TEK-AT3
80386DX SINGLE-BOARD COMPUTER
HARDWARE REFERENCE MANUAL
VERSION 1.1, February 1992

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This manual does not discuss standard features of the IBM family of Personal Computers. Instead, it focuses on the superset of features that TEKNOR has implemented into its single board computers.

For information on IBM standard features, please refer to the following books available at your local book stores:

- *IBM AT Technical Reference Manual*
- *DOS Technical Reference*
- *Peter Norton's Programming The IBM PC*

This is by no means an exhaustive list. Many titles exist on these subjects and just as many titles deal with specialized applications such as extended memory transfers, disk drives, ems, and so on.

If you require information not covered in this manual or in our Application Notes releases, contact our Technical Support/Services Department at (514) 437-5682.

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INTRODUCTION SECTION 1

The TEK-AT3 provides users with a high performance PC/AT type computer on a half-card format (7" x 4.7"), integrating all the basic functions available on an IBM AT. Including a hard disk interface and a floppy disk controller. Best of all, the TEK-AT3 is designed to operate in environments where a sturdy and compact system is essential. So elements such as a watchdog timer, solid state disks, and a power failure detector were added to make the TEK-AT3 perform even in the most extreme industrial applications.

Built using CMOS technology, the TEK-AT3 consumes very little power. Typically, less than 7.5 watts. The TEK-AT3 is also a versatile board. It can be installed in a PC passive backplane or, because of its small size, it can be used as a stand alone controller by utilizing the four standard mounting holes and a separate power connector. And to top it off, an XT extension header accommodates TEKNOR's TEK-PG VGA LCD/EL series of display controllers.

Here are more exciting features found on the TEK-AT3 single board computer:

- PC/AT bus or stand alone operation
- 80386DX @ 33Mhz
- 16K of Cache memory
- 1, 4 or 16M of DRAM
- Up to 1M of user EPROM/Flash EPROM
- Up to 1M user RAM with battery backup
- Supports Shadow RAM BIOS for fast execution
- ROM boot
- Real time clock with battery backup
- AT keyboard and speaker port
- One parallel printer port
- Two serial ports with COM2 as RS232 or RS485
- Watchdog Timer
- Onboard floppy controller: drives two floppies
- Onboard IDE hard disk interface
- CMOS technology for low power
- Two year warranty

INSTALLATION SECTION 2

UNPACKING

If the TEK-AT3 appears to be damaged, please notify Teknor immediately. Save the box and packing material in case you need to ship the card back in the future. The TEK-AT3 is comprised of the card itself, a keyboard cable, a 3.5" floppy disk containing the utilities, a hardware reference manual, and a software utility manual. The TEK-AT3 is preconfigured at the factory to operate as a standard IBM AT processor card.

MULTI-CONFIGURATIONS

There are two system configurations - the stand-alone and the PC/AT. The PC/AT operates like an IBM AT processor card, with video and disk controller cards. The stand-alone depends on a user supplied PC or VT100 to support the transmission of programs and commands. The stand-alone mode is meant to be embedded into a machine or test system.

The TEK-AT3 can operate in a standard PC/AT backplane or as an independent unit: a separate power connector is located on the board.

PC/AT PASSIVE BACKPLANE

The TEK-AT3 can be inserted into any slot on the backplane. Jumpers SW1 located on the TEK-AT3 are configured at the factory for standard AT operation. If you require a special configuration, please refer to *Section 6*.

☞ **To avoid damage, make certain the power is off before inserting or retrieving a card from the card cage.**

STAND ALONE

The TEK-AT3 is also designed to operate without a passive backplane. A separate power connector, J5, is located on the board to provide power. The power pin assignments are as follows:

1	2	3	4	5	6
VCC	GND	GND	+12V	-12V	PD

where PD represents *Powerfail Detection* input. Please refer to section 5-5-2 for more details on how to use this feature.

Four mounting holes are located at each corner of the TEK-AT3 for embedded or portable applications. Combine the TEK-AT3 with our TEK-PG VGA controller and you've got a complete, low power, palm

size AT computer.

KEYBOARD
The keyboard connector accepts a PC/AT type keyboard.

COM1 AND COM2 SERIAL CHANNELS
The TEK-AT3 supports two serial ports: COM1 and COM2. COM1 is available on J6 and COM2 on J4. Refer to section 5-8 for more details.

PRINTER PORT
A DB-25 pin connector, J7, supports the standard centronics printer interface.

RESET,SPEAKER, KEYBOARD and KEYLOCK INTERFACE
J3 is a 16-pin flat ribbon cable connector which provides all the necessary connections for the reset, speaker, keyboard, keylock and other special functions.

3.5" AND 5.25" FLOPPY DISK INSTALLATION
The installation of floppy drives on the TEK-AT3 is done via a standard IBM 34-pin flat ribbon cable that connects to J2.

HARD DISK INSTALLATION
To connect an IDE hard disk to the TEK-AT3, a 40-pin dual row header signal connector is required. This connector handles all command, data, and status I/O lines. The 40-pin male header connector, located at J1 on the TEK-AT3, connects directly with the cable.

SYSTEM MEMORY INSTALLATION
The TEK-AT3 uses SIMMs for system memory. Sockets U1-4 hold the devices and all four sockets must be occupied at all times. The following system configurations are available: 256Kx9, 1Mx9, or 4Mx9. This means you can install 1, 4 or 16Mbytes of DRAM on your TEK-AT3.

SEMICONDUCTOR-DISKS
The TEK-AT3 can accommodate from 128K to 1Mbyte of Flash EPROM and from 128K to 1Mbyte of SRAM memory. SRAM is mounted directly on the card while Flash EPROM are installed on a snap-on daughtercard (provided with each board).

Solid state disks have no moving parts and are far less

susceptible to dirt, moisture, vibration and temperature variations than mechanical Winchester and floppy disks. The TEK-AT3 has six sockets available for up to two mbytes of solid state disks. Two sockets are reserved for the battery-backed RAM disks and four others, provided on the snap-on daughtercard, are for EPROMs or Flash EPROMs. Please refer to section 5-11 for more details.

2-1 CONFIGURATION OVERVIEW

The TEK-AT3 is fully software configurable. The setup program allows for minimal hardware configuration.

2-1-1 SETUP UTILITY

The SETUP program is located within the BIOS and can be activated at boot time by pressing <CTRL-ALT-S>, or <CTRL-R> in VT100 Mode, at the configuration error prompt during the power up sequence. Once the SETUP screen is displayed you can modify the date, time, or other setup information contained in the clock CMOS RAM. The system will reboot on exit from SETUP. The SETUP program should only be activated when all information in the computer has been properly saved.

Use the arrow keys to select the item you want to change. When the item is selected, press <PgUp> or <PgDn> keys to change an entry.

Press <F10> to save the current configuration (press "Q" in VT100 Mode) then <ESC> to exit. The configuration, with the exception of the time and date, is not saved until <F10> is pressed. Press <ESC> to exit without saving the setup.

USER'S SETUP CONFIGURATION INFORMATION

The SETUP program can set the following:

Time of day and Date
Floppy disk configuration
Fixed disk configuration
System memory size
Extended memory size
Shadow memory size
EMS memory size
Video type
Execute BIOS from RAM or ROM
Wait state selection
Initial CPU speed

2-1-2 JUMPER CONFIGURATION OVERVIEW

The TEK-AT3 was designed to allow for minimal hardware configuration.

The following can be configured using shorting jumpers.

JUMPER	STATE	FUNCTION ** as shipped*
RAM Battery Back-up		
W1	*Open**	*NC*
W1	*Closed*	*Vbatt*
Power Monitoring		
W2	*Open**	*Disable*
W2	*Closed*	*Enable*
Watchdog Timer		
W3	*Open**	*Disable*
W3	*Closed*	*Enable*
Hard Disk Interface		
W4	*Open**	*IDE Enabled*
W4	*Closed*	*IDE Disabled*
RAM Disk Memory Type		
W6(A-B)	*32Kx8, 128Kx8 SRAM*	
W6(B-C)	*256Kx8, 512Kx8 SRAM*	
Boot From Flash EPROM		
SW1(1-2)	*Open*	*Boot From Flash*
SW1(1-2)	*Closed**	*Boot From Drives*

Color/Monochrome

SW1(3-4)	*Open* Monochrome*	
SW1(3-4)	*Closed Color*	

Boot From VT100 Terminal

SW1(5-6)	*Open*	*VT100 Mode*
SW1(5-6)	*Closed**	*Graphics Mode*

Remote Download

SW1(7-8)	*Open*	*Serial Download Mode*
SW1(7-8)	*Closed**	*Normal*

Installed on TEK753 Daughtercard:
Flash EPROM

W1	*Open*	*NO Flash*
W1	*Closed**	*FLASH Installed*

Refer to *Diagram 2-2* for exact jumper locations. Please note that jumper *W5* is not functional on the TEK-AT3. It is reserved for future applications.

2-2 JUMPER LOCATIONS

2-3 TEK753 FLASH EPROM BOARD

(Jumper Locations)

MEMORY SECTION 3

3-1 MEMORY MAPPING

The TEK-AT3 supports 1, 4 or 16 Megabytes of DRAM with parity check for system memory. You also have room for up to 2M of solid state disks: U1-4 on the TEK753 snap on daughterboard allow up to 1M of Flash EPROM, and U27-U33 are reserved for up to 1M of SRAM disk with battery backup protection.

3-2 SHADOW RAM

For efficient execution of BIOS, it is preferable to execute BIOS code through RAM rather than through the slower EPROMs. The TEK-AT3 provides the shadow RAM feature which, if enabled, allows the BIOS code to be executed from system RAM resident at the same physical address as the BIOS EPROM.

☞ **If Shadow RAM is enabled, the RAM memory used for shadowing is no longer available as user RAM.**

3-3 EXPANDED MEMORY SYSTEM

The TEK-AT3 supports the LIM EMS 4.0 specification. This specification allows the operating system and software applications to access memory above the DOS (1MB) limitation.

This is accomplished through the implementation of a page mapping scheme that is managed by an EMS driver. The TEK-AT3 also supports a combination of expanded and extended memory.

3-4 CACHE MEMORY

Cache or cacheing is used to accelerate memory accesses by providing a faster local storage memory. This is accomplished by holding copies of data frequently requested from main memory in much faster SRAM. Which in turn enables the processor to run at its full potential.

The TEK-AT3 comes with 16Kbytes of four-way high performance Intel® 386 "Smart Cache". A four-way cacheing scheme means more data paths are available for frequently accessed code, thereby reducing the average number of wait states seen by the CPU to nearly 0.

Cacheing is a cost effective way of maximizing system performance since it utilizes onboard memory for operation. And because it is transparent to the user, you don't have to spend time configuring your system for optimum performance.

The TEK-AT3L uses Intel's Smart Cache 82395DX and is located at socket U6.

TEK-AT3 MEMORY MAPPING

EFFFFF E80000	U4 Flash EPROMS
E7FFFF E00000	U3 Flash EPROMS
DFFFFF D80000	U43 Flash EPROMS
D7FFFF D00000	U42 Flash EPROMS
CFFFFF C80000	U38 RAM Backup
C7FFFF C00000	U29 RAM Backup
200000	RESERVED
100000	1-2 Mbytes User RAM
0FFFFF 0F0000	64K BIOS
0EFFFF 0EC000	BIOS Extension
0EBFFF 0C0000	112K User EPROM
0BFFFF 0A0000	128K Video RAM
09FFFF 000000	640K User RAM

I/O MAP SECTION 4

The following table outlines the I/O ports used by the TEK-AT3.

4-1 ONBOARD DECODED I/O MAP

Addresses	**Use**
000-00F	*DMA controller 1*
020-03F	*Interrupt controller* 1
040-05F	*Timer*
060-06F	*Keyboard(8742)*
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*
2x8-2xA	*EMS register,X=0 or 1*
201	*Watchdog timer, PDO, User*
278-27A	*LPT2*
2F8-2FF	*COM2*
378-37A	*LPT1*
3F2-3F7	*FLOPPY*
3F8-3FF	*COM1*

ONBOARD UTILITIES SECTION 5

5-1 DMA CONTROLLER (8237)

The TEK-AT3 supports seven direct memory access (DMA) channels. Two DMA controllers, functionally equivalent to the 8237, are used with four channels on each chip. Channel 0 is reserved for the DRAM refresh. Channel 4 is used to cascade channels 0 through 7 to the microprocessor.

5-2 INTERRUPT CONTROLLER (8259)

Two 8259 interrupt controllers handle the interrupts on the TEK-AT3. Six interrupt lines are directly linked to the keyboard controller timer, the real-time clock, both serial ports and the parallel port.

5-2-1 INTERRUPT REGISTER ADDRESSES

Address	**Register**
020	*Operation control word 1*
021	*Operation control word 2/ control word 3*

5-3 TIMER (8254)

The 8254 timer features three independent 16-bit timer/counters. Channel 0 is tied to interrupt 0, channel 1 is used to generate a refresh, and channel 2 is used for the speaker port.

5-4 KEYBOARD

5-4-1 KEYBOARD CONTROLLER

The keyboard controller on the TEK-AT3 is a single-chip microcomputer (Intel 8042) that is programmed to support the keyboard serial interface. The keyboard controller receives serial data from the keyboard, checks data parity, translates scan codes, and presents the data to the system as a byte of data in its output buffer. The controller can interrupt the system when data is placed in its output buffer, or wait for the system to poll its status register to determine when data is available.

Address		**Register**
060	*read*	*Keyboard output buffer register*
060	*write*	*Data write*
064	*write*	*Command write*
064	*read*	*Status register*

KEYBOARD, SPEAKER, RESET, AND KEYLOCK INTERFACE

Connector J3 on the TEK-AT3 provides all the necessary signals for connecting all of the above devices. The following diagram shows the signal connections at J3:

PIN NUMBER		PIN NUMBER

SIGNAL FLOW						SIGNAL FLOW
SIGNAL						SIGNAL
KBDCLK		1		2		GND
KBDDATA		3		4		GND
VCC		5		6		VCC
SPKR		7		8		VCC
KBDINH		9		10		GND
AUTO*		11		12		GND
PBRES*		13		14		GND
ACT*		15		16		VCC

ACT*: Hard Disk LED
AUTO*: Refer to *Physical Devices Table* pg. 40

The following functions are available on the keyboard header, J3:

i. Speaker: An 8ohm speaker can be directly connected to J3-7 and J3-8. All necessary drivers are on the TEK-AT3.

ii. Keyboard Disable: The keyboard can be disabled or locked up by shorting J3-9 and J3-10.

iii. Hard Disk LED: The onboard IDE interface activates an external LED. The LED must be connected *anode* on J3-16 and *cathode* on J3-15. No external current limiting resistor is required since one is already present on the TEK-AT3.

iv. Reset: The TEK-AT3 can be reset by shorting J3-13 and J3-14.

v. Auto: This signal, J3-11, when shorted with J3-12, puts the TEK-AT into *Download Mode* at boot up. *Auto* has the same effect and is in parallel with SW1 7-8.

5-5 SUPERVISOR UTILITIES

5-5-1 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 you write "1" in bit "0" at address 201 the first time. When it is enabled, the microprocessor must refresh the *Watchdog*. This is done by writing alternatively "0" and "1" to bit 1 at address 201, 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.

☞ **The user program must provide the first access to address 201, and must also include the refresh routine.**

5-5-1-1 WATCHDOG TIMER REGISTER

Address		**Register**
201 bit 0	*read/write*	*Watchdog enable*
201 bit 1	*read/write*	*Watchdog refresh*

5-5-1-2 HARDWARE CONFIGURATION

Jumper W3 must be installed to permit activation of the Watchdog. If jumper W3 is removed, the *Watchdog* is disabled.

5-5-2 POWER FAILURE DETECTOR

The power failure detector, which generates a non-maskable interrupt (NMI) when a failure occurs, provides a 1.25V threshold for DC power fail warning, low battery detection, or when monitoring a power supply other than +5VDC. The *Power Detection Output* (PDO) of the power failure detection circuit is connected to IOCHECK (NMI). Jumper W2 allows the user to disable this feature.

Power Monitoring

W2	*Open* Power Monitor Disable*
W2	*Closed Power Monitor Enable*

The detection circuit generates a non-maskable interrupt when a power failure occurs. The status of the PDO is available at address 201 bit D3.

For example, if it reads 0, the circuit has detected a low battery warning. Connector J5, pin 6, is used for the power detection input. This input can only accept DC voltage. The line is monitored via two external resistors, R35 and R34=1K installed, which are connected to the power failure input. The user should install resistor R35 according to the monitoring level desired.

EXAMPLE:
Assume the TEK-AT3 is powered by a 9V DC battery and it is required that the battery be monitored for a low battery warning at 7V DC. In this case, R35=4K7.

So, if the battery voltage goes below 7V, it will generate a non-maskable interrupt 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 R35 and R34=1K installed should be tailored to fit your specific application.

Please contact the factory for more details.

5-6 REAL-TIME CLOCK

The RTC is compatible with the popular MC146818. It combines a complete time-of-day clock with a one-hundred year calendar, an alarm, a programmable periodic interrupt, and 114 bytes of low-power static RAM. A battery backup facility is provided for the RTC. The internal clock circuitry uses 14 bytes of this RAM, and the rest is reserved for configuration information.

5-7 PARALLEL PORT (LPT1)

The parallel port is 100% PC/AT compatible. It provides the necessary control signals for use as a Centronics-compatible parallel interface. The connection is done through a DB-25 connector, J7, located at the edge of the board.

5-8 SERIAL COMMUNICATION PORTS

The TEK-AT3 features two UARTs which are functionally equivalent to the NS16450. They are both configured as DTE. The COM1 (J6) port is buffered directly on the board for RS232 operation. The COM2 (J4) port is buffered for RS232 or for RS485. If you require RS485 on COM2, you must specify it as OPT-300 when placing your order.

5-8-1 COM1 (J6) HARDWARE CONFIGURATION

The COM1 port is configured as RS232, and is 100% compatible with the IBM-AT serial port.

J6 (COM1)

PIN NUMBER				PIN NUMBER		
SIGNAL FLOW					SIGNAL FLOW	
SIGNAL						SIGNAL
DCD	IN	1		6	IN	DSR
RX	IN	2		7	OUT	RTS
TX	OUT	3		8	IN	CTS
DTR	OUT	4		9	IN	RI
GND	OUT	5				

5-8-2 COM2 (J4) HARDWARE CONFIGURATION

5-8-2-1 COM2 (J4) as RS232

The COM2 port is configured as RS232, and is 100% compatible with the IBM-AT serial port.

J4 (COM2) RS232

PIN NUMBER						PIN NUMBER
SIGNAL FLOW						SIGNAL FLOW
SIGNAL						SIGNAL
DCD	IN	1		2	IN	DSR
RX	IN	3		4	OUT	RTS
TX	OUT	5		6	IN	CTS
DTR	OUT	7		8	IN	RI
GND		9				

☞ **The pinout for J6 and J4, shown on the previous page, may seem different. However, since J4 (COM2) is a 10 pin flat ribbon connector, the flat ribbon cable will produce an identical pinout as J6 (COM1) when crimped to a DB9 connector as long as pin 1 is kept aligned.**

5-8-2-2 COM2 (J4) as RS485
If the TEK-AT3 is configured for RS485 operation. It can support either full-duplex or party line communication.

5-8-2-2-1 FULL DUPLEX OPERATION
Upon power-up or reset, the RS485 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.

5-8-2-2-2 PARTY LINE OPERATION
In order to enable party line operation, the user must first write "1" to bit 3 at I/O address 201. 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 R5 and R6 must be installed only on the boards at both ends of the network.

J4 (COM2) RS485

PIN NUMBER						PIN NUMBER
SIGNAL FLOW						SIGNAL FLOW
SIGNAL						SIGNAL
RESERVED	IN	1		2	IN	NC
RXD(-)	I/O	3		4	OUT	RXD(+)
TXD(-)	OUT	5		6	IN	TXD(+)
NC	OUT	7		8	IN	NC
GND	IN	9				

5-9 FLOPPY DISK CONTROLLER

The floppy disk controller on the TEK-AT3 is IBM PC and AT compatible (single and double density). It handles 3.5 and 5.25 inch low and high density drives. Up to two drives in any combination can be supported.

5-9-1 3.5" AND 5.25" FLOPPY DISK INSTALLATION

The installation of floppy drives on the TEK-AT3 is done via a standard IBM 34-pin flat ribbon cable that connects to J2. The pin-out is described below:

Pin number	**Signal Flow**	**Signal**
2	*OUT*	*RPM/LC*
4	-	*N.C.*
6	-	*N.C.*
8	*IN*	*INDEX**
10	*OUT*	*MOTRENA**
12	*OUT*	*DRIVESB**
14	*OUT*	*DRIVESA**
16	*OUT*	*MOTRENB**
18	*OUT*	*DIRC**
20	*OUT*	*STEP**
22	*OUT*	*WRIT DATA**
24	*OUT*	*WRIT ENABLE**
26	*IN*	*TRACK0**
28	*IN*	*WRIT PROTECT**
30	*IN*	*READ DATA**
32	*OUT*	*HEAD SELECT**
34	*IN*	*DCHG*
1-33 ODD		*GND*

5-10 HARD DISK CONTROLLER

The TEK-AT3 supports AT Integrated Disk Drives. The AT embedded drive architecture incorporates drive electronics and controller circuitry on a single printed circuit board which is mounted directly to the disk drive chassis. The integration of drive and controller functions increases reliability and performance by eliminating redundant circuitry. Thus, providing increased performance at reduced cost.

5-10-1 HARD DISK INSTALLATION

To connect an IDE hard disk to the TEK-AT3, a 40-pin dual row header signal connector is required. This connector handles all command, data, and status I/O lines. The 40-pin male header connector located at J1 on the TEK-AT3 connects directly with the cable.

1. Signal connector - 2 X 20-pin right vertical .1 inch Berg Stick REF: P/N AMP 2-102444-0

Maximum Cable length - 18 inches

The drive itself can be mounted in any horizontal or vertical plane.

☞ **The hard disk interface can be disabled on the TEK-AT3 by installing jumper W4. This allows you to install other types of hard disk interfaces.**

5-10-2 PIN OUT OF HARD DISK INTERFACE CONNECTOR

Pin number	Signal Flow	Signal
3	*I/O*	*SD7*
4	*I/O*	*SD8*
5	*I/O*	*SD6*
6	*I/O*	*SD9*
7	*I/O*	*SD5*
8	*I/O*	*SD10*
9	*I/O*	*SD4*
10	*I/O*	*SD11*
11	*I/O*	*SD3*
12	*I/O*	*SD12*
13	*I/O*	*SD2*
14	*I/O*	*SD13*
15	*I/O*	*SD1*
16	*I/O*	*SD14*
17	*I/O*	*SD0*
18	*I/O*	*SD15*

1	*I*	*RST-*
23	*I*	*IOW-*
25	*I*	*IOR-*
33	*I*	*SA1*
35	*I*	*SA0*
36	*I*	*SA2*
37	*I*	*CS0-*
38	*I*	*CS1*
31	*O*	*IRQ14*
32	*O*	*I/OCS16-*
39	*O*	*ACTIVE*
8	*RESERVED(NOT CONNECTED)*	
20	*KEY(NOT CONNECTED)*	
21	*RESERVED(NOT CONNECTED)*	
34	*-*	*PDIAG*
2,19,22,24 26,30,40	*-*	*GND*

5-11 SOLID STATE DISKS

The TEK-AT3 comes standard with a snap-on daughterboard specially designed to carry from 128K to 1M of Flash EPROM solid state (semiconductor) disks. Solid state disks have no moving parts and are far less susceptible to dirt, moisture, vibration and temperature variations than mechanical Winchester and floppy disks.

Two sockets on the TEK-AT3 itself are reserved for the battery-backed SRAM disk. Up to 1Mbyte is available by using 512Kx8 devices. Files transferred to

battery-backed RAM disks stay resident for a minimum of one year; 5 years typically.

Flash memories enable code version updates to be downloaded. A central host computer can download program codes to many remote systems. Flash memory is a solid-state, nonvolatile disk. Thus eliminating the risk of losing updates (a concern with battery backed RAM). These aspects of Flash memory offer major advantages in automated factories, remote systems, portable equipment and other applications. Finally, Flash memory provides this capability at a much lower cost than EEPROM or battery-backed SRAM.

5-11-1 INSTALLATION

5-11-1-1 USER CONFIGURATION

The TEK-AT3 semiconductor disk section does not require any jumper configuration except for the battery back-up, the write protect option, and the SRAM memory type.

User EPROM/Flash EPROM Disk

The TEK-AT3 supports four 32-pin Lead PLCC's for user EPROM and/or **Intel Flash EPROMS, model 28F010, 128Kx8 or model 28F020, 256Kx8** via the TEK753 snap-on daughterboard (refer to the TEK753 assembly layout in the *Specifications* section). Sockets U1-4 accept the devices. The virtual disk utility automatically detects what type of device is

installed and how much memory is present.

Flash Installed
Jumper W1 on the TEK753 must be installed when Flash EPROM devices are present. **If EPROM devices are installed, remove jumper W1.**

User RAM Disk
U23 and U33 on the TEK-AT3 support 32Kx8, 128Kx8, 256Kx8 or 512Kx8 SRAM devices. The virtual disk utility automatically detects what type of device is installed and how much memory is present.

RAM Disk Memory Type

W6(A-B)	*32Kx8 or 128Kx8 SRAM devices*
W6(B-C)	*256Kx8 or 512Kx8 SRAM devices*

5-11-2 BATTERY BACK-UP
A 350maH lithium battery is installed on the TEK-AT3. If the TEK-AT3 is strapped to be powered by the battery backup, the RAMs will retain their information after a power down.

W1	*Open*	*NC*
W1	*Closed Vbatt*	

☞ **Removing jumper W1 will cause the set-up and real-time clock information to be lost.**

The TEK-AT3 comes with a 350 maH TL5186 TADIRAN battery with a shelf life of approximately 10 years (under "no load" conditions).

TEK-AT3 draws approximately 10µA typical. This means the battery will last 4 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 -55^0 to 75^0C and discharge characteristics vary with temperature.

6-1 CONFIGURATION JUMPERS(SW1)

The TEK-AT3 has an onboard BIOS extension which controls certain functions of the BIOS related to industrial applications. The extended BIOS reads the status of the jumpers (SW1) 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 SW1 will be set by the user as needed. The following lists the available modes:

SW1	
(1-2)	Boot From Flash Devices
(3-4)	Mono/color
(5-6)	Boot From VT100 Terminal
(7-8)	Activate Serial Download Mode

6-2 LOGICAL DISK CONFIGURATION

The TEK-AT3 can detect two semiconductor drives - A Flash EPROM disk drive and a battery-backed SRAM disk drive.

These drives are installed as follows:

If SW1(1-2) is installed (i.e. booting operating system from Flash EPROMs), then Drive A: is the Flash Disk (assuming a valid Flash Disk is placed in sockets U1-4 on TEK753 daughterboard). Drive B: is Floppy 1 (if installed) or the next available drive according to the following list of priorities:

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

Subsequent logical drives are installed following the above priority list.

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

Please refer to the *Physical Devices Table* for complete information.

☞ 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.

PHYSICAL DEVICES TABLE

PHYSICAL DEVICES INSTALLED & DRIVE ASSIGNMENTS						
CONFIGURATION AND PHYSICAL DEVICES INSTALLED	JUMPER OR NO JUMPER FLOPPY 0 FLOPPY 1 NO FLASH DISK	NO JUMPER FLOPPY 0 FLOPPY 1 FLASH DISK	JUMPER FLOPPY 0 OR NO FLOPPY 0 FLOPPY 1 FLASH DISK	NO JUMPER FLOPPY 0 FLASH DISK	JUMPER FLOPPY 1 FLASH DISK	JUMPER 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 U26 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".

6-3 VT100 OPERATION (SW1(5-6))

The TEK-AT3 utilizes a feature known as VT1OO MODE. This mode enables your single board computer 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.

6-3-1 REQUIREMENTS

To use VT100 Mode, the TEK-AT board must be supplied with +/-12 volts. This is the voltage required by the RS232 drivers.

The terminal you are using should emulate a VT1OO or ANSI terminal. Although this is not an absolute requirement, strange characters may appear on screen if it does not. This occurs because the VT1OO recognizes these control characters, and causes them to perform a specific function. For example, screen erase, cursor position,etc..

6-3-2 HARDWARE SETUP AND CONFIGURATION

Follow these steps to setup for VT1OO Mode:

- Install jumper SW1(5-6) to enable VT1OO Mode {note: VT1OO Mode runs on COM1 (3F8H)}.

- Setup the communications cable as shown in *Diagram 6.3A* {Note: If you do not require a full cable

for your terminal, you can setup a partial cable using only the TXD and RXD lines. The control lines can be ignored by looping them back as shown in *Diagram 6.3B*}.

- 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.**

6-3-3 RUNNING WITHOUT A TERMINAL

If you wish to disconnect the VT1OO terminal or if you decide to run without a terminal, you must ensure the control lines are in an active state. Failing this, the system may "hang" while waiting for the control lines to become active. Wiring the system according to *Diagram 6.3B* allows the lines to remain active.

Furthermore, you can run without any console at all simply by not enabling VT1OO mode and by not installing a video card.

DIAGRAM 6A

TEK AT
SINGLE
BOARD
COMPUTER
TXD
RXD
DTR
DSR
RTS
CTS
DCD
GND
3
2
4
6
7
8
1
5
COM 1
CONNECTOR
RXD
TXD
DSR
DTR
CTS
RTS
GND
VT100 TERMINAL
FULL SETUP WITH CONTROL LINES.

DIAGRAM 6B

TEK AT
SINGLE
BOARD
COMPUTER
TXD
RXD
GND
RTS
CTS
DSR
DCD
DTR
3
2
5
7
8
6
1
4
COM 1
CONNECTOR
RXD
TXD
GND
VT100 TERMINAL
PARTIAL SETUP WITHOUT CONTROL LINES.

6-3-4 DISK DRIVES AND SEMI CONDUCTOR DISKS

All disk drives and semi conductor disks operate identically in both regular and VT1OO mode, and all drive assignments remain the same.

Downloading software to Flash devices is done through XFLASH, Teknor's transfer utility software. Please refer to the XFLASH user's manual for details.

6-3-5 BAUD RATE RESTRICTIONS

The baud rate is re-initialized each time a call to INT 1OH (display to console) is made. This is due to some software programs, such as MS-DOS, changing the baud rate when loading.

6-4 GRAPHICS/STAND-ALONE (SW1(5-6))

The TEK-AT3 can operate without any video controller, keyboard or mechanical drives. The TEK-AT3 will automatically detect the presence of video, keyboard and mechanical drive devices and act accordingly. The TEK-AT3 can be used with the TEK-PG VGA card or any IBM compatible graphics controller card. Before starting the system, the user should also verify that the color monitor attached to the system can support the desired graphics mode.

TEK-AT3 BIOS SECTION 7

7-1 OVERVIEW AND FEATURES

The TEK-AT3 uses the *Quadtel* BIOS. This BIOS provides a software interface between the operating system and the hardware of the TEK-AT3 single board computer. The interface provided by the BIOS is 100% IBM AT compatible. That is, all functions accept the same inputs and provide the same results, although the program code itself is different.

7-2 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*

SPECIFICATIONS SECTION 8

8-1 DC CHARACTERISTICS

Supply Voltage	Vcc min.:	4.75V
	Vcc max.:	5.25V
		+12V
		-12V
Supply Current	Icc typ.:	1.5A[1]
	Ipp +12V	10ma
	Ipp -12V	5ma

8-2 ENVIRONMENTAL SPECIFICATIONS

Operating Temperature:

0^0C to 70^0C

-40^0C to +85^0C Available

Non-Condensing relative humidity:

5% to 95%

1. This current was measured with 4Mbytes of RAM.

8-3 MECHANICAL SPECIFICATIONS

8-4 ASSEMBLY

J1
J2
J3
J4
J5
J6
J7
J9
C1
C2
C11
C48
U1
U2
U3
U4
U5
U6
U7
U8
U9
U13
U14
U17
U18
U19
U20
U21
U22
U23
U24
U25
U26
U27
U28
U29
U30
U31
U32
U33
U34
U35
U36
U38
U40
XTA1
XTA2
XTA3
XTA4
XTA5
XTA6
P1
R35
Q1
Q2
Q3
R1
R2
R3
R4
R5
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R40
R41
R42
R43
R44
R45
R46

8-5 BLOCK DIAGRAM

8-6 CONNECTOR OVERVIEW

8-6-1 J5 POWER CONNECTOR

PIN NUMBER						PIN NUMBER
SIGNAL FLOW						SIGNAL FLOW
SIGNAL						SIGNAL
VCC		1		2		GND
GND		3		4		+12V
-12V		5		6		PD

8-6-2 J3 KEYBOARD CONNECTOR

PIN NUMBER						PIN NUMBER
SIGNAL FLOW						SIGNAL FLOW
SIGNAL						SIGNAL
KBDCLK		1		2		GND
KBDDATA		3		4		GND
VCC		5		6		VCC
SPKR		7		8		VCC
KBDINH		9		10		GND
AUTO*		11		12		GND
PBRES*		13		14		GND
ACT*		15		16		VCC

8-6-3 J7 PRINTER CONNECTOR

PIN NUMBER SIGNAL FLOW SIGNAL				PIN NUMBER SIGNAL FLOW SIGNAL		
STB*		1		14		AFD*
P0		2		15		ERR*
P1		3		16		INIT*
P2		4		17		SLIN*
P3		5		18		GND
P4		6		19		GND
P5		7		20		GND
P6		8		21		GND
P7		9		22		GND
ACK*		10		23		GND
BUSY		11		24		GND
PE		12		25		GND
SLCT		13				

8-6-4 J6 COM1 CONNECTOR

J6 (COM1)

PIN NUMBER						PIN NUMBER
SIGNAL FLOW						SIGNAL FLOW
SIGNAL						SIGNAL
DCD	IN	1		6	IN	DSR
RX	IN	2		7	OUT	RTS
TX	OUT	3		8	IN	CTS
DTR	OUT	4		9	IN	RI
GND	OUT	5				

8-6-5 J4 COM2 CONNECTOR RS232

J4 (COM2) RS232

PIN NUMBER						PIN NUMBER
SIGNAL FLOW						SIGNAL FLOW
SIGNAL						SIGNAL
DCD	IN	1		2	IN	DSR
RX	IN	3		4	OUT	RTS
TX	OUT	5		6	IN	CTS
DTR	OUT	7		8	IN	RI
GND		9				

8-6-6 J4 COM2 CONNECTOR RS485

J4 (COM2) RS485

PIN NUMBER						PIN NUMBER
SIGNAL FLOW						SIGNAL FLOW
SIGNAL						SIGNAL
RESERVED	IN	1		2	IN	NC
RXD(-)	I/O	3		4	OUT	RXD(+)
TXD(-)	OUT	5		6	IN	TXD(+)
NC	OUT	7		8	IN	NC
GND	IN	9				

LIMITED WARRANTY SECTION 9

TEKNOR MICROSYSTEMS INC. ("the seller") warrants its products to be free from defects in material and workmanship for a period of two (2) years commencing on the date of shipment. The liability of the seller shall be limited to replacing or repairing, at the seller's option, any defective units. Equipment or parts which have been subject to abuse, misuse, accident, alteration, neglect, or unauthorized repair are not covered by this warranty. This warranty is in lieu of all other warranties expressed or implied.

Returning Defective Merchandise

If your TEKNOR product malfunctions, please do the following before returning any merchandise:

1) Call our Technical Support Department at (514) 437-5682. Make certain you have the following at hand: the Teknor Invoice #, your Purchase Order #, and the Serial Number of the defective unit.

2) Give the serial number found on the back of the card and explain the nature of your problem to a service technician.

3) If the problem cannot be solved over the telephone the technician will further instruct you on the return procedure.

4) When returning goods, please include the name

and telephone number of a person whom we can contact for further explanations if necessary. **Where applicable, always include all duty papers and invoice(s) associated with the item(s) in question**.

5) Prior to returning any merchandise, make certain you receive an RMA # and clearly mark this number on the outside of the package you are returning.

6) When returning a TEKNOR card:
   i) Make certain that the card is packed in conductive foam pads or conductive plastic bags.
   ii) Place it in a rigid cardboard box.
   iii) Ship prepaid and insured to:

TEKNOR MICROSYSTEMS INC.
Service Department
31 de la Seigneurie E.
Suite 107
Blainville, Quebec
J7C 4G6 CANADA

GETTING HELP SECTION 10

Need More Help?
At Teknor, we take great pride in our customer's successes. We strongly believe in providing full

support at all stages of your product development.
If at any time you encounter difficulties with your application or with any of our products, or if you simply need guidance on system setups and capabilities, you may contact our Technical Services/Support Department at

Tel: (514) 437-5682
Fax: (514) 437-8053

If you have any questions about Teknor, our products and/or services, you may reach us at the above numbers or by writing to:

TEKNOR MICROSYSTEMS INC.
31 de la Seigneurie E.
Suite 107
Blainville, Quebec
J7C 4G6 CANADA

RECOMMENDED DEVICES

The following is a list of recommended devices for use on the TEK-AT3. Many other devices are also available and function equally well. Users are encouraged to check with their local memory distributors for comparable substitutes.

DRAM (U1-U4)
DRAM devices with page mode at 80ns maximum access time, or better, should be used. E.g.:

SIEMENS HYM910005 (1M x 9)<T>
TOSHIBA THM91000A5-80 (1M X 9)
HITACHI HB56A19B-8 (1M x 9)
OKI MSC2312A159-8A/80 (1M x 9)

SRAM (U27-U33)
Static RAM CMOS memory with low power consumption for battery backup (no Pseudo-Static) with access time of 200ns, or better. Must be in DIP package. E.g.:

SONY 58256P (32K x 8)
MITSUBISHI MH12808TNA-15 (128K x 8)
MITSUBISHI MH51208TNA-15 (512K x 8)

EDI 8M8 128/LP (128K x 8)
EDI 8F8257/LP (256k x8)
EDI 8F8512/LP (512K x 8)
or equivalents.

FLASH EPROM (U1-4)
Use Flash EPROM's with 200ns access time, or better. Must be in PLCC package. Use only:

INTEL or AMD 28F010 (128K x 8) FLASH EPROM
INTEL or AMD 28F020 (256K x 8) FLASH EPROM

INTERFACE CONNECTORS
The following connectors are recommended for interfacing with the TEK-AT4 I/O devices. The parts shown here do not have a strain relief but one may be added.

Connector	Recommended Mating Part
Hard Disk (J1)	Robinson Nugent IDS-C40PK-TG
	Amp 746286-9 (499252-1*)
	Thomas & Betts 609-1041
	(40-pin flat cable connector)

Floppy Disk (J2)	Robinson Nugent IDS-C34PK-TG Amp 746286-8 (499252-6*) Thomas & Betts 609-3441 (34-pin flat cable connector)
Keyboard (J3)	Robinson Nugent IDS-C16PK-TG Amp 746286-3 (499252-8*) Thomas & Betts 609-1641 (16-pin flat cable connector)
COM2 (J4)	Robinson Nugent IDS-C10PK-TG Amp 746286-1 (499252-5*) Thomas & Betts 609-1041 (10-pin flat cable connector)
Power Connector (J5)	Leoco 2530 S060013 (housing) Leoco 2533 TCB00A0 (pins) Molex 22-01-2065 (housing) Molex 08-50-114 (pins)
COM1 (J6)	Robinson Nugent IDD-C9SM-440-TG30 Amp 747318-4 (747275-4*) Thomas & Betts 609-09S Amphenol 841-17-DBFR-B9S (9-pin flat cable connector)
LPT1 (J7)	Robinson Nugent IDD-C25PM-440-TG30

	Amp 747321-2 (747275-2*) Thomas & Betts 609-25P Amphenol 841-17-DBFR-B25P (25-pin flat cable connector)
XT Header (J9)	Samtec ESQ131-12-G-D PCB-mount female connector

* *optional Amp strain relief part number shown in bracket*