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4I29 ETHERNET INTERFACE MANUAL

VERSION 1.6

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HANDLING PRECAUTIONS

STATIC ELECTRICITY

The CMOS integrated circuits on the 4I29 can be damaged by exposure to electrostatic discharges. The following precautions should be taken when handling the 4I29 to prevent possible damage.

A. Leave the 4I29 in its antistatic bag until needed.

B. All work should be performed at an antistatic workstation.

C. Ground equipment into which 4I29 will be installed.

D. Ground handling personnel with conductive bracelet through 1 megohm resistor to ground.

E. Avoid wearing synthetic fabrics, particularly Nylon.

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INTRODUCTION

GENERAL

The 4I29 is a 16 bit Ethernet interface implemented on a stackable PC/104 bus card. The 4I29 supports 10BaseT (Twisted pair) and 10Base2 (Thin-BNC) Ethernet, plus has an AUI connector for connection to external transceivers. The 4I29 can also be supplied with a low cost external panel mount BNC transceiver for applications where access to the 4I29 card is restricted.

The 4I29 can be compatible with the NE2000 or WD8013EBT depending on EEPROM setup options.

Most 4I29 options are settable via a provided setup utility, there are only three option jumpers (8/16 bit bus select and 10Base2 termination, local tranceiver power). Setup options are stored in an on card EEPROM, so that the setup utility need only be run when changing hardware settings.

Programmable options include emulation mode (NE2000 or WD8013EBT), I/O address, boot PROM enable, boot PROM location, boot PROM size, interrupt select, and 10BaseT / 10Base2 / AUI selection. Selectable interrupts are IRQ2, IRQ3, IRQ4, IRQ5, IRQ10, IRQ11, and IRQ12.

The 10Base2 DC-DC converter can be turned off to minimize power when idle, and is automatically disabled when the 4I29 is setup for twisted pair use. The all CMOS design of the 4I29 plus efficient DC-DC converter keeps operating power below 2 watts.

Standard packet buffer is 16K bytes but a 64K byte buffer version is available if desired.

A 32 pin dip socket allows installation of 28 or 32 pin boot PROMs from network vendors. The 4I29 is capable of writing to the boot PROM, allowing use of a 5V flash boot PROM if desired.

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HARDWARE CONFIGURATION

GENERAL

The 4I29 has only three hardware configuration options, as most 4I29 configuration is done via the provided software configuration utility. The hardware options are 10Base2 (BNC) termination, 8 bit/AUTO bus size selection and local tranceiver power disconnect. The options are selected with shorting jumpers placed on three pin headers. In the following discussions, when the words "up", "down", "right", and "left" are used it is assumed that the 4I29 card is oriented with its bus connectors J1 and J2 at the bottom edge of the card (nearest the person doing the configuration).

DEFAULT HARDWARE CONFIGURATION

The 4I29 card is configured in the following manner when shipped from the factory.

FUNCTION	DEFAULT	JUMPER	POSITION
LOCAL XCVR POWER	ENABLED	W1	UP
TERMINATION	DISABLED	W2	DOWN
BUS SIZE	AUTO	W3	LEFT

DEFAULT SOFTWARE CONFIGURATION

The default EEPROM configuration on 4I29 card as shipped from the factory is as follows:

PARAMETER	VALUE
MAINMODE	IOMAPPED
COMPATIBLE	YES
PORTADD	300
INTERRUPT	IRQ5
PROMLOC	NONE
CABLETYPE	THIN
FASTREAD	NO
FASTIO16	NO
FASTCHRDY	NO

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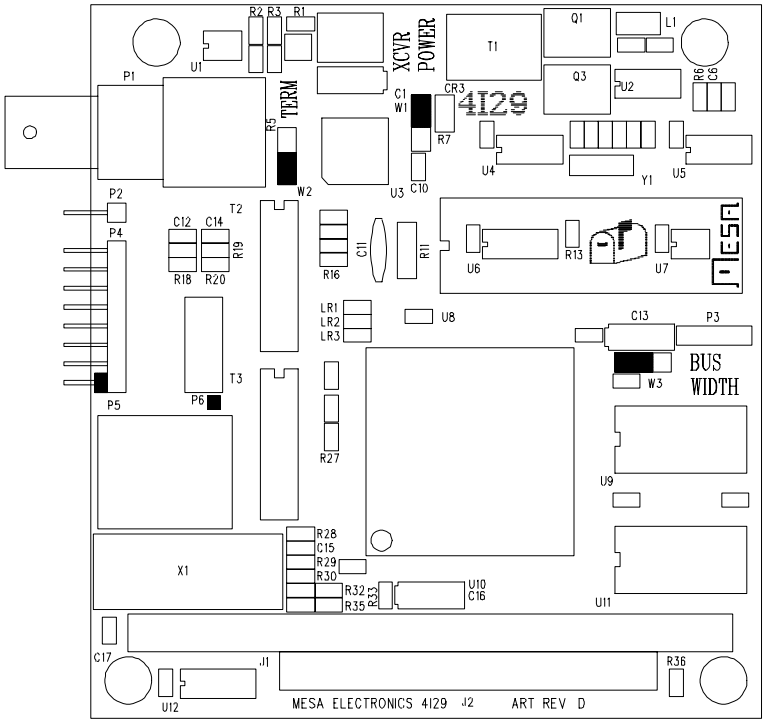
HARDWARE CONFIGURATION

DEFAULT JUMPER SETTINGS

10Base2

AUI
& external
10Base2

10BaseT



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HARDWARE CONFIGURATION

EXTERNAL 10BASE2 TRANCEIVER

The 4I29 can use an optional external 10base2 (BNC) tranceiver module from MESA. This small circuit card module can be panel mounted up to 1 foot away from the 4I29 card. This circuit card is called the MAU and is included with the 4I29-E model.

If the external BNC tranceiver is used, you must disconnect the local tranceivers power. This is done by moving W1 to the down position. The 4I29 setup must use the 'THIN' cable selection when using the MAU, as the MAU's power comes from the local tranceiver power supply

It is not necessary to change the default (enabled) W1 position when selecting between thin, thick, or twisted pair interfaces, as the hardware on the 4I29 card enables the DC-DC converter only when the thin ethernet interface is selected.

PANEL MOUNT 10BASET OPTION

If the RJ45 connector on the 4I29 is not located in a convenient place for the 10BaseT cable, an optional adapter is available from MESA that allows remote mounting of the RJ45 connector up to 1 foot away from the 4I29. The part name of this adapter is TAU. The TAU also has link status, receive, and transmit LEDs.

TERMINATION

The 10Base2 input (BNC) can be terminated on the 4I29 card. This eliminates the need for the TEE fitting + BNC terminator at the end of the line, and is very convenient for simple two or three node nets. The on card termination should not be used if the Ethernet cabling is subject to frequent change, as it is easy to forget that a card is terminated internally. The internal termination is enabled by setting the shorting jumper on jumper block W1 in the UP position. Setting the jumper to the DOWN position disables the internal termination.

BUS SIZE SELECTION

The 4I29 can work with 8 and 16 bit CPU's. Bus size is normally selected automatically by sensing the voltage on the PC/104 bus J2 connector pin 34. This is a 5V line on the AT part of the bus connector. If 5V is sensed on this line, an AT type CPU is assumed, and 16 bit bus transfers are used. This scheme is not guaranteed to work in all circumstances. For example, if other I/O cards with the J2 connector are used, pin 34 of J2 may be tied to +5V even with an XT type CPU. Because of this possibility, the 4I29 can be forced to work in 8 bit mode if required.

If the shorting jumper on jumper block W2 is placed in the left hand position, automatic bus sizing is enabled. If the shorting jumper is placed in the right hand position, the 4I29 is forced into the 8 bit mode.

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SOFTWARE CONFIGURATION

GENERAL

Most 4I29 setup options are stored in an on card EEPROM. This includes I/O address, interrupt line selection, Boot PROM enable, size ,and location, selection of compatibility mode, and various timing options.

Two setup utility programs are supplied with the 4I29. These programs allow you to change these parameters and display the current card setup.

SET4I29

SET4I29 is a utility program for setting 4I29 EEPROM options. SET4I29 is invoked with two or optionally three command line parameters, a port address, a file name, and an 'I' for immediate mode:

```
SET4I29 300 WD8013.CFG [I]
```

The port address will be 300 the first time SET4I29 is used, because all 4I29 cards are shipped from MESA configured for that location. All port addresses are in hexadecimal. Once a 4I29 card has been configured to a different port address, you need to specify the new port address when running SET4I29.

Because it is possible to forget the port location of a 4I29 card, the port address on the command line can be replaced with 'S' or '?'. This causes SET4I29 to look for the 4I29 card by probing all of the possible 4I29 I/O addresses. You should not use the (S)earch option if you know the 4I29 port address, as it is not guaranteed to work in all cases.

The second command line parameter is the name of the configuration file. The configuration file is an ASCII file containing the configuration parameters. The 4I29 distribution disk has two example configuration files, NE2000.CFG and WD8013.CFG. You should use these files as a starting point to creating your own configuration files. The format of the configuration file is very simple: each line of the configuration file consists of a parameter name followed by a parameter value. If a parameter name is not specified in the configuration file, that parameter will be set to the default value shown in the following table. ***Note that the defaults in the following table are not the same as the factory default options.***

The third parameter is the optional 'I'. The I stands for Immediate. When I is specified, the set utility does not change the EEPROM setup values, but only changes the current 4I29 operating parameters. These changes take effect immediately, but only last until the next hardware reset. This can be used for trying different setups before commiting them to permanent storage in the EEPROM.

Certain 4I29 parameters cannot be changed in the immeditate mode. If a configuration file that includes parameters that cannot be changed in the immediate mode is used in the immediate mode, warnings will be printed, and those parameter changes will be ignored.

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SOFTWARE CONFIGURATION

SET4I29

The following table shows SET4I29 parameter names, parameter values, default parameter values, and whether the parameter can be changed in immediate mode:

PARAMETER	VALUES	DEFAULT	IMMEDIATE
MAINMODE	IOMAPPED MEMMAPPED	IOMAPPED	NO

Main mode sets the emulation mode of the 4I29 to I/O mapped (NE2000) or memory mapped (WD8013) operation. Note that strict compatibility with the WD8013 mode is not guaranteed with the National ATLANTIC chip. Therefore the NE2000 mode is suggested.

COMPATIBLE	YES NO	YES	NO

If COMPATIBLE is YES, the buffer mapping matches the standard size and location for WD8013 and NE2000 compatibility. If COMPATIBLE is NO, and the 4I29 has 64K byes of buffer RAM, all buffer RAM will be accessible.

PORTADD	240 280 2C0 300 320 340 360	300	YES

Sets the 4I29 port address. Make sure that no other card in the system uses the same I/O address.

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SOFTWARE CONFIGURATION

SET4I29

PARAMETER	VALUES	DEFAULT	IMMEDIATE
INTERRUPT	NONE IRQ2 IRQ3 IRQ4 IRQ5 IRQ10 IRQ11 IRQ12	IRQ2	YES

Selects the IRQ line that the 4I29 will drive. Make sure that no other card in the system uses the same interrupt line.

PROMLOC	NONE C000-16K C400-16K C800-16K CC00-16K D000-16K D400-16K D800-16K DC00-16K C000-32K C800-32K D000-32K D800-32K C000-64K D000-64K	NONE	NO

Selects the boot PROM location and size. NONE means that the boot PROM is disabled. Make sure that the boot PROM location does not overlap any memory in the system.

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SOFTWARE CONFIGURATION

SET4I29

PARAMETER	VALUES	DEFAULT	IMMEDIATE
CABLETYPE	TWISTED THIN THICK TWISTEDLOW	TWISTED	YES

Selects the interface type. DC-DC converter is enabled when THIN is selected. TWISTEDLOW uses the twisted pair interface with a lower squelch level for use with longer than normal cables.

FASTREAD	YES NO	NO	YES

In I/O mapped mode, causes the next data to be fetched before the previous IORD has completed. Only enable in systems with fast ISA bus!

FASTIO16	YES NO	NO	YES

If enabled, causes IOCS16 to be generated by address decode only. If disabled, IOCS16 is generated with IORD, and IOWR. May be needed with some chip sets.

FASTCHRDY	YES NO	NO	YES

If enabled, IOCHRDY will be generated when BALE goes high. If disabled, IOCHRDY will be generated with IORD and IOWR.

SET4I29 should be run before any network software has been installed or unpredictable behavior may result! After SET4I29 has been run (in the non-immediate mode), you must reset the computer system for the new configuration parameters to take effect. A hardware reset is necessary, CONTROL-ALT-DEL will not work!

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SOFTWARE CONFIGURATION

QUICKSET

QUICKSET is a similar utility to SET4I29 except that is can only change one 4I29 parameter at a time and the parameter to be changed is supplied on the command line. QUICKSET only changes the 4I29 register vaulues, not the EEPROM, so that the 4I29 will return to its previous configuration after a system reset. QUICKSET is invoked with the hexadecimal port address on the command line:

```
QUICKSET 300 PARAMETER VALUE
```

Where PARAMETER and VALUE are the same parameters and values that SET4I29 uses. For example:

```
QUICKSET 320 CABLETYPE THIN
```

Would set the 4I29 at 0320H to use the BNC interface.

LINKOK

LINKOK is a simple utility to test the status of the 10BaseT link, and optionally switch the 4I29 cable type to 10 baseT. LINKOK is invoked with the hexadecimal port address on the command line:

```
LINKOK 300 [AUTO]
```

If the optional parameter AUTO is supplied, LINKOK will change the CABLETYPE setting to 10BASET if the 10BaseT link status is ok. This can be used to automatically select the 10BaseT port if the RJ 45 cable is installed. The CABLETYPE will revert to the original 4I29 card settings after a hardware reset. LINKOK should be run before any network software.

SHOW4I29

SHOW4I29 is a utility program that displays some of the current 4I29 setup parameters and the 4I29 Ethernet address. The COMPATIBLE option and the PROMLOC option are not readable, so they are not displayed. SHOW4I29 is invoked with the hexadecimal port address on the command line:

```
SHOW4I29 300
```

Because it is possible to forget the port location of a 4I29 card, the port address on the command line can be replaced with 'S' or'?'. This causes SHOW4I29 to look for the 4I29 card by probing all of the possible 4I29 I/O addresses. You should not use the (S)earch option if you know the 4I29 port address, as it is not guaranteed to work in all cases.

SHOW4I29 should not be run after network software is installed, or unpredictable behavior may result.

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INTERFACE CONNECTORS

10BASE2 CONNECTOR

Depending on 4I29 model, the 4I29 may have a BNC connector for connection to 10Base2 (Cheapernet) networks. This connector is marked P1. When the BNC connector is used, a BNC TEE must be connected to the 4I29's BNC connector if the Ethernet coax does not end at the 4I29. If the coax ends at the 4I29, a 50 Ohm terminator must be installed. This terminator can be a BNC terminator if the BNC TEE is used, or the internal 4I29 termination option can be used.

10BASET CONNECTOR

Depending on 4I29 model, the 4I29 may have a 8 pin modular telephone type jack for use with 10BaseT twisted pair networks.This connector is marked P5. When twisted pair networks are used, a 10BaseT hub must be supplied. You cannot simply connect from one interface card to another when twisted pair cable is used.

AUI CONNECTOR

An AUI connector is provided for connecting to external transceivers. This connector is a 16 pin header. When a flat cable with a female header at one end, and a female D-SUB connector at the other end is plugged onto the 16 pin header, the D-SUB pinout matches the AUI standard pinout. This flat cable is available from MESA. If you make your own cable, note that pin 16 of the flat cable is not used. The flat cable should be less than one foot long, as it is not a good impedance match to the 78 Ohm twisted pair transceiver cables. 12V power on the AUI connector is directly connected to the PC/104 bus 12V system power.

EXTERNAL TRANCEIVER OPTION

The 4I29 is available with a low cost external 10Base2 tranceiver option. This panel mount BNC tranceiver allows simple external access to the 10Base2 connector without depending on the PC/104 stack location. This tranceiver connects to the 4I29's AUI connector with a 20 pin flat cable and gets its isolated power from the 4I29's DC-DC converter. This flat cable must be 1 foot or shorter in length . When installing the flat cable, make sure that the pin one mark on the cable is aligned with the white dot on connector P4. When the external tranceiver is used, you must also move jumper W1 to the down position to disconnect the local BNC tranceiver.

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INSTALLATION

GENERAL

When the 4I29 has been properly configured for its application, it can be inserted into a PC/104 stack. The standoffs should then be tightened to secure the 4I29 in its place. When the 4I29 is secured in the stack the I/O connectors can be plugged in from the side.

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REFERENCE INFORMATION

SPECIFICATIONS

	MIN	MAX	UNIT	NOTES
POWER SUPPLY				
Voltage	4.5	5.5	V	
Supply current (5V)	---	125	mA	(AUI, 10BaseT)
Supply current (5V)	---	250	mA	(10Base2**)**
BUS LOADING:				
Input capacitance	---	15	pF	
Input leakage current	---	5	uA	
Output drive capability	150	---	pF	
Output sink current	12	---	mA	
ENVIRONMENTAL:				
Operating temperature range				
-I version	-40	+85	°C	
-C version	0	+70	°C	
Relative humidity	0	90	Percent	
			Non-condensing	

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With regard to any product returned within 2 years of purchase, said repairs or replacement will be made without charge. If the failure has been caused by misuse, neglect, accident, or abnormal conditions of operation, repairs will be billed at a nominal cost.

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If any failure occurs, the following steps should be taken:

1. Notify Mesa Electronics, giving full details of the difficulty. On receipt of this information, service data, or shipping instructions will be forwarded to you.

2. On receipt of the shipping instructions, forward the product, in its original protective packaging, transportation prepaid to Mesa Electronics. Repairs will be made at Mesa Electronics and the product returned transportation prepaid.

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SCHEMATICS

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