



# Series 4 Manual

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# 1 WHAT'S INCLUDED

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The JNIOR is shipped with the following items:

- **JNIOR – one of the following models with the main difference being the I/O mix**
  - JNIOR Model 410      Catalog No. JNR-100-004B      8 inputs 8 outputs
  - JNIOR Model 412      Catalog No. JNR-200-004B      4 inputs 12 outputs
  - JNIOR Model 414      Catalog No. JNR-300-004B      12 inputs 4 outputs
  - JNIOR Model 412DMX      Catalog No. JNR-200-004D      4 inputs 12 outputs, DMX Port

- **Connector Kit – 5-Piece**

<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

- **Power Adapter (optional) – includes 4 pin terminal connector already attached**
- **JNIOR Support Documentation**

Available on our website at <http://www.integpg.com/support/>

- **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**

## 2 INTRODUCTION TO THE JNIOR

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**JNIOR**, a Network I/O Resource utilizing the JAVA™ platform, is a cost effective automation controller that communicates over a network using TCP/IP via an Ethernet Port or via its serial port. The JNIOR is a general-purpose automation controller and I/O device that is easily configurable for 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 or by adding your own applications.

The TCP/IP connectivity allows the JNIOR to be easily connected with other computers over an Ethernet network or the Internet using the JNIOR protocol, web sockets, the standard Modbus TCP protocol and/or via OPC using a third party OPC Server for Modbus software package. Custom protocols can also be added.

The JNIOR Series 4 contains a modern web server to host its own dynamic web pages using web sockets and HTML5 code or custom web pages developed by INTEG or the end user.

The JNIOR contains 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 Series 4 can make 'secure' web and other connections.

The JNIOR contains a mix of digital inputs and relay outputs, and can be expanded with plug and play analog expansion modules (4 – 20 mA, +/- 10 VDC), 4 Relay Output expansion modules (for high voltages), LED Dimmer module, User Control Panel and/or digital temperature and humidity sensors.

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

- **Modbus Slave and/or Modbus Master** – allows the JNIOR to make a Modbus connection and act as either (or both) a slave and a master. Data can be transferred internally between the two.
- **SNMP** – Simple Network Management Protocol – allows the JNIOR to send 'traps' when an input or output goes on or off to network monitoring software applications
- **Serial-to-Ethernet Server** – allows the JNIOR to act as a serial to Ethernet converter
- **Serial Control PLUS** – allows the user to interact with the JNIOR I/O using ASCII commands via the serial port and/or an Ethernet connection
- **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
- **Cinema** – allows the JNIOR to execute macros to fully automate a movie theatre and other presentation facilities to control the lights, sound, projector, etc.
- **Utility Usage Monitoring** – allows the JNIOR to monitor and log the usage of utilities such as electricity, gas, water, etc. and store the data on the JNIOR for user retrieval and/or viewing via the built-in JNIOR web page.

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.

Uses for the JNIOR include:

- Cinema automation
- Lighting and presentation control
- Remote monitoring and control of equipment
- Utility usage monitoring and reporting
- Data acquisition and logging
- 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 6 of this manual. Additional installation information and drawings are provided on our website.

The JNIOR can be powered with 12 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 120/240 VAC to 12 VDC @ 1 amp. An international model is also available with the Euro plug. Other plug types are also available.

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 410



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 BLUE 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.

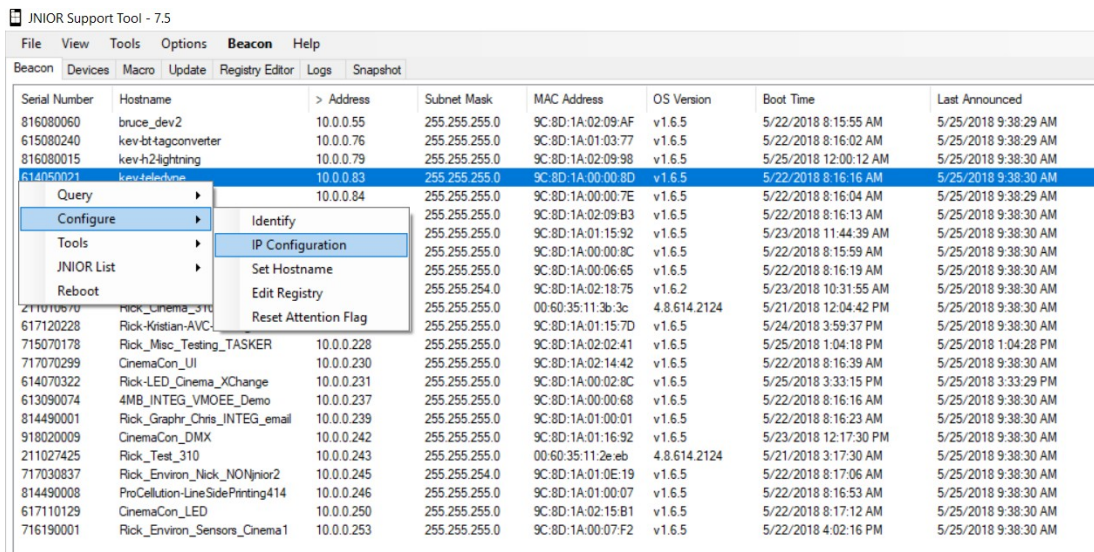
If the above address will not work on your network, then there are two ways to configure your JNIOR IP settings:

- By using the JNIOR **Support Tool** (Beacon tab) provided on our website at the following link:  
<http://www.integpg.com/support/jnior/>
- Via the RS232 Serial Port and a command line window available via the JNIOR Support Tool

### 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 Series 4. The JNIOR Support Tool is available on our website. 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. You may need to adjust your Firewall settings for Beacon to work.



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.

JNIOR Information

Serial Number **715070178** Enable Beacon

MAC Address **9C:8D:1A:02:02:41** "Responds to "Query New"

Auto Announce

Use DHCP

Use the following IP Config

IP Addressing

IP Address

Subnet Mask

Default Gateway

DNS

Primary DNS

Secondary DNS

DNS Timeout  ms

Domain Name   
for example "integpg.com"

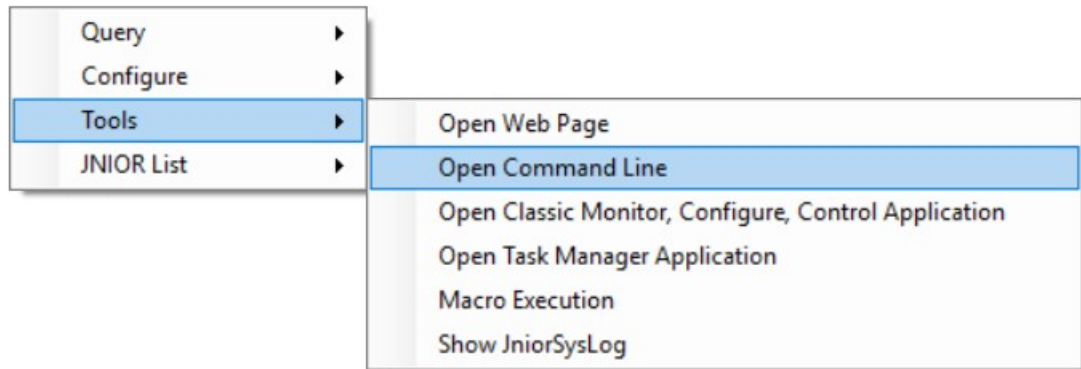
Time Zone

## 4.2 Configuration Using a Serial Connection from Your PC

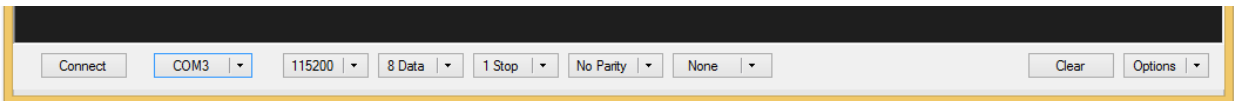
The alternate way to configure your JNIOR is via the **RS-232 port located along the bottom edge of the JNIOR**. The lower RS232 port is the JNIOR command console port and is a DB-9 connector that utilizes a standard, straight-through, serial cable. You will need to use a USB to DB-9 serial cable to work with your computer.

You will need to communicate with the JNIOR using a Command Line window that is available from the JNIOR Support Tool. “Right-click” in the white area on the Beacon tab and select Tools – Open Command Line as shown below.



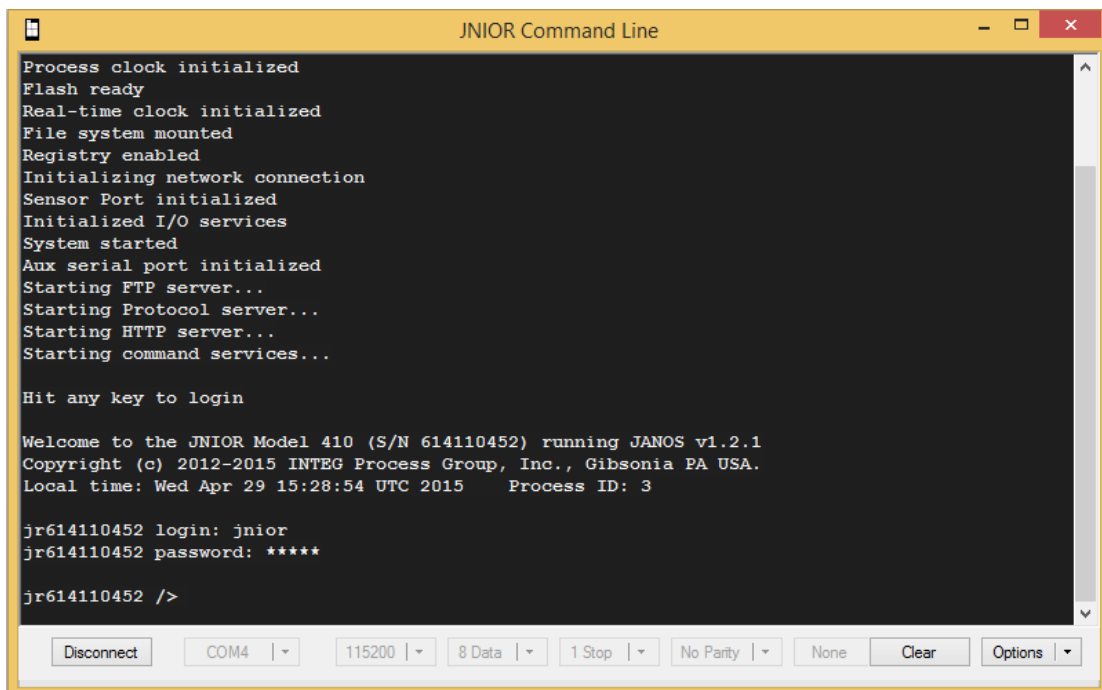


Your COM properties should be set for 115200 baud, 8 bits, no parity, 1 stop bit, and no handshaking (flow control) and appear as shown below (these are the default settings for the RS-232 port):



If you power-up your JNIOR **after** you have connected your serial cable to the JNIOR and opened a command line session, you will see the boot dialog. If you powered-up your JNIOR **before** you have opened a command line 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:

```

JNIOR Command Line
Copyright (c) 2012-2015 INTEG Process Group, Inc., Gibsonia PA USA.
Local time: Wed Apr 29 15:28:54 UTC 2015   Process ID: 3

jr614110452 login: jnior
jr614110452 password: *****

jr614110452 /> help ipconfig
IPCONFIG [options]...

-A ipaddr   Set IPv4 address.
-M mask     Set subnet mask.
-N name     Set domain name.
-G ipaddr   Set gateway address.
-P ipaddr   Set primary DNS address.
-S ipaddr   Set secondary DNS address.
-T millis   Set DNS timeout (set to 0 for backoff/retry).
-D          Use DHCP to lease an IP address.
-R          Release currently held DHCP IP address.
-H ipaddr   Set mailhost IP address
-F email    Set email address.
-U user     Set username (secure password will be requested).
-X          Remove email user credentials.

Configure or display network settings.
jr614110452 />
  
```

In order to properly configure your JNIOR network settings using `ipconfig`, use the command 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, the IP address may be something like 192.168.1.10. A common mask would be 255.255.255.0. The command would then look as follows:

```
ipconfig -a 192.168.1.10 -m 255.255.255.0
```

Other settings, such as a gateway, primary and secondary domain name servers, and a mail host, 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 192.168.1.1. It allows the JNIOR to get to another segment of the Ethernet network.
- The primary and secondary domain name servers (DNS) 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 DNS server has to be setup.

- The JNIOR Series 4 email system requires a Mail Host. Please see the Email Application Note for additional details on how to configure the JNIOR Series 4 to send email.

Typing in the above command will result in the following. Your IP settings can be checked by simply typing the `ipconfig` command at the command line and pressing <enter>:

```

JNIOR Command Line
-R          Release currently held DHCP IP address.
-H ipaddr  Set mailhost IP address
-F email   Set email address.
-U user    Set username (secure password will be requested).
-X         Remove email user credentials.

Configure or display network settings.
jr614110452 /> ipconfig -a 192.168.1.10 -m 255.255.255.0 ← Set IPCONFIG

jr614110452 /> ipconfig ← Verify
Current IPv4 addr.: 192.168.1.10/24 (255.255.255.0) (active)
Current IPv6 addr.: 0000:0:0:0:0000:0000:0000/00 (unsupported)
Default IPv4 GW   : 10.0.0.1
Ethernet Address  : 9c:8d:1a:00:07:59
Primary DNS       : 10.0.0.4
Secondary DNS     : 0.0.0.0
DNS Timeout       : 5000 (ms)
DHCP Server       : 0.0.0.0
DHCP Enabled      : false
Domain            :
Mailhost          :
Email Address     :
Email Username    :

jr614110452 /> |
  
```

The screenshot shows a terminal window titled "JNIOR Command Line". It displays a list of commands and their descriptions, followed by a configuration command: `ipconfig -a 192.168.1.10 -m 255.255.255.0`. A red arrow points from the text "Set IPCONFIG" to this command. Below that, the output of the `ipconfig` command is shown, with a red arrow pointing from the text "Verify" to the command. The output lists various network settings including IPv4 and IPv6 addresses, default gateway, Ethernet address, DNS servers, and DHCP settings. At the bottom of the window, there are several control buttons: Disconnect, COM4, 115200, 8 Data, 1 Stop, No Parity, None, Clear, and Options.

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 (also now referred to as MIT). The JNIOR has a real time clock that is battery backed so you may just have to set your time zone. The GMT time should be approximately 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 NTP server to work, you will need to set a DNS and possibly a gateway address.

You can change the NTP Server registry key to the IP address of any server/computer on the network that will respond to an NTP request or you can use any domain name that will provide the NTP functionality.

You can set your JNIOR date and time using the `date` command. Typing `help date` will provide you with the command format.

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

For more information concerning additional commands available to the user through a command line or a Telnet session, please see the **Command Line Communications Manual** on our website.

### 4.3 JNIOR Web Page

The JNIOR Series 4 contains the Dynamic Configuration Page (DCP) which is a web page used for a variety of functions including monitoring and manually controlling the I/O, changing various configuration items, opening a Telnet/Console session and several other functions. The DCP web page works with Microsoft Internet Explorer, Google Chrome, Fire Fox and other browsers.

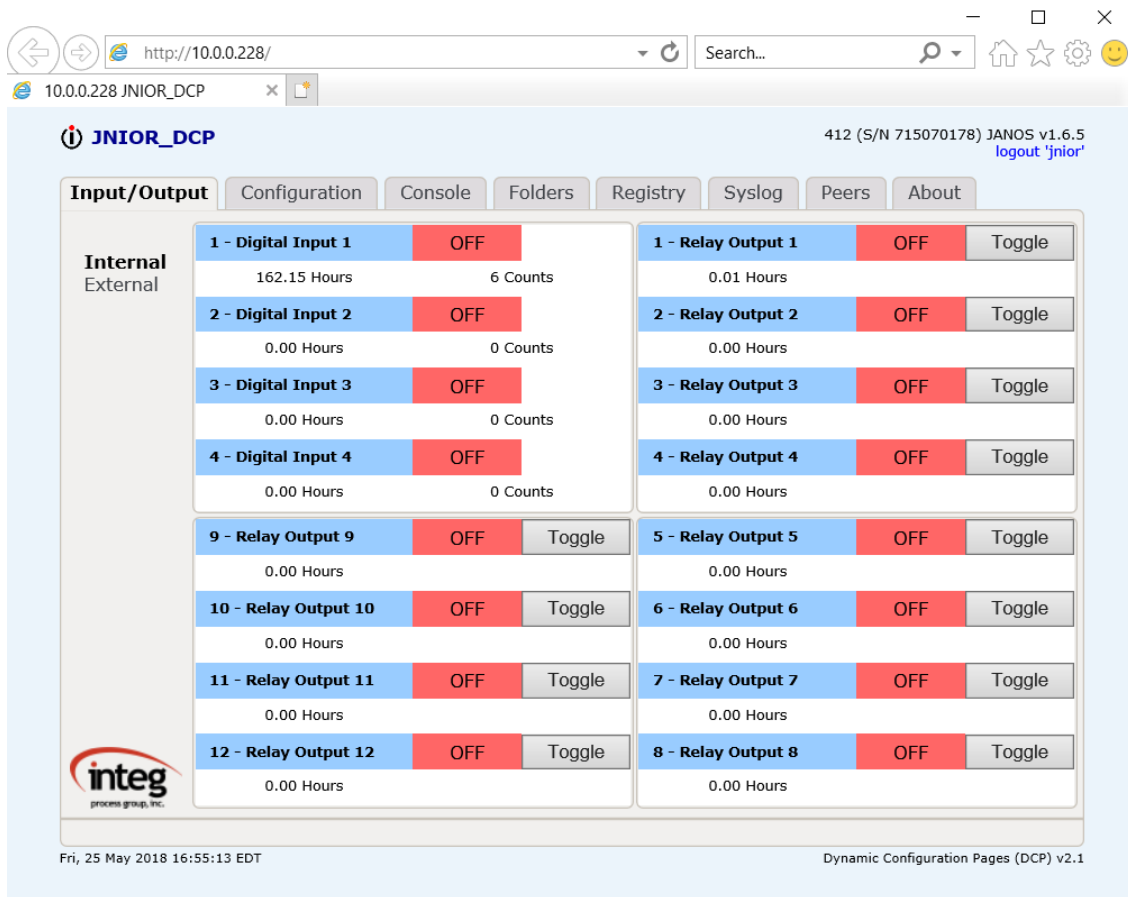
**PLEASE NOTE: The dynamic web page requires a ‘modern web browser’ which is defined as Internet Explorer 10 or greater, Google Chrome or Firefox.**

You can launch the JNIOR DCP Web page from the Beacon tab in the JNIOR Support Tool by right-clicking on your JNIOR and going to Tools – Open Web page or by manually entering the JNIOR IP address in your browser address line. To manually 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>      Dynamic Web Page (10.0.0.201 is the default IP address)

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).

The JNIOR DCP web page will be launched in your browser as shown below.



## 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 User Interface for Monitoring and Control
2. Serial-to-Ethernet Server
3. Serial Control Plus 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
9. Custom applications running on the JNIOR

### 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 our website.

### 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 our website.

### 5.3 Serial Control PLUS Program

The Serial Control Plus function for the JNIOR is a software application that runs on the JNIOR and allows the user to interact with the JNIOR I/O using simple ASCII commands via the serial port or an Ethernet connection. 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 (or via the Ethernet).

A complete explanation of how to use the Serial Control Plus Program is described in the **Serial Control Plus Manual** located on our website.

### 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 our website.

## 5.5 OPC Server

The JNIOR supports access to data points via OPC communications. You can use any third party OPC Server that works with the Modbus communications protocol.

## 5.6 Modbus – Master and Slave

The JNIOR supports access to the JNIOR I/O via **Modbus TCP** communications over the Ethernet network.

The JNIOR can serve as a **Modbus Slave** and is accessed by an external Modbus Master.

The JNIOR can also act as a **Modbus Master** and access other ‘slaves’ via Modbus. Data acquired as a Modbus Master can be moved to internal registers so that external Modbus Masters can access the data via the Modbus Slave connection.

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

## 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 our website.

## 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 the all the JNIOR functionality.

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

## 5.9 Custom Applications Running on the JNIOR

Custom applications can be developed using Java to run on the JNIOR. Custom web pages using Java script, web sockets, HTML5 and other standard web-based utilities can also be developed to be served by the JNIOR.

Please visit our website for our Software Development Kit (SDK).

## 6 HARDWARE SPECIFICATIONS

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### 6.1 JNIOR Series 4

The **JNIOR Series 4** contains a 32-bit microprocessor, 32 MB FLASH memory, 32 MB dynamic RAM, 2 MB battery-backed static RAM memory, and the JNIOR operating system (JANOS) with an integral Java Virtual Machine (JVM).

JNIOR's circuit board resides in a protective case with an integral low voltage 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 Series 4** specifications are provided in the following table:

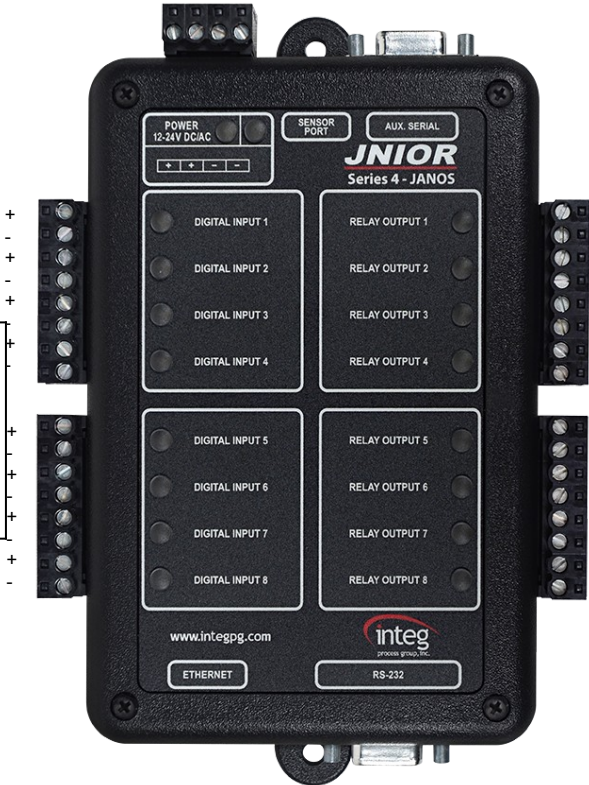
<b>Power Input</b>	
Input Voltage	12 to 24 Volts DC or AC, < 400 mA typical
<b>Digital Inputs</b>	
Range	0 to 30 Volts AC/DC
Logic Low input	0 to 1 Volt
Logic High input	2 to 30 Volts
Input Resistance	1.2 K ohm nominal
Response time	1 millisecond
Counter capability	2000 Hz Max (each input)
Isolation	Optically Isolated
Functions	Latching capability – as fast as 1 millisecond
<b>Relay Outputs</b>	
Type	SPST, Form A – 1 Normally Open Contact (Two relays are Form C and configurable as Normally Open or Normally Closed to the terminals)
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	DB-9 Female
<b>Ethernet (1)</b>	
Connection	RJ-45 Connection
Speed	10/100 Mb Auto-Negotiated, Full Duplex
<b>Sensor Port (1)</b>	
	RJ-12 Connection for Expansion Modules
<b>Certification</b>	
	TUV Safety Mark (60950), CE, FCC Class A

6.1.1 Wiring Diagram

The following diagram provides the user with the pin-outs of the digital inputs and digital outputs for the **JNIOR Model 410**. Please contact INTEG Process Group for additional assistance.

The Digital Inputs are polarity sensitive and require a voltage of 2 volts or greater to go ON

The inputs are optically isolated so they can use various voltage sources.



The Relay Outputs are dry contacts and do not output any voltage.

Two terminals per relay output.

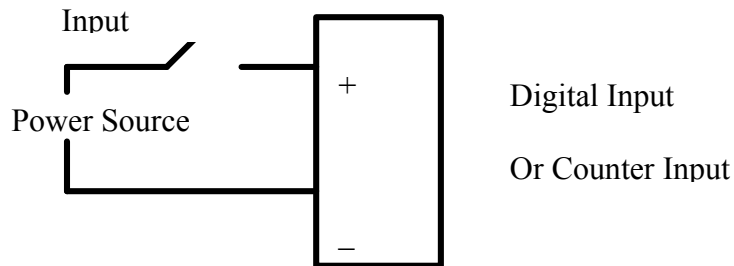
Relay contacts for relays 1 and 2 can be changed from normally open to normally closed by removing the lid and changing a jumper.



### 6.1.2 Digital Inputs

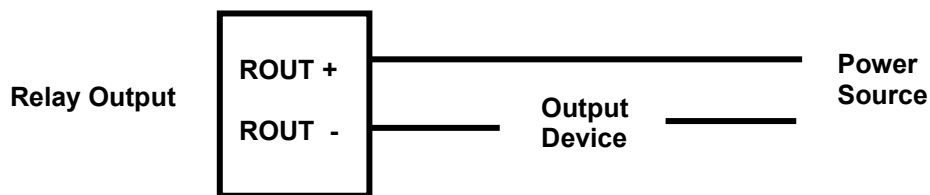
The JNIOR is equipped with optically isolated digital inputs. Each digital input can accept AC or DC voltage sources in the 0 – 30 V range. An LED associated with each digital input displays the current electrical status of the input (off or on). Isolation of each digital input allows you to connect input signals to different voltage sources without the addition of isolation devices. The input voltage must be greater than 2 VDC for the input to register as “on” and then less than 1 VDC to register as “off”.

A typical connection would be as follows:



### 6.1.3 Relay Outputs

The JNIOR is equipped with Relay Outputs with most of them being a Form A SPST relay (1 Normally Open Contact) and two of them being a Form C SPST relay (1 Normally Open Contact and 1 Normally Closed Contact – jumper selectable as to which one is available on the JNIOR terminals by removing the lid and changing the jumper setting. Normally Open is the default.) 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:

INTEG Process Group, Inc.  
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