do not support a current loop-type interface.

### **3.4 Disabling Serial Port #1**

Serial port #1 on the MegaPlus II board can be completely disabled by removing the jumpers discussed in Section 3.2.

### **3.5 Option S: Serial Port #2**

This section applies only to a MegaPlus II board that is equipped with the "S" option, a second serial port (serial #2). This is not to be confused with the Parallel port option or Serial #1. If your MegaPlus II board doesn't include this option, it can be added later (see Section 9, "User Upgrade Information").

If you have the "S" option, your MegaPlus II board has two asynchronous serial communications ports. Serial #1 has already been discussed. As shipped, your serial port #2 is set up as COM2. If you have the "S" option, there should definitely be *no* serial ports in your PC system, other than those on your MegaPlus II board. PC-DOS does not support more than two serial ports.

### **3.6 Verifying Your Serial #2 Configuration**

Your serial #2 is factory set and ready to use as shipped. You don't need to adjust any jumpers. Just to verify that the jumpers are in their proper positions, check the positions of the two jumpers used to control serial #2.

#### **Verifying the Position of the First Jumper**

Place your MegaPlus II board so that the mounting bracket is to the right, and find the set of jumper pins near U71. A jumper should be bridging the bottom set of pins, designated as S2.

#### **Verifying the Position of the Second Jumper**

Just above the edge connector at the bottom of the board are the interrupt request selection pins (IRQ). A jumper should be bridging the two pins designated as 3S.

### **3.7 DTE and DCE Interface Selection for Serial #2**

Your MegaPlus II board has two rows of pin connectors to the left of the battery housing. The top row (J3) is used to set up a DTE interface; the bottom row (J4) is used for a DCE configuration. These two types of interfaces are discussed extensively in Appendix E. Serial port #2 is configured at the factory as a DTE-type interface. In this respect, it is identical to serial #1, which is also a DTE interface. This type of interface is ideal for connecting your serial #2 to a modem or other DCE-type connector.

If you have decided to use the J3 DTE-type interface, you should skip ahead to Section 3.10, "Installing the Serial #2 Interface Cable".

The bottom row of pins (J4), DCE-type interface, is best used to connect your serial port #2 to a remote printer, terminal, or other DTE-type device.

### **3.8 Setting Up Serial #2 for DCE Configuration**

The DCE configuration allows pin-for-pin wiring to a remote DTE-type port. This helps save the time and expense of constructing a special cable for connecting like interfaces (see Appendix E). A jumper selects either the DTE or DCE pin connectors (J3 or J4). The factory configuration is DTE (J3). To use the DCE interface, find the three pins just below the right end of J4. A jumper should be bridging the right pair of pins, designated as TE. Remove the jumper and reinstall it so that it bridges the left pair of pins, designated as CE.

You have now selected the DCE-type interface and should install the adapter cable on the lower row of pins, labeled J4 DCE. Installation of the adapter cable is covered in Section 3.10, "Installing the Serial #2 Interface Cable".

### 3.9 DCE Configuration: Serial #2 RS-232 Pin Connector Listing

Below is the pin list signal arrangement for serial port #2 in DCE configuration only. You can use this information if you have to construct a special cable for your DCE-type serial interface. For more information on DCE-type interface signal arrangement and cabling, see Appendix A and Appendix E.

#### Serial Port #2 as a DCE Interface

RS232 Name	J4 Pin#	Signal Name	Signal Direction
AA	1	(Chassis Ground)	Common
BA	2	TxD (Transmit Data)	Input
BB	3	RxD (Receive Data)	Output
CA	4	RTS (Request to Send)	Input
CB	5	CTS (Clear to Send)	Output
CC	6	DSR (Data Set Ready)	Output
AB	7	SG (Signal Ground)	Common
CF	8	DCD (Data Carrier Detect)	Output
CD	20	DTR (Data Terminal Ready)	Input
CE	22	RI (Ring Indicator)	Output

#### NOTE

AST Research serial ports do not support a current loop-type interface.

### 3.10 Installing the Serial #2 Interface Cable

By now you should know which pin connector (J3, DTE; or J4, DCE) you are going to use. If you don't, go back over the above sections.



Examine the interface cable supplied with your "S" option. This ribbon-type cable is about eighteen inches long, has a rectangular connector at one end and a DB25P (plug- or male-type) connector at the other. The rectangular connector plugs into your MegaPlus II board. The larger, "D" shaped connector attaches to the cable from your remote serial device.

One edge of the ribbon cable is colored, usually red or blue. This is the pin #1 side of the cable. Position your MegaPlus II board so that the mounting bracket is to your right. Now position the cable so that the colored edge is towards the left end of the board. The ribbon cable should be exiting towards the bottom of your MegaPlus II board. Position the connector over the row of pins corresponding to the type of interface you have selected, and gently press the connector onto that row of pins. The connector should go on easily with an even, gentle pressure.

### **Routing the Adapter Cable**

The adapter cable can be routed in a variety of ways. If you have an older PC chassis with a cutout above the keyboard connection on the back panel, you can knock out the plug in this hole and mount the "D" type connector to the back panel. If your PC has an unused slot, you can mount the "D" connector in the supplied extra bracket and install the bracket in the unused PC slot.

#### **NOTE**

It is usually more advisable to route your adapter cable underneath existing boards, rather than over the top. The close tolerances at the top of the PC may produce some wear and tear on your cable or, worse yet, your cover may snag a cable and damage it.

### 3.11 Programming the Serial Port

The serial port on the MegaPlus II board is completely under software control and must be initialized for correct baud rate, parity, number of data bits, and number of stop bits before it can be used. Typically, this is done with the DOS MODE command (refer to your DOS manual for a detailed explanation of this command). This initialization must be performed each time you turn on the computer in order for the serial port to operate correctly. A typical MODE command might look like this:

```
MODE COM1:1200,N,8,1,P <enter >
```

The above command would initialize serial port COM1 for 1200 baud, no parity, 8 data bits, and 1 stop bit. The "P" is optional and tells DOS that you will be using the port with a serial printer.

Many application programs (such as word processors) will handle this initialization of the port automatically, thus making it unnecessary to use the MODE command. Refer to your software manual; if no mention is made of the MODE command, then it is probably safe to assume that you can omit that step. If you are unsure, it will not harm anything to go ahead and use the MODE command anyway.

If you are using the serial port to operate a serial printer, you may also need to redirect printer output from LPT1 to COM1 or COM2 as appropriate. This redirection is necessary because DOS always assumes that printer output goes to parallel port LPT1 unless told otherwise. The redirection of output is accomplished with a MODE command such as one of the following:

```
MODE LPT1:=COM1: <enter >           For printer serial  
                                     output to COM1
```

```
MODE LPT1:=COM2: <enter >           For printer serial  
                                     output to COM2
```

If one of the above commands is used, then it should follow the first MODE command in which you set up the baud rate, parity, etc. Again, it is possible that your application program is handling this redirection automatically. If so, you can eliminate this step as well.

### **3.12 Disabling Serial Port #2**

Serial port #2 on the MegaPlus II board can be completely disabled by removing the jumpers discussed in Section 3.6.

## SECTION 4

# PARALLEL PRINTER PORT (OPTION P)

This section applies to MegaPlus II boards that are equipped with the Parallel printer (**P**) option. This is not to be confused with the Serial option, discussed in Section 3. If your MegaPlus II board does not include this option, it can be added later. (See "User Upgrade Information".)

The IBM PC allows up to three parallel printer ports, called **LPT1**, **LPT2**, and **LPT3**. The parallel printer port on the MegaPlus II board is normally addressable as either LPT1 or LPT2. When there is an IBM Monochrome Display Adapter board installed in the PC, the printer port on the monochrome board is always LPT1, and the MegaPlus II board's parallel port defaults to LPT2. It can be set to LPT3, if desired (see Section 4.2). Your MegaPlus II board is configured at the factory as **LPT1**. If this is the only parallel printer port on your system, your MegaPlus II board is ready as shipped.

### 4.1 Installing the Interface Cable

Place the MegaPlus II board so that the mounting bracket is towards the right. Near the top of the board, just to the right of the large, round battery housing is connector **J2**, **PRINTER PORT**. (See Figure 1-1.)

Find the 18-inch-long gray interface cable supplied with your board. It has a rectangular connector at one end and a DB25S (socket- or female-type) connector at the other end. The end with the rectangular connector plugs into **J2** of your MegaPlus II board. The DB25S connector goes to your printer cable.

One edge of the ribbon-type adapter cable is colored, usually red or blue. This marks the wire to be connected to the pin #1 position of the set of pins labeled J2. Position the rectangular connector over J2 of the MegaPlus II board so that the colored edge of the cable is towards the left, closest to the battery housing on the MegaPlus II board. The cable should be exiting the connector toward the bottom of the board. Gently press the connector onto the row of pins. It should slide on easily with even pressure.

### **Routing the Adapter Cable**

The adapter cable can be routed in a variety of ways. If you have an older PC chassis with a cutout above the keyboard connection on the back panel, you can knock out the plug in this hole and mount the "D" type connector to the back panel. If your PC has an unused slot, you can mount the "D" connector in the supplied extra bracket and install the bracket in the unused PC slot.

#### **NOTE**

It is usually more advisable to route your adapter cable underneath existing boards, rather than over the top. The close tolerances at the top of the PC may produce some wear and tear on your cable or, worse yet, your cover may snag a cable and damage it.

## **4.2 Reconfiguring Your Parallel Port for Multiport Systems**

This section applies only if you are using more than one parallel port.

If you have an IBM Monochrome/Printer Adapter board: the printer port on the Monochrome/Printer board is **LPT1** and the printer port on the MegaPlus II board *automatically* defaults to **LPT2**. In this particular case, no reconfiguring is needed on the MegaPlus II board.

If you already have *another* (non-IBM Monochrome board) parallel printer port configured as LPT1, you should reconfigure the parallel printer port on the MegaPlus II board to function as LPT2.

Place your MegaPlus II board so that the mounting bracket is towards the right. Find the two sets of pins to the left of the MegaPlus II logo in the center of the board. A jumper should be on pin set P1. That stands for parallel port 1 (LPT1). Immediately below are two pins with the designation P2 (for LPT2). Move the jumper from position P1 to position P2. See Figure 1-1 for clarification.

#### NOTE

When the above change is made, *and* you have an IBM Monochrome board, the parallel port on the MegaPlus II board responds as LPT3.

### **4.3 Programming the Parallel Port**

The IBM PC always sends printer output to parallel port LPT1 unless specifically told otherwise. Unfortunately, PC-DOS 1.0 and 1.1 will not allow you to redirect output to LPT2 or LPT3. Appendix B of this manual gives information on how to cause the PC to send printer output to LPT2.

Although it is not required, you may want to use the DOS MODE command to set the line width and the number of lines per page. Refer to your IBM DOS manual for more information.

### **4.4 Printer Port Connections**

You can use the information below to make a cable for connecting to an IBM parallel printer or other parallel interface. This is a Epson-type parallel printer interface. When wiring to other parallel printers, check for variations. Not all printers have the same signal line connections. For minimal interference, you should use twisted pairs for the cable wirings. If you are unsure of how to construct a parallel interface cable, ask your printer dealer for assistance.

### NOTE

The cable supplied with your MegaPlus II board converts the board's parallel port output into the DB25 line signal format listed in the chart below. The J2 line outputs are supplied for reference only.

#### **Parallel Port Signal Line Configuration**

<b>Line Name</b>	<b>J2 Pin#</b>	<b>AST Adapter Cable Output DB25S</b>	<b>IBM Matrix Printer</b>
-STROBE	1	1	1
D0	3	2	2
D1	5	3	3
D2	7	4	4
D3	9	5	5
D4	11	6	6
D5	13	7	7
D6	15	8	8
D7	17	9	9
-ACK	19	10	10
BUSY	21	11	11
PE	23	12	12
SLCT	25	13	13
-AUTOFD	2	14	14
-ERROR	4	15	32
-INIT	6	16	31
-SLCT IN	8	17	36
GROUND	(10,12,14,16, 18,20,22,24)	(18-25)	(16,19-30,33)

### NOTE

A dash in front of the line name denotes lines which are functionally active when low.

## **4.5 Disabling the Parallel Printer Port**

The parallel printer port on the MegaPlus II board can be completely disabled by removing the jumper discussed in Section 4.2.



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## SECTION 5

### CLOCK-CALENDAR FEATURE

The Clock-Calendar comes standard with your MegaPlus II board and has the following features:

- 24-hour clock
- Four-year calendar (no leap year)
- Battery backup power supply (battery life approximately one year)
- User-replaceable lithium battery
- Full compatibility with PC-DOS
- Optional CP/M-86 and CCP/M-86 clock utility software available (see your dealer)

The Clock-Calendar feature answers the TIME and DATE prompts which the DOS operating system issues each time you boot the system.

#### 5.1 The Clock-Calendar Battery

The lithium battery is easily replaceable and should last for about a year. Since the battery is used only when your PC is not operating, the actual life of your battery will be determined by how much the PC is used. To replace the battery, *slightly* lift the retaining clip with your finger (or a small screwdriver) and use another small screwdriver to pry up the silver battery from its holder, then slide it out sideways. Do not remove the battery socket from the board. Replacement batteries can be purchased from your dealer (AST Research P/N 108-BR2325).

Take care not to damage or bend the retaining clip by lifting it too far. The clip completes an electrical circuit and must make solid contact with the positive (+) side of the battery. Whenever the battery is removed, it is a good idea to check the clip in the bottom of the battery holder; be sure that it is sticking up high enough to make good contact with the bottom surface of the battery. When installing a new battery, make sure it is clean and dry.

### NOTE

If you replace the battery, be sure to use the SETCLOCK procedure to restore the proper time and date.

## **5.2 Preparing Your Working DOS Diskettes**

After installing your MegaPlus II board, you must prepare your working DOS diskettes to automatically initialize the time and date each time that you boot the system. This section lists the process used to invoke your Clock-Calendar.

**STEP 1.** If you have not already done so, copy the two clock programs, ASTCLOCK.COM and SETCLOCK.COM to your working DOS diskette. These programs are on the SuperPak diskette supplied with your MegaPlus II board. If you are unsure of how to COPY a file, consult your DOS manual.

**STEP 2.** If your working DOS diskette already has an AUTOEXEC.BAT file, then you need to alter that file to include the ASTCLOCK command. To see the current contents of your Autoexec file, insert the working DOS diskette in drive A: and from the A> prompt, type the following command line:

```
TYPE AUTOEXEC.BAT <enter>
```

The contents of your Autoexec file will be listed on your CRT screen. You now need to create a new Autoexec file in which the command ASTCLOCK precedes these other command(s). The following sequence will do this for you:

```
COPY CON: AUTOEXEC.BAT <enter >  
ASTCLOCK <enter >  
.  
.  
.  
<Function key F6> <enter >
```

If your working DOS diskette has no Autoexec file, then you should use the above sequence to create one. The only command in the file will be ASTCLOCK.

**STEP 3.** If necessary, use the SETCLOCK utility to give the TIME and DATE variables their initial values as detailed in Section 5.3.

### **5.3 The SETCLOCK Utility: Setting the MegaPlus II Time and Date**

You need to execute the SETCLOCK utility whenever you want to correct the time or date of the MegaPlus II board's internal microprocessor clock. The DOS TIME and DATE commands only update the system's time and date parameters; they will not update the time and date values stored in the MegaPlus II board's clock chip until you execute the procedure below.

**STEP 1.** Boot the system with a diskette that leaves the screen at the A> prompt.

**STEP 2.** From the DOS prompt A>, enter the following instruction:

```
SETCLOCK <enter >
```

#### **NOTE**

The SETCLOCK.COM program must be on your DOS diskette.

A message will be displayed on your screen indicating that resident date and time processors are loaded. The current date and time will also be displayed.

**STEP 3.** Enter the DOS command DATE. The current date will be printed on the screen, and you will be given a chance to enter a new date. Press Enter if no change is necessary or type a new date in the form **mm/dd/yy <enter>** or **mm-dd-yy <enter>**. DOS will figure out the day of the week from the information that you enter.

**STEP 4.** Enter the DOS command TIME. The current date will be printed on the screen, and you will be given a chance to enter a new time. Press Enter if no change is necessary or type a new time in the form **hh:mm:ss <enter>**. For maximum accuracy, type in a time that is 10 to 15 seconds ahead of the actual time but do not press the Enter key; observe a digital clock or watch, and press Enter when the seconds reading on the clock catches up to the value that you typed in.

**STEP 5.** Reboot the system (press Ctrl and Alt simultaneously and hold while pressing Del) to install the new TIME and DATE values.

## **5.4 Device Addressing of the Clock-Calendar**

This technical information is for reference only; you do not need to read this section to use the Clock-Calendar feature. The Clock-Calendar is at I/O address hexadecimal 2C0 and uses 32 contiguous locations for programming functions. See Appendix C for a breakdown of programming functions and locations.

## **5.5 Disabling the Clock-Calendar on Your MegaPlus II**

To disable the Clock-Calendar, the jumper must be removed from pin pair CS. To locate CS, place your MegaPlus II board so that the mounting bracket is towards the right, and find the four jumper pin pairs near U71 (see Figure 1-1 for clarification). The top jumper is designated as CS.

## SECTION 6

### MEGAPAK

The MegaPak is a small piggyback board that is an optional feature of the MegaPlus II board. It contains rows of memory chips to provide additional memory beyond that of the MegaPlus II.

There are two versions of the MegaPak board. One version (P/N MPK-128) provides **128K** of memory, which brings the MegaPlus II board total to 384K bytes. The second (P/N MPK-256) provides **256K**, which brings the total to 512K.

A fully-populated MegaPlus II (256K) can be upgraded at any time with the MegaPak option. The MegaPak plugs onto connector **J5** on the MegaPlus II board (see Figure 1-1 for clarification). If you purchase the MegaPlus II with the MegaPak option, the piggyback board will already be installed on the MegaPlus II board. No changes to switch settings or jumper blocks are required on the MegaPlus II when installing the MegaPak. However, if you have a PC-1 or PC-2, you should set Switch #2 on the system board to reflect the new total amount of memory when adding the MegaPak. The PC-XT will automatically recognize the additional memory. See Section 2 regarding configuring the PC system board switches.

#### NOTE

Neither version of the MegaPak can be expanded with additional memory.

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## SECTION 7

### GAME ADAPTER PORT

The Game adapter port is located on a small piggyback board that is an optional feature of the MegaPlus II board. The piggyback board can be used to connect an IBM-compatible joystick to your IBM PC.

If you purchase the MegaPlus II board with the Game adapter port option, the piggyback board will already be installed on the MegaPlus II board. There are no switches to set or jumper blocks to install. The game port is totally software-compatible with the IBM game adapter when using the IBM-type joystick.

#### 7.1 Installing the Game Adapter Piggyback Board

Place the MegaPlus II board so that the mounting bracket is towards the right. Find the 16-pin connector that is designated as **J1** on the piggyback board (see Figure 7-1). Plug the cable's connector into J1 on the piggyback board, making sure that pin #1 on the cable is matched up with pin #1 on J1. (Pin #1 on J1 is designated by a "1"; the V-shaped notch on the cable's connector means that pin #1 is on that corner.) Then fold the cable at a right angle so that it exits toward the rear of the PC.

#### 7.2 Device Addressing of the Game Adapter

The game adapter is at I/O address hexadecimal 201. This technical information is for reference only; you do not need to know this to use the game adapter.



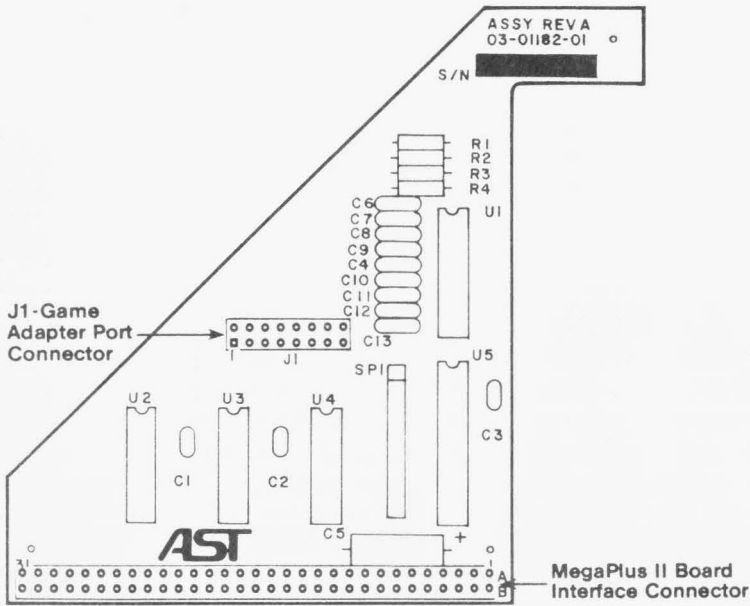


Figure 7-1. Game Adapter Piggyback Board Layout

### 7.3 Disabling the Game Adapter Port

The game adapter port can be completely disabled by removing the piggyback board from the MegaPlus II board. This is done by disassembling the screw set that connects the two boards together (found near the top of the mounting bracket at the right end of the MegaPlus II board) and unplugging the piggyback's 62-pin female connector from the 62-pin male connector on the MegaPlus II board.

## SECTION 8

# INSTALLING YOUR MEGAPLUS II BOARD

The MegaPlus II board can be inserted in any one of the five expansion slot receptacles on the PC system board.

### CAUTION

**BE SURE THAT THE POWER TO THE PC  
IS OFF BEFORE INSTALLING OR  
REMOVING ANY EQUIPMENT.**

**STEP 1.** Select a free expansion slot, and find the black metal bracket that covers the cut-out in the back panel of the PC chassis for the slot that you have selected. Remove and save the bracket-retaining screw using a small flathead screwdriver. Remove the bracket.

**STEP 2.** Install the black plastic card guide (supplied) on the inside of the front panel of the PC for the slot that you have selected.

**STEP 3.** Line up your MegaPlus II board and position its front bottom corner in the card guide channel (not the MegaPak). Keeping the top of the MegaPlus II board level, lower the MegaPlus II board until its edge connector is resting on the expansion slot receptacle. Using evenly distributed pressure, press the MegaPlus II board *straight down* until it is seated in the expansion slot. Replace the bracket-retaining screw that was removed in step 1.

**STEP 4.** (Parallel printer, Game adapter, and/or Serial #2 options only) The adapter cable can be routed in a variety of ways. If your PC has a cutout above the keyboard connector on the rear panel, route the adapter cable under all of the boards and out to the cutout. The cutout's plastic cover can be removed easily by pressing it towards the rear. If your PC has an unused slot, you can mount the "D" connector in the supplied extra bracket and install the bracket in the unused PC slot.

**STEP 5.** You can replace the system unit's cover prior to checkout of the new installation, or you can wait until later. To replace the cover, carefully slide the cover from the front until it stops securely against the rear panel. Reinstall the mounting screws that you removed earlier.

**STEP 6.** Replace the power cord to the system unit, and be sure that the keyboard and the monitor connectors are plugged in.

## 8.1 Testing the New Installation

Insert a DOS diskette in drive A: and turn on the power. The amount of time the machine takes to run through the power-up diagnostics will be longer than it was prior to installing the MegaPlus II board. This is because additional memory is tested to be sure it is functioning properly. A delay of 30 or more seconds is normal.

1. If everything was done properly, the system will boot as normal. If you get an error message or nothing happens, it is probably because the switch settings on the PC system board and/or the MegaPlus II board are wrong. Check the switches again.
2. With the DOS diskette in drive A:, type **CHKDSK <enter>**. The second line from the bottom of your display will indicate the number of bytes of total system memory.

Total System Memory	Displayed
128K	131072
192K	196608
256K	262144
320K	327680
384K	393216
448K	458752
512K	524288
544K	557056

### NOTE

Here again, the largest amount of memory the PC can "see" is tied to the switch settings on the system board. Consequently, in a PC-1, even if you have more than 544K installed, with the system board switches set for 544K, that is the amount displayed when you type a CHKDSK command under DOS. This is also the case when running IBM Diagnostics; only 544K of memory will be tested.

Verify that the amount of memory in your total system is as you expected. Next, run the IBM diagnostic routines to check out the options you have just installed. See your *IBM Guide to Operations* manual for instructions.

### NOTE

The diagnostic routines do not test the Clock-Calendar feature.

3. After you have finished the diagnostic routines, insert the DOS diskette that you have installed with the AUTOEXEC.BAT file in Section 5. Reboot the system (press CTRL and ALT and hold while pressing DEL). The ASTCLOCK program should come up and display the current time and date. In most cases the clock should give the valid time with the exception of time zone differences. If necessary, use the SETCLOCK program to set/reset the clock on your MegaPlus II board.

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# USER UPGRADE INFORMATION

The MegaPlus II board is designed to allow easy user upgrade. To order the optional items, please use the following part numbers.

### Memory Upgrade

- Order AST Research part number MP-009 for each increment of 64K memory upgrade which consists of nine pieces of 64K dynamic RAM chips.

### Second Serial Option

- Order part number MG-000S for the async communication (RS-232) upgrade kit which consists of a UART, interface ICs, adapter cable, and documentation.

### Parallel Printer Option

- Order part number MG-000P for the parallel printer upgrade kit which consists of all the necessary ICs, printer adapter cable, and documentation.

### MegaPak Option

- Order part number MPK-256 for the 256K piggyback board or part number MPK-128 for the 128K piggyback board.

## Game Adapter Option

- Order part number MG-000G for game adapter upgrade kit which consists of a game adapter piggyback board and a game adapter cable.

### NOTE

ALTHOUGH THE AST RESEARCH MEGAPLUS II BOARD IS DESIGNED FOR EASY USER EXPANSION, THE WARRANTY COVERAGE APPLIES ONLY TO THE CONFIGURATION OF THE BOARD AS ORIGINALLY SHIPPED FROM THE FACTORY. THE EXPANSION SOCKETS AND ANY ADDITIONAL EXPANSION-RELATED COMPONENTS ARE NOT WARRANTED.

## APPENDIX A

### RECOMMENDED SERIAL PORT CABLING

This section contains pin connections and wiring configurations for interfacing the serial port on your MegaPlus II board to specific serial printers and modems. For information on wiring other product interfaces, consult Appendix E of this manual and your serial device's manual, or call your printer manufacturer and tell them you wish to connect to an IBM PC asynchronous serial port.

#### \*\*\*DTE Type Cabling\*\*\*

The following interface diagrams refer to DTE interfaces only, such as the serial port on the MegaPlus II board.

-----

Suggested wiring to modem devices (Hayes Stack Smart modem, Novation Cat, UDS, etc):

MegaPlus II Serial Port Connector	Modem Port Connector
1 -----	1
2 -----	2
3 -----	3
4 -----	4
5 -----	5
6 -----	6
7 -----	7
8 -----	8
20 -----	20
22 -----	22

Use a DB25S (female/socket) connector for the MegaPlus II side and a DB25P (male/plug) connector for the modem side.



Suggested wiring for NEC 7700 series; TI 810 series; Epson MX-100-3; Brother HR-1; OKIDATA Microline 83A, 84; and Anadex 9501 serial printers:

MegaPlus II Serial Port Connector	Printer Port Connector	
1-----	1	
2-----	3	
3-----	2	
4-----	5	
5-----	11	} TI, Brother, Epson, OKIDATA only
5-----	19	
6 & 8-----	20	
7-----	7	
20-----	6 & 8	

Pins 6 and 8 on the PC side are wired together and connected to pin #20 from the printer. The same is true at the printer side.

This wiring allows the printer to inform the PC that its receiving buffer is full. Use a DB25S (female/socket) connector for the MegaPlus II board's serial port and a DB25P (male/plug) for the printer. If you have a printer like the NEC 7720 (which requires a DB25S), you will need to use an adapter to hook up to the port.

Suggested wiring for the Qume Sprint 9/45, 9/55 printers:

<b>MegaPlus II Serial Port Connector</b>	<b>Printer Port Connector</b>
1-----	1
2-----	3
3-----	2
4-----	5
5-----	20
6 & 8-----	4
7-----	7
20-----	6 & 8

This wiring allows the Qume printer to inform the PC that its receiving buffer is full. Use DB25S (female/socket) for the MegaPlus II board's serial port and a DB25P (male/plug) for the Qume printer.

-----

Suggested wiring for CRTs and printers running at low baud rates (110-300):

<b>MegaPlus II Serial Port Connector</b>	<b>CRT/Printer Port Connector</b>
1-----	1
2-----	3
3-----	2
7-----	7
4 & 5	---
6 & 8-----	20
-----	5 & 20 or 4 & 5 if needed

This wiring does not use standard EIA RS-232C handshaking; however, it should work with most CRTs and some printers. Use DB25S (female/socket) for the MegaPlus II board's serial port and a DB25P (male/plug) for the CRT or printer (in most cases). Notice that pins 5 and 20, or 4 and 5 on the CRT side can be wired together. Consult the user's manual for your CRT or printer for your specific configuration.

Suggested wiring for the Diablo 620 printer:

<b>MegaPlus II Serial Port Connector</b>	<b>Diablo 620 Serial Port Connector</b>
1-----	1
2-----	3
3-----	2
5-----	4
7-----	7
6 & 8-----	20
20-----	6

This arrangement allows the Diablo to inform the PC side of the interface that its receive buffer is full. Notice that pins 6 and 8 on the PC side are wired together and then commonly connected to pin #20 on the Diablo 620 side.

-----

There are several different versions of the Diablo 630 printer available. We have had the best success with the following wiring for the serial interface:

<b>MegaPlus II Serial Port Connector</b>	<b>Diablo 630 Serial Port Connector</b>
1-----	1
2-----	3
3-----	2
5-----	11
7-----	7
6 & 8 & 20-----	6 (or 6 & 4)

If the above wiring does not work for you, you will need to contact Diablo or the dealer from whom you purchased the printer.

Suggested wiring for the Smith-Corona TP-1, Epson MX-80 serial printer, and IDS Prism serial printers:

<b>MegaPlus II Serial Port Connector</b>	<b>Printer Port Connector</b>
1-----	1
2-----	3
3-----	2
4-----	5
5-----	4 (TP-1 only)
5-----	20 (MX-80, IDS only)
6 & 8 & 20	---
7-----	7
---	6 & 8 & 20 (TP-1 only)

This arrangement gives these printers sufficient control over output from the PC side of the interface. Notice that pins 6, 8, and 20 are connected to each other on either side of the link for the TP-1. This allows both devices to remain in a ready state, while pins 4 and 5 actually control the flow of data from one side to the other.

Suggested wiring for the Hewlett-Packard 7470A plotter.

<b>MegaPlus II Serial Port Connector</b>	<b>HP 7470A Serial Port Connector</b>
1-----	1
2-----	3
3-----	2
5-----	20
6 & 8 & 20	---
7-----	7

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## APPENDIX B

### SWITCHING BETWEEN LPT1 AND LPT2

The following program can be used in the .BAT mode to direct printer output, normally designated for the device attached to port LPT1, to instead be routed to the device attached to port LPT2. (The program also directs output, normally designated for the device attached to port LPT2, to instead be routed to the device attached to port LPT1.)

This can be used when your LPT1 printer (call it printer #1) is down for service, or when you desire, say, the type style or speed of the printer attached to LPT2 (call it printer #2). This program allows you to quickly switch between outputs without having to alter your hardware interface or change each line in programs where LPT1 or LPT2 appear as your output port designation.

If your printers are not configured to the same parameters, as defined in the PC-DOS MODE command, it will be necessary to add two MODE statements when switching devices.

You will note that the "swap" program below is written in BASIC. Since the printer port swap is best handled in DOS, it is necessary to invoke BASIC within the .BAT file. No RUN command is required when the BASIC call and the program filename occur on the same line (**BASIC LPTSWAP**).

The following DOS batch file and BASIC program will redirect printer output from LPT1 to LPT2 or vice versa, depending on which port is being used at the time.

LPTSWAP.BAT (or a name of your choosing) with the following:

```
MODE LPT1:[parameters for printer #2 (if needed)]  
MODE LPT2:[parameters for printer #1 (if needed)]  
BASIC LPTSWAP
```

LPTSWAP is a BASIC program, as shown below. The comments are included for clarification and need not be included in the actual program:

```
10 DEF SEG=&H40           ' finds port address table
20 A=PEEK (8): B=PEEK (9) ' save LPT1 address
30 POKE 8,PEEK (10): POKE 9,
   PEEK (11)              ' LPT2 address to LPT1
40 POKE 10,A: POKE 11,B  ' LPT1 address to LPT2
50 SYSTEM                 ' return to DOS
```

Omit the last statement if you will be LPRINTing from BASIC.

**To restore LPT1 to LPT1 AND ALSO to restore LPT2 to LPT2**

Use the same program, LPTSWAP, to restore your parallel printer ports to their original arrangement. Be sure to restore the proper parameters using a new batch file and MODE statements.

LPTRSTR.BAT is as follows:

```
MODE LPT1:[parameters for printer #1 (if needed)]
MODE LPT2:[parameters for printer #2 (if needed)]
BASIC LPTSWAP
```

## APPENDIX C

### CLOCK-CALENDAR CHIP

The following table lists the I/O addressing for the Clock-Calendar chip, MM58167A.

<b>I/O Address Offset</b>	<b>Function</b>
2C0	counter-1/10000 of seconds
2C1	counter-1/100 and 1/10 seconds
2C2	counter-seconds
2C3	counter-minutes
2C4	counter-hours
2C5	counter-day of the week
2C6	counter-day of the month
2C7	counter-month
2C8	RAM-upper nibble only
2C9	RAM-last month storage
2CA	RAM-year storage (-80)
2CB	RAM-reserved
2CC	RAM-not used
2CD	RAM-not used
2CE	RAM-not used
2CF	RAM-not used
2D0	interrupt status register
2D1	interrupt control register
2D2	counter reset
2D3	RAM reset
2D4	status bit
2D5	GO command
2D6	standby interrupt
2DF	test mode



## Counter and RAM Reset Format

Data	Function
01	1/10000 of seconds
02	1/100 and 1/10 of seconds
04	seconds
08	minutes
10	hours
20	days of the week
40	days of the month
80	months

## APPENDIX D

### PATCH PROCEDURES

The following patches correct problems in the DOS 1.1 versions of DISKCOPY and DISKCOMP.

Create a DOS diskette which contains the DEBUG utility and the program to be patched. (Your DOS manual explains the use and function of the DEBUG utility.) Place this disk in drive A: and boot the computer. After the patch is applied, the new (patched) version can be copied over to your working diskettes. *Do not apply patches to your master diskettes — use backups only! Test the patched version before actually using it!*

In the following procedures, the user enters all boldface text, exactly as shown; *be sure to include spaces*. The computer responds with all other output. Refer to your DOS manual for more information on using the DEBUG commands.

---

#### Patch for DOS 1.1 Version of DISKCOPY Utility

The following patch fixes a problem in DISKCOPY when you have a large amount of memory and double-sided drives.

```
A>DEBUG DISKCOPY.COM<enter>
-E861 E8 74 00<enter>
-E8D8 3D 51 00 72 02 B0 50 A2 36 05 C3<enter>
-RCX<enter>
CX 07D8
:7E3<enter>
-W<enter>
Writing 07E3 bytes
-Q<enter>
```

```
A>
```

---

### Patch for DOS 1.1 Version of DISKCOMP Utility

The following patch fixes a problem in DISKCOMP when you have a large amount of memory and double-sided drives.

```
A > DEBUG DISKCOMP.COM <enter >
-E6EC E8 79 00 <enter >
-E768 3D 51 00 72 02 B0 50 A2 95 04 C3 <enter >
-RCX <enter >
CX 0668
:673 <enter >
-W <enter >
Writing 0673 bytes
-Q <enter >
```

```
A >
```

---

## APPENDIX E

### WIRING RS-232 SERIAL INTERFACES

#### **Wiring Your PC Serial Port to Remote Serial Devices Using the Electronic Industry Association RS-232C Standard Interface**

AST Research designs its products so that they are easy to reconfigure. For example, there is no etch cutting or soldering required to reconfigure a serial port from COM1 to COM2. To make this change you simply move two jumpers to different pairs of pins.

The EIA RS-232C standard describes the arrangement of control and data signals on both sides of a serial communications interface. As a reference point to model the standard on, the RS-232 document describes an ideal case in which a data terminal is connected to a modem. A modem is a MODulator/DEMODulator used to connect a terminal to a communications device. The communications device interfaces to a transmission medium (for example, phone lines) which carries the signal to a similar device connected to a port on another DTE port or the communications element of a mainframe computer system (either of which we can call the "remote").

The EIA standard provides for various signals to be sent between a data terminal (DTE) and a data communications device (DCE) to control the exchange of data to and from the local modem and local terminal. These signals travel on separate wires from pins on the DTE side (terminal) to pins on the DCE side (modem).

For asynchronous applications such as your AST Research board's serial port, we are interested in the "states" of only eight or nine (of the twenty-five possible) wires between the DTE (your PC port) and the DCE (a modem or serial printer DCE port).

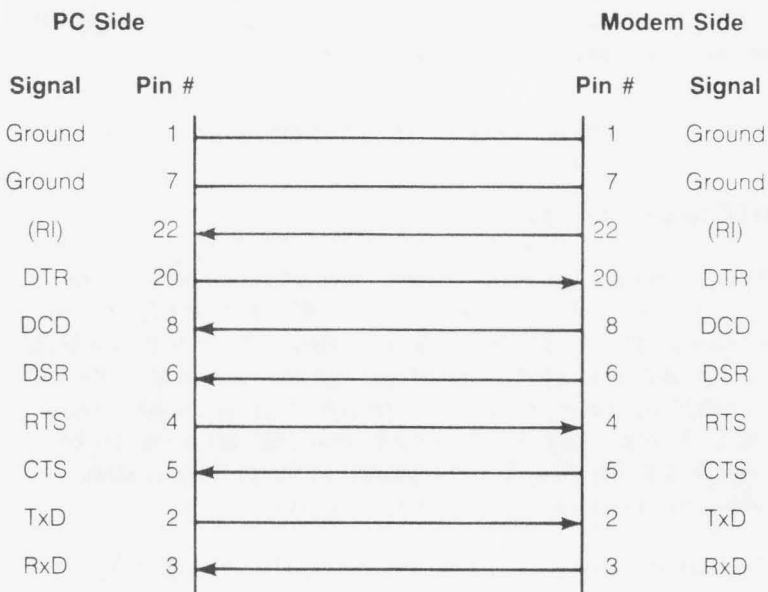
Let's look at an ideal case set up first so that you will become acquainted with the signal and sequence requirements of the RS-232 standard. In our ideal case scenario, we'll imagine that we are connecting the serial port on your AST Research board (DTE) to a telephone modem (DCE). A properly configured DCE/DTE interface will be wired "straight across"; i.e., pin #20 on the DTE side will be wired to pin #20 on the DCE side, pin #2 to pin #2, and so forth. Let's see what sort of "handshaking" (the manner in which two devices are set to interact so as to function properly) has to take place.

When the DTE serial port on your PC wants to transmit some data, it raises the voltage, or "brings up", pin #20 which is known as DTR (Data Terminal Ready). This voltage travels to pin #20 on the DCE side where, ideally, the DCE modem tells itself that a communications link is being requested by the terminal device. Assuming that an open phone line exists, the DCE brings up two lines on its side of the interface; DSR (Data Set Ready, pin #6) and DCD (Data Carrier Detect, pin #8). When the DTE (remember, that's your PC port) sees voltage at its pins 6 and 8, it is free to bring up pin #4, RTS (Request to Send). This tells the DCE, in effect, "I've got data to transmit to you right now!" The DCE checks to make sure it is ready to receive data and, if so, brings up pin #5, CTS (Clear to Send). The DTE, seeing voltage on its pin #5, starts transmitting on the wire connected to pin #2, TxD (Transmit Data). Any incoming traffic is received at pin #3, RxD (Receive Data). Note that some modems have an automatic answer mode which uses pin #22, Ring Indicator (RI), to alert the terminal that incoming data is due. The terminal responds with DTR.

#### NOTE

Be sure to wire pins 1 and 7. They are ground wires and can help protect your equipment from damage.

Figure E-1 shows which signals are used between the DTE and DCE and in which direction they travel.



**Figure E-1. The Ideal: Terminal to Modem**

Notice that the input signals on the DTE side of the interface are DCD, DSR, CTS, and RxD. Also, the DTE has output signals, DTR and RTS. These are the signals which must be handled by the interface before the DTE can transmit or receive data.

Now notice the sequence in which these signals occur (top to bottom in Figure E-1). From the DTE's standpoint, he must send DTR, see DCD, see DSR, send RTS, and see CTS before he can transmit or receive data. That is, the input signals must have voltage applied to them or the interface cannot become operational. (The output signals matter only in that they are input to the DCE side of the interface.) The hardware which controls the DTE serial interface will not release data to the communications link until the proper *set* and *sequence* of signals has been *received*.

One other concept: you can think of certain pins on one side of the interface as being "functional pairs". When the AST Research board's serial port sends DTR, it expects to see DSR (and DCD) raised in response. DTR and DSR are signal and response to one

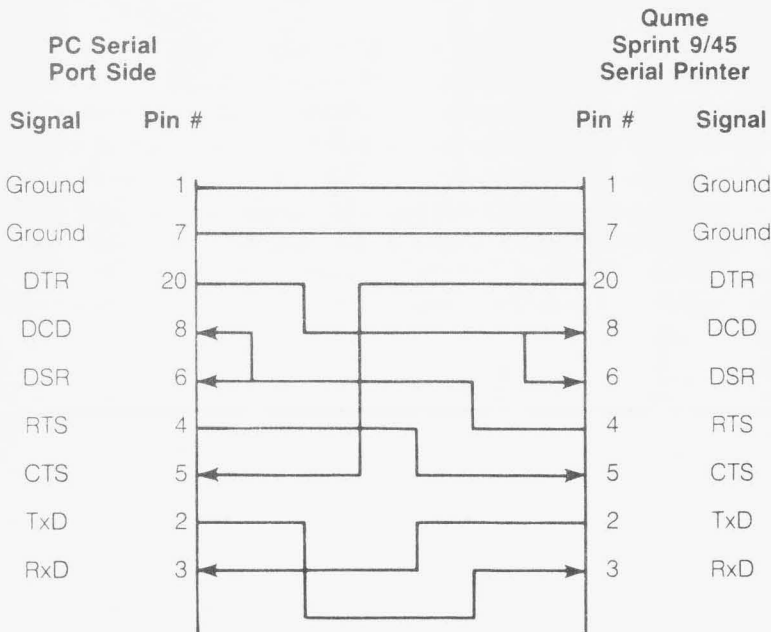
another. For this reason we will think of them as a pair. The same is true of RTS and CTS, and of TxD and RxD. This concept will be taken up again later in our discussion.

**NOW LET'S LOOK AT A TYPICAL (NON-IDEAL) CASE**

**DTE to DTE Interfaces**

As is often the case, many devices, such as serial printers, are set up as DTEs. To output data from your PC serial port (also DTE) to a serial printer or other DTE device requires the wiring of a DTE to DTE interface. Such an interface must fool each side of the link into thinking that it is receiving "response" input signals from a DCE. As mentioned above, not only must the input voltages be present, but they must become present in the proper sequence (although, this varies from device to device).

To illustrate, let's look at the case presented in Figure E-2.



**Figure E-2. Example of a Specific DTE to DTE Interface**

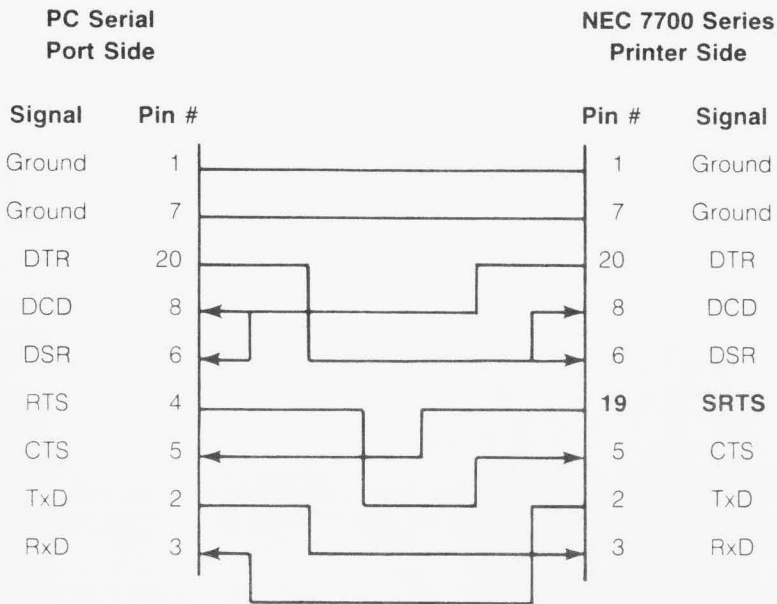
Notice that the necessary input signals have been supplied to both sides. DCD, DSR, and CTS have voltage applied to them on either side. The integrated circuit which controls the PC side (INS 8250) is fairly flexible in reading the sequence of input signals. That is why we can "drive" CTS with DTR from the printer's side. You'll notice that this is the only sequencing rule that we've broken. Why have we done this? The Qume manual explains that when the printer's receive buffer is about to fill up, it "drops" its DTR signal. Since we don't want to lose data by overflowing the printer's receive buffer, we need to immediately halt the output of data from the PC side of the interface. The best way to do this is to immediately drop the Clear to Send (CTS) input signal on the PC side. By having the printer's DTR output signal drive the PC's CTS input signal, we can ensure that this kind of control will occur. The remainder of the interface will "idle" until the printer "raises" DTR again. (Remember, this is a specific case for Qume serial printers.)

Let's look at another example of interfacing a serial DTE printer to the PC's AST Research board's serial port.

In this case, the printer uses line 19, a Secondary Request to Send (SRTS), instead of pin #4. Other than this oddity, careful examination of the interface will show that all of our DTE input and sequence rules have been followed. On both sides DCD, DSR, and CTS are raised, and in the top-down sequence that we are generally trying to follow for these signals.

Another nice thing about this particular wiring is that all of the pins are driven by their functional counterparts on the other side of the interface. You'll recall in our Ideal Case scenario we mentioned functionally related "pairs" of pins. (DTR/DSR, RTS/CTS, and TxD/RxD.) Figure E-3 shows that an element of a pair on one side of the interface is driving its partner element on the other side of the interface. When sequence is important, this is a good way to tell if your interface will work or not.

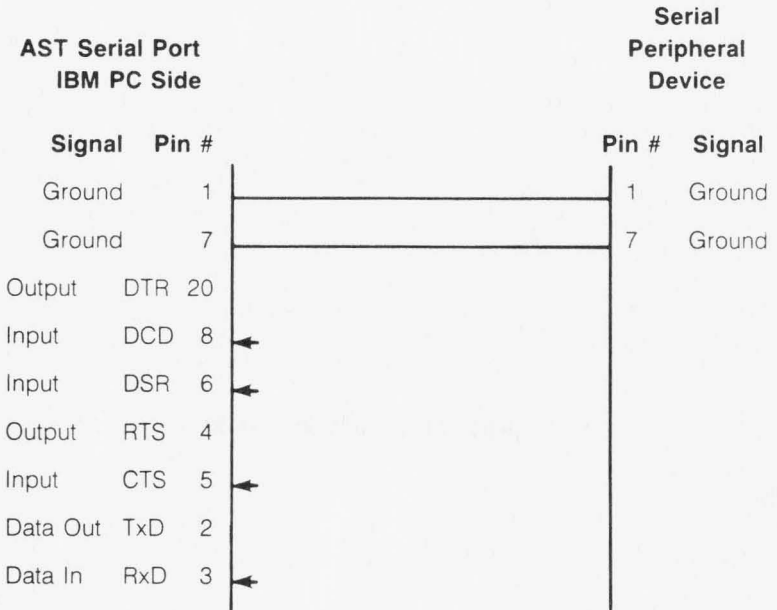




**Figure E-3. AST Research Board's Serial Port DTE to NEC 7700 Series Serial DTE Printer**

Any serial device manual worth the paper it's printed on will tell you how the device uses the RS-232 line signals and which pin numbers supply which signals. If your device manual doesn't give you enough information to go on, call or write the device company and tell them you are interfacing their product to an IBM Personal Computer asynchronous serial port. Serial ports on all AST Research boards are set up to be functionally identical to the IBM product. The appendices of your AST Research product manual may also be of some help, and your dealer can usually assist you if you have problems. Your dealer can also direct you to a parts store which carries the products you need to construct an interface cable. Be sure you buy the correct type of 25-pin connectors (male or female) to connect both ends properly. Your AST Research board's serial port end requires a DB25S, female- or socket-type connector.

To properly wire your serial interface signals, we suggest that you use the form below as a design aid.

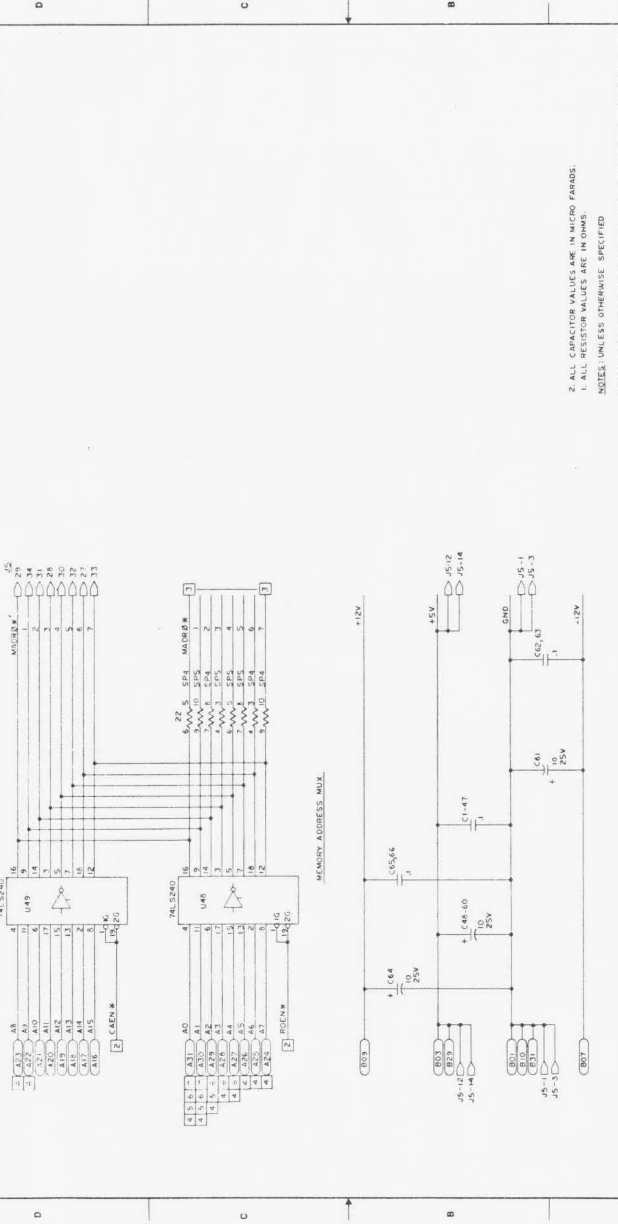


**Figure E-4. Serial Interface Form**

**Helpful Hint:** If you have several different serial devices which will be using your serial port, make all of your wiring translations in small assemblies. Then you can use the same long cable to connect your PC to any of these devices.

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10/26/59	A	PRODUCTION BLUE



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AST RESEARCH INC.  
SCHEMATIC DIAGRAM  
MEGAPLUS II

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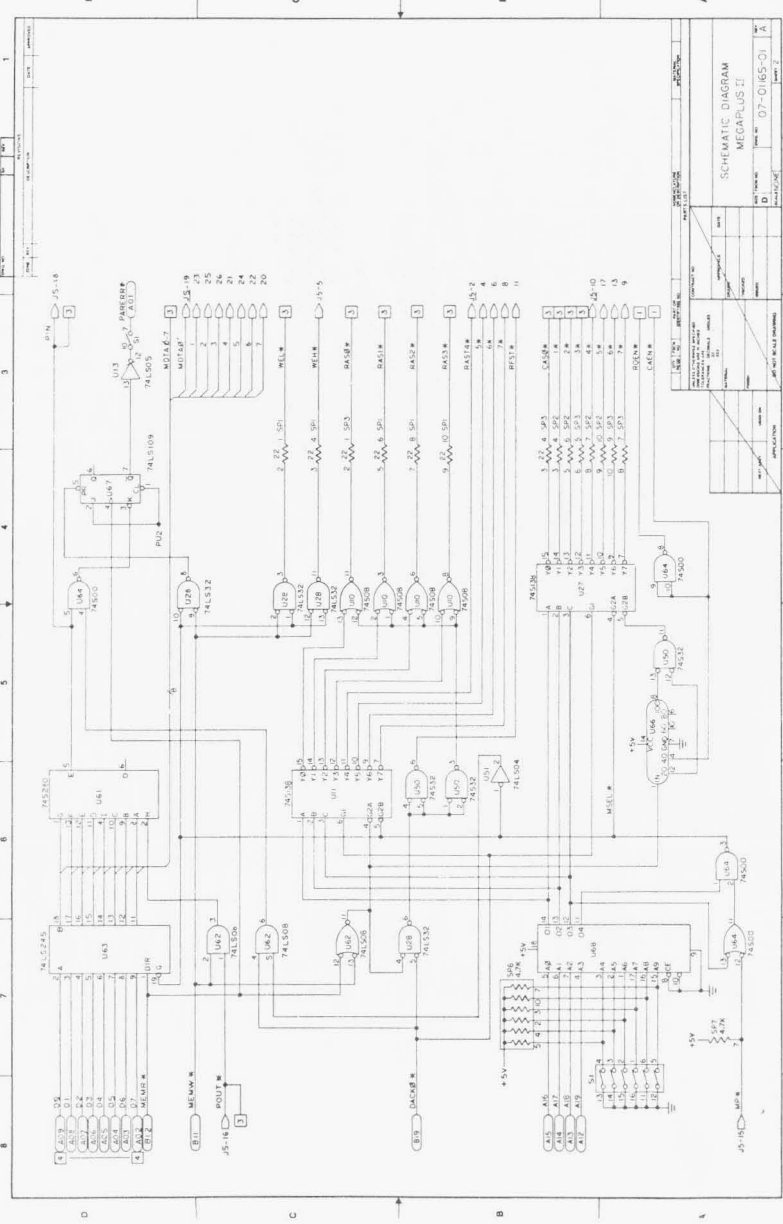
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SCHEMATIC DIAGRAM  
MEGAPLUS II

Doc No: 07-0165-01  
Rev: 1

NO	REVISION	DATE	BY	CHK	APP
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DATE	DESIGNED BY	CHECKED BY
10/10/78	W. J. B. J. J.	W. J. B. J. J.
DATE	DESIGNED BY	CHECKED BY
10/10/78	W. J. B. J. J.	W. J. B. J. J.
DATE	DESIGNED BY	CHECKED BY
10/10/78	W. J. B. J. J.	W. J. B. J. J.

DATE	DESIGNED BY	CHECKED BY
10/10/78	W. J. B. J. J.	W. J. B. J. J.
DATE	DESIGNED BY	CHECKED BY
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DATE	DESIGNED BY	CHECKED BY
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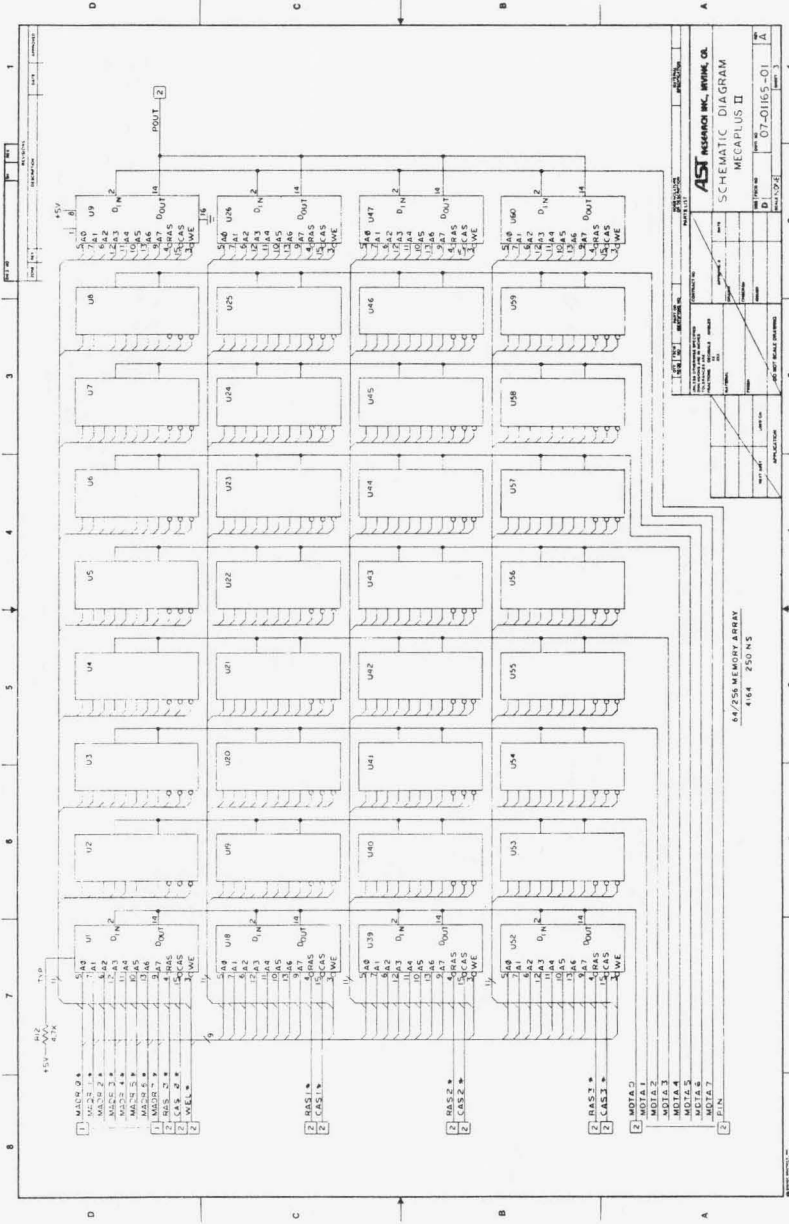
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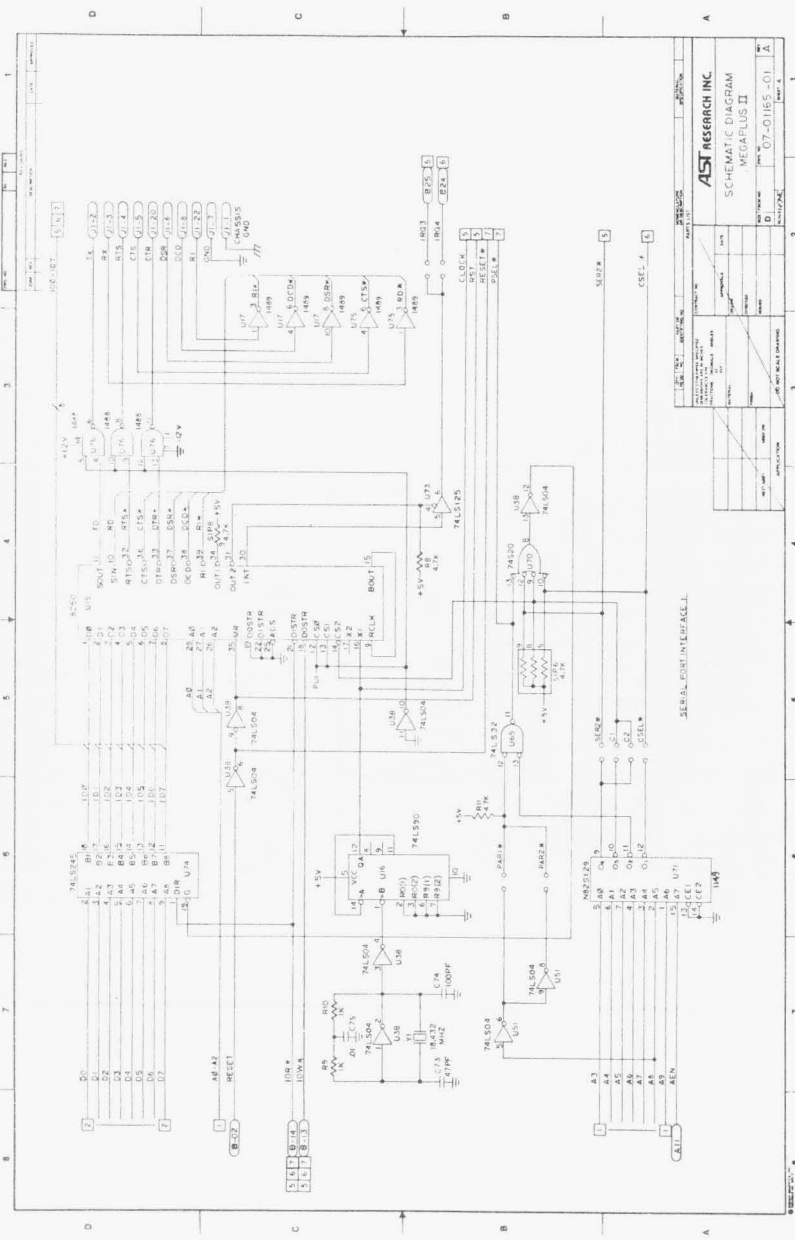
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**AST** MEMPHIS INC. MEMPHIS, TN  
**SCHEMATIC DIAGRAM**  
 MEGAFLOUS II  
 PART NO. 07-0165-01  
 REV. 1

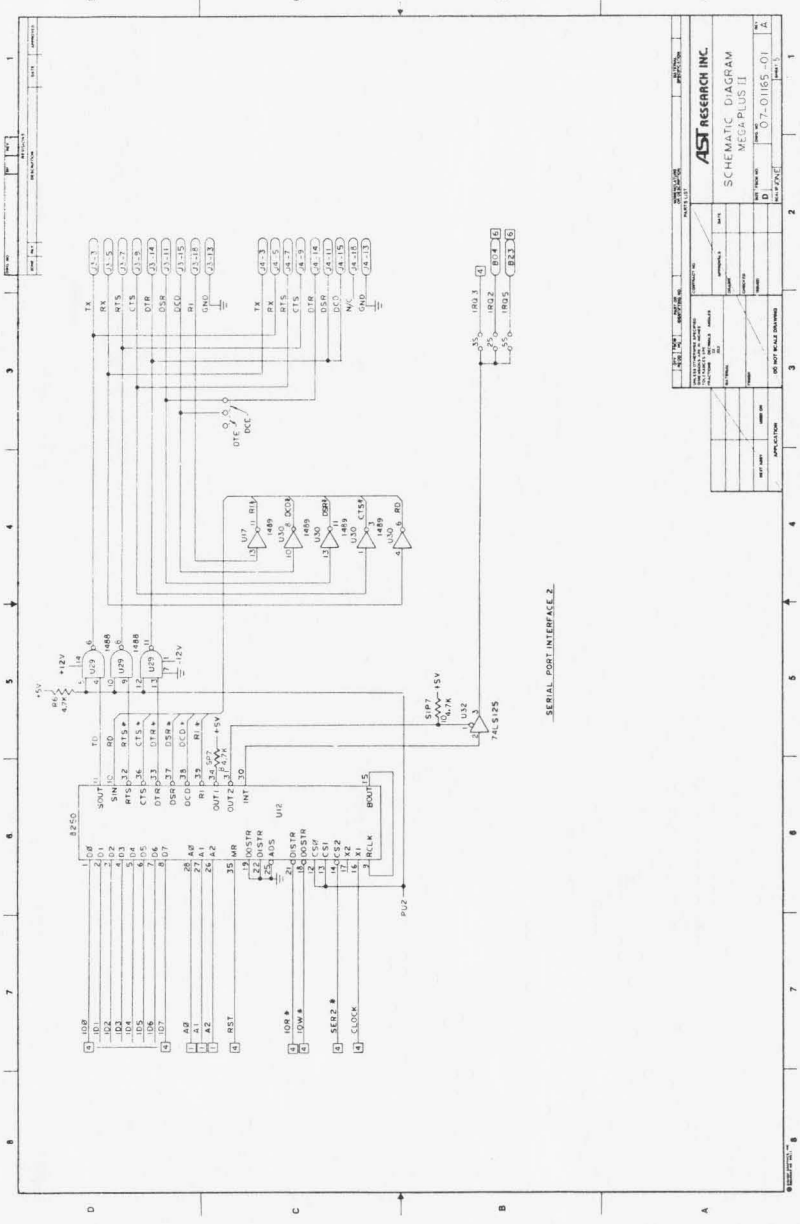
**84258 MEMORY ARRAY**  
 4164 250 NLS



NO.	DESCRIPTION	QTY.	UNIT PRICE	TOTAL PRICE
1	74LS244	1	...	...
2	74LS04	...	...	...
3	74LS30	1	...	...
4	74LS125	1	...	...
5	74LS237	1	...	...
6	74LS104	1	...	...
7	74LS149	1	...	...
8	74LS148	1	...	...
9	74LS147	1	...	...

AST RESEARCH INC  
SCHEMATIC DIAGRAM  
MEGALUS II

DATE: 07-01EE-01 A  
DRAWN BY: ...  
CHECKED BY: ...  
APPROVED BY: ...

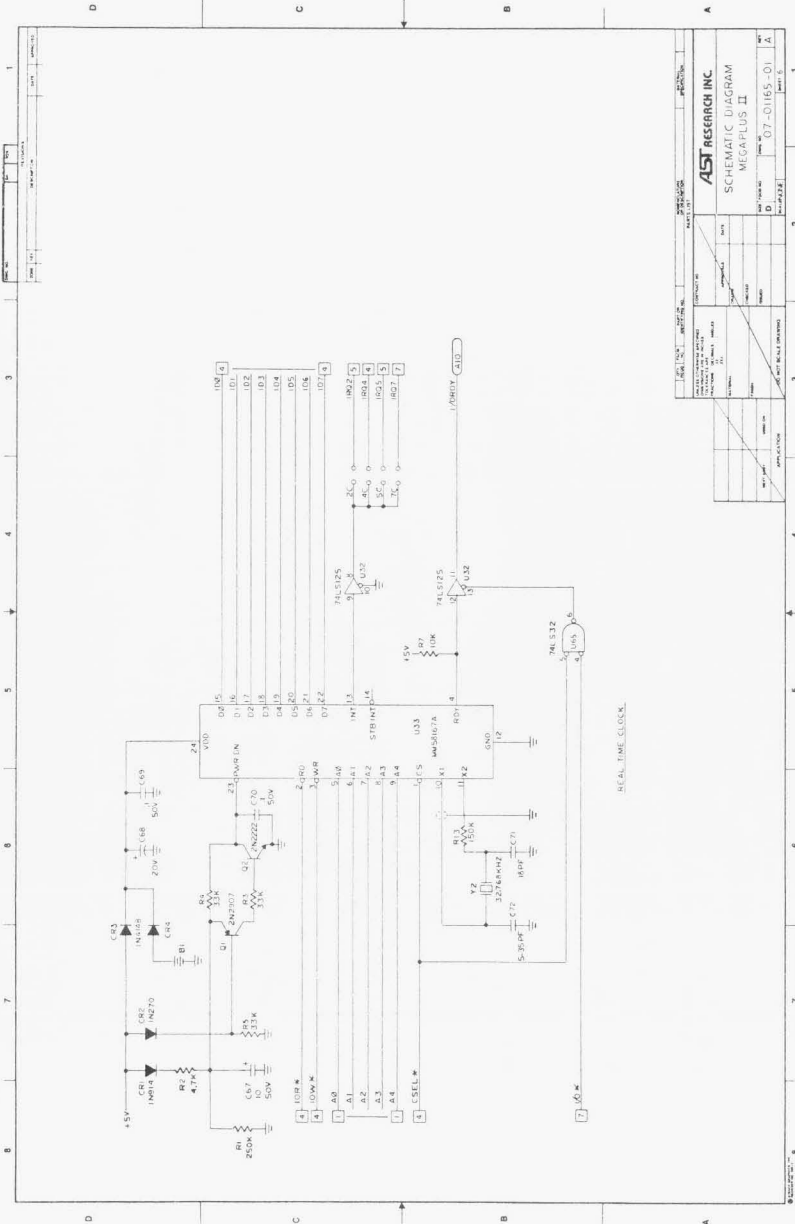


**AST RESEARCH INC.**  
SCHEMATIC DIAGRAM  
MEGA PLUS II

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CHECKER:	REV:
APP'D:	REV 1
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DESIGNED DATE:	
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PART NO.:	
REV:	
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REV. REASON:	
REV. NO.:	
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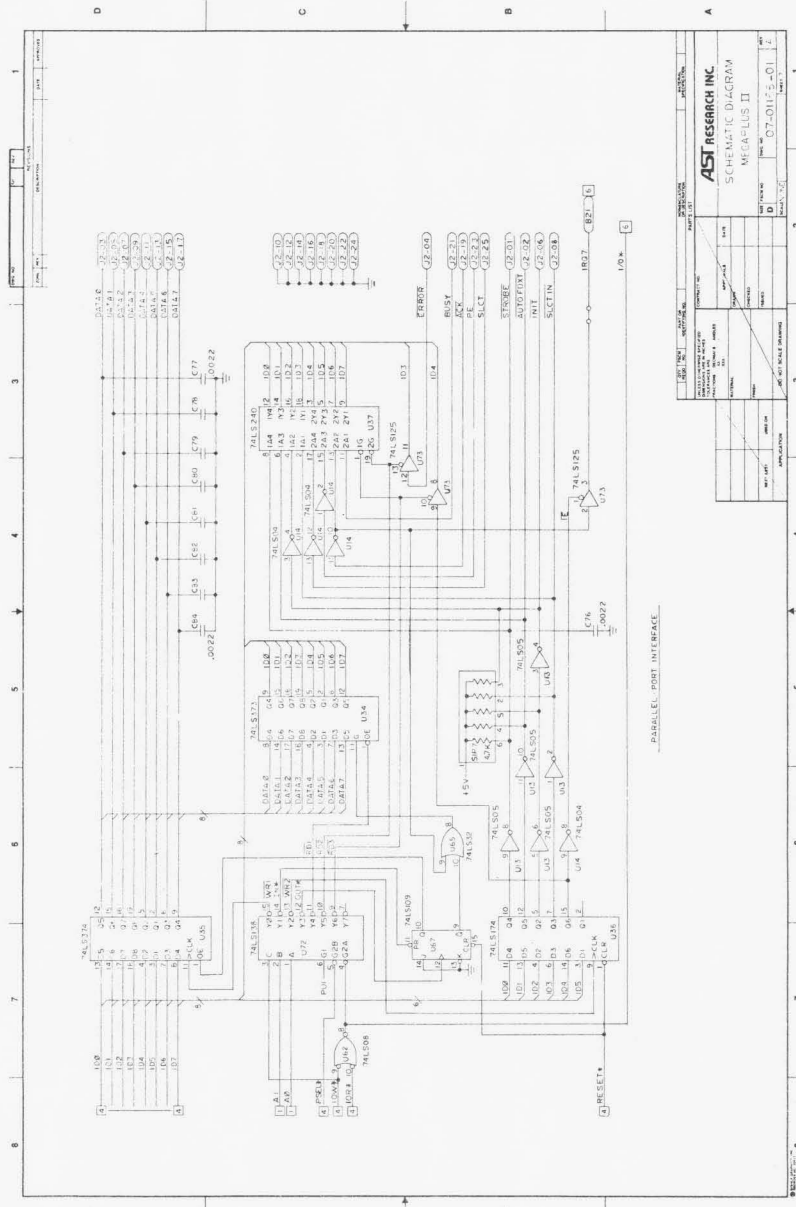
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REV. REASON		REV. BY	





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001	11/11/83	W. J. H.	W. J. H.
PROJECT NO. 07-0165-01			
DRAWING TITLE SCHEMATIC DIAGRAM MEGAPLUS II			
DESIGNED BY	CHECKED BY	DATE	BY
W. J. H.	W. J. H.	11/11/83	W. J. H.
DRAWN BY	DATE	BY	CHKD.
W. J. H.	11/11/83	W. J. H.	W. J. H.
JOB NO. 07-0165-01			
SHEET NO. 1			





PARALLEL PORT INTERFACE

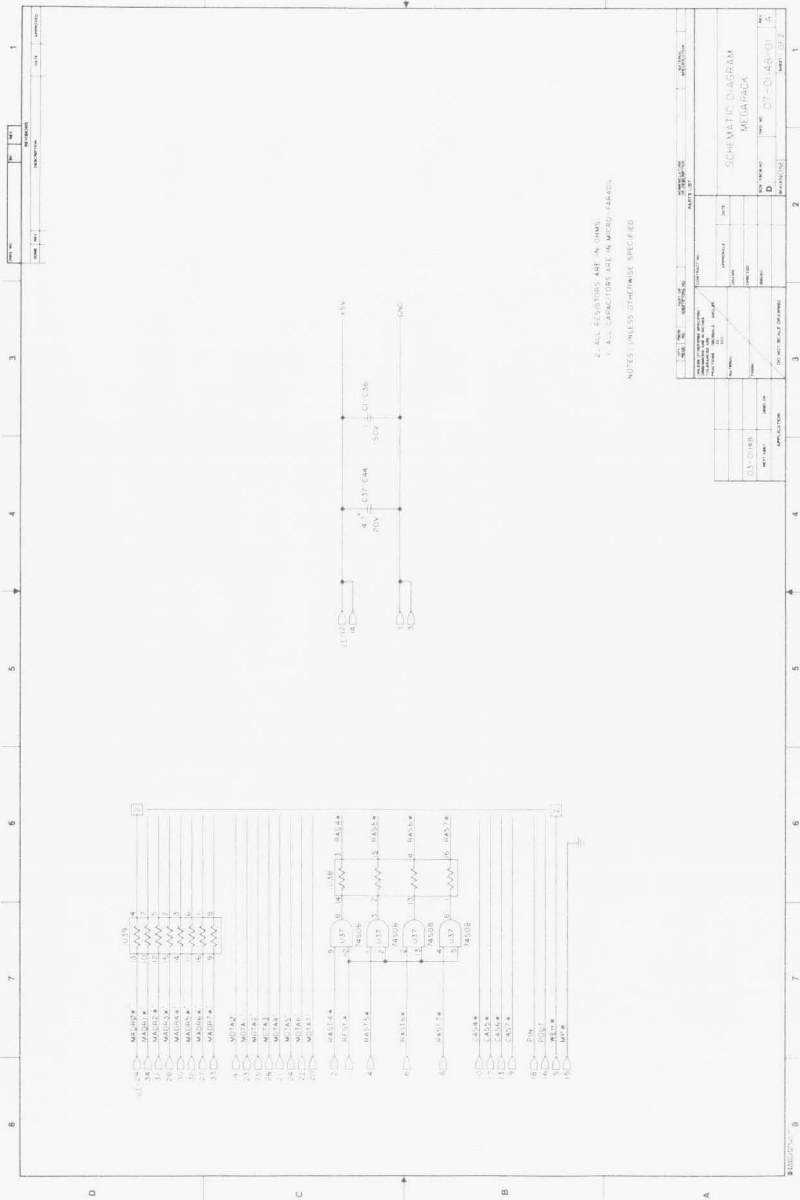
NO.	REV.	DATE	BY	CHKD.	APPROVED
1	1	07-01-77	...	...	...

AST RESEARCH INC  
SCHEMATIC DIAGRAM  
MEGA-PUS II

NO.	REV.	DATE	BY	CHKD.	APPROVED
1	1	07-01-77	...	...	...

NO.	REV.	DATE	BY	CHKD.	APPROVED
1	1	07-01-77	...	...	...

DATE	REV.	BY	CHK.



DATE	REV.	BY	CHK.

PART NO.		REV.	DATE

DESIGNED BY	
CHECKED BY	
DATE	


PART NO.		REV.	DATE

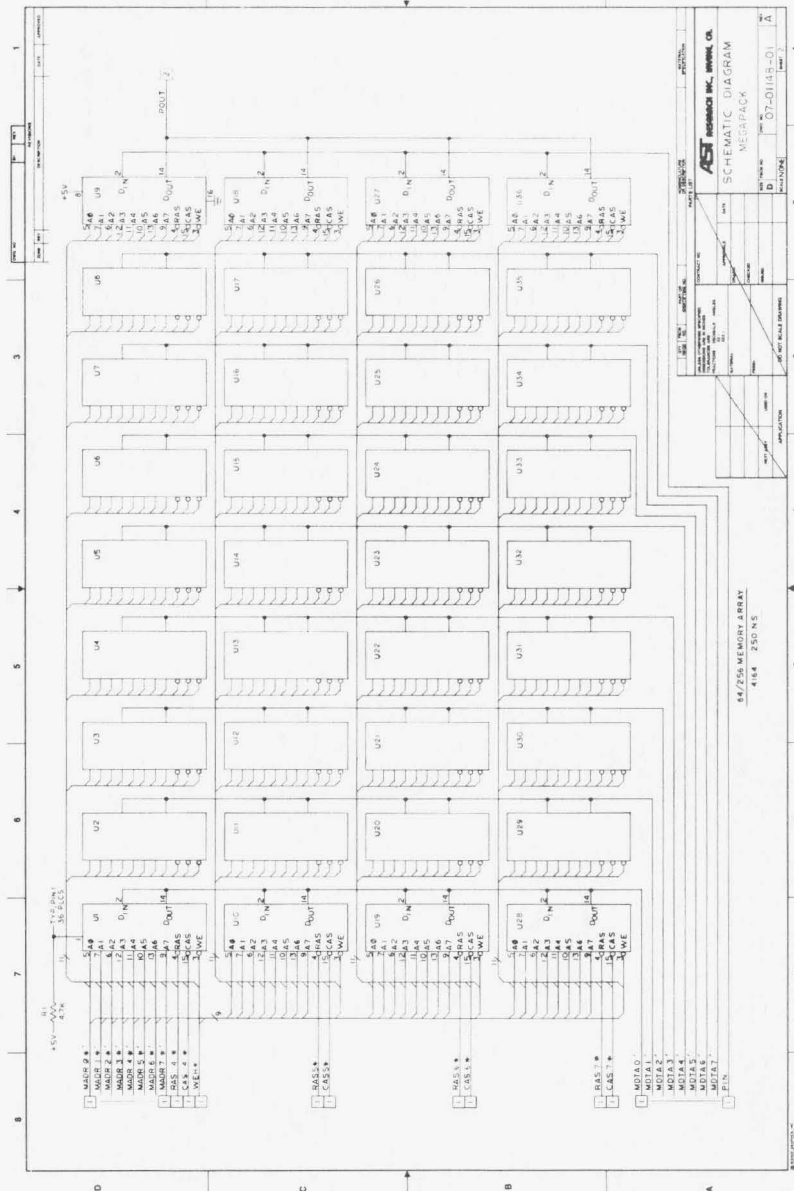
  

DESIGNED BY	
CHECKED BY	
DATE	


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**ASIT**  
ASIT ELECTRONIC INC. BIRMINGHAM, AL.  
SCHEMATIC DIAGRAM  
REARPACK

DESIGNED BY: [ ]  
CHECKED BY: [ ]  
DATE: [ ]

APPROVED BY: [ ]  
DATE: [ ]

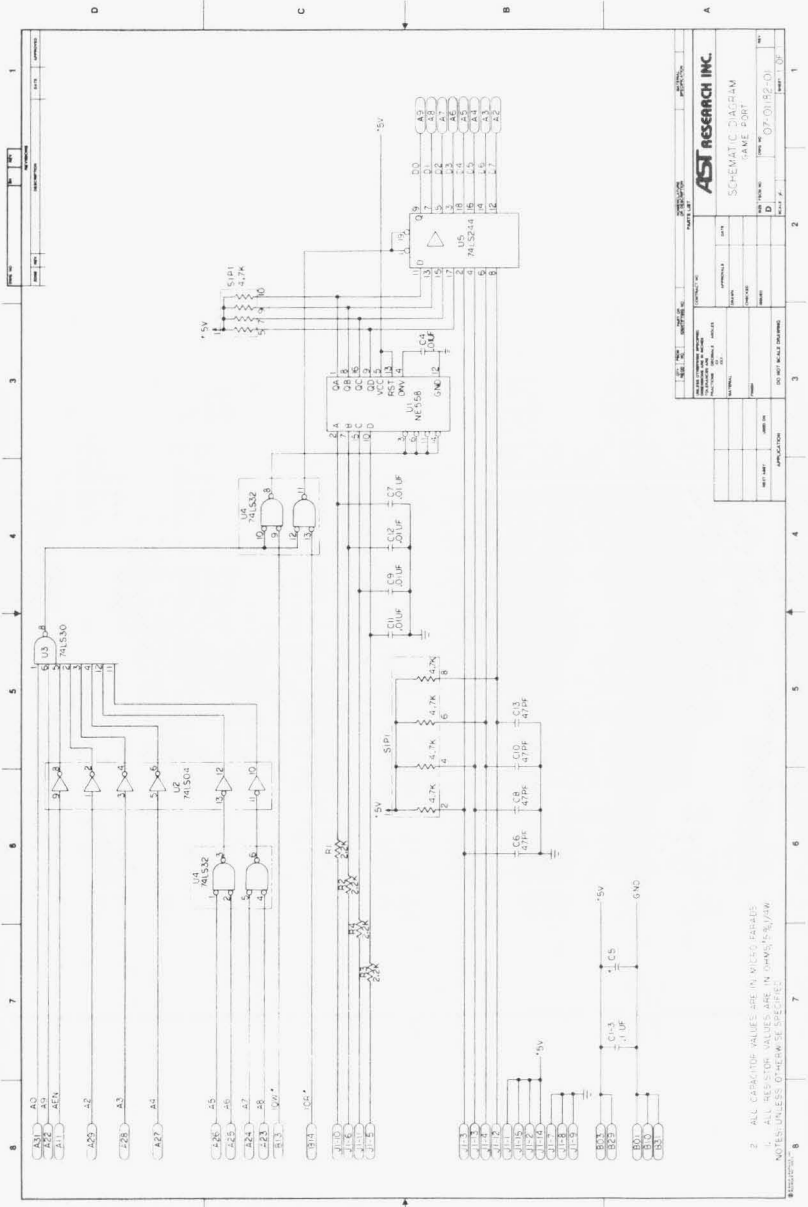
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AST RESEARCH INC.	
DATE: 07-01-82	DESIGNER: [ ]
REV: 01	PROJECT: [ ]
SHEET NO. [ ] OF [ ]	

**AST RESEARCH INC.**  
 SCHEMATIC SYMBOLS  
 PARTS LIST  
 MATERIALS  
 MANUFACTURERS  
 CUSTOMER: [ ]  
 PROJECT NO.: [ ]  
 DRAWING NO.: [ ]  
 SHEET NO.: [ ] OF [ ]

2 ALL CAPACITOR VALUES ARE IN MICROFARADS  
 3 ALL RESISTOR VALUES ARE IN OHMS 1K=1000  
 4 UNLESS OTHERWISE SPECIFIED

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