ROCKY – 328E
386SX with Ethernet
SBC

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Introduction

Welcome to the ROCKY-328E 386SX with Ethernet Single Board Computer. The ROCKY-328E is an ISA with PC/104 form factor board, which comes equipped with ALI 6117 (includes 386SX CPU) and advanced high-performance multi-mode I/O, designed for the system manufacturers, integrators, or VARs that want to provide all the performance, reliability, and quality at a reasonable price.

An advanced high performance super AT I/O chip SMC FDC37C669 or equivalent chip is used in the ROCKY-328E board. The UART is compatible with the NS16C550. The parallel port and IDE interface are compatible with IBM PC/AT and XT architecture's, as well as EPP and ECP. The FDC37C669 incorporates sophisticated power control circuitry(PCC). The PCC supports multiple low power down modes.

The most outstanding feature in the ROCKY-328E is built-in PC/104 expansion bus. Based on the PC/104 bus, you could easily install over thousands of PC/104 modules from hundreds' vendors in the world. The ROCKY-328E has external power connector that could let it connects with power supply directly. It is more suitable for your standalone applications.

In addition, the ROCK-328E provides one 72-pin SIMM (Single In-line Memory Module) socket to install max. 32MB memory(single side RAM). The board also designed 4MB DRAM on board for OEM customer.

1.1 Specifications :

The ROCKY –328E 386SX with Ethernet Single Board Computer provides the following specification:

¨ System :

- **CPU** : ALI 6117,includes 386SX CPU
- **DMA channels** : 7
- **Interrupt levels** : 15
- **Real-time clock/calendar** : by Li-battery backup

¨ Memory :

- **RAM memory** : 512KB to 32MB,only support single side SIMM.
- **Shadow RAM memory** :
  System BIOS : 0F0000h ~ 0FFFFFh

¨ Input/Output :

- **IDE hard disk drive interface** : Supports up to two IDE hard disk drives. Can be disabled by BIOS Setup.
- **Floppy disk drive interface** : Supports two 2.88 MB, 1.44MB, 1.2MB, 720KB, or 360KB floppy disk drives. Can be disabled by BIOS Setup.
- **Two high speed Series ports** : NS16C550 compatible UARTs with send/receive 16-byte FIFOs, data rates are independently programmable from 115.2K baud down to 50 baud. Modem control circuitry.
- **Multi-mode Parallel Port** :
  Standard mode - IBM PC/XT, PC/AT, PS/2 compatible bi-directional parallel port.
  Enhanced mode - Enhanced parallel port (EPP) compatible with IEEE 1284 specification.
  High speed mode - Microsoft and Hewlett Packard extended capabilities port (ECP), compatible with IEEE 1248 specification.

¨ **Industrial features** :

- **Watch-dog timer** : can be set by 1,2,10,20,110,or 220 seconds period. Reset or NMI was generated when CPU did not periodically trigger the timer. Your program use hex 043 and 443 to control the watch-dog and generate a system reset.
- **PC/104 expansion bus** : A 64-pin and 40-pin, industrial embedded-PC bus standard.
- **External power connector** : 8-pin male connector
- **Keyboard connector** : A 5-pin header on board and 6-pin mini-DIN keyboard connector is located on the mounting bracket.

¨ **General** :

- **Power Consumption** : +5V @ 1A (40MHz,4MB RAM)
- **Operating Temperature** : 0◦ ~ 60◦C (CPU needs Cooler)
- **Humidity** : 5% ~ 95%, non-condense
- **Dimension**: 180mm(W) x 122mm(L), standard AT form factor

1.2 What You Have

In addition to this *User's Manual*, the ROCKY-328E package includes the following items:

- ROCKY-328E 386SX with Ethernet Single Board Computer
- Printer Cable
- FDD/HDD Cable
- 6-pin Mini-Din to Keyboard/Mouse Adapter Cable

If any of these items is missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

2

Installation

This chapter describes how to install the ROCKY-328E. At first, the layout of ROCKY-328E is shown, and the unpacking information that you should be careful is described. The jumpers and switches setting for the ROCKY-328E's configuration, such as CPU type selection, system clock setting, and interrupt IRQ setting for serial ports and parallel port, are also included.

2.1 ROCKY-328E's Layout

< reference next page >

2.2 CPU Operation Speed Setting

• **CPU SPEED SETTING**:
The system clock is generated by the AV9155-02, and the different CPU clock frequency can be selected by JP8 and shown as following table:

JP8	1-2	3-4	5-6
8MHz	OPEN	CLOSE	CLOSE
16MHz	CLOSE	OPEN	CLOSE
20Mhz	OPEN	OPEN	CLOSE
25MHz	CLOSE	CLOSE	OPEN
40MHz	**CLOSE**	**OPEN**	**OPEN**

2.3 System Memory DRAM

The system DRAM on board is divided into two banks, bank 0 and 1. The Bank 0 is the on board optional 4MB DRAM. Bank 1 is the one 72-pin SIMM. Based on the chipset function the 72-pin SIMM only support single side DRAM. There have two jumpers for the related setting.

• **JP3/JP6 : 4MB DRAM and 72-pin SIMM selection**

Function	JP3	JP6
On Board 4MB	CLOSE	CLOSE
72-pin SIMM	**OPEN**	**OPEN**

2.4 Watch-Dog Timer

The Watch-Dog Timer is enabled by reading port 443H. It should be triggered before the time-out period ends, otherwise it will assume the program operation is abnormal and will issue a reset signal to start again, or activate NMI to CPU. The Watch-Dog Timer is disable by reading port 043H. The Watch-Dog Timer time-out period can be set 1,2,10,20,110 or 220 sec. by jumper JP9.

- **JP10 : Watch-Dog Active Type Setting**

JP10	DESCRIPTION
2-3	**RESET WHEN WDT TIME-OUT**
1-2	ACTIVATE NMI TO CPU WHEN WDT TIME-OUT
OPEN	DISABLE WDT

- **JP9 : WDT TIME-OUT PERIOD**

JP8	1-2	3-4	5-6	7-8
1sec	OPEN	OPEN	CLOSE	OPEN
2sec	OPEN	OPEN	CLOSE	CLOSE
10sec	**OPEN**	**CLOSE**	**OPEN**	**OPEN**
20sec	OPEN	CLOSE	OPEN	CLOSE
110sec	CLOSE	OPEN	OPEN	OPEN
220sec	CLOSE	OPEN	OPEN	CLOSE

2.5 DiskOnChip™Flash Disk

The DiskOnChip™ Flash Disk Chip(DOC) is produced by M-Systems. The DOC(MD-2200-xMB) is 32-pin DIP package. Because the DOC is 100% compatible to hard disk and DOS. Customer don't need any extra software utility. It is just "plug and play", easy and reliable.

- **JP15 : DiskOnChip™ Memory Address Setting**

Address	1-2	3-4	5-6
CE000	CLOSE	OPEN	OPEN
D6000	**OPEN**	**CLOSE**	**OPEN**
DE000	OPEN	OPEN	CLOSE

2.6 Clear CMOS Setup

If want to clear the CMOS Setup(for example forgot the password you should clear the setup and then set the password again.), you should close the JP17 pin 2-3 about 3 seconds, then open again. Then take set back to normal operation mode take off the jumper.

- **JP17 : Clear CMOS Setup (Reserve Function)**

JP17	DESCRIPTION
1-2	**Normal Operation**
2-3	Clear CMOS Setup

3

Connection

This chapter describes how to connect peripherals, switches and indicators to the ROCKY-328E board. You can access most of the connectors from the top of the board while it is installed in the chassis.

3.1 Floppy Disk Drive Connector

ROCKY-328E board comes equipped with a 34-pin daisy-chain driver connector cable. The detailed pin assignment of the connector is specified as following table:

- **CN2 : FDC CONNECTOR**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GROUND	2	REDUCE WRITE CURRENT#
3	GROUND	4	N/C
5	GROUND	6	N/C
7	GROUND	8	INDEX#
9	GROUND	10	MOTOR ENABLE A#
11	GROUND	12	DRIVE SELECT B#
13	GROUND	14	DRIVE SELECT A#
15	GROUND	16	MOTOR ENABLE B#
17	GROUND	18	DIRECTION#
19	GROUND	20	STEP#
21	GROUND	22	WRITE DATA#
23	GROUND	24	WRITE GATE#
25	GROUND	26	TRACK 0#
27	GROUND	28	WRITE PROTECT#
29	GROUND	30	READ DATA#
31	GROUND	32	SIDE 1 SELECT#
33	GROUND	34	DISK CHANGE#

3.2 IDE Disk Drive Connector

You can attach two IDE(Integrated Device Electronics) hard disk drives to the ROCKY-328E internal controller. The board comes equipped with a 40-pin flat-cable connector. The detailed pin assignment of the connector is specified as following table:

- **CN1: IDE Interface Connector**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	RESET#	2	GROUND
3	DATA 7	4	DATA 8
5	DATA 6	6	DATA 9
7	DATA 5	8	DATA 10
9	DATA 4	10	DATA 11
11	DATA 3	12	DATA 12
13	DATA 2	14	DATA 13
15	DATA 1	16	DATA 14
17	DATA 0	18	DATA 15
19	GROUND	20	N/C
21	N/C	22	GROUND
23	IOW#	24	GROUND
25	IOR#	26	GROUND
27	N/C	28	BALE - DEFAULT
29	N/C	30	GROUND - DEFAULT
31	INTERRUPT	32	IOCS16#-DEFAULT
33	SA1	34	N/C
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD ACTIVE#	40	GROUND

3.3 Parallel Port

This port is usually connected to a printer, The ROCKY-328E includes an on-board parallel port, accessed through a 26-pin flat-cable connector CN9. The detailed pin assignment of the connector is specified as following table:

- **CN9 : Parallel Port Connector**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	STROBE#	2	DATA 0
3	DATA 1	4	DATA 2
5	DATA 3	6	DATA 4
7	DATA 5	8	DATA 6
9	DATA 7	10	ACKNOWLEDGE
11	BUSY	12	PAPER EMPTY
13	PRINTER SELECT	14	AUTO FORM FEED #
15	ERROR#	16	INITIALIZE
17	PRINTER SELECT LN#	18	GROUND
19	GROUND	20	GROUND
21	GROUND	22	GROUND
23	IOW#	24	GROUND
25	GROUND		

3.4 Serial Ports

The ROCKY-328E offers two high speed NS16C550 compatible UARTs with Read/Receive 16 byte FIFO serial ports. These ports let you connect to serial devices or a communication network. Two DB-9 connectors are provides by the ROCKY-328E The detailed pin assignment of the connectors are specified as following tables:

- **CN13 & CN15 : Serial Port Connector(ACE0 & ACE1)**

PIN NO.	DESCRIPTION
1	DATA CARRIER DETECT (DCD)
2	RECEIVE DATA (RXD)
3	TRANSMIT DATA (TXD)
4	DATA TERMINAL READY (DTR)
5	GROUND (GND)
6	DATA SET READY (DSR)
7	REQUEST TO SEND (RTS)
8	CLEAR TO SEND (CTS)
9	RING INDICATOR (RI)

3.5 Keyboard / Mouse Connector

The ROCKY-328E provides two keyboard connectors. A 5-pin header keyboard connector CN11 supports passive backplane applications. Another one is a 6-pin Mini-DIN connector CN16 on the board mounting bracket for single board computer

applications. The detailed pin assignment of the connector is specified as following table:

- **CN11 : 5-pin Header Keyboard Connector**

PIN NO.	DESCRIPTION
1	KEYBOARD CLOCK
2	KEYBOARD DATA
3	N/C
4	GROUND
5	+5V

- **CN10 : 5-pin Header PS/2 Mouse Connector**

PIN NO.	DESCRIPTION
1	MOUSE CLOCK
2	MOUSE DATA
3	N/C
4	GROUND
5	+5V

- **CN16 : 6-pin Mini-DIN Keyboard/Mouse Connector**

PIN NO.	DESCRIPTION
1	KEYBOARD DATA
2	MOUSE DATA
3	GROUND
4	+5V
5	KEYBOARD CLOCK
6	MOUSE CLOCK

3.6 Lan RJ45 Connector

The ROCKY-328E built-in a RJ45 Lan connector for 10Mbps Ethernet(NE-2000 compatible) operation.

- **CN14 : Lan RJ45 Connector**

1	TX+	5.	NC
2	TX-	6.	RX-
3.	RX+	7.	NC
4.	NC	8.	NC

- **CN17 : LED Connector(4-pin header) for Lan**

1	LED Link	2	+5V
3	LED RX	4	+5V

3.7 External Switches and Indicators

There are many external switches and indicators for monitoring and controlling your CPU board. These features are completely optional install them if you need them. The detailed pin assignment of the connectors is specified as following table:

- **CN8 : RESET BUTTON**

PIN NO.	DESCRIPTION
1	EXTERNAL RESET
2	GROUND

- **CN3 : IDE LED connector**

PIN-NO	DESCRIPTION
1	+5V
2	HDD ACTIVE#

- **CN4 : POWER LED & KEYLOCK**

PIN NO.	DESCRIPTION
1	POWER LED ANODE
2	KEY
3	GROUND
4	KEYLOCK
5	GROUND

3.8 External Power Connector

The ROCKY-328E has an on-board external power connector CN12. You can connect power directly to the CPU board for some single-board-computer(without passive backplane) application.

· **CN12 : EXTERNAL POWER CONNECTOR**

PIN NO.	DESCRIPTION
1	+5V
2	+12V
3	-12V
4	GROUND
5	GROUND
6	-5V
7	+12V
8	+5V

3.9 External Speaker

The ROCKY-328E has its own buzzer, you also can connect to the external speaker through the connector CN5.

• **CN5 : SPEAKER**

PIN NO.	DESCRIPTION
1	SPEAKER SIGNAL
2	GROUND

3.10 PC/104 Connection Bus

The ROCKY-328E's PC/104 expansion bus let you attach any kind of PC/104 modules. The PC/104 bus is already become the industrial embedded PC bus standard, so you could easily install over thousands of PC/104 modules from hundreds of venders in the world.

NOTE : ROCKY-328E allows directly plug in PC/104 module, don't need PC/104 Connection Kit.

4

AMI BIOS Setup

The ROCKY-328E use AMI BIOS for system configuration, and the AMI BIOS setup program is designed to provide maximum flexibility in configuring the system by offering various options which may be selected for end-user requirements. This chapter is written to assist you in the proper usage of these features.

4.1 Getting Start

When the system is powered on, the BIOS will enter the Power-On-Self-Test routines. These routines will be executed for System Test and Initialization and System Configuration Verification. After the POST routines are completed, the following message appears :

" Hit < Del>, if you want to run SETUP"

To access AMI BIOS Setup program, press <Del> key.

4.2 Standard CMOS Setup

Standard CMOS Setup is the first option on the main menu.

The standard CMOS setup utility is used to configure the following features :

- Date/Time,
- Hard Disk Type,
- Floppy Disk Type,

All of these features are almost the same as common, so we do not describe more detailed in here.

4.3 Advanced CMOS Setup

When you enter the Advanced CMOS Setup, this Setup program is equipped with a series of help screens, accessed by <F1> key, which will display the options available for a particular configuration features. All the items on the left side of the screen are very common, they will not be mentioned here. Here, we just focus on some special items which are in ROCKY-328E board only. These items are specified as following :

- On-board IDE Controller : The IDE hard disk drive can be **Enable** or **Disable** by this item. When you do not need hard disk, the IDE controller can be disabled.
- On-board Floppy Controller : The floppy disk drive can be **Enable** or **Disable** by this item. When you do not need floppy disk, the FDD controller can be disabled.
- Serial Port 1 : The options are **Disable**, **3E8**,**2F8 ,**or **3F8**. You can set the I/O address of the serial port (COMA) or disable it.
- Serial Port 2 : The options are **Disable**, **2E8**,**3F8**,or **2F8**. You can set the I/O address of the serial port 1 (COMB) or disable it.
- Parallel Port : The options are **Disable**, **3BC**, **378** or **278**. You can set the I/O address of the parallel port or disable it.
- Parallel Port Mode : ROCKY-318 provides **EPP,ECP,ECP+EPP,** and **Normal Mode.**

Primary Display : You could set **VGA/EGA, CGA40x25, CGA80x25, Mono or Absent**. When set Absent the ROCKY-328E will not check the display adapter when power on the system.

System Keyboard : You could set **Present** or **Absent**. When set Absent the ROCKY-328E will not check the display adapter when power on the system.

Appendix A. E^2 Key™Function

The ROCKY-328E provides an outstanding E^{2}KEY™ function for system integrator. Based on the E^{2}KEY™ you could free to store the ID Code, Pass Word, or Critical Data in the 1Kbit EEPROM. Because the EEPROM is nonvolatile memory, you don't have to worry the losing of the very important data.

Basically the E^{2}KEY™ is based on a 1Kbit EEPROM which is configured to 64 words(from 0 to 63). You could access(read or write) each word at any time.

When you start to use the E^{2}KEY™ you should have the utility in the package. The software utility will include four files as follows,

README.DOC
E2KEY.OBJ
EKEYDEMO.C
EKEYDEMO.EXE.

The E2KEY.OBJ provides two library function for user to integrate their application with E^{2}KEY™ function. These library **(read_e2key and write_e2key)** are written and compiled in C format. Please check the following statement, then you will know how to implement it easily.

unsigned int read_e2key(unsigned int address)
/* This function will return the E^{2}KEY™'s data at address. The address range is from 0 to 63. Return data is one word,16 bits */
void write_e2key(unsigned int address,unsigned data)
/* This function will write the given data to E^{2}KEY™ at address. The address range is from 0 to 63. The data value is from 0 to 0xffff. */

To easy start to use the function, please refer the include EKEYDEMO.C code at first.

Please note the E^{2}KEY™ function is based on the working of parallel port. So you should enable the ROCKY-328E's parallel port, otherwise will be not working.

Appendix B. Watch-Dog Timer

The Watch-Dog Timer is provided to ensure that standalone systems can always recover from catastrophic conditions that caused the CPU to crash. This condition may have occurred by external EMI or a software bug. When the CPU stops working correctly, hardware on the board will either perform a hardware reset (cold boot) or a non-maskable interrupt (NMI) to bring the system back to a known state.

The Watch-Dog Timer is controlled by two I/O ports.

443 (hex)	Read	Enable the refresh the Watch-Dog Timer.
043 (hex)	Read	Disable the Watch-Dog Timer.

To enable the Watch-Dog Timer, a read from I/O port 443H must be performed. This will enable and activate the countdown timer which will eventually time out and either reset the CPU or cause an NMI depending on the setting of JP10. To ensure that this reset condition does not occur, the Watch-Dog Timer must be periodically refreshed by reading the same I/O port 433H. This must be done within the time out period that is selected by jumper JP9.

A tolerance of at least 30% must be maintained to avoid unknown routines within the operating system (DOS), such as disk I/O that can be very time consuming. Therefore if the time out period has been set to 10 seconds, the I/O port 443H must be read within 7 seconds.

Note: when exiting a program it is necessary to disable the Watch-Dog Timer, otherwise the system will reset.