



# *JNIOR Series 3*

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A Network I/O Resource  
Utilizing the JAVA™ Platform

## Getting Started Manual

Release 3.2

NOTE: JNIOR OS 3.4 or greater required

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# 1 WHAT'S INCLUDED

The JNIOR is shipped with the following items:

- **JNIOR (either one of the following)**

- JNIOR Model No. JNR-100-003A (Aux Serial Port has 5-pole connector)
- JNIOR Model No. JNR-100-003B (Aux Serial Port has DB9 connector)

- **Connector Kit – 5-Piece (Model -003A) or 6-Piece (Model -003B)**

<u>Connection</u>	<u>Type</u>	<u>Quantity</u>	
○ Power	4 Pin terminal connector	1	
○ Digital Inputs	8 Pin terminal connector	2	
○ Relay Outputs	8 Pin terminal connector	2	
○ Aux. Serial	5 Pin terminal connector	1	(Model -003A only)

- **Power Adapter (optional) – includes extra 4 pin terminal connector**

- **Serial Cable – straight through DB9 to DB9 cable (initial purchase only)**

- **JNIOR CD (with your initial JNIOR) Containing:**

- **JNIOR Support Tool** – PC Software for configuring your JNIOR IP settings and updates
- **Documentation** – User Manuals, Technical Manuals and Drawings
- **JNIOR Software Development Kit (SDK)** and Sample Software
- **Miscellaneous Tools**

CD Homepage



The JNIOR CD contains our JNIOR Support Tool for easy network (IP) configuration, software updates and file management

## 2 INTRODUCTION TO THE JNIOR

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**JNIOR**, a Network I/O Resource utilizing the JAVA™ platform, is a cost effective interface that communicates over a network using TCP/IP via an Ethernet Port and/or via its serial port. JNIOR is a general-purpose I/O device that is easily configurable for remote control and monitoring of your equipment or process via the built-in web pages or by enabling the built-in software applications or via interaction with an application running on another computer. The TCP/IP connectivity allows the JNIOR to be easily connected with other computers over an Ethernet network using the JNIOR protocol, the standard Modbus TCP protocol and/or via OPC.

JNIOR contains an HTTP Server to host its own web pages, and File Transfer Protocol (FTP) and Telnet servers, for transferring data files, loading software, system configuration, and maintenance. The JNIOR is also an e-mail client capable of sending e-mails, with attachments, based on alarms or system events.

The JNIOR contains 8 digital inputs and 8 relay outputs, and can be expanded with plug and play analog expansion modules (4 – 20 mA, +/- 10 VDC, RTD), 4 Relay Output expansion modules and/or digital temperature sensors.

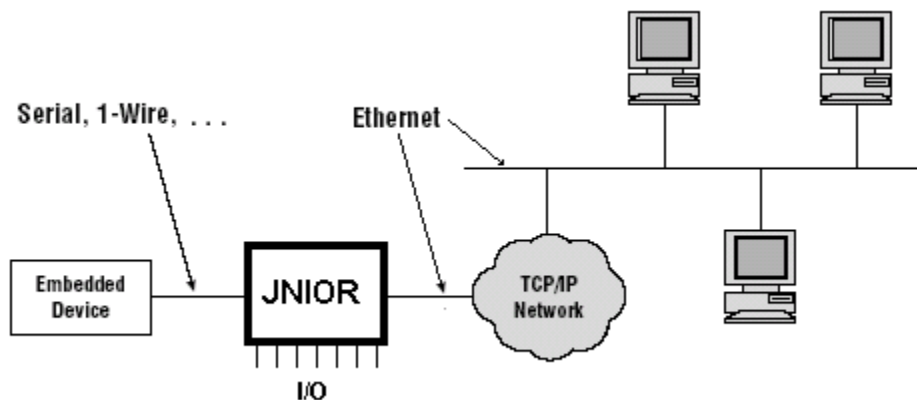
The JNIOR includes three applications that can be easily enabled and configured by the user:

- **Serial-to-Ethernet Server** – allows the JNIOR to act as a serial to Ethernet converter
- **Serial Control** – allows the user to interact with the JNIOR I/O via the serial port
- **Task Manager** – allows the user to configure Tasks to run Actions at various times, or based on Events, to control outputs, log data or send e-mail

For custom applications, a Java Virtual Machine (JVM) is also available on the JNIOR for implementing application programs written in Java. Please contact INTEG Process Group for more details.

Applications include:

- Remote monitoring and control of equipment
- Serial-to-Ethernet interface
- Interface with legacy systems
- Linking I/O to existing operator interfaces
- E-mail alert



### 3 POWERING YOUR JNIOR

The JNIOR uses a 2-piece terminal connector system for all power and I/O wiring connections allowing for easy installation and/or removal of the JNIOR. The connection details are described in section 5 of this manual. Additional installation information and drawings are provided on the **JNIOR CD**.

The JNIOR can be powered with 9 to 24 volts AC or DC. An optional, wall transformer (AC power converter) for North American outlets is available from INTEG that can be used for converting 120 VAC to 12 VDC @ 1 amp.

The Power Connector is located along the upper left edge of the JNIOR. Note that this is a 4-pin connector. If numbered from one (1) through four (4) from left to right **power is always connected to positions 2 and 3** (middle two connectors). The polarity is irrelevant although it is recommended that the positive (+) lead be connected to position 2.



**JNIOR Model 310**

The left two positions (1 & 2) are internally connected together, as are the right two positions (3 & 4). This is to facilitate the interconnection of the supplied power to other devices and circuits such as input or output devices. If you power the I/O circuits with your JNIOR power supply, please make sure the power supply is sized appropriately.

#### WARNING

**Do not connect the transformer leads both to Positions 1 & 2 or both to positions 3 & 4. This will short the transformer and possibly damage it and/or the JNIOR. Always use a fused/protected power source.**

When a proper power source is connected and turned on the leftmost LED adjacent to the power connector will glow GREEN continuously. The LED to the right may glow ORANGE for several seconds. This orange STATUS LED remains on through most of the JNIOR boot sequence. Later it will flash whenever an external connection is made to the JNIOR via the Ethernet port.

## 4 COMMUNICATIONS SET-UP

In order to utilize your JNIOR via the Ethernet network, you will most likely have to adjust the JNIOR IP configuration to work on your network.

**The JNIOR is shipped with the default IP Address of 10.0.0.201**

The JNIOR supports DHCP for dynamic setting of the JNIOR IP address by a network server, however, this method is normally not recommended because the IP address of the JNIOR may change and prevent your application from finding the JNIOR. The default JNIOR setting is to have DHCP disabled.

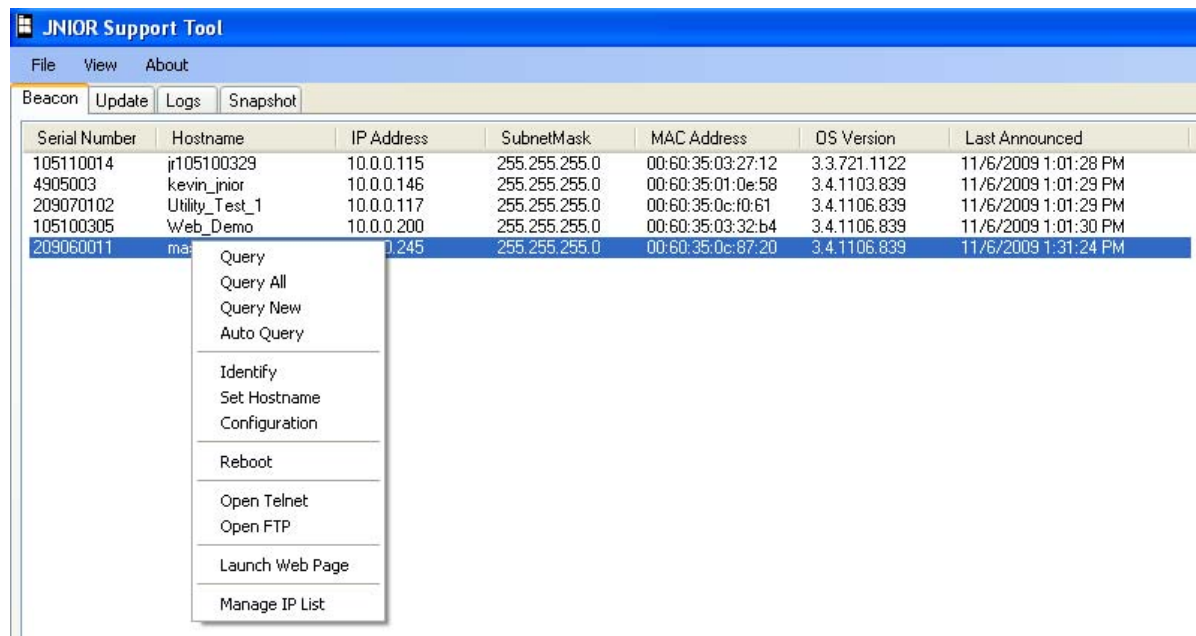
If the above address will not work on your network, then there are several ways to configure your JNIOR IP settings:

- By using the JNIOR **Support Tool** (Beacon tab) provided on the **JNIOR CD**
- Via the RS232 Serial Port and a program such as HyperTerminal

### 4.1 Configuration Using the JNIOR Support Tool

The easiest way to configure your JNIOR is via the JNIOR Support Tool and the JNIOR Beacon functionality. Beacon is built into every JNIOR with OS 3.1 or greater. The JNIOR Support Tool Manual and PC installation application are included on your **JNIOR CD**. The JNIOR Support Tool Manual is installed on your PC under Start – Programs – INTEG – Support Tool.

Simply install the JNIOR Support Tool and then connect an Ethernet cable to your JNIOR and power-up the JNIOR. The JNIOR Support Tool will automatically detect the JNIOR (as long as the JNIOR is on the same local Ethernet network) when the JNIOR completes its boot. Or you can right click in the Beacon Tab and select Query New or Query All. The Manage IP List feature allows you to manually enter JNIOR IP addresses so they can be found across a VPN, routers, etc. Please see the JNIOR Support Tool Manual for additional details on how to use the other features of the JNIOR Support Tool.



By “right clicking” on your JNIOR listed in the window, you can display the Configuration pop-up as shown below. At a minimum, you need to type in your desired JNIOR IP Address and click OK. You should then be able to interact with your JNIOR via your Ethernet network.

The image shows a Windows-style configuration window titled "JNIOR Information". It contains the following fields and options:

- Serial Number:** 209020174
- MAC Address:** 00:60:35:0b:d4:37
- Enable Beacon:** ☒
- Responds to "Query New":** ☒
- Auto Announce:** ☐
- IP Addressing:**
  - ☐ Use DHCP
  - ☒ Use the following IP Config
- IP Addressing fields:**
  - IP Address:** 10 . 0 . 0 . 201
  - Subnet Mask:** 255 . 255 . 255 . 0
  - Default Gateway:** 0 . 0 . 0 . 0
- DNS fields:**
  - Primary DNS:** 0 . 0 . 0 . 0
  - Secondary DNS:** 0 . 0 . 0 . 0
  - DNS Timeout:** 5000 ms
- Domain Name:** (empty text box) with a hint "for example 'integpg.com'"
- Time Zone:** GMT (+0000) (dropdown menu)
- Buttons:** OK and Cancel

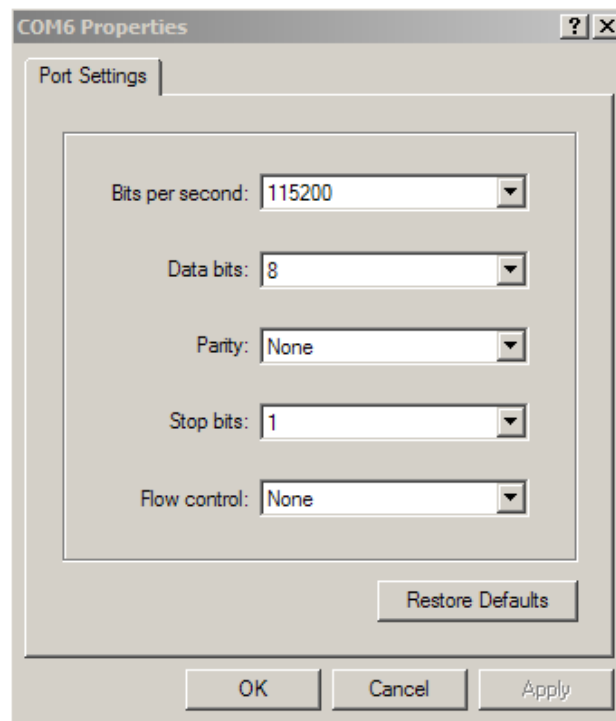
## 4.2 Configuration Using a Serial Connection from Your PC

The alternate way to configure your JNIOR is via the **RS-232 port located along the bottom edge of the JNIOR**. The lower RS232 port is the JNIOR command console port and is a DB-9 connector that utilizes a standard, straight-through, serial cable. INTEG provides a complimentary serial cable with your initial JNIOR purchase. However, this cable requires a DB-9 connector on the PC side, too. You may have to obtain a USB to DB-9 serial cable to work with your computer if your computer does not have a serial port.

You will need to communicate with the JNIOR using a program such as HyperTerminal. This program is standard on all Windows operating systems prior to Vista. If your PC is using Vista (or another operating system), then you may have to download HyperTerminal or use an alternate package or use the JNIOR Support Tool.

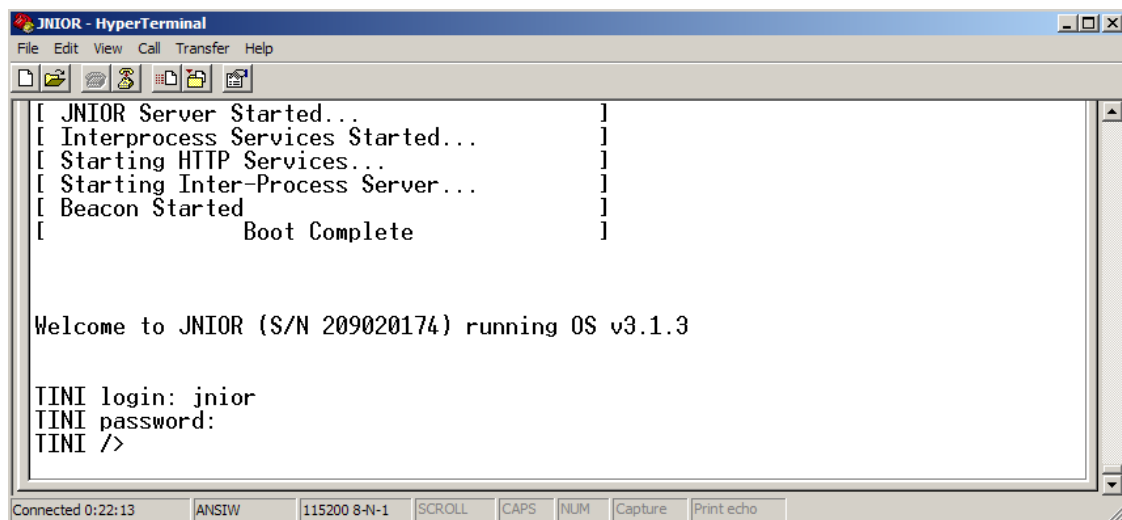
The following instructions are based on using HyperTerminal and having a serial cable connected from your PC (either a serial port or USB port) to the JNIOR RS-232 port.

Your COM properties should be set for 115200 baud, 8 bits, no parity, 1 stop bit, and no handshaking (flow control) and appear as shown below (these are the default settings for the RS-232 port):



If you power-up your JNIOR **after** you have connected your serial cable to the JNIOR and opened a HyperTerminal session, you will see the boot dialog. If you powered-up your JNIOR **before** you have opened a HyperTerminal session, you will not see the Boot dialog. In either case, the JNIOR is ready to accept a login. You may need to hit the ENTER key to obtain the login prompt.

Enter a username for the JNIOR (default is "jnior") and enter a password for the JNIOR (default is "jnior"). If you are successful, your screen should look similar to the following:





You will use the `ipconfig` command to configure the JNIOR Ethernet port for your required static (fixed) IP Address. The `ipconfig` command has several options associated with it and they can be viewed by typing, `help ipconfig` at the command line prompt. The options are shown below:

```
TINI /> help ipconfig
ipconfig [options]

Configure or display the network settings.
[-a IP -m mask] Set IPv4 address and subnet mask.
[-n domainname] Set domain name
[-g IP] Set gateway address
[-p IP] Set primary DNS address
[-s IP] Set secondary DNS address
[-t dnstimeout] Set DNS timeout (set to 0 for backoff/retry)
[-d] Use DHCP to lease an IP address
[-r] Release currently held DHCP IP address
[-x] Show all Interface data
[-h mailhost] Set mailhost
[-f] Don't prompt for confirmation
[-E] commit to EEPROM

TINI />
```

In order to properly configure your JNIOR network settings using `ipconfig`, use the command line shown below. You must enter, at a minimum, your IP address and a mask:

```
ipconfig -a IP -m MASK
```

where:

IP	= desired IP address
MASK	= IP mask

On a private network, such as within a company, the IP address may be something like 169.144.25.10. A common mask would be 255.255.255.0. The command would then look as follows:

```
ipconfig -a 169.144.25.10 -m 255.255.255.0
```

Typing in the above command will result in the following:

```
TINI /> ipconfig -a 169.144.25.10 -m 255.255.255.0
Warning: This will disconnect any connected network users
and reset all network servers.

OK to proceed? (Y/N): y
[ Wed Mar 25 01:37:05 GMT 2009 ] Message from System: FTP server stopped.
[ Wed Mar 25 01:37:06 GMT 2009 ] Message from System: Telnet server stopped.
[ Wed Mar 25 01:37:08 GMT 2009 ] Message from System: Service server stopped.
[ Wed Mar 25 01:37:13 GMT 2009 ] Message from System: Telnet server started.
[ Wed Mar 25 01:37:13 GMT 2009 ] Message from System: FTP server started.
[ Wed Mar 25 01:37:14 GMT 2009 ] Message from System: Remote Service started.

TINI />
```

Other settings, such as a gateway, primary and secondary domain name servers, and a mailhost, may or may not be needed.

- The gateway often, although not always, is the .1 of the IP address. In the above example it would be 169.144.25.1. It allows the JNIOR to get to another segment of the Ethernet network.

- The primary and secondary name servers provide resolution for the aliases that are used for the IP addresses of other devices on the network and for e-mail addresses. If other devices are referred to by their IP address only and not by name or the JNIOR e-mail feature is not being used, then neither name server has to be setup. A Secondary DNS Server is rarely required.
- The JNIOR mail system has been enhanced such that you do not need to enter a MailHost. The JNIOR will use the DNS to resolve the IP address of the mail server for the e-mail you want to send and deliver the e-mail directly. An intermediate e-mail server (MailHost) is not required and it is recommended that you do not configure one.

Your IP settings can be checked by simply typing the `ipconfig` command at the command line and pressing <enter>:

```
TINI /> ipconfig
Hostname       : jr209020174.
Current IPv4 addr.: 169.144.25.10/24 (255.255.255.0) (active)
Current IPv6 addr.: fe80:0:0:0:260:35ff:fe0b:d437/64 (active)
Default IPv4 GW  :
Ethernet Address : 00:60:35:0b:d4:37
Primary DNS      :
Secondary DNS    :
DNS Timeout      : 5000 (ms)
DHCP Server      :
DHCP Enabled     : false
Mailhost         :
TINI /> _
```

While you are logged into the JNIOR, you can also set your date and time. The JNIOR date and time are set during the factory build to GMT. The JNIOR has a real time clock that is battery backed so you may just have to set your time zone. The date and GMT time should be correct.

If the JNIOR is connected to the Ethernet, the time can automatically be synced via the JNIOR Network Time Protocol (NTP). The default website the JNIOR checks is clock.isc.org. However, for this feature to work, you will need to set a DNS and possibly a gateway address.

You can set your JNIOR date and time using the `date` command. Typing `help date` will provide you with the command format. The following example shows you how to set the date for the Eastern Standard Time zone in the USA. The JNIOR will handle daylight savings for the appropriate time zones.

```
TINI /> date
Wed Mar 25 14:12:28 GMT 2009
TINI /> date EST
TINI /> date
Wed Mar 25 10:12:40 EST 2009
TINI />
```

When finished with your HyperTerminal session, type `logout` or `bye` on the command line to end your session and then close the HyperTerminal window.

For more information concerning additional commands available to the user through HyperTerminal or a Telnet session, please see the **Command Line Communications Manual** located on the **JNIOR CD**.

### 4.3 Check Your IP Setting via the Main JNIOR Web Page

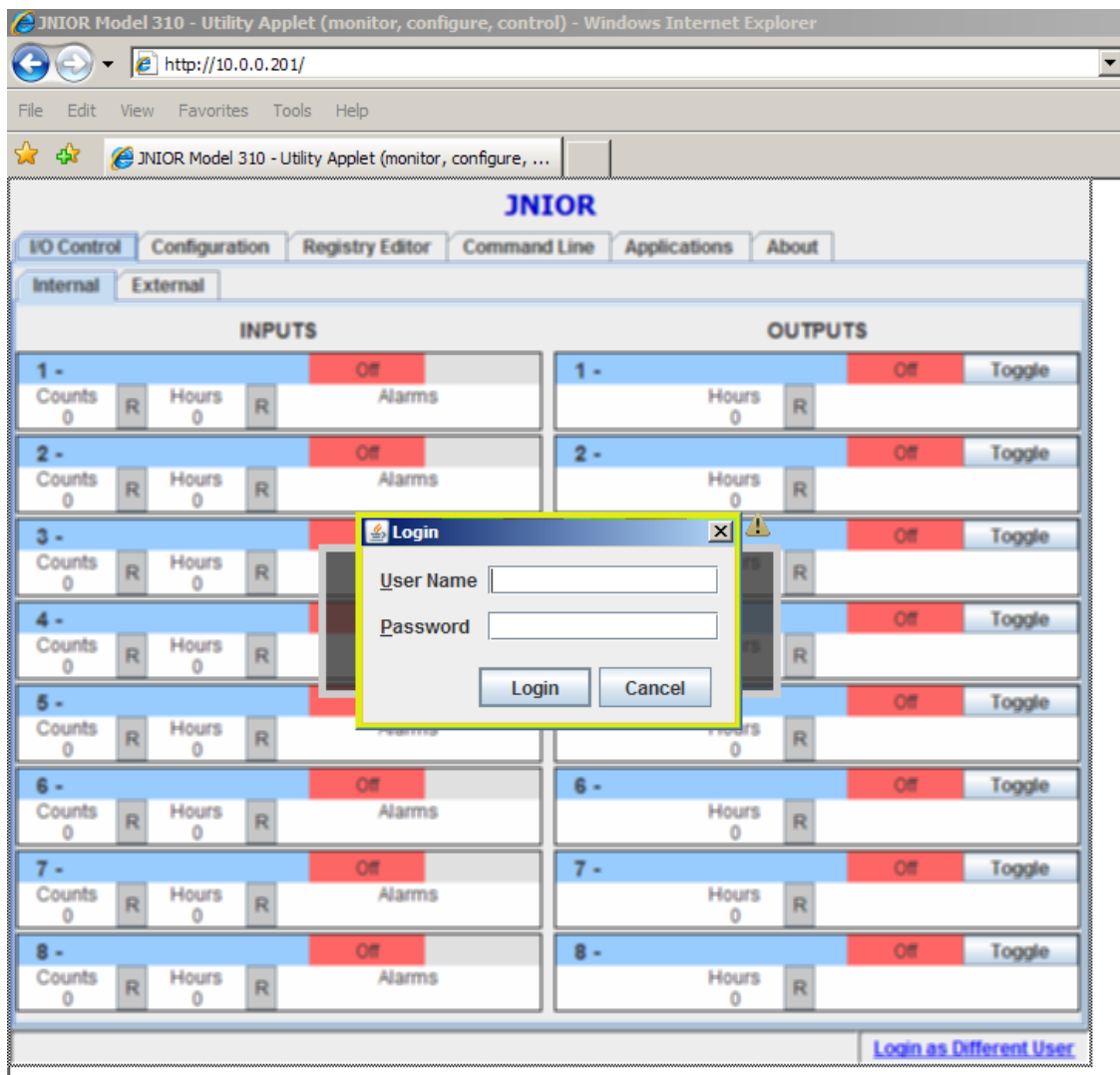
One way to check that your JNIOR is successfully connected to the Ethernet network is to make a Telnet connection to the JNIOR. Another way is to launch the main JNIOR web page. The JNIOR web page works with Microsoft Internet Explorer, Fire Fox and other browsers and requires the Java plug-in (available on most computers or at [www.java.com](http://www.java.com)). To launch the JNIOR web page, open your browser and in the address line of the browser type your JNIOR IP address, for example:

<http://10.0.0.201> (this is the default, use your JNIOR IP address)

**NOTE: The JNIOR web page communicates back to the JNIOR using port 9200**

Once the applet begins to load it should be displayed within 30 seconds depending on the network and other activities the JNIOR is handling. After the JNIOR web page is loaded, the user is asked to login with a valid username and password. You can use the default username (jnior) and default password (jnior). See screen shot below.

Please see the **Web Based Interface Manual installed with the JNIOR Support Tool at Start – Programs – INTEG – JNIOR** and also located on the **JNIOR CD** for more details.



## 5 INTERACTING WITH THE JNIOR

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Once you have your new JNIOR set up on the network, the next step is to determine the best way to integrate the JNIOR into your application.

There are several ways that your new JNIOR can be utilized and integrated into your application. A few of these are highlighted below, with a detailed discussion of each being contained in other documents.

1. Web-Based Browser Screen
2. Serial-to-Ethernet Server
3. Serial Control Program
4. Task Manager Program
5. OPC Server
6. Modbus Server
7. Windows DLL that utilizes the JNIOR Communications Protocol
8. Custom Communications via the JNIOR Communications Protocol

### 5.1 Web-Based Browser Screen

The JNIOR contains its own web pages for system monitoring, manual control and configuration.

A complete explanation of how to use the supplied web pages is in the **Web Based Interface Manual installed with the JNIOR Support Tool at Start – Programs – INTEG – JNIOR** or located on the **JNIOR CD**.

### 5.2 Serial-to-Ethernet Server

The Serial-to-Ethernet function for the JNIOR is a software application that runs on the JNIOR and allows the JNIOR to act as a converter between a serial device connected to the JNIOR and a remote application communicating to the JNIOR via the Ethernet network using TCP/IP.

A complete explanation of how to use the Serial-to-Ethernet server is in the **Serial-to-Ethernet Manual** located on the **JNIOR CD**.

### 5.3 Serial Control Program

The Serial Control function for the JNIOR is a software application that runs on the JNIOR and allows the user to interact with the JNIOR I/O via the serial port. The user can control the relay outputs (on, off, pulse) and receive the status of the digital inputs (on, off) and counters via the serial port.

A complete explanation of how to use the Serial Control Program is described in the **Serial Control Manual** located on the **JNIOR CD**.

### 5.4 Task Manager Program

Task Manager is a program that runs on the JNIOR to provide control, logging and notification capabilities based on time and events.

A complete explanation of how to use the Task Manager Program is in the **Task Manager Manual** located on the **JNIOR CD**.

## 5.5 OPC Server

The JNIOR supports access to data points via OPC communications. An OPC Client can access the JNIOR I/O via the JNIOR OPC Server software (provided on your **JNIOR CD**) by installing the server on a Windows PC.

For detailed information on implementing the OPC Server connectivity, please see the document **Getting Started with JNIOR OPC** located on the **JNIOR CD**.

## 5.6 Modbus Server

The JNIOR supports access to the JNIOR I/O via **Modbus TCP** communications over the Ethernet network. The JNIOR acts as a **Modbus Client** and is accessed by a Modbus Master.

For detailed information on implementing the Modbus connectivity, please see the document **Modbus Protocol Implementation** located on the **JNIOR CD**.

## 5.7 Windows DLL

The JNIOR Windows DLL allows the user to access many of the JNIOR functions through easy to use API calls. By taking advantage of these predefined API calls, the user can easily design custom applications which access all available JNIOR data and functionality without having to know the details behind the JNIOR communications structure. There are many functions in the DLL to accommodate the needs of the developer.

For detailed information on what API calls are available and for detailed instructions on how to take advantage of this Windows DLL, please see the document **Windows Library Reference** located on the **JNIOR CD**.

## 5.8 Custom Communications via JNIOR Communications Protocol

The JNIOR uses a series of custom, well-defined packets of information to send and receive data and requests for data from the JNIOR to whatever application is communicating with it. By implementing the JNIOR protocol communications within their application directly, the user can establish an efficient communications link with the JNIOR and take advantage of all the JNIOR functionality.

For detailed information on the structure of the JNIOR communications protocol, please see the document **JNIOR Communications Protocol** located on the **JNIOR CD**.

## 6 HARDWARE SPECIFICATIONS

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### 6.1 JNIOR Model 310

The **JNIOR Model 310** contains a microprocessor, 1 MB FLASH memory, 2 MB battery-backed RAM memory, and the JNIOR operating system with an integral Java Virtual Machine (JVM).

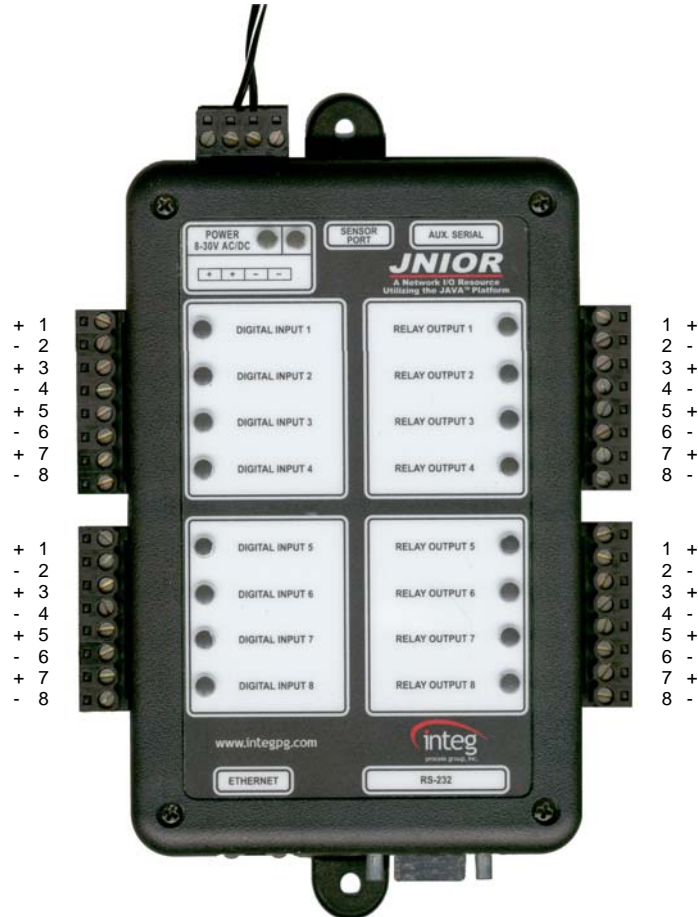
JNIOR's circuit board resides in a protective case with an integral power supply and a variety of general-purpose I/O points. External communications are handled via the Ethernet port, Auxiliary Serial Port and RS232 Serial Port.

The **JNIOR Model 310** specifications are provided in the following table:

<b>Power Input</b>	
Input Voltage	9 to 24 Volts DC or AC, < 400 mA typical
<b>Digital Inputs</b>	
Range	0 to 30 Volts AC/DC
Logic Low input	0 to 1 Volt
Logic High input	2 to 30 Volts
Input Resistance	1.2 K ohm nominal
Response time	1 millisecond
Counter capability	2000 Hz Max (each input)
Isolation	Optically Isolated
Functions	Latching capability – as fast as 1 millisecond
<b>Relay Outputs</b>	
Type	SPST, Form A – 1 Normally Open Contact
Contact Ratings	1 Amp @ 24 Volts AC/DC
Pulse Resolution	1 millisecond pulse increments
<b>RS232 Serial Port (1)</b>	
Communication	DB-9 female with 9 pin DTE pinout
Default Settings	Configurable based on application 115,200 BPS, 8 Data bits, No parity, 1 stop bit, No Flow Control
<b>Aux Serial Port (1)</b>	
Communication	Auxiliary Serial Port – RS232, RS422, RS485
Default Settings	Configurable based on application 9600 BPS, 8 Data bits, No parity, 1 stop bit, No Flow Control
Connector	5-Pole Connector (Model -003A) or DB-9 Female (Model -003B)
<b>Ethernet (1)</b>	
Connection	RJ-45 Connection
Speed	10/100 Mb Auto-Negotiated, Full Duplex
<b>Sensor Port (1)</b>	
Protocol	RJ-11 Connection for Expansion Modules Dallas Semiconductor 1-Wire® or INTEG
<b>Certification</b>	
	TUV Safety Mark (60950) CE FCC Class B

### 6.1.1 Wiring Diagram

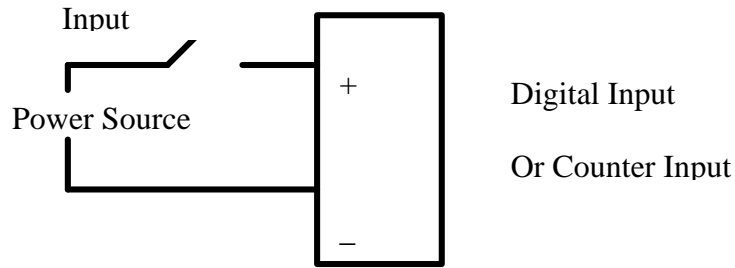
The following diagram provides the user with the pin-outs of the digital inputs and digital outputs with the **JNIOR Model 310**. Please contact INTEG Process Group for additional assistance.



### 6.1.2 Digital Inputs

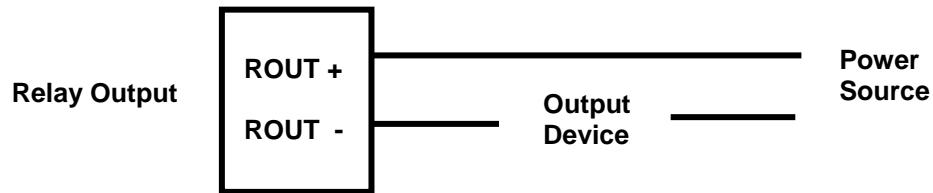
The JNIOR Model 310 is equipped with eight (8) optically isolated digital inputs. Each digital input can accept AC or DC voltage sources in the 0 – 30 V range. An LED associated with each digital input displays the current status of the input. Isolation of each digital input allows you to connect inputs to different sources without the addition of isolation devices. The input voltage must be greater than 2 VDC for the input to register as “on”.

A typical connection would be as follows:



### 6.1.3 Relay Outputs

The JNIOR Model 310 is equipped with eight (8) Relay Outputs with each being a Form A SPST relay (1 Normally Open Contact). Each relay output is independent and isolated from the other relay output. Each relay contact rating is 1A @ 24VDC and the voltage source must be in the range of 5 – 30V AC or DC. A typical connection would be configured as follows:





## Summary

Thank you for purchasing the **JNIOR**. Hopefully this manual made the getting-to-know process of your new **JNIOR** very quick and easy. The **JNIOR** has many more wonderful tools and features available, and are explained in detail in the supplied documents.

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Please do not hesitate to contact our **JNIOR** team at **INTEG Process Group, Inc.** We can be reached via phone, fax or e-mail as follows:

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