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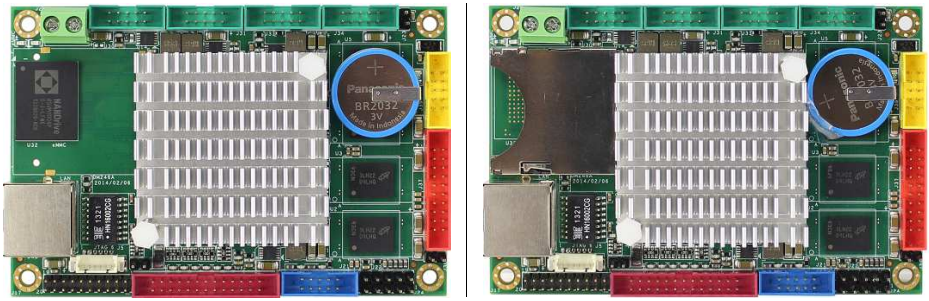

VDX2-6518-E / VDX2-6518-S

DM&P Vortex86DX2 800MHz

Tiny CPU Module

with 4S/2USB/VGA/LVDS/LAN/eMMC or SD Card/PWMx8

1GB DDR2 Onboard

User's Manual

(Revision 1.2A)

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Manual No. IUM6518000-01 Ver.1.3A April, 2015

Trademarks Acknowledgment

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Chapter 1

Introduction

1.1 Packing List

Product Name	Package
VDX2-6518	Embedded Vortex86DX2 CPU All-in-One Board RS232 cable x 4 PRINTER cable x1 GPIO cable x1 USB cable x 1 (USB port x 2) VGA cable x 1 PS/2 Mouse cable x 1 PS/2 Keyboard cable x 1 Screw Kit x 1

1.2 Product Description

The VDX2-6518, a low-power x86 embedded controller, is designed to meet tiny module specification, and is integrated with the following features.

- 800 MHz Vortex86DX2 SoC
- VGA, LVDS LCD support up to 1280x1024 resolution
- 1 GB DDR2 system memory
- 10/100Mbps Ethernet
- 2 USB 2.0 (host)
- Up to 4 serial ports
- Parallel port
- 8-bit GPIO
- Onboard 4MB SPI Flash
- 2 watchdog timer
- PWM 8~16channels
- JTAG interface
- AMI BIOS
- Single voltage +5V DC
- Support operating temperature range of -10°C to +60°C

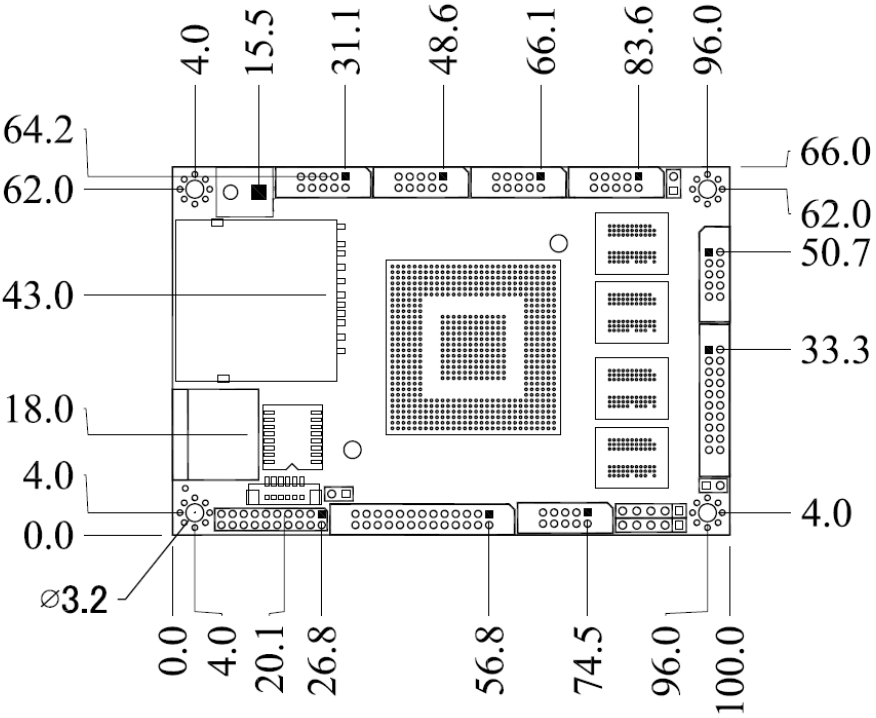
The embedded controller tiny module VDX2-6518 is designed with backward compatibility in mind, to provide migration path for projects facing end-of-life challenges with their existing x86 based tiny module controller. This versatile controller is designed as a plug in replacement, with backward compatibility to support legacy software to extend running product life cycle without heavy and time consuming work.

VDX2-6518 is suitable for broad range of data-acquisition, Industrial automation, Process control, Automotive controller, AVL, Intelligent Vehicle management device, Medical device, Human machine interface, Robotics, machinery control And more…application that required small footprint, low-power and low-cost hardware.

1.3 Specifications

Features	VDX2-6518
CPU	DM&P SoC CPU Vortex86DX2- 800MHz Real Time Clock with Lithium Battery Backup
Cache	L1:16K I-Cache, 16K D-Cache L2:256KB Cache
BIOS	AMI BIOS
System Memory	1GB DDR2 Onboard
Watchdog Timer	Software programmable from 30.5 us to 512 seconds x2 sets (Watchdog 1 fully compatible with M6117D)
VGA	Integrated 2D VGA chip with dual display support (VGA + TTL / VGA + LVDS) VGA: Maximum resolution up to 1280x1024 @ 60Hz LVDS: Maximum resolution up to 1024x768 @ 60Hz Single channel 24-bit LVDS
LAN	Integrated 10/100M Ethernet
I /O Interface	• RS-232 port x3 • RS-232/422/485 port x1 • Parallel port x1 • USB port x2 (USB 2.0 version) • 8-bit GPIO port x1 • 10/100Mbps Ethernet port x1
Connectors	• 2.00 mm ∅ 26-pin box header for Printer x1 • 2.00 mm ∅ 20-pin box header for 8-bit GPIO x1 • 2.00 mm ∅ 20-pin header for LVDS x 1 • 2.00 mm ∅ 10-pin box header for VGA x1 • 2.00 mm ∅ 10-pin box header for USB x1 • 2.00 mm ∅ 10-pin box header for RS-232 x4 • 2.54 mm ∅ 5-pin box header for Keyboard x1 • 2.54 mm ∅ 5-pin header for Mouse x1 • 2.54 mm ∅ 4-pin header for DC-in x1 • 2.54 mm ∅ 2-pin header for Reset x1 • 1.25 mm ∅ 6-pin Wafer for JTAG x1 • External RJ-45 connector for Ethernet x1
Flash Disk Support	• Onboard 4MB SPI Flash Disk (Driver: A) • 4GB eMMC or SD Card Slot
PWM	8 channels
Power Requirement	Single Voltage +5V @720mA
Dimension	100 X 66mm (3.94 x 2.6 inches)
Weight	63g
Operating Temperature	-10°C ~ +60°C
Operating System Support	Free DOS, MS-DOS,WINCE6.0, WINCE7.0, Windows XP Professional, Windows Embedded Standard (XPE), POS Ready(WePOS), Embedded Linux, X-Linux,

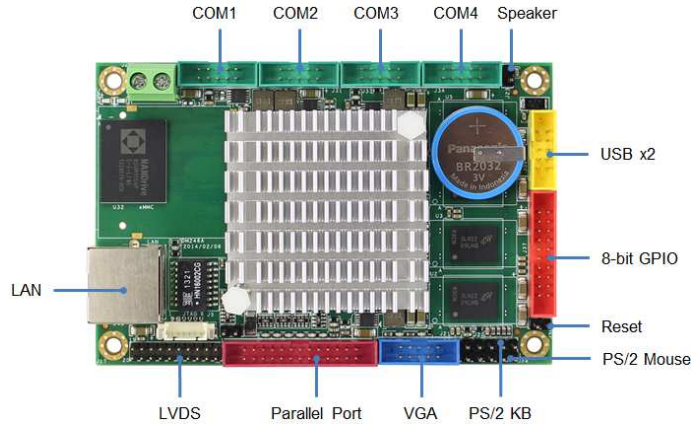
1.4 Board Dimension



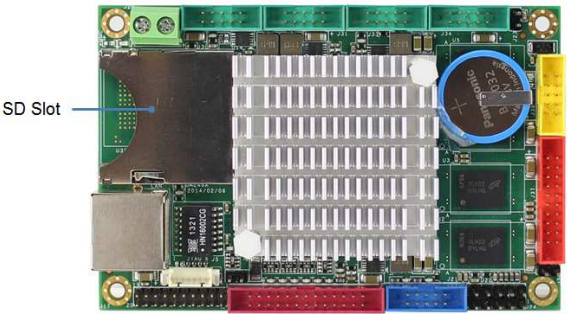
Chapter 2

Installation

2.1 Board Outline



VDX2-6518-E



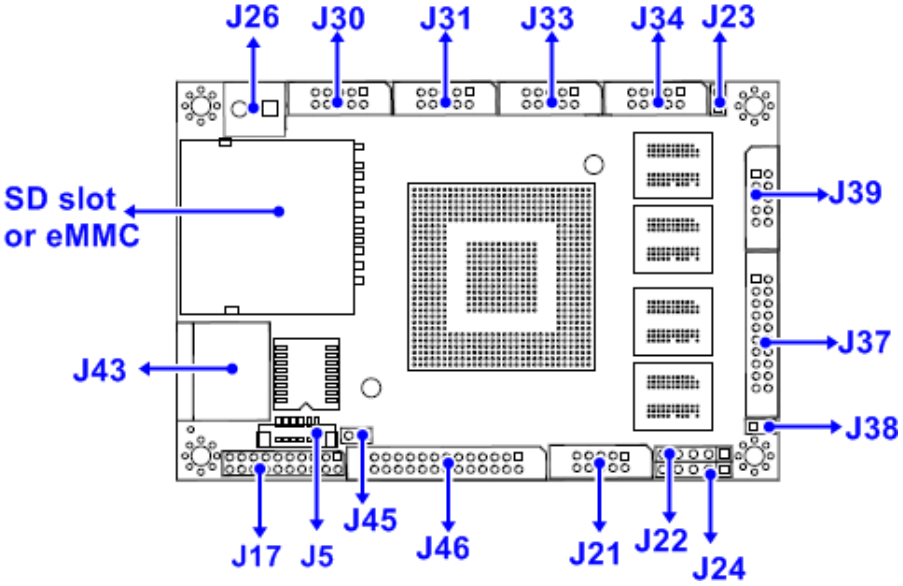
VDX2-6518-S

(Note1: COM2 RS232/485 is selected by BIOS setting)

(Note2: GPIO has 8-bit available only (Optional))

2.2 Connectors Location

Connectors



2.3 Connectors & Jumpers Summary

Summary Table			
Nbr	**Description**	**Type of Connections**	**Pin nbrs.**
J5	JTAG	Wafer, 1.25∅,1x6	6-pin
J17	LVDS	Pin Header, 2.0∅, 10x2	20-pin
J21	VGA	Pin Header, 2.0∅, 5x2	10-pin
J22	PS/2 Keyboard	Box Header, 2.54∅,1x5	5-pin
J23	Speaker	Pin Header, 2.54∅,1x2	2-pin
J24	PS/2 Mouse	Box Header, 2.54∅,1x5	5-pin
J26	Power Connector	Terminal Block, 5.0∅, 2x1	2-pin
J30	COM1(TTL/ GPIO-P4/PWMx8)	Box Header, 2.0∅, 5x2	10-pin
J31	COM2(RS232/422/485)	Box Header, 2.0∅, 5x2	10-pin
J33	COM5(TTL)	Box Header, 2.0∅, 5x2	10-pin
J34	COM6(TTL)	Box Header, 2.0∅, 5x2	10-pin
J37	GPIO(Port 3)	Box Header, 2.0∅,10x2	20-pin
J38	Reset	Pin Header, 2.54∅,1x2	2-pin
J39	USB	Pin Header, 2.54∅, 5x2	10-pin
J43	LAN	Pin Header, 2.00∅, 4x2	8-pin
J45	CLOSE:SPI FLASH HOLD	Pin Header, 2.54∅,1x2	2-pin
J46	PRINT	Box Header, 2.0∅, 13x2	26-pin

2.4 Pin Assignments & Jumper Settings

J5:JTAG

Pin #	Signal Name	Pin #	Signal Name
1	VCC	2	GND
3	TCK	4	TDO
5	TDI	6	TMS

J17: LVDS (24-bit support only)

Pin #	Signal Name	Pin #	Signal Name
1	VCC3(+3.3V)	2	VCC3(+3.3V)
3	GND	4	GND
5	RxIN0+	6	RxIN0-
7	RxIN1-	8	GND
9	GND	10	RxIN1+
11	RxIN2+	12	RxIN2-
13	CKIN-	14	GND
15	GND	16	CKIN+
17	RxIN3-	18	GND
19	GND	20	RxIN3+

J21: VGA

Pin #	Signal Name	Pin #	Signal Name
1	R OUT	2	GND
3	G OUT	4	GND
5	B OUT	6	GND
7	HSYNC	8	GND
9	VSYNCD	10	GND

J22: PS/2 Keyboard

Pin #	Signal Name	Pin #	Signal Name
1	KBCLK	2	KBDAT
3	NC	4	GND
5	VCC		

J23: SPEAKER (BUZZER)

Pin #	Signal Name	Pin #	Signal Name
1	SPEAKER	2	VCC

J24: PS/2 Mouse

Pin #	Signal Name	Pin #	Signal Name
1	MSCLK	2	MSDATA
3	NC	4	GND
5	VCC		

J26: Power Connector (Terminal Block 5.0mm)

Pin #	Signal Name
1	+5V
2	GND

J30: COM1 (Optional: TTL / GPIO-P4 / PWMx8)

Pin #	Signal Name	Pin #	Signal Name
1	DCD1-	2	RXD1+
3	TXD1	4	DTR1
5	GND	6	DSR1
7	RTS1	8	CTS1
9	RI1	10	NC

J31: COM2 RS232 / 422 / 485

Pin #	Signal Name	Pin #	Signal Name
1	DCD2 / **422TX-** / RS485-	2	RXD2 / **422TX+** / RS485+
3	TXD2 / **422RX+**	4	DTR2 / **422RX-**
5	GND	6	DSR2
7	RTS2	8	CTS2
9	RI2	10	NC

J33: COM5 (Optional: TTL)

Pin #	Signal Name	Pin #	Signal Name
1	DCD5	2	RXD5
3	TXD5	4	DTR5
5	GND	6	DSR5
7	RTS5	8	CTS5
9	RI5	10	NC

J34: COM6 (Optional: TTL)

Pin #	Signal Name	Pin #	Signal Name
1	DCD6	2	RXD6
3	TXD6	4	DTR6
5	GND	6	DSR6
7	RTS6	8	CTS6
9	RI6	10	NC

J37: GPIO Port 3 (Not available if SPI ROM is enabled in BIOS)

Pin #	Signal Name	Pin #	Signal Name
1	GND	2	NC
3	GP30/SPICS	4	NC
5	GP31/SPICLK	6	NC
7	GP32/SPIDO	8	NC
9	GP33/SPIDI	10	NC
11	GP34	12	NC
13	GP35	14	NC
15	GP36	16	NC
17	GP37	18	NC
19	VCC	20	NC

***Please see Page16 for detail**

J38: RESET

Pin #	Signal Name	Pin #	Signal Name
1	RST_SW	2	GND

J39: USB

Pin #	Signal Name	Pin #	Signal Name
1	VCC	2	VCC
3	LUSBD3-	4	LUSBD2-
5	LUSBD3+	6	LUSBD2+
7	GND	8	GND
9	GGND	10	GGND

J45: CLOSE: SPI FLASH HOLD

Pin #	Signal Name	Pin #	Signal Name
1	GND	2	VCC3

J46: PRINT

Pin #	Signal Name	Pin #	Signal Name
1	STB-	14	AFD-
2	PD0	15	ERR-
3	PD1	16	INIT-
4	PD2	17	SLIN-
5	PD3	18	GND
6	PD4	19	GND
7	PD5	20	GND
8	PD6	21	GND
9	PD7	22	GND
10	ACK-	23	GND
11	BUSY	24	GND
12	PE	25	GND
13	SLCT	26	NC

2.5 System Mapping

System Mapping

Memory Mapping

Address	Description	Usage
00000000 – 0009FFFF	System RAM	*
000A0000 – 000AFFFF	EGA/VGA Video Memory	*
000B0000 – 000B7FFF	MDA RAM, Hercules graphics display RAM	*
000B8000 – 000BFFFF	CGA display RAM	*
000C0000 – 000C7FFF	EGA/VGA BIOS ROM	*
000C8000 –000CFFFF	Boot ROM enable	
000CC000 – 000CFFFF	Console Redirection enable	
000D0000 – 000D7FFF	Expansion ROM space	
000D8000 –000DBFFF	SPI FLASH Emulation Floppy A Enable	
000DC000 – 000DFFFF	Expansion ROM Space	
000E0000 – 000EFFFF	USB Legacy SCSI ROM space	
000F0000 – 000FFFFF	Motherboard BIOS	*
FEFDBC00 – FEFDBCFF	Standard OpenHCD USB Host Controller	*
FEFBB400 – FEFBB4FF	On board Ethernet Adapter	*
FEFDB800 – FEFDBFFF	Standard Enhanced PCI to USB Host Controller	*

I/O Mapping

I/O Address	Owner	Usage
0000h – 000Fh	DMA 8237-1	*
0020h – 0021h	PIC 8259-1	*
0022h – 0023h	Indirect Access Registers (6117D configuration port)	*
0040h – 0043h	Timer Counter 8254	*
0060h	Keyboard / Mouse data port	*
0061h	Port B + NMI control port	*
0062h – 0063h	8051 download 4k address counter	*
0064h	Keyboard/ Mouse status/ command port	*
0065h	WatchDog0 reload counter	*
0070h – 0071h	CMOS RAM port	*
0072h – 0075h	MTBF control register	*
0078h – 007Ch	GPIO port 0,1,2,3,4 default setup	*
0080h – 008Fh	DMA page register	*
0092h	System control register	*
0093h – 0097h	GPIO port 6,7,8,9,A direction control	*
0098h – 009Dh	GPIO port 0,1,2,3,4,5 direction control	*
00A0h - 00A1h	PIC 8259-2	*
00A8h – 00ADh	WatchDog1 control counter	*
00AEh	WatchDog1 reload counter	*
00C0h - 00DFh	DMA 8237-2	*
00E0h – 00EFh	DOS 4G Page access	*
0100h – 0105h	GPIO port 5,6,7,8,9,A default setup	*
0170h – 0177h	IDE1(IRQ 15)	*
0278h – 027Fh	Printer port (IRQ7, DMA 0)	*

02E8h – 02EFh	COM6 (IRQ 11)	*
02F8h – 02EFh	COM2 (IRQ3)	*
03E8h – 03EFh	COM5 (IRQ 10)	*
03F6h	IDE1 ATAPI device control write only register	*
03F8h – 03FFh	COM1 (IRQ 4)	*
0480h – 048Fh	DMA High page register	*
0490h – 0499h	Instruction counter register	*
04D0h – 04D1h	8259 Edge / level control register	*
0CF8h – 0CFFh	PCI configuration port	*
DE00h – DEFFh	On board LAN	*
FC00h – FC05h	SPI Flash BIOS control register	*
FC08h – FC0Dh	External SPI BUS control register	*

IRQ Mapping

IRQ#	Description	Usage
IRQ0	System Timer	*
IRQ1	Keyboard Controller	*
IRQ2	Cascade for IRQ8 – 15	
IRQ3	Serial Port 2	*
IRQ4	Serial Port 1	*
IRQ5	USB	*
IRQ6	USB	*
IRQ7	Printer port	*
IRQ8	Real Time Clock	*
IRQ9	USB/ Ethernet 10/100M LAN	*

IRQ10	Serial Port 5	*
IRQ11	Serial Port 6	*
IRQ12	Mouse	*
IRQ13	Math Coprocessor	*
IRQ14	Multimedia Device	*
IRQ15	Hard Disk Controller#2	*

DMA Mapping

DMA#	Description	Usage
DMA0		
DMA1		
DMA2		
DMA3		
DMA4		
DMA5		
DMA6		
DMA7		

2.6 Watchdog Timer

There are two watchdog timers in Vortex86SX/DX/DX2 CPU. One is compatible with M6117D watchdog timer and the other is new. The M6117D compatible watchdog timer is called WDT0 and new one is called WDT1.

We also provide DOS, Linux and WinCE example for your reference. For more technical support, please visit: http://dmp.com.tw/tech

2.7 GPIO (General Purpose Input / Output)

20 GPIO pins (16 channels without ACC and Ground) are provided by the Vortex86DX2 for general usage in the system. All GPIO pins are independent and can be configured as inputs or outputs, with or without pull-up/pull-down resistors.

However, VDX2-6518 only offers 8 channels of GPIO, GPIO Port 3, for you to use. These channels are also occupied by onboard SPI flash disk. If you enable SPI flash disk in the CMOS setting, you will not be able to use any GPIO channel.
Here is register information of GPIO Port 3 for your reference.

Port 6	
Data Register:	**7BH**
Direction Register:	**9BH**

We also offer DOS, Linux and WinCE example for your reference. For more technical support, please visit: http://www.dmp.com.tw/tech

2.8 SPI flash (Serial Peripheral Interface)

As SPI Flash (Serial Peripheral Interface) offers many benefits including: reduced controller pin count, smaller and simpler PCBs, reduced switching noise, less power consumption, and lower system cost

Many of users may consider using a formatted SPI flash to boot for the system or emulate SPI flash as Floppy (A: Driver or B: Driver). Then you must know how to set for this condition in CMOS Setup and boot up under DOS 6.22, X-DOS, DR-DOS and Free DOS.

For more technical support, please visit: http://dmp.com.tw/tech

2.9 PWM (Pulse-width modulation)

Pulse-width modulation (PWM) of a signal or power source involves the modulation of its duty cycle, to either convey information over a communications channel or control the amount of power sent to a load.

The popular applications of pulse width modulation are in speed control of electric motors, volume control of Class D audio amplifiers or brightness control of light sources and many other power electronics applications.

The Vortex86DX2 SoC integrated 16 channels of PWM interface enabling the Automation, robotic industry to a New Age x86 SoC platform and we also offer the sample code of PWM which will guide the engineer to control the PWM functionality smoothly.

For more inquire of this sample code that please contact our sales team or mail to: info@icop.com.tw

Chapter 3

Driver Installation

VGA
The Vortex86DX2 processor integrated a 2D VGA chip within. It is capable in providing VGA display resolution up to 1280x1024 and also supports TFT/ LVDS flat panel resolution up to 1024x768 while share system memory of 16MB/ 32MB.

LAN
The Vortex86DX2 processor also integrated 10/100Mbps Ethernet controller that supports both 10/100BASE-T and allows direct connection to your 10/100Mbps Ethernet based Local Area Network for full interaction with local servers, wide area networks such as the Internet.

The controller supports: Half / Full-Duplex Ethernet function to double channel bandwidth, auto media detection.

HD Audio
Besides the above mentioned, the Vortex86DX2 processor includes an ALC 262 (HD Audio) in the CPU as well.

Operating system support
The Vortex86DX2-6518 Tiny CPU board supports embedded software: Free DOS, DOS 6.22, PCDOS 7.1, DR-DOS, x-DOS, OS/2, Windows CE 6.0, Windows XP Professional, and Windows Embedded standard (XPE). Windows 7 is not officially supported but we have drivers for your testing.

For drivers, please visit DMP official website: http://dmp.com.tw/tech for them and if you cannot locate them, please mail us at info@icop.com.tw

Vortex86DX2-6518 also supports most of the popular Linux distributions, for more detail information, please also visit DMP official website: http://dmp.com.tw/tech

Appendix

A. LVDS Flat Panel Support List

VDX2-6518 ONLY supports 24-bit LVDS Panel

Approved LVDS Flat Panel List

Size	Brand	Resolution	Model No.
8.4”	AUO	800x600	G084SN03 V3
10.1”	AUO	1024x600	B101AW06_V0
10.4”	AUO	800x600	G104SN02 V2
12.1”	AUO	800x600	G121SN01
15”	AUO	1024x768	G150XG01

B. Flat Panel Wiring and Lighting

- **Hardware**

  Before you connect the TFT LCD Flat Panel with VDX2-6518, please make sure the input Voltage of LCD is + 3.3V

- **BIOS**

  Please contact or e-mail our regional sales to get the special BIOS for any TFT LCD Flat Panels.

C. TCP/IP library for DOS real mode

DSock is a TCP/IP library for DOS real mode, which is used by RSIP. It provides simple C functions for programmer to write Internet applications. ICOP also provide Internet examples using DSock: BOOTP/DHCP, FTP server, SMTP client/server, HTTP server, TELNET server, Talk client/server, etc.

DSock provides a lot of example source code. Programmer can add Internet functions to their project easily and save development time. With the utility "MakeROM", programmer also can make a ROM image to fit their application, those examples can be seen in the following Application systems: Mity-Mite Serial Server, Web Camera Tiny Server and RSIP Serial Server.

DSock is free for all ICOP products using M6117D/ Vortex86/ Vortex86SX/ Vortex86DX/ Vortex86DX2 CPUs and ICOP also provides the business version of DSock for those customers who are using other x86 CPUs.
If you would like to use DSock or business version of DSock, Please mail to info@icop.com.tw or contact your regional sales.

Please download the trial DSock software and Utilities from our website:
http://www.dmp.com.tw/tech/dmp-lib/dsock/

D. BIOS Default setting

If the system cannot be booted after BIOS changes are made, Please follow below procedures in order to restore the CMOS as default setting.

- Press **"End"** Key, when the power on

- Press **<Del>** to enter the AMI BIOS setup
- Press **"F9"** to Load Optimized Defaults
- Press **"F10"** to Save configuration changes and exit setup

Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster. Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, originality to use this product. Vendor will not be liable for any claim made by any other related party. Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.