AJ010
Startup Guide

Version 2.03

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Atmark Techno, Inc.
http://www.atmark-techno.com/

Armadillo Official Site
http://armadillo.atmark-techno.com/

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1. Introduction

Thank you for purchasing the Armadillo-J [AJ010].

The Armadillo-J is an ultra-compact network computer with Ethernet, Serial and GPIO interfaces.

It can be easily used for Serial-Ethernet conversion and external device control via GPIO in its shipped state.

Additionally, the Armadillo-J comes with “µClinux” as its standard operating system, allowing the user to utilize Linux’s extensive software resources by rewriting the content of the Flash ROM. The user can also use GNU assembler and C-compiler to execute his or her own programs.

■

This manual explains how to use the various Armadillo-J functions that are available in its shipped state. (If you want to customize the Armadillo-J, refer to “User’s Guide”.

The standard Armadillo-J has the following features:

◆ Easily Configurable from Windows

With the Windows-compatible “Armadillo-J Configuration Tools”, you can easily configure the network, serial communication and general purpose I/O (GPIO).

◆ Serial－Ethernet Conversion

The Armadillo-J allows the user to control serial devices via Ethernet and bridge serial devices to one another via Ethernet from a PC.

◆ Remote Monitoring/Controlling GPIO

The Armadillo-J allows the user to easily monitor the input status and configure output of GPIO, and send notification when the input status changes.
It also uses the SNMP network communication protocol to enable automatic remote control of GPIOs using a simple program.

Note: Firmware with version number 2.00 or earlier does not support the above functions. If the product has version 2.00 or earlier, please upgrade the firmware using (image/recover.img) contained in the supplied CD as according to User’s Guide, Chapter 5 “Rewriting the Flash Memory”.

2. Precautions

2.1. Safety Precautions

Read carefully the following safety precautions to assure correct use of the Armadillo-J.

This product uses semiconductor components designed for generic electronics equipment such as office automation equipment, communications equipment, measurement equipment and machine tools. Do not incorporate the product into devices such as medical equipment, traffic control systems, combustion control systems, safety equipment and so on which can directly threaten human life or pose a hazard to the human body or property due to a malfunction or failure. Moreover, products incorporating semiconductor components can be caused to malfunction or fail due to a foreign noise or surge. To avoid injury, death or loss of property in the case of malfunction or failure, be sure to take all possible safety measures.

2.2. Operational Precautions

To avoid permanent damage to the Armadillo-J, the following operational precautions must be observed when operating the product.

- Power-on:
  While the Armadillo-J or peripheral circuits are supplied with power, be sure not to connect or disconnect a GPIO connector.

- Static Electricity:
  Armadillo-J incorporates CMOS devices. Until the product is used, store it safely in the provided antistatic package.

- Latch-up:
  Due to excessive noise or surge from the power supply or I/Os, or rapid voltage fluctuations, the CMOS devices incorporated in the product can cause a latch-up. Once latch-up occurs, this situation continues until the power supply is disconnected. As a result, it can damage the device. It is recommended to take safety measures such as adding a protection circuit into the noise-susceptible I/O lines or not sharing the power supply with devices that can be the cause of noise.

2.3. Software Precautions

- Software contained in this product:
  The software and documentation contained in this product are provided “AS IS” without warranty of any kind including any warranty of merchantability or fitness for a particular purpose, reliability, or accuracy. Furthermore, Atmark Techno, Inc. does not guarantee any outcomes resulting from the use of this product.

2.4. Trademarks

Armadillo is a registered trademark of Atmark Techno, Inc.

Other company and product names are registered trademarks or trademarks of the respective companies or organizations.

3. Setup

3.1. Component Names

Each Armadillo-J component name and their functions are described below.

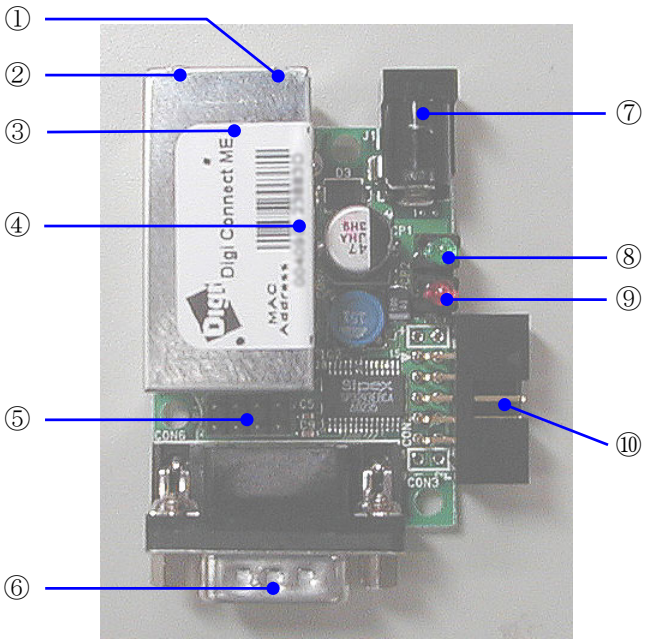

Figure 3-1 Armadillo-J Interfaces

① LANLink LED (Yellow)
Represents link status of LAN.

② LED (Green)
Unused (lights at all times while powered)

③ LAN Connector
A connector used to connect a LAN cable. PoE (Power over Ethernet) is supported.
Note: The Armadillo-J LAN connector is somewhat deep compared to other generic products. We therefore recommend the use of a long nailed LAN cable.

④ MAC Address

⑤ Jumper Pins
For detailed information on jumper pin setting, refer to Chapter 5 “Interface Specifications” in the Hardware Manual.

⑥ Serial Connector
A connector used to connect a serial cable.

⑦ Power Connector
A connector used to connect an AC adapter within a range of DC8V to 48V.

⑧ Power LED (Green)
Represents the power status of the Armadillo-J. It lights while power is on.

⑨ Status LED (Red)
This LED shows the boot status of the Armadillo-J. It lights after boot up completes.

⑩ Extension Connector
This connector is only available on Armadillo-J (AJ010-CB0).

3.2. Preparations

The following components are normally required when using Armadillo-J.

- Serial Cable
  (Dependent on the type of devices connecting to the Armadillo-J, a cross-cable or straight-cable is used. For PC connection, a cross-cable is used).
- LAN Cable (Category 5 or higher straight-cable)
- AC Adapter (8-48V) or PoE (Power Over Ethernet) compatible HUB

3.3. Setting the Armadillo-J in its Case

Set the Armadillo-J in its case and fit it with the supplied screws as shown in Figure 3-2.

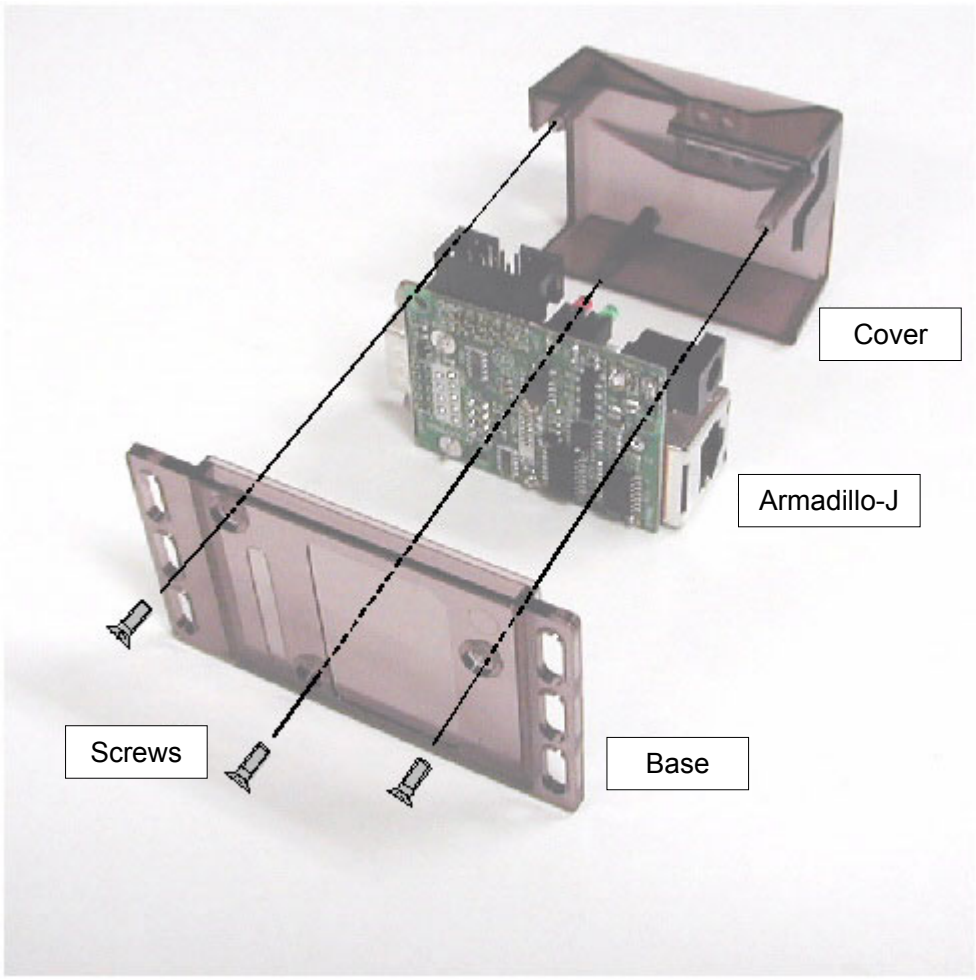

Figure 3-2 Setting Armadillo-J in a Case

Caution: Turning the screws too tightly can damage the case.

3.4. Connecting Cables

Properly connect a serial cable and a LAN cable.

3.5. Power-on

The Armadillo-J supports not only a normal AC adapter but also power supply via PoE.

If an AC adapter is used, connect the adapter to the power connector. While, if PoE is used, connect a LAN cable to the LAN connector.

Caution: If power is supplied from both the AC adapter and PoE simultaneously, it can cause the system to accidentally restart.

When the Armadillo-J is powered on, the power LED lights and it automatically starts its boot process. When the boot process is completed, the status LED turns on. It takes approximately five seconds from power-on to the completion of the boot process.

3.6. Shutting down the Armadillo-J

Disconnecting the AC adapter causes the Armadillo-J to shut down (if PoE is being used, disconnecting the LAN cable does the same).
Be careful not to power off the Armadillo-J while it is applying changes to its internal settings, as these settings may not be saved properly. A subsequent section describes how the Armadillo-J makes changes to its internal settings.

4. Network Settings

4.1. Starting the Armadillo-J Configuration Tool

Network configuration is performed using the “Armadillo-J Configuration Tool” (tools/discover.exe) contained in the supplied CD. This tool works on Windows98, Windows2000 and Windows XP.

After coping Armadillo-J Configuration Tool to an appropriate folder, double-click the icon to start it. When started, the following screen appears.

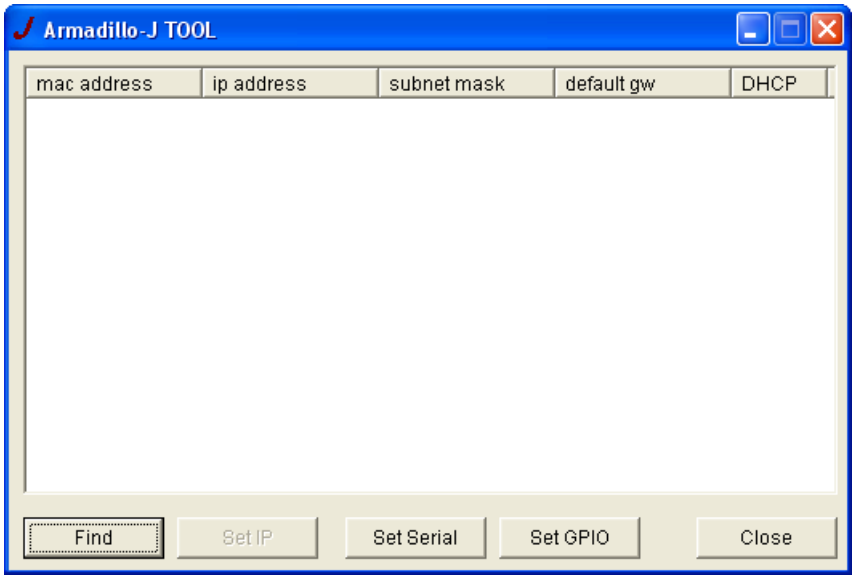

Figure 4-1 Armadillo-J Configuration Tool Screen

To uninstall Armadillo-J Configuration Tool, delete the copied file.

4.2. Searching for the Armadillo-J

Click the “Search” button on Armadillo-J Configuration Tool to start searching for the Armadillo-J.

Discoverable Armadillo-Js are limited to those within the area where “broadcast packets” sent from the PC using Armadillo-J Configuration Tool can reach. (Normally, broadcast packets do not reach the area exceeding a router).

When Armadillo-J Configuration Tool finds an Armadillo-J, network information concerning the Armadillo-J is displayed on the screen.

If more than one Armadillo-J is present, multiple information sets are listed. In this case, specify the desired Armadillo-J by its MAC address. You can find the MAC address on the top of the device. (Refer to Section 3.1 “Component Names”).

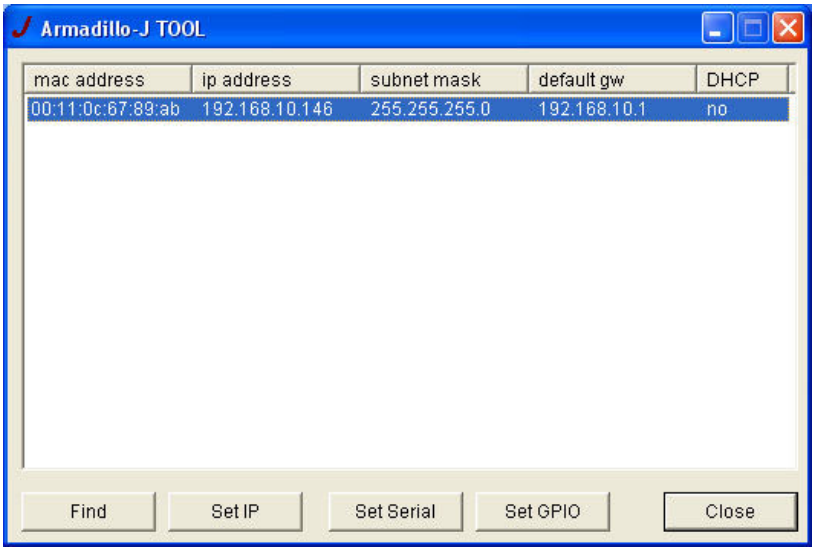

Figure 4-2 Screen after Searching

4.3. Changing Network Settings

Select from the list the Armadillo-J whose internal settings you want to change and press the “Set IP” button or double-click it on the list to display the “Set IP Dialog”.

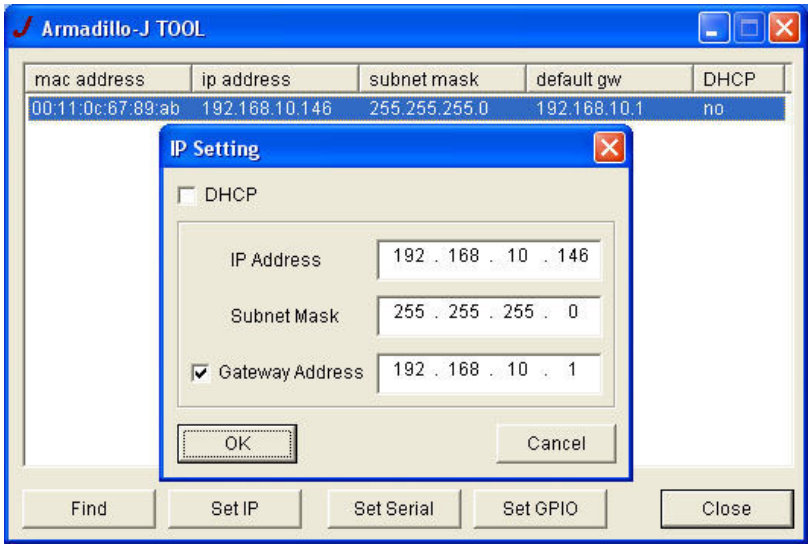

Figure 4-3 Network Configuration Dialog

Set the network parameters in the dialog and then click “OK” to execute the changes.
(For details about setting these values, consult with your network manager).

Note1: Some time is required to complete the changes to the settings after the “OK” button is clicked. Be careful not to power off the Armadillo-J before it has completed, as the settings may not be saved.

Note2: If DHCP is selected, the previous IP address of the Armadillo-J will still be displayed. This is because the assignment of the new IP address by the DHCP server has not yet been performed. Wait for approximately 10 seconds after changing the settings and then try the “Search” button again. The new IP address will be displayed.

4.4. Exiting Armadillo-J Configuration Tool

Click the “Close” button or ”×” button on the upper right side of the screen to exit Armadillo-J Configuration Tool.

5. Serial Communication

You can control a serial controllable device from a PC by connecting it to the Armadillo-J via LAN.
The serial cable used for this connection must be the same type of cable used for connecting the device to a PC. For more information, refer to the device's manual.
An image of controlling the device from a PC is shown in Figure 5-1.

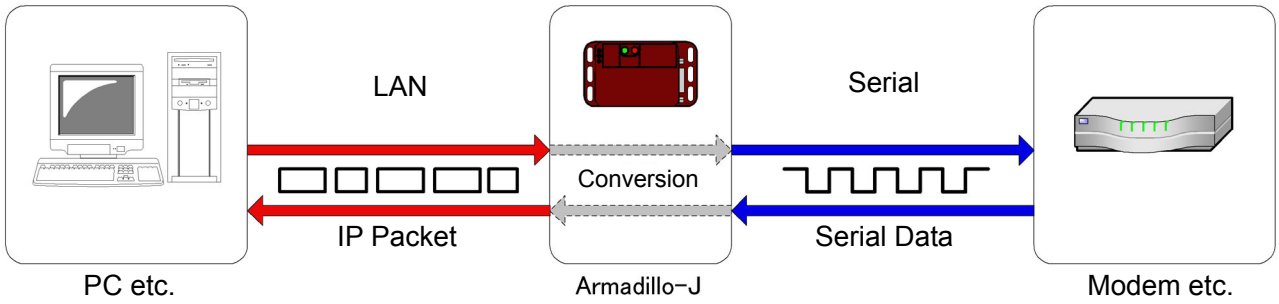

Figure 5-1 Image of Serial Communication

By preparing two Armadillo-Js, you can bridge two serial control devices over Ethernet, or create a network communication program to control a remote device automatically. (When creating a program, specify port number "21347" on the Armadillo-J end).

Note1: When utilizing serial communication, make sure that jumper pins are properly set according to the Hardware Manual, Chapter 5 "Interface Specifications".
Note2: Security measures have not been implemented. Be careful about security when utilizing serial communication.

5.1. Configuring Serial Communication

Start up Armadillo-J Configuration Tool and then press the “Search” button. (For information on how to start up Armadillo-J Configuration Tool, refer to Section 4.1. ”Starting the Armadillo-J Configuration Tool”).

From the discovered Armadillo-J list, select the target Armadillo-J and then press the “Set Serial” button to display the “Set Serial Dialog”. If the target Armadillo-J is not found in the search, press the “Set Serial” button and then specify its IP address within the “Serial setting Dialog”.

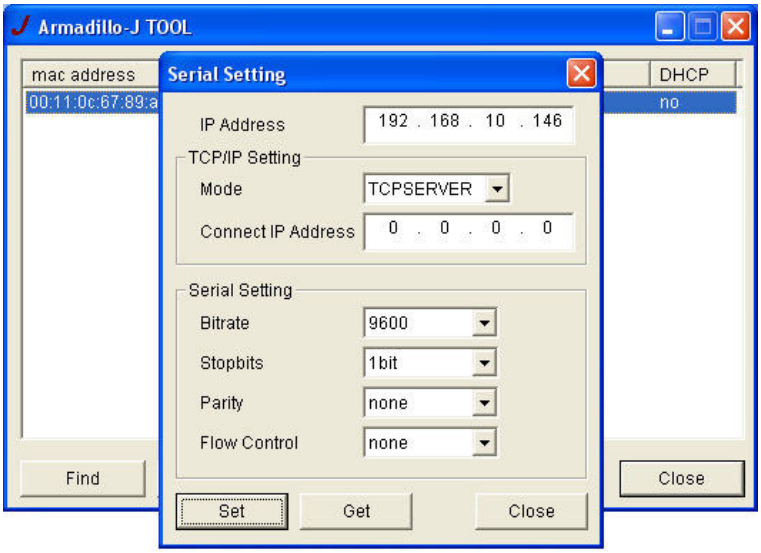

Figure 5-2 Serial Settings Dialog

If the “Get” button on the “Set Serial Dialog” is pressed, current serial settings are displayed.

If you want to change these settings, change the parameters to the desired value and then press the “Set” button. The parameters set in this procedure are retained even after the Armadillo-J is restarted.

The following describes the parameters on the “Serial Setting” dialog.

- IP Address:
  Specify the IP address of the target Armadillo-J whose serial communication settings are to be changed.

- Connection Method:
  This refers to the connection with the Armadillo-J. The following three types of connection methods are available.

1. TCPSERVER
   This is a connection-oriented communication method, being always in standby mode. Once a connection is established, it will not accept other connection requests until disconnected. Furthermore, if the “Connect IP address” is specified, it will not accept other IP addresses for connection. (If the IP address of 0.0.0.0 is specified, it accepts connection requests from any IP address).

   Note: If a connection is released immediately after data is transfer to the Armadillo-J, it will not accept another connection until all the data is completely transferred to serial.

2. TCPCLIENT
   This is a connection-oriented communication method, trying to connect to the specified “Connect IP address” in a short time interval.
   (If the Armadillo-J is used as an Ethernet bridge, set one Armadillo-J to TCPCLIENT and the other Armadillo-J to TCPSERVER).

3. UDP
   This is a connectionless-oriented communication method, allowing simultaneous communication with multiple terminals. It does not insure data arrival and sequence. The data received serially is transferred to the specified destination IP address.

- Connect IP Address:
  This IP address is used to specify the communication target IP address. (The meaning of the IP address differs dependent on the type of connection system).

- Bit Rate:
  This is the data transfer rate. 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200 and 230400 [bps] are available.

- Stop Bit:
  This is the number of stop bits. Either “1” or “2” or can be specified.

- Parity:
  This is used to specify parity. Either “odd number”, “even number” or “none” can be specified.

- Flow Control:
  This is used to specify flow control. Either “none” or “HW Flow” (Hardware) can be specified.

Note: Since SNMP is used in serial configuration, settings can be changed from a MIB browser etc. For more information about MIB used by the Armadillo-J, refer to the “mibs/armadillo-J.mib” file contained in the supplied CD.

5.2. Serial Communication Example

This section describes an example of issuing an AT command to a modem connected serially to the Armadillo-J, utilizing “Hyper Terminal” which is included in Windows as standard.

As sccording to Section 5.1 “Setting Serial Communication”, set connection type to “TCPSERVER” and the various serial communication parameters to the same settings of the connected modem.
In Windows then click “Start”, “Programs”, “Accessories”, “Communications” and “HyperTerminal”. When HyperTerminal starts, “Connection Description” is displayed. Enter an appropriate name and then click “OK”.

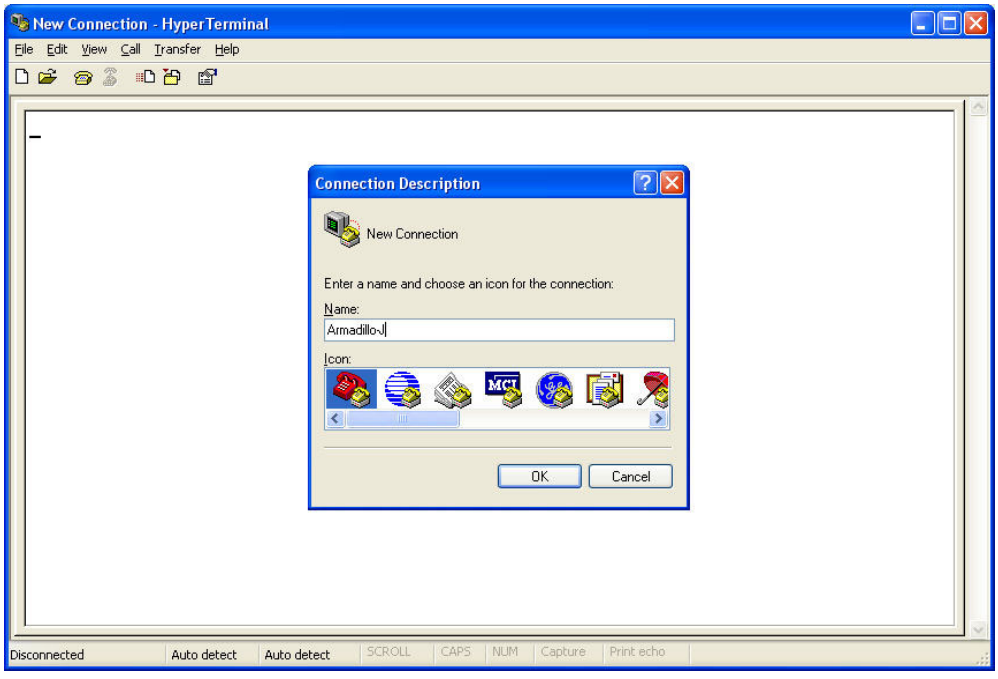

Figure 5-3 Connection Description Screen

A screen for entering a telephone number and other information is displayed. Set “Connection Method” to “TCP/IP（Winsock）”. Enter the IP address of the Armadillo-J in the “Host Address” field and “21347” in the “Port Number” field. Then click “OK”.

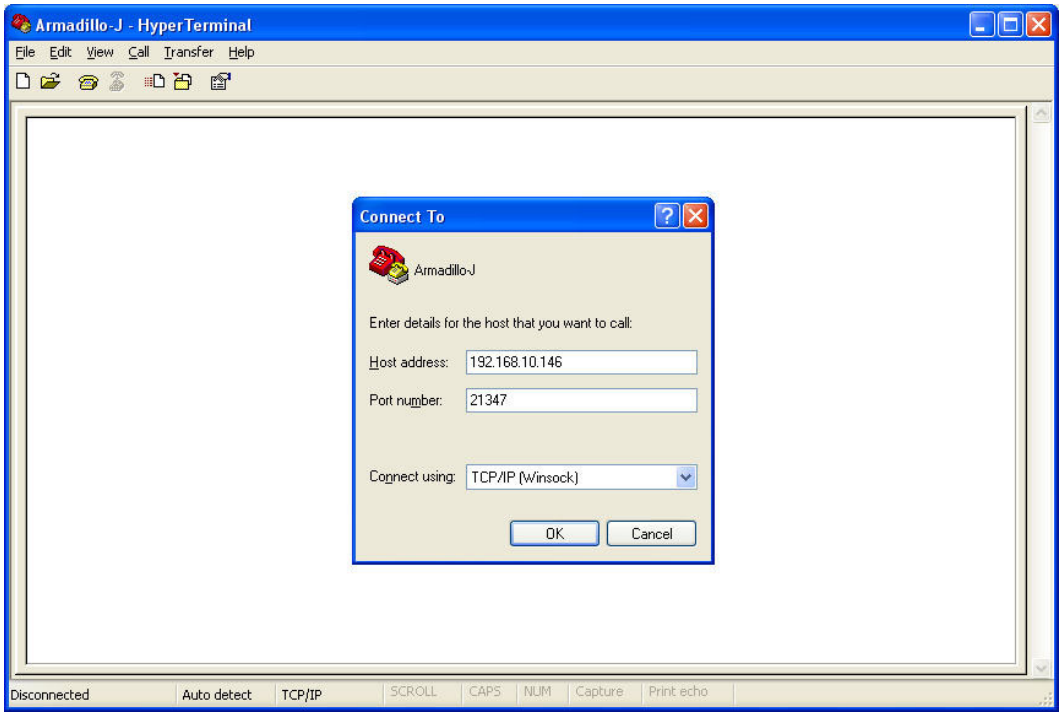

Figure 5-4 Connection Configuration

The connection will be initiated and the cursor will begin to blink in the upper left of the window. The modem will now respond to any commands that are entered.

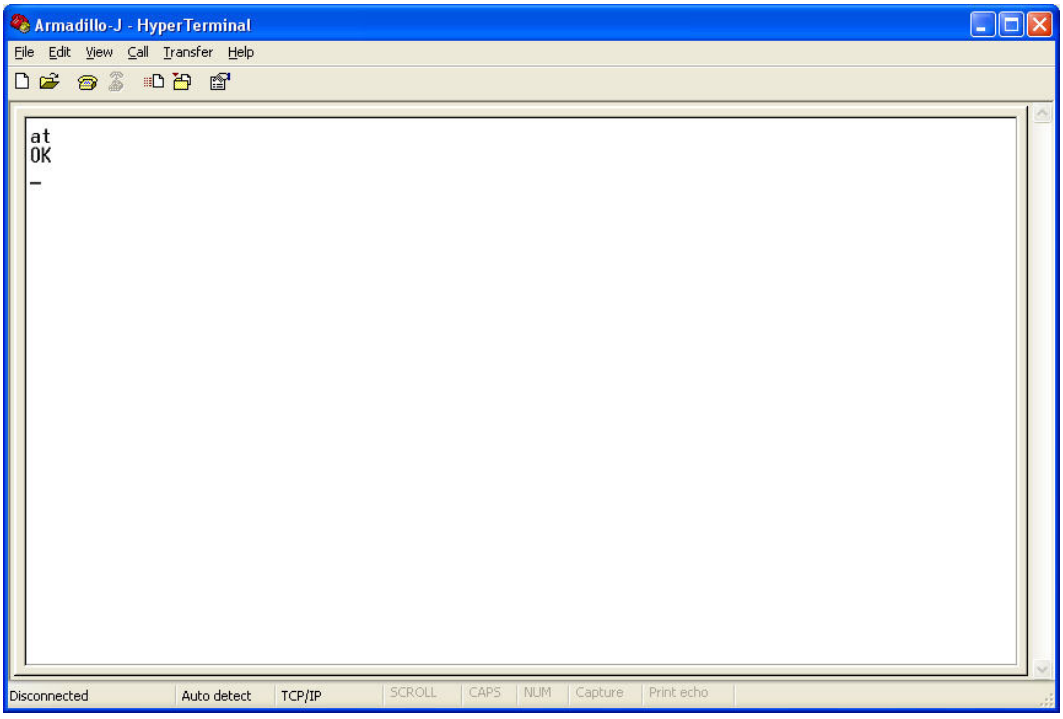

Figure 5-5 Serial Communication Example

6. Controlling GPIO

You can monitor and control Armadillo-J GPIO from a PC or other devices over the network.

The following three are possible:

- Obtaining Input port status
- Setting Output port
- Receiving input port state change notification

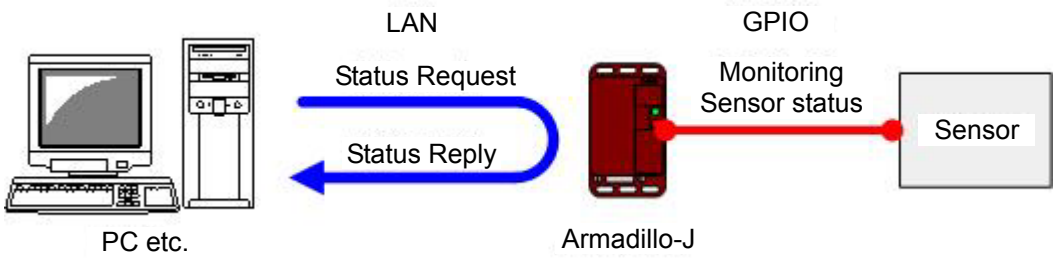

Figure 6-1 Obtaining status of sensor (input port)

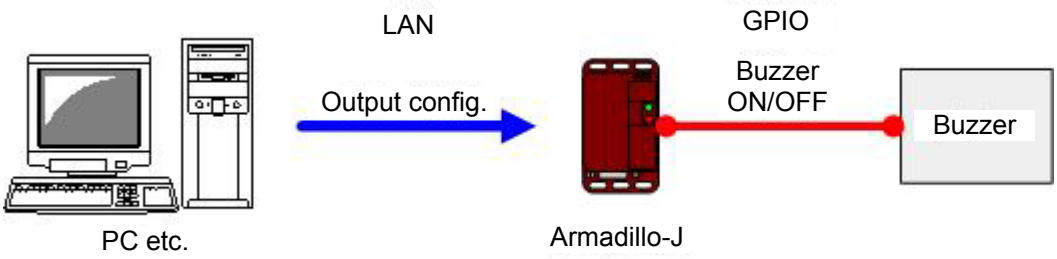

Figure 6-2 Setting the Output of a buzzer (output port)

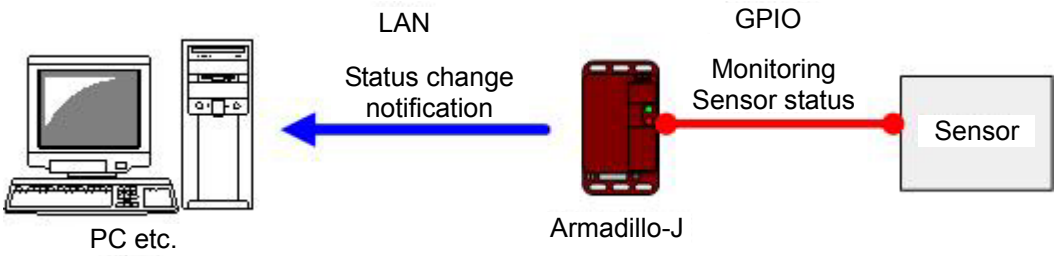

Figure 6-3 State change notification of a sensor (input port)

Note1: When GPIO is used, make sure that jumper pin(s) are properly set, according to the Hardware Manual, Chapter 5 “Interface Specifications”.

Note2: Security measures have not been implemented. Be careful of security when using GPIO.

6.1. Configuring GPIO

First start Armadillo-J Configuration Tool and then press the “Search” button. For information on how to start up Armadillo-J Configuration Tool, refer to Section 4.1 “Starting up Armadillo-J Configuration Tool”.

From the discovered Armadillo-J list, select the target Armadillo-J and press the “Set GPIO” button to display the “GPIO Setting Dialog”. If the target Armadillo-J has not been discovered, press the “Set GPIO” button and specify its IP address within the “GPIO Setting Dialog”.

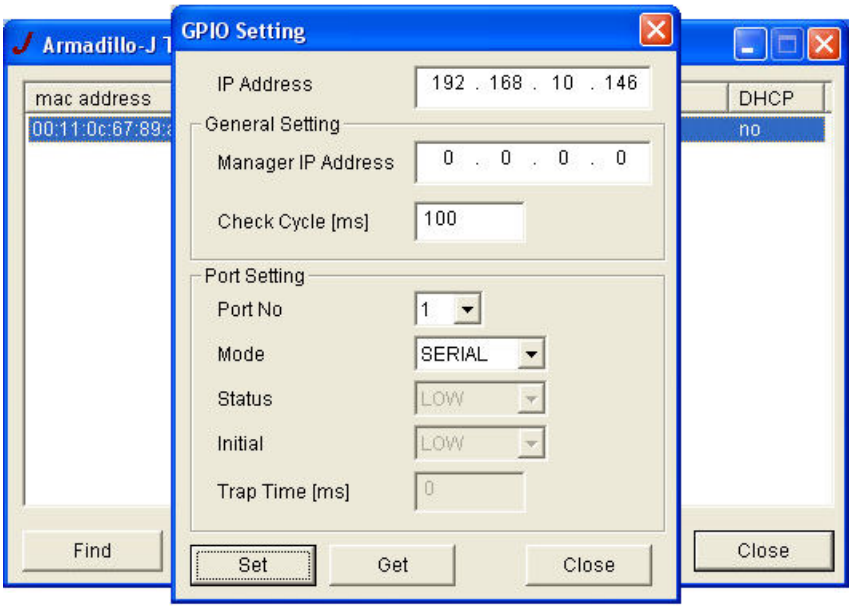

Figure 6-4 Set GPIO Dialog

Pressing the ”Get” button in the “GPIO Setting Dialog” displays the current GPIO settings. If you want to change these settings, set each parameter to its desired value and then press the “Set” button.

The following describes each parameter in the GPIO Setting dialog:

- IP Address:
  This field is used to specify the IP address of the Armadillo-J whose GPIO settings are to be changed.

- Manager IP Address:
  This field is used to the specify IP address of the device which is notified of the state change of the GPIO input port.
  (Notification of state transition is made with SNMP traps).

- Check Cycle:
  This field is used to specify the cycle (ms) at which the GPIO input port state is monitored. Valid setting values are 10ms to 1000ms. (Selecting a lower value enables a higher accuracy of state change, however the Armadillo-J’s processing load will increase).

- Port Number:
  This field is for the GPIO port number. The parameters below are applied to the port number defined in this parameter. Table 6-1 is the mapping table for the Armadillo-J’s CON2. (For details on CON2, refer to the Hardware Manual, Section 5.4 “CON2 (GPIO)”).

Table 6-1 GPIO Port Mapping

Port Number	CON2 (GPIO)
1	PORTA0
2	PORTA1
3	PORTA2
4	PORTA5
5	PORTA6

- Mode:
  This field is used to specify the function to be assigned to each GPIO port. If a port is not to be used as GPIO, set it to “serial”, if it is to be used as an input port, set it to “input”, and if it is to be used as an output port, set it to “output”.
  This GPIO mode setting is retained even when the Armadillo-J is restarted. The default value is “serial”.

- Status:
  This field is used to monitor or set the current value of each GPIO port. However, if GPIO mode is set to ”serial” or “input”, changing a setting value will have no effect.
  Note that GPIO status setting is not retained when the Armadillo-J is restarted.

- Initial:
  This field is used to specify the initial state of each GPIO port when the Armadillo-J is started. However, if GPIO mode at startup is not set to “output”, the setting value will have no effect. It also should be noted that the current GPIO state is not changed.
  The initial state of GPIO is retained even when the Armadillo-J is restarted. The default setting is “LOW”.

- Trap Time:
  This field is used to specify the length of time (ms) that elapses after the state of the GPIO port set to “input” changes before a notification message is generated. The valid values are 30ms to 604800000ms. If a notification is not required, set it to “0”.
  This trap time is retained even when the Armadillo-J is restarted. The default value is “0”.

  Note: Since SNMP is used, the GPIO settings can be configured remotely from a MIB browser etc. For details on MIB used by the Armadillo-J, refer to the “mibs/armadillo-j.mib” file contained in the supplied CD.

6.2. Example of GPIO Utilization

This section describes how to receive a state transition notification message (trap) sent from the Armadillo-J.

To receive the state transition notification message, special software to receive a trap is required, such as:

- NET-SNMP (http://net-snmp.sourceforge.net/)

For information on how to install and use them, refer to the respective HP.

Then change the Armadillo-J GPIO settings. As an example, here the monitoring cycle is set to “100ms”, manager IP address to “192.168.10.2”, port 1 mode to “input” and trap transmit time to “1000ms”. (For the manager IP address, specify the IP address of the PC on which the trap receiving software is running).

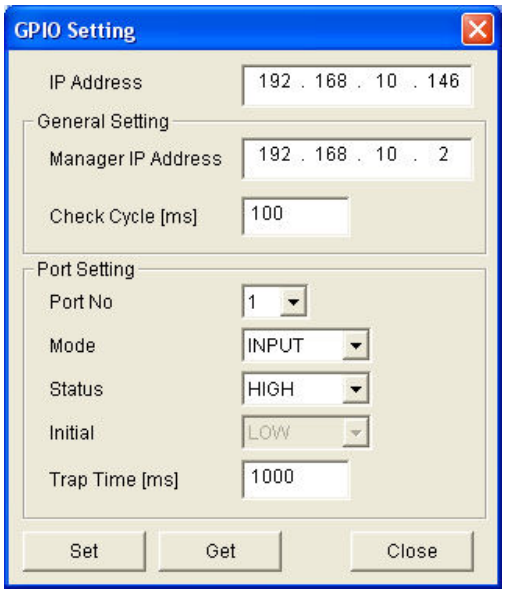

Figure 6-5 Example of GPIO Settings

When the time duration of 1000ms has elapsed since the state of the Armadillo-J GPIO port number 1 (PORTA0 of CON2) was changed, the PC specified with the manager IP address is notified of the state transition.
An example of having received an Armadillo-J trap with NET-SNMP is shown in Figure 6-6.

```
snmphost:/root# snmptrapd -L o -f
2004-12-20 14:40:52 NET-SNMP version 5.1 Started.
2004-12-20 14:40:55 192.168.10.146 [192.168.10.146]:
SNMPv2-MIB::sysUpTime.0 = Timeticks: (32606) 0:05:26.06 SNMPv2-MIB::snmpTrapOID.0 = OID:
ATMARKTECHNO-MIB::changestatus.0 ATMARKTECHNO-MIB::portData.1 = INTEGER: low(0)
2004-12-26 14:41:44 192.168.10.146 [192.168.10.146]:
SNMPv2-MIB::sysUpTime.0 = Timeticks: (32826) 0:05:28.26 SNMPv2-MIB::snmpTrapOID.0 = OID:
ATMARKTECHNO-MIB::changestatus.0 ATMARKTECHNO-MIB::portData.1 = INTEGER: high(1)
```

Figure 6-6 Example of Having Received a Trap

7. Troubleshooting

7.1. Unable to boot the Armadillo-J

- Check to see that the power LED lights on. If it doesn't, make sure that the power cable is properly connected.

7.2. Unable find a Armadillo-J from Armadillo-J Configuration Tool

- Make sure that LANLinkLED lights on. If it doesn't, properly connect a LAN cable.
- Make sure that a router is not present between the PC using Armadillo-J Configuration Tool and the target Armadillo-J. If a router is present between them, the Armadillo-J cannot be discovered.

7.3. Unable to configure Serial/GPIO with Armadillo-J Configuration Tool

- The Armadillo-J firmware may be an old version.
  Following the User's Guide, Chapter 5 "Rewriting the Flash Memory", replace the firmware with that contained in the supplied CD (image/recover.img).

7.4. IP address becomes 0.0.0.0 when DHCP is used with Armadillo-J Configuration Tool

- Make sure that a DHCP server is present within your network.
- There are cases when the IP address might be displayed as 0.0.0.0 during the time between choosing DHCP and the acquisition of an IP address. Once around 10 seconds have passed after making the changes, try a search once more.

7.5. Unable to use serial communication function

- Make sure that the IP address of the Armadillo-J is correctly specified.
- Make sure that the port number of 21347 is correctly specified.
- Following the Hardware Manual, Chapter 5 "Interface Specifications", make sure that all jumpers are properly set.
- Following section 5.1. "Setting Serial Communication", make sure that serial communication settings are the same with those for the connected device.

7.6. Unable to monitor or set GPIO state

- Make sure that the IP address of the Armadillo-J is correctly specified.
- Following section 6.1 "Setting GPIO", make sure that each port mode is properly set.

7.7. Unable to receive GPIO state change notification

- Following section 6.1 "Setting GPIO", make sure that the port mode is set to "input".
- Following section 6.1 "Setting GPIO", make sure that trap time is set to a value other than "0".
- Following section 6.1 "Setting GPIO", make sure that manager IP address is properly set.

Appendix.A SNMP Specifications

Specifications of the SNMP used by the Armadillo-J are shown in Table A-1.

Table A-0-1 Armadillo-J SNMP Specifications

Port Number for Agent	161
Trap Version	SNMP v2c
Destination Port Number for Trap	162
Trap Transmit MIB Data	armadillo-j.parallel.portTable.portEntry.portData.1-5
MIB Definition File	Contained in the development kit CD (mibs/armadillo-j.mib)

Appendix.B Serial Port Configuration List

Serial port settings supported by the Armadillo-J are shown in Table B-1.

Table B-0-1 Armadillo-J Serial Port Setting List

Parameter	Valid Value	Default Value
Data Rate	600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bps	9600
Data Length	8bit	8bit
Stop Bit	1bit, 2bit	1bit
Parity	None, odd, even	None
Flow Control	None, hardware	None

Revision History

Ver.	Date	Description
1.00	2003.12.24	・Initial release
1.01	2004.01.06	・Addition of revision history
1.02	2004.01.15	・Correction to MIB name in Table 8-4 “Trap Transmission Time”. ・Addition of cautions when using DHCP (on section 4.3. “Changing Network Setting”). ・Addition of description regarding simultaneous utilization of PoE and AC adapter (on section 3.5. “Power-on”).
1.03	2004.01.22	・Deletion of description regarding Ethernet bridging of serial devices (on Chapter 1 “Introduction”).
2.00	2004.02.19	・Entire correction
2.01	2004.04.09	・Addition of description regarding a reconnection (on section 5.1 “Setting Serial Communication”).
2.02	2004.09.03	・Correction of typographical error
2.03	2004.12.20	・Updated company address

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