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MZ-6SER Manual

PC/104 bus compatible ZFx86 SBC with six serial ports

Manufactured by
TRI-M ENGINEERING
Engineered Solutions for Embedded Applications

Technical Manual

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Warning

- **A working knowledge of electronics and PC-technology is required to use this product.**
- **Pay attention to electrostatic discharges. Use a CMOS protected workplace.**
- **Disconnect power source when connecting any cables or devices.**

This is a high-technology product.
A working knowledge of electronics and PC-technology is required!

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CHAPTER 1: GENERAL INFORMATION

1.1 General Description

The MZ-6SER is an embedded system controller measuring just 3.63 inches x 4.86 inches, which incorporates the revolutionary ZFx86™ "PC-on-a-chip" processor. The MZ-6SER offers the quickest route of integrating a full x86 AT-compatible computer into your embedded control application. In addition, the built-in peripherals minimize the number of additional modules required. By combining the system hardware, I/O, software, and solid-state mass storage, the MZ-6SER lowers your exposure to possible development risks, costs and significantly reduces your time-to-market.

The MZ-6SER's fully compatible PC/104 embedded expansion bus, permits easy integration to a wide selection of low-cost hardware peripherals. The numerous features provide an ideal price/performance solution.

1.2 Specifications

586 CPU

- 32-bit CPU core operating at 33Mhz to 128Mhz
- 8K byte Level 1 cache, write back and write through support
- Floating point unit

PC Core Logic with PCI enhancement

- 32 bit 33MHz PCI rev 2.1 compliant “Northbridge” and “Southbridge”
- AT-compatible DMA controllers, interrupt controllers, timer/counters
- AT keyboard controller and Real-time clock

Memory

- Synchronous DRAM support
- Up to 64Mb SDRAM soldered in place

Universal Serial Bus

- Two independent USB interface, USB 1.1 and OpenHCL compliant
- PCI bus master burst reads and writes
- Over current and power control support

Serial Ports

- Six 16550-compatible serial ports
- Six RS-232 with two ports convertible to RS-485
- Baud rates up to 115.2 K baud

Parallel Ports

- One enhanced bi-directional parallel port
- Supports SPP, ECP and EPP

Keyboard/Mouse Interface

- Supports AT keyboard and PS/2 mouse

Floppy interface

- Supports one floppy disk drive

IDE Hard Drive Interface

- One enhanced IDE channel, supports up to two drives (master/slave)
- PCI bus master burst reads and writes
- Ultra DMA and PIO modes (1-4) support

Power Management

- I/O traps and idle timers for peripheral power management
- Hardware and software CPU suspend mode support

Solid State Flash Storage

- Can be supplied with M-System 32Mbyte TSOP Millennium Plus DiskOnChip or Millennium DiskOnChip in byte wide socket.

Expansion Bus - ISA PC/104 signals

- Fully compliant with the PC/104 expansion bus

Mechanical/Environmental

- 3.63 inches x 4.86 inches
- Standard PC/104 16-bit stack through connector for PC/104-compliant modules
- Standard ribbon cable connectors for IDE, serial, and parallel
- Case temperature: -40 to +85°C
- Storage temperature: -67F to 185F (-55C to 85C)
- Weight: 70 grams

1.3 Embedded Features

Failsafe Boot ROM

- 12Kbyte BIOS update ROM (BUR) to allow flash BIOS install or upgrade
- Provides permanent and fail-safe mechanism to update software under all adverse conditions

Z-Tag Interface

- High speed interface to download S/W
- Uses floppy interface when “Drive Select” signal is inactive
- Communication protocol compatible with serial EEPROMs
- Z-tag programming tool allows easy field upgrade

Dual Watchdog Timer

- Software and hardware control of watch dog timer event
- 16 bit counter primary watch dog connected to WSIRQ/NMI/SMI, reset by WDT input
- Second 8 bit counter connected to H/W reset line, enabled by primary counter output

Software included

- Phoenix embedded PC BIOS

Software Compatibility

- Linux
- DOS
- Windows 9X/NT
- Most PC-Compatible RTOS

CHAPTER2: INSTALLATION

2.1 Locating the Connectors & Jumpers

Jumpers on the MZ-6SER are provided to configure the board for different functionality.

Table 1: Jumper List

Label	Function
JP1	CPU CLOCK MULTIPLIER & PCI CLOCK DIVIDE
JP2	BIOS WRITE ENABLE
JP3	WATCH DOG SOURCE
JP4	COMPACT FLASH MASTER/SLAVE SELECT
JP5	CPU OSCILLATOR SELECT
JP6	CORE VOLTAGE SELECT
JP7	RS232 COM5 & 6 ENABLE
JP8	RS485 HALF/FULL DUPLEX SELECT
JP9	MILLENIUM PLUS DOC WRITE ENABLE
JP10	BUR/BOOT ROM SELECT

Figure 1: Connector and Jumper Location MZ-6SER Top

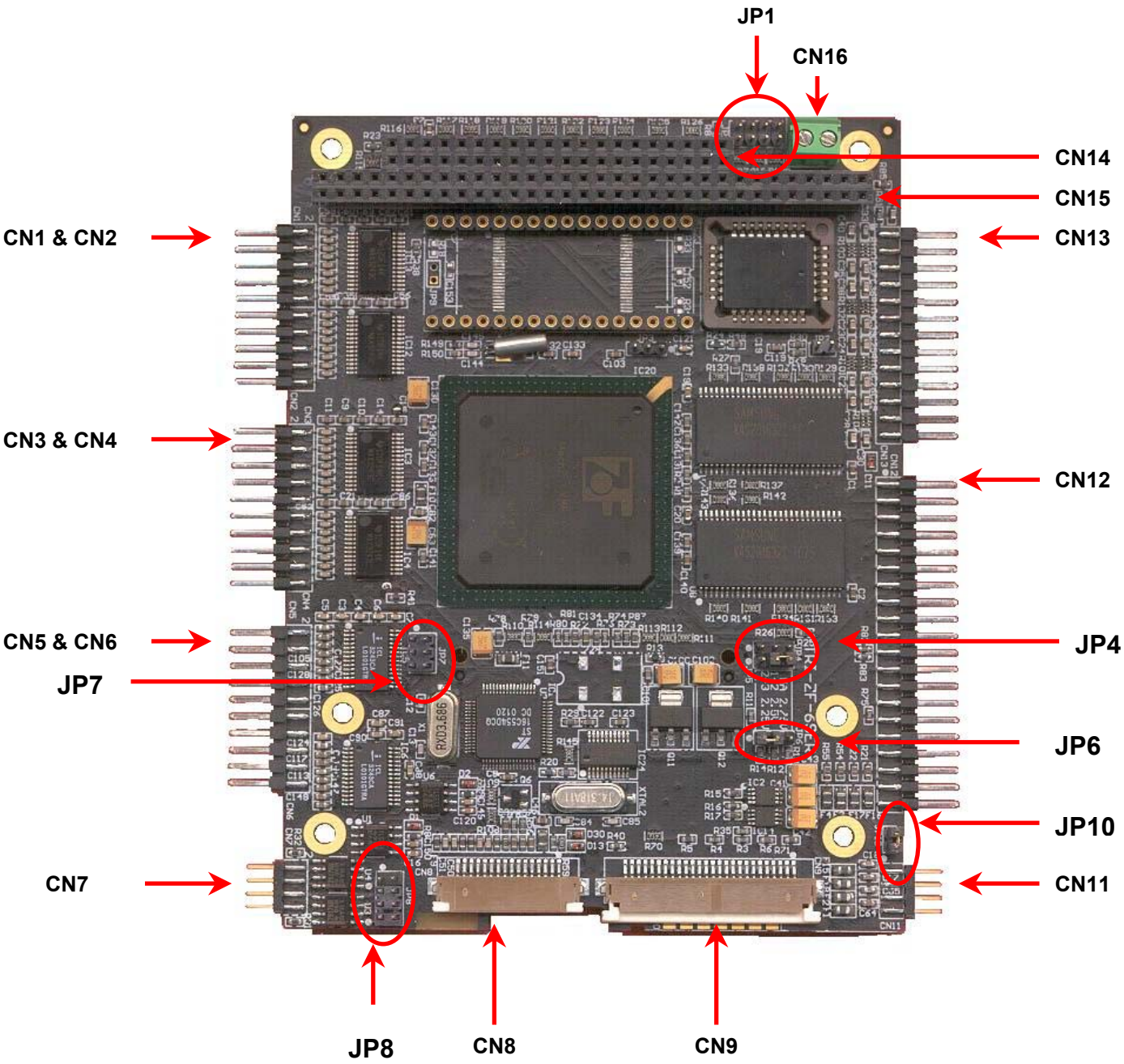
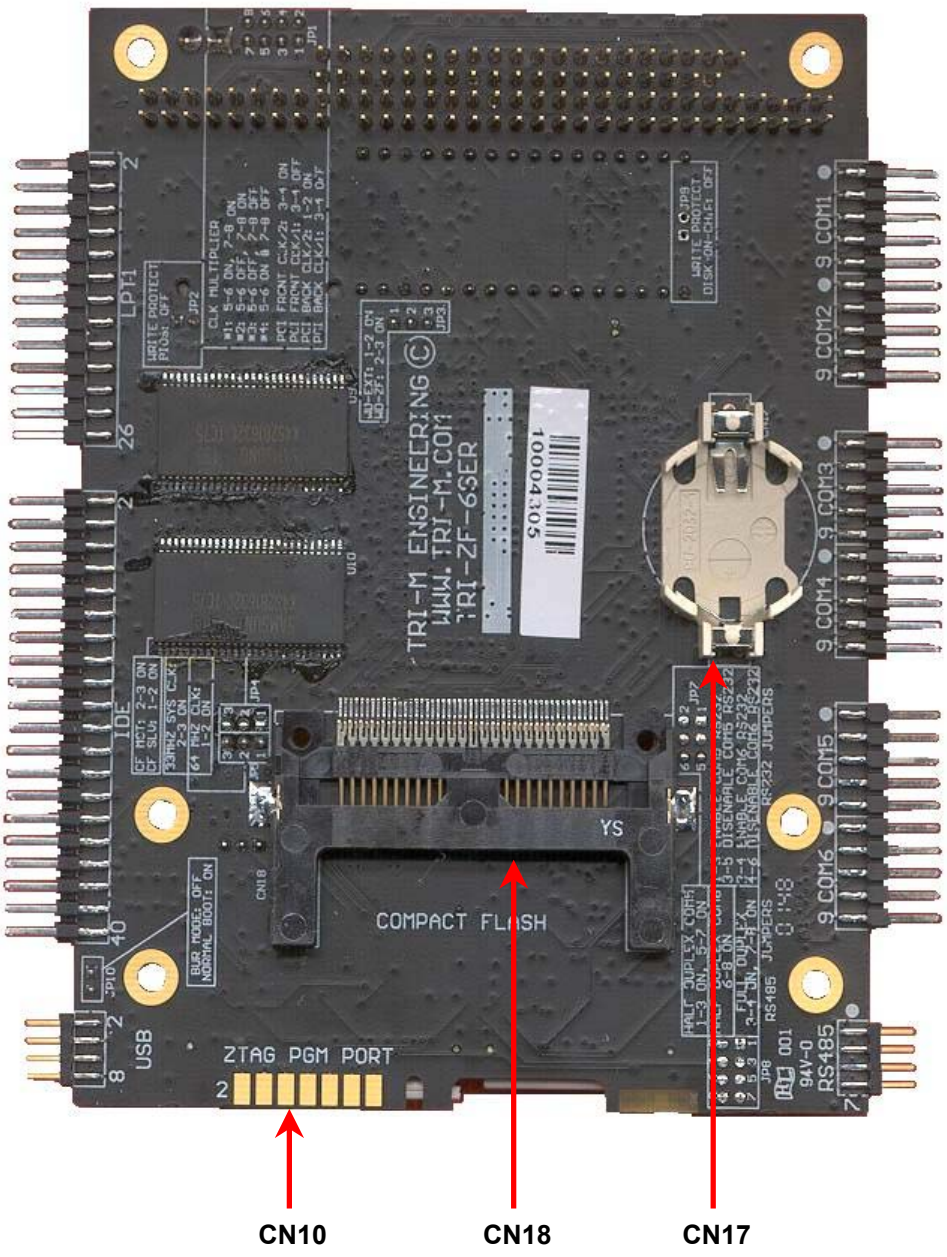


Figure 2: Connector Location MZ-6SER Bottom



CHAPTER 3: JUMPERS

3.1 Clock Multiplier select (JP1)

The clock multiplier selection jumper sets the clock frequency multiplier for the MZ-6SER core. Each setting will put the MZ-6SER core at a different operating speed.

The CPU operating speed is determined by the CPU clock (33MHz or 64MHz) multiplied by the CPU frequency ratio.

- Refer to section 3.6 for setting CPU clock
- For example, using 2X ratio, the CPU speed will be (2x64) = 128 MHz

Table 2: Clock Multiplier Select (JP1)

Jumper / CPU Freq ratio	JP1 [3-4]	JP1 [1-2]
1X	ON*	ON*
2X	OFF	ON
3X**	OFF	OFF
4X**	ON	OFF

*Factory default setting

**The maximum rated speed of the ZFx86 processor is 128MHz. Avoid using combinations of CPU Freq ratio and Oscillator frequency that results in over clocking the ZFx86. Over clocking will void the warranty.

3.2 PCI Clock Divider (JP1)

When the CPU oscillator is set for 33 MHz, set the PCI dividers for divide-by-one for proper operation. When the CPU oscillator is set for 64 MHz, set the PCI Clock dividers for divide-by-two operation.

- Refer to section 3.6 for setting CPU clock

Table 3: PCI Clock Divider (JP1)

Function description	Front side PCI divider	Back side PCI divider
	JP1 [5-6]	JP1 [7-8]
Divide by one	Off	Off
Divide by two	On*	On*

*Factory default setting

3.3 Write Enable Jumper for Bios Flash (JP2)

Install jumper shunt on JP2 to enable writing to the Bios Flash chip. The Bios chip is a 512Kbyte device with the Bios located at 40000H to 7FFFFH. Locations from 0 to 3FFFFH are available for the customers use.

- Remove the jumper shunt on JP2 to write protect the Bios Flash. This will allow read only accesses.

3.4 Watchdog Timer (JP3)

The MZ-6SER has two watchdog timers, WD1 and WD2. Both timers are programmable. WD1 counter expires in 2 seconds and WD2 in 7ms. WD2 starts counting down after WD1 expires. When WD2 counter reaches zero, it will unconditionally cause a system reset.

The watchdog timer alarms if not triggered by the system or application at least once every 2 seconds. If the watchdog timer does not receive a reset “tickle” when 2 seconds has elapsed, it generates an alarm signal. The watchdog timer alarm is reset “tickled” by toggling the WDI signal or writing to index 0x10h of the ZF-Logic I/O space. The watchdog is triggered continuously (disabled) if jumper shunt JP3 [2-3] is installed. This arrangement allows watchdog input (WDI) to be toggled by the watchdog alarm output (WDO) in a self-triggering fashion. If a jumper shunt JP3 [1-2] is installed, the watchdog will be triggered by an external signal or event from pin5 of CN8.

The watchdog timer alarm signal (WDO) can be programmed to generate the following response when the corresponding bit is set at the watchdog control register in the ZF-Logic I/O space.

- Non-maskable interrupt (NMI)

- System controller interrupt (SCI)
- System Management interrupt (SMI)
- Hardware reset

Table 4: Watchdog Jumper (CN16)

Function	Jumper Position
External source to reset watchdog	**1-2**
Disable watchdog	**2-3**

Note: The watchdog timer is not enabled at power up by the BIOS. Therefore, the position of the jumper at CN16 does not affect the operation of the MZ-6SER.

3.5 Master /Slave Mode Select (JP4)

JP4 configures the compact flash device inserted into CN18 either as a master or slave IDE device.

Table 5: Master/Slave Mode Select (JP4)

Mode	JP4
Master	Off*
Slave	On

*Factory default setting

3.6 CPU Clock Oscillator Select (JP5)

The CPU clock oscillator can be set for 33 MHz or 64 MHz operation. Selecting the 33MHz oscillator and setting the clock multiplier to 1X will offer the lowest power consumption, while setting the CPU clock oscillator to 64 MHz and the clock multiplier to 2X will offer the greatest processing capability.

Table 6: CPU Clock select (JP5)

Oscillator Frequency	**JP5**
33 MHz	JP5 [2-3] shunt On
64 MHz	JP5 [1-2] shunt On*

*Factory default setting
**The MZ-6SER will not function without a shunt installed on JP5

3.7 CPU Core Voltage Select (JP6)

At a CPU speed of 128 MHz, the core voltage must be set for 2.75 volts. At frequencies below 128 MHz, the core voltage should be lowered to conserve power, and to reduce the dissipated heat. Jumper JP6 allows for three possible core voltages of 2.75 volts, 2.5 volts and 2.25 volts.

Table 7: CPU Core Voltage Select (JP6)

Core Voltage	JP6
2.25 volts	JP6 [2-3] shunt On
2.5 volts	JP6 [1-2] shunt On*
2.75 volts	No shunt installed

*Factory default setting

3.8 Enable RS232 Drivers for Serial 5 and Serial 6 Port (JP7)

When using serial five in half duplex RS485 mode, the serial five RS232 driver must be disabled. When using serial six for half or full duplex RS485 mode, the serial six RS232 driver must be disabled.

Table 8: Serial 5 and 6 RS232 Driver Disable (JP7)

	Serial 5 RS232 Driver	Serial 6 RS232 Driver
Driver Enable	JP7 [1-3]*	JP7 [2-4]*
Driver Disable	JP7 [3-5]	JP7 [4-6]

*Factory default setting

3.9 RS485 Half/Full Duplex Mode Select (JP8)

Jumper JP8 routes the RS485 signals to setup half or full duplex operation. When half duplex operation is setup, communication for the RS485 port five is routed to serial ports five, and communication for the RS485 ports six is routed to serial port six. When full duplex mode is selected the RS485 receive signal is routed to the RS485 port six.

Table 9: Half/Full Duplex Routing (JP8)

	Installed Jumpers
Half Duplex	JP8 [1-3] [5-7] [6-8]
Full Duplex	JP8 [3-4] [7-8]

3.10 M-Systems Millennium Plus Disk-On-Chip Write Enable (JP9) - (Only for the MZ-6SER-MP version)

Install jumper shunt on JP9 to enable writing to the Millennium Plus. The Millennium Plus chip is a 32Mbyte solid-state disk. Please refer to the M-Systems manual on the Millennium Plus for setup, configuration and programming.

Remove the jumper shunt on JP9 to write protect the Millennium Plus. This will allow read only accesses.

3.11 BUR/Boot ROM Select (JP10)

JP10 allows the MZ-6SER to boot from standard BIOS or BUR. If boot ROM mode is selected, the MZ-6SER will startup normally by executing the BIOS code and transfer control to a boot device. If BUR mode is selected, the MZ-6SER will execute the BUR code to update the flash BIOS using the Z-Tag interface. It also provides an elementary debugger console functionality through COM1. For details of Z-Tag and BUR operation, see the MachZ data book.

Table 10: Bur/Boot Rom Select (JP10)

BUR/BOOT select	BUR Mode	Boot ROM
JP10	OFF	ON*

*Factory setting

CHAPTER 4: CONNECTORS

Connectors on the MZ-6SER are provided to interface to external devices such as hard disk drives, floppy drives and keyboards. Pin 1 of each connector on the MZ-6SER should line up with Pin 1 of the corresponding mating connector on the cable.

Table 11: MZ-6SER Connector List

Connector	Function
CN1 & 2	RS232 COM1 & 2 connector
CN3 & 4	RS232 COM 3 & 4 connector
CN5 & 6	RS232 COM 5 & 6 connector
CN7	RS485 COM5 & 6
CN8	Utility (keyboard, mouse, speaker)
CN9	Floppy interface connector
CN10	Z-Tag interface
CN11	USB 1 &2 connector
CN12	IDE interface connector
CN13	Parallel connector
CN14	PC 104 connector (40 pin)
CN15	PC 104 connector (64 pin)
CN16	Main power input connector
CN17	CMOS backup battery holder
CN18	Compact flash connector

Note: Pin-1 of each connector on the MZ-6SER *is designated by a small white dot on the PCB. Pin-1 on the connector should line up with pin-1 of the corresponding mating connector on the cable.*

4.1 Serial Interfaces (CN1 to CN6)

The MZ-6SER provides six PC-compatible asynchronous serial ports. All six serial ports have RS232 drivers. Serial port five and serial port six are jumper configurable as half duplex RS485 ports. Serial port six can be configured as a full duplex RS485 (with serial port five in RS232 mode only). Serial RS232 ports connectors are grouped in sets of two. That is, Serial 1 (CN1) and Serial 2 (CN2) connectors are adjacent to each other creating a 10 pin by 2 pin header. Similarly, serial 3 (CN3) and serial 4 (CN4) are adjacent, and serial 5 (CN5) and serial 6 (CN6) are adjacent. RS485 signals are available on connector CN7.

All six serial ports supply full complements of input and output handshaking lines. These signals are at standard RS232C levels. The RS232C level converters provide the required RS232C voltage levels with internal +5 volt to ±9 volt converters. The serial port drivers have

an automatic power down mode that turns off the driver outputs. This occurs whenever there isn't a valid signal level on any of the receive pins on the driver chip.

Serial port one and Serial port two can be disabled using BIOS SETUP. The IOCS (I/O chip select) signals the quad UART uses for Serial ports 3 to 6 can be disabled through the BIOS SETUP. When disabled, the port's I/O address is made available for other expansion devices on the 16-bit BUS.

Table 12: Serial Port Resources

Serial Port	Typical Usage	I/O Address	Standard Interrupt
Serial 1 (CN1)	COM1	3F8h–3FFh	IRQ4
Serial 2 (CN2)	COM2	2F8h–2FFh	IRQ3
Serial 3 (CN3)	COM3	3E8h–3EFh	IRQ5
Serial 4 (CN4)	COM4	2E8h–2EFh	IRQ10
Serial 5 (CN5)	COM5	2E0h–2E8h	IRQ11
Serial 6 (CN6)	COM6	2F0h–2F8h	IRQ15

Table 13: RS232 Serial Ports Com1 (CN1) and Com2 (CN2)

Serial Port COM1 Connector (CN1)									
CN1	DB-9 Pin 1	**Signal**	**Function**	**In/Out**	**CN1**	DB-9 Pin 1	**Signal**	**Function**	**In/Out**
1	1	DCD1	Serial 1 Data Carrier Detect	INPUT	**2**	6	DSR1	Serial 1 Data Set Ready	INPUT
3	2	RXD1	Serial 1 Receive Data	INPUT	**4**	7	RTS1	Serial 1 Request To Send	OUTPUT
5	3	TXD1	Serial 1 Transmit Data	OUTPUT	**6**	8	CTS1	Serial 1 Clear To Send	INPUT
7	4	DTR1	Serial 1 Data Terminal Ready	OUTPUT	**8**	9	RI1	Serial 1 Ring Indicator	INPUT
9	5	GND	Signal Ground		**10**		N/C	No connection	
Serial Port COM2 Connector (CN2)									
CN2	DB-9 Pin 1	**Signal**	**Function**	**In/Out**	**CN2**	DB-9 Pin 1	**Signal**	**Function**	**In/Out**
1	1	DCD2	Serial 2 Data Carrier Detect	INPUT	**2**	6	DSR2	Serial 2 Data Set Ready	INPUT
3	2	RXD2	Serial 2 Receive Data	INPUT	**4**	7	RTS2	Serial 2 Request To Send	OUTPUT
5	3	TXD2	Serial 2 Transmit Data	OUTPUT	**6**	8	CTS2	Serial 2 Clear To Send	INPUT
7	4	DTR2	Serial 2 Data Terminal Ready	OUTPUT	**8**	9	RI2	Serial 2 Ring Indicator	INPUT
9	5	GND	Signal Ground		**10**		N/C	No connection	

Table 14: RS232 Serial Ports Com3 (CN3) and Com4 (CN4)

Serial Port COM3 Connector (CN3)									
CN3	DB-9 Pin[1]	**Signal**	**Function**	**In/Out**	**CN3**	DB-9 Pin[1]	**Signal**	**Function**	**In/Out**
1	1	DCD3	Serial 3 Data Carrier Detect	INPUT	**2**	6	DSR3	Serial 3 Data Set Ready	INPUT
3	2	RXD3	Serial 3 Receive Data	INPUT	**4**	7	RTS3	Serial 3 Request To Send	OUTPUT
5	3	TXD3	Serial 3 Transmit Data	OUTPUT	**6**	8	CTS3	Serial 3 Clear To Send	INPUT
7	4	DTR3	Serial 3 Data Terminal Ready	OUTPUT	**8**	9	RI3	Serial 3 Ring Indicator	INPUT
9	5	GND	Signal Ground		**10**		N/C	No connection	
Serial Port COM4 Connector (CN4)									
CN4	DB-9 Pin[1]	**Signal**	**Function**	**In/Out**	**CN4**	DB-9 Pin[1]	**Signal**	**Function**	**In/Out**
1	1	DCD4	Serial 4 Data Carrier Detect	INPUT	**2**	6	DSR4	Serial 4 Data Set Ready	INPUT
3	2	RXD4	Serial 4 Receive Data	INPUT	**4**	7	RTS4	Serial 4 Request To Send	OUTPUT
5	3	TXD4	Serial 4 Transmit Data	OUTPUT	**6**	8	CTS4	Serial 4 Clear To Send	INPUT
7	4	DTR4	Serial 4 Data Terminal Ready	OUTPUT	**8**	9	RI4	Serial 4 Ring Indicator	INPUT
9	5	GND	Signal Ground		**10**		N/C	No connection	

Table 15: RS232 Serial Ports Com5 (CN5) and Com6 (CN6)

Serial Port COM5 Connector (CN5)									
CN5	DB-9 Pin[1]	**Signal**	**Function**	**In/Out**	**CN5**	DB-9 Pin[1]	**Signal**	**Function**	**In/Out**
1	1	DCD5	Serial 5 Data Carrier Detect	INPUT	**2**	6	DSR5	Serial 5 Data Set Ready	INPUT
3	2	RXD5	Serial 5 Receive Data	INPUT	**4**	7	RTS5	Serial 5 Request To Send	OUTPUT
5	3	TXD5	Serial 5 Transmit Data	OUTPUT	**6**	8	CTS5	Serial 5 Clear To Send	INPUT
7	4	DTR5	Serial 5 Data Terminal Ready	OUTPUT	**8**	9	RI5	Serial 5 Ring Indicator	INPUT
9	5	GND	Signal Ground		**10**		N/C	No connection	
Serial Port COM6 Connector (CN6)									
CN6	DB-9 Pin[1]	**Signal**	**Function**	**In/Out**	**CN6**	DB-9 Pin[1]	**Signal**	**Function**	**In/Out**
1	1	DCD6	Serial 6Data Carrier Detect	INPUT	**2**	6	DSR6	Serial 6 Data Set Ready	INPUT
3	2	RXD6	Serial 6 Receive Data	INPUT	**4**	7	RTS6	Serial 6 Request To Send	OUTPUT
5	3	TXD6	Serial 6 Transmit Data	OUTPUT	**6**	8	CTS6	Serial 6 Clear To Send	INPUT
7	4	DTR6	Serial 6 Data Terminal Ready	OUTPUT	**8**	9	RI6	Serial 6 Ring Indicator	INPUT
9	5	GND	Signal Ground		**10**		N/C	No connection	

[1]References to DB-9 connectors are for cross-reference only since they are not present on the MZ-6SER but only at the end of an attached cable. The connector description of DB-9 is used in this manual for clarity even though the correct technical term is DE-9. The second letter of DE-9 designates the shell size (per EIA standard). However, the majority of the world recognizes the description of DB-9 and not DE-9.

[2]CN1 to CN6 are edge mounted PCB connectors with even number pins located on the “top”, and odd number pins on the “bottom”.

Table 16: RS485 Serial Connector (CN7) for Half Duplex Mode

Pin#	Signal	Function	Input/Output
1	TR1A	100 ohm termination resistor 1	N/A
2	TR1B	100 ohm termination resistor 1	N/A
3	CMD6+	Serial 6 RS-422 Data +	Input/Output
4	CMD6-	Serial 6 RS-422 Data -	Input/Output
5	TR2A	100 ohm termination resistor 2	N/A
6	TR2B	100 ohm termination resistor 2	N/A
7	CMD5+	Serial 5 RS-422 Data +	Input/Output
8	CMD5-	Serial 5 RS-422 Data -	Input/Output

Table 17: RS485 Serial Connector (CN7) for Full Duplex Mode

Pin#	Signal	Function	Input/Output
1	TR1A	100 ohm termination resistor 1	N/A
2	TR1B	100 ohm termination resistor 1	N/A
3	CMD6+	Serial 6 RS-422 Transmit Data +	Output
4	CMD6-	Serial 6 RS-422 Transmit Data -	Output
5	TR2A	100 ohm termination resistor 2	N/A
6	TR2B	100 ohm termination resistor 2	N/A
7	CMD6+	Serial 6 RS-422 Receive Data +	Input
8	CMD6-	Serial 6 RS-422 Receive Data -	Input

[2]CN7 is edge mounted PCB connectors with even number pins located on the “top”, and odd number pins on the “bottom”.

4.2 Utility Connector (CN8)

The following inputs and outputs on are provided on a flat ribbon connector:

- Keyboard input
- PS/2 mouse input
- Infrared I/O
- Speaker Out
- SMBus/I2C
- RTC & CMOS backup battery
- Watchdog trigger source
- Hardware reset
- Hard drive LED

The MZ104+UTIL card supports the flat ribbon cable from the MZ-6SER card. This provides an easy and quick method to connect to the external "utility" devices to the MZ-6SER.

Table 18: Utility connector (CN8)

Pin	Signal	Function
1	HDDLEDOUT	Hard drive LED output (8mA source)
2	RESETX	Hardware reset
3	IRRXD	Infrared receive
4	IRTXD	Infrared Transmit
5	WD_EXT	External Trigger Source for watchdog timer
6	VBAT_CLK	RTC backup battery +V terminal (3.6V)
7	SDA	SMBus data
8	KBMPWR	+5V
9	GND	Ground
10	SCL	SMBus clock
11	SPKOUT	Speaker output
12	KBLOCKX	Keyboard lock
13	MCLKX	P/S2 mouse clock
14	MDATX	P/S2 mouse data
15	KBCLKX	Keyboard clock
16	KBDATX	Keyboard data

4.3 Floppy Interface (CN9)

The floppy interface uses a flat ribbon cable connector to provide the signals to control one 3½“ or 5¼” floppy drive. The default interrupt request for the floppy interface is IRQ6.

Table 19: Floppy Interface (CN9)

Pin	Signal	Function	Pin	Signal	Function
1	VCC5V	+5V	**2**	INDX	Index
3	VCC5V	+5V	**4**	DRX0	Drive select 0
5	VCC5V	+5V	**6**	DSKCHGX	Disk Change
7	NC	-	**8**	NC	-
9	NC	-	**10**	MTRXO	Motor On
11	NC	-	**12**	DIRX	Direction Select
13	NC	-	**14**	STEPX	Step
15	GND	Ground	**16**	WDATAX	Write data
17	GND	Ground	**18**	WGATEX	Write gate
19	GND	Ground	**20**	TRKX0	Track 00
21	GND	Ground	**22**	WPX	Write Protect
23	GND	Ground	**24**	RDATAX	Read data
25	GND	Ground	**26**	HDSELX	Side one select

4.4 Z-Tag connector (CN10)

The Z-Tag connector (CN10) is a 14-pin edge connector that interfaces with the Z-Tag Dongle allowing for easy field flash updates or user code execution. Please refer to the Z-Tag and BUR chapter of the ZFx86 Data Book for complete details. A *Z-Tag Manager* utility program and manual are provided on the MZ104+ Quickstart CD and are available for download at www.ZFMicro.com. The Z-Tag Dongle, part number ZFx86DONGLE-1, is available from Tri-M Systems.

4.5 USB 1,2 Connector (CN11)

The MZ-6SER provides two USB (Universal Serial BUS) interfaces, which give complete plug and play, for external devices.

Table 20: USB 1,2 Connector (CN11)

Pin	Signal	Pin	Signal
1	USBVCC2	2	USBD2F-
3	USBD2F+	4	GND
5	USBVCC1	6	USBD1F-
7	USBD1F+	8	GND

[1]CN11 is an edge mounted PCB connector with odd number pins located on the “top”, and even number pins on the “bottom”.

4.6 IDE Interface (CN12)

The MZ-6SER has a PCI bus mastering ATA-4 compatible IDE controller. The IDE controller supports Ultra DMA, Multi-word DMA, and all Programmed I/O (PIO) modes. Up to two drives can be connected, in a master-slave arrangement. Generally, the first hard disk drive (master) will appear as C drive. The second drive, if attached, will appear as D.

Table 21: Hard Disk Resources

Resource	Function
I/O Address (1F0h-1F7h)	Hard Disk Interface
IRQ14	Interrupt

Use SETUP to auto-detect your attached hard drives. For further details about setting up IDE hard disk parameters See the SETUP description in the BIOS manual provided on the MZ104 Quickstart CD or available for download at www.ZFMicro.com.

Table 22: IDE Drive Interface (CN12)

Pin	Signal Name	Function	In/Out	Pin	Signal Name	Function	In/Out
1	RESET	Reset signal from host	OUT	2	GND	Ground	GND
3	DD7	Data bit 7	I/O	4	DD8	Data bit 8	I/O
5	DD6	Data bit 6	I/O	6	DD9	Data bit 9	I/O
7	DD5	Data bit 5	I/O	8	DD10	Data bit 10	I/O
9	DD4	Data bit 4	I/O	10	DD11	Data bit 11	I/O
11	DD3	Data bit 3	I/O	12	DD12	Data bit 12	I/O
13	DD2	Data bit 2	I/O	14	DD13	Data bit 13	I/O
15	DD1	Data bit 1	I/O	16	DD14	Data bit 14	I/O
17	DD0	Data bit 0	I/O	18	DD15	Data bit 15	I/O
19	GND	Ground	GND	20	KEY	Keyed pin	N/C
21	DREQ	DMA 0 Request	OUT	22	GND	Ground	GND
23	DIOW	Write strobe	OUT	24	GND	Ground	GND
25	DIOR	Read strobe	OUT	26	GND	Ground	GND
27	IORDY	I/O channel ready	IN	28	GND	Ground	OUT
29	IDEPDACK	DMA 0 Acknowledge	IN	30	GND	Ground	GND
31	IRQ14	Drive interrupt request	IN	32	IOCS16	I/O Chip Select 16	In
33	DA1	IDE Address 1	Out	34	RSVD	Reserved	N/C
35	DA0	IDE Address 1	Out	36	DA2	IDE Address 2	Out
37	HDCS0	IDE Chip Select 0	Out	38	HDCS1	IDE Chip Select 1	Out
39	HDDLED	Drive Activity	Out	40	GND	Ground	GND
41	VCC5V	+5V	+5V	42	VCC5V	+5V	+5V
43	GND	Ground	GND	44	NC	-	NC

[1]CN12 is an edge mounted PCB connector with odd number pins located on the “top”, and even number pins on the “bottom”.

4.7 Parallel (CN13)

The MZ-6SER parallel port is fully compatible with the PC/AT parallel port. In the extended mode, it functions as a PS/2-like bi-directional port. In Extended Capabilities Port (ECP) mode, it is IEEE 1284 compliant, including level 2.

The parallel ports uses the following PC resources when enabled:

Table 23: Parallel Port Resources

Parallel Port	Typical Usage	I/O Address	Standard Interrupt
Parallel 1	LPT1	378H – 37Fh	IRQ7

The default interrupt for parallel port LPT1 is IRQ7. The parallel port output signals provide up to 14-mA drive current. RC filters are provided for noise suppression. The parallel port signals appear on CN13, a dual-row ribbon-cable pin edge connector. The port may be cabled to appear on a standard PC DB-25 connector. A DB-25 connector and cable are provided for this purpose in the optional MZ-6SER cable kit. The following table shows the parallel port signals appearing on CN13 and the equivalent pin out on a DB-25 connector.

Table 24: Parallel Port Connections (CN13)

CN13	DB-25 Pin[1]	Signal	Function	In/Out	CN13	DB-25 Pin[1]	Signal	Function	In/Out
1	1	STRB-	Output data strobe	OUT	**2**	14	AUTOFD-	Auto feed	OUT
3	2	PD0	Data bit 0	I/O	**4**	15	ERR-	Printer error	IN
5	3	PD1	Data bit 1	I/O	**6**	16	INIT-	Initialize printer	OUT
7	4	PD2	Data bit 2	I/O	**8**	17	SLCTIN-	Selects printer	OUT
9	5	PD3	Data bit 3	I/O	**10**	18	GND	Signal Ground	N/A
11	6	PD4	Data bit 4	I/O	**12**	19	GND	Signal Ground	N/A
13	7	PD5	Data bit 5	I/O	**14**	20	GND	Signal Ground	N/A
15	8	PD6	Data bit 6	I/O	**16**	21	GND	Signal Ground	N/A
17	9	PD7	Data bit 7	I/O	**18**	22	GND	Signal Ground	N/A
19	10	ACK-	Character acknowledged	IN	**20**	23	GND	Signal Ground	N/A
21	11	BUSY	Printer busy	IN	**22**	24	GND	Signal Ground	N/A
23	12	PE	Out of paper	IN	**24**	25	GND	Signal Ground	N/A
25	13	SLCT	Printer selected	IN	**26**	N/A	GND	Signal Ground	N/A

[1]References to DB-9 connectors are for cross-reference only since they are not present on the MZ-6SER but only at the end of an attached cable.
[2]CN13 is an edge mounted PCB connector with odd number pins located on the “top”, and even number pins on the “bottom”.

4.8 PC/104 connectors (CN14, AND CN15)

CN14 and CN15 allow PC/104 expansion modules to be added the MZ-6SER. All data, address and control signals are able to sink 10mA and source 8mA.

Table 25: PC/104 8bit Connector (CN14)

Pin #	Signal	Pin #	Signal
A1	IOCHK	**B1**	GND
A2	SD7	**B2**	RSTDRV
A3	SD6	**B3**	+5V
A4	SD5	**B4**	IRQ9
A5	SD4	**B5**	N/A
A6	SD3	**B6**	N/A
A7	SD2	**B7**	-12V
A8	SD1	**B8**	ZEROWS
A9	SD0	**B9**	+12V
A10	IOCHRDY	**B10**	KEY
A11	AEN	**B11**	SMEMW
A12	SA19	**B12**	SMEMR
A13	SA18	**B13**	IOW
A14	SA17	**B14**	IOR
A15	SA16	**B15**	N/A
A16	SA15	**B16**	N/A
A17	SA14	**B17**	DACK1
A18	SA13	**B18**	DRQ1
A19	SA12	**B19**	REFRESH
A20	SA11	**B20**	CLK8MHZ
A21	SA10	**B21**	IRQ7
A22	SA9	**B22**	N/A
A23	SA8	**B23**	IRQ5
A24	SA7	**B24**	IRQ4
A25	SA6	**B25**	IRQ3
A26	SA5	**B26**	N/A
A27	SA4	**B27**	TC
A28	SA3	**B28**	BALE
A29	SA2	**B29**	+5V
A30	SA1	**B30**	CLK14MHZ
A31	SA0	**B31**	GND
A32	GND	**B32**	GND

Table 26: PC/104 16bit Connector (CN15)

Pin #	Signal	Pin #	Signal
C0	GND	**D0**	GND
C1	SBHEX	**D1**	MCS16
C2	SA23	**D2**	IOCS16
C3	SA22	**D3**	IRQ10
C4	SA21	**D4**	IRQ11
C5	SA20	**D5**	IRQ12
C6	SA19	**D6**	IRQ15
C7	SA18	**D7**	N/A
C8	SA17	**D8**	N/A
C9	MEMR	**D9**	N/A
C10	MEMW	**D10**	DACK5
C11	SD8	**D11**	DRQ5
C12	SD9	**D12**	N/A
C13	SD10	**D13**	N/A
C14	SD11	**D14**	N/A
C15	SD12	**D15**	N/A
C16	SD13	**D16**	+5V
C17	SD14	**D17**	MASTER
C18	SD15	**D18**	GND
C19	KEY	**D19**	GND

4.9 External Power (CN16)

The MZ-6SER can be powered by supplying 5VDC and common to CN4. Alternatively, the MZ-6SER can be powered by supplying 5VDC through the 16-bit PC104 connector (CN14 & CN15) with a PC/104 power supply such as the Tri-M Engineering HE104 or HESC-104.

Table 27: External Power Connector (CN16)

Pin Number	Signal
1	VCC +5VDC
2	GND

4.10 CMOS & RTC Battery Holder (CN17)

A lithium battery, model CR2032 is used to maintain the RTC (real time clock) operation when +5VDC main power is removed. The battery can be inserted into battery holder CN17 or it can be connected to the utility connector CN8.

4.11 Compact Flash Connector (CN18)

Table 28: Compact Flash Connector (CN18)

Pin	Signal	Pin Type	Pin	Signal	Pin Type
1	GND	N/A	**2**	D03	I/O
3	D04	I/O	**4**	D05	I/O
5	D06	I/O	**6**	D07	I/O
7	-CS0	Input	**8**	A10	Input
9	-ATA SEL	Input	**10**	A09	Input
11	A08	Input	**12**	A07	Input
13	Vcc	N/A	**14**	A06	Input
15	A05	Input	**16**	A04	Input
17	A03	Input	**18**	A02	Input
19	A01	Input	**20**	A00	Input
21	D00	I/O	**22**	D01	I/O
23	D02	I/O	**24**	-IOCS16	Output
25	-CD2	Output	**26**	-CD1	Output
27	D11	I/O	**28**	D12	I/O
29	D13	I/O	**30**	D14	I/O
31	D15	I/O	**32**	-CS1	Input
33	-VS1	N/A	**34**	-IORD	Input
35	-IOWR	Input	**36**	-WE	Input
37	INTRQ	Output	**38**	Vcc	N/A
39	-CSEL	Input	**40**	-VS2	N/A
41	-RESET	Input	**42**	IORDY	Output
43	-INPACK	Output	**44**	-REG	Input
45	-DASP	I/O	**46**	-PDIAG	I/O
47	D08	I/O	**48**	D09	I/O
49	D10	I/O	**50**	GND	N/A

4.12 Interrupt and I/O Port assignments

Table 29: IRQ Interrupt

IRQ Number	MZ-6SER Assignment
0	Systems timer (not available for other devices)
1	Keyboard controller (not available for other devices)
2	Second PIC cascade (not available for other devices)
3	Serial port two (COM2:)
4	Serial port one (COM1:)
5	Serial port three
6	Floppy disk controller (not available for other devices)
7	Parallel (printer) port one (LPT1:)
8	Real-time clock (RTC)
9	Unassigned
10	Serial port four
11	USB / Serial port five
12	PS/2 Mouse
13	Math coprocessor
14	Primary IDE
15	Secondary IDE / Serial port six

Table 30: I/O Port

I/O Address	Hardware
0000 - 000F	DMA Controller
0020 - 0021	PIC
0022 - 0021	Motherboard Resources
0040 - 0043	System Timer
0060 - 0060	Keyboard
0061 - 0061	Systems Speaker
0064 - 0064	Keyboard
0070 - 0071	System CMOS / Real time clock
0081 - 008F	DMA Controller
0092 - 0092	Motherboard Resources
00A0 - 00A1	PIC
00C0 - 00DF	DMA Controller
00F0 - 00FF	Numeric Data Processor
02E0 – 02E7	Serial Port 5
02E8 – 02EF	Serial Port 4
02F0 – 02F7	Serial Port 6
02F8 - 02FF	Serial Port 2
0378 - 037F	Printer Port
03E8 – 03EF	Serial Port 3
03F0 - 03F5	Floppy Disk Controller
03F7 - 03F7	Floppy Disk Controller
03F8 - 03FF	Serial Port 1
0480 - 048F	Motherboard Resources
04D0 - 04D1	Motherboard Resources
0778 - 077F	Printer Port
0CF8 - 0CFF	PCI Bus
AC00 - AC1F	Motherboard Resources
AC80 - AC9F	Motherboard Resources

CHAPTER 5: BIOS SETTINGS

5.1 BIOS Setup

The MZ-6SER system BIOS (Basic Input Output System) supports a standard SETUP function to configure system parameters. The BIOS uses these parameters to establish default conditions during system initialization, both during the Power On Self Test (POST) phase, and during system boot.

Using SETUP

To enter the SETUP function, press the <F2> key during POST.

Note: When you change SETUP parameters, the new values do not take effect until the system is rebooted.

For details about how to set the various parameters using SETUP, please refer to the MachZ BIOS Users Manual Supplement and the Phoenix BIOS 4.0 Rev 6 manual.

Customizing BIOS CMOS default

The CMOS default settings of the MZ-6SER can be customized by using the ZEB and AMDFLASH utilities from ZFMicro. www.zflinux.com

The ZEB utility allows the majority of the CMOS parameters to be set to a particular value which become the default settings when the MZ-6SER is powered up. ZEB modifies a BIOS image file which is then programmed into the flash device using AMDFLASH utility. Please note that setting the CMOS defaults is different from changing the CMOS settings. The CMOS default settings only become effective when there is a no backup battery provided or when the CMOS settings are cleared.

APPENDIX 1: OPTIONAL MZ104+UTIL UTILITY BOARD

The MZ104+UTIL Utility Board, (see Figure 3) provides a convenient means to connect peripheral devices to the MZ-6SER embedded CPU module. In addition, the MZ104+UTIL provides input/output functionality of a status LED, and a hardware-reset switch. For applications requiring a GPS receiver, the Utility Board also acts as carrier board to mate with several models of Royaltek GPS receivers available from Tri-M Systems.

The MZ104+UTIL interfaces to the MZ-6SER CPU module via three ribbon cables and one flex-foil cable. The MZ104+UTIL can be mounted above the MZ-6SER with PC/104 stand offs.

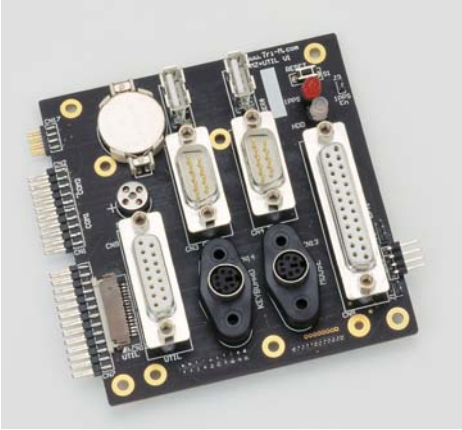


Figure 3: MZ104+UTIL Utility Connector Board

Table 31: MZ104+UTIL104 Interface

Cable	Function	MZ-6SER	Utility Board
8-pin (2x4) IDC ribbon cable	USB	CN11	CN17
20-pin (2x10) IDC ribbon cable	COM1/COM2	CN1/CN2	CN1/CN2
26-pin (2x13) IDC ribbon cable	Parallel	CN13	CN7
16-pin flex-foil cable	Utility	CN8	CN12

The MZ104+UTIL supports the Royaltek REB2000/2100 series as well as the REB12R series GPS receivers. A 10-position single-row female socket is provided for REB2000 series receiver while a 20-position dual-row female socket is provided for REB12R series receiver. Power is provided to the MZ104+UTIL board through connector CN7 on the MZ-6SER. No separate power source is required.

APPENDIX 2: LITERATURE REFERENCES

The following references are for information about the PC/104 architecture, the PC DOS, and the PC BIOS.

ISA System Architecture

MindShare, Inc., Tom Shanley and Don Anderson
Internet: mindshar@interserv.com
CompuServe: 72507,1054
Published by Addison Wesley, Inc.

AT Bus Design

Edward Solari
Anabooks
12145 Alta Carmel Ct., Suite 250
San Diego, CA 92128
ISBN 0-929392-08-6

Personal Computer Bus Standard P996

Institute of Electrical and Electronic Engineers, Inc.
445 Hoes Lane
Piscataway, NJ 08854

PC Interrupts

PC Interrupts, Ralf Brown, Addison/Wesley.

BIOS Reference

System BIOS for IBM PC/XT/AT Computers, Phoenix, Addison/Wesley

PC/104 Consortium

809 B-175 Cuesta Drive,
Mountain View, CA 94040
Phone: 415 903-8304
FAX: 415 967-0995

DiskOnChip

M-Systems Corp
8371 Central Avenue Suite A
Newark, CA 94560
Phone: 510-494-2090
FAX: 510-494-5545

MachZ

ZF Linux Devices, Inc.
1052 Elwell Court
Palo Alto, CA 94301
Phone: 650-940-4793
FAX: 650-965-4050

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