

TEK-AT4 L *PLUS*

486 SX/DX/DX2 SINGLE BOARD COMPUTER

TECHNICAL REFERENCE MANUAL VERSION 1.1
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FOREWORD

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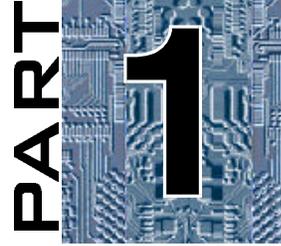
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PART
1



PRODUCT DESCRIPTION

1. **PRODUCT OVERVIEW**
2. **ONBOARD SUBSYSTEMS**

1. PRODUCT OVERVIEW

The TEK-AT4LPLUS is a high performance PC/AT type computer on a single-slot card format (13.3" x 4.7"). It provides all the basic functions available on standard IBM AT computers such as a hard disk interface and floppy disk controller, serial ports, keyboard, and mouse.

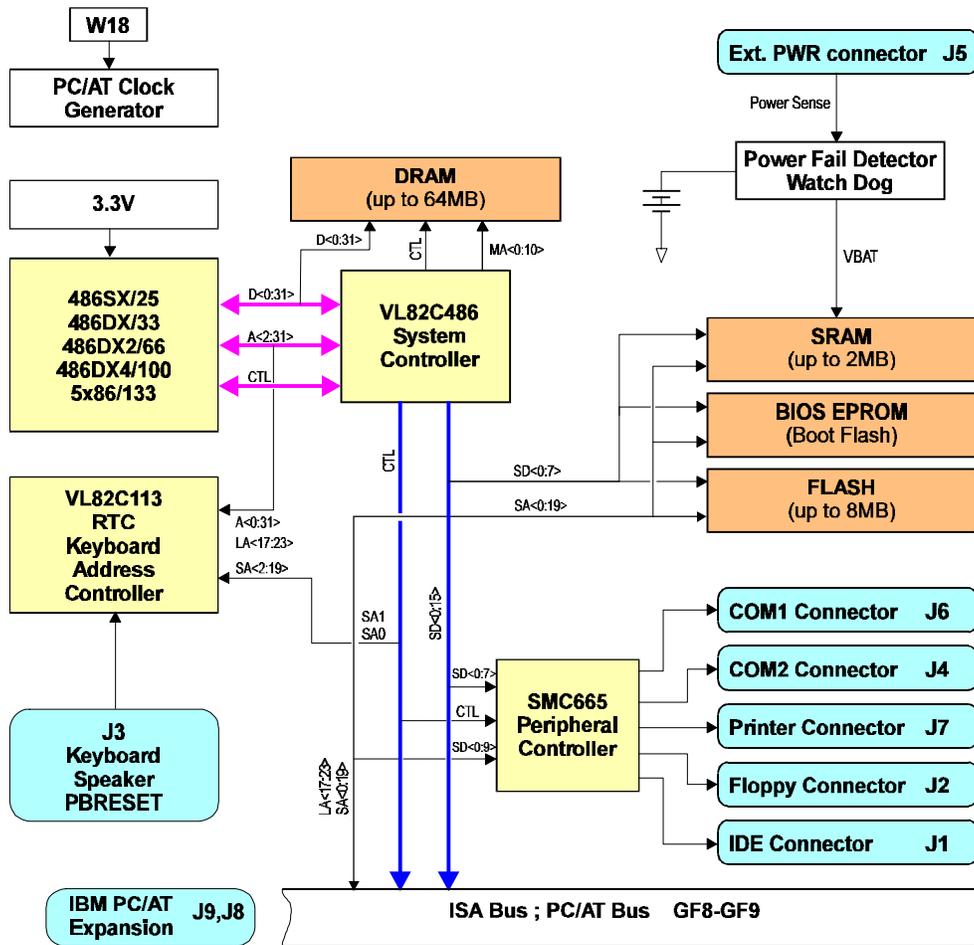
This Single Board Computer (SBC) is designed to operate in environments where a sturdy and compact system is essential. It provides a watchdog timer, solid state disks, and a power failure detector and can be installed in the most extreme industrial applications.

CMOS technology makes the TEK-AT4LPLUS consume very little power (less than 7.5W with 33MHz processor version).

The TEK-AT4LPLUS offers a high level of versatility. It can be installed in a standard PC passive backplane or, thanks to its small size, it can be installed as a stand-alone controller, using the four standard mounting holes and separate power connector.

To top it off, a 93-pin, AT expansion header accommodates TEKNOR's series of mezzanine display controllers or other optional expansion cards.

TEK-AT4LPLUS - Block Diagram



2. ONBOARD SUBSYSTEMS

The TEK-AT4LPLUS provides the following features:

- PC/AT bus or stand alone operation
- 486SX/25MHz
- 486DX/33MHz
- 486DX2/66MHz
- 486DX4/100MHz
- 5x86/133MHz
- 1 to 64MB of system memory with DRAM support
- Up to 8MB of user Flash EPROM
- Up to 2MB user SRAM with battery backup
- Supports Shadow RAM BIOS for fast execution
- Flash EPROM boot
- Real-time clock with battery backup
- AT keyboard and speaker port
- One parallel printer port (LPT1)
- Two serial ports with COM2 as RS-232 or RS-485
- Watchdog Timer
- Power Fail Detector
- Low Battery Circuit Detector
- Onboard floppy controller: drives two floppies
- Onboard IDE hard disk interface
- Sleep Mode support
- CMOS technology for low power
- Two years warranty
- Supports Teknor mezzanine boards

The TEK-AT4LPLUS single board computer is a versatile board that will function either on a passive backplane or as a stand-alone controller, with or without disks, keyboard and monitor.

2.1 *Passive Backplane*

The TEK-AT4LPLUS can be installed on a PC/AT passive backplane in conjunction with any PC/AT and XT compatible cards. Power is drawn directly from the PC Bus, and is provided by the backplane. Video cards may be used but are not a prerequisite for operation.

2.2 *User Interface*

The TEK-AT4LPLUS will operate with any PC Bus compatible display card. When stand-alone mode is required, a TEKNOR Mezzanine SVGA card may be used.

A VT100 terminal (or a PC emulating VT100) may be used as an inexpensive alternative to a display and keyboard. Refer to Section 5, *Using VT100 Mode* for more details on this mode.

2.3 Stand-Alone Operation

An alternate power connector is available to supply the necessary voltages to the TEK-AT4LPLUS board. This is useful in situations where a passive backplane system is not appropriate.

With TEKNOR's Mezzanine card, it is possible to assembly a complete computer in a 13.3" x4.7" x 1.25" area - without ever using any passive backplane system.

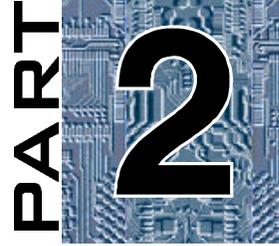
And when your applications call for it, the TEK-AT4LPLUS is fully operational without any user interfaces at all - able to run without disks, keyboard, and video.

2.4 Diskless Operation

The TEK-AT4LPLUS can operate without mechanical drives in any basic mode of operation. A Flash disk can be configured as a bootable disk and temporary data may be securely stored on SRAM disks.

In essence, the TEK-AT4LPLUS is an industrial controller withstanding shock, vibration, and temperature variations - all major concerns in industrial environments.

PART
2



INSTALLATION

- 3. UNPACKING**
- 4. SAFETY PRECAUTIONS**
- 5. CUSTOMIZING THE BOARD**
- 6. INSTALLING DEVICES**
- 7. INSTALLING VIDEO DEVICES**
- 8. SETTING JUMPERS**
- 9. CONFIGURING DMA AND IRQ**
- 10. TEK-AT4L PLUS BIOS**

3. UNPACKING

3.1 *Unpacking*

Follow these recommendations while unpacking:

- ☞ After opening the box, save it and the packing material for possible future shipment.
- ☞ Remove the board from its antistatic wrapping and place it on a grounded surface.
- ☞ Inspect the board for damage. If there is any damage, or items are missing, notify TEKNOR immediately.

3.2 Contents

When unpacking you will find:

- ☞ one TEKAT4*LPLUS* AT Single Board Computer
- ☞ one Technical Reference Manual.
- ☞ Cables

4. SAFETY PRECAUTIONS

4.1 *Static Electricity*

Since static electricity can damage a board, the following precautions should be taken:

- ☞ Keep the board in its antistatic package, until you are ready to install it.
- ☞ Touch a grounded surface or wear a grounding wrist strap before removing the board from its package; this will discharge any static electricity that may have built up in your body.
- ☞ Handle the board by the edges.

4.2 *Storage Environment*

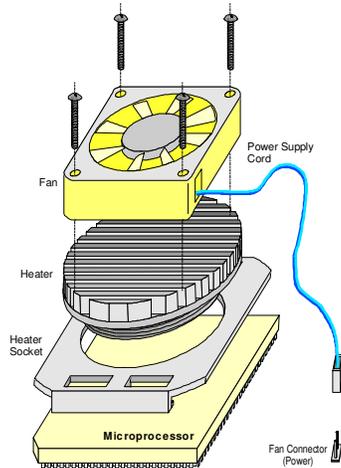
Electronic boards are sensitive devices. Do not handle or store devices near strong electrostatic, electromagnetic, magnetic or radioactive fields.

4.3 *Power Supply*

Before any installation or setup, ensure that the board is unplugged from power sources or subsystems.

5. CUSTOMIZING THE BOARD

5.1 Installing Microprocessor and Fan



The following microprocessors are supported:

486SX/25MHz	486DX/33MHz
486DX2/66MHz	486DX4/100MHz
5x86/133MHz	

Depending on the processor and the system environment, fan and/or heater may be installed on it.

Please refer to your processor specifications for more information.

5.2 Installing Memory

The TEK-AT4LPLUS supports from 1 to 64 Megabytes of DRAM with parity check for system memory. The memory must be installed on 30-pin (U3, 4, 5, 6) or 72-pin (U7, 8) SIMM sockets.

At least 1MB of system memory must be installed for proper operation.

Total System Memory can be configured as follows depending on the memory type:

- . 4 or 16MB using 9-bit SIMM devices (modules: 1 or 4 MB).
- . from 1 to 64MB using 36-bit SIMM devices (modules: 1, 2, 4, 8, 16, 20, 32 and 64 MB).

WARNING: 9-bit and 36-bit SIMM devices must never be installed together.

DRAM devices with page mode at 70ns maximum access time is recommended.

Follow the steps outlined below to install the memory:

- With the board flat on the table, turn it so that the end of the board with the sockets is near you.
- Hold the module with the notch on the bottom right facing you, and insert the connector into the socket at a 70° angle from the board (pin 1 on the module lines up with pin 1 on the socket).
- Snap the module forward to a vertical position in the socket. The module is fully inserted when the retaining pegs snap into the holes at each end of the module.

5.3 Memory and I/O Mapping

5.3.1 Memory Mapping

You also have room for up to 10 MB of Solid State Disks (SSDs):

U10 allows up to 128KB of EPROM for the BIOS.

Up to 8MB of FLASH EPROM can be installed on U19 and U20.

Up to 2MB of battery-backed SRAM disk can be installed on U27/28/35/36.

TABLE 5-1: Memory Map

600000 to 7FFFFFFF: SRAM			800000 to FFFFFFFF: Flash		
600000	U36	SRAM	800000	U19	Flash
67FFFF			9FFFFFF		
680000	U28		A00000	U19	
6FFFFFF			BFFFFFF		
700000	U35		C00000	U20	
77FFFF			DF0000		
780000	U27	E00000	U20		
7FFFFFF		FFFFFF			

TABLE 5-2: Onboard Decoded I/O Map

ADDRESS	FUNCTION
000-00F	DMA controller 1
020-03F	Interrupt controller 1
040-05F	Timer
060-06F	Keyboard & Mouse
070-07F	Real-time clock, NMI mask
080-09F	DMA page register
0A0-0BF	Interrupt controller 2
0C0-0DF	DMA controller 2
0F0-0FF	Math coprocessor
1F0-1F7	Hard disk
201	Watchdog timer, PDO, user
378-37A	LPT1
2F8-2FF	COM2
3F2-3F7	Floppy disk
3F8-3FF	COM1

5.4 Expanded and Extended Memory

Memory on the board consists of two areas: memory below 1 MB (0-640KB) referred to as the standard or base memory, and memory located above 1 MB which is either *Expanded* or *Extended* memory (memory located between 640KB and 1 MB is reserved for shadowing. This is described later in this section).

Expanded and Extended memory refer to the mapping scheme that is used to access memory above 1 MB in real mode. Since DOS requires real mode to operate, different techniques are available. The TEK-AT4LPLUS offers the following options:

5.4.1 Expanded Memory

In Expanded memory mode, hardware is used to remap a defined area of memory. This mode is driven by standard software commonly referred to as the LIM Standard or EMS. A hardware-specific device driver (supplied with your single board computer) is loaded in the CONFIG.SYS file to setup the software in order for it to access memory above 1 MB.

5.4.2 Extended Memory

In Extended memory mode, the CPU's own protected mode is used to access the memory above 1 MB. This mode requires that the software jump into protected mode, perform the transfer and return back to real mode. This is available through the BIOS using INT 15h function 87h.

5.5 Memory Mode

Above 1MB can be defined either as EMS or Extended.

If EMS is used, the EMS hardware must be enabled, and the EMS driver loaded.

- . EMS is enabled by entering SETUP at boot up
- . Type the following command (or its equivalents) in the CONFIG.SYS file:
DEVICE=EMM386.EXE

5.6 Shadow RAM

As previously mentioned, memory between 640KB and 1MB is used for *Shadow RAM* or *Shadowing*. This is simply the process of copying EPROM based code, such as the BIOS and BIOS extensions, into DRAM (which is located in the same physical memory map). *Shadowing* allows your code to run faster.

WARNING: If Shadow RAM is enabled, the RAM memory used for shadowing is no longer available as EMS or Extended memory.

5.7 Configuring the TEK-AT4LPLUS

Configuring your board is purely a matter of the application at hand. As an example, a 2MB system can be defined as 640KB base + 384KB shadow + 1 MB extended memory, or, 640KB base + 384KB shadow + 512KB extended + 512KB EMS and so on. The user is free to adapt the configuration to his particular needs.

5.8 SW1 - Configuration Jumpers

The TEK-AT4LPLUS supports an onboard BIOS extension which controls certain functions of the BIOS related to industrial applications. The extended BIOS reads the settings of the SW1 jumpers and acts accordingly.

Upon system start-up, the BIOS automatically determines how much ROM/RAM disk memory is available to the system, and what equipment is connected to the system. Jumpers

WARNING: The RAM disk is automatically detected and installed upon booting. The beginning of the disk is checked and reformatted if it is found to be corrupt or if data is unrecognizable.

SW1 are to be set by the user as needed.

5.8.1 SW1 (1-2) Selecting BIOS Boot Option

If SW1(1-2) is installed (booting MS-DOS from Flash EPROM), then Drive A: is the Flash Disk (assuming jumper W14 is installed). Drive B: is Floppy 1 (if installed) or the next available drive according to the following list of priorities:

- 1- Floppy 1
- 1- Flash Disk if not already installed as A:
- 1- RAM Disk (if installed)
- 1- Hard Disk (if installed)

Subsequent logical drives are installed following the above priority list.

If SW1(1-2) is not installed (booting operating system from Floppy/Hard drives), then Drive A: is Floppy 0. Drive B:, and subsequent drives follow the priority list above.

The following table describes drive assignments according to the installed devices:

TABLE 5-3: Physical Devices Installed & Drive AssignmentsTable

Configuration and Physical Devices Installed	Jumper/No Jumper	No Jumper	Jumper	No Jumper	Jumper	Jumper
	Floppy 0 Floppy 1 No Flash Disk	Floppy 0 Floppy 1 Flash Disk	Floppy 0 Or No Floppy 0 Floppy 1 Flash Disk	Floppy 0 Flash Disk	Floppy 1 Flash Disk	Flash Disk
DRIVE NAME:						
A:	Floppy 0	Floppy 0	Flash	Floppy 0	Flash	Flash
B:	Floppy 1	Floppy 1	Floppy 1	Flash	Floppy 1	Available
C:	Available	Flash	Available	Available	Available	Available
D:	Available	Available	Available	Available	Available	Available

NOTES: The indication "FLASH DISK" assumes at least one Flash device is installed at U19 with a valid DOS content. "Floppy 0" specifies the physical drive connected to the twisted end of the flat cable. "Floppy 1" specifies the physical drive connected to the untwisted end of the flat cable. "Jumper" specifies configuration Jumper SW1(1-2). All other drives are installed following the above assignments in this manner: RAM Disk, and then Hard Disk. Therefore, with a full configuration, RAM Disk is "D" and the Hard Disk is "E".

5.8.2 SW1(3-4) Selecting COM1/COM2 for VT00 or Download Mode

You can run VT100 mode or Serial Download mode from either COM1 or COM2. Installing this jumper selects COM2, removing it selects COM1 (default).

5.8.3 SW1(5-6) Enabling VT100 Mode

The TEK-AT4LPLUS supports VT100 mode to enable the board to run without a local keyboard or screen. That is, operation can be controlled via a remote terminal or a computer with a terminal emulation program.

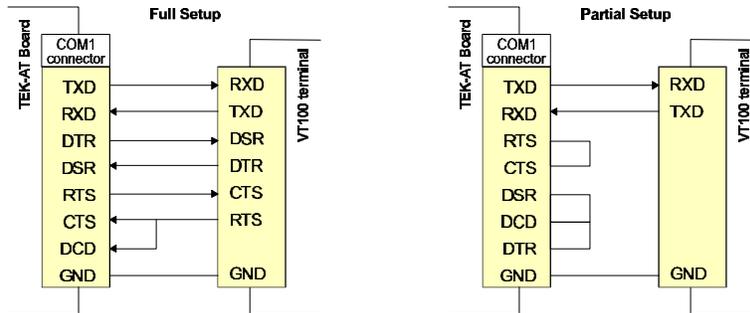
Requirements

The board must be supplied with +/-12 volts to support VT100 mode, (required by the RS-232 drivers).

The connected terminal should emulate a VT100 or ANSI terminal. Although this is not an absolute requirement, strange characters may appear on screen if it does not. This occurs because the VT100 recognizes these control characters, and causes them to perform a specific function. For example, screen erase, cursor position, and so on.

Follow these steps to setup VT100 mode:

- Install SW1(5-6) to enable VT100 mode.
- Setup the communications cable as follows:



Full cable configuration with all control lines can be used to connect a VT100 terminal to COM1 or COM2.

If a full cable is not required, a partial cable using only the TXD and RXD lines can be used. The control lines are ignored by looping as shown above.

- Boot up your terminal and set it up with the following parameters:
19200 Baud / 8 Bits / No Parity / Echo off (or full duplex)

☞ Use CTRL-R to configure your system in VT100 mode.

Running Without a Terminal

To disconnect the VT100 terminal or to run without a terminal, ensure the control lines are in an active state. Failing this, the system may "hang" while waiting for the control lines to become active. Refer to partial cabling to remain the lines active.

Disabling VT100 mode allows the board to run without any console, then video card is not necessary.

5.8.4 SW1(7-8) Enabling Serial Download Mode

Installing this jumper, enables Serial Download Mode; removing it disables Serial Download Mode (default).

5.9 Installing Supervisor Utilities

5.9.1 Special Note on Register 201h

IBM PCs use address 201h as the game port. TEKNOR computers utilize this address to give industrial PC users the greatest amount of I/O addressing space possible. This ultimately renders the game port unusable.

Hence, some problems may occur with various test software packages that intentionally write to the game port and leave it with unknown values.

The following table illustrates how TEKNOR computers utilize I/O Register 201h:

TABLE 5-4: Register 201h

Bit	Function
0	Enable Watchdog (1=enable, R/W bit)
1	Watchdog activate (1-0-1 to toggle, R/W bit)
2	Flash VPP enable (1=VPP 12v, 0=VPP 5v, R/W bit)
3	Enable direction control RS-485 (1=enable RS-485 only, write only)/(Read=PDO Status)
4	Make printer 8 data bits read only (1=input, 0=output, write only)
5	Select alternate SW1/SW2 (TEK-AT4L+, TEK-AT3L, TEK-AT4L+) (1=select SW2, read only)
6	Not used
7	Not used

WARNING: Not all bits are R/W. Therefore, be certain to keep a mirror image of register 201(hex) when programming it. All bits are 0 after a hardware RESET or power up condition.

5.9.2 Watchdog Timer

The *Watchdog Timer* is extremely useful in embedded systems where human supervision is not required. Following a reset, the Watchdog is always disabled. The Watchdog is enabled once "1" is written in bit 0 at address 201h the first time. When enabled, the microprocessor must refresh the Watchdog. This is done by writing alternatively "0" and "1" to bit 1 at address 201h, once every 1.6 seconds to verify proper software execution.

If a hardware or software failure occurs such that the Watchdog is not refreshed, a reset pulse is generated by the Watchdog to restart the processor.

WARNING: The user program must provide the first access to address 201h, and must also include the refresh routine. In addition, be certain to keep a mirror image of register 201h when programming it. This is necessary since register 201h is a write-only user register and, as a result, is not used by the BIOS.

TABLE 5-5: Watchdog Timer Register

ADDRESS		REGISTER
201 bit 0	read/write	Watchdog enable
201 bit 1	read/write	Watchdog refresh

Jumper W12 must be installed to enable activation of the Watchdog. If jumper W12 is removed, the Watchdog is disabled.

5.9.3 Power Failure Detector (PFD)

The PFD, which generates a non-maskable interrupt (NMI) when a failure occurs, provides a 1.25V threshold for DC power fail warning, low battery detection W7(2-3), or when monitoring a power supply other than +5VDC W7(1-2). The Power Detection Output (PDO) of the power failure detection circuit is connected to IOCHECK (NMI). Jumper W13 allows the user to disable this feature. However, the PDO status is still available by reading I/O address 201h bit 3.

The detection circuit generates a non-maskable interrupt when a power failure occurs. The status of the PDO is available at I/O address 201h bit D3. For example, if it reads 0, the circuit has detected a low power warning from the power detect pin on 6, connector J5.

Pin 6 on connector J5 is used for the power detection input. This input can only accept DC voltage. The line is monitored via two user-defined external resistors, R19 and R18, which are connected to the power failure input (Note: R19 is a surface mount resistor and R18 is fixed to 1KB). The user should position the resistors according to the monitoring level desired. If the voltage level supplied to this line drops below 1.3V typical, a *Power Fail* status is detected and directed to the NMI line.

Example:

Assume the TEK-AT4LPLUS is powered by a 9V DC battery and it is required that the battery be monitored for a low battery warning at 7.5V DC. In this case, R19=4700Ω and R18=1000Ω.

So, if the battery voltage goes below 7.5V, it will generate a non-maskable interrupt (NMI) and the status can be read at address 201 bit D3. If bit D3 is 0, a low battery is indicated.

Bear in mind that R19 and R18 should be tailored to fit your specific application. The values for these two resistors can be identified by using the following formula:

$$R18 / (R19+R18) \times 7.5V \leq 1.3V$$

where: $R19 = 1000 \times V_{mon} - 1300 / 1.3$

Please contact our Technical Support department if more details are needed.

WARNING: All TEK-AT boards are equipped with an onboard detection circuit which is activated when +5V drops below 4.75V. When this occurs, the system is reset disabling access to SRAM, DRAM, and so on.

5.9.4 Low Battery Detection

The Low Battery Voltage detection uses the same circuit as the Power Failure Detector, and thus, both cannot be used at the same time.

The Low Battery Detector generates an NMI when the battery voltage drops below 3 volts.

To monitor a Low Battery Voltage, install jumper W7(2-3) and jumper W13. The status of PDO can be read back at I/O port 201 hex D3.

WARNING: Although the Low Battery Detector uses the same circuit as the Power Failure Detector, J5-6, R19 and R18 are not utilized. Instead, we have added two other resistors for this function: R14 and R17.

5.10 Attaching the AT4LPLUS to Enclosure

Four mounting holes are available on the board to ensure an optimal mechanical fixing. It is highly recommended to use all the mounting holes when attaching the TEK-AT4LPLUS to its enclosure.

Precise mounting holes location is given in the Appendices: TEK-AT4LPLUS - *Mounting Holes* .

6. INSTALLING DEVICES

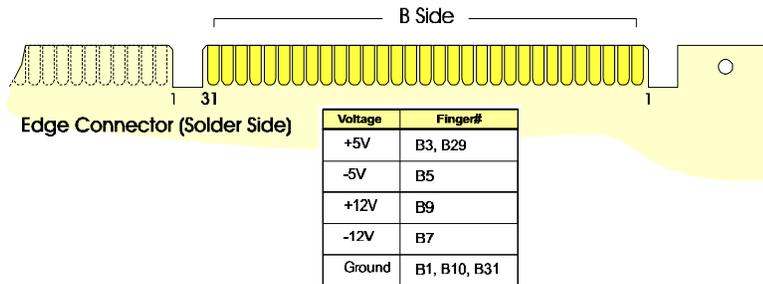
6.1 Connecting Power Supply

Power can be drawn on the TEK-AT4LPLUS using the onboard power connector (J5), or the ISA-AT bus power capabilities when the board is connected in a backplane.

WARNING: Both power supply must not be connected together. While using one, the other must be disconnected.

6.1.1 Supplying Power Using the ISA-AT Bus

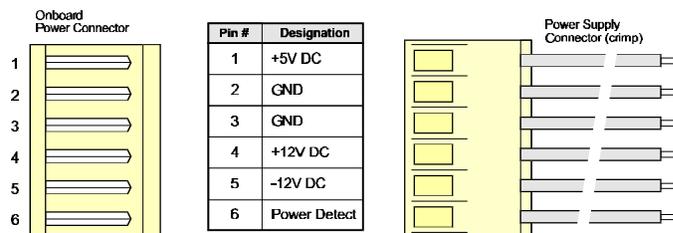
+5V, -5V, +12V, -12V and ground voltages are routed on the edge connector as follows:



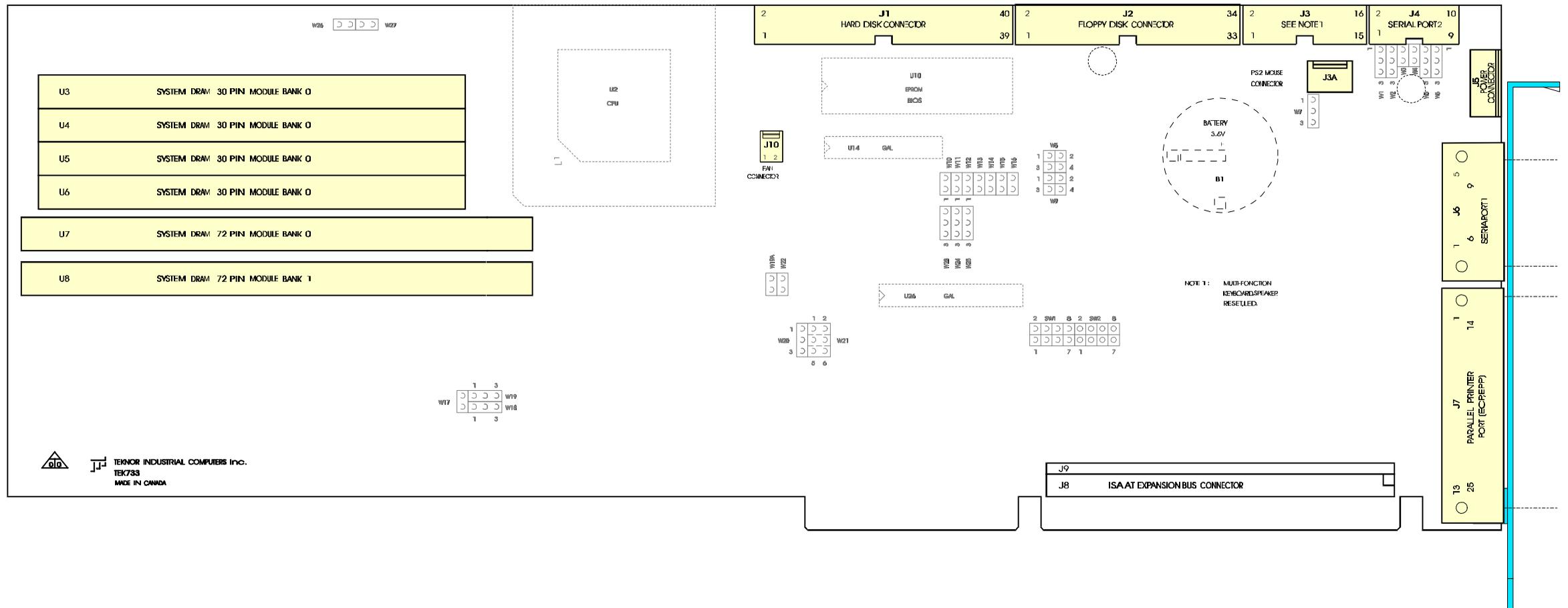
Note: The complete description of the edge connector is given in the appendix E - *Board Connectors and Pinout*.

6.1.2 Supplying Power Using the Power Connector (J5)

The Power Supply is drawn on the Backplane using the 6-pin J5 connector.

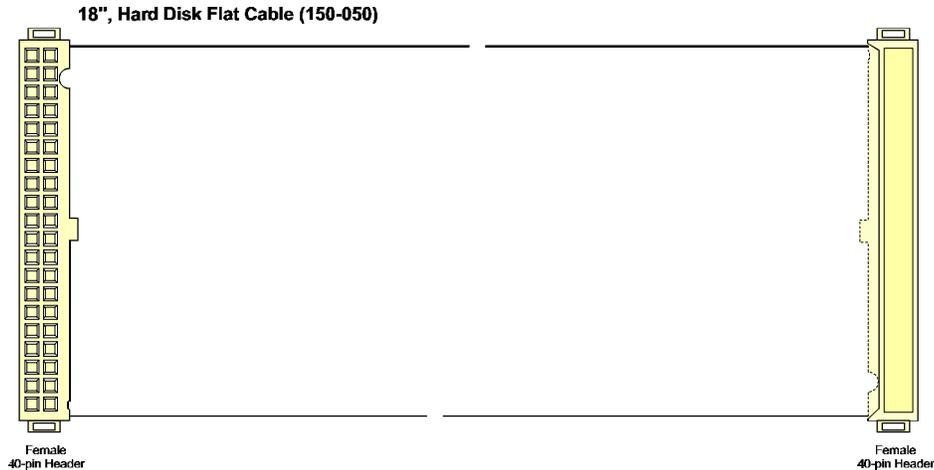


CONNECTOR LOCATION



6.2 Connecting Hard Disk (J1)

IDE connections use standard 40-pin header flat cables. This connector handles all command, data, and status I/O lines. Recommended maximum cable length is 18-24 inches.



The drive can be mounted in any horizontal or vertical plane. The hard drive and its type must be specified in the CMOS setup (number of cylinders, heads, sectors per track, landing zone, and write precompensation). The specification can be done by selecting a standard drive type listed in the setup screen or by using a user defined drive type (type 48), whereby the user can enter the required parameters.

Please refer to your drive manufacturer to obtain this information.

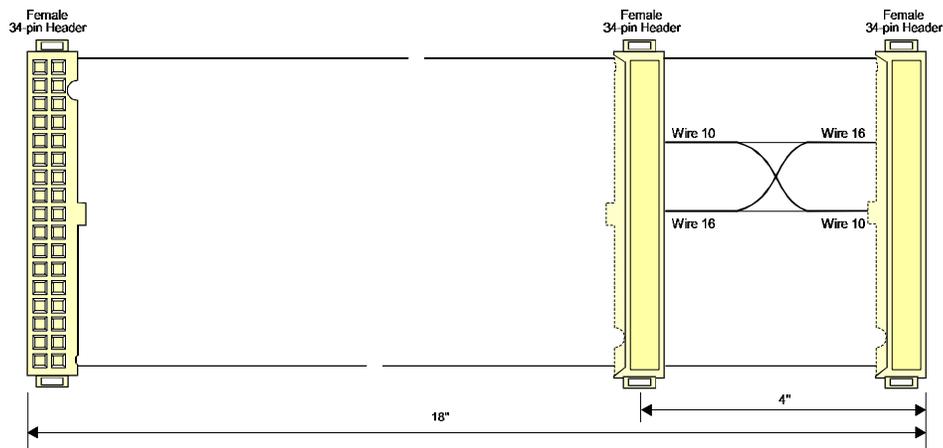
Hard disk interface can be disabled using J11 jumper. Please refer to Section 9 - *Setting Jumpers*.

Using Solid State Disk (SSD): Solid State Disks have no moving parts and are far less susceptible to dirt, moisture, vibration and temperature variations than mechanical disk drives. Two types of SSDs are available: Static-RAM (SRAM) and Flash EPROM. The TEK-AT4LPLUS supports up to 2MB of SRAM and 8MB of Flash EPROM.

Solid State Disks installation is described at the end of this section.

6.3 Connecting Floppy Disk Drive (J2)

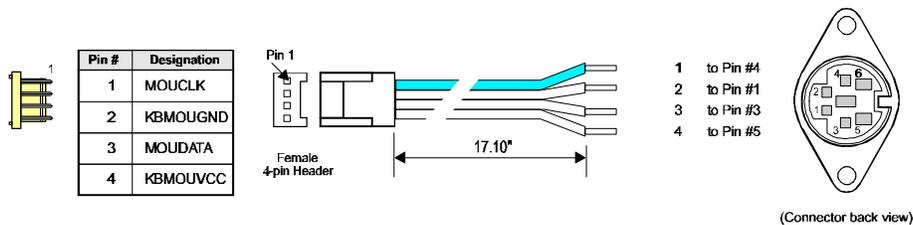
Floppy Drive connections use standard 34-pin header flat cables. The disk controller is IBM PC XT/AT compatible (single and double density), and supports Enhanced Floppy Mode (2.88MB). It handles 3.5" and 5.25", low and high density drives. Up to two drives can be supported in any combination.



6.4 PS/2 Mouse Connector (J3A)

The TEK-AT4LPLUS supports PS/2 standard mouse through the J3A connector.

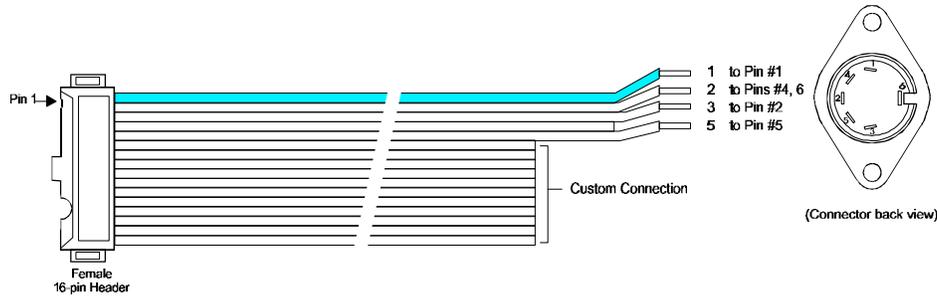
Important: make sure the PS/2 mouse driver (provided by its manufacturer) is installed.



Note: This cable is available from TEKNOR - referenced as 150-052.

6.5 Multi-Function Connector (J3)

The TEK-AT4LPLUS offers a 16-pin header to support keyboard, speaker, Reset button, and LED devices. To output the signals, the cable must be built as follows:



Note: This cable is available from TEKNOR - referenced as 150-018.

Devices are described as follows:

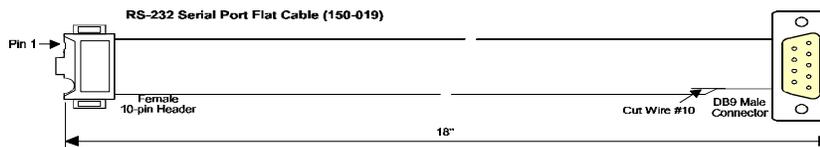
Speaker	an 8 ohm speaker can be directly connected to pins 7 and 8. All necessary drivers are installed.
Reset	a Normally Open Push button can be connected to reset the TEK733 (electrical short between pin 13 and 14).
Hard Disk LED	the onboard IDE interface drives an external LED during the drive activity. Anode must be connected to pin 16. No external current limiting resistor is required since one is already present.

6.6 Serial Port #2 Connector (J4)

The TEK-AT4LPLUS features two UARTs which are functionally equivalent to the NS16450. Both are configured as DTE.

6.6.1 COM1(J6)

The COM1 port is buffered directly on the board for RS-232 operations. COM1 is 100% compatible with the IBM-AT serial port.



Note: This cable is available from TEKNOR - referenced as 150-019.

6.6.2 COM2 (J4)

The Serial Port COM2 supports both RS-232 and RS-485 standard via J4 connector (standard male DB9 connector at the edge of the board).

COM2 pinouts (RS-232 and RS-485) are given in Appendix E - *Board Connectors and Pinout*.

When configured for RS-485 the TEK-AT4LPLUS supports either full-duplex or party line communication.

Full Duplex Operation

Upon power-up or reset, the RS-485 interface circuits are automatically configured for full duplex operation. J4(3,4) act as the receiver lines and J4(5,6) as the transmitter lines.

Party Line Operation

In order to enable party line operation, the user must first write "1" to bit 3 at I/O address 201h. This allows the transceiver (J4 3,4) to be controlled by the RTS signal. Upon power-up or reset, the transceiver is by default in "receiver mode" in order to prevent unwanted perturbation on the line.

In party line operation, termination resistors R9 and R10 must be installed only on the boards at both ends of the network.

6.7 Parallel Printer Port Connector (J7)

The Parallel Printer Port (J7) provides the necessary control signals for Centronics-compatible parallel interface. The connection is done through a standard female DB25 connector located at the edge of the board. Its pinout is given in Appendix E - *Board Connectors and Pinout*.

The port is set to output 8-bit data by default. It can be changed to input data simply by writing 10h to address 201h (set bit 4).

WARNING: Port 201h is also used to control the Watchdog Timer. Therefore, it is highly recommended you keep a mirror image of port 201h in memory
--

6.8 *Installing Solid State Disks*

The TEK-AT4LPLUS Single Board Computer supports 2, 4 or 8MB Flash EPROM Disk. The Flash EPROM is surface mounted component option which must be sized and ordered by the customer.

6.8.1 *Writing To Flash Disks*

To create a Flash disk (i.e. writing information to it), use the XFLASH utility found on the utilities diskette which came with the board.

The XFLASH software utility allows you to choose files from floppy and hard disks and write them to the Flash disks.

Information can be transferred to the Flash disk by directly running XFLASH on the TEK-AT4LPLUS computer, or remotely - by using a serial link. The second option is referred to as Download Mode and is enabled by installing jumper SW1(7-8).

In addition, the Flash disk can be made to boot simply by installing SW1(1-2). This function causes the Flash disk to replace floppy disk 0 from the "A" position - leaving the mechanical floppy unused. Floppy 0 must then be physically moved to the floppy 1 position where it becomes the "B" drive. Please refer to the *Physical Devices Table* (see Page 5-7) for more information.

The only difference between the two drive types is that Flash disks are read only. Hence, whenever an attempt is made to write to the Flash disk, a write-protect error is generated. Writing to Flash disks is explained below and in detail in Teknor's *XFLASH User's Manual*.

WARNING: In order for the AT4LPLUS to recognize the Flash disk, Jumper W14 must be installed.

6.8.2 *SRAM Disk*

The TEK-AT4LPLUS supports from 512KB to 2MB SRAM. The SRAM is surface mounted component option which must be sized and ordered by the customer.

Please refer to Section 9 - *Setting Jumpers* to enable SRAM on the board (if installed).

WARNING: SRAM power consumption is usually less than 5mA in 3V backup mode. So files transferred to battery-backed SRAM disks typically stay resident for two years. Actual life, however, is dependent on the actual consumption of the SRAM devices installed.

6.8.3 Battery Backup Circuit

The board comes with a 350mA/h lithium battery. If the TEK-AT4LPLUS is strapped to be powered by the battery back-up, the RAMs will retain their information after a power down.

Please refer to Section 9- *Jumper Settings* to locate and set Battery Backup Circuit (W10).

WARNING: Removing jumper W10 will cause the set-up and real-time clock information to be lost.

The TEK-AT4LPLUS comes with a 350mA/h TL5186 TADIRAN battery with a shelf life of approximately 10 years (under "no-load" conditions).

TEK-AT4LPLUS draws approximately 24mA typical. This means the battery will last 1.6 years if no power is applied to the board. Remember, when the 5V is supplied, the battery is electronically disconnected. Virtually as if it were on the shelf.

The actual life of the battery depends on the amount of time DC power is not applied and on environmental (temperature) conditions. The TADIRAN TL5186 has an operating range of -55⁰ to 75⁰C and discharge characteristics vary with temperature.

The TADIRAN TL5186 is U.L. recognized. Its U.L. component recognition is MH12193.

WARNING: The actual voltage supplied by the battery is 3.6 volts. This can be verified at pins 16-32 on the SRAM device using a standard voltmeter.

7. INSTALLING VIDEO DEVICES

7.1 Using Standard Video Adapter Board

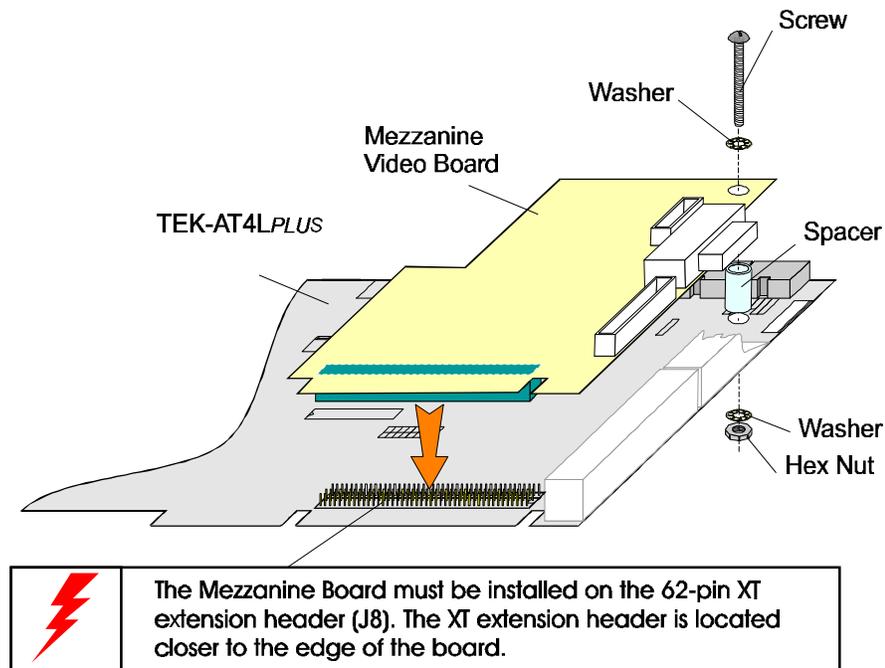
When using a passive backplane, the video adapter board can be installed directly in one slot. The video adapter board depends on the display to be connected to the system. The display must be connected directly to the Video Adapter onboard connector.

7.2 Using Video Mezzanine Board

With TEKNOR's mezzanine board, it is possible to assembly a complete computer without passive backplane. When stand-alone mode is required, a mezzanine board may be used.

7.2.1 Installing Mezzanine Board

Proceed as follows to connect a mezzanine board to the TEK-AT4LPLUS:



The Mezzanine Video Board provides connectors for CRT and Flat Panel display. Please refer to its User's Manual for more information on display connecting.

8. SETTING JUMPERS

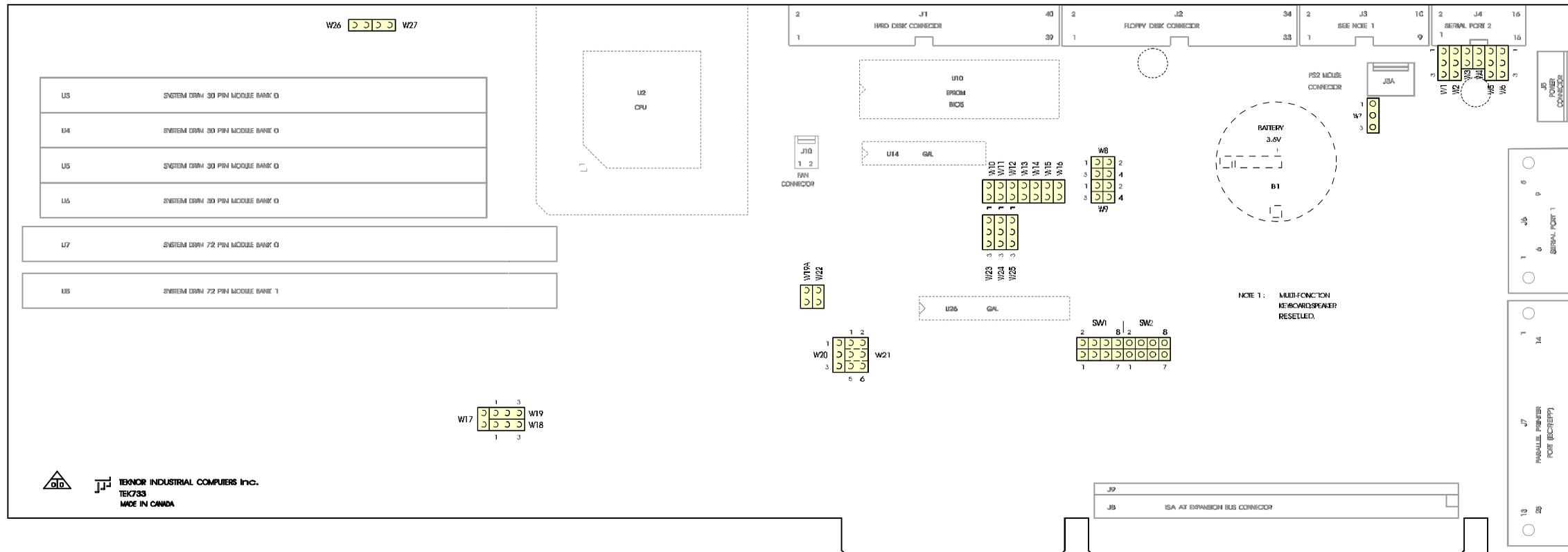
The TEK-AT4LPLUS is designed to allow for minimal hardware configuration. The following is a list of the basic configuration jumpers available on the board:

Jumper	Function
W1	Serial In 2 (SIN2)
W2	Request To Send 2 (RTS2)
W3	CTS2 to RTS2
W4	DTR2 to DSR2
W5	Serial Out 2 (SOUT2)
W6	CTS2
W7(1-2)	Power Fail Detection
W7(3-4)	Low Battery Detection
W8	EDOUT (Floppy)
W9	DHOUT (Floppy)
W10	SRAM Battery Backup
W11	IDE Hard Disk Interface
W12	Watchdog Timer
W13	Power Monitoring
W14	Flash EPROM Write

Jumper	Function
W15	BIOS Boot Flash
W16	TEKNOR Extension
W17-19, W26	CPU Type Selection
W19A	PS/2 Mouse
W20	Bus Clock Signal Selection
W21	CPU Clock Selection
W22	Graphic Mode Selection
W23-W24	DMA Channel Selection
W25	Parallel Port Interrupt
W26	CLKMUL Enable
W27	CPU power (3.3V or 5V)
SW1(1-2)	Boot from Flash
SW1(3-4)	COM1/COM2 Selection
SW1(5-6)	Selects VT100 as Console
SW1(7-8)	Download Mode

	<p>WARNING Depending on the microprocessor model, CPU power must be set to 3.3V or 5.0V using W27. Improper voltage can damage the CPU.</p>
---	---

JUMPER LOCATIONS





TECNOR INDUSTRIAL COMPUTERS Inc.
 TEK733
 MADE IN CANADA

TABLE 8-1: Jumper Settings (W1-W11)

NAME	FUNCTION	CONFIGURATION (INITIAL SETTING: *)
W1 W2 W3 W4 W5 W6	COM2 Configuration	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>RS-232*</p> </div> <div style="text-align: center;"> <p>RS-485</p> </div> </div>
W7	Power Detection Circuitry	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Power Fail Detection*</p> </div> <div style="text-align: center;"> <p>Low Battery Detection</p> </div> </div>
W8 W9	2.88MB High Density Floppy . W8 is associated to EDOUT signal . W9 is associated to HDOUT signal	<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>EDOUT left to software*</p> </div> <div style="width: 30%;"> <p>or: EDOUT to Pin 29 (J2) and Ground to Pin 17 (J2)</p> </div> <div style="width: 30%;"> <p>or: EDOUT to Pin 17 (J2) and Ground to Pin 29 (J2)</p> </div> </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>HDOUT left to software*</p> </div> <div style="width: 30%;"> <p>HDOUT to Pin 33 (J2) and Ground to Pin 27 (J2)</p> </div> <div style="width: 30%;"> <p>HDOUT to Pin 27 (J2) and Ground to Pin 33 (J2)</p> </div> </div>
W10	Battery Backup on SRAM (Vbatt)	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Vbatt Disconnected*</p> </div> <div style="text-align: center;"> <p>Vbatt Connected</p> </div> </div>
W11	IOCHRDY Signal to IDE Interface	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Disabled*</p> </div> <div style="text-align: center;"> <p>Enabled</p> </div> </div>

TABLE 8-2: Jumper Settings (W12-W19, W26)

NAME	FUNCTION	CONFIGURATION (INITIAL SETTING: *)																																																				
W12	Watchdog Timer	Enabled* 	Disabled 																																																			
W13	Power Monitoring	Disabled* 	Enabled 																																																			
W14	Flash EPROM Write	Enabled* 	Disabled 																																																			
W15	BIOS EPROM/Flash Write	EPROM BIOS* 	Flash BIOS 																																																			
W16	Teknor BIOS Extension	Enabled* 	Disabled 																																																			
W17 W18 W19 W26	Processor Selection	<table border="1"> <thead> <tr> <th>PROCESSOR</th> <th>W17</th> <th>W18</th> <th>W19</th> <th>W26</th> </tr> </thead> <tbody> <tr> <td>486SX / SX2</td> <td>removed</td> <td>1-2</td> <td>removed</td> <td>removed</td> </tr> <tr> <td>486DX / DX2</td> <td>1-2</td> <td>2-3</td> <td>1-2</td> <td>removed</td> </tr> <tr> <td>486 Overdrive</td> <td>1-2</td> <td>2-3</td> <td>2-3</td> <td>removed</td> </tr> <tr> <td>486DX2 wb</td> <td>1-2</td> <td>2-3</td> <td>1-2</td> <td>removed</td> </tr> <tr> <td>486DX4</td> <td>1-2</td> <td>2-3</td> <td>1-2</td> <td>removed</td> </tr> <tr> <td>486DX4 wb</td> <td>1-2</td> <td>2-3</td> <td>1-2</td> <td>removed</td> </tr> <tr> <td>AMD 486DX2</td> <td>1-2</td> <td>2-3</td> <td>1-2</td> <td>1-2</td> </tr> <tr> <td>AMD 486DX4</td> <td>1-2</td> <td>2-3</td> <td>1-2</td> <td>removed</td> </tr> <tr> <td>AMD 5x86</td> <td>1-2</td> <td>2-3</td> <td>1-2</td> <td>1-2</td> </tr> </tbody> </table>			PROCESSOR	W17	W18	W19	W26	486SX / SX2	removed	1-2	removed	removed	486DX / DX2	1-2	2-3	1-2	removed	486 Overdrive	1-2	2-3	2-3	removed	486DX2 wb	1-2	2-3	1-2	removed	486DX4	1-2	2-3	1-2	removed	486DX4 wb	1-2	2-3	1-2	removed	AMD 486DX2	1-2	2-3	1-2	1-2	AMD 486DX4	1-2	2-3	1-2	removed	AMD 5x86	1-2	2-3	1-2	1-2
PROCESSOR	W17	W18	W19	W26																																																		
486SX / SX2	removed	1-2	removed	removed																																																		
486DX / DX2	1-2	2-3	1-2	removed																																																		
486 Overdrive	1-2	2-3	2-3	removed																																																		
486DX2 wb	1-2	2-3	1-2	removed																																																		
486DX4	1-2	2-3	1-2	removed																																																		
486DX4 wb	1-2	2-3	1-2	removed																																																		
AMD 486DX2	1-2	2-3	1-2	1-2																																																		
AMD 486DX4	1-2	2-3	1-2	removed																																																		
AMD 5x86	1-2	2-3	1-2	1-2																																																		
W19A	PS/2 Mouse	Enabled* 	Disabled 																																																			

Setting Jumpers 8-6

TABLE 8-3: Jumper Settings (W20-W25, SW1, SW2)

NAME	FUNCTION	CONFIGURATION (INITIAL SETTING: *)																														
W20	BUSCLK Signal	<table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>16MHz ASYNC*</td></tr> <tr><td></td></tr> </table> <table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>25MHz CPUCLK</td></tr> <tr><td></td></tr> </table> <table style="display: inline-table; vertical-align: top;"> <tr><td>33MHz CPUCLK</td></tr> <tr><td></td></tr> </table>	16MHz ASYNC*		25MHz CPUCLK		33MHz CPUCLK																									
16MHz ASYNC*																																
25MHz CPUCLK																																
33MHz CPUCLK																																
W21	CPU Clock	<table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>25/50MHz</td></tr> <tr><td></td></tr> </table> <table style="display: inline-table; vertical-align: top;"> <tr><td>33/66MHz</td></tr> <tr><td></td></tr> </table>	25/50MHz		33/66MHz																											
25/50MHz																																
33/66MHz																																
W22	Graphic Modes	<table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>CGA, EGA, VGA*</td></tr> <tr><td></td></tr> </table> <table style="display: inline-table; vertical-align: top;"> <tr><td>Monochrome</td></tr> <tr><td></td></tr> </table>	CGA, EGA, VGA*		Monochrome																											
CGA, EGA, VGA*																																
Monochrome																																
W23 W24	ECP DMA Channel	<table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>DMA 1</td></tr> <tr><td></td></tr> </table> <table style="display: inline-table; vertical-align: top;"> <tr><td>DMA 3</td></tr> <tr><td></td></tr> </table>	DMA 1		DMA 3																											
DMA 1																																
DMA 3																																
W25	Parallel Port Interrupt	<table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>IRQ 5</td></tr> <tr><td></td></tr> </table> <table style="display: inline-table; vertical-align: top;"> <tr><td>IRQ 7</td></tr> <tr><td></td></tr> </table>	IRQ 5		IRQ 7																											
IRQ 5																																
IRQ 7																																
W27	CPU Power	<table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>3.3V</td></tr> <tr><td></td></tr> </table> <table style="display: inline-table; vertical-align: top;"> <tr><td>5.0V</td></tr> <tr><td></td></tr> </table>	3.3V		5.0V																											
3.3V																																
5.0V																																
SW1-SW2	Multi-Function Jumpers	<div style="text-align: center;"> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Pin#</th> <th>Name</th> <th>Function</th> <th>Installed</th> <th>Removed</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>FLHBOOT*</td> <td>Selects Boot from Flash or Drive</td> <td>Flash</td> <td>Drives</td> </tr> <tr> <td>3-4</td> <td>COM1/2</td> <td>COM1/COM2 Select for VT100 / Download Mode</td> <td>COM2</td> <td>COM1</td> </tr> <tr> <td>5-6</td> <td>VT100*</td> <td>Display Mode Output</td> <td>VT100</td> <td>Standard</td> </tr> <tr> <td>7-8</td> <td>DOWNLD*</td> <td>Download Mode</td> <td>Remote</td> <td>Normal</td> </tr> <tr> <td>1-2 3-4 5-6 7-8</td> <td></td> <td>SW2 is not implemented</td> <td></td> <td></td> </tr> </tbody> </table> <p>*Active Low Signal</p>	Pin#	Name	Function	Installed	Removed	1-2	FLHBOOT*	Selects Boot from Flash or Drive	Flash	Drives	3-4	COM1/2	COM1/COM2 Select for VT100 / Download Mode	COM2	COM1	5-6	VT100*	Display Mode Output	VT100	Standard	7-8	DOWNLD*	Download Mode	Remote	Normal	1-2 3-4 5-6 7-8		SW2 is not implemented		
Pin#	Name	Function	Installed	Removed																												
1-2	FLHBOOT*	Selects Boot from Flash or Drive	Flash	Drives																												
3-4	COM1/2	COM1/COM2 Select for VT100 / Download Mode	COM2	COM1																												
5-6	VT100*	Display Mode Output	VT100	Standard																												
7-8	DOWNLD*	Download Mode	Remote	Normal																												
1-2 3-4 5-6 7-8		SW2 is not implemented																														

9. CONFIGURING DMA and IRQ

9.1 DMA Channels Allocation

The TEK-AT4LPLUS supports seven Direct Memory Access channels: Channel 0 is reserved for the DRAM refresh. Channel 4 is used to cascade channels 0 through 7 to the microprocessor, and Channel 2 is reserved for the floppy controller.

TABLE 9-1: 8237 Controller Table

DMA 0	Refresh
DMA 1	Available
DMA 2	Floppy controller
DMA 3	Available
DMA 4	Cascade controller # 1
DMA 5	Available
DMA 6	Available
DMA 7	Available

9.2 Allocating IRQ Lines

Two 8259 interrupt controllers handle the interrupts on the TEK-AT4LPLUS. Six interrupt lines are directly linked to the keyboard controller, timer, the real-time clock, both serial ports and the parallel port. A seventh interrupt line (IRQ12) is used for the PS/2 MOUSE but the mode can be made available by the W19A jumper.

TABLE 9-2: 8259 Controller Table

CONTROLLER # 1		CONTROLLER # 2	
IRQ 0	Timer 0	IRQ 8	Real-time clock*
IRQ 1	Keyboard	IRQ 9	Available
IRQ 2	Cascade controller # 2	IRQ 10	Available
IRQ 3	COM 2*	IRQ 11	Available
IRQ 4	COM 1*	IRQ 12	PS/2 Mouse/Available
IRQ 5	Available	IRQ 13	Available
IRQ 6	Floppy controller	IRQ 14	Fixed disk*
IRQ 7	LPT 1*	IRQ 15	Available

* All functions marked with an asterisk (*) can be disabled.

10. TEK-AT4L*PLUS* BIOS

10.1 OVERVIEW AND FEATURES

The TEK-AT4L *PLUS* uses the American Megatrends INC. PC/AT BIOS. This BIOS provides a software interface between the MS-DOS operating system and the hardware of the Single Board Computer. The interface provided by the BIOS is 100% IBM AT compatible. That is, all functions accept similar inputs and provide the same results as IBM, although the program code itself is different.

10.2 ERROR HANDLING

Teknor BIOS can be configured to handle errors differently. Two possibilities exist:

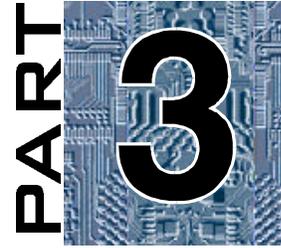
Stop: The BIOS will stop the booting process if an error is detected and request the user to press F1.

WARNING: The BIOS will display an error message but will continue the booting procedure

The following lists the error sources and their default values.

[Warning]	Diskette
[Warning]	Fixed Disk
[Warning]	Keyboard
[Warning]	Video
[Warning]	Memory size
[Warning]	CMOS checksum
[Warning]	Real-Time Clock
[Warning]	POST configuration
[Warning]	Coprocessor
[Warning]	Other

APPENDICES



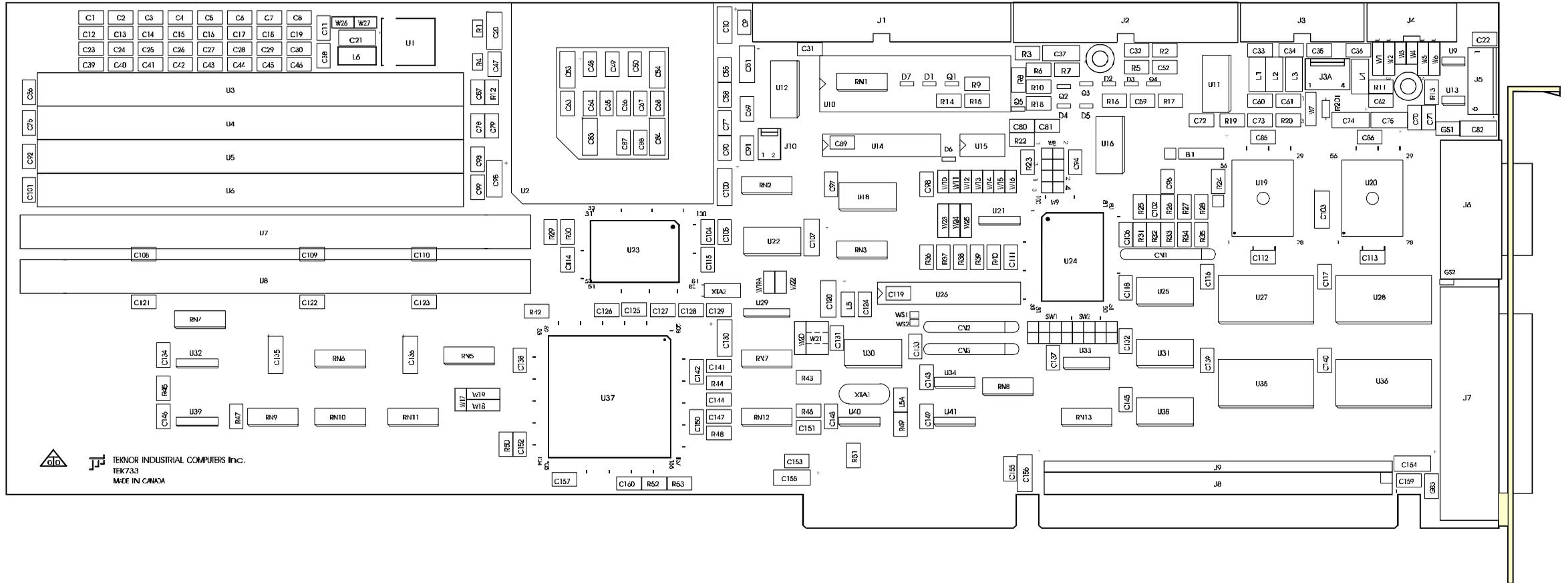
- A. PRODUCT SPECIFICATIONS
- B. BOARD DIAGRAMS
- C. CONNECTOR PINOUTS

A. PRODUCT SPECIFICATIONS

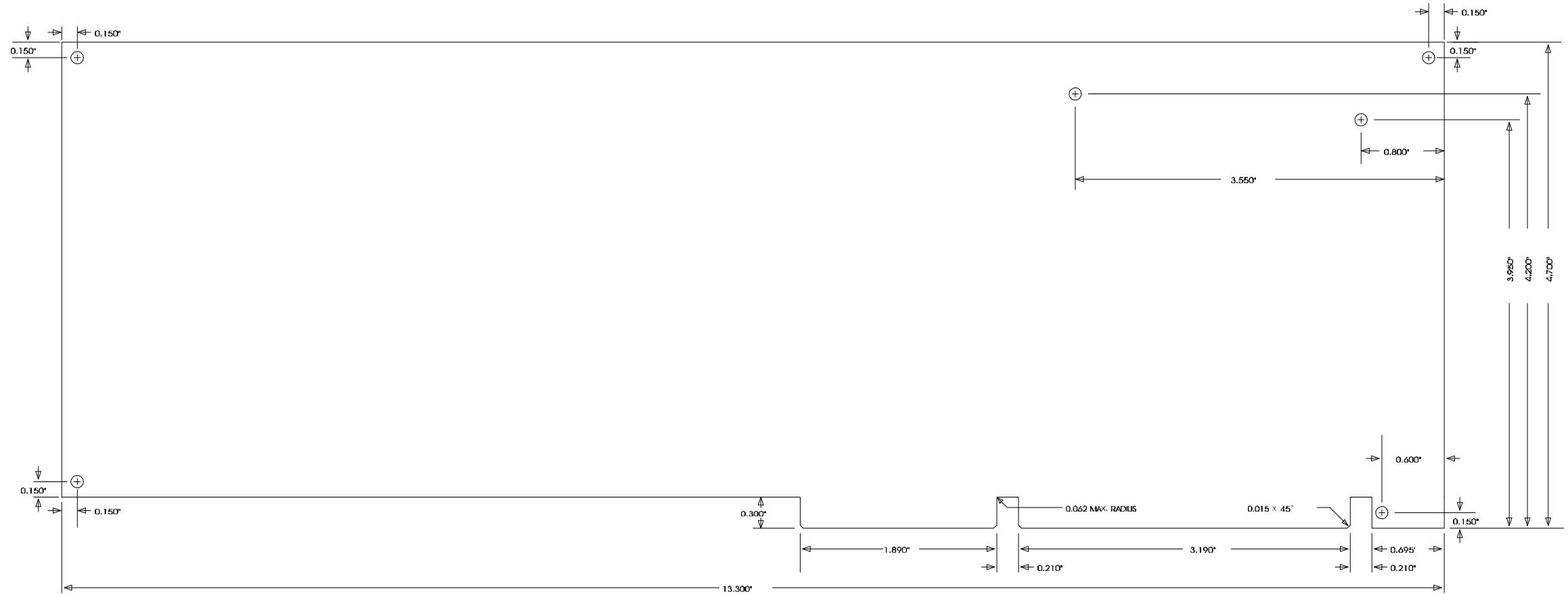
A.1 TEK-AT4LPLUS - Product Specifications

TEK-AT4LPLUS	DESCRIPTION												
Overview	PC AT Single Board Computer												
Supported Microprocessors	486SX/25MHz 486DX/33MHz 486DX2/66MHz 486DX4/100MHz 5x86/133MHz												
Memory	<ul style="list-style-type: none"> . System Memory: 1 to 64 MB - DRAM . Up to 8MB of user Flash EPROM (option) . Up to 2MB user SRAM with battery backup (option) . Supports Shadow RAM BIOS for fast execution 												
I/O Connectors	<ul style="list-style-type: none"> . ISA available on expansion headers . IDE AT standard, available on a standard 40-pin connectors . Floppy Disk available on a standard 34-pin connector . Multi-Function connector : <ul style="list-style-type: none"> Keyboard - keyboard, speaker, reset and LED on a 16-pin connector . Serial Ports <ul style="list-style-type: none"> COM1 - RS-232 on a DB9 male connector COM2 - RS-232 or RS-485 on a 10-pin connector . Parallel Port DB25 male connector . Mouse IBM PS/2 mouse compatible (4-pin header) 												
Power Supply	ISA Bus +5V, -5V, +12V and -12V DC through ISA Bus from backplane Auxiliary +5V, -5V, +12V and -12V DC on standard 6-pin header												
Supply Current	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">5x86</th> <th style="text-align: center;">DX4</th> <th style="text-align: center;">DX2</th> </tr> </thead> <tbody> <tr> <td>I_{cc} (+5V)</td> <td style="text-align: center;">1.7A</td> <td style="text-align: center;">2.1A</td> <td style="text-align: center;">2.0A</td> </tr> <tr> <td>I_{pp}(+12V/-12V)</td> <td style="text-align: center;">5/10mA</td> <td style="text-align: center;">5/10mA</td> <td style="text-align: center;">5/10mA</td> </tr> </tbody> </table> <p>Test Conditions: 2MB Flash, 1MB SRAM, 8MB DRAM</p>		5x86	DX4	DX2	I_{cc} (+5V)	1.7A	2.1A	2.0A	I_{pp} (+12V/-12V)	5/10mA	5/10mA	5/10mA
	5x86	DX4	DX2										
I_{cc} (+5V)	1.7A	2.1A	2.0A										
I_{pp} (+12V/-12V)	5/10mA	5/10mA	5/10mA										
Operating Temperature	0°C to 70°C* - 5% to 95% Non-condensing Relative Humidity * (requires cooling)												
M.T.B.F.	Over 200.000 hours												
PCB Characteristics	Four layers: Signal/Ground/Power/Signal Designed to minimize EMI Total thickness: 0.093" ±0.005" (2.36mm ±0.12mm)												
Outline Dimensions	13.300" x 4.700" (337.80mm x 119.40mm) - without bracket												
Order Guide	Use the following part number : TEK733, AT4LPLUS Single Board Computer												

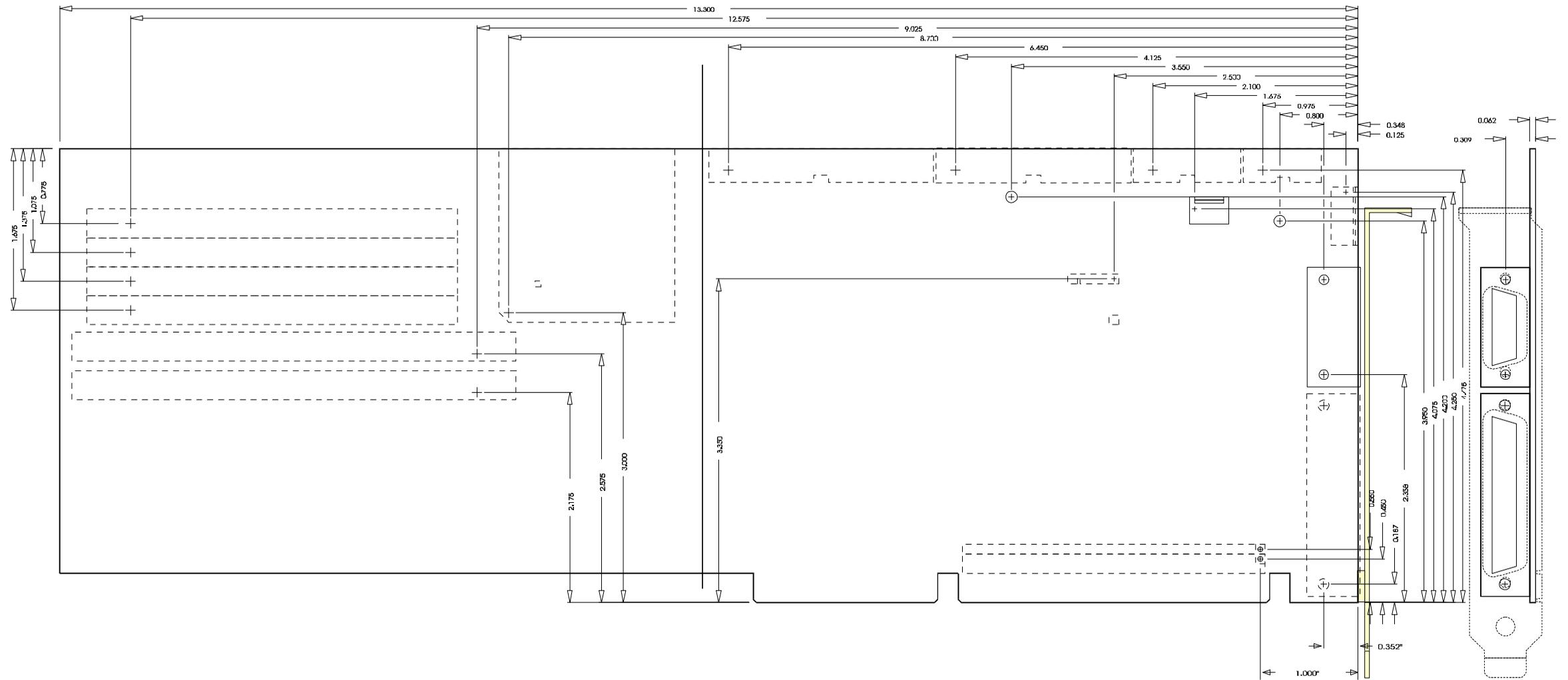
B.1 TEK-AT4LPLUS - Assembly Diagram (Top View)



B.2 TEK-AT4LPLUS - Mounting Holes



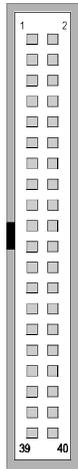
B.3 TEK-AT4LPLUS - Mechanical Specifications



C.1 J1 - IDE #1 Connector

Pin Number		Signal Flow	Signal
			1
			3
			5
			7
			9
			11
			13
			15
			17
			19
			21
			23
			25
			27
			29
			31
			33
			35
			37
			39

Top View



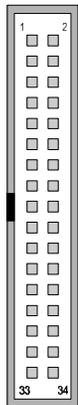
Pin Number		Signal Flow	Signal
2			GND
4			SD8
6			SD9
8			SD10
10			SD11
12			SD12
14			SD13
16			SD14
18			SD15
20			Not Connected
22			GND
24			GND
26			GND
28			BALE
30			GND
32			IOCS16#
34			Not Connected
36			SA2
38			CS1#
40			GND

Active Low Signal

C.2 J2 - Floppy Disk Drive Connector

Pin Number		Signal Flow	Signal
			1
			3
			5
			7
			9
			11
			13
			15
			17
			19
			21
			23
			25
			27
			29
			31
			33

Top View

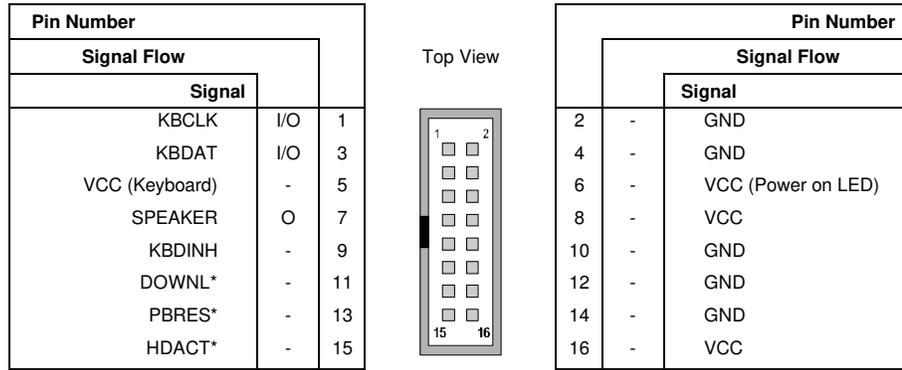


Pin Number		Signal Flow	Signal
2	O		RPM/LC
4	-		Not Connected
6	-		Not Connected
8	I		INDEX*
10	O		MOTOR ENABLE A*
12	O		DRIVE SELECT B
14	O		DRIVE SELECT A
16	O		MOTOR ENABLE B*
18	O		DIR CONTROL*
20	O		STEP*
22	O		WR_DATA*
24	O		WRITE ENABLE*
26	I		TRACK0*
28	I		WRITE PROTEC*
30	I		RD_DATA*
32	O		HEAD SELECT
34	I		DSKCHG

* Active Low Signal

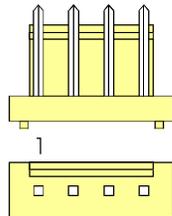
Connector Pinouts C-1

C.3 J3 - Multi-Function Connector



* Active Low Signal

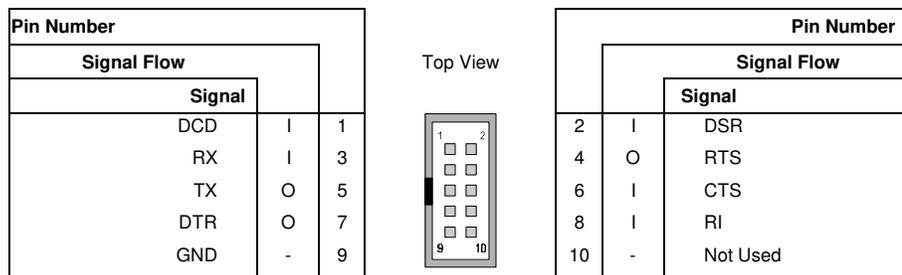
C.4 J3A - Mouse Connector



Pin #	Designation
1	MOUCLK
2	KBMOUGND
3	MOUDATA
4	KBMOUVCC

C.5 J4- Serial Port #2 Connector

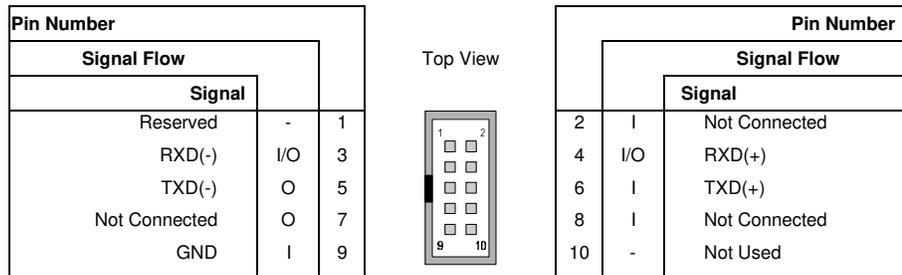
RS-232 Mode



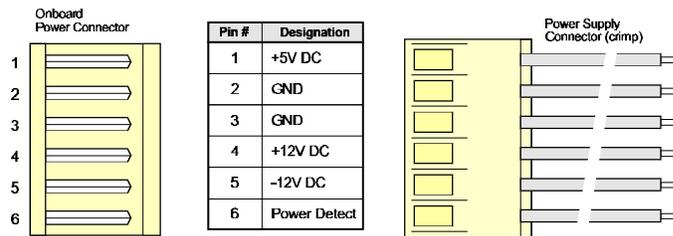
Connector Pinouts C-2

J4- Serial Port #2 Connector (Continued)

RS-485 Mode

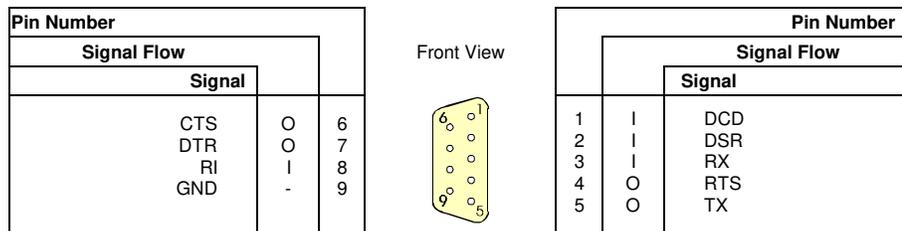


C.6 J5 - Power Connector



C.7 J6 - Serial Port #1 Connector

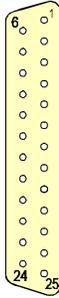
RS-232 Mode



C.8 J7 - Parallel Port Connector

Pin Number			
Signal Flow			
Signal			
P0	I/O		2
P2	I/O		4
P4	I/O		6
P6	I/O		8
ACK*	I		10
PE	I		12
AFD*	O		14
INIT*	O		16
GND	-		18
GND	-		20
GND	-		22
GND	-		24

Front View



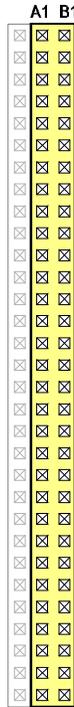
Pin Number			
Signal Flow			
Signal			
1	O	STB*	
3	I/O	P1	
5	I/O	P3	
7	I/O	P5	
9	I/O	P7	
11	I	BUSY	
13	I	SLCT	
15	I	ERR*	
17	O	SLIN*	
19	-	GND	
21	-	GND	
23	-	GND	
25	-	GND	

C.9 J8 - Mezzanine ISA AT Bus Connector

A Side

	I/O PIN	Signal Name	I/O
1	A1	I/O CH CK*	I
3	A2	SD7	I/O
5	A3	SD6	I/O
7	A4	SD5	I/O
9	A5	SD4	I/O
11	A6	SD3	I/O
13	A7	SD2	I/O
15	A8	SD1	I/O
17	A9	SD0	I/O
19	A10	I/O CH RDY*	I
21	A11	AEN	O
23	A12	SA19	I/O
25	A13	SA18	I/O
27	A14	SA17	I/O
29	A15	SA16	I/O
31	A16	SA15	I/O
33	A17	SA14	I/O
35	A18	SA13	I/O
37	A19	SA12	I/O
39	A20	SA11	I/O
41	A21	SA10	I/O
43	A22	SA9	I/O
45	A23	SA8	I/O
47	A24	SA7	I/O
49	A25	SA6	I/O
51	A26	SA5	I/O
53	A27	SA4	I/O
55	A28	SA3	I/O
57	A29	SA2	I/O
59	A30	SA1	I/O
61	A31	SA0	I/O

Top View



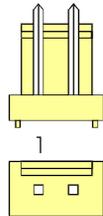
B Side

	I/O PIN	Signal Name	I/O
2	B1	GND	-
4	B2	RESET DRV	O
6	B3	+5 Vdc	-
8	B4	IRQ9	I
10	B5	-5 Vdc	-
12	B6	DRQ2	I
14	B7	-12 Vdc	-
16	B8	OWS	I
18	B9	+12 Vdc	-
20	B10	GND	-
22	B11	SMESW*	O
24	B12	SMEMR*	O
26	B13	IOW*	I/O
28	B14	IOR*	I/O
30	B15	DACK3*	O
32	B16	DRQ3	I
34	B17	DACK1*	O
36	B18	DRQ1	I
38	B19	REFRESH*	I/O
40	B20	CLK	O
42	B21	IRQ7	I
44	B22	IRQ6	I
46	B23	IRQ5	I
48	B24	IRQ4	I
50	B25	IRQ3	I
52	B26	DACK2*	O
54	B27	T/C	O
56	B28	BALE	O
58	B29	+5 Vdc	-
60	B30	OSC	O
62	B31	GND	-

C.10 J9 - Mezzanine ISA AT Extension Bus Connector

I/O PIN	SIGNAL NAME	I/O	1	A1	B1
1	SBHE*	I/O	⊗	⊗	⊗
2	LA23	I/O	⊗	⊗	⊗
3	LA22	I/O	⊗	⊗	⊗
4	LA21	I/O	⊗	⊗	⊗
5	LA20	I/O	⊗	⊗	⊗
6	LA19	I/O	⊗	⊗	⊗
7	LA18	I/O	⊗	⊗	⊗
8	LA17	I/O	⊗	⊗	⊗
9	SD08	I/O	⊗	⊗	⊗
10	SD09	I/O	⊗	⊗	⊗
11	SD10	I/O	⊗	⊗	⊗
12	SD11	I/O	⊗	⊗	⊗
13	SD12	I/O	⊗	⊗	⊗
14	SD13	I/O	⊗	⊗	⊗
15	SD14	I/O	⊗	⊗	⊗
16	SD15	I/O	⊗	⊗	⊗
17	MEM CS16*	I/O	⊗	⊗	⊗
18	I/O CS16*	I/O	⊗	⊗	⊗
19	IRQ10	I/O	⊗	⊗	⊗
20	IRQ11	I/O	⊗	⊗	⊗
21	IRQ12	I/O	⊗	⊗	⊗
22	IRQ15	I/O	⊗	⊗	⊗
23	MASTER*	I/O	⊗	⊗	⊗
24	MEMR*	I/O	⊗	⊗	⊗
25	MEMW*	I/O	⊗	⊗	⊗
26	DACK5*	I/O	⊗	⊗	⊗
27	DRQ5	I/O	⊗	⊗	⊗
28	DACK6*	I/O	⊗	⊗	⊗
29	DRQ6	I/O	⊗	⊗	⊗
30	DACK7*	I/O	⊗	⊗	⊗
31	DRQ7	I/O	⊗	⊗	⊗

C.11 J10 - Fan Connector



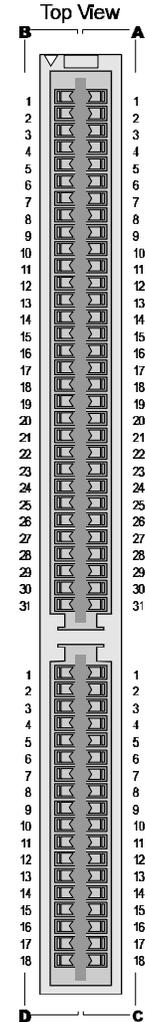
Pin #	Designation
1	+12V
2	GND

Connector Pinouts C-6

C.12 J14 - ISA Bus Extension Connector

PIN	Signal Name	I/O	PIN	Signal Name	I/O
A Side			C Side		
A1	IOCHK#	I	B1	GND	-
A2	SD7	I/O	B2	RESET DRV	O
A3	SD6	I/O	B3	+5Vdc	-
A4	SD5	I/O	B4	IRQ9	I
A5	SD4	I/O	B5	-5Vdc	I
A6	SD3	I/O	B6	DRQ2	I
A7	SD2	I/O	B7	-12Vdc	-
A8	SD1	I/O	B8	ENDXFR#	I
A9	SD0	I/O	B9	+12Vdc	-
A10	IOCHRDY	I	B10	GND	-
A11	AEN	O	B11	SMEMW#	O
A12	SA19	I/O	B12	SMEMR#	O
A13	SA18	I/O	B13	IOW#	I/O
A14	SA17	I/O	B14	IOR#	I/O
A15	SA16	I/O	B15	DACK3#	O
A16	SA15	I/O	B16	DRQ3	I
A17	SA14	I/O	B17	DACK1#	O
A18	SA13	I/O	B18	DRQ1	I
A19	SA12	I/O	B19	REFRESH#	I/O
A20	SA11	I/O	B20	SYSCLK	O
A21	SA10	I/O	B21	IRQ7	I
A22	SA9	I/O	B22	IRQ6	I
A23	SA8	I/O	B23	IRQ5	I
A24	SA7	I/O	B24	IRQ4	I
A25	SA6	I/O	B25	IRQ3	I
A26	SA5	I/O	B26	DACK2#	O
A27	SA4	I/O	B27	T/C	O
A28	SA3	I/O	B28	BALE	O
A29	SA2	I/O	B29	+5Vdc	-
A30	SA1	I/O	B30	OSC	O
A31	SA0	I/O	B31	GND	-
C Side			D Side		
C1	SBHE#	I/O	D1	MEMCS16#	I
C2	LA23	I/O	D2	IOCS16#	I
C3	LA22	I/O	D3	IRQ10	I
C4	LA21	I/O	D4	IRQ11	I
C5	LA20	I/O	D5	IRQ12	I
C6	LA19	I/O	D6	IRQ15	I
C7	LA18	I/O	D7	IRQ14	I
C8	LA17	I/O	D8	DACK0#	O
C9	MEMR#	I/O	D9	DRQ0	I
C10	MEMW#	I/O	D10	DACK5#	O
C11	SD08	I/O	D11	DRQ5	I
C12	SD09	I/O	D12	DACK6#	O
C13	SD10	I/O	D13	DRQ6	I
C14	SD11	I/O	D14	DACK7#	O
C15	SD12	I/O	D15	DRQ7	I
C16	SD13	I/O	D16	+5Vdc	-
C17	SD14	I/O	D17	MASTER#	I
C18	SD15	I/O	D18	GND	-

Active Low Signal



Connector Pinouts C-7

GLOSSARY

ANSI (AMERICAN NATIONAL STANDARD INSTITUTE)

A group of committees formed to establish voluntary commercial and government standard. ANSI is a member of ISO.

AT BUS

The AT bus is the ISA bus. It is a 16-bit electronic path containing active signals and power lines to interface with compatible interfaces or adapter cards for the transfer of data. Data is exchanged 8 or 16-bit at a time (per access) in parallel.

BIOS (BASIC INPUT/OUTPUT SYSTEM)

BIOS is permanent built-in firmware that controls accesses to devices that are connected to the computer, such as the memory, the monitor, the disk drives, the serial communications port, etc. In TEKNOR single board computer, this may include video BIOS, TEKNOR's BIOS extension, main BIOS and Flat Panel BIOS.

CMOS (COMPLEMENTARY METAL-OXIDE SEMICONDUCTOR)

A computer chip that allows many components to be packed together in a very small area. CMOS uses a very small electric current, thereby generating very little heat, making it suitable for very-large-scale integration (VLSI). CMOS are nonvolatile, meaning they retain their information even after the power is switched off. In a few words CMOS is a digital logic family that is characterized by high density, low-to-medium power, and medium-to-high speeds.

DEVICE DRIVER

Software that tells the computer how to connect to a peripheral device, for instance a printer. It acts as an interface between the operating system and the hardware attached to a computer, to allow applications to communicate in an orderly fashion.

DIP (DUAL IN-LINE PACKAGE)

A method of packaging semiconductor chips that was omnipresent until the 1980s. Since then, it is being replaced with small outline packages for devices with low or medium pin counts and pin grid arrays or plastic quad flatpack for devices with high pin counts.

DMA (DIRECT MEMORY ACCESS)

A method of transferring blocks of data directly between a mass-storage device and memory, with no intervention from the CPU. To transfer data from a non-storage devices (terminals) to a destination (memory), the CPU must intervene in the transfer of each byte. The DMA interface is typically incorporated into the device controller.

DRAM (DYNAMIC RANDOM ACCESS MEMORY)

A memory technology that is characterized by extremely high density, low power and low cost. It must be refreshed often (every one thousandth of a second) to avoid loss of data. This type of memory is used as the system memory in many personal computers. DRAM can be configured using 36-bit or 9-bit SIMMs (Single In-line Modules), and is the only type of memory that can be installed by the user.

EPROM (ERASABLE PROGRAMMABLE READ-ONLY MEMORY)

EPROM is a chip with a glass window that is useful for storing firmware. It can be erased by removing the protective cover from the chip package and exposing the semiconductor material to ultraviolet light. It can then be re-programmed.

EXPANDED MEMORY SPECIFICATION (EMS)

Personal computers using DOS have a RAM limitation of 640 KB, not enough for applications like spreadsheets and multiple program loading. The EMS is a technique that establishes a set of rules for organizing and accessing extended memory, for use as conventional DOS memory. Up to 32 MB of extended memory can be accessed through the 64 KB window in conventional memory, divided into four 16 KB memory pages.

EXTENDED MEMORY SPECIFICATION (XMS)

In an industry-standard computer, any amount of memory above the base configuration supplied by the manufacturer. It is the memory above 1 MB accessible only in protected mode. Microsoft Windows, Xenix, and Unix can access it but, DOS and ordinary applications programs cannot because they must use real mode.

FLASH MEMORY

A type of EEPROM, only at a much lower cost, that can be re-programmed by the computer or peripheral device to which it is connected. Flash memory is nonvolatile and as a result, it eliminates the risk of losing valuable data updates. Flash memory offers major advantages in applications like automated factories, remote systems, portable equipment and similar environments.

IDE (INTEGRATED DRIVE ELECTRONICS)

A hard disk drive standard/protocol characterized by the integration of the controller circuitry onto the drive itself; this reduces interface costs and allows easy implementation of a drive within a computer system.

INTERRUPT

Interrupt is a signal that stops what the computer system is currently doing, caused by a deliberate instruction to the microprocessor. This allows the system to perform a higher priority task. After the interrupt is serviced, the suspended microprocessor task can be resumed at the point where it stopped.

The interrupt channel is designated for receiving and transmitting interrupts, so that input/output or other operations can take place. See IRQ.

Glossary 2

I/O MAP

An I/O (Input/Output ports) map is a list of all special hardware circuits used by the computer to communicate with external devices. They are simply a special type of memory location that can be accessed only by means of the IN and OUT instructions. It is possible to have up to 65 536 different I/O devices attached to the system since the I/O port addresses are 16-bit numbers. Actually, most I/O devices (disk drive controller, video display controllers, etc.) require more than one I/O port to control them.

IRQ (INTERRUPT REQUEST)

Hardware channels over which devices such as I/O ports, disk drives, and the keyboard can send interrupts to the processor. They are built into the computer's internal hardware and are assigned different priority levels so the processor can determine the relative importance of incoming requests for service. There are 16 IRQs in ISA systems. See Interrupt.

ISA (INDUSTRY STANDARD ARCHITECTURE)

In reference to IBM PC AT compatible computers, it is the definition of the standard bus. In other words ISA is the Industrial Standard Architecture expansion bus built into the IBM PC AT computer.

MEMORY MAP

A technical reference that shows the entry point and marks the blocks of memory that are reserved for specific functions.

MEZZANINE CARD - MEZZANINE BOARD

A peripheral card which uses the PC/104 or the 62-pin XT extension header connectors on TEKNOR boards. Mezzanine Board allows to assembly a complete computer without passive backplane.

PASSIVE BACKPLANE

A Printed Circuit Board (PCB) populated mostly with passive electronic components (connectors, resistors...) equipped with connectors that accept different types of Plug-in Electronic boards (SBC, Video Board, I/O Board...). The main purpose of the Passive Backplane is to serve as an interconnection medium for the different Plug-in boards installed in a computer system. The backplane is also generally used to supply power to the different Plug-in boards.

REAL-TIME CLOCK (RTC)

It is needed for software compatibility and it has no direct relationship with the ISA bus. It provides time and date information.

RS-232 OR RS-232C

A standard which defines the physical and electrical serial interface used to connect data communications equipment. This is the most commonly used interface, especially between modems and computers. There are two interfaces : DTE (Data Terminal Equipment), used by computers, and DCE (Data Communications Equipment), used by modems.

RS-485

Electrical interconnection standard. This standard specifies a differential data transmission protocol that allows data rates of up to 10 MB/second over line lengths up to 4000 ft. The standard also establishes a means of implementing multi-drop interconnection for up to 32 users.

SBC (SINGLE BOARD COMPUTER)

A term generally used for a computer in which all of the functions (processor, memory, I/O, peripherals, etc.) are contained on a single board. All of TEKNOR's processor boards are examples of SBC's.

SHADOW RAM BIOS

This is installed to boost overall system speed by copying the system BIOS and VGA BIOS directly into system RAM at the time the system is booted. RAM runs two to three times faster than the ROM that holds the BIOS, so, as a result, the system's response to all BIOS calls is much quicker.

SHADOWING

To make a copy of a program from a slower memory (like ROM) to a faster one (like RAM), in order for the program to run faster.

SOLID STATE DISK (SSD)

A secondary storage peripheral that uses semiconductor memory as its storage medium, rather than a magnetic disk, providing performance 10 to 30 times better than that of a magnetic disk. SSDs have no moving parts and are less susceptible to dirt, moisture, vibration and temperature variations than mechanical Floppy disks. The Flash EPROM and SRAM disks are types of SSDs available on TEKNOR boards.

SRAM (STATIC RANDOM ACCESS MEMORY)

As opposed to DRAM, SRAM is memory that does not need to be refreshed by a controller and holds its information as long as the power is on.

VGA (VIDEO GRAPHICS ARRAY)

VGA offers improved graphics and text resolution and an expanded number of available colors for both text and graphics while maintaining software compatibility with most CGA and EGA applications. It has a maximum screen resolution of 640x480 or 720x400 pixels, where each character is formed in a 9 x16 pixel matrix. A maximum of 256 colors can be displayed at once, from an overall selection of 256 000 colors.

VT100 MODE

A mode which allows a single board computer to run without a local keyboard or screen. The operation can be controlled via a remote terminal supporting VT100 Mode or a computer with a terminal emulation program (for example, Telix, Procomm).

WATCHDOG TIMER

A device that watches for CPU inactivity and then resets the CPU after a specified duration of inactivity. It is extremely useful in embedded systems where human supervision is not required.

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**TEKNOR INDUSTRIAL
COMPUTERS INC.
616 Cure Boivin
Boisbriand, Quebec
J7G 2A7 CANADA**

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