

JNIOR USERS MANUAL

JANOS Help System

16 Sep 2021



Website : integpg.com

JANOS Version : v2.1

Help Revision : 3 Sep 2021 16:12

Includes : Tasker, JBakup, FtpClient

JANOS - JNIOR Automation Network Operating System
Copyright (c) 2012-2021 INTEG Process Group, Gibsonia PA USA

TABLE OF CONTENTS

Formalities	<u>1</u>
Trademarks	<u>1</u>
Licensing	<u>2</u>
Getting Help	<u>3</u>
Help System (HELP)	<u>3</u>
Command Line Help	<u>3</u>
WebUI Help Access	<u>4</u>
Technical Support	<u>5</u>
Getting Started	<u>6</u>
Power UP	<u>6</u>
User Interface	<u>7</u>
Network Access	<u>7</u>
Serial Access	<u>8</u>
Networking Basics	<u>9</u>
IP Settings	<u>10</u>
Setup Summary	<u>13</u>
Factory Configuration	<u>14</u>
Firmware	<u>14</u>
Files	<u>15</u>
Factory Reset	<u>17</u>
Security	<u>19</u>
Overview	<u>19</u>
Default Account	<u>19</u>
Encrypted Communications	<u>21</u>
User Commands	<u>23</u>
Command Line	<u>23</u>
TAB Auto-Complete Feature	<u>23</u>
Console Prompt	<u>24</u>
Current Working Directory (CD)	<u>24</u>
Command Line History (HIST)	<u>25</u>
Exiting a Console Session (QUIT)	<u>25</u>
Configuration	<u>26</u>
Setting Date and Time (DATE)	<u>26</u>
Network Addresses (IPCONFIG)	<u>27</u>
Setting the Hostname (HOSTNAME)	<u>29</u>
Registry Settings (REG)	<u>30</u>
File Management	<u>32</u>
Listing Files (DIR/LS)	<u>33</u>
Removing Files (RM)	<u>34</u>
Copying Files (CP)	<u>35</u>
Moving Files (MV)	<u>36</u>
Renaming Files (REN)	<u>37</u>
Creating a Directory/Folder (MD)	<u>37</u>
Removing a Directory/Folder (RD)	<u>38</u>
Library Manager (ARC/JAR/ZIP)	<u>38</u>
Modifying Permissions (CHMOD)	<u>40</u>
Changing Ownership (CHOWN)	<u>41</u>

TABLE OF CONTENTS (cont'd)

Command Line Tools	42
Displaying Text Files (CAT/TYPE)	42
Searching File Content (GREP/FIND)	43
Locally Editing Text Files (ED)	44
Issuing an Email (SENDMAIL)	46
Making a Log Entry (LOGGER)	47
Update File Timestamp (TOUCH)	48
Batch Scripting and Program Execution	49
Executing an Application (JAVA)	49
Executing Scripts (RUN)	50
Process Environment (SET)	51
Batch File Comments (REM)	51
Batch Mode Text Display (ECHO)	52
Process Management	52
Displaying Activity (PS)	52
Detailed Application Status (THD)	53
Stopping an Application (KILL)	53
Non-Volatile Memory Blocks (NV)	54
Garbage Collection (GC)	54
JNIOR Digital and Analog I/O	55
Managing External Modules (EXTERN)	55
Logging (IOLOG)	56
Locally Controlling I/O (JRMON)	57
Serial Port Extensions (MODE)	60
User Accounts	61
Listing Users (USERS)	61
Setting Passwords (PASSWD)	62
Modifying Permissions (USERMOD)	63
Adding Accounts (USERADD)	64
Removing Accounts (USERDEL)	65
Displaying User Groups (GROUPS)	65
Adding a User Group (GROUPADD)	65
Removing a User Group (GROUPDEL)	66
Modifying a User Group (CHGRP)	66
Current User (WHOAMI)	67
Network Utilities	67
Network Status (NETSTAT)	67
SSL/TLS Certificates (CERTMGR)	68
Testing Connectivity (PING)	70
Address Resolution Protocol (ARP)	71
Domain Name Services (NSLOOKUP)	72
NetBIOS Status (NETSTAT)	72
System Maintenance	73
Rebooting (REBOOT)	73
System Statistics (STATS)	73
File Monitoring (MANIFEST)	74
Performing Updates (JRUPDATE)	76
Flash File System (JRFLASH)	77
Registry	78
Overview	78
Using the Registry	79

TABLE OF CONTENTS (cont'd)

System Configuration	<u>80</u>
Built-in Dynamic Keys	<u>80</u>
System Boot Time (\$BootTime)	<u>80</u>
JNIOR Model (\$Model)	<u>80</u>
Serial Number (\$SerialNumber)	<u>80</u>
JANOS Version (\$Version)	<u>80</u>
Last Time Sync (\$LastNtpSuccess)	<u>81</u>
JANOS Build Identifier (\$BuildTag)	<u>81</u>
Device Keys (Device/)	<u>81</u>
Description (../Desc)	<u>81</u>
Timezone (../Timezone)	<u>82</u>
Jumper Reset Action (../ResetAction)	<u>82</u>
 Network Configuration	 <u>83</u>
Dynamic Host Configuration (IpConfig/DHCP)	<u>83</u>
IP Address Assignment (IpConfig/IPAddress)	<u>83</u>
Subnet Mask (IpConfig/SubnetMask)	<u>84</u>
Gateway IP Address (IpConfig/GatewayIP)	<u>84</u>
Primary DNS Address (IpConfig/PrimaryDNS)	<u>85</u>
Secondary DNS Address (IpConfig/SecondaryDNS)	<u>85</u>
HostName (IpConfig/HostName)	<u>86</u>
Domain Name (IpConfig/Domain)	<u>86</u>
Email Host Address (IpConfig/MailHost)	<u>87</u>
Email Account Username (IpConfig/Username)	<u>87</u>
Email Account Password (IpConfig/Password)	<u>87</u>
Account Email Address (IpConfig/EmailAddress)	<u>88</u>
DNS Timeout (IpConfig/DNSTimeout)	<u>88</u>
Time Server Address (IpConfig/NTPServer)	<u>88</u>
Time Sync Period (IpConfig/NTPUpdate)	<u>89</u>
Maximum Packet (IpConfig/MTU)	<u>90</u>
Time To Live (IpConfig/TTL)	<u>90</u>
Syslog Server (IpConfig/SyslogServer)	<u>91</u>
Connection Keepalive (IpConfig/Keepalive/)	<u>92</u>
Initial Probe (../Time)	<u>92</u>
Retry Delay (../Interval)	<u>92</u>
Retries (../Retry)	<u>92</u>
Socket Timeout (IpConfig/Socket/ConnectTimeout)	<u>93</u>
Network Capture Buffer (IpConfig/CaptureBuffer)	<u>93</u>
Capturing All Traffic (IpConfig/Promiscuous)	<u>94</u>
Capture Filtering (IpConfig/CaptureFilter)	<u>95</u>
Bad Credential Reveal (IpConfig/ShowPass)	<u>96</u>
Multicast Name Resolution (IpConfig/LLMNR)	<u>96</u>
NetBIOS Name Resolution (IpConfig/NetBIOS)	<u>97</u>
Ip Address Filtering (IpConfig/Allow)	<u>98</u>
 Secure Communications Using SSL/TLS	 <u>98</u>
Enabling/Disabling (SSL/Enabled)	<u>98</u>
Forcing Secure Connections (SSL/Required)	<u>99</u>
Basic Authentication	<u>99</u>
Passwords	<u>99</u>
Default Accounts	<u>100</u>

TABLE OF CONTENTS (cont'd)

Warning Message (Users/IgnoreDefault)	101
RSA Keys	102
SSL Certificates	103
Country (SSL/Cert/C)	103
State (SSL/Cert/ST)	104
Organization (SSL/Cert/O)	104
Organizational Unit (SSL/Cert/OU)	105
Common Name (SSL/Cert/CN)	105
Subject Alternate Name (SSL/Cert/SAN)	106
Email Address (SSL/Cert/E)	106
Expiration (SSL/Cert/Days)	107
SHA1 Legacy Use (SSL/Cert/SHA1)	107
Event Management	108
Services (Events/Services)	108
Startup Events (Events/OnBoot)	108
Email Notification (Events/OnBoot/Email)	109
Custom Notification (Events/OnBoot/EmailBlock)	110
Program Startup (Events/OnBoot/RunEnable)	110
Alarm Events (Events/OnAlarm)	111
Counter Limit 1 (Events/OnAlarm1)	111
Counter Limit 2 (Events/OnAlarm2)	111
Usage Alarm (Events/OnUsage)	112
Configuration Change (Events/OnConfig)	112
Email Notification (Events/OnConfig/Email)	112
Custom Notification (Events/OnConfig/EmailBlock)	113
Email Configuration	113
Custom Email Notifications	113
Recipient Addresses (Email/ToAddress)	113
Carbon Copy Recipients (Email/CcAddress)	114
Blind Carbon Copy (Email/BccAddress)	114
Subject (Email/Subject)	115
Message Content (Email/Message)	115
Message File (Email/MessageFile)	116
Attaching Files (Email/Attachments)	116
HTML Formatted Email (Email/HTML)	117
General Settings	118
SMTP Server Port (Email/Port)	118
STARTTLS Option (Email/StartTLS)	119
SMTP Secure Connection (Email/SMTPS)	119
Delivery Attempts (Email/RetryCount)	120
Delay Before Retrying (Email/RetryDelay)	120
Signature (Email/Signature)	121
Server Configuration	122
World Wide Web (Web) Server	122
Enabling/Disabling (WebServer/Server)	122
Unsecure HTTP Port (WebServer/SSLPort)	122
Secure HTTPS Port (WebServer/SSLPort)	122
Web Server Login (WebServer/Login)	123
Anonymous Login (WebServer/Anonymous)	123

TABLE OF CONTENTS (cont'd)

Website Folders & Files	124
Default Home Page (WebServer/Index)	124
Root Directory (WebServer/Root)	124
Alternate Search Paths (WebServer/Path)	125
Folder Redirection (Locators)	126
Websocket Interface	127
Login Requirement (Websocket/Login)	127
Anonymous Login (Websocket/Anonymous)	127
Disabling File Management (Websocket/Files)	128
Console Access (Websocket/Console)	128
JANOS Management Protocol (JMP)	129
Enabling/Disabling (JMPServer/Server)	129
JMP Server Port (JMPServer/Port)	129
Login Requirement (JMPServer/Login)	129
Anonymous Login (JMPServer/Anonymous)	130
JNIOR Protocol (Deprecated)	131
Enabling/Disabling (JniorServer/Server)	131
Protocol Port (JniorServer/Port)	131
Login Requirement (JniorServer/Login)	131
Anonymous Login (JniorServer/Anonymous)	132
Outbound Connection (JniorServer/RemoteIP)	133
Outbound Destination Port (JniorServer/RemotePort)	133
File Transfer Protocol (FTP)	134
Enabling/Disabling (FTP/Server)	134
Command Port (FTP/Port)	134
Directory Listing Format (FTP/UnixStyle)	135
Telnet Server - Console Access	136
Enabling/Disabling (Telnet/Server)	136
Assigned Port (Telnet/Port)	136
BEACON Protocol Service	137
Enabling/Disabling (Beacon/Enabled)	137
Announcement (Beacon/Announce)	137
Persistent Broadcast (Beacon/AutoAnnounce)	138
Input/Output (I/O) Configuration	139
Digital Inputs (DIN)	139
Overview	139
Inversion	141
Debouncing	142
Latching	143
Logging	144
Enabling/Disabling (IO/Inputs/Log)	145
Usage Metering	145
Counting	146
Alarming	146
Configuration by Input (IO/Inputs/[DIN]/)	147
Text Descriptions	147
Inverting Sampled State (../Inversion)	148
Reported State (../Conditioning)	148
Debouncing (../Debounce)	149
Latching	149
Enabling/Disabling (../Latching)	149

TABLE OF CONTENTS (cont'd)

Latching Period (../LatchTime)	150
Latched State (../LatchState)	150
Enabling/Disabling Logging (../Log)	150
Usage Metering (../\$HourMeter)	151
Input State Alarms	152
Enabling/Disabling (../Alarming)	152
Alarming State (../Alarm/Inversion)	152
Email Notification (../Alarm/Email)	153
Custom Email (../Alarm/EmailBlock)	153
Flood Prevention (../Alarm/HoldOff)	153
Counter Settings	154
Counted State (../Count/State)	154
Reported Units (../Count/Units)	154
Scaling (../Count/Multiplier)	155
Sampled Counts (../Count/SampleTime)	155
Counter Alarms	156
Enabling/Disabling	156
Events & Email Notification	157
Usage States & Alarms	158
Relay Outputs (ROUT)	160
Configuration by Output (IO/Outputs/[ROUT]/)	160
Text Descriptions	160
Initial Relay State	161
Usage Metering (../\$HourMeter)	161
Usage States & Alarms	162
Logging	164
Serial RS-232/RS-485 Ports	165
Overview	165
AUX Serial Port	166
Overview	166
Communications Settings (Baud)	167
Flow Control	168
RS-485 Communications	169
COM RS-232 Port	169
Overview	169
Diagnostic Output	170
Communications Settings (Baud)	170
Flow Control	172
ZIP/JAR Compression	173
Overview	173
Parameters	173
JANOS Management Protocol (JMP)	175
Overview	175
Connection	175
Secure Communications	178
Initial Connection	179
Messaging	181
I/O Monitoring	183
Monitor Message	183

TABLE OF CONTENTS (cont'd)

Requesting Status	184
Control Messages	185
Relay Control	185
Counter and Usage Resets	187
File System Commands	189
Listing Files	189
Reading and Writing	190
Managing Files	193
Registry Commands	196
Notifications	196
Listing Keys	196
Reading and Writing	198
Console Access	201
Creating	201
Data Transfer	202
Terminating	203
Example Session	203
External Devices	205
Realtime Clock	209
Shutdown/Reboot Notification	209
System Logging (Syslog)	210
Auth-Digest Calculation	211
Application Programming	212
Overview	212
Java Virtual Machine (JVM)	212
Compiling Program Files (JAR)	213
Web Development	215
Overview	215
Default Web Pages (WebUI)	216
Scripting (PHP-like)	217
Overview	217
Script	218
Variables	220
Statements	223
Functions	225
User-Defined	225
Built-In	227
Rendering & Output	227
String Operations	228
Array Operations	229
Conversions	230
Date & Time	231
File System Functions	232
JSON Functions	233
Language Support	234
Registry Access	234
System Functions	235
Regular Expressions (REGEX)	235
Including Files	236

TABLE OF CONTENTS (cont'd)

Error Handling	237
Example: Batch Scripting (CKSUMS)	239
Hardware	242
JNIOR Models	242
Power Supply	243
Relay Outputs	244
Digital Inputs	245
COM Serial Port	246
AUX Serial Port	247
Sensor Port Expansion Bus	249
Memory Areas	250
/etc (JanosClasses.jar)	250
/flash	250
/temp	250
References	251
Users Manual	251
Timezones	251
System Logs	254
Process Environment	256
Network Filtering	257
SafeMode	260
Regular Expressions (REGEX)	261
ASCII Table	263
Morse Code	264
Javascript Object Notation (JSON)	265
JNIOR Protocol	265
VT-100 Terminal Compatibility	266
Tasker Application	269
Overview	269
JBakup Log Archiving Application	270
FTP Client Application	271
Command Line Syntax	271
Interactive Mode Commands	272
INDEX	274

Trademarks**Legal**

JNIOR

JNIOR(R) is a Registered Trademark of INTEG Process Group, Inc. This acronym stands for the Java Network I/O Resource and is pronounced "Junior". The JNIOR is the heart of INTEG Automation and has been available in various models since 2005.

JANOS

JANOS(R) is a Registered Trademark of INTEG Process Group, Inc. This acronym stands for the JNIOR Automation Network Operating System and is pronounced "Jan-Us". JANOS is the INTEG developed real-time operating system first introduced with the Series 4 JNIOR.

JANOS was named after Janus who in myth is the god of comings and goings, beginnings and endings, passages, gates, transitions and time. All of these relating to the role of the JNIOR as a data interface/integrator between systems, devices and hardware of all forms.

INTEG

INTEG(R) is a Registered Trademark of INTEG Process Group, Inc.

INTEG Process Group (also known as INTEG) is located in Gibsonia, Pennsylvania USA. The company has been developing, manufacturing and supplying automation products and software since 1999. These products are in use worldwide in markets such as Cinema, Transportation, Manufacturing, Security, Utilities, and Recreation.

Licensing**Legal****TERMS OF USE**

INTEG grants the end-user or business entity ("Customers") using INTEG products full license to employ these products as desired provided that the use is completely legal as per any and all applicable laws and regulations. These products are not certified for, and therefore not licensed for, use in any life safety situation wherein the operation of the product could place any person(s) or animal(s) at risk of injury or death.

FIRMWARE LICENSE

The JANOS operating system ("Firmware") remains the property of INTEG Process Group. The operating system code and associated runtime libraries (such as JanosClasses.jar) as well as any future updates are licensed for use only with INTEG products. INTEG reserves all associated Rights. This Firmware is proprietary to INTEG and is protected under Copyright law. Reverse Engineering and any use of any portion of the Firmware in any situation unrelated to INTEG products is strictly forbidden.

APPLICATIONS

Applications, developed for the JNIOR and generally made available by INTEG to all Customers, are fully licensed for use with any INTEG product.

Custom applications developed specifically for individual Customers under paid contract are thereby property of Customers. INTEG will not distribute such applications directly.

INTEG encourages Customers to develop their own applications and will support their efforts.

HELP/MAN**User Commands****NAME**

help - Help System

ALIASES

HELP, MAN

SYNOPSIS

help [OPTIONS] [TOPIC]

DESCRIPTION

The Help System is designed to make information more readily available to users during Command Line Console sessions. The HELP command issued without parameters lists the available commands. Help information for any of the available commands can then be displays using the name as the TOPIC.

Additional HELP Topics are available for Registry keys and reference information.

-S

When a topic is not found HELP displays search results displaying topics which contain the TOPIC keyword. By default only a limited number of matches are displayed. This option skips the search for a specific TOPIC, performs the content search, and shows ALL results. Results are listing in order of decreasing relevance.

-I [CATEGORY]

Generates an index including all of the available HELP topics. If a valid CATEGORY is specified the list is limited to a related subset.

-C

List all available categories. Most HELP topics belong to at least one category.

-P

This option pages the Help response 24 lines at a time. The user can page through the information using any keyboard keystroke. This eliminates the need to scroll back for reading. A Ctrl-C disables the paging for the balance of the text.

-L

Displays the brief legacy Help text as is available for commands.

NOTES

The Topic may contain '*' and '?' wildcards but only matches legacy Help text in that case. The command HELP * then can generate a quick reference for commands.

SEE ALSO

HELP Topics: [SUPPORT](#), [MANUAL](#)

HELP**WebUI**

The Help System is available through the WebUI.

CONTEXT SENSITIVE HELP

Context sensitive Help is provided when placing the mouse over any configuration setting. The Registry Key related to the setting is displayed in the status bar at the bottom of the WebUI display. Pressing F1 or clicking on the displayed Registry Key enters the Help System displaying information about the key if available in a new browser tab. A search is otherwise performed.

The original Registry Specification document is also supplied with the JNIOR and can be reached using the 'Registry Documentation' link located under the Registry tab in the WebUI.

HELP SYSTEM

The Help System itself can be reached using the '[Help System]' link located at the bottom right of the WebUI display. This opens the Help System under a new browser tab and displays an exhaustive list of available Help Topics. Click on any topic for additional information.

The Help System header also provides access to a list of all of the Console commands. This is a subset of topics. There is also a link specifically for Technical Support and the topic provides details on contacting INTEG.

PRINTABLE MANUAL

The Help System can generate a Users Manual with content specific to the current JNIOR. This not only includes Help information for the version of JANOS operating system but also any that is available for installed applications. The Users Manual appears in the browser fully paginated with a Table of Contents and Index ready for printing. It is suggested that this manual be saved as a PDF as opposed to hard copy printing. It is a useful reference and helpful in exploring the JNIOR.

SEARCHING

A Search link opens a small dialog requesting a search term to be used in performing a simple scan of Help Topics. The top 10 resulting topics are displayed in decreasing relevance along with the collection of words surrounding the located search terms. The entire set of matched topics can be displayed from the command line using the `HELP -S search` command.

Matching topics are scored and displayed in decreasing score. While the score itself is abstract you can display it. Define a `Help/ShowScore` Registry key setting it to "true". This will include the scores with the results.

Searches, especially when searching for a very common term, can take several seconds to complete.

SEE ALSO

HELP Topics: [USERS MANUAL](#), [HELP](#)

SUPPORT

For technical assistance:

1. Check the Knowledge Base at jnior.com
2. Email: support@integpg.com

Monday-Friday 8AM-4PM EST

3. Enter Chat at integpg.com
4. Call +1 724-933-9350

PRINTABLE MANUAL

A printable manual containing all of the information available here may be generated using the JANOS WebUI. The content is dependent on the current version of JANOS and will uniquely include any Help information supplied by installed application programs.

It is recommended that this be saved as a PDF in preference to printing. Links within the document should then be usable for navigation. It can take a minute to generate this Users Manual.

NOTES

We recommend that you update to the latest version of JANOS to insure that you are not experiencing a known and corrected issue.

To save time you can include a snapshot taken with the Support Tool with your communications.

jnior.com and integpg.com are presently the same destination.

SEE ALSO

HELP Topics: [HELP](#), [MANUAL](#)

Power Up**Getting Started****GETTING UP AND RUNNING**

To get started with a JNIOR you will need a power supply or some source of power. In many cases the JNIOR ships in bulk to integrators and power supplies are obtained separately since they depend on the destination country. That often means that you might be handed a JNIOR without a power supply. Any roughly 12 VDC source capable of supplying at least 1 AMP will do fine.

Power supplies for the JNIOR are supplied with the 4-position screw terminal connector. JNIORs purchased without power supplies come with a 5-piece Connector Kit containing the screw terminal blocks for the I/O and POWER connectors on the unit. There are 4 of the 8-position connectors and 1 with 4 positions for POWER. When power supplies are included a 4-piece Connector Kit is supplied with just the 8-position connectors given that the 4-position connector you need is already on the supply.

You can cut the barrel connector off a suitable supply, strip and tin the wires as needed. See [PWR](#) for wiring details.

With power applied to the JNIOR the Blue LED will illuminate. The Orange LED illuminates briefly during boot. This orange status LED has many uses and may flash at times to indicate activity.

NOTES

The Series 3 JNIOR used a Green LED to indicate power. The Series 3 units are not recommended for new applications.

SEE ALSO

HELP Topics: [KEYBOARD](#), [PWR](#), [POWER_SUPPLY](#)

User Interface

Getting Started

COMMUNICATING

In order to configure and program the JNIOR you will need to communicate with it. The JNIOR has no keyboard or display interface. There are ways to interact with the unit both serially and through the network.

NETWORK ACCESS

In order to fully interact with the JNIOR and use its WebUI you must properly configure the unit to operate on the network. JNIORs are now being shipped from the factory with Dynamic Host Configuration Protocol (DHCP) enabled. With a network supporting DHCP the JNIOR will obtain a valid IP address and automatically configure itself properly for the network. You will still need to determine the IP address that it has been assigned.

One unique method uses the orange status LED. If you know the first 3 octets of the IP addressing used by the network you can determine the forth octet and therefore the full IP address assigned to the JNIOR. Connect the JNIOR to the network and power it up. After a couple of minutes disconnect the network connection leaving the unit powered. The status LED will flash the digits of the last octet in Morse Code! See the [MORSE CODE](#) reference for the digit patterns.

You can download the JNIOR Support Tool from the Downloads area under Support on the website jnior.com. The Support Tool uses the [Beacon](#) Protocol to communicate with JNIORs on the local network segment. The active JNIORs on the network are listed under the Beacon tab. This protocol does not require that the JNIOR have a valid network configuration. A JNIOR even if configured for a foreign network will appear in the list. You can right-click on a JNIOR and select Configure and IP Configuration to establish settings.

Once the IP Address of a JNIOR properly configured for the network is known you may enter the following URL in a browser to activate the Dynamic Configuration Pages WebUI.

```
http://[IP Address]
```

The WebUI is distributed as the file `/flash/www/config.zip` and the default setting of the Registry Key `/WebServer/Path` is `/flash/www/config`. This allows the simple use of the IP address (or hostname) in the URL to locate the supplied WebUI.

If the JNIOR has been previously configured to support a custom Website you may bypass that site and reach the WebUI with the following URL.

```
http://[IP Address]/config
```

The JNIOR supports the HTTPS:// secure protocol as well.

SERIAL ACCESS

In the absence of a network connection you can reach the Command Line Interface (CLI) or Console through the COM serial port. A USB-to-Serial adapter may be used as PCs these days do not provide serial ports. The communications parameters are 115,200 Baud, 8 Data Bits, 1 Stop Bit and No Parity.

The [IPCONFIG](#) command at the command line can be used to determine and alter the IP configuration of the JNIOR. This command may be necessary in establishing proper network addressing if DHCP or the Support Tool cannot be used. For example: The JNIOR may be connected to the network using a cellular modem or other wireless approach not supporting the broadcast required by the Beacon protocol.

The CLI is quite powerful in many ways and not just for configuration although, the network is still required for transferring files either on to, or off of, the device.

NOTES

A network cable can often be used to connect the JNIOR directly to a PC. The Support Tool running on the PC will locate the JNIOR and allow you to configure the unit.

SEE ALSO

HELP Topics: [MORSE_CODE](#), [BEACON](#), [NETWORK](#), [COM_SERIAL](#), [IPCONFIG](#)

Basics

Networking

NETWORKING

A JNIOR must be properly configured to participate reliably on the local network. Network configuration can be quite complex and a great deal of planning often goes into the structuring of commercial networks. While the IT Department or appropriate networking professionals should be consulted when adding devices like the JNIOR to a network, some relatively simple concepts are all that are needed to get the JNIOR up and running.

The JNIOR is a wired network device. While WiFi and Cellular adapters are available to provide the JNIOR with such connectivity, the device is typically connected to a Network Switch via a CAT5 cable. Any number of computers, printers and devices connected to a network switch or multiple switches constitutes a Local Area Network or LAN. The connected devices can all message one another.

A Wireless Access Point provides wireless connectivity and is at some overly simplified level just a big multi-port network switch in the sky. WiFi extends the wired network and all devices both wired and wireless are able to communicate with one another.

A Wireless Router often serves on the local network side as a network switch with wireless access. The router has another connection allowing it to be connected to another network which is often referred to as the Wide Area Network or WAN.

ETHERNET MAC ADDRESS

Just as when someone wishes to send you a letter they need your postal address or when they send you an email they need your email address, a machine on the LAN can send another a message if it knows its Media Access Control or MAC address. This is an address like 9c:8d:1a:00:07:f9 and is something that thankfully you never really need to know.

On the wire though that MAC address is absolutely necessary to get packets of information from one place to another. Of importance is that every device manufactured should have a unique MAC address permanently programmed. Each JNIOR has a unique address and the prefix 9c:8d:1a is assigned to INTEG. This can be used to identify all of the Series 4 JNIOR products on a network.

IP ADDRESSING

As opposed to the MAC address the address that you do need know to communicate with devices locally and outside is the Internet Protocol address or IP Address. This is an address that looks something like 192.168.2.37 which is not all that easy to remember either. Typically the first three numbers (or octets) displayed here are consistent for every device on the LAN. Only the last octet varies.

On the network, and very much in the background, there is a procedure for finding the MAC address for any destination with an IP address. You need not know much more about it.

While a JNIOR may be assigned any IP address it has but one MAC address. Units are labeled with the programmed MAC address and this can also be obtained by using the IPCONFIG command in the Command Line Console.

CLIENT vs. SERVER

When you open your Browser and enter a URL it is typically some text like

```
https://jnior.com
```

In this case you are a Client and are attempting to connect to a Server located at INTEG. Fortunately you do not need to know the IP Address 50.197.34.74 in order to make the connection.

You will want to use the browser to access the JNIOR. In this case you will need to know its IP address. The URL would look like:

```
http://192.168.2.37
```

IP SETTINGS

To properly configure the JNIOR for the network there are 2 critical IP settings and 3 fairly important settings. These are as follows:

- | | |
|--------------------|---------------|
| 1. IP Address | 192.168.2.37 |
| 2. Subnet Mask | 255.255.255.0 |
| 3. Gateway Address | 192.168.2.1 |
| 4. Primary DNS | 8.8.8.8 |
| 5. Secondary DNS | 8.8.4.4 |

If you are uncertain as to the proper settings for your network you may try the Dynamic Host Configuration Protocol (DHCP). Most routers enable this protocol. This helps computers join the network and properly configure. The JNIOR now ships with DHCP enabled.

DHCP can be enabled from the command line with the following command:

```
ipconfig -d
```

In the Support Tool it is a selection. Right-click on the JNIOR in the Beacon tab and select Configure and then IP Configuration. There is a selection to enable DHCP. After a minute if DHCP is available the JNIOR will acquire a valid network setup.

You can then check the IP configuration through the Support Tool or by using [IPCONFIG](#). This will give you items 2 thru 5 in the above list. DHCP IP addresses themselves are leased. While it is likely that the JNIOR will retain the assigned IP address for some time, that address is assigned from a pool (range of addresses) and can change. Since you need the IP address to communicate with the JNIOR you don't need it to be a moving target.

The solution is then to disable DHCP and assign a fixed IP address which should be outside of the DHCP range. You will need to get that address from your network administrator. In a pinch you can use the [ARP](#) -S command to locate a low numbered unused address. The ARP command scans the network and reports any addresses that actively respond.

You can then disable DHCP again using the Support Tool or with the following command:

```
ipconfig -r
```

The JNIOR will retain the DHCP configuration. It is important to reassign the IPv4 address outside of the DHCP range either using the Support Tool or command. For example:

```
ipconfig -a 192.168.2.37
```

SUBNET MASK

It was mentioned that the first 3 numbers or octets of IP addresses on the local network typically all match. The local network must use only a small range of all possible IP addresses as those outside of the range are then used to access hosts and devices all over the world. The local address scheme uses an address range typically reserved for individual local networks.

The Subnet Mask defines the portion of the IP address that must match that assigned to the JNIOR for any local network participant. This is a bit mask specifying bit by bit from the left (most-significant bit) the bits that must match between source IP address (the JNIOR) and destination. So with a typical local network a subnet mask of 255.255.255.0 indicates that all of the bits in the first 3 octets must match for local communications. With 8 bits per octet (byte) there are 24 bits from the left that must match. You may also see the IP address specified as for example 192.168.2.37/24 .

When the destination address DOES NOT match in every indicated bit position the destination is assumed to be outside of the local network. The source then attempts to contact the destination using the Gateway device. The gateway then potentially providing access to the Wide Area Network and hopefully the host destination.

The Subnet Mask can be set using the Support Tool or using [IPCONFIG](#). In these command examples the latter sets both the IP Address and Subnet Mask in one step.

```
ipconfig -s 255.255.255.0  
ipconfig -a 192.168.2.37/24
```

If you erroneously set the Subnet Mask, communications may fail to reach some members of the local network or some external hosts. This may depend on the operation of the gateway which might optionally assist in properly locating the destination as still being on the local network. Basically, the subnet mask typically is set identically for all members of the local network. More complex network topologies are possible. It is best to consult your network administrator.

GATEWAY

The Gateway is a device on the local network that also is a member of another network. The latter being presumably connected to the Wide Area Network and ultimately possibly the Internet. The Gateway then is likely the router for the local network. It serves as a bridge to the outside world.

If a Gateway address is not properly defined the JNIOR will not be able to contact hosts outside of the local network. In a typical automation scenario it may not seem that the JNIOR would have any reason to communicate outside of the local network. The JNIOR periodically reaches out to a NTP server in order to synchronize its clock. This occurs about every 4 hours and relies on proper Gateway settings and DNS.

The JNIOR can also be configured to send email notifications. For this to be possible the unit also needs to access the outside world. It is important to properly define the Gateway IP address.

DNS SETTINGS

The Domain Name System is a huge distributed database spread across the Internet. Its basic function is to translate a domain name like those you use in URLs to IP addresses. You use a DNS server to convert the website jnior.com to the INTEG IP address 50.197.34.74 so that behind the scenes your computer can communicate with the company's server and the browser can render the website.

While the JNIOR does not support a browser it is configured with domain names that it will need to convert to IP addresses from time to time. In particular the JNIOR synchronizes its clock with an external NTP Server. The NTP server is located by first requesting an IP address from a DNS server for the domain:

```
pool.ntp.org
```

There are other NTP services that you can use. This one selects from a large pool of available NTP servers and offers an IP address for one that can best service your location. With a DNS server properly specified the [DATE](#) command can reach out and synchronize. For example:

```
bruce_dev /> date -n
Requesting time sync from pool.ntp.org (195.33.242.132)
Clock synchronized by NTP
Wed Jul 28 11:28:51 EDT 2021

bruce_dev />
```

Note here that `pool.ntp.org` has been resolved to the address 195.33.242.132 and that the JNIOR successfully synchronized its clock.

There are two DNS addresses, a Primary and a Secondary . A DNS server may get too busy to respond or may be down for service. It is critical to have a backup. We specify a primary and a secondary DNS server address in hopes that at least one of the two is available to help us. The JNIOR may try the primary first and if there is no timely response attempt to use the secondary. It may also just ask both and take the first response and run with it.

The [NSLOOKUP](#) command can be used to resolve domains. For example:

```
bruce_dev /> nslookup jnior.com

Issuing DNS request (<0.1s)
  Inet Addr      Domain
  50.197.34.74   jnior.com

bruce_dev />
```

If DNS addresses are not defined or if the DNS Servers cannot be reached the JNIOR clock will likely drift away from the correct time. This may only affect the timestamps that appear in logs. If the application is performing tasks on a schedule those events may not occur on time. Email notifications if configured will not be deliverable. You might use the Google public DNS addresses 8.8.8.8 and 8.8.4.4 although there are many other servers available.

SUMMARY

For proper network use the JNIOR needs 1) a unique IP Address valid for the local network; 2) A proper Subnet Mask for the local network; 3) A Gateway IP Address for access to the outside world; And, 4) at least one valid DNS server address. DHCP can be a valuable tool for discovering settings for all but the IP address itself. Finally, the IP Address must be uniquely defined for each device on the network. The JNIOR will query for conflicts during boot. If the IP address assigned to the JNIOR is claimed by another device on the network the JNIOR will not be available. In this case it will report an IP Address of 0.0.0.0 and will remain accessible through the Support Tool for reconfiguration.

SEE ALSO

HELP Topics: [IPCONFIG](#), [ARP](#), [NSLOOKUP](#), [DATE](#)

Factory**Configuration****FIRMWARE**

The Firmware consists of the JANOS operating system and Java Runtime Library. These are programmed at the factory into a Read-Only Memory (ROM) area within the processor itself. This is sufficient to bring the JNIOR to life. Any further configuration for any specific purpose is achieved by loading files, some containing application programs (JAR files), into the File System.

The ROM can contain two separate copies of the operating system. The update process is managed by the [JRUPDATE](#) command. INTEG supplies an updated version of JANOS in an update file (UPD extension). The JRUPDATE command takes the UPD file and transfers the new version of the operating system into the second area and signals the availability of the update. On reboot the system, in an absolutely fault tolerant way, swaps the two JANOS images installing the updated version.

The UPD file also contains an updated version of the Java Runtime Library [JanosClasses.jar](#) that is accessible in the /etc folder. The JRUPDATE command immediately updates the runtime library image. There is a very slight risk that an updated runtime library might not be compatible with the running version of JANOS. An immediate reboot is recommended to insure that the new version of the operating system, which would be compatible with the runtime, comes on-line. Any incompatibility would simply generate an Exception during application execution. This would only be a temporary condition.

NOTES

The update file (UPD) is generally about 1MB in size. This should be transferred into the /temp temporary folder before executing the JRUPDATE command. The only other area in the file system that can accommodate a file of this size is the /flash folder and its sub-folders. Attempting to place this large file anywhere else in the file system could cause the unit to run out of memory and potentially lose data. This should, however, be a recoverable situation.

If you are running an Update Project such as an All-In-One using the Support Tool, this update process is handled for you.

SEE ALSO

HELP Topics: [JRUPDATE](#), [FLASH](#), [TEMP](#)

Factory**Configuration****FILES**

In production a number of files are initially loaded onto the JNIOR and specifically into the /flash file area. The file system in general is stored within a battery-backed Static Random Access Memory (SRAM). There are two exceptions to this. One is the /flash folder and all of its contents. This information is stored within a Flash Memory component. This is not dependent on the battery and therefore considered a bit more permanent. The other exception is the /temp area which is temporary and therefore stored in the larger general-purpose Heap memory. There is also the /etc folder which is read-only and contains the runtime. It is actually in processor ROM.

On a JNIOR you may observe files with the [DIR](#) or [LS](#) command. The files that you find outside of the /flash folder are actually generated by the JNIOR. These are typically log files. The /flash folder is pre-loaded in production and will contain the following files:

/flash/cksums.bat

This is a batch program that creates a [CKSUMS](#) command for use at the command line. This reports checksum and digest calculations for the content of files. This is useful in validating content against the published checksum or digest information calculated from the original files.

/flash/ftp.jar

The JNIOR supports a built-in File Transfer Protocol (FTP) server allowing you to upload and download files from the unit using FTP from a PC for instance. The ftp.jar application program allows you to use [FTP](#) from the command line as a client. Using this command on the JNIOR you can go to remote FTP servers and get or put files. This might be useful in pulling (or pushing) a file from one JNIOR to another.

/flash/jnior.ini

This is generated by the JNIOR once it is up and running. The jnior.ini file is a backup for the [Registry](#) . In general one should not edit or overwrite this file.

/flash/manifest.json

The [MANIFEST](#) -U command creates a reference point for the file system. This essentially is a database of checksum/digest information for all of the files. In production a target version of this file is uploaded and MANIFEST is used to verify the file set. This detects any missing files or any upload errors even if a single bit. It is employed initially as a quality control function.

/flash/manpages.zip

This contains the extended Help information available with the [HELP](#) command. Its content is what generates this book.

/flash/ModbusServer.jar

MODBUS is a protocol that may be used to communicate with the JNIOR.
If needed this protocol can be enabled through the WebUI on the
Configuration tab Applications page. It can also be started by setting
a Registry /Run key.

/flash/serialcontrol.jar

Serial Control Plus runs on the JNIOR and allows the user to interact with
the JNIOR I/O via the serial port or the Ethernet port using simple
ASCII commands. The user can control the relay outputs (on, off, pulse)
and receive the status of the digital inputs and relay outputs (on, off)
along with counters via the serial port or Ethernet port. The application
is enabled using the WebUI on the Configuration tab Applications page.

/flash/SerialEthernet.jar

Serial-to-Ethernet acts as a converter between a Serial device connected
to the JNIOR and a remote application communicating with the JNIOR. The
connection made using Serial-to-Ethernet is bi-directional allowing
information to travel both ways. The application is enabled using the
WebUI on the Configuration tab Applications page.

/flash/SlaveService.jar

The Slaving service when running can be configured to cause an input or
output on one JNIOR to reflect the input or output on another. This can
be used to extend a remote signal through the network. The application
is enabled using the WebUI on the Configuration tab Applications page.

/flash/SNMP.jar

The Simple Network Management Protocol (SNMP) can be enabled through the
WebUI on the Configuration tab Applications page. SNMP can be used to
manage the JNIOR remotely. Variables can be define which be monitored or
controlled in a manner consistent with other SNMP enabled devices.

/flash/Tasker.jar

The Tasker application replaces the Task Manager that has previously been
distributed on the JNIOR. Tasker can perform an action or series of
actions either triggered manually or scheduled. The tasks can relate to
I/O actions or even email or network events.

/flash/www/config.zip

This contains the entire WebUI (default JNIOR website) which is served
directly from this one file. This forms a virtual /config folder for
the WebServer.

/flash/www/slaving.zip

This contains the configuration pages for the Slaving application. This forms a virtual /slaving folder for the WebServer.

/flash/www/tasker.zip

Contains the configuration pages for the Tasker application. This forms a virtual /tasker folder for the WebServer.

SEE ALSO

HELP Topics: [DIR](#), [CKSUMS](#), [REGISTRY](#), [MANIFEST](#)

Factory

Configuration

FACTORY RESET

A JNIOR may be reset to factory configuration. This involves clearing the unit which is an operation referred to as Sanitizing . Once this is done an All-In-One update project must be run using the Support Tool in order to restore the factory set of files.

SANITIZING

This procedure clears the JNIOR completely of any prior configuration placing the unit in a fresh and blank condition. This performs the following actions:

1. Shuts down running applications.
2. Reformats the Flash memory erasing all content.
3. Resets the Registry removing all content.
This retains key IpConfig settings so connection with the unit is not interrupted. This also retains the Timezone.
4. Erases User Database resetting to default credentials.
This retains clock configuration, the POR count, and the runtime tally.
5. Performs a reboot.

This reset does not revert the operating system to that originally supplied. If a particular version is required the proper All-In-One must be used containing the desired UPD for the version. We recommend that you use the latest All-In-One in this process.

The command to perform this operation must be run from the Command Line and is as follows:

```
REBOOT -ERASEALL
```

This Sanitization sufficiently removes all user related information as may be of security concern. If the JNIOR is employed in a secure Secret or Top

Secret environment it must be sanitized with this procedure before being removed.

RESTORING FILES

The latest All-In-One Update Project may be run using the Support Tool to finally update the JANOS operating system and restore the factory installed files. Both the Support Tool and the update projects may be obtained from the website at jnior.com .

Note that in the absence of the Support Tool you can transfer the files listed in the [Initial Files](#) section to the unit from another JNIOR or backup file.

NOTES

Do not copy the /flash/jnior.ini file. If you intend to copy Registry settings to the unit the Registry import/ingest command Reg -I should be used. The jnior.ini file is automatically generated and should not be edited or overwritten.

SEE ALSO

HELP Topics: [REBOOT](#), [REG](#)

Overview

Security

OVERVIEW

The JNIOR can be used with confidence on the open Internet provided that certain security precautions are taken and consistently observed. The product configuration as shipped is not appropriate for use in the uncontrolled environment. There are default accounts with default login credentials which would set you up for disaster. There are protocols, for example MODBUS, that do not support login (without customization) and therefore cannot be used freely. With care however, the product can exist securely in a chaotic world like the Internet.

Even in a controlled environment such as an air gapped or sandboxed network you would still want to control access to the JNIOR. Another trusted person with access to the network might in a moment of curiosity accidentally activate the JNIOR or alter configuration. Depending on what might be wired to the product, randomly closing a relay could damage the connected equipment or at a minimum disrupt the normal operation of things. A small accidental configuration change might later be difficult to detect and remedy. Both cases would be things to avoid. Proper security would limit that risk.

DEFAULT ACCOUNTS

The JNIOR ships with four (4) default user accounts two of which have full Administrator permissions. Leaving just one of these active in an uncontrolled situation would create a security risk.

Eliminate Unneeded User Accounts

A previously used JNIOR might have several user accounts. A new JNIOR has just 4. Those being:

- | | | |
|----|-------|---------------|
| 1. | jnior | Administrator |
| 2. | admin | Administrator |
| 3. | user | Control |
| 4. | guest | View Only |

The users are administered through the Command Line Interface (CLI) or Console. The [USERS](#) command will display the available accounts. Typically in a single user situation the 'jnior' account would be the primary. Log into the 'jnior' account and then disable the other accounts with using the following [USERMOD](#) commands:

```
usermod +d admin
usermod +d user
usermod +d guest
```

Similarly you may disable any other accounts that may also exist on the unit from any prior use. These commands add the Disabled flag to the accounts but do not remove the users. This would allow you to later restore the users if necessary.

You may also remove unnecessary user accounts using the [USERDEL](#) command. This command allows you to remove more than one user. It does not confirm removal so do use this cautiously. You cannot remove the currently active

user (see [WHOAMI](#)). Only an Administrator can make these user changes. So you can never remove all of the administrator accounts. There is always going to be one. The following command removes the extra accounts:

```
userdel admin user guest
```

Note that [SAFEMODE](#) temporarily reinstates the 'jnior' account with the default password. This is important should usernames and/or passwords be lost and forgotten.

Change Default Passwords

The default user accounts each have a default password consisting of the username itself. It is highly recommended that you alter these default passwords before putting the JNIOR into service. For each of the remaining user accounts you would use the [PASSWD](#) command to change the password. This command can be used by an Administrator to both change the password for the current user and that for any of the other accounts.

To alter the current account simply enter the command:

```
passwd
```

You will be prompted for the current password which you must properly provide. You will then be asked for a new password and then to reenter the password. Both must match for the command to succeed.

To change the password for any of the other accounts you must supply the username as follows:

```
passwd admin
```

In this case you will not need to enter the current password. You will be asked for a new password and then to reenter it. Both must match for the command to be successful.

Passwords on the JNIOR can be as few as 4 characters and as many as 19. These may contain any of the printable characters. Account passwords are never displayed by the JNIOR. These are stored in secure internal memory area.

NOTES

The command `HELP U*` will display the syntax for each in the collection of user commands.

SEE ALSO

HELP Topics: [HELP](#), [USERS](#), [USERMOD](#), [USERDEL](#), [USERADD](#), [WHOAMI](#), [SAFEMODE](#), [PASSWD](#), [FACTORY_RESET](#)

Encryption

Security

SECURE COMMUNICATIONS

Access to the JNIOR is controlled by login credentials involving a username and secret password. This assumes that you have not disabled login for any of the services and do not use those protocols that do not support login. It is not likely that you would allow someone to watch over your shoulder as you enter these credentials and log into your JNIOR even if they were trusted. But without some care others may be able to easily and remotely observe your login compromising the security of the product. Your username and password may be communicated from you to the JNIOR in a plain text form.

Even if no one can monitor network traffic on your closed network the JNIOR itself performs network capturing. The [NETSTAT](#) command can be used to generate a network capture file that can be downloaded and analyzed offline. Your plain text user credentials may be evident in this capture file. You can eliminate the risk by insuring that all communications are secure and encrypted using SSL/TLS.

Use Secure Access

By default the JNIOR has SSL enabled. You do need to elect to use the encrypted protocols. That means accessing the JNIOR Webui using the HTTPS:// URL as opposed to the previously more typical HTTP:// protocol. In using the secure protocol you eliminate the ability for a remote observer to not only see your login credentials but to know anything about what you are doing.

Browsers can utilize the AUTH DIGEST procedure for transferring login credentials even over the plain text HTTP protocol. This does encrypt your login credentials specifically and provides some peace of mind. This can still be thwarted by a particularly malicious actor and it is not a sound alternative to the more secure HTTPS connection.

FTP

Beyond the browser interface other protocols are routinely used in managing the JNIOR. One would be the File Transfer Protocol (FTP) use to transfer files on to and off of the JNIOR. The WebUI provides you with the ability to move files to and from the JNIOR under the `Folders` tab. This securely uses the JANOS Management Protocol (JMP) and not FTP. If you generally would rely on the WebUI for file management it is recommended that you disable FTP with the following command.

```
reg FTP/Server = disabled
```

The FTP server can also be disabled under the Configuration tab on the FTP page by unchecking `Server Enabled`. In either case you must then reboot the unit to change the server status. Note that you can use the NETSTAT command to see what services are running. After disabling FTP you can confirm that it is no longer listening.

NOTE

The Support Tool currently relies on FTP for file transfer.

If you rely on the Support Tool you should not disable the FTP Server.

The FTP Server does have a secure mode using the STARTTLS command. The remote FTP client must be configured to use STARTTLS for transfers. In this case once an FTP connection is made the STARTTLS FTP command is issued to convert the connection to an encrypted channel before the credentials and anything else is transferred. This is a configuration setting for whatever FTP client or clients that you plan use.

TELNET

The Telnet protocol is used for making Command Line Interface (CLI) connections. Unfortunately Telnet clients (terminal programs) do not support SSL/TLS encryption. This protocol was developed in a time where SSH security was in use. The JNIOR does not currently support SSH.

The JNIOR does support a STARTTLS capability similar to that used by FTP. To utilize this feature you will need to obtain the client terminal program from INTEG.

You can disable Telnet just as you can FTP using the WebUI or by setting the appropriate Registry key. Again the Support Tool does currently rely on Telnet and the command connection for many of its procedures.

JMP PROTOCOL

The WebUI uses the JMP protocol through the Websockets through the same ports used by HTTP or HTTPS. If you have achieved a secure connection in accessing the WebUI the background JMP connection will also be secure. The JMP protocol also supports login. It has been integrated with the WebUI sharing the single entry of credentials.

The JMP Protocol is also available on Port 9220. It also supports the STARTTLS capability and clients programs designed to communicate the JMP protocol can take advantage of an encrypted connection. It is possible that you can safely disable the JMP Protocol under the Configuration tab and Protocol page in the WebUI.

JNIOR PROTOCOL

The JNIOR Protocol is a legacy protocol still in use today. It has limited capability and can also be elevated to an encrypted connection. It is available on Port 9200. This can be disabled as well if it is not required in your application.

SEE ALSO

HELP Topics: [NETSTAT](#)

AUTO-COMPLETION**User Commands****DESCRIPTION**

The TAB keystroke on the Command Line has a particular utility. The function is context-sensitive depending on the position in the command and on the command itself.

File Completion

When entering a command that may require a FILESPEC you may start typing the file specification and hit the TAB key. The file specification will be auto-completed with an existing matching file or folder. You may repeat the TAB keystroke and the system will toggle through all matching names. This allows you to locate a file or folder with minimal typing.

Registry Completion

When entering a REGISTRY or HELP command (including aliases) the auto-complete set is enhanced to include existing and system Registry keys. This can reduce the amount of typing but also help remind you of the proper key to use.

With the REGISTRY command if you use TAB immediately after the equals '=' sign the line will be pre-filled with the current value of the Registry entry if any. An existing Registry Key can be quickly accessed and brought up for editing using the TAB feature.

Command Completion

When using the TAB key at the beginning of the command line in starting to type a command it will toggle through all of the valid matching commands. This is further augmented by any matching commands from the existing command history. This can be very helpful in quickly recalling a recent command entry.

NOTES

When in doubt hit TAB. This is THE Series 4 JNIOR feature that makes the Series 3 JNIOR even more painful to use.

SEE ALSO

HELP Topics: [HIST](#), [HELP](#), [REG](#), [PROMPT](#)

PROMPT**User Commands****DESCRIPTION**

The Command Line prompt contains both the Hostname assigned to the JUNIOR and the current working directory. Depending on the selection of hostname and use of [CD](#) to change the working directory the prompt can become quite lengthy and crowd the command line.

The Del Delete Key when used at the beginning of a blank command line toggles the inclusion of the hostname in the prompt. This may help to shorten the prompt.

SEE ALSO

HELP Topics: [HOSTNAME](#), [CHDIR](#), [TAB](#)

CHDIR/CD**User Commands****NAME**

chdir - Change Working Directory

SYNOPSIS

chdir DIRECTORY

ALIASES

CHDIR, CD

DESCRIPTION

Use this command to change the current working directory. Initially the working directory is the File System root. The current directory (or folder) is displayed in the prompt.

SEE ALSO

HELP Topics: [MKDIR](#), [MD](#)

HISTORY/HIST**User Commands****NAME**

history - Command Line History Utility

ALIASES

HISTORY, HIST

SYNOPSIS

hist [INDEX]
hist [SEARCH]

DESCRIPTION

The Command Console maintains the history of entered commands. This is generally accessed using the UP and DOWN cursor arrows. A previous command may be recalled, optionally edited, and potentially reissued.

The command history has been greatly enhanced as many more commands are retained and now are carried from console session to console session. These histories are unique to the user for obvious security reasons.

In the absence of INDEX or SEARCH parameters the HISTORY command displays an enumerated list of past entries. The numeric INDEX can then be entered in a subsequent HIST command to recall the entry to the command line for optional editing and reissue.

A SEARCH string may be used to display prior entries containing a match. These will be enumerated but if there is only one matching entry it will just be brought to the command line for you. The SEARCH string may contain Regular Expression (REGEX) syntax.

SEE ALSO

HELP Topics: [REGEX](#), [TAB](#), [PROMPT](#)

BYE/EXIT/QUIT**User Commands****NAME**

exit - closes the console session.

ALIASES

BYE, EXIT, QUIT

DESCRIPTION

A Console Session is a separate process running on the JNIOR. A session can be terminated by closing a connection to the JNIOR. This command can be used to explicitly close the session.

DATE **User Commands**

NAME

date - displays and adjusts the system time and date.

SYNOPSIS

```
date [OPTIONS] [NEWDATE] [TIMEZONE]
date -n [NTP_SERVER]
```

DESCRIPTION

The DATE command without parameters simply displays the current time, date and timezone.

- T
Displays the current set of available timezones.
- G
Displays the current time in UTC.
- N [NTP_SERVER]
Requests the current time from the NTP server and updates the clock if a response is received. If NTP_SERVER is specified it is used in the request and sets the NTP server to be used in all subsequent requests.
- S
Disables the use of Daylight Saving Time (DST).
- D
Enables the use of DST.
- H
The system maintains a hardware clock when power is removed. This is queried during boot. This option reports the time according to the hardware. It also reports any difference between this time and the running (software based) system clock.
- V
Verbose output. When the time and date are displayed this goes into great detail. It describes any active DST rule and the DST status.

NEWDATE

This manually set the new time and date. The format is as follows:

```
MMDDYYYYHHMMSS
MM   - 2 digit month (01-12)
DD   - 2 digit day (01-31)
YYYY - 4 digit year (2021)
HH   - 2 digit hour (00-23)
MM   - 2 digit minute (00-59)
SS   - 2 digit second (00-59)
```

The entire string is not required. The unspecified portion is assumed to be 00. You can optionally append "am" or "pm" however time can best be set in 24-hour format.

TIMEZONE

Sets the timezone if specified. This is either the standard or DST abbreviation for the timezone.

NOTES

The system clock is updated from an available NTP server upon boot and approximately every 4 hours thereafter.

IPCONFIG**User Commands****NAME**

ipconfig - IP Network Utility

SYNOPSIS

ipconfig [OPTIONS]

DESCRIPTION

This command is used to configure network settings. If issued without options the current settings are displayed.

The product is shipped with Dynamic Host Configuration Protocol (DHCP) enabled which will allow the JNIOR to properly configure itself for most networks. In most applications the JNIOR should be assigned a fixed IP address.

-A IPADDR

Assign the IP Address IPADDR. The accepted formats are:

NNN.NNN.NNN.NNN Defining IP address only.

NNN.NNN.NNN.NNN/BB Defining IP address and BB netmask.

where:

 NNN is 0-255

 BB is typically 24 (number of 1's in netmask)

-M NETMASK

Assign the net mask NETMASK. Often 255.255.255.0 is used. Note there are 24 1's left-justified and therefore the /24 is used.

-G IPADDR

Define the Gateway IP Address. This is required to reach external servers as may be needed for DNS name resolution, Network Time Protocol (NTP) for clock updates, and sending email notifications.

-P IPADDR

Define Primary DNS IP Address.

-S IPADDR

Define Secondary DNS IP Address.

-D

Enable DHCP configuration (default).

- R
Release DHCP leased IP address and disable DHCP.
- T MILLIS
Set DNS timeout to MILLIS milliseconds (default 5000).
- H HOST
Sets the mailhost. HOST can reference a Domain or Ip Address.
- F EMAIL
Defines the Sender's (FROM) email address. This will be validated by the Mail Server and must be the user's valid registered email address.
- U USERNAME
Defines the username for the email account used for sending email. Note that in setting the username a password will be automatically requested, encrypted and stored securely.
- X
Remove/Delete user credentials entered with the -U option. Necessary to insure that both the Username and the securely stored password are cleared from the unit.
- L SYSLOG
Defines a SYSLOG server for external logging. SYSLOG may reference a Domain or IP address.
- N DOMAIN
Defines the local Domain. By default this is jnior.local and it is generally arbitrary.

NOTES

The NTP time server address is set by the DATE command. The default is pool.ntp.org.

The ARP -S command performs a local IP scan and can be used to verify availability of IP addresses.

The PING -V command can be used to verify communications with the configured gateways and servers.

SEE ALSO

HELP Topics: [ARP](#), [DATE](#), [NSLOOKUP](#), [SENDMAIL](#), [LOGGER](#), [PING](#)

HOSTNAME**User Commands****NAME**

hostname - Sets system hostname.

SYNOPSIS

hostname NEWNAME

DESCRIPTION

By default the system Hostname is the unit's Serial Number with a "JR" prefix. The Hostname is displayed as part of the command line prompt. The HOSTNAME command sets a new Hostname to NEWNAME.

Hostnames should be short and descriptive. The Hostname can be used in a URL to reference a unit whose IP address might not be known. In this case only characters compatible with a fully qualified domain name (FQDN) should be used. The Hostname is included in the unit's TLS Certificate to assist in establishing secure connections.

The Hostname is also used in NetBIOS Name Resolution. In this case the name should be no more than 15 characters and avoid punctuation. This limitation may be required before the Hostname will work in a URL.

SEE ALSO

HELP Topics: [IpConfig/HostName](#)

REGISTRY/REG**User Commands****NAME**

reg - Configuration Utility

ALIASES

REGISTRY, REG

SYNOPSIS

```
reg [KEY] [= VALUE]
reg [KEY]
reg [OPTIONS] [SEARCH]
reg [OPTIONS]
```

DESCRIPTION

Configuration settings are maintained using a database of Name-Value pairs. This is referred to as the Registry. Registry Keys can be created for just about any purpose. There is a set of built-in Registry Keys that have specific roles in the configuration of the JNIOR.

Querying a Registry Key or Keys
reg KEY

The command `REG KEY` displays the current `VALUE` of the key if any has been assigned. The `KEY` parameter may use the '*' and '?' wildcards. Therefore the command `REG *` dumps all assigned Registry Keys.

Setting a Registry Key
reg KEY = VALUE

The `REG KEY = VALUE` command sets the Registry Key to the `VALUE`. Registry entries contain string values even when numeric settings are required. If `VALUE` contains a space it must be enclosed in double-quotes. When entering a `KEY` striking the `TAB` key immediately after the equals '=' will pre-fill the line with the existing `VALUE`. This may be useful when an entry simply needs to be edited.

Deleting a Registry KEY
reg KEY =

Assigning a blank `VALUE` to a Registry Key removes it from the system. The operating system or an application may then choose to use a default `VALUE` to the setting.

Options**-D KEY**

The `KEY` parameter may specify a single `KEY` or use wildcard characters such as '*' and '?' to select a group of keys. Each deletion must be confirmed.

-A

This option overrides the deletion confirmation. This is the same as confirming a deletion with `[A]ll` and all operations will complete without prompting.

- E
The SEARCH parameter contains Regular Expression (REGEX) syntax.
- M
Displays the last modification timestamp for each Key. This is in the form [YYMMDDHHMM] and can be useful in determining when a setting may have been made.
- X
When listing Keys using a wildcard this option will include unassigned known system keys also matching the SEARCH. The command REG -X * not only displays all assigned keys but also those system keys that are defaulted.
- B
Displays keys formatted as another command. This output may be redirected to a BAT batch file and later executed to restore settings.
- F FILE
Exports keys matching SEARCH to the specified file in INI format. If SEARCH is omitted the entire Registry is exported with the exception of the IpConfig section. This allows the file to be moved to another JNIOR and when ingested not damage that unit's network configuration.
- I FILE
Import (or ingest) the FILE. This file must be in INI format. If the FILE is a JAR file then any included AppInfo.INI file is ingested. This is the same as Registering the application. Note that this creates the keys defined in FILE but does not remove those that are not.
- U FILE
Uninstall the FILE. This file must be in INI format. All keys referenced in the INI file are removed (deleted) from the Registry. If a JAR file is specified then the keys referenced by the included AppInfo.INI file are removed. This is equivalent to de-registering the application. Use the option VERY carefully.
- S
Generate Registry Snapshot. The saves the entire Registry to a file located in the /flash/registry folder. The file name is in the format jnior_YYMMDDHHMM.ini and this contains all entries including the IpConfig section. This creates a backup save point for the Registry.

NOTES

Registry Keys are not case-sensitive although when they are defined character case is retained to improve readability.

The TAB key has a specific utility on the Command Line. It is of particular use in working with the Registry.

The /flash/jnior.ini file should not be edited or overwritten. This is a backup for the Registry and is not referenced unless the Registry has

been damaged. Use -I to import Registry content and -F to export content for updating other JNIORS.

Registry changes are logged to the jniorsys.log file.

SEE ALSO

HELP Topics: [TAB](#), [BATCH](#), [INI](#)

FILES**User Commands**

The JANOS File System was modeled after Linux in order to maintain some familiarity for some users. Also the Linux file permissions are handled more logically than in other operating systems.

OWNERSHIP

Each file or directory has an Owner. This is the user account that created the file or directory or 'root' is the system did so. The USERS command lists the current users. The [CHOWN](#) command can alter the assigned ownership as well as the Group.

GROUPS

A file or directory may be assigned to a Group. A Group is a subset of the user accounts that can be given specific access permissions for the file or directory. The [GROUPS](#) command lists the current Groups. The [CHGRP](#) command can alter the Group assignment. The 'root' Group includes all users and is the default.

PERMISSIONS

File and directory permissions are displayed as a 10-character string in the format:

```
drwxrwxrwx
```

'd'	Is present for directories.
'r'	Indicates that 'read' permission is granted.
'w'	Indicates that 'write' permission is granted.
'x'	Is set for executable files.
'-'	Is displayed otherwise.

After the first character that describes the entry type there are 3 'rwx' sets corresponding to permissions respectively for the Owner, Group and then everyone else. The CHMOD command is used to alter file and folder permissions.

NOTES

An Administrator has access to all files and directories regardless of the defined permissions. Permission settings are then generally not required unless the product is to be accessed by other types of users.

SEE ALSO

HELP Topics: [LS](#), [USERS](#), [GROUPS](#), [CHOWN](#), [CHGRP](#), [CHMOD](#)

DIR/LS**User Commands****NAME**

dir - File Directory List Utility

ALIASES

DIR, LS

SYNOPSIS

dir [OPTIONS] [FILESPEC]

DESCRIPTION

Lists files stored in the File System. FILESPEC may define a specific file or contain '*' and '?' wildcards.

-L, -V

Long or Verbose mode lists file details such as permissions, size and last modification date.

-A

Lists ALL files including Hidden files. Hidden files and folders have names beginning with a period '.' .

-F

Lists only Files. Folders or Directorys are not listed.

-D

Lists only Directories or Folders. Files are not listed.

-S, -R

Recurses sub-directories or sub-folders listing content in each.

-W

Lists files in columnar format. Not valid with verbose listings are

-X

Includes the '.' file entry (current folder) when used with a recursive (-S or -R) verbose (-V) listing.

FORMAT

The long format (option -L) is interpreted by other systems and protocols such as File Transfer Protocol (FTP). It is therefore somewhat cryptic and may look foreign to some. A header is not provided as it might be misinterpreted in processing. The output appears as follows:

```
-rw-r--r--  1 root      root          387 May 27 08:45 jniorsys.log
```

-rw-r--r--

The initial column displays the Permissions for the file or directory. It comprises of 10 characters in the format 'drwxrwxrwx'.

1

The digit '1' is always listed. JANOS does not support multiple hard-links.

root

Next the file Owner is listed using the account username or 'root' if the file or directory was created by the system. The USERS command lists the current users.

root

The Group to which the file has been assigned. The GROUPS command lists the currently defined Groups. The 'root' group includes all users and is always available.

387

The file size in bytes. If the listing is a directory (first char in the permissions is a 'd') then this is the count of entries in the folder.

May 27 08:45

The date of the last file or directory modification. The format may change to include the year when the entry is sufficiently old.

jnorsys.log

Finally the file or directory name is listed.

SEE ALSO

HELP Topics: [PERMISSIONS](#), [USERS](#), [GROUPS](#)

RM/DEL

User Commands

NAME

rm - Remove File(s)

ALIASES

RM, DEL

SYNOPSIS

rm FILE

DESCRIPTION

Deletes the specified file or files. The parameter FILE may contain the '*' and '?' wildcard characters. If wildcards are used the command will prompt to confirm matching files for deletion.

COPY/CP**User Commands****NAME**

copy - Copies files

ALIASES

COPY, CP

SYNOPSIS

copy SOURCE DESTINATION

DESCRIPTION

Copies one or more files specified by SOURCE to DESTINATION.

SOURCE may specify files using the wildcards '*' and '?'.

If SOURCE specifies a single file then DESTINATION can define both a new location and name for the file.

If SOURCE specifies one or more files and DESTINATION is a folder then the files are copied into the destination folder.

If SOURCE specifies a folder then all file content is copied to the specified DESTINATION folder. The *.* wildcard is assumed.

-O

Overwrite all. If the destination file already exists it will be overwritten without confirmation.

-S, -R

Includes subfolders in wildcard copies. Note that the folder structure is maintained and destination folders will be created if needed.

SEE ALSO

HELP Topics: [MOVE](#)

MOVE/MV**User Commands****NAME**

move - Move files.

ALIASES

MOVE, MV

SYNOPSIS

move SOURCE DESTINATION

DESCRIPTION

Copies one or more files specified by SOURCE to DESTINATION. Once a successful copy is completed the SOURCE file(s) are removed. The files are moved to a new location.

SOURCE may specify files using the wildcards '*' and '?'.

If SOURCE specifies a single file then DESTINATION can define both a new location and name for the file.

If SOURCE specifies one or more files and DESTINATION is a folder then the files are copied into the destination folder.

If SOURCE specifies a folder then all file content is copied to the specified DESTINATION folder. The *.* wildcard is assumed.

-O

Overwrite all. If the destination file already exists it will be overwritten without confirmation.

-S, -R

Includes subfolders in wildcard actions. Note that the folder structure is maintained and destination folders will be created if needed.

SEE ALSO

HELP Topics: [COPY](#), [RENAME](#)

RENAME/REN

User Commands

NAME

rename - Rename file

ALIASES

RENAME, REN

SYNOPSIS

ren FILE NEWNAME

DESCRIPTION

This command renames the source FILE to NEWNAME. The FILE must exist and the NEWFILE cannot already be present. This command cannot be used to move a file. The MOVE command however can rename a file in the process of moving it.

SEE ALSO

HELP Topics: [MOVE](#)

MKDIR/MD

User Commands

NAME

mkdir - Create Folder/Directory

ALIASES

MKDIR, MD

SYNOPSIS

md FOLDER

DESCRIPTION

Creates the specified FOLDER.

SEE ALSO

HELP Topics: [RMDIR](#), [LS](#), [DIR](#)

RMDIR/RD **User Commands**

NAME

rmdir - Remove Folder/Directory

ALIASES

RMDIR, RD

SYNOPSIS

rd [OPTION] FOLDER

DESCRIPTION

Removes the specified FOLDER. The folder/directory must be empty. The -S option can be used to removed existing content.

-S

Recursion removes the folder/directory along with any files and sub-folders it may contain.

SEE ALSO

HELP Topics: [MKDIR](#), [LS](#), [DIR](#)

ARC/JAR/ZIP **User Commands**

NAME

arc - manages content within a compressed library file.

ALIASES

ARC, JAR, ZIP

SYNOPSIS

arc [OPTIONS] archive [FILES]

DESCRIPTION

ARC is a compression and file packaging utility. Files are stored in single library usually with the .ZIP or .JAR extension. This is used to compress files reducing storage space and to package multiple files in one library that can be managed as a single entity.

-E

Extracts uncompressed FILES to their relative path locations. To override the destination path use the -P option.

-A

Compresses and adds FILES to an archive preserving their relative paths. To override the stored paths use the -P option.

-U

Compresses and updates FILES in the archive when the new files have been more recently modified.

- F Scans the archive comparing the last modification dates with any matching external files. If an external file has been modified more recently it will replace the copy in the archive.
- M Same as -A adding FILES to the archive. Once the archive has been successfully modified the added external files are removed. The FILES are moved into the archive.
- D Removed FILES from the archive.
- L List archive content. Use the -V verbose option for greater detail.
- S Recurses folders when wildcard file specifications are used.
- P pathspec
Overrides the destination path associated with a file. When extracting this affects the destination of the file(s). When adding this defines the relative path stored for the file(s).
- V Verbose output. Increases detail.
- O Overwrite when extracting. If an external copy of the file would be overwritten the action is confirmed. The -O option bypasses the confirmation and overwrites as requested.
- T Test the archive. This decompresses archive content and confirms that each file can be successfully extracted. This uses stored CRC information.

JAR and ZIP archives are equivalently formatted archive files. The JAR file is so named as it generally contains an application program for the JNIOR written in Java.

The JANOS Java Virtual Machine, Webserver and Help system are each able to access files directly out of archives. Programs and websites each require multiple files in order to function properly and an archive allows those to be transferred and managed easily as a group.

CHMOD

User Commands

NAME

chmod - Modify Permissions

SYNOPSIS

chmod [OPTIONS] MODE FILESPEC

DESCRIPTION

This command alters the permissions for FILESPEC. Wildcards may be used to alter a set of files or directories. There are two optional syntax for MODE that define how permissions are altered. This is similar to the Linux usage.

Numeric Syntax

The numeric representation contains 3 digits each specifying the permissions for the owner, group and others in that order. Each is a bitwise mapping of 'rwx' where: r is 4 (bit 2), w is 2 (bit 1) and x is 1 (bit 0). For example:

```

--- 0      r-- 4      r-x 5      rw- 6      rwx 7

```

And therefore:

```

777      -rwxrwxrwx
644      -rw-r--r--

```

Symbolic Syntax

[ugoa][-+=[rwx][, ...]

The symbolic approach can be used to conditionally alter permissions. Here MODE is a command separated list of actions defined with a mnemonic. Where:

- u User or Owner
- g Group
- o Others
- a All (Owner, Group and Others)

- Remove permissions
- + Add permissions
- = Set permissions

- r Read permission
- w Write permission
- x Execute permission

EXAMPLES

To set test.bat permissions to -rwxr-xr-x use either syntax:

```

chmod 755 test.bat
chmod u=rwx,go=rx test.bat
chmod a=rx,u+w test.bat

```

To add execute permissions on test.bat for all users. This does not alter any previously defined read or write permissions.

```
chmod a+x test.bat
```

OPTIONS

- S
When wildcards are used this applies the change recursively through sub-directories.
- D
Alter permissions on a directory. This option is required when changing permissions on one or more directories. This is necessary to signal the intent in wildcard and recursive actions.
- V
Provides additional detail when changes occur.

SEE ALSO

HELP Topics: [PERMISSIONS](#), [LS](#)

CHOWN

User Commands

NAME

chown - Change Ownership

SYNOPSIS

```
chown [OPTIONS] USERNAME FILESPEC
chown [OPTIONS] USERNAME:GROUP FILESPEC
```

DESCRIPTION

This command alters the Ownership of FILESPEC. Wildcards may be used to alter a set of files or directories. This sets the new owner to USERNAME.

If GROUP is supplied the command will change both the Ownership and the Group assignment.

- S
When wildcards are used this applies the change recursively through sub-directories.
- D
Alter Ownership of a directory. This option is required when changing the ownership on one or more directories. This is necessary to signal the intent in wildcard and recursive actions.
- V
Provides additional detail when changes occur.

SEE ALSO

HELP Topics: [USERS](#), [GROUPS](#), [CHGRP](#), [FILES](#)

CAT/TYPE**User Commands****NAME**

cat - displays file content.

ALIASES

CAT, TYPE

SYNOPSIS

cat [OPTIONS]... FILESPEC

DESCRIPTION

Displays the content of FILESPEC to the standard output.

-H

The file content is dumped in standard hex debug format.

-J

Attempts to display a JSON file in a more readable form.

-P

Displays the last page (23 lines) of the file. Cannot be combined with other options.

Commands and options are not case-sensitive. Options may appear anywhere on the command line and in any order. Options may be combined following the dash '-' or separately specified.

EXAMPLES

```
cat jniorsys.log -p
    Displays the most recent page of SYSLOG entries.
```

```
type -j manifest.json
    Formats and displays the MANIFEST command reference point database.
```

NOTES

This command does not concatenate as it might on other systems. You can concatenate files using CAT and redirection first with '>' to create the new file and then with '>>' to append subsequent file content.

For example:

```
cat jniorsys.log.bak > syslog.log
cat jniorsys.log >> syslog.log
cat syslog.log -p
```

SEE ALSO

HELP Topics: [MANIFEST](#), [JSON](#), [ASCII](#)

EGREP/GREP/FIND**User Commands****NAME**

find - File Search Utility

ALIASES

FIND, GREP, EGREP

SYNOPSIS

```
find [OPTIONS] SEARCH FILE
egrep [OPTIONS] REGEX FILE
```

DESCRIPTION

This command searches a text FILE for matches to a specified SEARCH string. Each line containing a match is displayed. FIND and GREP search for an exact match to the string. Case-dependent and case-independent searches are possible. Regular Expressions (REGEX) are used with EGREP or when optionally selected.

-E

Use Regular Expressions (REGEX) for searches. This is the default with the command alias EGREP.

-C

Counts the number of lines with matches. Only the resulting count is reported.

-N

Displays the line number in the FILE for each matching line.

-H

Displays the FILE specification and line number for each matching line.

-I

Performs a case-independent search.

-M

This displays each matching line and subsequently underlines the matched text with a series of dashes '---'. When this option is used with REGEX the captured Groups as may be specified in the Regular Expression using parentheses () are displayed.

SEE ALSO

HELP Topics: [REGEX](#)

EDIT/ED**User Commands****NAME**

edit - Text Editor

ALIASES

EDIT, ED

SYNOPSIS

edit FILE

DESCRIPTION

The EDIT Editor is a simple text editor relying on VT-100 compatible terminal clients. It is fully compatible with the WebUI Console tab.

EDIT opens the specified text file displaying a page of lines at a time. There are relatively few editing functions provided. It is important to know that Ctrl-Q exits the editing and at that point the option to save any modifications is offered. You can also optionally save the file with a new name. No mouse function is available.

Editing Key Reference**Ctrl-Q**

Exit the editor. Optionally save, rename or cancel at that point.

Ctrl-Z

Undo.

Ctrl-Y

Redo.

Ctrl-A

Drop the Anchor. The cursor keys can then be used to highlight or select text for subsequent editing. This is similar to holding the Shift key when editing on the computer but since VT-100 does not support Shift key status reporting we have to 'drop an anchor' and then drag it by moving the cursor.

Ctrl-C

Copy the selected text to the clipboard.

Ctrl-X

Copy the selected text to the clipboard and remove it from the file.

Ctrl-V

Paste any text from the clipboard to the current cursor location in the file.

Ins

The Insert key toggles between insert or overstrike on key entry.

PgUp

The Page Up key display the previous page of text if there is

more to display.

PgDn

The Page Down key displays the next page of text until the end of the file is reached.

Home

Moves the cursor to the beginning of the current line. If you are at the beginning of a line it move to the beginning of the current page. If you are at the beginning of a page the Home key move to the beginning of the file.

End

Moves the cursor to the end of the current line. If you are at the end of a line it moves to the end of the last line in the displayed page. If you are at the end of the last line of the page the End key moves to the end of the file.

Del

Deletes the character at the cursor or deletes any selected text.

Bksp

Backspace deletes the character before the cursor or any selected text.

NOTES

If you have selected text and begin typing, the selection is removed and replaced with your keystrokes.

When using the WebUI you can right-click and Paste from the PC clipboard. Similarly you can select text by holding the Shift key and right-click to Copy the selection. This is independent from text selection cut, copy and paste in the editor.

SENDMAIL**User Commands****NAME**

sendmail - Command Line Email Utility

SYNOPSIS

sendmail [OPTIONS] RECIPIENTS [SUBJECT]

DESCRIPTION

This command permits the creation of an email from the command line. The email will be sent if the Mail Server/Host is defined, a user email address is specified and proper user credentials have been entered through the IPCONFIG command.

One or more RECIPIENTS must be specified. Multiple recipients are separated by a semicolon ';'. A SUBJECT line may be specified.

The command will then accept entry of one or more lines of the message. The message entry is terminated by a single line containing the period '.' character.

-C ADDR

Specifies one or more email address to be CC'd. Multiple recipients are separated by a semicolon ';'.

-B ADDR

Specified one or more email address to be BCC'd. Multiple recipients are separated by a semicolon ';'.

-I FILE

Specifies a text file that is to be appended to the message. If used in combination with the -S option the email will contain only the message in FILE.

-A FILES

Specifies one or more attachments to be included with the email. Multiple attachments are separated by a semicolon ';'.

-S

Skip message entry. The email will either be blank or contain text specified by the -I option.

NOTES

The JNIOR may be configured to send emails on particular events such as at boot. When configured to send at boot the default includes LOG files which can be useful in determining the reason for the reboot.

SEE ALSO

HELP Topics: [IPCONFIG](#)

LOGGER**User Commands****NAME**

logger - Log Entry Utility

SYNOPSIS

logger [OPTIONS] MSGTEXT

DESCRIPTION

Makes a log entry using the MSGTEXT. By default this logs to /juniorsys.log and to the SYSLOG Server if configured. This command is useful in batch and script files when the action should be logged. The log entry by default has a [logger] prefix tag.

-F FILE

Redirects the log entry to FILE.

-T TAG

Log the entry with a [TAG] prefix. Overrides [logger] default.

-I

Includes the Process ID (PID) with the entry.

-R

Directs the log entry to the external SYSLOG Server only.

-P LEVEL

Sets the severity level reported to the external SYSLOG server.

- 0 - Emergency
- 1 - Alert
- 2 - Critical
- 3 - Error
- 4 - Warning
- 5 - Notice
- 6 - Info (Default)
- 7 - Debug

SEE ALSO

HELP Topics: [BATCH](#), [SCRIPTING](#)

TOUCH**User Commands****NAME**

touch

SYNOPSIS

touch FILE

DESCRIPTION

This command sets the last modification timestamp of FILE to the current time. This makes the file appear to be new. The content is not altered. If FILE does not exist a 0 length file is created.

SEE ALSO

HELP Topics: [LS](#), [DIR](#)

JAVA**User Commands****NAME**

java - Execute Java Application

SYNOPSIS

[java] FILESPEC [&]

DESCRIPTION

This executes the Java program. FILESPEC typically defines a JAR file generated externally by a standard Java compiler such as Netbeans. The program must be expressly built using the JanosClasses.jar runtime library.

The optional ampersand '&' must lie at the end of the line and when present causes the program to execute in the background as a new process.

The JAVA command itself is optional. When a command line is processed and a built-in command has not been specified the system looks for a Java program. If FILESPEC does not specify a folder the system will search for the program, FILESPEC also does not need to include the .JAR extension as it will be assumed.

Java programs are typically stored in the /flash folder. The system searches the /flash folder first. If the program is not found the search will continue in the root and then the current working directory before finally indicating that the program cannot be found.

NOTES

Applications are started on boot using Run keys in the Registry.

Run/<NAME> = <COMMAND>

The NAME is arbitrary and usually the program name is used. The value of the key is handled as a COMMAND as if were entered from the command line. Programs started with Run keys execute in the background each with their own instance of the JVM.

SEE ALSO

HELP Topics: [PROGRAMMING](#), [THD](#), [PS](#)

RUN**User Commands****NAME**

run - Execute Script

SYNOPSIS

run SCRIPT PARAMETERS

DESCRIPTION

JANOS uses a PHP-like language for scripting. In batch file execution, scripts may be used to render batch file commands which are then executed. This is analogous to using PHP to render an HTML document which is then served to a browser. The RUN command executes the script the results of which are simply sent to the display. In this case the SCRIPT is essentially a program.

The SCRIPT file typically has a PRG file extension. If an extension is omitted then .PRG is assumed. The system searches for the SCRIPT file as it would a Java program. Scripts may be placed in the /flash folder and easily executed without path or extension using RUN.

Script files accept PARAMETERS as do batch files and Java applications.

NOTES

The RUN command can be used to render a batch program allowing you to examine the resulting commands without executing them. Once you are satisfied that the script generates the correct command set you can execute the batch file normally.

A SCRIPT could be written to output information using the ECHO command allowing it to be used without the RUN command in batch mode.

Scripts are compiled and therefore run fairly efficiently. The resulting compiled script is cached for the duration of the command session.

SEE ALSO

HELP Topics: [BATCH](#), [SCRIPTING](#), [PHP](#)

SETENV/SET

User Commands

NAME

set

ALIASES

SETENV, SET

SYNOPSIS

set
 set VARIABLE
 set VARIABLE = VALUE

DESCRIPTION

Each process has its own Environment. This command displays the variables that may be defined in the current Environment.

If VARIABLE is specified its value will be displayed. If VALUE is given then the variable will be replaced.

NOTES

Environment variables are case-sensitive and are inherited from a parent process.

An Env/ Registry Key may be used to pre-initialize a variable in the Environment. This would insure that it is always defined.

SEE ALSO

HELP Topics: [ENVIRONMENT](#)

REM

User Command

SYNOPSIS

rem TEXT

DESCRIPTION

On the command line and in batch files the REM command has no effect. The content of the line is ignored and can serves as a comment.

ECHO **User Commands**

NAME
 echo - Display a message

SYNOPSIS
 echo MESSAGE

DESCRIPTION
 The echo command displays MESSAGE to the console. The MESSAGE can be redirected to a file as can the output of any command.

The entire remaining command line is echoed. Leading and trailing spaces are trimmed and multiple spaces within the message are shortened to a single space. If white space is to be preserved in formatting the string may be enclosed in double quotation marks. Those will be removed. Escaping of non-printable characters is supported.

SEE ALSO
 HELP Topics: [SCRIPT](#), [CKSUMS](#)

PS **User Commands**

NAME
 ps - Process List

SYNOPSIS
 ps [OPTIONS]

DESCRIPTION
 Lists currently active processes along with the Process ID (PID). This command also displays the current uptime.

- V Provides additional process information.
- runtime - Total runtime accumulated
- mem - Amount of memory in use (KB)
- hnd - Number of handles allocated
- stk - Maximum stack usage (percent)
- frm - Count of Stack frames (Applications)

NOTES
 Developers want to insure that an application does not monopolize CPU resources. An application abnormally accumulating runtime may benefit from the use of process sleep() and yield() functions where appropriate.

SEE ALSO
 HELP Topics: [THD](#), [KILL](#)

THD **User Command****NAME**

thd - Display JVM Thread Status

DESCRIPTION

Applications are written in Java and each executes with its own instance of a Java Virtual Machine (JVM). The THD command displays the status of each active JVM.

Classes are cached and shared. The THD command indicates how many Java classes have been loaded and the amount of memory associated with the cache.

Each process is listed along with the accumulated process time, memory usage, PID and stack as would be displayed by the PS command. In addition the amount of memory associated with active Java Objects and classes is shown.

Each Thread in the program is enumerated along with the associated amount of runtime accumulated by the thread. The status of the thread is indicated. For instance SLEEP is shown if a thread has executed a sleep().

If an application sets a system Watchdog the status of the watchdog is displayed along with the remaining time on its timer.

SEE ALSO

HELP Topics: [PS](#), [KILL](#), [JAVA](#)

KILL **User Commands****NAME**

kill - Terminate Process

SYNOPSIS

kill PID
kill PROCNAME

DESCRIPTION

This command allows you to terminate a process that is running in the background. The PID parameter is the ID of the process as shown by the PS command. You may also identify a process by its PROCNAME or description displayed by the PS command.

NOTES

The system attempts to shutdown the process by setting an interrupt flag as would occur when using Ctrl-C to interrupt a foreground program. If the process has not shutdown on its own after 15 seconds it is terminated forcibly.

SEE ALSO

HELP Topics: [PS](#), [THD](#)

NV**User Commands****NAME**

nv

DESCRIPTION

This lists any application created non-volatile memory blocks sometimes referred to as "immutable blocks". These blocks provide a form of fast variable storage that retain content through a reboot/restart.

GC**User Commands****NAME**

gc - Garbage Collection

SYNOPSIS

gc [OPTIONS]

DESCRIPTION

JNIOR applications are Java programs and Java programs continually create objects using memory. When objects fall out of scope (are no longer used) they must be cleaned up. This process is called Garbage Collection (GC).

The GC activity under JANOS has minimal impact on program performance. The GC command is available for status.

-R

Resets statistics.

-D

Disable GC. This option is available to assist in diagnostics and performance evaluations. GC will automatically restart when memory reaches a critical level.

EXTERN**User Commands****NAME**

extern - External Module Utility

SYNOPSIS

extern [OPTION]

DESCRIPTION

Displays the status (present or not preset) and the ID string assigned by the factory.

-R

Removes devices that are no longer present.

NOTES

Module order affects the extension of the internal I/O. For instance the Model 410 has 8 relay outputs 1 - 8. Adding an external 4ROUT module then adds relays 9-12. Adding another module adds relays 13-16 for a maximum of 16. The order in which the modules are added determines the relationship to the relay numbers.

To insure the proper order:

1. Disconnect all external modules.
2. Execute the EXTERN -R command
3. Connect the first module (for relays 9-12 for instance).
4. Execute EXTERN confirm that the module has been recognized.
5. Connect the second module.

The order would then be correct and properly remembered.

Do not attempt to manipulate the TypeHH_N Registry keys. These are dynamically updated by the system.

IOLOG**User Commands****NAME**

iolog - I/O Log Utility

SYNOPSIS

iolog [OPTIONS]

DESCRIPTION

The IOLOG command provides access to digital and communications logs that are available for digital inputs, relay outputs, the AUX serial port and the JNIOR Sensor Port (expansion bus).

The command entered without OPTIONS generates the /jniorio.log file containing detailed entries for each digital transition of an input or relay.

-T

Indicates digital transitions. The standard /jniorio.log uses 0's and 1's indicating the state of the input or output. An entry is made when a state changes. This option uses an 'L' to indicate and state changes 1->0 and an 'H' for the change 0->1.

-A

This option specifies the AUX port. This generates the /auxio.log file detailing communications activity over the AUX port.

-S

This options specifies the Sensor Port. This generates the /sensorio.log file detailing communications with external modules.

-O

Redirects output to the console. This displays the log to the console and the associated file is not generated.

-R

Resets the logs. All previous activity either digital or serial is erased.

NOTES

Serial logs are in hexadecimal. Data transmitted by the JNIOR is shown as HH along with the character representation. Data received by the JNIOR is surrounded by dashes as -HH- to distinguish the direction of the communication.

The NETSTAT command provides a network capture capability that is also useful in diagnostics.

SEE ALSO

HELP Topics: [NETSTAT](#), [JRMON](#), [ASCII](#)

JRMON**User Commands****NAME**

jrmon - JNIOR I/O Utility

SYNOPSIS

jrmon [OPTIONS]

DESCRIPTION

This command provides command line access to the I/O features of the JNIOR. It is a useful diagnostic tool as well.

When executed without OPTIONS the command displays the current state of digital inputs and relay outputs including those assigned to external 4ROUT modules. A 'twirly' (a character sequence / - \ | emulating rotation) spins to indicate active monitoring. Any keyboard keystroke exits the command.

WARNING: THE FOLLOWING COMMANDS AFFECT RELAY STATES AND THEREBY ANY EQUIPMENT WIRED TO THOSE RELAYS. DO NOT ATTEMPT THESE ACTIONS UNLESS YOU ARE CERTAIN THAT THE RESULT WILL NOT DAMAGE EQUIPMENT OR OTHERWISE CAUSE UNWANTED EVENTS TO OCCUR.

ACTIONS

Single character commands are accepted at the JRMON prompt in interactive mode. A sequence is executed with the ENTER keystroke. These can also be executed from the command line using the JRMON -X command.

[C]lose NNN

Causes 1 or more relays to Close (be activated, LED illuminates). For example 'c35' closes Relay Outputs 3 and 5 simultaneously.

[O]pen NNN

Causes 1 or more relays to Open (be deactivated, LED extinguishes). For example 'o35' opens Relay Outputs 3 and 5 reversing the above example.

[P]ulse

A relay may be pulsed for a very specific time defines in milliseconds. This action must be combines with a Close or Open. For instance the command 'cp2' pulses Relay Output 2. This can pulse an output ON for a moment and then back OFF. I can also pulse the output OFF and then back ON.

Pulses have a duration. The default pulse duration is 100 milliseconds. The '=' equals sign can be used to specify the pulse duration. The command 'clp = 2000' pulses Relay Output 1 for 2 seconds. This does not alter the default and therefore the command 'clp' pulses the same output for just 0.1 seconds (100 milliseconds). However, the command 'p = 2000' alters the default to 2000 milliseconds.

NNN

Relay outputs and Digital Inputs are identified by single individual numeric digits. You can enter 1 or more digits. Relay Outputs 1-8 are designated with numerals '1' thru '8'. Relay Outputs 9-12 are considered to be a second bank of 8 and are referenced by preceding the digit with

the '+' sign. The command 'c1+12' closes Relay Outputs 1, 2, and 9. An '*' asterisk specifies ALL. You can open all relays with the command 'o*'.

[R]eset NNN

Digital Inputs may be latched. Depending on configuration these may require manual intervention to be reset or unlatched. The command 'r2' resets any active latching on Digital Input 2.

[L]ist

The 'l' lowercase 'L' command lists the values of the input counters.

[S]et NNN

This sets the counter or counters for the specified Digital Inputs. You can set a counter to a specific value if a correction is needed or clear the counters to 0 zero. The command 's1=1241' set the counter to Digital Input 1 to 1,241 while the command 's*=0' resets all counts to 0 zero.

[U]sage

The 'u' command displays the value of Usage (Metering) timers. These may be viewed and can only be reset by application.

[Q]uit

The 'q' command exits JRMON terminating the interactive session.

COMMAND LINE SYNTAX

-C

Enters Control Mode. In this mode commands may be issued to Close, Open or Pulse individual relays or even all of the relays. For example:

```

q           - exit the program
c1          - close Relay Output 1
o1          - open Relay Output 1
c3p=2000   - close Relay Output 3 for 2 seconds (pulse)
c25        - close Relay Outputs 2 and 5 simultaneously
o*         - open all Relay Outputs
    
```

Relay Outputs 1-8 are defined by a single character. The plus '+' sign is used to reach relays 9-16 with digit characters 1-8.

```

c+1        - close Relay Output 9
c5+2       - close Relay Outputs 5 and 10
    
```

The default pulse is 100 milliseconds. This can be altered for the current command instance.

```

p=5000     - set 5 second pulsing
c1p        - close Relay Output 1 for 5 seconds
c2         - close Relay Output 2
o2p        - open Relay Output 2 for 5 seconds.
    
```

Digital inputs can be configured for Latching. Once latched the input need to be reset somehow and possible by an application.

r2 - reset latched Digital Input 2

Input transitions are tallied by Counters. These can be displayed and even preset by the following actions.

l - list counters (lowercase L)
s1=1024 - set DIN1 counter to 1024
s*=0 - reset all counters

Usage meters tally time for inputs and outputs. While those cannot be set here you can view them.

u - view all usage meters

-X CMD

Execute control command CMD immediately and return. This performs the request and does not enter the monitoring mode. The following immediately opens all relays.

jrmon -x o*

-D

Diagnostics Mode. This is the same as the -C Control Mode with the addition of a T action. This runs a complex pattern of relay outputs just to showoff the relays. It is interesting but would be really really bad if anything were actually wired to the JNIOR.

-M

System Monitor mode. This mode is not related to I/O but allows you monitor system load in real-time. The system load is determined by measuring the overhead time involved in process swaps away from the monitoring process. System heap status is also shown. Any keyboard input exits the command.

SEE ALSO

HELP Topics: [IOLOG](#)

MODE **User Commands****NAME**

mode - Adjust system mode.

SYNOPSIS

mode [OPTION]

DESCRIPTION

The MODE command is provided for modifying the mode of the COM RS-232 port. The COM port provides access to the Command Line Console and also provides diagnostic dialog during boot. If the port is to be used in an application the default diagnostic and command line operation can be disabled. The application may do so through programming. The MODE command can be used to restore default operation.

-S

Option silences the COM port dialog and disables command line access.

-V

Restores COM port boot dialog and command line access.

-A

Temporarily allows Command Line access through the AUX port.

NOTES

The COM port setting is stored in the COMSerial/BootDialog Registry key. The AUX port command line capability once activated is available only until power is removed.

USERS**User Command****NAME**

users - List User Accounts

DESCRIPTION

The USERS command lists the current set of defined users. The output includes the Username, UserID and Account Permissions. Accounts either have 'Administrator' permissions, 'Control' capabilities, or are 'Guest' accounts.

Administrators can perform all actions, execute everything and make any and all configuration changes. Users with Control capabilities can control the state of outputs and have access to a limited set of commands. Guests basically can only monitor the status of the JNIOR I/O.

In addition to permissions a user account may be 'Disabled'. This allows an account to be rendered inactive without removing it. This would allow the account to later be reactivated.

Accounts also have passwords. These cannot be displayed.

NOTES

By default the JNIOR ships with 4 accounts defined. The USERS command shows:

admin	3	Administrator
guest	0	Disabled
jnior	1	Administrator
user	2	Control

The default passwords are set to be the same as the user names.

When you install a JNIOR you might decide whether as Administrator you are going to use the 'jnior:jnior' account or the 'admin:admin' account and use the USERMOD command to disable the other accounts. Then use the PASSWD command to set a unique password for the administrator.

SEE ALSO

HELP Topics: [DEFAULT_ACCOUNTS](#), [USERADD](#), [USERDEL](#), [USERMOD](#), [GROUPS](#), [SAFEMODE](#)

PASSWD**User Commands****NAME**

passwd - Change User Password

SYNOPSIS

passwd [USERNAME]

DESCRIPTION

Sets the password for the USERNAME account. The USERNAME parameter can only be specified by an Administrator. When USERNAME is not specified this sets a new password for the current account.

You are asked to first enter the current password to authenticate and then the new password. You will need to successfully reenter the new password before the command will make the change.

NOTES

Passwords may contain any characters however they must be at least 4 characters in length and no more than 19 characters.

If you have forgotten your Administrator account (jnior) password you will need to use SAFEMODE to regain access to the unit. This procedure requires physical access to the JNIOR.

SEE ALSO

HELP Topics: [SAFEMODE](#)

USERMOD**User Commands****NAME**

usermod - Modify User Permission

SYNOPSIS

usermod USER ACTION

DESCRIPTION

This command is user to set or unset the Administrator, Control or Disabled flags associated with the USER account. Onlys a single flag may be modified by ACTION with each command use. The USERS command can be used to confirm the changes. The actions are as follows:

+A	Add Administrator permissions
-A	Remove Administrator permissions
+C	Add Control capabilities
-C	Remove Control capabilities
+D	Disable an account
-D	Activate an account

NOTES

Administrators by definition can perform all of the Control actions and the Control flag need not be set for administrators.

An account without Administrator permissions and Control capabilities is considered a Guest account. These have limited access and can only monitor things.

Any account can be temporarily Disabled and later activated.

SEE ALSO

HELP Topics: [DEFAULT_ACCOUNTS](#), [USERS](#)

USERADD**User Commands****NAME**

useradd - Add New User

SYNOPSIS

useradd [OPTIONS] USERNAME

DESCRIPTION

This command adds the USERNAME user. USERNAME cannot already exist. If OPTIONS are not specified the user is created as a Guest. With the creation of the user you are asked for a password and must successfully reenter the password.

-D

Creates USERNAME as a Disabled account. A password must still be set.

-C

Creates USERNAME with Control capabilities.

-A

Creates USERNAME as an Administrator.

NOTES

Use the USERS command to confirm the account creation. Login as the user and confirm the password as well as the intended permissions.

SEE ALSO

HELP Topics: [DEFAULT_ACCOUNTS](#), [USER](#), [USERMOD](#), [USERDEL](#)

USERDEL **User Commands**

NAME

userdel - Delete User

SYNOPSIS

userdel USERS

DESCRIPTION

This command removes one or more users from the system. There are no options or confirmations. Multiple users may be removed simply by listing them separated by spaces.

NOTES

You cannot remove the current user. Since you must be an Administrator to remove users you can never remove all of the Administrator accounts. That would obviously be a bad thing.

SEE ALSO

HELP Topics: [DEFAULT_ACCOUNTS](#), [USERS](#), [USERADD](#)

GROUPS **User Commands**

NAME

groups - List Groups

DESCRIPTION

A Group can have one or more members. Each member is a user account. The GROUPS command lists the available Groups, the Group ID and the members.

SEE ALSO

HELP Topics: [GROUPADD](#), [GROUPDEL](#), [CHGRP](#), [FILES](#)

GROUPADD **User Commands**

NAME

groupadd

SYNOPSIS

groupadd GROUP USERLIST

DESCRIPTION

This command adds each member from USERLIST to the GROUP. If the GROUP does not exist it is created. The USERLIST can contain one or more account names separated by spaces.

SEE ALSO

HELP Topics: [GROUPS](#), [GROUPDEL](#), [CHGRP](#), [FILES](#)

GROUPDEL **User Commands**

NAME

groupdel

SYNOPSIS

groupdel GROUP USERLIST

DESCRIPTION

If the USERLIST is omitted the command will remove the entire GROUP. If the GROUP has members a confirmation of the deletion is required. Otherwise the command removes each member of the USERLIST from the GROUP. The USERLIST may specify one or more account names separated by spaces.

SEE ALSO

HELP Topics: [GROUPS](#), [GROUPADD](#), [CHGRP](#), [FILES](#)

CHGRP **User Commands**

NAME

chgrp

SYNOPSIS

chgrp [OPTIONS] GROUP FILESPEC

DESCRIPTION

This command alters the Group assignment for FILESPEC. Wildcards may be used to alter a set of files or directories.

-S

When wildcards are used this applies the change recursively through sub-directories.

-D

Alter Group assignment on a directory. This option is required when changing the Group assigned to one or more directories. This is necessary to signal the intent in wildcard and recursive actions.

-V

Provides additional detail when changes occur.

SEE ALSO

HELP Topics: [GROUPS](#), [GROUPADD](#), [GROUPDEL](#), [FILES](#)

WHOAMI**User Commands****NAME**

whoami - Display current user

DESCRIPTION

Displays the current username, userID and role.

NETSTAT**User Commands****NAME**

netstat - Network Status Utility

SYNOPSIS

netstat [OPTIONS]

DESCRIPTION

This displays the status of the LAN connection and lists all of the active network connections as well as any of the services accepting connections.

-U

Displays any services accepting connectionless UDP packets.

-A

Displays network statistics such as packet and error tallies.

-M

Dynamically displays network activity. The display mode is exited by any keyboard entry.

-C [FILTER]

Generates the /temp/network.pcapng capture file which contains recent network traffic. This may be downloaded and opened with Wireshark <https://wireshark.org> . An optional FILTER may be used to limit the content.

-F [FILTER]

JANOS always buffers recent network traffic for capturing. This option can set a FILTER to limit the traffic collected. Since only a limited space is available for buffering, a filter can be used to retain packets of interest for a much longer period of time. The filtering is removed if FILTER is omitted.

-R

Resets the network buffer removing prior buffered traffic.

-T

Displays TLS statistics regarding the negotiation of various security suites.

SEE ALSO

HELP Topics: [FILTER](#)

CERTMGR**User Commands****NAME**

certmgr - TLS/SSL Certificate Management

SYNOPSIS

certmgr OPTIONS

DESCRIPTION

JNIOR network connections support TLS v1.02 security. This insures that information passed over the connection is encrypted and unreadable. Most importantly this protects usernames and passwords which are normally required to gain access to the JNIOR.

A Certificate is required during TLS negotiation. This not only verifies the identity of the JNIOR but also passes public key information. The CERTMGR command performs a number of functions related to keys and certificates.

By default the JNIOR generates a unique and secret key pair. It then creates a self-signed certificate for use in negotiating a TLS connection.

-V

Verifies the current active keys and the associated certificate.

-C [FILE]

Regenerates the self-signed certificate. If FILE is specified an externally generated certificate is installed. This must be in PEM format.

-A FILE

Adds an intermediate certificate. The FILE must be in PEM format.

-S FILE

Validates the digital signature on the certificate in FILE.

-K FILE

Installs an RSA key pair from the FILE. The key file can be encrypted and the command will prompt for the password.

-D [FILE]

Dumps the current certificate or if FILE is specified the certificate within the file. This formats the ASN.1 content in a somewhat readable form.

-E FILE

Exports the current certificate to the FILE in PEM format. Note that the resulting file can be added to your computer's trusted certificate store allowing your browser to trust the JNIOR. This avoids warning messages.

-P FILE

This exports the current Public Key to FILE. The Private Key is secret and cannot be exported.

- B
Performs the certificate export in binary format. This option is used in conjunction with the -E export option.
- G [BITS]
Generates a new RSA Key Pair. This requests that a new key pair be generated and this is performed as a background process. By default a 1,024 bit key pair is generated. The optional BITS parameter can define a different bit length. Note that only a limit range of key sizes are possible.
- X FILE
This generates a Certificate Signing Request (CSR) from the installed RSA Key Pair. A CSR can be provided to a suitable Certificate Authority (CA) for signature. The resulting signed certificate can then be installed with the -C FILE option. The JNIOR would then be trusted by browsers.
- R
Restore default credentials. The JNIOR is shipped with a temporary 512 bit RSA key pair. Once up an running the JNIOR will generate a 1,024 bit key pair as a background task. This option resets the key pair and repeats that process.

NOTES

When IP addressing or the hostname is changed the JNIOR will automatically generate a new self-signed certificate.

PING**User Commands****NAME**

ping

SYNOPSIS

ping [OPTIONS] [ADDRESS]
ping [OPTIONS] [HOST]

DESCRIPTION

PING is used to test the ability to communicate with a specific HOST over the IP network (Internet). A small packet is transmitted to a destination which, if it is configured to do so, will reply. The round trip time is displayed. A HOST may be specified by IP ADDRESS or Domain Name.

-C COUNT

By default PING will make 4 communication attempts. This number may be specified by COUNT.

-I MILLIS

By Default PING sends a communication every 1 second. This interval may be specified by MILLIS in milliseconds (1 sec = 1000 milliseconds).

-T TTL

The Time To Live (TTL) specifies "how far" a packet is allowed to travel. This is in hops and by the standards each router handling the packet counts as a step. By default TTL is 128. Using a limited TTL allows you to probe only the local network neighborhood.

-W MILLIS

After a packet is transmitted the JNIOR waits for a response. By default if there is not response in 5 seconds the target is declared unreachable. This timeout period can be specified in milliseconds.

-V

This option validates the JNIOR network configuration. This PINGS all of the configured addresses for the Gateway, DNS servers, Mail Server, NTP Server, and SYSLOG Server. This also checks access to the INTEG website at www.integpg.com which is just a simple way to confirm access to the Internet.

-F

The Flood option can be used to test communications reliability. This continually PINGS the target. A "twirly" is displayed (a sequence of characters / - \ | mimicking rotation). If a response is lost the twirly is replaced with a period '.' and the test continues. This provides a feeling for reliability as periods appear or do not appear during the test. A Ctrl-C key combination terminates the activity and reports statistics.

NOTES

The standard implementation of a network stack supports ICMP (Internet Control Message Protocol) which includes the PING service. Sites wishing to limit their visibility may disable PING responses.

SEE ALSOHELP Topics: [IPCONFIG](#)**ARP****User Commands****NAME**

arp - Address Resolution Protocol

SYNOPSIS

arp [OPTIONS] [IPADDR]

DESCRIPTION

Communications over the local network use the fixed MAC addressing assigned by device manufacturers. The Address Resolution Protocol (ARP) helps us find the MAC address associated with the IP addresses that we give to local devices and computers. The ARP command displays the cached mappings.

If IPADDR is specified the command displays the mapping for the IP address if known. Otherwise the entire database of active devices is displayed.

-A IPADDR

Issues an ARP request for IPADDR if not present in the cache.

-D IPADDR

Removes IPADDR from the cache. This forces the JNIOR to issue a new request when next attempting to contact the remote device.

-S

Scans the entire subnet displaying the IP addresses used by any computers or devices on the network. In addition to the IP address the listing shows the MAC address and other identification information. If the remote device is referenced in the JNIOR's network configuration its role is also indicated.

The ARP -S command is useful in locating unused IP addressing.

SEE ALSOHELP Topics: [IPCONFIG](#)

NSLOOKUP**User Commands****NAME**

nslookup - DNS Cache Utility

SYNOPSIS

nslookup [OPTIONS] [DOMAIN]

DESCRIPTION

When the JNIOR accesses a domain it must resolve the text into an IP address. An external DNS server provides the service and the results are cached for a period of time. This command displays the content of the cached database.

If DOMAIN is provided the system attempt to resolve the domain.

-D

Deletes the specified domain from cache.

NOTES

Domain addresses remain in the cache for 5 minutes.

SEE ALSO

HELP Topics: [IPCONFIG](#)

NBTSTAT**User Commands****NAME**

nbtstat - NetBIOS Name Resolution Status

DESCRIPTION

Some systems can use NetBIOS Name Resolution to resolve Hostnames into IP addresses. The JNIOR supports this and it allows you to specify the JNIOR by its Hostname in the browser. The NBTSTAT command reports the registered NetBIOS naming for the unit.

NOTES

Hostnames longer than 19 characters or that use forms of punctuation may not be compatible with this form of name resolution.

By default all JNIORs are reachable using their "Birth Name". That being the unit's serial number with a "JR" prefix.

SEE ALSO

HELP Topics: [HOSTNAME](#)

REBOOT **User Commands****NAME**

reboot - Restart the JNIOR

SYNOPSIS

reboot [OPTIONS]

DESCRIPTION

This command reboots/restarts the JNIOR. This is required for an operating system (JANOS) update. The command terminates all processes in a controlled fashion bringing the system to a halt before restarting.

-F
Skips the confirmation prompt.

-A
Resets heap and system memory.

SEE ALSO

HELP Topics: [JRUPDATE](#)

STATS **User Commands****NAME**

stats - System status

SYNOPSIS

stats [OPTIONS]

DESCRIPTION

Displays various system information such as specific JANOS version and build. The Model, Serial Number and POR (Power On Reset) count are displayed as well as the current system uptime (time since boot).

JANOS maintains record of the longest uptime achieved and an accumulation of time the product has been up and running. These are provided. A status for the various memory areas within the JNIOR is also displayed.

-A
This option resets the Attention Status to 'All Clear'.

SEE ALSO

HELP Topics: [JRFLASH](#)

MANIFEST**User Commands****NAME**

manifest - File System Verification Utility

SYNOPSIS

manifest [OPTIONS] [FILESPEC]

DESCRIPTION

This command lists files and the output differs from the LS or DIR command in that a Message Digest which reflects the file content is calculated from each byte in the file and displayed. The default message digest is MD5. While the digest may be useful in comparing with an externally published value the benefit in the MANIFEST command is its ability to compare against a Reference Point (RefPoint).

The FILESPEC parameter is typically not used. By default MANIFEST scans the entire file system but can be directed to evaluate a single file or set of files.

The -U option (see below) generates the RefPoint which retains information about each and every file on the JNIOR. This is stored in the /manifest.json file and in a second backup copy of this JSON database located in /flash. When MANIFEST is subsequently run it compares the current status of a file against the RefPoint. Differences are reported and this can go a long way in helping the user understand what is changing on the JNIOR.

The following are indications MANIFEST provides when differences are detected.

[New]	- File did not exist before. It is new.
[Modified]	- File has changed.
[Missing]	- File existed before and is no longer found.
[Corrupt]	- File content has changed but the timestamp has not.

The following are displayed when updating the RefPoint.

[Added]	- File is new and added.
[Updated]	- File has changed and updated.
[Removed]	- File no longer exists and has been removed.

Options:

-U
Update the RefPoint. The JSON database is overwritten.

-L
Only list differences.

-C
Report CRC32 instead of MD5.

-H
Report SHA1 instead of MD5.

-S, -R

Recurse sub-directories when the FILESPEC parameter is provided.
FILESPEC can include the wildcards '*' and '?'.

NOTES

Typical usage is to issue the MANIFEST -UL command at a point when you are confident in the status of the JNIOR. At a later time you can use the MANIFEST -L command to compare against the RefPoint. You will then know if any files have been lost or corrupted. Presumably those that are modified can be explained. Logs typically quickly become modified. You would also find out if any new files have appeared. Once satisfied you would update the RefPoint with another MANIFEST -UL.

SEE ALSO

HELP Topics: [LS](#), [DIR](#), [JSON](#)

JRUPDATE**User Commands****NAME**

jrupdate - JNIOR Update Utility

SYNOPSIS

```
jrupdate [OPTIONS] UPDFILE
jrupdate [OPTIONS] ZIPFILE
jrupdate [OPTIONS] URL
```

DESCRIPTION

The JNIOR firmware can be updated using the JRUPDATE command. This is used to update the operating system (JANOS). It is highly recommended that the latest version of JANOS be used. In many cases it is a prerequisite for continuing technical support.

-U

Prepare to update from the file UPDFILE. Typically a UPD file is obtained from INTEG and loaded into the /temp folder. This option readies the firmware for update upon reboot. The JanosClasses runtime is immediately updated.

-P

When used in combination with the -U option this causes the system to proceed with the reboot after preparing the UPDFILE.

-F

Skips the update confirmation and proceeds with the update.

-C

Cancel a prepared update. The firmware will not be updated upon reboot. Note that the JanosClasses runtime has been updated in the preparation and this may or may not cause issues pending the eventual firmware update.

-R

At the completion of a firmware update the prior version of the operating system remains stored. This option will revert the firmware to the original upon reboot. Note that the JanosClasses runtime is unaffected and may or may not cause issues with the older firmware. The -R option can be repeated to toggle between JANOS versions. There generally has been little or no need for this reversion option.

-I

Run installer. If a ZIPFILE is specified that contains a setup.bat batch file, it is executed to complete the steps involved in the installation.

-G

Downloads a files from the supplied URL into the /temp folder before proceeding with other options. This may load a UPD file or other installation file.

NOTES

Typically updates are performed using the Support Tool and a supplied Update Project. Manually the firmware is updated by copying the UPD file to the /temp folder and executing the following command.

```
jrupdate -fup /temp/longfilename.upd
```

The TAB feature of the command line is useful in constructing this command in that you need not type the lengthy UPD file name.

Product firmware update procedures typically warn against removing power during the procedure. JANOS performs a fault tolerant firmware exchange procedure that is unaffected by the loss of power. This also completes fairly quickly and won't keep you on the edge of your seat waiting.

SEE ALSO

HELP Topics: [TAB](#)

JRFLASH**User Commands****NAME**

jrflash - Flash File System (FFS) Utility

SYNOPSIS

```
jrflash [OPTIONS]
```

DESCRIPTION

Part of the JNIOR File System is retained in Flash Memory. This is the content of the /flash folder. This command displays the size of the Flash and the amount of remaining space.

-C

Displays statistics including the status of any cached data. The writes_per_minute statistic may be used as an indication as to how heavily the Flash is used. Flash components do have a finite life.

-F

Formats the FFS. You will need to confirm the action. All data will be lost. It is recommended that data be copied from the Flash first if possible. It can then be restored.

-R

Perform reclamation pass. Flash memory areas can be written once and then must be reclaimed before being used again. The FFS utilizes all of the available memory before reclaiming. The process is transparent and happens in the background. This option allows you to manually reclaim memory. This can greatly improve Flash performance in terms of the average write time.

Registry**Configuration****OVERVIEW**

The JNIOR Automation Network Operating System (JANOS) and its applications can be configured to suit your needs. Configuration involves choices, and those settings may be stored in a variety of ways. JANOS relies on its Registry system for all operating system configuration. The Registry can also be easily used by applications and web pages for the storage of custom configuration settings. The Registry may also be used to store and share data dynamically.

The JANOS Registry is non-volatile. Its content remains in place even when power is removed. Information is stored as a set of name-value pairs. Each entry is referenced by a unique Registry Key or name. Each entry contains information formatted as a character string representing its value. The content is available to JANOS directly, to external applications and web pages through protocols, and to local application programs through the JanosClasses.jar runtime library.

JANOS maintains a backup copy of the Registry in the /flash/jnior.ini file. When content in the Registry is changed this INI file will later be updated to reflect the changes. This backup file is automatically generated and should not be overwritten or modified. JANOS performs this backup every several minutes as needed. The /flash/jnior.ini file may be read and saved as a representation of Registry content. This INI file will reflect changes only after the backup occurs. The backup is automatically performed on reboot.

A copy of the /flash/jnior.ini file may be edited and saved under a different filename. This then may be ingested using the REG -I command as means a performing bulk configuration.

All actions are logged to the jniorsys.log file providing an audit trail for configuration management.

SEE ALSO

HELP Topics: [REG](#)

Access**Configuration****USING THE REGISTRY**

Configuration is likely best performed using the Dynamic Configuration Pages (WebUI). Once the JNIOR is connected to the network the browser can be used to open the WebUI with the unit's IP address. The JNIOR is configured by default to open the WebUI. An administrator login is required to access the Registry.

The 'Configuration' tab of the WebUI provides an organized form-oriented means for adjusting the various configuration settings. In this section you are provided with over a dozen different categories. These settings affect both how the JNIOR operates and how the WebUI displays information. Not all of the valid and useful Registry Keys are presented within this section but only the most common and appropriate settings for each category. Certain advanced settings will need to be made manually by a different means. The unit's Network configuration, for instance, may be easily adjusted here.

The WebUI also provides a 'Registry' tab. This section shows the raw content of the Registry Keys in a form similar to a file explorer. Only those keys with values are shown. You can add, remove or edit any Registry Key using this tab. Here you are required to know specifically what key or keys you want to change. This is most appropriate for advanced administrators. This provides a graphical user interface for Registry Key management.

The Console tab in the WebUI provides access to the JANOS Command Line Console. This is the same command line facility that can be accessed using a Terminal or Telnet application to open the standard Telnet port (port 23) over the network. Even in the absence of a network connection you may open the console by making a serial connection to the [COM](#) port located to the right of the Ethernet/LAN connection on the JNIOR.

If you are working with a Windows based PC you may download and install the INTEG Support Tool. The installer is available from our website at jnior.com. Once the Support Tool is opened the Beacon tab will display all of the JNIORs located on the current network segment. If you right-click any JNIOR the resulting context menu will provide access to the unit's WebUI, a Telnet application, and many other useful functions. The Support Tool also provides a Registry Editor tab through which you can add, remove and edit content as needed for the selected JNIOR.

SEE ALSO

HELP Topics: [WEBUI](#), [REG](#)

\$BootTime Registry Key

NAME

\$BootTime

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns a string representing the time according to the JNIOR clock at the completion of the latest power-up boot sequence.

\$Model Registry Key

NAME

\$Model

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns the product Model number. For example: "410".

\$SerialNumber Registry Key

NAME

\$SerialNumber

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns the product serial number as a String. For example: "612080001".

\$Version Registry Key

NAME

\$Version

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns the current Version string for the product release. For example: "v2.0"

\$LastNtpSuccess Registry Key

NAME

\$LastNtpSuccess

DEFAULT

Updated by the system.

DESCRIPTION

This returns the last time the system clock was successfully updated from the network using the NTP protocol.

SEE ALSO

HELP Topics: [DATE](#)

\$BuildTag Registry Key

NAME

\$BuildTag

DEFAULT

Generated by the system at boot.

DESCRIPTION

This returns a tag uniquely defining the current OS build. These tags will increase with each new build and can be numerically compared.

Device Registry Key

NAME

Device/Desc

DEFAULT

None

DESCRIPTION

This key provides a textual description for this JNIOR. This might be displayed by the WebUI or applications as identification. JANOS will include this description as part of the default email signature if it is defined.

Device **Registry Key****NAME**

Device/Timezone

DEFAULT

UTC - Coordinated Universal Time

DESCRIPTION

Specifies the local Timezone to be used in displaying date and time. The set of available Timezones may be viewed using the DATE -T command. This setting can be easily made using the DATE command followed by the appropriate Timezone abbreviation. For example DATE EST.

SEE ALSOHELP Topics: [DATE](#)**Device/ResetAction** **Registry Key****NAME**

Device/ResetAction

DEFAULT

reboot -f

DESCRIPTION

Specifies the action to be taken when the RESET switch is triggered. The JNIOR provides access to a 2-pin connector for an external Reset Switch. When a reset switch is momentarily activated (pins connected together) the command line command detailed by this Registry key is executed. By default this forces a reboot using the REBOOT -F command and performing a well-behaved controlled restart. Any command may be executed and it need not result in a restart. Note that this reset switch is also used to enter SAFE MODE when it is held through a reboot.

IpConfig/DHCP**Registry Key****NAME**

IpConfig/DHCP

DEFAULT

enabled

DESCRIPTION

When enabled the JNIOR will lease an IP address from a DHCP server if available on the network. This insures that the JNIOR is compatible with the network.

NOTES

ipconfig -d

Enables DHCP using the IPCONFIG command. Sets this key to enabled.

ipconfig -r

Disables DHCP and releases any leased IP address. Sets this key to disabled.

SEE ALSO

HELP Topics: [IPCONFIG](#)

IpConfig/IPAddress**Registry Key****NAME**

IpConfig/IPAddress

DEFAULT

10.0.0.201 (if DHCP not enabled)

DESCRIPTION

This defines a fixed network IP Address to be used with this JNIOR. The address may be defined using this Registry key or by using the IPCONFIG command. The Registry change takes effect on reboot. Use IPCONFIG to make immediate changes.

The JNIOR queries for IP address conflicts when establishing its address. If another device responds to the IP address defined here, the unit will log the issue and temporarily adopt an IP address of 0.0.0.0.

SEE ALSO

HELP Topics: [IPCONFIG](#), [DHCP](#)

IpConfig/SubnetMask**Registry Key****NAME**

IpConfig/SubnetMask

DEFAULT

255.255.255.0

DESCRIPTION

This defines the network Subnet Mask to be used with this JNIOR. The mask may be defined through changes to this Registry key or by using the IPCONFIG command. Changes take effect on reboot. Use IPCONFIG to make immediate changes.

SEE ALSOHELP Topics: [IPCONFIG](#), [IPADDRESS](#)**IpConfig/GatewayIP****Registry Key****NAME**

IpConfig/GatewayIP

DEFAULT

0.0.0.0

DESCRIPTION

This defines the network Gateway IP Address. This address is only required if JNIOR is to communicate outside its home network. This would be the case if JNIOR is to synchronize its clock with an external time server as is the default. Changes take effect on reboot. Use IPCONFIG to make immediate changes. This key is ignored when DHCP is enabled.

SEE ALSOHELP Topics: [IPCONFIG](#)

IpConfig/PrimaryDNS**Registry Key****NAME**

IpConfig/PrimaryDNS

DEFAULT

0.0.0.0

DESCRIPTION

This defines the Primary DNS Address used for name resolution on the network. This would be required if JNIOR is to synchronize its clock with an external time server as DNS is used to resolve "pool.ntp.org" into the appropriate IP Address for communication. Changes take effect on reboot. Use IPCONFIG to make immediate changes. This key is ignored when DHCP is enabled.

SEE ALSOHELP Topics: [IPCONFIG](#)**IpConfig/SecondaryDNS****Registry Key****NAME**

IpConfig/SecondaryDNS

DEFAULT

0.0.0.0

DESCRIPTION

This defines the Secondary DNS Address used for name resolution on the network should the Primary DNS not be available. Changes take effect on reboot. Use IPCONFIG to make immediate changes. This key is ignored when DHCP is enabled.

SEE ALSOHELP Topics: [IPCONFIG](#)

IpConfig/HostName**Registry Key****NAME**

IpConfig/HostName

DEFAULT

The default is the 9-digit serial number with a "jr" prefix in the form "jrNNNNNNNNN". This is known as the unit's "Birth Name".

DESCRIPTION

This defines a Hostname for the device. This name appears in many places. It will be listed as identification in the Beacon tab of the Support Tool. It is used as the command line console prompt. The name may be used in a URL to access the JNIOR if it is on the local network. It is noted in the default signature when emails are sent.

JANOS allows the Hostname to be defined as just about anything. However, it is recommended that it not exceed 15 characters in length and use only alphanumeric characters. You can use underscore '_' and dash '-' if necessary. These limitations allow the Hostname to be properly used to access the unit over the network using NetBios.

The default Hostname will always be available for network access in addition to any alternative defined by this key. A short name is also best for the command line prompt.

NOTES

This can be easily set using the HOSTNAME command.

SEE ALSO

HELP Topics: [HOSTNAME](#)

IpConfig/Domain**Registry Key****NAME**

IpConfig/Domain

DEFAULT

jnior.local

DESCRIPTION

Defines the Domain Name associated with the local network. In general you can usually leave this as the default. It is supplied with email transfers. You may need to use a valid domain in order to satisfy requirements for passing spam filters.

IpConfig/MailHost**Registry Key****NAME**

IpConfig/MailHost

DESCRIPTION

This specifies the address of the SMTP Mail Server that accepts email for the defined email account. This must be specified if JNIOR is going to send email messages. Changes take effect on reboot. Use IPCONFIG to make immediate changes.

SEE ALSO

HELP Topics: [IPCONFIG](#), [SENDMAIL](#)

IpConfig/Username**Registry Key****NAME**

IpConfig/Username

DESCRIPTION

Specifies the Username required for SMTP Authentication. This may or may not include the domain as this depends on the requirements of the particular server. SMTP Authentication is used ONLY when a MailHost is defined and when both the Username and Password keys are valid.

The Username must be entered through the WebUI or by the IPCONFIG command. Upon entering or re-entering the Username a Password will be requested and confirmed. The password must be encrypted by the system before it is saved. This cannot be done manually.

SEE ALSO

HELP Topics: [IPCONFIG](#), [SENDMAIL](#)

IpConfig/Password**Registry Key****NAME**

IpConfig/Password

DESCRIPTION

This cannot be successfully updated manually.

This key specifies the Password required for SMTP Authentication. The password is encrypted in the Registry and is not displayed by the JNIOR. The login credentials must be entered using the WebUI or IPCONFIG command by first entering or reentering the Username. Each JNIOR has its own unique encryption key and therefore passwords cannot be copied through INI file transfer. SMTP Authentication is used ONLY when a MailHost is defined and when both the Username and Password keys are valid.

SEE ALSO

HELP Topics: [IPCONFIG](#), [SENDMAIL](#)

IpConfig/EmailAddress **Registry Key****NAME**

IpConfig/EmailAddress

DESCRIPTION

Specifies the email address used as the FROM address in sending email. This email address should be valid and the one associated with the email account having the defined Username and Password. This address appears as the sender in most communications. It is also placed in SSL certificates to refer to the device Owner.

SEE ALSOHELP Topics: [IPCONFIG](#), [SENDMAIL](#)**IpConfig/DNSTimeout** **Registry Key****NAME**

IpConfig/DNSTimeout

DEFAULT

5000 milliseconds (5 seconds)

DESCRIPTION

This defines the timeout in milliseconds to be used in waiting for a response from configured DNS servers.

SEE ALSOHELP Topics: [IPCONFIG](#)**IpConfig/NTPServer** **Registry Key****NAME**

IpConfig/NTPServer

DEFAULT

pool.ntp.org

DESCRIPTION

JNIOR can synchronize with a network time server supporting Network Time Protocol (NTP). To utilize this capability JNIOR must be properly configured for a network with access to an NTP server. The NTPServer key defines the server using either a domain name or an IP address. An optional parameter may be used to define an alternate port. The format is as follows:

```
IpConfig/NTPServer = ServerAddress [, ServerPort]
```

Another typical server address is 'time.nist.gov' and you may define a local NTP server. The standard NTP port number is 123. You may optionally specify a custom port number following the ServerAddress separated by a comma.

Only one server can be specified. If that server is not available then the synchronization will be bypassed. Note that the clock is maintained by a battery during periods without power. Synchronization is not required but useful periodically as the clock will drift in accuracy over long periods. Typical computer hardware clocks (PCs for instance) typically drift by several seconds per day. NTP synchronization is critical in maintaining accurate time.

NOTES

Time synchronization occurs during boot. Synchronization is attempted every four hours by default to maintain clock alignment. JNIOR may also be commanded to synchronize using the DATE -N command in the Command Console.

Proper network configuration including Gateway and DNS Server is required unless a local NTP server is used.

SEE ALSO

HELP Topics: [DATE](#), [IPCONFIG](#)

IpConfig/NTPUpdate**Registry Key****NAME**

IpConfig/NTPUpdate

DEFAULT

240 (minutes)

DESCRIPTION

JNIOR attempts to synchronize with a network time server every 4 hours (240 minutes) by default. The update period may be adjusted through this Registry key. This defines the period in minutes and can be set for any amount of time 5 minutes or longer. To disable NTP synchronization you can set this key to 0. This configuration setting takes effect on boot.

SEE ALSO

HELP Topics: [DATE](#), [IPCONFIG](#)

IpConfig/MTU**Registry Key****NAME**

IpConfig/MTU

DEFAULT

1500 (bytes)

DESCRIPTION

This Registry key defines the maximum size of packets transmitted over the Ethernet port. The Maximum Segment Size (MSS) is defined as MTU - 40 (40 bytes less than the MTU setting) and no packet will be transmitted with a payload exceeding this size. Regardless of the MTU setting JNIOR will properly receive packets of any size up to the standard network MTU of 1500. The product ignores Jumbo packets upon their arrival.

Valid MTU settings are 400 to 1500 inclusive. A change in MTU setting applies to all Ethernet connections and takes effect upon reboot.

NOTES

MTU issues are generally a thing of the past. It is unlikely that you will need to change this setting.

IpConfig/TTL**Registry Key****NAME**

IpConfig/TTL

DEFAULT

128 (hops)

DESCRIPTION

The IpConfig/TTL Registry key defines the lifespan of a network packet. The time-to-live value is a kind of upper bound on the time that an IP datagram can exist in the Internet system. The value is reduced with the passage through a router (a hop). If it reaches 0 the packet is discarded.

The TTL setting can be considered to limit the maximum radius (in terms of hops) of the network within reach of the JNIOR. The default setting should allow packets to reach the far end of the globe. A low setting would limit access to the unit as only those in the local vicinity could communicate with it. In this respect the TTL setting can be used to improve device security.

A very low setting of 1 or 2 would constrain the JNIOR to the immediate network. One must consider the need to reach Domain Name Servers (DNS) and Network Time Servers (NTP). There may also be the requirement for email transfers wherein the JNIOR needs to reach out to a SMTP Server. To help determine the minimum setting you may be able to use your PC's TRACERT command to detect the hop count involved in reaching those destinations. The JNIOR does not support a route tracing function.

IpConfig/SyslogServer**Registry Key****NAME**

IpConfig/SyslogServer

DEFAULT

None

DESCRIPTION

This defines the address of a Syslog Server that accepts System Log messages. This may be optionally specified to remotely log system status messages. This is typically the information found in the `jniorsys.log` file. Changes take effect immediately. The format for the `IpConfig/SyslogServer` key is as follows:

```
IpConfig/SyslogServer = ServerAddress [, ServerPort]
```

By default the `ServerAddress` is not set and no SYSLOG transmissions occur. You can set the `ServerAddress` through the `IPCONFIG -L` command syntax. The standard Syslog port number is 514. You may optionally specify a custom port number following the `ServerAddress` separated by a comma. This must be accomplished through the WebUI or by setting the Registry key directly. If you set the SYSLOG server address using the `IPCONFIG` command the default port will be used.

Typically SYSLOG postings reflect the `jniorsys.log` entries. You may post manually to the system log file using the `LOGGER` command or directly to the SYSLOG server with the `LOGGER -R` syntax. Applications may also optionally post directly to the syslog server.

JANOS will allow you to configure a broadcast address (255.255.255.255). This may be helpful if you want to support multiple SYSLOG destinations or monitor postings to an existing SYSLOG server.

SEE ALSOHELP Topics: [LOGGER](#)

IpConfig/Keepalive/Time **Registry Key****NAME**

IpConfig/Keepalive/Time

DEFAULT

300 (seconds)

DESCRIPTION

This is the timeout in seconds before JANOS will probe a connection. By default it is set to 5 minutes (300 seconds). A connection will be probed if there has not been packet traffic from the peer in the configured time period.

IpConfig/Keepalive/Interval **Registry Key****NAME**

IpConfig/Keepalive/Interval

DEFAULT

30 (seconds)

DESCRIPTION

If there is no response from a probe JANOS will retry after the configured interval. By default this is 30 seconds.

IpConfig/Keepalive/Retry **Registry Key****NAME**

IpConfig/Keepalive/Retry

DEFAULT

8

DESCRIPTION

Specifies the number of keep alive retries attempted. By default JANOS will retry the probe 8 times before closing the connection.

IpConfig/Socket/ConnectTimeout Registry Key**NAME**

IpConfig/Socket/ConnectTimeout

DEFAULT

5000 (milliseconds)

DESCRIPTION

By default socket connections initiated by an application will time out after 5 seconds and generate an IOException. This define the time in milliseconds.

IpConfig/CaptureBuffer Registry Key**NAME**

IpConfig/CaptureBuffer

DEFAULT

512 (KB)

DESCRIPTION

The JNIOR by default allocates 512KB of memory for network capture. If network traffic needs to be analyzed, the NETSTAT FC command is used to generate a PCAPNG capture file which can be downloaded and opened with the Wireshark network protocol analyzer <https://www.wireshark.org> . This means that there is always recent network history available for capture. The default 512KB can represent minutes or even hours of network operation depending on the amount of network use. Only packets involving the JNIOR are captured. This packet buffer can be increased using this Registry key and can be set for any number KB between 512 and 8192 (8MB Maximum).

This Registry key setting takes effect only on reboot.

NOTES

the capture buffer is volatile and records network activity while the unit remains powered. The content survives a reboot but is reset when power is removed. The NETSTAT -R command will also reset the capture buffer.

If the network capture is not covering a long enough period of time, we recommend first using a capture filter to limit the content to pertinent activity before increasing the buffer. An extremely large PCAPNG file can be difficult to upload and process. Similarly the NETSTAT -C command can include a capture filter moving only those packets of interest to the capture file.

SEE ALSO

HELP Topics: [FILTERING](#), [NETSTAT](#)

IpConfig/Promiscuous**Registry Key****NAME**

IpConfig/Promiscuous

DEFAULT

disabled

DESCRIPTION

By default the network capture collects packets that specifically reference either the JNIOR's MAC address or IP address either as the source or destination. This then excludes general broadcasts and any other unrelated network traffic that the unit may see.

If you need to see all of the network traffic set this Registry key to "enabled". This will enable Promiscuous Mode and the capture of all network traffic that reaches the JNIOR. Note that changes in this setting do not require a reboot and take effect immediately.

Network switches and routers generally optimize network traffic and present devices with the subset of communications that are specifically addressed for that destination. In Promiscuous Mode you will generally receive additional broadcast packets and packets addressed to other possibly non-existing devices which the switch or router has yet to locate and filter.

NOTES

The network hub has been obsoleted by the network switch as traffic and bandwidth optimization is a good thing. However the older technology in the hub may be desirable if you need to analyze communications between two other devices. The hub forwards all network traffic to all interconnected devices. The JNIOR in Promiscuous Mode can then capture packet traffic between the other devices. This may be very useful in debugging larger multi-device systems. If you own a hub you should hang onto it as it can be a useful debugging tool when used as a temporary network switch replacement.

SEE ALSOHELP Topics: [FILTERING](#), [NETSTAT](#)

IpConfig/CaptureFilter**Registry Key****NAME**

IpConfig/CaptureFilter

DEFAULT

None

DESCRIPTION

The network traffic can be filtered prior to the capture buffer. This can extend the period over which traffic can be collected by limiting the content to only those connections or communications of interest. The syntax used to define a capture filter utilizes logical operations such as NOT, AND, OR and XOR. The filter can include references to MAC addresses, IP addresses (IPv4), and TCP/IP or UDP port numbers. Matters of operation precedence can be handled through the use of parenthesis groups. By default the network capture is not filtered.

The NETSTAT -F command should be used to set the incoming filter. This command first verifies the filter syntax and if no errors are found it then sets the Registry key. This is the preferred method in that it includes the syntax check.

The filter setting takes effect immediately and does not require a reboot. An incoming capture filter is non-volatile and will remain in use. To remove the filter you must either remove the Registry key or issue the NETSTAT -F command without further arguments.

NOTES

In a similar fashion packets can be selected from the network capture buffer in creating the PCAPNG file /temp/network.pcapng . The filter syntax is the same. You can therefore use the NETSTAT -C command to prototype and test a packet filter before using it to define the incoming filter.

SEE ALSOHELP Topics: [FILTERING](#), [NETSTAT](#)

IpConfig/ShowPass**Registry Key****NAME**

IpConfig/ShowPass

DEFAULT

disabled

DESCRIPTION

Failed Console login attempts, which are failed Telnet login attempts, are logged to the `access.log` file. This port is a favored target for those seeking malicious access to a device. The log entry shows the remote IP address attempting entry along with the username. When this Registry key is enabled the password tried is also displayed. It is not recommended that this feature be used at length since a typographic error by a legitimate user might reveal the user's password by logging it. This is useful in determining the source of the activity. Bots repeatedly use a sequence of common passwords from a dictionary. A bad actor familiar with the JNIOR would try default passwords. You may wish to know if someone is specifically trying to attack your JNIOR.

IpConfig/LLMNR**Registry Key****NAME**

IpConfig/LLMNR

DEFAULT

disabled

DESCRIPTION

You can access the JNIOR using the unit's Hostname. The process required to convert the text name into the IP address needed to locate the JNIOR on the network is called Name Resolution . A computer might utilize a local DNS server or attempt a NetBIOS name query to do this. An alternative is Link-Local Multicast Name Resolution (LLMNR). This has not been adopted as an IETF standard. The JNIOR is capable of performing LLMNR and the feature can be enabled by this Registry key.

LLMNR is disabled by default as some systems currently consider it unsafe. When attempting to resolve a name it may be possible for a malicious system to offer an incorrect IP address and thereby intercept communications. At that point a login might be requested and your credentials stolen.

SEE ALSOHELP Topics: [NETSTAT](#), [HOSTNAME](#)

IpConfig/NetBIOS**Registry Key****NAME**

IpConfig/NetBIOS

DEFAULT

enabled

DESCRIPTION

You can access the JNIOR using the unit's Hostname. The process required to convert the text name into the IP address needed to locate the JNIOR on the network is called Name Resolution . Most computers will attempt to utilize NetBIOS in resolving a name. By default the JNIOR supports this method. You may need to specifically enable it on some Linux based machines. This Registry key can be used to disable the NetBIOS service.

The NBTSTAT command displays the current NetBIOS status for the JNIOR. Note that the unit registers the Hostname and the default name which is "jr" combined with the Serial Number (jr615010258 for instance). The latter is considered to be the unit's Birth Name. Only the first 15 alphanumeric characters of the current Hostname are used and the default Birth Name is always available. You can use these names in addition to the IP address to reach the JNIOR.

NOTES

When DHCP is enabled the assigned IP address may remain stable for a long time but it is subject to change. Access using the Hostname will avoid loss of connectivity.

SEE ALSOHELP Topics: [HOSTNAME](#), [NBTSTAT](#)

IpConfig/Allow**Registry Key****NAME**

IpConfig/Allow

DEFAULT

None

DESCRIPTION

This Registry key defines filtering to be applied to incoming connection requests. This uses the network capture filter syntax. This not only provides for the ability to specify IP addresses that are allowed to connect to the JNIOR but gives you the flexibility to block IP addresses. This includes domain ranges and destination ports. This filter can be used to not only control who can access the unit, it can also be used to define what they can access.

Care must be exercised in setting this key remotely. If the capture filter is improperly defined you may prevent your own access. Doing so will require that you subsequently access the unit through the serial COM port and correct the key through the Command Console.

SEE ALSOHELP Topics: [FILTERING](#), [SAFEMODE](#)**SSL/Enabled****Registry Key****NAME**

SSL/Enabled

DEFAULT

true

DESCRIPTION

Controls the ability to make TLS secured connections. When set to FALSE this disables the Secure Web Server on Port 443 (HTTPS); Removes the ability to upgrade a JNIOR Protocol, JMP Protocol, FTP and Telnet connections to the secured state (disables STARTTLS); And, disables the routine Security Update procedure which otherwise is run to update keys.

The CERTMGR command remains fully functional. Security keys and certificates may still be managed while the ability to make secure connections is disabled. This setting takes effect upon reboot.

SEE ALSOHELP Topics: [CERTMGR](#)

SSL/Required**Registry Key****NAME**

SSL/Required

DEFALUT

false

DESCRIPTION

When TRUE this forces the use of SSL secured connections. No web services are provided on Port 80 (HTTP). All FTP sessions must be secured through the STARTTLS mechanism. The JNIOR Protocol, JMP Protocol and Telnet connections will close should data be received before the connections are secured. This setting takes effect upon reboot. It is ignored if SSL/Enabled is set to FALSE.

Authentication**Security****BASIC AUTHENTICATION**

Access to the JNIOR is password controlled. All protocols provide for a means of login which requires the entry of a username and password. If those connections are not secure (such as standard browser access using HTTP as opposed to HTTPS) then both the username and password may be transferred in clear text. These are easily compromised by the simplest of techniques.

To insure security, you MUST be sure that ALL protocols are set to require password authentication. Otherwise, even when SSL secure connections are made anyone will be able to alter and/or control your JNIOR.

Not all protocols that are typically used in the industry provide for a standard means of password authentication. MODBUS is an example of this. The JNIOR does extend these protocols providing such a means but this must be specifically enabled through this Registry and may require changes to the connecting client.

SEE ALSOHELP Topics: [DEFAULT_ACCOUNTS](#)

Authentication**Security****DEFAULT CREDENTIALS**

Even with care to use both secure connections and password authentication the JNIOR may be easily compromised if the default user accounts are not removed or given unique strong passwords. Surprisingly a large percentage of JNIORs are left with the default user accounts. A common oversight is to change the password on the 'jnior' administrator account while leaving the secondary 'admin' administrator account active and with default credentials.

To insure security, you **MUST** remove any unused user accounts and change the passwords from their defaults on remaining accounts.

The JNIOR may be supplied with two (2) default administrator accounts 'jnior' and 'admin', a default 'user' account and a default 'guest' account. The default passwords are simply the usernames. JANOS command line functions provide for user management. Use the `PASSWD` command to alter passwords from their defaults. Use the `USERMOD` command to disable unused accounts or the `USERDEL` command to remove accounts. The `USERS` command is used to list the defined users.

```
jr615010258 /> users
  admin      3  Administrator
  guest      0
  jnior      1  Administrator
  user       2  Control

jr615010258 />
```

Users typically rely on the 'jnior' account for administration. It is recommended that you remove the 'admin' account. The Support Tool defaults to the 'jnior' account. The 'guest' account should also be disabled using the `USERMOD +D` command.

SEE ALSO

HELP Topics: [USERS](#), [USERDEL](#), [USERMOD](#), [PASSWD](#)

Users/IgnoreDefault**Registry Key****NAME**

Users/IgnoreDefault

DEFAULT

false

DESCRIPTION

The JNIOR comes with two (2) default Administrator accounts. These are the 'jnior' and 'admin' accounts whose default passwords are 'jnior' and 'admin' respectively. This represents a significant security risk if either account is left active with the default password. Users often alter the 'jnior' account password but neglect to adjust the 'admin' account or vice versa. Periodically JANOS will post a warning to the jniorsys.log file if either default account is determined to still be using the default password.

If you do forget your administrator password(s), the SAFE_MODE access procedure may be used to regain control of your JNIOR. You can then assign a new password.

If you are comfortable with the risk and would like to continue to use the default accounts and passwords, you can eliminate the warnings by setting this Registry key to TRUE.

SEE ALSOHELP Topics: [DEFAULT_ACCOUNTS](#), [SAFEMODE](#)

Public/Private Key Pair**Registry Key****OVERVIEW**

Secure communications require RSA keys. 1024-bit or 2048-bit key lengths are typically used today. Longer keys are usually required to protect highly sensitive information and to increase protection as the computer capacity to break (determine the private key associated with a published public key) increases. The JNIOR control is not intended for use in extremely secure environments and its processing capabilities limit it to a maximum 1024-bit key pair.

As shipped the JNIOR is factory configured with a standard 512-bit key. At some point if SSL remains enabled and the JNIOR is connected to an active network, JANOS will initiate the 'Security Update' process. This will generate a unique 1024-bit key replacing the default. This procedure will take an hour or more to complete during which time the JNIOR remains fully functional. This can also be interrupted and restarted as you need.

The RSA Key or key pair is required to establish encrypted SSL/TLS communications. It is the two-part key, with a private part and a public part, that allows two parties to privately exchange information. The key pair is used in creating a Certificate that not only conveys the public part of the key to others but serves as device authentication. Certificates are digitally signed using the RSA key. By default the JNIOR creates, and self-signs, its own Certificate. The CERTMGR -V command can be used to verify the current RSA Key and Certificate.

```
jr615010258 /> certmgr -v
1024-bit key pair verifies
private key operation requires about 4.0 seconds
certificate:
  Issuer O=INTEG Process Group, OU=JNIOR Controllers, CN=jr615010258
  Subject O=INTEG Process Group, OU=JNIOR Controllers, CN=jr615010258
  is self-signed
  valid with current key pair

jr615010258 />
```

As can be seen from this, RSA operations are time-consuming. Security calculations are designed to be so. It is the effort in performing the calculations that makes it extremely difficult for others to attempt to decode the private part of the key. You rely on this. Fortunately, the RSA calculation is performed only once in setting up a secure connection to convey a unique one-time shared secret that the two parties will then use to efficiently encrypt and decrypt their communications.

The CERTMGR command may also be used to install an externally generated RSA key pair. This is limited to a 1024-bit key length. The Security Update process will not overwrite an externally loaded key pair. JANOS can work with keys up to 4096-bit should that be in use by the remote party seeking connection. The CERTMGR command also allows you to install and manage an externally generated Certificate.

SEE ALSO

HELP Topics: [CERTMGR](#)

SSL Certificates**Registry Key****OVERVIEW**

A TLS secured communications channel requires both the RSA key pair and a SSL Certificate. The CERTMGR command may be used to install an externally generated and signed SSL Certificate that must be associated with the separately installed RSA key pair. Typically the internally generated key pair and certificate are sufficient.

A secure connection to the JNIOR may be flagged by browsers as 'NOT SECURE' or 'UNSAFE'. This is only because the the JNIOR's self-signed Certificate has not been obtained from any of the approved Certificate Authorities. The Certificate may be labeled as 'INVALID'. You may rest assured that the connection is still fully encrypted and 'PRIVATE'.

In the absence of a loaded SSL Certificate, JANOS will generate a self-signed certificate using the current RSA key pair. Registry keys are provided which allow you to customize the information provided in this certificate. Since self-signed certificates are not generally recognized as trusted by browsers, users will be confronted by a standard warning. The information in the certificate may be configured so your users may recognize the device and decide on their own to accept the connection. The default values provide for a fully functional connection.

The CERTMGR command may also be used to export the internally generated Certificate. The resulting file may be imported into your computer's Trusted Certificate Store. With this step the browser, recognizing a now trusted certificate, will show a secured connection using a symbol such a lock.

SEE ALSO

HELP Topics: [SSL/Cert/C](#), [RSA_KEYS](#), [CERTMGR](#)

SSL/Cert/C**Registry Key****NAME**

SSL/Cert/C

DEFAULT

None

DESCRIPTION

This text string defines the Country in which the JNIOR is located. By default this field is not included in the internally generated self-signed certificate.

SEE ALSO

HELP Topics: [SSL/Cert/ST](#), [CERTMGR](#)

SSL/Cert/ST**Registry Key****NAME**

SSL/Cert/ST

DEFAULT

None

DESCRIPTION

This text string defines the State in which the JNIOR is located. Generally this is not an abbreviation. By default this field is not included in the internally generated self-signed certificate.

SEE ALSOHELP Topics: [SSL/Cert/L](#), [CERTMGR](#)**SSL/Cert/L****Registry Key****NAME**

SSL/Cert/L

DEFAULT

None

DESCRIPTION

This text string defines the Locality, City or Town. By default this field is not included in the internally generated self-signed certificate.

SEE ALSOHELP Topics: [SSL/Cert/O](#), [CERTMGR](#)**SSL/Cert/O****Registry Key****NAME**

SSL/Cert/O

DEFAULT

INTEG Process Group

DESCRIPTION

This text string defines the Organization. This field is included in the internally generated self-signed certificate.

SEE ALSOHELP Topics: [SSL/Cert/OU](#), [CERTMGR](#)

SSL/Cert/OU**Registry Key****NAME**

SSL/Cert/OU

DEFAULT

JNIOR Controllers

DESCRIPTION

This text string defines the Organizational unit, Division, Department or other. Here we take the opportunity to identify the device. This field is included in the internally generated self-signed certificate.

SEE ALSOHELP Topics: [SSL/Cert/CN](#), [CERTMGR](#)**SSL/Cert/CN****Registry Key****NAME**

SSL/Cert/CN

DEFAULT

Hostname

DESCRIPTION

This text string defines the Common Name or FQDN. For the proper operation of the web site this should reflect the domain in the URL used to reach the JNIOR.

Since in addition to the hostname you may address your JNIOR using its IP address or default hostname ('jr' with serial number), the certificate must be made a bit more general. This is accomplished by including the Subject Alternate Name extension. This extension adds the IP address (both in binary and text forms), the hostname, and the default hostname ('jr' with serial number) to every certificate.

SEE ALSOHELP Topics: [CERTMGR](#)

SSL/Cert/SAN**Registry Key****NAME**

SSL/Cert/SAN

DEFAULT

List of Hostname, Birth Name and IP Address

DESCRIPTION

Certificates are expected to be created for specific domains and should match the URL used to access the unit. The Common Name or FQDN is by default defined to be the hostname for the JNIOR. Additional identities are included in every certificate. This is accomplished using the Subject Alternate Name extension. This extension adds the IP address (both in binary and text forms), the hostname (if not the defined Common Name), and the default hostname ('jr' with serial number) to every certificate.

If you also want to access the unit using different domain names you can add additional DNS names using this Registry key. One or more names may be added using comma (,) separated list. These will also appear in the Subject Alternative Name extension. Note that you will need to regenerate your certificate if you make changes to SSL/Cert keys. Use the CERTMGR -C.

SEE ALSOHELP Topics: [SSL/Cert/E](#), [SSL/Cert/CN](#), [CERTMGR](#)**SSL/Cert/E****Registry Key****NAME**

SSL/Cert/E

DEFAULT

None

DESCRIPTION

This text string defines the contact email address. By default this will use the email address defined by IpConfig/EmailAddress . If neither key defines an email address then this field is omitted from the internally generated certificate.

SEE ALSOHELP Topics: [SSL/Cert/Days](#), [IpConfig/EmailAddress](#), [CERTMGR](#)

SSL/Cert/Days**Registry Key****NAME**

SSL/Cert/Days

DEFAULT

730 (days)

DESCRIPTION

This integer defines the length in days of the period during which the certificate is considered valid. This starts on the date when the certificate is generated or regenerated. By default this is 730 days (2 years). As expiration draws near an internally generated certificate will be automatically renewed for an additional period.

An internally generated Certificate is regenerated automatically when it expires, the Hostname is changed, or the unit's IP address changes.

If you export the certificate to install in a Trusted Certificate Store, you will need to repeat that procedure when the certificate renews. You may elect to use a much longer period with this Registry key.

SEE ALSOHELP Topics: [SSL/Cert/SHA1](#), [HOSTNAME](#), [CERTMGR](#)**SSL/Cert/SHA1****Registry Key****NAME**

SSL/Cert/SHA1

DEFAULT

false

DESCRIPTION

The SHA1 cryptographic hash function is no longer considered to be secure. It remains secure for most of the world but those with sufficient resources are assumed now to be capable of breaking it. The JNIOR now uses the SHA256 algorithm (SHA2). You can disable use of SHA2 if you need to communicate securely with legacy systems. This is achieved by setting this key to TRUE.

As with most of the settings in this category, changes take effect when the certificate is regenerated.

SEE ALSOHELP Topics: [CERTMGR](#)

Events/Services**Registry Key****NAME**

Events/Services

DEFAULT

enabled

DESCRIPTION

JNIOR monitors events and responds to certain situations depending on the configuration established by the Registry. JNIOR also can generate an audit trail of events and otherwise routinely log changes in data. By default these services are available.

Application program startup at boot and email notifications are considered to be EVENTS and are affected by this Registry key. It is recommended that individual events be disabled if necessary as opposed to this setting.

This Registry key can be used to completely disable all such services. A setting of disabled will stop processing without affecting the event configuration. This key takes effect immediately in some cases and a reboot generally stops all services.

SEE ALSO

HELP Topics: [Events/OnBoot](#)

Events/OnBoot**Registry Key****NAME**

Events/OnBoot

DEFAULT

enabled

DESCRIPTION

This key can be used to globally enable or disable the activities performed at startup (boot). If set to disabled this will globally disable the startup actions. This includes the running of applications defined by Run keys and the boot email notification.

SEE ALSO

HELP Topics: [Events/OnBoot/Email](#)

Events/OnBoot/Email**Registry Key****NAME**

Events/OnBoot/Email

DEFAULT

disabled

DESCRIPTION

When enabled this instructs JNIOR to send an Email Notification on Boot. This requires that the JNIOR be properly configured for the network with access to an SMTP Email Server. The IpConfig/MailHost must be configured defining that Email Server. The correct username and password for logging into the Email Server must have been set using either the WebUI or IPCONFIG command. The account owner's Email Address must be properly defined by the IpConfig/EmailAddress key. The email capability can be tested from the command line using the SENDMAIL command.

The Boot Notification email can be fully customized. The default message is relatively simple and conveys important system information. This is configured to send the notification to the account owner. The Subject is "Boot Notification" referencing also the JNIOR's Hostname.

The message indicates that the JNIOR has completed booting. The text includes the content of the jniorboot.log file. The current jniorsys.log file is also attached. All of this is very helpful should the reboot come as a surprise.

SEE ALSO

HELP Topics: [IpConfig/MailHost](#), [IpConfig/EmailAddress](#), [SENDMAIL](#), [IPCONFIG](#), [LOGS](#)

Events/OnBoot/EmailBlock**Registry Key****NAME**

Events/OnBoot/EmailBlock

DEFAULT

None

DESCRIPTION

This key specifies a node in the Registry Email/ section that defines a custom email message. When this key is undefined the Boot Notification email is sent using the default message definition. A custom or named message might optionally be defined using a named block.

Various keys define the recipients, subject, message detail, and attachments. While when appearing in the Email section these define a default, each can be placed in a named block (node) creating a unique email designed for a specific use. The block name is arbitrary but logically should relate to the email's use. The details involved in designing an email are describe in a subsequent section.

SEE ALSO

HELP Topics: [EMAIL_BLOCK](#)

Events/OnBoot/RunEnable**Registry Key****NAME**

Events/OnBoot/RunEnable

DEFAULT

enabled

DESCRIPTION

During boot applications defined by Run keys are started. Janos is a multi-tasking system and multiple programs can be running simultaneously. This Registry key can be used to temporarily disable program startup on boot.

Programs will also not be started if the JNIOR is in SAFE MODE. If an application is responsible for a reboot loop, SAFE MODE may be required to regain control of the unit.

You may want to work with your JNIOR without the added complication of background programs. The PS command can be used to display running processes. The KILL command can be used to stop processes. This Registry key can be used to prevent programs from running in the first place without a need to remove the associated Run keys.

SEE ALSO

HELP Topics: [PS](#), [KILL](#), [SAFEMODE](#)

Events/OnAlarm **Registry Key**

NAME

Events/OnAlarm

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable all alarm based events. By default the alarm based events must be enabled by their individual keys. This key provides a global means by which alarm events can be disabled.

SEE ALSO

HELP Topics: [Events/OnAlarm1](#), [ALARMING](#)

Events/OnAlarm1 **Registry Key**

NAME

Events/OnAlarm1

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable the Digital Input Counter alarm Type 1 services. This is an alarm that occurs when Limit 1 is reached. These alarms are individually enabled through the IO/Inputs/[DIN]/Alarm1 keys where [DIN] specifies the Digital Input (DIN1 thru DIN12).

SEE ALSO

HELP Topics: [Events/OnAlarm2](#), [ALARMING](#)

Events/OnAlarm2 **Registry Key**

NAME

Events/OnAlarm2

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable the Digital Input Counter alarm Type 2 services. This is an alarm that occurs when Limit 2 is reached. These alarms are individually enabled through the IO/Inputs/[DIN]/Alarm2 keys where [DIN] specifies the input.

SEE ALSO

HELP Topics: [Events/OnUsage](#), [ALARMING](#)

Events/OnUsage**Registry Key****NAME**

Events/OnUsage

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable Usage Alarm services. These alarms are individually enabled through the individual IO/Inputs/[DIN]/Usage/OnAlarm and IO/Outputs/[ROUT]/Usage/OnAlarm keys where [DIN] specifies the input or [ROUT] the output.

SEE ALSO

HELP Topics: [Events/OnAlarm](#), [ALARMING](#)

Events/OnConfig**Registry Key****NAME**

Events/OnConfig

DEFAULT

enabled

DESCRIPTION

An event occurs when the JNIOR updates the /flash/jnior.ini file in response to changes in the Registry. By default this key enables configuration events.

Events/OnConfig/Email**Registry Key****NAME**

Events/OnConfig/Email

DEFAULT

disabled

DESCRIPTION

When settings have been altered in the Registry the /flash/jnior.ini file will be updated. This Registry key can be used to configure the JNIOR to send a Configuration Change Notification email.

Email/CcAddress **Registry Key**

NAME

Email/CcAddress
[BLOCK]/CcAddress

DEFAULT

None

DESCRIPTION

This defines one or more destination email addresses of the form user@domain.com. Multiple addresses are separated by commas. These addresses will receive the defined message as a CC recipient.

SEE ALSO

HELP Topics: [Email/BccAddress](#), [EMAIL_BLOCK](#)

Email/BccAddress **Registry Key**

NAME

Email/BccAddress
[BLOCK]/BccAddress

DEFAULT

None

DESCRIPTION

This defines one or more destination email addresses of the form user@domain.com. Multiple addresses are separated by commas. These addresses will receive the defined message as a BCC blind recipient.

SEE ALSO

HELP Topics: [Email/Subject](#), [EMAIL_BLOCK](#)

Email/Subject**Registry Key****NAME**

Email/Subject
[BLOCK]/Subject

DEFAULT

Varies

DESCRIPTION

This defines the Subject line to be used with the message. JNIOR requires that a Subject be defined for all messages although this is not strictly a requirement for email itself. If the Subject key is not given, JNIOR will utilize a default Subject as appropriate to the purpose of the email.

SEE ALSO

HELP Topics: [Email/Message](#), [BLOCK_EMAIL](#)

Email/Message**Registry Key****NAME**

Email/Message
[BLOCK]/Message

DEFAULT

Varies

DESCRIPTION

This defines message content to be sent in the email. JNIOR does not require that message content be supplied. This may be used in conjunction with a Message File and the text defined here will appear as a prefix to the content of the file. A default message is used with event notifications.

SEE ALSO

HELP Topics: [Email/MessageFile](#), [EMAIL_BLOCK](#)

Email/MessageFile**Registry Key****NAME**

Email/MessageFile
[BLOCK]/MessageFile

DEFAULT

Varies

DESCRIPTION

This defines the file that contains textual Message content to be included in the email. If separate Message text is supplied the content of this file will be appended to that text in the message.

For example, the `jniorboot.log` text file is supplied in the text of the default Boot Notification email.

SEE ALSO

HELP Topics: [Email/Attachments](#), [Email/Message](#), [EMAIL_BLOCK](#), [LOGS](#)

Email/Attachments**Registry Key****NAME**

Email/Attachments
[BLOCK]/Attachments

DEFAULT

Varies

DESCRIPTION

This lists one or more files to be sent as attachments with the email message. Each file specification is to be separated by a ';' semicolon. For example, the `jniorsys.log` file is attached to the default Boot Notification email. Attachments may be of any type although some email servers will not accept certain types of attachments.

SEE ALSO

HELP Topics: [Email/HTML](#), [EMAIL_BLOCK](#), [LOGS](#)

Email/HTML**Registry Key****NAME**

Email/HTML
[BLOCK]/HTML

DEFAULT

disabled

DESCRIPTION

This key is to be enabled when an email is properly designed using HTML structure and content.

SEE ALSO

HELP Topics: [Email/ToAddress](#), [EMAIL_BLOCK](#)

Email/Port**Registry Key****NAME**

Email/Port

DEFAULT

25

DESCRIPTION

The Simple Mail Transfer Protocol (SMTP) is used for email delivery. This key may be used to specify a port as may be required by your MailHost. Note that the MailHost and any associated SMTP Authentication settings (Username and Password) are set by the IPCONFIG command.

By default JANOS will utilize the STARTTLS capability if offered. The Email/StartTLS Registry key must be enabled.

Port 25 is the standard SMTP port for mail delivery. This port may or may not require authentication (SMTP_AUTH). It may or may not support STARTTLS allowing for the encrypted transfer of content. JANOS will use SMTP_AUTH by default and if STARTTLS is supported will make the secure connection.

Port 587 is the Mail Submission Agent (MSA) port which requires authentication (SMTP_AUTH). This port may also support STARTTLS. If STARTTLS is supported (and generally it is) JANOS will establish an encrypted connection and transfer content securely.

Port 465 is the SMTPS port. This is like the MSA port in that it requires authentication before mail can be submitted. It also requires that a SSL/TLS encrypted connection be established initially. The STARTTLS option is not used. For JANOS to properly transfer mail using this port the Email/SMTPS Registry key must be enabled.

Note that JANOS can successfully post email using any of the above three ports. Generally the email content will be transferred securely using an encrypted connection. That assumes the availability of the STARTTLS option. But if you need to be absolutely certain of a secure transfer, use port 465 and enable the Email/SMTPS key.

SEE ALSO

HELP Topics: [IPCONFIG](#), [Email/SMTPS](#), [Email/StartTLS](#), [Email/SMTPS](#)

Email/StartTLS**Registry Key****NAME**

Email/StartTLS

DEFAULT

enabled

DESCRIPTION

Email deliveries that initially begin with a clear text non-encrypted connection are upgraded to secure using the STARTTLS option (when offered). This Registry key should remain enabled to insure proper security. This can be used to disable SSL/TLS use for email delivery. You should only do so if there are issues with secure connections.

SEE ALSOHELP Topics: [CERTMGR](#), [SSL/Enabled](#), [Email/Port](#)**Email/SMTPS****Registry Key****NAME**

Email/SMTPS

DEFAULT

disabled

DESCRIPTION

Port 465 can be used for email submission. This uses SMTPS which is essentially SMTP with authentication using SMTP_AUTH. The port also requires an initial SSL/TLS connection. In order for JANOS to know to make that initial secure connection you must set this key to enabled. This should be disabled for email delivery over ports 25 and 587. For either of these ports the Email/StartTLS key should be enabled.

SEE ALSOHELP Topics: [Email/Port](#), [Email/StartTLS](#)

Email/RetryCount**Registry Key****NAME**

Email/RetryCount

DEFAULT

6 (retries)

DESCRIPTION

There may be difficulties in delivering an email. By default after an attempt has failed JNIOR will reschedule the delivery of the message. Failures on an initial attempt are typical these days as servers are implementing grey-listing techniques to reduce the amount of unsolicited spam email. In general the Internet is a lossy network and retries are not unusual. Set RetryCount to 0 or 1 to disable retrying.

SEE ALSOHELP Topics: [Email/RetryDelay](#), [EMAIL_BLOCK](#)**Email/RetryDelay****Registry Key****NAME**

Email/RetryDelay

DEFAULT

10 (minutes)

DESCRIPTION

After a failed email delivery attempt JNIOR will reschedule another delivery at a later time. This key defines the delay period in minutes. Email servers implementing grey-listing my routinely reject initial deliveries. These techniques are designed to cause spammers some difficulty and help to cut down the amount of unsolicited email. The JNIOR should be set to attempt repeated deliveries for at least a couple of hours to increase chances of success.

SEE ALSOHELP Topics: [EMAIL_BLOCK](#)

Email/Signature**Registry Key****NAME**

Email/Signature

DEFAULT

By default the JNIOR includes a signature line in all emails indicating the model and serial number of the sending unit. The version of JANOS is also included.

DESCRIPTION

You may provide a custom signature line overriding the default using this Registry entry.

SEE ALSO

HELP Topics: [Email/RetryCount](#), [EMAIL_BLOCK](#)

WebServer/Server **Registry Key****NAME**

WebServer/Server

DEFAULT

enabled

DESCRIPTION

This Registry key can be used to disable the HTTP Server. This may be desirable if communications with JNIOR will be through some other means and connections to the JNIOR HTTP Port are to be ignored. Note that the WebUI is accessed using the WebServer and your browser. A reboot is required when enabling or disabling the WebServer.

SEE ALSOHELP Topics: [WebServer/Port](#), [WebServer/SSLPort](#)**WebServer/SSLPort** **Registry Key****NAME**

WebServer/SSLPort

DEFAULT

80

DESCRIPTION

This specifies the TCP/IP port to use for unsecure Hypertext Transfer Protocol (HTTP) services. The default is the standard Port 80.

SEE ALSOHELP Topics: [WebServer/SSLPort](#)**WebServer/SSLPort** **Registry Key****NAME**

WebServer/SSLPort

DEFAULT

443

DESCRIPTION

This specifies the TCP/IP port to use for Secure Hypertext Transfer Protocol (HTTPS) connections using TLS/SSL. The default is the standard Port 443.

SEE ALSOHELP Topics: [WebServer/Root](#), [WebServer/SSLPort](#)

WebServer/Login**Registry Key****NAME**

WebServer/Login

DEFAULT

enabled

DESCRIPTION

By default the Web Server requires a successful login. This is highly recommended. If the JNIOR is connected to a private secure network this login requirement can be removed by setting this Registry key to disabled. When Login is disabled you must also define a user account for anonymous login using the WebServer/Anonymous Registry key. These changes take effect immediately. You will not be logged out of your current session. Note that login may still be required if folder or file permissions are restricted (See [CHMOD](#) console command). By default initially all users have access to all folders and files.

SEE ALSOHELP Topics: [WebServer/Anonymous](#), [CHMOD](#)**WebServer/Anonymous****Registry Key****NAME**

WebServer/Anonymous

DEFAULT

None

DESCRIPTION

If the Login requirement is removed using the WebServer/Login key a user account must be defined for the JNIOR to use. This Registry key must be set to a valid active user account with the entry of either a UserID or Username. With the default set of user accounts, you would set this key to 'jnior' for example. Note that if the anonymous account is invalid or disabled the JNIOR will continue to request login credentials.

SEE ALSOHELP Topics: [WebServer/Login](#), [USERS](#)

/WebServer/Path

Registry Key

NAME

/WebServer/Path

DEFAULT

/flash/www/config

DESCRIPTION

This is used to specify alternate search paths for web content. The JNIOR first searches the /flash/public folder and then the /WebServer/Root folder. The default for that is /flash/www . If the requested page is not located then each path defined in the /WebServer/Path key will be searched in sequence. Paths must be specified from the root of the file system starting with a '/' and a trailing '/' is optional. Multiple paths must be separated by a semicolon ';'.

NOTES

The default WebUI is supplied completely enclosed in a single library file named /flash/www/config.zip . A ZIP file creates a virtual folder from which pages may be served. The default for this Registry key is /flash/www/config creating a path to the WebUI. In the absence of a custom website the WebServer looks next to the path specified by this key. With the default it looks for the home page in the folder /flash/www/config and that folder does not exist. Instead it finds the virtual folder created by the ZIP file and in that library it locates a suitable home page. That home page serves the JANOS WebUI.

SEE ALSO

HELP Topics: [ZIP](#)

Locators**Registry Key****NAME**

/WebServer/Locator/[FOLDER]
/WebServer/Public/[FOLDER]

DEFAULT

None

DESCRIPTION

A Locator allows you to redirect a folder specified in the URL to another. The target folder may exist or be created as a virtual folder by a ZIP (or JAR) file named and positioned as would the folder. For example, an application may include configuration web pages along with executable program code. A Locator can be registered to redirect an appropriately named folder to the program JAR file. The target folder may exist anywhere in the JNIOR file system.

The /WebServer/Locator redirects web page access to locations that are subject to authentication (login) as might be required by the setting of the /WebServer/Login key. The folder to be referenced in the URL is defined in the key name replacing [FOLDER] and the key value defines the target folder location.

The /WebServer/Public redirects web page access to locations that are NOT subject to authentication (login) regardless of the /WebServer/Login key. The folder to be referenced in the URL is defined in the key name replacing [FOLDER] and the key value defines the target folder location.

NOTES

The JANOS Help System creates a /WebServer/Public/manpages entry in the Registry which allows web access to images included in Help entries. Although otherwise located those image files then appear to the external browser as being in a manpages folder.

SEE ALSO

HELP Topics: [/WebServer/Path](#), [/WebServer/Root](#)

Websocket**Registry Key****WEBSOCKET INTERFACE**

The WebServer provides the ability to upgrade a connection to support the Websockets Protocol. JANOS supplies a built-in Websocket interface that supports the JANOS Management Protocol (JMP). This can replace all of the functionality of the legacy JNIOR Protocol while providing much more capability. In addition, application programs can be created as custom Websocket servers.

SEE ALSO

HELP Topics: [Websocket/Login](#), [JMP](#)

Websocket/Login**Registry Key****NAME**

Websocket/Login

DEFAULT

enabled

DESCRIPTION

The Websocket interface fully supports administrative management and data monitoring functions. It requires a successful login. When this service is accessed through a local website served by the WebServer the login credentials used to access the web pages are applied automatically to the Websocket interface. If you have disabled the WebServer login you will need to support the Websockets login or otherwise set this key to disabled. This is not recommended as anyone can then do anything with the JNIOR.

SEE ALSO

HELP Topics: [Websocket/Anonymous](#), [WEBSOCKET](#)

Websocket/Anonymous**Registry Key****NAME**

Websocket/Anonymous

DEFAULT

None

DESCRIPTION

Defines the user name or ID for anonymous logins. When a Websocket connection requires a login (default) the login must reference a defined username using the correct password for that account. In order to accommodate a scheme whereby data monitoring would not require login but control or configuration would, JANOS allows for anonymous login. When the Websocket/Anonymous key is

defined (exists) and the Websocket/Login key is set to disabled, anonymous login is allowed. The key must contain a valid user name or ID for a user account with the permissions appropriate for anonymous use. To prevent anonymous login this key should be removed from the Registry.

SEE ALSO

HELP Topics: [Websocket/Files](#), [Websocket/Login](#), [USERS](#)

Websocket/Files Registry Key

NAME

Websocket/Files

DEFAULT

enabled

DESCRIPTION

The built-in Websocket interface supports file management. Files may be listed, read, written, renamed and deleted. Similarly folders can be created, renamed and removed. For additional security this feature can be disabled with this key. This removes the file management function from the interface (after a reboot). This key also signals the WebUI to remove the File Folders tab.

SEE ALSO

HELP Topics: [Websocket/Console](#), [FILES](#)

Websocket/Console Registry Key

NAME

Websocket/Console

DEFAULT

enabled

DESCRIPTION

Each connection to the built-in Websocket interface can support a single command line (console) session. For additional security this feature can be disabled by this key. This removes the console functionality from the Websocket interface (after reboot). The key also signals the WebUI to remove the Console tab.

SEE ALSO

HELP Topics: [WEBSOCKET](#)

JMPServer/Server **Registry Key****NAME**

JMPServer/Server

DEFAULT

enabled

DESCRIPTION

This can be used to disable the JMP Server. This may be desirable if communications with JNIOR will be through some other means and connections to the JMP Port are to be ignored. Changes take effect on reboot.

SEE ALSOHELP Topics: [JMPServer/Port](#), [JMP](#)**JMPServer/Port** **Registry Key****NAME**

JMPServer/Port

DEFAULT

9220

DESCRIPTION

This defines the TCP/IP port on which JNIOR will listen for JMP connections. The default port is 9220. Changes take effect on reboot.

SEE ALSOHELP Topics: [JMP](#)**JMPServer/Login** **Registry Key****NAME**

JMPServer/Login

DEFAULT

enabled

DESCRIPTION

By default the JMP server requires a successful login. This is achieved as part of the protocol. Login is highly recommended. If the JNIOR is connected to a private secure network this login requirement can be removed by setting this Registry key to disabled. The change takes effect immediately. Note that this requires that JMPServer/Anonymous be set.

SEE ALSOHELP Topics: [JMPServer/Anonymous](#), [JMP](#)

JMPServer/Anonymous**Registry Key****NAME**

JMPServer/Anonymous

DEFAULT

None

DESCRIPTION

Defines the user name or ID applied to anonymous logins. When the JMP server requires a login (default) the login must reference a defined username using the correct password for that account. In order to accommodate a scheme whereby data monitoring would not require login but control or configuration would, JANOS allows for anonymous login. When the JMPServer/Anonymous key is defined anonymous login is allowed. The key must contain a valid Username or ID defining a user account with the permissions appropriate for anonymous use. To prevent anonymous login this key should be removed from the Registry.

NOTES

The User name or ID for any user account can be found using the USERS command at the command line prompt.

SEE ALSO

HELP Topics: [JMPServer/Login](#), [JMP](#), [USERS](#)

JniorServer/Server **Registry Key****NAME**

JniorServer/Server

DEFAULT

enabled

DESCRIPTION

This entry can be used to disable the JNIOR Server. This protocol should be disabled if the JANOS Management Protocol (JMP) is used routinely. Changes take effect on reboot.

SEE ALSOHELP Topics: [JniorServer/Port](#), [JPROTOCOL](#), [JMP](#)**JniorServer/Port** **Registry Key****NAME**

JniorServer/Port

DEFAULT

9200

DESCRIPTION

This defines the TCP/IP port on which JNIOR will listen for protocol connections. The default port is 9200. Changes take effect on reboot.

SEE ALSOHELP Topics: [JniorServer/Login](#), [JPROTOCOL](#)**JniorServer/Login** **Registry Key****NAME**

JniorServer/Login

DEFAULT

enabled

DESCRIPTION

By default the JNIOR protocol requires a successful login. This is achieved through a function as part of the protocol. It is highly recommended that Login be accommodated. If the JNIOR is connected to a private secure network this login requirement may be removed. Set this Registry key to disabled. The change takes effect immediately. Note that this requires that JniorServer/Anonymous be set.

SEE ALSOHELP Topics: [JniorServer/Anonymous](#), [JPROTOCOL](#)

JniorServer/Anonymous**Registry Key****NAME**

JniorServer/Anonymous

DEFAULT

Defines the user name or ID applied to anonymous logins. When the JNIOR protocol requires a login (default) the login must reference a defined username using the correct password for that account. In order to accommodate a scheme whereby data monitoring would not require login but control or configuration would, JANOS allows for an anonymous login. When this Registry key is defined anonymous login is allowed. The key must contain a valid user name or ID for a user account with the permissions appropriate for anonymous use. To prevent anonymous login this key should be removed from the Registry.

The user name or ID for accounts can be found using the USERS command at the command line prompt.

SEE ALSO

HELP Topics: [JniorServer/RemoteIP](#), [JniorServer/Login](#), [JPROTOCOL](#), [USERS](#)

JniorServer/RemoteIP**Registry Key****NAME**

JniorServer/RemoteIP

DEFAULT

None

DESCRIPTION

The JNIOR protocol server can be configured to maintain a outbound connection to an external JNIOR protocol server. This Registry key defines the IP address of the remote connection point. Once defined the connection will be established.

Outbound connections allow JNIOR communications between an Internet server and individual devices behind a firewall or NAT router. This is best accomplished with an application program which can be written to handle custom protocols as may be required for such a system. The JNIOR Protocol is a binary master-slave interface that takes some care in implementation. The protocol includes unsolicited messages as well which are often overlooked.

SEE ALSOHELP Topics: [JniorServer/RemotePort](#), [JPROTOCOL](#)**JniorServer/RemotePort****Registry Key****NAME**

JniorServer/RemotePort

DEFAULT

9200

DESCRIPTION

The JNIOR protocol server can be configured to make an outbound connection to one remote host. This is enabled using the JniorServer/RemoteIP Registry key and the Port number may be specified by this key.

SEE ALSOHELP Topics: [JniorServer/RemoteIP](#), [JPROTOCOL](#)

FTP/Server**Registry Key****NAME**

FTP/Server

DEFAULT

enabled

DESCRIPTION

JANOS supports a fully functional File Transfer Protocol (FTP) server. This FTP Server provides one of the methods available for moving files on and off of the JNIOR.

This Registry key can be used to disable the FTP Server for added security. Changes take effect on reboot.

SEE ALSOHELP Topics: [FTP/Port](#), [FTPCLIENT](#)**FTP/Port****Registry Key****NAME**

FTP/Port

DEFAULT

21

DESCRIPTION

This defines the TCP/IP port on which JNIOR will listen for FTP command connections. The standard port is 21.

SEE ALSOHELP Topics: [FTP/UnixStyle](#), [FTPCLIENT](#)

FTP/UnixStyle**Registry Key****NAME**

FTP/UnixStyle

DEFAULT

disabled

DESCRIPTION

The specification for the File Transfer Protocol (FTP) does not specify the format for directory listings. Originally the detail was only for display and could be in the system's native format. There are two generally used layouts. Systems based on the Windows operating system provide an MS-DOS style listing while most others provide a Unix format. JANOS provides the MS-DOS style by default.

FTP clients typically now need to interpret the listing for graphical display and tracking of directory/folder content. Most client programs will detect the formatting and process the content as needed. Other clients might expect one style or the other.

If an FTP client has difficulty retrieving the directory listing from the FTP Server you may set this Registry Key to enabled. The FTP Server will then supply the Unix formatted directory listing when requested.

SEE ALSOHELP Topics: [FTP/Server](#), [FTPCLIENT](#)

Telnet/Server**Registry Key****NAME**

Telnet/Server

DEFAULT

enabled

DESCRIPTION

JANOS supports a Telnet server providing access to the Console or Command Line Interface (CLI). Telnet simulates serial communications in this case similar to a connection to the RS-232 COM port. Both are a means of working with the command line interface. This is typically used for product configuration, maintenance and diagnostics.

This Registry entry can be used to disable the Telnet Server for increased security. Changes take effect on reboot. The Console is also available through the WebUI.

SEE ALSOHELP Topics: [Telnet/Port](#), [COM](#)**Telnet/Port****Registry Key****NAME**

Telnet/Port

DEFAULT

23

DESCRIPTION

This defines the Telnet port. The standard TCP/IP port is 23. A unique port may be used for increased security.

SEE ALSOHELP Topics: [Telnet/Server](#), [COM](#)

Beacon/Enabled**Registry Key****NAME**

Beacon/Enabled

DEFAULT

enabled

DESCRIPTION

The BEACON protocol service is used to identify JNIORs on the network, configure IP addressing, and provide management functions. The protocol allows us to communicate with a JNIOR on the local network segment even when its IP configuration is faulty or set for a foreign network. Changes to Registry settings in this section require a reboot in order to become effective.

For added security this protocol may be disabled using this Registry key. The BEACON protocol is required for proper operation of the Support Tool. JANOS also uses this protocol to identify peers on its local network.

SEE ALSO

HELP Topics: [Beacon/Announce](#)

Beacon/Announce**Registry Key****NAME**

Beacon/Announce

DEFAULT

enabled

DESCRIPTION

The BEACON protocol service by default announces the presence of the JNIOR on the network using a broadcast UDP communication. The Support Tool uses this to list local JNIORs on the Beacon tab. This feature may be disabled for added security by setting this key to disabled.

NOTES

On boot JANOS issues a QUERY_ALL BEACON request requesting announcements from its peers on the local network segment.

SEE ALSO

HELP Topics: [Beacon/AutoAnnounce](#)

Beacon/AutoAnnounce**Registry Key****NAME**

Beacon/AutoAnnounce

DEFAULT

disabled

DESCRIPTION

The BEACON protocol service announces the JNIOR on boot by default using a UDP broadcast. This also occurs whenever key configuration settings are changed. There will be otherwise extended periods without any announcement. This Registry Key may be used to actively monitor the health of the JNIOR. The JNIOR will emit a periodic announcement every 30 seconds when this key is set to enabled.

NOTES

The BEACON broadcasts on UDP Port 4444. Each pack is minimal and while such broadcasts are persistent they do not significantly impact overall network bandwidth.

SEE ALSO

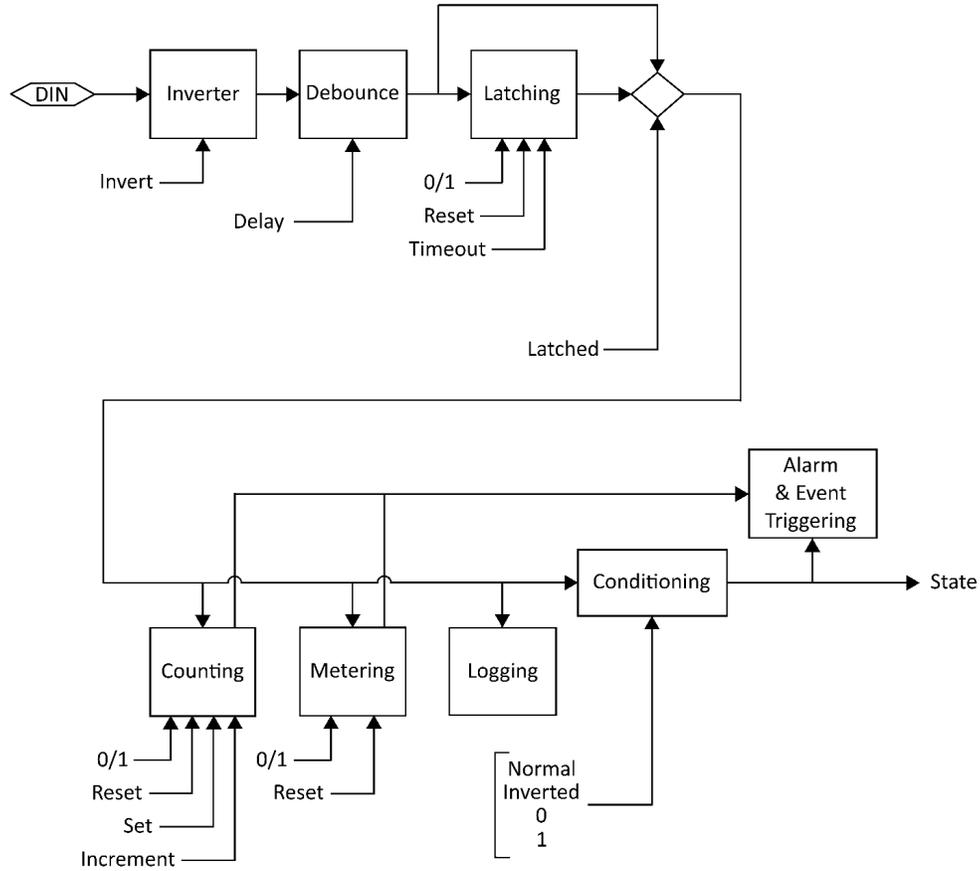
HELP Topics: [Beacon/Enabled](#)

Digital Inputs

Inputs

OVERVIEW

Each digital input may be configured in a number of ways to achieve the desired function. Each Digital Input is processed as follows:



1. Sampled (Hardware)
2. [Inversion](#)
3. [Debounce](#)
4. [Latching](#)
5. [Counting](#)
6. [Metering](#)
7. [Logging](#)
8. [Conditioning](#)
9. [Alarming](#)
10. State Reported

All of the above steps are configurable through the WebUI and follow the resulting Registry key settings.

REGISTRY NAMING

Each Digital Input has its own Registry section (node) which is numerically defined. Presently there can be 4, 8 or 12 inputs depending on the JNIOR model. Here we use [DIN] as a placeholder for the appropriate section name. For example using 'din3' for Digital Input 3 we can set a text description as follows:

```
reg IO/Inputs/din3/Desc = "Power Enabled"
```

NOTES

Registry keys are not case-sensitive however case is preserved when a key is first defined. This improves readability without causing difficulty in referencing keys.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Desc](#), [REG](#), [MODELS](#), [INPUTS](#)

Inversion**Inputs****DESCRIPTION**

A Digital Input may be configured to be read as ON when no voltage is applied to the input and be considered OFF when the LED associated with the input is actually illuminated. This is the case when the input is 'Inverted'.

The inversion can be accomplished in two different ways. The input signal may be inverted as it is sampled by the system. It can also be inverted as it is reported by the system. The difference is in how other input features perceive the input state.

Sampled Inversion

The input Debounce, Latching, Counting, Metering, and Logging features operate on the input state as it is sampled. When Inversion is applied to the sampled input all of these features see and respond to the inverted input state. This is useful in accommodating an input signal whose voltage works with opposite meaning (5VDC means not active for instance).

Conditioned Inversion

When an application uses an input state in a sense opposite in meaning to the signal itself, it may be appropriate to invert the reported state. In this case input features work logically and the application is still satisfied. In this case the Inversion is applied as a form of state Conditioning prior to reporting.

NOTES

State Alarming reflects the reported state. Counting and Metering (Usage) alarms result from the sampled state.

Both Counting and Metering can be configured to respond to either a '0' or '1' state. In effect these each have their own type of inversion. There is sufficient flexibility to accommodate whatever is needed.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Inversion](#), [IO/Inputs/\[DIN\]/Conditioning](#)

Debouncing

Inputs

DESCRIPTION

Relays and switches have mechanical contacts which physically make or break a circuit. Rarely will the contacts come together solidly or separate decisively without bouncing (briefly making and breaking the circuit). This can raise havoc with digital latching and counting circuits that might be monitoring through the relay/switch contact. It can result in latching at the wrong time (when the relay opens for instance) or in extra counts. Both are undesirable.

An input transition is sampled on either the input turning ON or turning OFF.

When an input changes after being stable longer than the defined Debounce delay the input transition is immediately reported and processed. This eliminates filtering delay.

The Debounce delay timer is restarted with each input transition. When the timer is active additional transitions are not processed. This ignores noise from switch and relay contact bounce.

When the Debounce timer expires the state of the input is updated to reflect its current status. In effect this accomplishes pulse stretching. A short input pulse shorter than the defined delay will activate the input which will remain active until the delay expires. This can be long after the pulse completed.

NOTES

Another way to capture short input pulses is [Latching](#). This can be configured to accomplish pulse stretching as well. Additionally a pulse may be captured and require a manual reset through Latching.

Debounce can also be used to achieve a stable state detecting the presence of an AC voltage. In order to avoid counting each period of a 60Hz AC voltage the Debounce setting needs to be at least 167 milliseconds. The default setting of 200 milliseconds is perfect for that. The input detects the presence of the voltage and gives a steady ON result. Note though that an input is rated only to 30V.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Debounce](#), [INPUTS](#), [LATCHING](#)

Latching**Inputs****DESCRIPTION**

When pulsed signals are applied to a Digital Input the input state may change so fast that it cannot be seen or detected by an application. The solution is to capture the pulse and hold the signal state long enough to be detected and then processed. An input can be configured to latch on either the 1 (ON) state or the 0 (OFF) state. A pulse as short as 1 millisecond can be detected.

Once latched a timer can be configured to reset the latch after a period suitable for the application. Alternatively the latch might hold the condition indefinitely until it is manually reset or acknowledged by the application programming. This may be appropriate in a fire alarm situation.

NOTES

Pulses may also be stretched using Debounce.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Latching](#), [DEBOUNCE](#)

Logging

Inputs

DESCRIPTION

Individual changes in I/O state are accurately logged. The [IOLOG](#) command can be used to display and save I/O logs. Applications have the ability to query I/O log detail with sufficient accuracy to calculate information such as the RPM (Revolutions Per Minute) of a wind turbine both at high speeds and very low speeds (fractions of RPM). The I/O logs can be used in preference to monitoring the input state itself.

EXAMPLE

```
I/O Log content:
06/10/21 13:00:45.487, DIN ---- 0000 0000, RLY ---- ---- 0000 0000
06/11/21 11:10:41.197, DIN ---- 0000 0000, RLY ---- ---- 0000 0001
06/11/21 11:10:41.297, DIN ---- 0000 0000, RLY ---- ---- 0000 0000
06/11/21 13:23:29.008, DIN ---- 0000 0000, RLY ---- ---- 0000 0001
06/11/21 13:23:31.008, DIN ---- 0000 0000, RLY ---- ---- 0000 0000
06/11/21 13:23:34.813, DIN ---- 0000 0000, RLY ---- ---- 0000 0001
06/11/21 13:23:34.913, DIN ---- 0000 0000, RLY ---- ---- 0000 0000
06/11/21 13:28:30.665, DIN ---- 0000 0000, RLY ---- 0001 0000 0000
06/11/21 13:28:39.023, DIN ---- 0000 0000, RLY ---- 0001 0000 0010
06/11/21 13:30:24.665, DIN ---- 0000 0000, RLY ---- 0000 0000 0000
```

Note that in this example an external Power 4ROUT was added a one point and one of its relays closed and later opened.

NOTES

High frequency input signals can impact product performance and logging for individual inputs may be disabled if that is of concern. It may be more that a frequently changing signal may mask the activity of other inputs given that the I/O log queue itself is of a fixed size.

SEE ALSO

HELP Topics: [IO/Inputs/Log](#), [IOLOG](#), [JRMON](#)

IO/Inputs/Log**Registry Key****NAME**

IO/Inputs/Log

DEFAULT

enabled

DESCRIPTION

This key can be used to disable logging of all of the Digital Inputs regardless of the logging settings for individual inputs. This setting does require a reboot to take effect.

NOTES

You might consider disabling input logging if input signals change more than a few times per second. Applications however can refer to the I/O log to perform calculations such as averaging for reporting information such as Revolutions per Minute (RPMs).

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Log](#), [LOGGING](#), [IOLOG](#)

Metering**Inputs****DESCRIPTION**

JANOS performs Usage Metering for both Digital Inputs and Relay Outputs. This tallies the amount of time that either input or output remains in a defined state. By default this is the ON or 1 state for inputs and the CLOSED or 1 state for relays. The accumulated time is maintained to the millisecond and can be viewed through the Registry to the tenth of an hour. The JRMON command can also display usage meters. These are also displayed by the WebUI.

These meters may be used for preventative maintenance. A Usage Alarm can be enabled to transmit an email notification when a service interval may be approaching.

SEE ALSO

HELP Topics: [\\$HOURLMETER](#), [JRMON](#), [DIN](#)

Counting**Inputs****DESCRIPTION**

JANOS tallies the number of times a Digital Input enters a predefined state. By default the count reflects the ON or 1 input state. A counter is advanced each time the input transitions from the OFF 0 state to the ON 1 state.

The counters may be viewed, set and reset using the JRMON command. They are also displayed by the WebUI. Applications may also utilize and manage counts.

Alarms may be set and configured to send an email when counts reach either of two separate trigger points (Alarm1 and Alarm2).

SEE ALSO

HELP Topics: [ALARMING](#), [DIN](#), [JRMON](#)

Alarming**Inputs****DESCRIPTION**

JANOS is capable of handling a number of Alarm situations. These are events that can be enabled to preform an action or issue a notification. By default a notification can be configured. Applications can be written to respond to alarms and take other actions. Alarms are reported externally through the JMP and JNIOR protocols.

Input Alarms may be defined to react to a specific input state. For example an input wired to a door sensor may be configured to send an email when going to the ON state.

Alarms may be generated when an Input Counter reaches predefined values. Two separate input counter alarm trigger points may be defined: Alarm1 and Alarm2.

And finally, an alarm may be triggered with an Digital Input or a Relay Output reaches a predefined Usage Metering hour total.

SEE ALSO

HELP Topics: [JMP](#), [JPROTOCOL](#), [Events/OnAlarm](#), [EventsOnAlarm1](#), [Events/OnAlarm2](#), [Events/OnUsage](#)

Text Descriptions**Registry Key****NAME**

IO/Inputs/[DIN]/Desc

DEFAULT

"Digital Input ##"

DESCRIPTION

This defines a textual description for the associated Digital Input. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application desiring a description for the input.

ON STATE

IO/Inputs/[DIN]/OnDesc

DEFAULT

"On"

DESCRIPTION

This defines the text used to describe the state when the associated input is ON. By default an input is considered to be ON when sufficient voltage is applied illuminating the associated LED.

This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application desiring a description for the input state.

NOTES

An input may be configured to be Inverted either as JANOS perceives the input state or as it is reported. The associated LED follows the voltage state of the input. Depending on configuration the system may report a different condition.

OFF STATE

IO/Inputs/[DIN]/OffDesc

DEFAULT

"Off"

DESCRIPTION

This defines the text used to describe the state when the associated input is OFF. By default an input is considered to be OFF when the associated LED is not illuminated.

This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application desiring a description for the input state.

NOTES

An input may be configured to be Inverted either as JANOS perceives the

input state or as it is reported. The associated LED follows the voltage state of the input. Depending on configuration the system may report a different condition.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Inversion](#), [DIN](#), [INPUTS](#)

IO/Inputs/[DIN]/Inversion **Registry Key****NAME**

IO/Inputs/[DIN]/Inversion

DEFAULT

disabled

DESCRIPTION

When this Registry key is enabled the JNIOR will invert the sense of the Digital Input as it is sampled. When enabled the input will be considered OFF when sufficient voltage is applied to the external circuit causing the associated LED to be illuminated.

This inversion is applied immediately to the input and affects all other subsequent functions (Debounce, Latching, Alarming, Counting, etc.).

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Conditioning](#), [DIN](#)

IO/Inputs/[DIN]/Conditioning **Registry Key****NAME**

IO/Inputs/[DIN]/Conditioning

DEFAULT

0 (Normal)

DESCRIPTION

The input state may be Cconditioned prior to being reported and after all other operations. By default the input state is as reported by the latching or debounce stages (Mode 0). You may configure inversion here or force the input to be always read as 0 (OFF) or 1 (ON). Note that counting and usage metering remain operational even when inputs are forced to a fixed state. The following settings are valid:

- 0 Normal (no change)
- 1 Inverted
- 2 Forced to 0 (OFF) state
- 3 Forced to 1 (ON) state

A value other than those above will be handled as if set to the default.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Debounce](#), [DIN](#), [INVERSION](#)

IO/Inputs/[DIN]/Debounce **Registry Key****NAME**

IO/Inputs/[DIN]/Debounce

DEFAULT

200 (milliseconds)

DESCRIPTION

This defines the Debounce Delay in milliseconds.

Relays and switches have mechanical contacts which physically make or break a circuit. Rarely will the contacts come together solidly or separate decisively without bouncing (briefly making and breaking the circuit). This can raise havoc with digital latching and counting circuits that might be monitoring through the relay/switch contact. It can result in latching at the wrong time (when the relay opens for instance) or in extra counts. Both are undesirable.

By default the JNIOR digital inputs are debounced . An input must remain quiet (not change) for the specified delay before any transition on that input will be processed (latched, counted or logged).

This is sufficient to eliminate most all of the issues arising from contact bounce.

A setting of 0 disables the debounce. In this case the JNIOR is capable of counting transitions occurring at rates up to roughly 1,800 per second.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Latching](#), [DEBOUNCE](#), [DIN](#)

IO/Inputs/[DIN]/Latching **Registry Key****NAME**

IO/Inputs/[DIN]/Latching

DEFAULT

disabled

DESCRIPTION

Enable this Registry key when the associated input is to be latched. When enabled, the input will be considered to remain in the state defined by the LatchState setting after the voltage applied to the external input is changed. If the LatchTime is set to 0 seconds the User must manually reset the input. This can be done through the WebUI or other application.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/LatchTime](#), [IO/Inputs/\[DIN\]/LatchState](#), [DIN](#)

IO/Inputs/[DIN]/LatchTime Registry Key

NAME

IO/Inputs/[DIN]/LatchTime

DEFAULT

0.0 (seconds)

DESCRIPTION

This defines the time in seconds (0.1 equals 100 milliseconds) that an input remains latched before being automatically reset. A value of 0.0 will require the user to separately reset the latched input through an application or the [JRMON](#) command.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/LatchState](#), [DIN](#), [JRMON](#)

IO/Inputs/[DIN]/LatchState Registry Key

NAME

IO/Inputs/[DIN]/LatchState

DEFAULT

1 (ON)

DESCRIPTION

When Latching is enabled this specifies whether the input is latched in the ON state (1) or in the OFF state. The key is set to 1 or 0 respectively.

SEE ALSO

HELP Topics: [LATCHING](#), [DIN](#)

IO/Inputs/[DIN]/Log Registry Key

NAME

IO/Inputs/[DIN]/Log

DEFAULT

enabled

DESCRIPTION

This key can be optionally used to disable logging on an input by input basis. If an input is going to be rapidly changing the time spent in the logging process can degrade system performance. In such circumstances it is suggested that logging can be disabled for the input.

SEE ALSO

HELP Topics: [IO/Inputs/Log](#), [LOGGING](#), [IOLOG](#)

IO/Inputs/[DIN]/\$HourMeter **Registry Key**

NAME

IO/Inputs/[DIN]/\$HourMeter

DESCRIPTION

This dynamic key reports the total number of hours that a digital input has physically been in the state specified by UsageState . This value is nonvolatile and maintains its content through power removal and until it is specifically reset. It is reported here in hours to the one-hundredth. The Hour Meter is accurate to the millisecond and this high resolution value may be read through the JMP Protocol, the JNIOR Protocol or using the JRMON command.

SEE ALSO

HELP Topics: [METERING](#), [JMP](#), [JPROTOCOL](#), [JRMON](#), [DIN](#)

IO/Inputs/[DIN]/Alarming Registry Key

NAME

IO/Inputs/[DIN]/Alarming

DEFAULT

disabled

DESCRIPTION

When enabled an alarm is generated when then associated input enters the specified state. By default the alarm is issued when the conditioned state for the input indicates that the input has turned ON.

NOTES

Inputs may be inverted when sampled, latched and/or conditioned prior to being monitored for alarming.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Alarm/Inversion](#), [DIN](#), [INVERSION](#), [LATCHING CONDITIONING](#), [ALARMING](#)

IO/Inputs/[DIN]/Alarm/Inversion Registry Key

NAME

IO/Inputs/[DIN]/Alarm/Inversion

DEFAULT

disabled

DESCRIPTION

This setting defines the state triggering the alarm. Enable this key when the associated input is to alarm upon entering the OFF state. This inverts the input state prior to alarm monitoring and essentially changes the triggering state. By default an alarm normally is generated when the input turns ON.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Alarm/Email](#), [ALARMING](#), [DIN](#)

IO/Inputs/[DIN]/Alarm/Email Registry Key

NAME

IO/Inputs/[DIN]/Alarm/Email

DEFAULT

disabled

DESCRIPTION

This key enables Email Notifications in response to a Digital Input state Alarm.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Alarm/EmailBlock](#), [ALARMING](#), [DIN](#)

IO/Inputs/[DIN]/Alarm/EmailBlock Registry Key

NAME

IO/Inputs/[DIN]/Alarm/EmailBlock

DEFAULT

None

DESCRIPTION

This may be used define a custom Email Notification message transmitted when the input state alarm is triggered.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Alarm/HoldOff](#), [EMAIL_BLOCK](#), [ALARMING](#), [DIN](#)

IO/Inputs/[DIN]/Alarm/HoldOff Registry Key

NAME

IO/Inputs/[DIN]/Alarm/HoldOff

DEFAULT

300000 (milliseconds)

DESCRIPTION

This defines the amount of time in milliseconds that the Digital Input state alarm must remain clear before any subsequent state alarm for this input will be acted upon. The default is 300000 or 5 minutes. When an alarm occurs the services associated with that event are performed. The alarm must reset and remain so for this amount of time before those actions would be performed again. Even at this setting an email notification could be sent once every 5 minutes if the input is actively changing.

SEE ALSO

HELP Topics: [ALARMING](#), [DIN](#)

IO/Inputs/[DIN]/CountState Registry Key

NAME

IO/Inputs/[DIN]/CountState

DEFAULT

1 (ON)

DESCRIPTION

This specifies whether an input transition from OFF to ON is counted (1) or if the transition from ON to OFF is counted. The key is set to either 1 or 0 respectively. By default the counters are advanced when the input state transitions from OFF 0 to ON 1.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Count/Units](#), [COUNTING](#), [DIN](#)

IO/Inputs/[DIN]/Count/Units Registry Key

NAME

IO/Inputs/[DIN]/Count/Units

DEFAULT

"counts"

DESCRIPTION

This defines the text describing the units to be displayed with the associated input counter. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application requiring a description of the count units.

The units of count may vary depending on the scaling and sampling options used. By default input transitions are simply counted and the counts are reported.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Count/Multiplier](#), [COUNTING](#), [DIN](#)

IO/Inputs/[DIN]/Count/Multiplier Registry Key**NAME**

IO/Inputs/[DIN]/Count/Multiplier

DEFAULT

0.0

DESCRIPTION

When the Count Multiplier is set to 0.0 (default) the absolute counter value is displayed. When a non-zero multiplier is specified the value is used to scale the counter value for display. The scaled counter value is also used for count alarm trigger points.

Input pulses are counted and each count may represent some incremental value of a quantity measured by the remote sensor. For instance each pulse might indicate that 5 gallons of water has passed through a flow sensor. In this example you might set the multiplier IO/Inputs/[DIN]/Count/Multiplier to 5.0 and the reported units IO/Inputs/[DIN]/Count/Units to "Gallons". The WebUI would then report the accumulated gallons as measured.

SEE ALSO

HELP Topics: [IO/Inputs/\[DIN\]/Count/SampleTime](#), [IO/Inputs/\[DIN\]/Count/Units COUNTING](#), [DIN](#)

IO/Inputs/[DIN]/Count/SampleTime Registry Key**NAME**

IO/Inputs/[DIN]/Count/SampleTime

DEFAULT

0.0 (seconds)

DESCRIPTION

This defines a sampling period in seconds. A fractional value may be specified.

Normally Counts accumulate until reset separately by the user through the WebUI, JRMON or other application. This is the case when SampleTime is set to 0.0 (default). When a nonzero time is defined the counter displays the total count accumulated during that period. For instance, with the appropriate combination of Multiplier and SampleTime the counter can display Revolutions Per Minute (RPM) for an input using a Hall Effect sensor mounted on a wheel hub.

NOTES

When RPM is measured in this fashion it is perhaps better to allow an application to perform the calculation. With access to the I/O log and the appropriate Java class the application can average pulses over a moving window or sample time for the accurate real-time measurement of high RPMs. When the wheel is rotating extremely slowly the application can

then use the pulse-to-pulse timing to derive an estimate of fractional RPMs and even the rate of change. This would be a useful approach for use with a wind turbine as an example.

SEE ALSO

HELP Topics: [JRMON](#), [COUNTING](#), [DIN](#)

Count Alarms

Registry Key

ALARM ENABLES

IO/Inputs/[DIN]/Count/Alarm1

IO/Inputs/[DIN]/Count/Alarm2

DEFAULT

disabled

DESCRIPTION

Set to enable an alarm when the scaled count exceeds the Limit1 or Limit2 value as appropriate.

TRIGGER POINTS

IO/Inputs/[DIN]/Count/Limit1

IO/Inputs/[DIN]/Count/Limit2

DEFAULT

0 (zero)

DESCRIPTION

This defines the trigger point for the associated count alarm. An alarm can be generated when the scaled counter exceeds this value.

SEE ALSO

HELP Topics: [COUNTING](#), [DIN](#)

Usage

Registry Key

METERED STATE

IO/Inputs/[DIN]/UsageState

DEFAULT

1 (ON)

DESCRIPTION

This specifies whether usage time is accumulated with the input in the ON state (1) or in the OFF state (0). The key is set to 1 or 0 respectively.

ALARM ENABLE

IO/Inputs/[DIN]/Usage/Alarm

DEFAULT

disabled

DESCRIPTION

Set this Registry key to enable an alarm when the associated usage meter reaches a specified number of hours.

USAGE LIMIT

IO/Inputs/[DIN]/Usage/Limit

DEFAULT

0.0

DESCRIPTION

Defines the alarm setpoint in hours and fractions of hours. The associated input goes into alarm when the usage meter reported by \$HourMeter reaches or exceeds this setpoint.

EVENTS ENABLE

IO/Inputs/[DIN]/Usage/OnAlarm

DEFAULT

disabled

DESCRIPTION

This key may be optionally defined to enable services related to Digital Input Usage Alarms.

EMAIL ENABLE

IO/Inputs/[DIN]/Usage/Email

DEFAULT

disabled

DESCRIPTION

This Registry key enables Usage Notification email.

CUSTOM NOTIFICATION

IO/Inputs/[DIN]/Usage/EmailBlock

DEFAULT

None

DESCRIPTION

This may be used define a block that creates a unique Usage Notification message.

HOLDOFF

IO/Inputs/[DIN]/Usage/HoldOff

DEFAULT

300000 (milliseconds)

DESCRIPTION

This defines the amount of time in milliseconds that the Digital Input usage alarm must remain clear before any subsequent usage alarm on this input will be acted upon. The default is 300000 or 5 minutes.

When an alarm occurs the services associated with that event are performed. The alarm must reset and remain so for this amount of time before those actions would be performed again.

SEE ALSO

HELP Topics: [\\$HOURLMETER](#), [JRMON](#), [DIN](#)

Relay Outputs

Registry Key

OVERVIEW

The following keys are associated with the Relay Outputs. In each of the keys replace the [ROUT] with the appropriate string with channel number ROUT1 thru ROUT16 depending on the configuration. The Model 410 has 8 relay outputs while the Model 412 has 12 and the Model 414 only 4. Power 4ROUT Expansion Modules may be added to provide additional relays. The first 16 are addressable through the Registry.

IO/Outputs/[ROUT]/Desc

Registry Key

NAME

IO/Outputs/[ROUT]/Desc

DEFAULT

"Relay Output ##"

DESCRIPTION

This defines the textual description for the associated Relay Output. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application requiring a description.

CLOSED STATE

IO/Outputs/[ROUT]/ClosedDesc

DEFAULT

"Closed"

DESCRIPTION

This defines the text shown when the associated relay has been activated and is in the CLOSED state. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application requiring a description of the output status.

OPEN STATE

IO/Outputs/[ROUT]/OpenDesc

DEFAULT

"Open"

DESCRIPTION

This defines the text shown when the associated relay is in the OPEN state. This Registry key is not specifically used by the operating system. It is used by the WebUI and can be referenced by any other application requiring a description of the output status.

IO/Outputs/[ROUT]/InitialState Registry Key**NAME**

IO/Outputs/[ROUT]/InitialState

DEFAULT

undefined

DESCRIPTION

This key is used to define the initial behavior of relay outputs on boot. The value defines a pulse duration in milliseconds where an entry of 0 indicates infinity. Setting the key to a value of 0 would effectively close the output. Setting the key to a positive integer would cause the output to pulse for the duration defined by the value. An undefined or negative value (default) results in no action.

NOTES

On power up all relays are in the inactive state. By default that is the OPEN state where the contacts are not conducting. These are Normally Open (NO) contacts. Depending on the model certain relays may be reconfigured by internal jumper to be Normally Closed (NC). These would be conducting after boot. Consider this option if you need a relay to conduct when the JNIOR is powered down or after it reboots.

IO/Outputs/[ROUT]/\$HourMeter Registry Key**NAME**

IO/Outputs/[ROUT]/\$HourMeter

DESCRIPTION

This dynamically reports the total number of hours that the relay output has been in the CLOSED state. This value is non-volatile maintaining content through power loss and until it is specifically reset. It is reported here in hours to the one-hundredth. The Hour Meter is accurate to the millisecond and this high resolution value may be read through the JMP Protocol, the JNIOR Protocol or using the JRMON command.

SEE ALSOHELP Topics: [JRMON](#), [HOURLMETER](#), [JMP](#), [JPROTOCOL](#)

Usage	Registry Key
NAME	IO/Outputs/[ROUT]/UsageState
DEFAULT	1 (CLOSED)
DESCRIPTION	<p>This specifies whether usage time is accumulated when the relay is in the CLOSED state (1) or in the OPEN state (0). The key is set to 1 or 0 respectively.</p> <p>Note that certain relays may be reconfigured from Normally Open (NO) to Normally Closed (NC) by jumper. This may affect the choice of metering state.</p>
ALARM ENABLE	IO/Outputs/[ROUT]/Usage/Alarm
DEFAULT	disabled
DESCRIPTION	Set to enable an alarm when the associated usage meter reaches the Limit specified.
USAGE LIMIT	IO/Outputs/[ROUT]/Usage/Limit
DEFAULT	0.0
DESCRIPTION	Defines the alarm setpoint in hours and may include a fractional part. The associated relay output goes into alarm when the usage meter reaches or exceeds this setpoint.
EVENTS ENABLE	IO/Outputs/[ROUT]/Usage/OnAlarm
DEFAULT	disabled
DESCRIPTION	This key may be optionally defined to enable services related to Relay Output Usage Alarms.
EMAIL ENABLE	IO/Outputs/[ROUT]/Usage/Email

DEFAULT

disabled

DESCRIPTION

This Registry key enables Usage Notification email.

CUSTOM EMAIL NOTIFICATION

IO/Outputs/[ROUT]/Usage/EmailBlock

DEFAULT

None

DESCRIPTION

This may be used define a block that creates a unique Usage Notification message.

HOLDOFF

IO/Outputs/[ROUT]/Usage/HoldOff

DEFAULT

300000 (milliseconds)

DESCRIPTION

This defines the amount of time in milliseconds that the Relay Output usage alarm must remain clear before any subsequent usage alarm on this input will be acted upon. The default is 300000 or 5 minutes.

When an alarm occurs the services associated with that event are performed. The alarm must reset and remain so for this amount of time before those actions would be performed again.

SEE ALSO

HELP Topics: [EMAIL_BLOCK](#)

Output Logging**Registry Key****LOGGING ENABLE**

IO/Outputs/Log

DEFAULT

enabled

DESCRIPTION

This key can be used to disable logging of all of the Relay Outputs. This setting requires a reboot.

ENABLE BY OUTPUT

IO/Outputs/[ROUT]/Log

DEFAULT

enabled

DESCRIPTION

This key can be optionally used to disable logging on an output by output basis. If an output is going to be rapidly changing the time spent in the logging process can degrade system performance. In such circumstances it is recommended that logging be disabled for the relay output.

NOTES

The logging process would impact performance significantly with Series 3 JNIOR (Models 310, 312 and 314). This was due to the fact that I/O changes were immediately logged to the jniorio.log file. With Series 4 JNIOR (Models 410, 412, 414 and 412DMX) I/O changes are queued in high-speed local memory. This process has little if any impact on performance. The jniorio.log file is then generated on-demand using the IOLOG console command.

SEE ALSOHELP Topics: [IOLOG](#)

Serial Comm**Registry Key****OVERVIEW**

The JNIOR (Models 410, 412 and 414) support two serial ports, the [COM](#) RS-232 Port and the [AUX](#) Serial port. Both ports may be used by application programs to communicate with and control other devices. By default the COM port provides Diagnostic output information which generally reports status during the boot process. Once the product is up and running the COM port may be used to access to the JANOS Command Line Console. This can be disabled using the [MODE](#) command to insure dedicated communications with external equipment.

The default communications parameters are 115.2K baud, 8 data bits, 1 stop bit with no parity or handshake. The COM port supports only 3-wire communications. This port does not include hardware handshake lines. The AUX port provides for RTS and CTS handshake signals which may be optionally enabled. In addition the AUX port on the Model 410 may be configured for RS-422 or RS-485 communications. In the latter case the output driver may be software controlled supporting multi-drop serial networks.

NOTES

Access to the Command Line Console may be enabled for the AUX Serial port on a session by session basis using the MODE command.

The AUX Serial port is also supported by the [IOLOG](#) command. A bi-directional transmission log is maintained showing recent communications. This data can be displayed or saved to an auxio.log file for further analysis. It is a very useful diagnostic tool.

The Model 412DMX eliminates the AUX Serial port. It is replaced by a dedicated DMX512 Universe 5-pin output.

SEE ALSO

HELP Topics: [MODELS](#), [COM](#), [AUX](#), [MODE](#), [IOLOG](#)

AUX Serial**Registry Key****OVERVIEW**

The [AUX](#) Serial port is available on Models 410, 412, and 414 JNIOR products. It is located at the top of the JNIOR next to the POWER and Sensor Port Expansion Bus connections. This port supports RS-232 communications with optional capability for RTS/CTS hardware handshake. A software XON/XOFF handshake for pacing communications is also possible.

The Model [410](#) additionally supports RS-422 and RS-485 communications that provide longer distance communications capabilities or multi-device serial networking. It is possible to configure a Model 410 to generate a standard DMX512 Universe output for controlling stage lighting.

NOTES

The AUX Serial Port is not available on the Model 412DMX. This is replaced by a dedicated 5-pin DMX output channel.

SEE ALSO

HELP Topics: [AUX_PORT](#)

AUX Serial **Registry Key**

BAUDRATE

AUXSerial/Baudrate

DEFAULT

115200 (115.2 kBaud)

DESCRIPTION

The default baud rate is 115.2K baud. The communications baud rate may be modified through this Registry key either directly, by application program or using the WebUI. Valid settings are:

250000, 128000, 115200, 57600, 38400, 31250, 28800, 19200,
14400, 9600, 4800, 2400, 1200, 600, 300, 150, and 110

The 250K baud setting is for supporting the DMX512 standard used by stage lighting equipment over RS-485.

DATABITS

AUXSerial/Databits

DEFAULT

8 (bits)

DESCRIPTION

The default setting is 8 data bits. Valid settings are 7 and 8. The 7 data bit mode is most often used with either ODD or EVEN parity wherein the parity bit is added maintaining the normal 8 bit stream.

STOPBITS

AUXSerial/Stopbits

DEFAULT

1 (bits)

DESCRIPTION

The default setting is 1 stop bit. Valid settings are 1 or 2. The typical asynchronous receiver always recognizes the end of a character using a single stop bit since there can be any amount of time between characters unless the protocol specifically sets a timeout. The transmitter uses this stop bit setting to stretch the minimum time between characters by one extra bit time.

PARITY

AUXSerial/Parity

DEFAULT

NONE

DESCRIPTION

The default setting is for No Parity (NONE or 0). Valid settings are 0, 2 and 3 where 0 means No Parity or NONE, 2 indicates EVEN parity and 3 ODD

parity. An additional bit is added to the transmitted stream when EVEN or ODD parity is specified. When either EVEN or ODD is specified the received data is expected to contain a parity bit which is checked and removed. This bit is in addition to that specified by the data bit setting.

SEE ALSO

HELP Topics: [AUX_PORT](#), [AUX_FLOW](#)

AUXSerial/Flow**Registry Key****NAME**

AUXSerial/Flow

DEFAULT

0 (NO_CONTROL)

DESCRIPTION

The default setting is NO_CONTROL or 0 meaning that no flow control or handshaking either by hardware or software is used. For the AUX port the valid settings are:

- 0 (NO_CONTROL)
- 1 (RTSCTS_IN)
- 2 (RTSCTS_OUT)
- 3 (RTSCTS)
- 4 (XONXOFF_IN)
- 8 (XONXOFF_OUT)
- 12 (XONXOFF)

The RTSCTS_IN setting uses the available CTS hardware handshake line to control the flow of data from an external source (IN). To hold off incoming data the JNIOR activates the CTS line when internal buffers near capacity. In RTSCTS_OUT mode the AUX port monitors the RTS line and stops transmission when it is activated. The RTSCTS mode employs the handshake bidirectionally.

The XONXOFF_IN handshake transmits the XOFF character (Ctrl-S 0x13) when internal buffers reach capacity to hold off the incoming data. The XON character (Ctrl-Q 0x11) is later sent to resume communications. Similarly in XONXOFF_OUT mode the AUX port listens for the XOFF character and stops transmission when received. When a subsequent XON character is received the communications resume. Both the XON and XOFF characters are filtered from the stream. The XONXOFF setting applies these rules bidirectionally.

SEE ALSO

HELP Topics: [AUX_PORT](#), [AUX_RS485](#), [ASCII](#)

AUXSerial/RS485**Registry Key****NAME**

AUXSerial/RS485

DEFAULT

disabled

DESCRIPTION

By default the RS485 mode is disabled. RS485 communications are only available with the Model [410](#) JNIOR. When enabled the RX, TX, RTS and CTS lines are reconfigured. The transmit drivers are disabled and can be controlled by the application program.

Originally the Model 410 JNIOR included internal jumpers allowing the unit to be configured for RS-422 or RS-485 wiring including optional termination resistors. In general these requirements are now achieved with external wiring. Some 410 PCBs still have an unpopulated location for jumpers that may be used.

SEE ALSOHELP Topics: [AUX_PORT](#), [AUX_FLOW](#)**COM Serial****Registry Key****OVERVIEW**

The COM RS-232 port is located at the bottom of the JNIOR next to the Ethernet LAN connector. This port supports 3-wire RS-232 communications with optional capability for software XON/XOFF handshake for pacing communications.

By default the COM port also provides diagnostic output during boot and serves as a serial access point to the Command Line Console. This port is available for connection to remote equipment.

In connecting a remote serial device it is recommended that you first use the [AUX](#) port. The AUX port is by default dedicated to application use; It is supported by IOLOG providing comprehensive transmission logging; It provides no unexpected output such as diagnostics; And, there are additional communications lines and communication modes.

NOTES

The MODE -S command can be used to silence diagnostic output and to disable access to the Command Line Console. The Boot Dialog may also be disabled through the WebUI under the Serial I/O Configuration tab.

SEE ALSOHELP Topics: [COM_PORT](#), [AUX_PORT](#), [MODE](#), [IOLOG](#)

COMSerial/BootDialog**Registry Key****NAME**

COMSerial/BootDialog

DEFAULT

enabled

DESCRIPTION

The [COM](#) port by default supplies reports during the boot process. Once the unit is up and running this port can also be used to access the command line console. When the port is employed in communicating with another device these messages can cause protocol issues. The unwanted messages can be disabled using this Registry key.

Note that the application program should also disable the boot dialog and command line capabilities to insure reliable port use. This is done using the `com.integpg.comm.COMSerialPort.setBootDialog()` static method. This can also be controlled from the command line using the `MODE -S` command.

Diagnostic port information is included in the `jniorboot.log` file. This eliminates the prior need to observe the boot through the serial port while debugging. Additionally, the `jniorboot.log.bak` file accumulates prior boot detail providing an expanded record of boot detail.

NOTES

Log retention can be greatly expanded by running the [JBakup](#) utility.

SEE ALSO

HELP Topics: [COM_PORT](#), [MODE](#), [JBAKUP](#)

COM Serial**Registry Key****BAUDRATE**

COMSerial/Baudrate

DEFAULT

115200 (115.2 kBaud)

DESCRIPTION

The default baud rate is 115.2K baud. The communications baud rate may be modified through this Registry key either directly, by application program or using the WebUI. Valid settings are:

250000, 128000, 115200, 57600, 38400, 31250, 28800, 19200,
14400, 9600, 4800, 2400, 1200, 600, 300, 150, and 110

DATABITS

COMSerial/Databits

DEFAULT

8 (bits)

DESCRIPTION

The default setting is 8 data bits. Valid settings are 7 and 8. The 7 data bit mode is most often used with either ODD or EVEN parity wherein the parity bit is added maintaining the normal 8 bit stream.

STOPBITS

COMSerial/Stopbits

DEFAULT

1 (bits)

DESCRIPTION

The default setting is 1 stop bit. Valid settings are 1 or 2. The typical asynchronous receiver always recognizes the end of a character using a single stop bit since there can be any amount of time between characters unless the protocol specifically sets a timeout. The transmitter uses this stop bit setting to stretch the minimum time between characters by one extra bit time.

PARITY

COMSerial/Parity

DEFAULT

0 (NONE)

DESCRIPTION

The default setting is for No Parity (NONE or 0). Valid settings are 0, 2 and 3 where 0 means No Parity or NONE, 2 indicates EVEN parity and 3 ODD parity. An additional bit is added to the transmitted stream when EVEN or ODD parity is specified. When either EVEN or ODD is specified the received data is expected to contain a parity bit which is checked and removed. This bit is in addition to that specified by the data bit setting.

SEE ALSOHELP Topics: [COM PORT](#), [COM FLOW](#)

COMSerial/Flow**Registry Key****NAME**

COMSerial/Flow

DEFAULT

0 (NO_CONTROL)

DESCRIPTION

The default setting is NO_CONTROL or 0 meaning that no flow control or handshaking is used. For the COM RS-232 port the valid settings are:

0	(NO_CONTROL)
4	(XONXOFF_IN)
8	(XONXOFF_OUT)
12	(XONXOFF)

The COM port does not support hardware handshaking.

The XONXOFF_IN handshake transmits the XOFF character (Ctrl-S 0x13) when internal buffers reach capacity to hopefully hold off the incoming data. The XON character (Ctrl-Q 0x11) is later sent to resume communications. Similarly in XONXOFF_OUT mode the COM port listens for the XOFF character and stops transmission when received. When a subsequent XON character is received the communications resume. Both the XON and XOFF characters are filtered from the stream. The XONXOFF setting applies these rules bidirectionally.

SEE ALSOHELP Topics: [COM_PORT](#), [ASCII](#)

ZIP/JAR Compression**Registry Key****OVERVIEW**

JANOS supports ZIP library files. In fact the WebServer uniquely uses a ZIP library to create virtual folders allowing an entire website to be contained within a single file. Applications written in Java utilize a JAR library which is nothing more than a renamed ZIP file.

ZIP/JAR files usually contain multiple files in an efficient compressed form. The compression is performed when files are added to a library. While there are optional compression algorithms, JANOS supports the DEFLATE compression. This is compatible with libraries generated by most systems.

The ARC command, and its aliases ZIP and JAR, can be used at the command line to manage a compressed library file. When adding files the necessary compression is handled by JANOS. There are a couple of options affecting the compression procedure and these are controlled by Registry settings. Changes in these settings do not affect the ability to extract files from libraries generated with other settings by the JNIOR or any remote PC.

SEE ALSO

HELP Topics: [ZIP](#)

Zip/Window**Registry Key****WINDOW PARAMETER**

Zip/Window

DEFAULT

16384

DESCRIPTION

The DEFLATE algorithm compresses a file by locating combinations of bytes or characters that repeat. The redundancy is removed and replaced by an efficient pointer to the original grouping. The most efficient compression then would remove any and all redundant groups from an entire file. This is certainly possible for small files. With large files the pointers need to address data further and further away. As the distance grows so do the pointers and efficiency suffers. The solution is to limit the distance using a sliding window through the file.

By default JANOS uses a 16KB (16384 byte) sliding window. This Registry key may be used to adjust the window from a minimum of 2KB (2048) to a maximum of 32KB (32768). In practice there should be no reason to alter this setting. A change in this setting affects the very next compression that is performed.

DEPTH PARAMETER

Zip/Depth

DEFAULT

256

DESCRIPTION

With each successive character in a file the compressor looks back over the sliding window for groupings where replacement by pointer would provide the greatest compression. This is a time consuming endeavor. As a tradeoff the JANOS routine employs a queue of likely targets in the window for each unique character. This reduces the search effort and the time it takes to perform the compression.

By default the search queue depth is set at 256 entries. Values may range from a minimum of 16 to a maximum of 1024. In practice there should be no reason to alter this setting. A change in this setting affects the very next compression that is performed.

SEE ALSOHELP Topics: [ZIP](#), [COMPRESSION](#)

JMP**Protocol****OVERVIEW**

The JANOS Management Protocol (JMP) is available to remote devices and computers for control and management of the JNIOR. Available by default on Port 9220 this protocol replaces the deprecated JNIOR Protocol and provides for better security and a greater range of capabilities. The protocol is based on the [JSON](#) data-interchange format.

The JNIOR WebUI also uses JMP through a Websockets connection to perform all of the functions it offers.

While the JNIOR Protocol remains a viable option for controlling and monitoring I/O on the JNIOR the JANOS Management Protocol or JMP (pronounced "JuMP") offers a single connection point allowing the JNIOR to be fully managed and monitored. The older binary JNIOR Protocol can be a challenge to implement and is not recommended for new development.

SEE ALSO

HELP Topics: [JMPCONNECT](#), [JSON](#)

JMP**Protocol****DESCRIPTION**

There are two methods of achieving a JMP protocol connection. Both provide access to the full capabilities of the protocol.

WEBSOCKET

A WebSocket connection creates a full-duplex communications channel as would be available by direct connection to a TCP port but using the HTTP or HTTPS mechanism. This enables direct interaction between a website and JANOS. By default a WebSocket channel supports the JMP protocol. This is how the JNIOR WebUI performs tasks such as are available through the Folders, Console and Syslog tabs.

Websocket has been standardized by the IETF <https://www.ietf.org/> as RFC 6455 <https://tools.ietf.org/html/rfc6455> . The JNIOR WebUI is installed by the file `/flash/www/config.zip` and in particular the JavaScript file `comm.js` in that library handles the Websocket communications. You are free to use that source code as reference or to incorporate any part of it in your custom website.

Note that the JMP protocol requires a login. This is critical as the protocol is very powerful. When a website login to the JNIOR is successful (or if the login is disabled) a Session Cookie is generated. This is passed when a related HTTP connection is elevated to Websocket. It then is accepted as a valid login credential providing seamless operation.

PROTOCOL PORT

By default a connection to TCP Port 9220 provides direct access to the JMP protocol. In this case there is a special wrapper that must be used in

transporting the JSON messages.

One of the issues in using JSON in communications protocols stems from the lack of message length information. In the absence of a length the communications driver must count open '{' and close '}' curly braces in order to ascertain when an entire structure has been read from the channel. This is complicated by the fact that curly braces may appear in string data and those must be ignored. The algorithm, while not complicated, is an annoyance. The JMP connection uses a wrapper that conveys a message length.

Once a successful connection is made to the JMP Server port, messages may be exchanged. With one exception all messages conform to the JSON format using the ASCII printable character set. The high-level message format must be as follows. This forms the message wrapper which is a 2-element JSON Array construct.

```
[ length , object ]
```

Where `length` defines the exact size of the object in bytes excluding leading and trailing white-space if any. Leading and trailing white-space, which can include newline characters, may be present surrounding both the length value and the object. Here `object` must be a fully formed and valid JSON Object beginning with '{' and ending with '}' curly braces. Both these curly braces and any characters in between are included in the length value. The leading '[' opening square bracket, ',' comma, and trailing ']' closing square bracket are required. The opening and closing JSON Object curly braces are also verified. If there is any violation to this format the message will be simply ignored. There is no response or indication of error. All bytes outside of the square brackets are ignored as well.

A valid parsing strategy would be as follows:

- * Read and ignore bytes up to a '[' opening square bracket
- * Read and ignore white-space characters (space, tab, newline, etc.)
- * Accumulate a decimal length (must be digits 0-9, the result must be ≥ 2)
- * Read and ignore white-space
- * Read and confirm the presence of the ',' comma
- * Read and ignore white space
- * Extract the JSON Object of precise length defined by the numeric value
- * Read and ignore white-space
- * Read and confirm the ']' closing square bracket (no other character is acceptable)
- * Confirm that the JSON object is properly enclosed by '{' and '}' curly braces
- * Process the JSON object and repeat

This wrapper is not used by the Websocket connection since Websocket already includes message length information.

EXAMPLE

All TCP/IP Port 9220 communications utilize the 2-element JSON Array format for conveying valid JSON Objects. This is not used in WebSocket communications. In describing JMP protocol Messages the 2-element JSON Array format will be assumed. We will only show the enclosed JSON Objects.

To initialize communications the client should send a blank or empty message. The following is acceptable.

```
{  
  "Message":""  
}
```

This message properly formatted for JMP Port 9220 would be transmitted as follows.

```
[14,{"Message":""}]
```

The connection will proceed depending on the authentication requirements established by configuration and the client environment for the connection.

NOTES

It is important to note that the TCP/IP connection is a streaming channel and one or more network packets may be required to convey an entire message. Similarly a packet may include the final bytes of one message and those beginning the next. A reliable implementation will buffer incoming data until an entire message is received. Once the message is processed it is removed from the buffer leaving any additional data which will be required to form the message that follows.

JMP is not Master-Slave. Many requests do solicit a response but not all. There are also unsolicited messages produced by the server. These alert the client to I/O changes as well as many other events.

The protocol allows you to specify any amount of META data with your request. That data is echoed in the associated response. This can be used to maintain synchronization between request and response. It is a very flexible means of synchronization and can be used to convey, for example, detailed processing instructions for the response.

SEE ALSO

HELP Topics: [SECURITY](#), [JMP](#), [JSON](#)

JMP**Protocol****SECURITY**

Any protocol providing control and management functions must employ some form of security preventing unauthorized access and abuse. By default the JMP Server requires authentication (login). While the login requirement may be disabled it is not recommended. When the login is disabled an account must be specified for the anonymous login. This is configured through the Registry. We strongly urge you to accommodate the login requirement.

In addition to user authentication the JMP Server supports a TLSv1.2 secure connection. A secure connection is established by first connecting to the JMP Server port and issuing the following clear-text command exactly as shown below. This is the one exception to the 2-element JSON Array formatting mentioned earlier.

```
[STARTTLS]
```

Immediately following the ']' closing square bracket the JNIOR will begin a SSL/TLS negotiation. The client should expect to do the same. If successful all further communications will be encrypted.

NOTES

When accessing JMP through a Websocket connection the login credentials that may have been used to access the website are passed through a Session Cookie. This creates seamless use under the browser. If for any reason the cookie is out of date, the Websocket driver in `comm.js` in the WebUI distribution file `/flash/www/config.zip` will initiate its own login dialog requesting new credentials.

A Websocket secure connection is achieved by using the `WSS://` URL protocol specifier as opposed to `WS://`. The WebUI utilizes that appropriate protocol to track with either `HTTPS://` or `HTTP://` respectively.

SEE ALSO

HELP Topics: [INITIALIZE](#), [JMP](#), [JMPCONNECT](#)

JMP**Protocol****INITIAL CONNECTION**

To initialize communications the client should send a blank or empty message.

```
{
  "Message":""
}
```

This message properly formatted for JMP Port 9220 would be transmitted as follows.

```
[14,{"Message":""}]
```

The connection will proceed depending on the authentication requirements established by configuration and the client environment for the connection.

With the login requirement the exchange will proceed as follows. In this example the client properly utilizes the supplied Nonce to properly calculate a digest inclusive of the login credentials for the username 'jnior'. The response indicates successful login and that the account has Administrator and Control permissions. All Administrators have the ability to control the JNIOR. Not all accounts with Control permission are administrators.

TRANSMITTED	RECEIVED
<pre>{ "Message":"" }</pre>	
	<pre>{ "Message":"Error", "Text":"401 Unauthorized", "Nonce":"5d894efb48e1c3bc074fe78e7a5f" }</pre>
<pre>{ "Auth-Digest":"jnior:65f2d1cb66ef63f7d17a764f3a2f2508" }</pre>	
	<pre>{ "Message":"Authenticated", "Administrator":true, "Control":true }</pre>

A "Monitor" message will likely immediately follow. This might even be received before the "Authenticated" message. That is the asynchronous nature of the connection.

DIGEST CALCULATION

When the JMP connection requires a login it will respond with a "401 Unauthorized" error text. The server provides a unique "Nonce" string as part of this message. This can be used in conjunction with the username and password to calculate the appropriate Authorization Digest.

This requires a MD5 message digest calculation which generates a 16 byte digest represented as 32 hexadecimal characters. The calculation proceeds as follows:

Digest = Username + ":" + MD5(Username + ":" + Nonce + ":" + Password)

Where Username, Password, Nonce and Digest are all strings. The resulting Digest string is returned in the "Auth-Digest" member. Here is an example login with the default administrator's account.

TRANSMITTED	RECEIVED
<pre>{ "Message":"" }</pre>	<pre>{ "Message":"Error", "Text":"401 Unauthorized", "Nonce":"bc581a9683d3e1857218db135e4b" }</pre>
<pre>{ "Auth-Digest":"jnior:6b7b418f223e7e0dc600c41c7b6644b3" }</pre>	<pre>{ "Message":"Authenticated", "Administrator":true, "Control":true }</pre>

SEE ALSO

HELP Topics: [MESSAGING](#), [SECURITY](#), [JMP](#), [JMPCONNECT](#)

JMP**Protocol****MESSAGING**

The JMP server implementation is not Master-Slave however there are a number of 'Requests' that have 'Responses' which is typical for such a server. In addition to this, unsolicited messages may be received from the server. These provide immediate notification for changes in I/O status and updates in configuration settings for instance. Any use of this implementation must handle the presence of unsolicited messages. Care is also required to pair responses with the associated requests as messaging order is not guaranteed. Optional Meta data supplied with a Request is returned with the Response unmodified. This can then be used to identify each response and the action it then requires.

Common Message Structure

All messages use JSON formatting. Each consists of a set of members enclosed by curly braces '{' and '}'. An empty set is acceptable '{}' although it would be ignored by the server and solicit no response. A set may consist of any number of members separated by commas. Each member represents a name/value pair where the name is separated from the value by a colon ':'. The value can be a string, number, object, array, true, false or null. The members are referenced by name and therefore may appear in any order. An array however consists of 0 or more elements each of which are values separated by a commas and presented in sequence dependent order.

THE MESSAGE MEMBER

JMP requires that each valid message contain a 'Message' member. This is a name/value pair where the name is exactly the string "Message" and the value separated by the colon be any one of the following.

Client generated messages:

```
"Status"  
"Control"  
"Registry List"  
"Registry Read"  
"Registry Write"  
"Registry Write Encrypted"  
"Enumerate Devices"  
"Read Devices"  
"Write Devices"  
"Console Open"  
"Console Stdin"  
"Console Close"
```

Server generated responses:

```
"Registry List Response"  
"Registry Response"  
"Enumerate Devices Response"  
"Read Devices Response"  
"Write Devices Response"  
"Console Response"  
"Error"  
"Authenticated"
```

Server generated messages (unsolicited):

```
"Monitor"  
"Registry Update"  
"Console Stdout"
```

Messages received by the server not containing a valid "Message" member are ignored. These will not cause an error or solicit any response.

META MESSAGE MEMBER

The "Meta" message member is entirely optional and since its associated value may be an object it can contain any information and any amount of information. The value of this message pair is ignored by the server. However, the entire pair is returned unmodified with the associated response. The "Meta" object then can contain detailed application specific information that later can be used by the client to synchronize Responses and Requests or to determine any other appropriate course of action when the Response is received.

GENERAL MESSAGE CONTENT

Any number of message members may appear in the message although only those appropriate for the specific request will be used. All others will be ignored. One possible use for any extra message members beyond those required by the request is in providing debug information when viewed/logged on the wire using Wireshark <https://wireshark.org> for instance.

SEE ALSO

HELP Topics: [INITIALIZE](#), [JMP](#), [JMPCONNECT](#)

JMP**Protocol****MONITOR MESSAGE**

Here is an example of the "Monitor" message. In addition to the State and Count for each Digital Input in sequence and Relay Output in sequence, there is information about the JNIOR including a timestamp. The "Monitor" message will be sent by the server whenever any I/O status changes.

```
{
  "Message":"Monitor",
  "Model":"410",
  "Version":"v1.4",
  "Serial Number":614070500,
  "Inputs":[
    {"State":1,"Count":49},
    {"State":0,"Count":360},
    {"State":0,"Count":8},
    {"State":0,"Count":38},
    {"State":0,"Count":3},
    {"State":0,"Count":4},
    {"State":0,"Count":5},
    {"State":0,"Count":7}
  ],
  "Outputs":[
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0}
  ],
  "Timestamp":1444155435066
}
```

Note that the number of inputs and outputs vary depending on the model of JNIOR and number of 4ROUT external modules. The standard Model 410 has 8 inputs and 8 outputs. The Model 412 has an additional 4 outputs for 12 and correspondingly less inputs where there are only 4. Similarly the Model 414 has 4 additional inputs for 12 and correspondingly fewer outputs where there are only 4.

There may be additional outputs included. The JNIOR will include up to 8 additional Relay Outputs from up to 2 external 4ROUT modules in this message. The order in which the external relay modules are assigned into the output sequence is managed by the Registry and the EXTERN command based upon each external module's ID.

JMP

Protocol

STATUS REQUEST

The "Monitor" message previously discussed is an unsolicited message however, the message may be requested using the "Status" request message. This is not typically required as a "Monitor" message is sent immediately after a connection is authenticated and whenever there is a change thereafter. If for any reason this initial message is not processed you can request the information using the "Status" request.

```

                TRANSMITTED                                RECEIVED
{
  "Message":"Status"
}

{
  "Message":"Monitor",
  "Model":"410",
  "Version":"v1.4",
  "Serial Number":614070500,
  "Inputs":[
    {"State":1,"Count":49},
    {"State":0,"Count":360},
    {"State":0,"Count":8},
    {"State":0,"Count":38},
    {"State":0,"Count":3},
    {"State":0,"Count":4},
    {"State":0,"Count":5},
    {"State":0,"Count":7}
  ],
  "Outputs":[
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0},
    {"State":0}
  ],
  "Timestamp":1444155435066
}

```

Recall that messages are encapsulated with length information. Just as a reminder the Status request/command is actually sent as follows where whitespace outside of the JSON content is ignored:

```
[ 20, {"Message":"Status"} ]
```

JMP

Protocol

CONTROL MESSAGES

Each "Control" message must contain a "Command" member which may be one of the following valid values:

- "Toggle"
- "Close"
- "Open"
- "Reset Latch"
- "Reset Counter"
- "Reset Usage"

Each "Control" Message must contain a numeric "Channel" member specifying the input/output channel. This parameter is 1-based where the number '1' specifies either the first Digital Input or first Relay Output. This depends on the specific "Command".

There is no formal response to these command messages although a "Monitor" message will invariably follow some for obvious reasons. Monitor messages are sent whenever I/O status changes. These may be unsolicited but if the control message alters I/O status the Monitor message is a logical response. If the control message does not alter I/O status there is no response.

TOGGLE COMMAND

The "Toggle" command inverts the state of the defined output "Channel". If the relay is open it will be closed. If it is closed it will be opened. The optional "Duration" member parameter if positive and non-zero specifies the milliseconds before the relay is to be returned to its original state. Therefore the following will close Relay Output 1 assuming that it originally is open.

```
{
  "Message":"Control",
  "Command":"Toggle",
  "Channel":1
}
```

Similarly the following will pulse Relay Output 2. Assuming that originally the relay is open, it will be closed for precisely 5000 milliseconds (5 seconds).

```
{
  "Message":"Control",
  "Command":"Toggle",
  "Channel":2,
  "Duration":5000
}
```

Note then that this last version of the Toggle control message will result in 2 Monitor messages. One when the relay closes and another 5 seconds later when it opens.

CLOSE COMMAND

The "Close" command closes the defined output "Channel". If the relay is open

it will be closed. If it is closed it will remain closed (state = 1). The optional "Duration" member parameter if positive and non-zero specifies the milliseconds before the relay is to be returned to its original state. Therefore the following will close Relay Output 1.

```
{
  "Message":"Control",
  "Command":"Close",
  "Channel":1
}
```

Similarly the following will pulse Relay Output 2. It will be closed for precisely 5000 milliseconds (5 seconds). There will be no change if the relay is already closed.

```
{
  "Message":"Control",
  "Command":"Close",
  "Channel":2,
  "Duration":5000
}
```

OPEN COMMAND

The "Open" command opens the defined output "Channel". If the relay is open it will remain so (state = 0). If it is closed it will be opened. The optional "Duration" member parameter if positive and non-zero specifies the milliseconds before the relay is to be returned to its original state. Therefore the following will open Relay Output 1.

```
{
  "Message":"Control",
  "Command":"Open",
  "Channel":1
}
```

Similarly the following will pulse Relay Output 2. It will be opened for precisely 5000 milliseconds (5 seconds). There will be no change if the relay is already open.

```
{
  "Message":"Control",
  "Command":"Open",
  "Channel":2,
  "Duration":5000
}
```

BLOCK COMMAND

The "Block" command allows the state of one or more relays to be changed simultaneously. The "Mask" parameter selects the relay or relays to be affected by the command. Here the presence of a '1' bit indicates that the associated relay state is to be affected. The parameter's least significant bit (LSB) represents Relay Output 1. The corresponding bit in the "States" parameter defines the new state of the associated relay where a '1' indicates that the relay is to be closed, a '0' it is to be opened. The optional "Duration" member parameter if positive and non-zero specifies the milliseconds before the relay

is to be returned to its original state. Therefore the following will close Relay Outputs 1 and 3 and open Relay Output 2 all at the same time.

```
{
  "Message":"Control",
  "Command":"Block",
  "Mask":7
  "States":5
}
```

Similarly the following will pulse Relay Outputs 1 and 2 for precisely 5000 milliseconds (5 seconds).

```
{
  "Message":"Control",
  "Command":"Block",
  "Mask":3,
  "States":3
  "Duration":5000
}
```

RESET LATCH COMMAND

Latching may be enabled for any of the digital inputs. This is a form of event capture which can be very useful in monitoring pulsed signals. A latching input may be set to trigger on either a positive going or negative going signal edge. In waiting for the event the input is considered to be armed. When the trigger signal is detected the input changes state.

A LatchTime may be configured. This defines a timer setting. The timer starts when the event occurs and the input signal is automatically reset when it expires. This provides for a form of pulse stretching. With a latch time of 10 seconds, pulsing an input for a mere 1 millisecond results in the input being activated for 10 seconds. The very brief event is captured. The result is signaled for a period long enough to alert any monitoring system.

If LatchTime is not configured (default is 0) or configured for 0 seconds there will be no automatic reset. The input state indicating the capture of an event must be manually reset or reset by the monitoring system using the "Reset Latch" command. An example message follows.

```
{
  "Message":"Control",
  "Command":"Reset Latch",
  "Channel":2
}
```

RESET COUNTER COMMAND

Input transitions are tallied. The counter can be configured to tally positive going or negative going edges. This provides an indication of the total number of input pulses detected. The JNIOR can count signals up to 2 kHz but is typically employed to count more reasonable paced events. At some point there may be a need to reset the counts to 0. This might occur each time this "meter" is read for instance and perhaps on a monthly basis. The following command does the job.

```
{
  "Message":"Control",
  "Command":"Reset Counter",
  "Channel":3
}
```

RESET USAGE COMMAND

Often it is necessary to keep track of how long that a piece of equipment is in use. The JNIOR tallies the time that either an input or an output is active. Each I/O point can be configured to tally usage time for either the high/1/ON state or the low/0/OFF state. It is reported as a fraction of hours. At some point you may need to reset this Usage Meter. The following command does the job.

```
{
  "Message":"Control",
  "Command":"Reset Usage",
  "Channel":11
}
```

The JNIOR maintains 16 separate usage meters representing the 16 internal I/O points. This covers a mixture of inputs and outputs that varies depending on JNIOR Model. In this example, if we are running a Model 410 with 8 inputs and 8 outputs, we are resetting the Usage Meter for Relay Output 3. Channels 1 through 8 are inputs and 9 through 16 then correspond to Relay Outputs 1 through 8. So for this example Channel 11 is Relay Output 3.

JMP**Protocol****FILE SYSTEM COMMANDS**

The JNIOR supports a file system comparable to that on the PC. It is not possible to support, maintain or program a JNIOR without access to the file system. The JMP Server provides access to files for reading and writing depending on login permissions. This then provides for the greatest flexibility in application development.

FILE LIST REQUEST

The "File List" message is used to request a listing of files in a particular directory/folder within the file system. This solicits a "File List Response" message providing the content. The response echoes the requested "folder" specification and supplies the "Content" as an array of objects each specifying the "Name", "Size", and last modification timestamp "Mod" for the file or folder. Note that a folder is distinguished from a file by the inclusion of a trailing '/' in the name. The folder's size is a count of the items it contains. A trailing '/' is not necessary in the folder specification.

A typical exchange follows. The response message can be quite extensive depending on the number of files your system stores.

TRANSMITTED

```
{
  "Message":"File List",
  "Folder":"/"
}
```

RECEIVED

```
{
  "Message":"File List Response",
  "Folder":"/",
  "Content":[
    {
      "Name":"etc/",
      "Size":1,
      "Mod":"07 Jul 2016 10:25"
    },
    {
      "Name":"temp/",
      "Size":0,
      "Mod":"14 Sep 2016 13:16"
    },
    {
      "Name":"flash/",
      "Size":38,
      "Mod":"23 Sep 2016 07:50"
    },
    {
      "Name":"manifest.json",
      "Size":32698,
      "Mod":"29 Jul 2016 10:26"
    },
    {
      "Name":"jniorsys.log.bak",
```

```

        "Size":65557,
        "Mod":"20 Sep 2016 15:49"
    },
    {
        "Name":"jniorsys.log",
        "Size":16526,
        "Mod":"23 Sep 2016 07:52"
    },
    {
        "Name":"jniorboot.log.bak",
        "Size":1056,
        "Mod":"23 Sep 2016 07:33"
    },
    {
        "Name":"jniorboot.log",
        "Size":1010,
        "Mod":"23 Sep 2016 07:50"
    }
]
}

```

FILE READ REQUEST

The "File Read" operation is used to obtain the data for a single file. Data is returned using Base64 encoding. This allows for the transfer of files containing binary data. The "Encoding" parameter indicates "base64". At this time this is the only encoding that is supported. The "Size" parameter indicates the size of the file and the length of the decoded content of the "Data" parameter.

TRANSMITTED	RECEIVED
<pre> { "Message":"File Read", "File":"/flash/www/config/folder.png" } </pre>	<pre> { "Message":"File Read Response", "File":"/flash/www/config/folder.png" "Size":329, "Encoding":"base64", "Data":"iVBORw0KGgoAAAANSUheUgAAABAAAAAQCAIAAA... UQBG+9eyXUtY0pRt27bXtsaWXGtYss2L533Xej... NEN3vhsJvBA4DS7r5GwgK9bjkyDG7DmNWoxSyw... RuNikAzjk6AWQvVxDk5KcFEN0QjZAtUG3Q6zh9... 1bhsgLhZhDQjGZIVhUVvuRqhd5NxxEXKcVHHx+... ", "Status":"Succeed" } </pre>

READING LARGE FILES

For very large files the "File Read Response" can become quite huge. This can lead to memory and performance concerns. Fortunately you can optionally use "Limit" and "Offset" parameters to read sections of the file while limiting the "data" content size. Repeated "File Read" requests can then be used to retrieve the entire file. This is also useful if the application requires the retrieval of only a small amount of information from a certain offset in a file and not the entire file.

When an "Offset" is specified in the "File Read" request the content of "Data" reflects the bytes starting at the file offset. A value of "0" indicates the beginning of the file.

When the "Limit" parameter is specified, the read operation will return only that number of bytes or the balance of the file whichever is less.

When either "Limit" or "Offset" are specified the "File Read Response" will contain a "NumRead" parameter indicating the actual number of bytes read. The "Size" parameter will always reflect the total file size. The following is an example of a the exchanges needed to read a file limiting the message size. Note that you might likely be able to transfer files as large as 128KB in a single message.

```

                TRANSMITTED                                RECEIVED

{
  "Message": "File Read",
  "File": "/flash/www/config/folder.png"
  "Limit": 256,
}

{
  "Message": "File Read Response",
  "File": "/flash/www/config/folder.png",
  "Size": 329,
  "Offset": 0,
  "Limit": 256,
  "NumRead": 256,
  "Encoding": "base64",
  "Data": "iVBORw0KGgoAAAANSUUEUgAAABAAAA...
          GUQBG+9eyXUtY0pRt27bXtsaWXGtYs...
          VANEN3vhsJvBA4DS7r5GwgK9bjkyDG...
          MxeRuNikAzjk6AWQvVxDk5KcFEN0Qj...
          ",
  "Status": "Succeed"
}

{
  "Message": "File Read",
  "File": "/flash/www/config/folder.png"
  "Offset": 256,
  "Limit": 256,
}
    
```

```

    {
      "Message": "File Read Response",
      "File": "/flash/www/config/folder.png",
      "Size": 329,
      "Offset": 256,
      "Limit": 256,
      "NumRead": 73,
      "Encoding": "base64",
      "Data": "MOYfZOC0BOfVuGyAuFmENCMZki+FRW...",
      "Status": "Succeed"
    }

```

FILE WRITE REQUEST

The "File Write" operation is used to transfer a file to the JNIOR. The write request specifies the target "File" from the root of the file system. The "File" parameter must be present for the request to be considered valid.

Since files may contain binary data the "Data" portion of the message is encoded with Base64 encoding. The "Encoding" parameter must be specified as precisely as "base64".

The "Size" parameter is required and must define the intended size of the file in bytes. It must match the decoded Base64 "Data" content in length. The data is decoded and the byte count compared to that specified before attempting to write the file.

You may optionally specify the last modification timestamp parameter "Mod" for the file. The timestamp is represented as a Linux time in milliseconds since midnight January 1st 1970 in Universal Coordinated Time (UTC). If present the last modification time for the resulting file will be as specified.

Once the file is written the "File Write Response" is returned. The "File" and "Size" are reflected in the response (as would any "Meta"). The formatted timestamp is also returned in a "Mod" parameter. The "NumWritten" parameter reflects the result of the file write. This should match the specified "Size" value if the write is to be successful. A value less than zero indicates an error. A typical exchange follows.

TRANSMITTED	RECEIVED
<pre> { "Message": "File Write", "File": "/temp/main.c", "Size": 144, "Mod": 1310414726000, "Encoding": "base64", "Data": "DQojaW5jbHVkZSAiaW80MzAuaCINCg0KaW50IG1haW4oIHZvaWQgKQ0Kew0KIC... bWVyIHRvIHByZXZlbnQgdGltZSBvdXQgcmVzZXQNCiAgV0RUQ1RMID0gV0RUUF... dHVybiAwOw0KfQ0K" } </pre>	<pre> { "Message": "File Write Response", "File": "/temp/main.c", </pre>

```

        "Size":144,
        "Mod":"11 Jul 2011 16:05",
        "NumWritten":144,
        "Status":"Succeed"
    }

```

WRITING LARGE FILES

For very large files the "File Write" message can become huge. This can lead to memory and performance concerns. Fortunately, you can optionally use the boolean parameter "Append" to break file writes into manageable blocks.

To append to an existing file you use the "File Write" message exactly as described above. You must include an additional parameter named "Append" set to the value of "true". In this case the file must previously exist and the data included with the "Data" parameter will be appended to it. The write operation will fail if the file is not present. So to transfer a large file using multiple messages the first must not indicate "Append". It would be included only in subsequent "File Write" messages. This will insure that the resulting file will be as you are expecting.

In this case the returned "Size" parameter will increase as the size of the target file increases by the "NumWritten" byte count.

FILE REMOVE REQUEST

One or more files or folders can be removed/deleted using the "File Remove" request. The "Files" parameter is an array of file/folder names. You do not use a trailing '/' when specifying a folder in this request. The JNIOR will attempt to remove each file/folder specified in the array.

Each individual deletion may or may not succeed. The "File Remove Response" will enumerate the successful deletions in a "Succeed" array. Similarly any failures will be listed in a "Fail" array. Depending on the results the response message may contain either a "Succeed" array or a "Fail" array or both. Between the two arrays the results of each attempt for those items listed in the original "Files" array will be reported. For example:

TRANSMITTED	RECEIVED
<pre> { "Message":"File Remove", "Files":["/flash/image.txt", "/flash/main.c"] } </pre>	<pre> { "Message":"File Remove Response", "Succeed":["/flash/image.txt", "/flash/main.c"] } </pre>

Here we attempt to remove a folder and the request fails. In this case we expect that it would fail both because the folder contains files and sub-folders (it is not empty) and also because it is a special system folder. You cannot remove the /etc, /flash, or /temp folders. You also cannot remove any content from the /etc folder.

```

                TRANSMITTED                                RECEIVED

    {
      "Message":"File Remove",
      "Files":[
        "/flash"
      ]
    }

                                {
      "Message":"File Remove Response",
      "Fail":[
        "/flash"
      ]
    }

```

FILE RENAME REQUEST

You may rename a file or folder using the "File Rename" request. In this case you specify the file/folder with the "old" parameter and the new file/folder name with the "New" parameter. The files must be specified from the root of the file system and both specifications must be in the same folder. You cannot "move" a file through a rename operation. A file/folder matching the "New" specification cannot already exist.

The "File Rename Response" reiterates the request and adds a "Result" parameter. The "Result" will be either "Succeed" or "Fail" reflecting the result of the rename operation. An example follows.

```

                TRANSMITTED                                RECEIVED

    {
      "Message":"File Rename",
      "Old":"/flash/main.c",
      "New":"/flash/test-prog.c"
    }

                                {
      "Message":"File Rename Response",
      "Old":"/flash/main.c",
      "New":"/flash/test-prog.c",
      "Result":"Succeed"
    }

```

FILE MKDIR REQUEST

The ability to create a folder completes the set of file system functions. Here you can create a new folder using the "File Mkdir" message. The new folder is specified from the root of the file system by the "Folder" parameter.

The "File Mkdir Response" reiterates the "Folder" and adds a "Result" which will be either "Succeed" or "Fail" depending on the outcome of the creation attempt.

TRANSMITTED

RECEIVED

```
{  
  "Message": "File Mkdir",  
  "Folder": "/flash/testing"  
}
```

```
{  
  "Message": "File Mkdir Response",  
  "Folder": "/flash/testing",  
  "Result": "Succeed"  
}
```

JMP**Protocol****REGISTRY COMMANDS**

The JNIOR is configured by various parameter settings which are stored in the non-volatile Registry. In addition to configuration there are special keys (that start with the dollar sign '\$') which record and report dynamic information. The input and output Usage Meter status is reported through a system Registry key named \$HourMeter for example. The Registry then plays an important role in monitoring the status of a JNIOR.

REGISTRY UPDATE NOTIFICATION

The "Registry Update" message is an unsolicited message. It is transmitted through the JMP Server whenever there is a change in the Registry. This notifies the client when new keys are created and when they are removed (content is empty/null). It notifies the client whenever the content of a key is changed. This allows the client to respond to the changing configuration of a connected unit as well as to receive information stored in dynamic system keys. The following is a very typical update for a channel's usage meter.

```
{
  "Message":"Registry Update",
  "Keys":{
    "IO/Inputs/din1/$HourMeter":"43.68"
  }
}
```

Note that the "Keys" member passes an object which may contain 0 or more name/value pairs where the name is the Registry Key and the value its content. Here the \$HourMeter reports 43.68 hours of usage. These update every 100th of an hour. That is the resolution of the Usage Meter. In general, Registry Updates will report only one key per message since changes occur in sequence and each change generates an update message through the inter-process messaging system. The Web Server picks up the internal message and broadcasts the information to all active JMP connections.

REGISTRY LIST REQUEST

The Registry stores information that from time to time you may need to retrieve. This is easily done if you know precisely what Registry keys to read. A lot of work can be saved if you can determine easily what Registry keys have been defined and that have data available for reading. The "Registry List" command is used to obtain a listing similar to a file directory or folder listing for a node in the Registry.

The "Registry List" command summons a "Registry List Response" message. A complete exchange is shown below. The Client sends the request and the server supplies the response message. Note how the "Meta" member might be used to pass information to the routine that eventually (and asynchronously) will receive the response.

```
TRANSMITTED                                RECEIVED

{
  "Message": "Registry List",
  "Meta": { "Op": "registry", "Node": "/IO/Inputs/din1" },
  "Node": "/IO/Inputs/din1"
}

{
  "Message": "Registry List Response",
  "Meta": { "Op": "registry",
            "Node": "/IO/Inputs/din1" },
  "Keys": [
    "/IO/Inputs/din1/Enabled",
    "/IO/Inputs/din1/$HourMeter",
    "/IO/Inputs/din1/Conditioning",
    "/IO/Inputs/din1/LatchState",
    "/IO/Inputs/din1/Desc",
    "/IO/Inputs/din1/ClosedDesc",
    "/IO/Inputs/din1/OpenDesc",
    "/IO/Inputs/din1/Count/",
    "/IO/Inputs/din1/ShowCount",
    "/IO/Inputs/din1/ShowUsageMeter",
    "/IO/Inputs/din1/UsageState",
    "/IO/Inputs/din1/CountState",
    "/IO/Inputs/din1/ShowControls"
  ]
}
```

Here we note that a list (or array) of key names is returned in the "Keys" member. Note too that those that end in a forward slash '/' represent sub-nodes which will contain keys or additional nodes which can be retrieved with a subsequent request for that node. There are no empty sub-nodes (subdirectories or subfolders) in the JANOS Registry. Therefore if the node is listed it must have content within its structure somewhere.

REGISTRY READ REQUEST

The "Registry Read" command request is used to retrieve the content of one or more Registry keys. The request includes the "Keys" member which provides an array of Registry keys for which we want the content. Note that the optional "Meta" member is available for use but not employed in this example. The request solicits a "Registry Response" message which returns the "Keys" member which list time returns an object whose members are name/value pairs reporting each key and its content.

```

                TRANSMITTED                                RECEIVED
{
  "Message":"Registry Read",
  "Keys":[
    "/IO/Inputs/din1/Enabled",
    "/IO/Inputs/din1/$HourMeter",
    "/IO/Inputs/din1/Conditioning",
    "/IO/Inputs/din1/LatchState",
    "/IO/Inputs/din1/Desc",
    "/IO/Inputs/din1/ClosedDesc",
    "/IO/Inputs/din1/OpenDesc",
    "/IO/Inputs/din1/ShowCount",
    "/IO/Inputs/din1/ShowUsageMeter",
    "/IO/Inputs/din1/UsageState",
    "/IO/Inputs/din1/CountState",
    "/IO/Inputs/din1/ShowControls"
  ]
}

{
  "Message":"Registry Response",
  "Keys":{
    "/IO/Inputs/din1/Enabled":"true",
    "/IO/Inputs/din1/$HourMeter":"44.28",
    "/IO/Inputs/din1/Conditioning":"1",
    "/IO/Inputs/din1/LatchState":"1",
    "/IO/Inputs/din1/Desc":"Input 1",
    "/IO/Inputs/din1/ClosedDesc":"ON",
    "/IO/Inputs/din1/OpenDesc":"OFF",
    "/IO/Inputs/din1/ShowCount":"true",
    "/IO/Inputs/din1/ShowUsageMeter":"true",
    "/IO/Inputs/din1/UsageState":"0",
    "/IO/Inputs/din1/CountState":"0",
    "/IO/Inputs/din1/ShowControls":"true"
  }
}

```

Note that there is a name/value pair corresponding to each requested Registry key even if that key is undefined (does not exist). All of the keys requested here in this example have values. If a key is not present it will return the empty or null string value "".

REGISTRY WRITE REQUEST

An external application may need to alter the configuration of a JNIOR. In order to do so it is necessary to create or change the content of a Registry key. The "Registry Write" command is used for this purpose. There is no restriction as to what can be written to the Registry. Specific keys have specific purposes and some are recognized internally by the JANOS operating system. Others pertain to the formatting of the dynamic pages. Still others may be specific to custom applications and programs running on the JNIOR.

The "Keys" member of the "Registry Write" command message provides an object containing 1 or more name/value pairs. Each element represents a write request where the name is the Registry key and the value its intended content. Note that the JANOS Registry stores strings. Only strings can be written however they may encode practically anything. The "Registry Write" request solicits a "Registry Response" returning the keys successfully written.

If there is an error in writing a key, the key will be returned either with an empty or null string ("") or the prior and still valid content. Here is an example changing the description displayed by the configuration pages for Digital Input 2. The write was successful.

TRANSMITTED	RECEIVED
<pre>{ "Message":"Registry Write", "Keys":{ "IO/Inputs/din2/Desc":"Part Produced" } }</pre>	<pre>{ "Message":"Registry Response", "Keys":{ "IO/Inputs/din2/Desc":"Part Produced" } }</pre>

Not surprisingly this exchange is immediately followed by a "Registry Update" message. This signals to all who are listening that the key has been altered.

```
{
  "Message":"Registry Update",
  "Keys":{
    "IO/Inputs/din2/Desc":"Part Produced"
  }
}
```

REGISTRY WRITE ENCRYPTED

The Registry may store user names and passwords for configured email accounts for example. The user's and administrator's account credentials defined in JANOS are stored very securely internal the processor chip itself. Passwords for other purposes are configured in the Registry and should not be stored in plain text. Note the result of the following "Registry Read" request.

```

                TRANSMITTED                                RECEIVED

    {
      "Message":"Registry Read",
      "Keys":[
        "/IpConfig/Password"
      ]
    }

                                {
                                  "Message":"Registry Response",
                                  "Keys":{
                                    "/IpConfig/Password":"Qrq5CQ/rYBPfye..."
                                  }
                                }
  
```

This password for the default email account is not readable. This is not just obfuscated from view but securely encrypted by a secret key known only to the JANOS operating system and one that is unique to the unit. Nevertheless an external application (including the configuration pages) needs to be able to set a new password. This cannot be done without special handling as the encryption secret is not externally known and cannot be determined.

To make this possible, the "Registry Write Encrypted" command is available. This is used to write new password credentials for the default email account and indeed any other such account where JANOS later requires access to the plain text password. JANOS needs to be able to decrypt the content. If an application wants to store data securely it can encrypt the data using its own procedures and write the encrypted result using the normal "Registry Write" command. Later the content can be read and decrypted. The special form of write command is used only for information that JANOS stores with its own secure encryption. Data that only JANOS can then decrypt and use.

The "Registry Write Encrypted" command works exactly as does the "Registry Write" command. It also summons a "Registry Response" but one that shows only the encrypted password content. The password is provided in the request in combination with the username and in plain text. It is highly recommended that passwords not be configured through this protocol unless the connection used is secured by TLS/SSL. The procedure for setting a new password can be gleamed from the dynamic web pages supplied with the unit. The steps to handle it are in the Javascript. You can also contact INTEG Process Group, Inc. for assistance if you have trouble. Typically this password is set using the IPCONFIG command in the Console.

JMP**Protocol****CONSOLE SESSIONS**

A Console Session provides access to the JANOS Command Line interpreter. Practically every operating system has a command line interpreter. Windows(R) has the DOS Command Prompt. JANOS is no different and in fact provides a command line interpreter that recognizes many different commands some of which are similar to commands available in either the DOS or Linux environments. The command line Console provides the tools needed for JNIOR configuration, diagnostics and application development.

The Console can be accessed by 115,200 BAUD serial connection to the RS-232 port directly on the JNIOR. If the unit is configured for operation on the network the Console can also be opened by making a Telnet connection to the unit. The command line interpreter functions identically using either approach. The RS-232 diagnostic port provides some additional information such as a boot dialog chronicling the boot sequence and error messages should critical assertions occur.

The JMP Server also provides access to the command line interpreter. A JMP connection can open a Console Session. This is a separate command process under the control of the JMP Server on behalf of the JMP connection. The client can supply data simulating keystroke entry and consume characters output from the session perhaps for display. Only one session can be opened for each JMP connection although it may be closed and reopened any number of times while the JMP connection is active.

The dynamic configuration pages supplied with the unit support a "Console" tab through which the user can interact with the Console Session in a fashion virtually identical to any Telnet client or serial terminal client application. You can review the Javascript for more insight.

An application may use a Console session to accomplish some action only available through the command line interpreter. In such case the session may be opened, the command or commands executed, and then immediately closed.

CONSOLE OPEN REQUEST

When a JMP connection is made there is no command session associated. If commands are to be fed to the command line interpreter or a console session supported it must be opened. The "Console Open" command is then required and this solicits a "Console Response" message whose "Status" member provides the status of the result. The outcome can be either "Established" or "Failed". Below a Console Session is started.

```
                TRANSMITTED                RECEIVED

    {
      "Message": "Console Open"
    }

                                {
                                  "Message": "Console Response",
                                  "Status": "Established"
                                }
```

Note that while a Console session is open all other JMP requests and unsolicited messaging are still valid and active. The console session can be supported in parallel with all other activity over the connection.

CONSOLE STDIN MESSAGE

The "Console Stdin" message passes character data to the command line interpreter through its stdin serial stream. These characters function exactly as if they were typed at the keyboard in a Telnet session. You use "\r" as the ENTER keystroke. An UP-ARROW or DN-ARROW keystroke is replaced by its VT-100 escape sequence which the Series 3 and Series 4 JNIORs have come to expect. Characters entered through the Console tab in the dynamic configuration pages are each sent immediately as typed one at a time to the stdin stream. Note that the console session command line interpreter echoes character input just as it does everywhere else.

```
{
  "Message":"Console Stdin",
  "Data":"dir\r"
}
```

CONSOLE STDOUT MESSAGE

With every stdin stream there is likely a stdout and the Console Session is no exception. The "Console Stdout" message is transmitted by the server and it supplies data available for display. This may be echoed characters or command output. It is delivered asynchronously and therefore may contain 1 or more characters. It may contain the entire output of a command or only part depending on JANOS activity levels. In other words this is a character stream and a single "Console Stdout" message may contain multiple lines of output or the output from multiple commands. The output from a single console command may be spread across multiple messages. Applications must be coded with this in mind. For example this is data from the Console session tab where the command was typed in and executed.

TRANSMITTED

```
{"Message":"Console Stdin","Data":"d"}
{"Message":"Console Stdin","Data":"i"}
{"Message":"Console Stdout","Data":"d"}
{"Message":"Console Stdin","Data":"r"}
{"Message":"Console Stdout","Data":"i"}
{"Message":"Console Stdin","Data":"\r"}
{"Message":"Console Stdout","Data":"r"}
```

RECEIVED

```
{
  "Message":"Console Stdout",
  "Data":"\r\netc\r\nflash\r\njniorbboot.log\r\n
jniorbboot.log.bak\r\njniorsys.log\r\n
jniorsys.log.bak\r\nmyfile.txt\r\nnphp
.log\r\ntemp\r\n\r\nBruce_Dev /> "
}
```

This would be the same command executed by an application. The results may not be consistent although the output of the command certainly should.

```

TRANSMITTED                                RECEIVED

{
  "Message": "Console Stdin",
  "Data": "dir\r"
}

{
  "Message": "Console Stdout",
  "Data": "dir\r\netc\r\nflash\r\njniorboot.log
          \r\njniorboot.log.bak\r\njniorsy"
}

{
  "Message": "Console Stdout",
  "Data": "s.log\r\njniorsys.log.bak\r\nmyfile.
          txt\r\nphp.log\r\ntemp\r\n\r\nBruce
          _Dev /> "
}

```

An application would likely buffer all data until the command line prompt is detected. Only then can it interpret the list of files supplied reliably.

CONSOLE CLOSE REQUEST

A Console session will remain active until closed. It is automatically closed should the JMP connection terminate. It is good practice however to close the command session if there is no immediate need for it. This keeps the load on JANOS to a minimum and keeps the process slot open for other activities. The "Console Close" command solicits a "Console Response" message whose "Status" member indicates "Closed" in all cases.

```

TRANSMITTED                                RECEIVED

{
  "Message": "Console Close"
}

{
  "Message": "Console Response",
  "Status": "Closed"
}

```

EXAMPLE CONSOLE SESSION

Here is a example of opening a command session and logging in using the default credentials. The session is then closed once the prompt has been reached. Note how the entry of the password is not echoed. This is just as it is in any JNIOR Telnet session.

```

TRANSMITTED                                RECEIVED

{
  "Message": "Console Open"
}

```

```
{
  "Message":"Console Response",
  "Status":"Established"
}

{
  "Message":"Console Stdout",
  "Data":"\r\nWelcome to the JNIOR Model 410...
  Copyright (c) 2012-2015 INTEG Process ...
  Local time: Wed Oct 07 13:45:38 EDT 20...
  Bruce_Dev login: "
}

{
  "Message":"Console Stdin",
  "Data":"jnior\r"
}

{
  "Message":"Console Stdout",
  "Data":"jnior\r\nBruce_Dev password: "
}

{
  "Message":"Console Stdin",
  "Data":"jnior\r"
}

{
  "Message":"Console Stdout",
  "Data":"*****\r\n\r\nBruce_Dev /> "
}

{
  "Message":"Console Close"
}

{
  "Message":"Console Response",
  "Status":"Closed"
}
```

While access to the Console offers a great amount of flexibility for any application it should not be abused.

JMP**Protocol****EXTERNAL DEVICES**

There are a number of external modules that can be used with JNIOR. These attach to the Sensor Port and can be daisy-chained. The most popular of these is the Power 4ROUT modules adding an additional 4 relay outputs to the JNIOR I/O set. Up to two 4ROUT modules can be used which will logically extend the number of relay outputs reported in the "Monitor" message. But additional 4ROUT and other modules can be used limited only by the power load on the sensor port/network. Modules are read and written using their ID string as an address.

Each interaction with an external module involves the exchange of a Data Block. The data blocks will differ depending on whether a device is being read or written. These blocks define a structure of fields. The definitions for the device blocks are provided as part of the JNIOR Protocol Specification.

ENUMERATE DEVICES REQUEST

Each external module has a unique ID. This is a 16 character hexadecimal string representing 8 bytes. The least significant byte or rightmost 2 characters always specify the type of module. This would be 'FB' for a standard 4ROUT external module. The 5 bytes or 10 characters immediately preceding the type can be considered a Serial Number of sorts. Typically these are constrained to the digits 0 through 9. The first byte or 2 characters is a check byte and the byte following a software code (typically but not always a '11').

The "Enumerate Devices" command is used to retrieve a list of the active modules connected to the JNIOR. This solicits an "Enumerate Devices Response" which includes a "Devices" list of 0 or more module IDs. Note that the "Meta" member can be included in the request and will be returned unmodified in the response. This can be used to pass information to the routine that will process the response. For example we have this exchange.

TRANSMITTED	RECEIVED
<pre>{ "Message":"Enumerate Devices" }</pre>	<pre>{ "Message":"Enumerate Devices Response", "Devices":["CD111090708109FB", "16111100125011FE"] }</pre>

This tells us that the JNIOR has two connected modules. One is type 0xFB which is a 4ROUT module. The other a type 0xFE which is the Analog 4-20 ma module. The device types are described in the JNIOR Protocol Specification document.

READ DEVICES REQUEST

The "Read Devices" command is used to obtain the current data block from one or more devices. The format of the data block is specific to the device type. This solicits the "Read Devices Response" which includes only those devices successfully read and the data block content encoded in a "Hex" string. Here we read both of the devices reported in the previous enumeration.

TRANSMITTED	RECEIVED
<pre>{ "Message":"Read Devices", "Devices":["CD111090708109FB", "16111100125011FE"] }</pre>	<pre>{ "Message":"Read Devices Response", "Devices":[{ "Address":"CD111090708109FB", "Hex":"0F000000000000000000" }, { "Address":"16111100125011FE", "Hex":"000000000000000000000000" }] }</pre>

The content of these blocks can be interpreted using the formats defined in the JNIOR Protocol Specification document. From this response we can see that all of the relays on the 4ROUT device are open and not activated. The 4-20 module is connected but since in this instance it is not wired to any current loop devices it reports all inputs at 4 ma (0x0000) and its two outputs are set to 4 ma (0x0000).

WRITE DEVICES REQUEST

The "Write Devices" command is used to write to an external module. Here we pass a properly formatted data block to the 4ROUT module reported in the prior example. The goal is to close the 3rd relay (Relay Output C). This is achieved by setting the mask (first byte) to 0x04 informing the module that we will only be setting the state of the 3rd relay. We define the state (second byte) as 0x04 to close that relay. The command solicits the "Write Devices Response" which returns the result of each write attempt. The "Result" member will be 'true' if the write is successful and 'false' otherwise.

```

                TRANSMITTED                RECEIVED

{
  "Message":"Write Devices",
  "Devices":[
    {
      "Address":"CD111090708109FB",
      "Hex":"04040000000000000000"
    }
  ]
}

{
  "Message":"Write Devices Response",
  "Devices":[
    {
      "Address":"CD111090708109FB",
      "Result":true
    }
  ]
}

```

Note that the relays in the 4ROUT module can be pulsed. Here we simply turned Relay C on. The value for its pulse duration being 0x0000 in the block.

EXPANSION MODULES

The following module types are typically used with JNIOR. The type is represented in hexadecimal. This appears as the last two characters in a module's ID string.

```

Type 10 -- Temperature Probe
Type 26 -- Temperature Probe
Type F9 -- 3-Channel LED Dimmer
Type FA -- Rack Mounted User Panel
Type FB -- 4ROUT Quad Relay Output Module
Type FC -- RTD Temperature Module
Type FD -- 10V Analog Module
Type FE -- 4-20ma Analog Module

```

READ DATA BLOCK

The read and write data blocks appropriate for each module are defined in the JNIOR Protocol Specification. The data blocks for the 4ROUT Quad Relay Output module are represented here as an example of translation between the binary descriptions and that required for this protocol.

4ROUT Read Data Block

```
"Hex": "00000000000000000000"
| | | | |
| | | | | 0000 Relay D Pulse Time Remaining
| | | | | (0 to FFFF hexadecimal milliseconds)
| | | | | 0000 Relay C Pulse Time Remaining
| | | | | (0 to FFFF hexadecimal milliseconds)
| | | 0000 Relay B Pulse Time Remaining
| | | (0 to FFFF hexadecimal milliseconds)
| | 0000 Relay A Pulse Time Remaining
| | (0 to FFFF hexadecimal milliseconds)
| 00 Bit mapped relay status (0-open 1-closed)
00 Bit mapped last relay mask used (1-selected)
```

```
Bit mappings (mask and status)
+-----+-----+-----+-----+-----+-----+-----+-----+
| 0 | 0 | 0 | 0 | Rly D | Rly C | Rly B | Rly A |
+-----+-----+-----+-----+-----+-----+-----+-----+
```

Of most importance here are the last 4 bits of the second byte. This is basically the 4th character of the "Hex" string encoding which relays are closed and which are open. '0' indicating that all are OFF. 'F' indicating all are ON.

WRITE DATA BLOCK

4ROUT Write Data Block

```
"Hex": "00000000000000000000"
| | | | |
| | | | | 0000 Relay D Pulse Time
| | | | | (0 to FFFF hexadecimal milliseconds)
| | | | | 0000 Relay C Pulse Time
| | | | | (0 to FFFF hexadecimal milliseconds)
| | | 0000 Relay B Pulse Time
| | | (0 to FFFF hexadecimal milliseconds)
| | 0000 Relay A Pulse Time (0 to FFFF hexadecimal milliseconds)
| 00 Bit mapped relay state (0-open 1-closed)
00 Bit mapped relay selection mask (1-selected)
```

```
Bit mappings (mask and state)
+-----+-----+-----+-----+-----+-----+-----+-----+
| 0 | 0 | 0 | 0 | Rly D | Rly C | Rly B | Rly A |
+-----+-----+-----+-----+-----+-----+-----+-----+
```

The state of the relays corresponding to the '1' bits in the 'mask' are changed to the desired 'state'. For a permanent/static change the corresponding Pulse Time must be 0000. To pulse Relay A ON for 5 seconds the Pulse Time field would be set to 5000 milliseconds which is represented as 1388 hexadecimal. The "Hex" string for this command would be "01010000000000001388". Note that the mask indicates the target relay. The state indicates the desired change and the length of the pulse in milliseconds is defined.

JMP**Protocol****REALTIME CLOCK**

Access to the JNIOR's realtime clock is provided. This can be used to obtain and display the clock as it is maintained by the JNIOR. This exchange can be useful as a tick allowing you to detect the loss of connection.

TRANSMITTED

RECEIVED

```
{
  "Message": "Clock Read"
}
```

```
{
  "Message": "Clock Response",
  "Time": 1452012668787,
  "Date": "Tue, 05 Jan 2016 16:51:08 GMT"
}
```

An Administrator may adjust the JNIOR's realtime clock. There is no response.

```
{
  "Message": "Clock Set"
  "Time": 1452012668787
}
```

JMP**Protocol****REBOOT NOTIFICATION**

This message is sent when the JNIOR is shutting down for a reboot.

```
{
  "Message": "Device Shutdown"
}
```

JMP**Protocol****SYSTEM LOGGING**

JANOS logs system events to the jnorsys.log file. When this file reaches a certain size it is aged to the jnorsys.log.bak file. The content of the latter is discarded. As a result there can be as much as 128KB of system logs.

The "Syslog Read" request will return the log history in sequence from oldest to latest. This includes both the content of both files, as much as 128KB worth of log information.

```

                TRANSMITTED                                RECEIVED

{
  "Message":"Syslog Read"
}

{
  "Message":"Syslog Read Response",
  "Data":[
    "10/10/16 10:28:16.645, -- JANOS 410 ...",
    "10/10/16 10:28:16.683, Registry expo...",
    "10/10/16 10:28:17.791, Added: WebSer...",
    .
    .
    "10/20/16 12:55:26.582, -- JANOS 410 ...",
    "10/20/16 12:55:26.596, ** Warning: P...",
    "10/20/16 12:55:49.467, Requesting ti...",
    "10/20/16 12:55:55.000, Clock synchro...",
    "10/20/16 13:26:15.698, Starting sess...",
    "10/20/16 13:26:15.939, Successful lo...",
    "10/20/16 14:02:33.633, FTP/10.0.0.20...",
    "10/20/16 14:02:40.130, FTP/10.0.0.20..."
  ]
}

```

Note that the "Syslog Read Response" can be quite lengthy. Each line of the log is supplied in sequence in the "Data" string array.

As new entries are posted to the jnorsys.log file the JMP Server will supply them. This is a real-time update and these messages are unsolicited. Note here the the "Data" is simply a string and not an array. These messages supply one line at a time.

```

{
  "Message":"Syslog Update",
  "Data":"10/20/16 14:11:10.561, [logger] This is a new log entry"
}

```

JMP**Protocol****AUTH-DIGEST**

The JMP connection requires a login and will respond with a "401 Unauthorized" error text pending a successful login. The server provides a unique "Nonce" string as part of this message. This can be used in conjunction with the username and password to calculate the appropriate Authorization Digest. This requires a MD5 message digest calculation which generates a 16 byte digest represented as 32 hexadecimal characters. The calculation proceeds as follows:

$$\text{Digest} = \text{Username} + ":" + \text{MD5}(\text{Username} + ":" + \text{Nonce} + ":" + \text{Password})$$

Where Username, Password, Nonce and Digest are all strings. The resulting Digest string is returned in the "Auth-Digest" member. Here is an example login with the default administrator's account.

TRANSMITTED	RECEIVED
<pre>{ "Message":"" }</pre>	<pre>{ "Message":"Error", "Text":"401 Unauthorized", "Nonce":"bc581a9683d3e1857218db135e4b" }</pre>
<pre>{ "Auth-Digest":"jnior:6b7b418f223e7e0dc600c41c7b6644b3" }</pre>	<pre>{ "Message":"Authenticated", "Administrator":true, "Control":true }</pre>

NOTES

The login requirement can be disabled. This creates a huge security vulnerability and is to be highly discouraged. Do not disable login requirements.

Programming**Overview****OVERVIEW**

Anyone with basic programming skills can develop an Application Program to run on JNIOR. JANOS can in fact run several such applications simultaneously. A small additional program is sometimes needed to accomplish a particularly custom requirement. In order to provide this capability JANOS application programs utilize the Java language.

Java is a high-level language and is typically the first language students encounter in an introduction to programming course. Java is a general purpose language that is designed to be for the most part independent of hardware configuration and operating system version. Application programs need not be recompiled when platform characteristics change. Programs once written for JNIOR, run on every Series 4 and later JNIOR with little or no maintenance.

SEE ALSO

HELP Topics: [JAVA](#), [JVM](#)

JVM**Programming****DESCRIPTION**

Java programs are compiled into bytecode which is independent of the underlying computer architecture. The resulting compiled classes can run on any Java virtual machine (JVM). The JANOS JVM is a 'clean-room' implementation developed entirely from 'The Java(tm) Virtual Machine Specification' written by Tim Lindholm and Frank Yellin published by Addison Wesley Longman, Inc. Copyright (c) 1997 Sun Microsystems, Inc.

Each application program is executed by its own instance of JVM. Each appears as a separate process. Each program may have any number of independently running threads. As JANOS can execute as many as 16 separate processes and understanding that several processes need be reserved for network and system activity, JANOS can reliably run several instances of the JVM getting the job done for you.

RUNTIME

Java is a class-based, object-oriented programming language. The `java.lang.Object` is the root of the entire Java class hierarchy. Every class has `Object` as a superclass. The `/etc/JanosClasses.jar` file located on every JNIOR in read-only memory contains the necessary `java.*` class library as well as additional libraries as are necessary for programs to interface to JNIOR hardware and the rest of the world.

To be successful, application programs developed for JNIOR must be built entirely on `JanosClasses.jar` and not with respect to any libraries that might otherwise be installed in combination with the IDE and compiler you use. The `JanosClasses.jar` file may be uploaded from the JNIOR and specified in the `-bootclasspath` option to the compiler. A program built in this way is guaranteed to have everything it needs to run reliably without Exception on any JNIOR.

The JanosRuntime_2.0.jar runtime library file can separately be obtained from the INTEG website at jnior.com . This file contains the same class libraries that are available in JanosClasses.jar, additionally including Javadoc and source code detail to support development using an IDE. While either file will generate the same program the latter is invaluable in getting the most out of your IDE and JNIOR.

NOTES

Programs access JNIOR hardware and other capabilities using a low-level native interface. A optimized call-by-name method is used permitting the operating system to be freely updated without creating a need to recompile application programs. Once a built-in method is located its location is cached and programs execute fast and efficiently.

SEE ALSO

HELP Topics: [COMPILING](#), [PROGRAMMING](#), [JanosClasses.jar](#)

Program Files**Programming****DESCRIPTION**

Application programs are written in the Java language. The application program and any other supporting *.java files are compiled into *.class files. The resulting class files which contain the bytecode are then packaged into a single library file with the .JAR extension.

In addition to class files the JAR file contains a Manifest.mf file used by the JVM among other things to locate the main() program entry point. An AppInfo.ini file may be present. The presence of this file is detected by JANOS during boot an used to Register the application. Registered applications show up in the WebUI Configuration Applications tab.

There may be other files added to the JAR file as needed by the application. Sometimes the developer will include the source files. This is the case with JBakup.jar for instance.

COMPILING

For proper operation the application program MUST be compiled against the JanosClasses.jar runtime library or the expanded JanosRuntime_2.0.jar runtime (available from jnior.com). With Java being standard a simple "Hello World" program compiled with standard Java libraries will, in fact, execute properly on the JNIOR. With those libraries however, you will not be able to utilize the unique classes that provide access to all of JNIOR features and hardware.

Depending on your choice of IDE or compiler the procedure will vary. With NetBeans (<https://netbeans.apache.org//>) when a Project is created you need to specify JanosRuntime_2.0.jar as a Library in the Project Properties dialog. With that JAR you can edit the library entry to indicate that it contains both Javadoc and Sources.

Additionally in the Project Properties under Build and Compiling you must add a `-bootclasspath` option as an Additional Compiler Option. For example:

```
-bootclasspath "C:\My Projects\JanosRuntime_2.0.jar"
```

The above instructs the compiler to build on the JANOS runtime only. Adding the library to the project tells the IDE about classes unique to JNIOR.

One last thing that will help the Netbeans IDE popup useful information as you develop your program is to edit one of the `project.properties` in the `nbproject` folder. You can make the following setting or otherwise point the `endorsed.classpath` to the `JanosRuntime_2.0.jar` file.

```
endorsed.classpath=${javac.classpath}
```

This setting insures that only JANOS pertinent information is displayed eliminating references to the standard libraries. If you do not make this change you might be led to use a class or method that is actually not supported on the JNIOR. With the `-bootclasspath` setting above the program will not successfully compile when it encounters the unknown.

NOTES

The `.JAR` file extension identifies the library as containing an application that can be executed by JANOS using the `JAVA` command. `JAR` files located in the `/flash` folder are in the default search path for programs and can be executed by name on the command line without specifically using the `JAVA` command. This allows application programs to masquerade as custom commands. The `FtpClient` is an example where `/flash/ftp.jar` creates an `FTP` command for interaction with an external `FTP` server.

A `JAR` file is identical in structure to a `ZIP` file. These can be manipulated with the `ARC` command (same as `ZIP` and `JAR` commands).

SEE ALSO

HELP Topics: [JVM](#), [ARC](#), [JAR](#), [JanosClasses.jar](#), [JAVA](#), [JBakup](#), [FtpClient](#)

Web Development

OVERVIEW

JANOS supports a highly capable WebServer which can handle multiple connections from multiple clients simultaneously. Both non-secure (HTTP) and secure (HTTPS) connections are possible for pages served publicly and those requiring authentication.

A Hypertext Preprocessor modeled after PHP is available providing the ability to create dynamic and fully-featured websites. This general purpose scripting language is also uniquely available for program and batch file use in the Command Line Console environment.

Each WebServer connection can be dynamically upgraded to support the WebSocket protocol providing full-duplex general-purpose communications with JNIOR. By default a WebSocket connection supports the JANOS Management Protocol (JMP), a rich JSON based message exchange capable of all aspects of product administration. This includes file transfer, command line console access, Registry manipulation and I/O control and monitoring. In short, the entire product can be managed through a single HTTP/HTTPS connection.

Inter-process communications are provided allowing an Application Program to be written as a network server. Custom protocols are then possible and proprietary protocols can be accommodated.

Finally, uniquely the JANOS Webserver can serve an entire website directly from a single ZIP library file. This incredible feature allows the website to be installed and updated as a single file eliminating any risk that files may be missing or go out of sync. For example the entire default WebUI is contained within the `/flash/www/config.zip` file. This file need never be expanded.

NOTES

The default WebUI demonstrates the power of the JANOS WebServer. These dynamic configuration pages leverage the power of the WebSocket connection and the strength of the JMP protocol.

SEE ALSO

HELP Topics: [WebServer/Server](#), [WEBSOCKET](#), [JMP](#), [WEBUI](#), [ZIP](#)

WebUI**Web Development****DESCRIPTION**

By default the JANOS WebServer provides access to the Dynamic Configuration Pages User Interface (WebUI). This default website provides immediate access to JNIOR I/O, product configuration, command line console (CLI) services, file management and much more. The entire product can be managed through this one connection and a remote browser.

OPERATION

When a browser accesses the JNIOR IP address the WebServer looks to the default root location `/flash/www` for a Home Page named `index.html` or `index.php`. The WebServer also looks in `/flash/public` where pages not subject to authentication can be placed. No home page will be found in these locations on a factory fresh JNIOR.

When a home page is not found in the normal root locations the WebServer refers to the `/WebServer/Path` Registry key for additional paths to search. The default value of that key is `/flash/www/config`. The WebServer then looks in that folder for a home page. This would be the same location that a URL would reach had it included the `/config` sub-folder after the units IP address or domain name.

On a factory fresh unit the `/flash/www/config` folder is not present. Here a unique feature of the JANOS WebServer comes into play. The ZIP library named `/flash/www/config.zip` in fact is present on a new JNIOR. This file actually creates a virtual folder providing content at the `/flash/www/config` location. A home page providing the JANOS WebUI will be located in this file along with all of the other files necessary to support this default website.

NOTES

A custom website can be designed and served by the JNIOR. These new pages can be located in the `/flash/www` default WebServer root folder. This will then be found by the browser overriding the default configuration. Access to the default WebUI will remain possible simply by including the `/config` folder in the URL when accessing the JNIOR.

A `/flash/www.zip` file can also house a custom website. The Webserver in checking the default `/flash/www` root folder will find the desired home page from the virtual folder created by `/flash/www.zip`. If a file is found in an actual folder the WebServer stops the search. This file then would override any file by the same name present in a corresponding virtual folder.

SEE ALSO

HELP Topics: [/Webserver/Path](#), [WEBSERVER](#)

Overview**Scripting****OVERVIEW**

The JANOS WebServer utilizes a Hypertext Preprocessor modeled after the popular PHP general-purpose scripting language. This is not an official version of PHP and so it is referred to as a PHP-like scripting language.

Web developers familiar with PHP will find working with scripting on JANOS to be very similar. JANOS scripting is a stable environment benefiting from a commitment to backwards compatibility. JANOS scripting can offer functionality tuned for use with JNIOR products.

JANOS scripting implements a subset of the PHP Hypertext Pre-Processor. This allows segments of script to be interposed into HTML web content and used by the server to generate context specific web content on the fly and on demand. This may be used simply to label a page uniquely based on unit configuration. Or, a page may consist entirely of script and respond to parameters supplied in the URL to provide support for AJAX type requests and dynamic HTML.

Uniquely JANOS scripting extends beyond the WebServer where it is used to render HTML. Scripting can be included as part of a command line batch file. In the batch environment scripts can conditionally render commands generating a batch file as appropriate for the current state of JNIOR. This proves to be very powerful and avoids having a separate and yet different scripting environment for batch.

Scripts can also be written to be executed as a program. While batch files use the .BAT extension, scripted programs use the .PRG file extension and can be executed using the RUN command. Of course in this case the script simply renders general output. A little less useful but invaluable in testing, script snippets can also be directly entered at the command line.

JANOS scripting is compiled. This is critical in attaining performance both in rendering websites and executing command line programs.

SEE ALSO

HELP Topics: [SCRIPT](#), [WEBSERVER](#), [RUN](#), [CKSUMS](#)

Script Tags**Scripting****DESCRIPTION**

Script is inserted using the `<?php` opening tag and `?>` closing tag. A closing tag at the end of a file is not required thus avoiding the insertion of unnecessary trailing white space. The `<php=` opening shortcut can be used with the following content assumed to be parameters to an ECHO statement.

With JANOS scripting the preference is to use the generic scripting tags `<?` and `?>`. The "php" characters are optional in the opening tags. So to add lines of script you can just use `<?` or for the shorthand echo statement `<?=`.

WEBSERVER

The JANOS Web Server interprets PHP script in files with the `.PHP` extension. The `index.php` file is a default home page which if it exists takes precedence over and `index.html` file. The PHP file is assumed to contain HTML content which would be served like any other page with the exception of any script which is identified by the special tags. A `.PHP` file when served first executes script (if any) generating a `.HTML` file which subsequently is served to the client browser. Scripts then are designed to render HTML.

BATCH PROCESSING

From the JANOS Command Line you can execute Batch Files which have the `.BAT` extension. Script may be interposed in these files for pre-processing. The syntax is identical to that used in the HTML implementation including the `<?` and `?>` tags. The script renders commands formatted as if entered at the command line which are then executed. You can use script to conditionally customize and/or generate the commands.

SCRIPTED PROGRAMS

The scripting implementation is very powerful. While such scripting is usually implemented by an interpreter, JANOS compiles these scripts prior to execution and caches the compiled code for reuse. As a result scripts execute fast and efficiently. This can be used to create utility and even application programs. A Program File can be created with the default extension `.PRG` and executed directly using the RUN command. These program files are logically created just as PHP HTML pages or scripted batch files. One or more blocks of script are interposed using the `<?` and `?>` tags. In this case, text outside of the script is merely echoed as program output.

INLINE SCRIPT

Script may be entered at the command line. The line must begin with the opening `<?` tag and be terminated with `?>`. The script therein generates the command that then is executed. This can be useful in testing fragments of script.

Inline script entered in this fashion must also simulate an ENTER keystroke by including a trailing newline character `'\n'`. Output without the newline is simply displayed and execution is not attempted. The `puts($string)` function echos the `$string` followed by the necessary carriage return and linefeed for execution. For example:

```
bruce_dev /> <? puts("date");?>
date
Sun Jun 27 08:02:45 EDT 2021
```

```
bruce_dev /> <? echo "date\n";?>
date
Sun Jun 27 08:03:02 EDT 2021

bruce_dev /> <?="date\n";?>
date
Sun Jun 27 08:03:11 EDT 2021

bruce_dev /> <?="date";?>
date

bruce_dev />
```

Inline script can also simply generate output that would not be interpreted as a command. a Line of script may be entered following an exclamation point '!'. This syntax assumes the opening and closing tags. These should not then be entered. For example:

```
bruce_dev /> ! puts("Hello World.");
Hello World.
```

NOTES

Errors in scripts are reported in the `php.log` file. Inline script errors are reported to the console.

```
bruce_dev /> <? echo "Hello World." ?>
Scripting error: /temp/tmp31076 (Line 1)
1: <? echo "Hello World." ?>
1:           ^ expected semicolon

bruce_dev />
```

SEE ALSO

HELP Topics: [VARIABLES](#), [SCRIPTING](#), [RUN](#)

Variables**Scripting****DESCRIPTION**

JANOS scripting is modeled after PHP and just as is PHP variable names always start with the dollar sign '\$' character. By convention the next character in a name must be either the underscore '_' or an upper or lowercase letter in the set [a-zA-Z]. Variable names are case-sensitive. The name can be any length and the remaining characters may also be a digit [0-9].

TYPES

Variables store information that is needed by the script. These information types are supported.

- * Booleans
- * Integers
- * Float Point Numbers
- * Strings
- * Arrays
- * NULL

Script is loosely typed. You do not declare the variable type. That is defined by what you store in them. A variable can contain different types at different times. In fact you generally needn't worry about conversions either. Except for rare situations this is handled for you.

Boolean variables store either True or False. These literal terms are case-insensitive. Boolean variables are great as flags to control script operation or to store the results of comparisons.

Integers are in the range from -2,147,483,648 to +2,147,483,647 inclusive. An overflow can occur when a result exceeds the largest integer value at either end of the range.

Floating point values are supported to 6 significant digits. The IEEE 754 format is used. Care should be used with floating point as the limited precision can lead to rounding errors and the error can easily compound and accumulate.

Strings can be of any length and can contain the values from 0x00 to 0xff inclusive. Binary data can be stored by String variables.

Arrays are name-value pairs with the name being the array index and the value any variable type. Arrays may be multi-dimensional as the values can be arrays as well.

STRINGS

String literals are defined using single quotation marks (') as follows:

```
'This is a string literal'
```

Escape sequences such as '\n' are not converted within literals. Everything between the single quotes including line breaks are part of the string. The only escape sequence recognized is that escaping a single quote itself.

```
bruce_dev /> echo 'Bruce\'s test literal';
Bruce's test literal

bruce_dev />
```

A string enclosed in double-quotes (") is subject to further processing. In addition to the handling of special characters using escape sequences any included variable names are expanded into a string representation of the value. This is a very powerful formatting tool.

Strings may be concatenated using the period '.' operator.

```
bruce_dev /> !="TEST"."ING";
TESTING

bruce_dev />
```

ARRAYS

Arrays are created using the `array()` function. These can be fully defined using the following construct. This takes any number of key => value pairs as arguments.

```
array(
    key => value,
    key2 => value2,
    key3 => value3,
    ...
)
```

BUILT-IN VARIABLES

JANOS provides a small set of built-in variables.

`$_GET[]`

This array provides access to parameters supplied in the GET request URL. For example `$_GET['name']` returns "INTEG" if ?name=INTEG is supplied in the URL. This would return NULL if it is not present. If a parameter appears in the URL without a value defined it is set to an empty string ("").

When used from the Command Line the `$_GET` array enumerates the command line parameters following the command (either the batch file name or RUN command).

`$_POST[]`

This array provides access to parameters supplied as data in a POST request. HTML forms data may be submitted by either GET or POST methods. In the case of the latter the `$_POST` array provides access.

`$_SERVER[]`

This array provides access to parameters supplied by the Web Server. This includes the HTTP-Request headers.

```
array $_SERVER {
    'HTTP_GET' => string ('/test.php HTTP/1.1'),
    'HTTP_HOST' => string ('bruce_dev'),
```

```
'HTTP_CONNECTION' => string ('keep-alive'),
'HTTP_UPGRADE_INSECURE_REQUESTS' => string ('1'),
'HTTP_USER_AGENT' => string ('Mozilla/5.0 (Windows NT 6.1; ...
'HTTP_ACCEPT' => string ('text/html,application/xhtml+xml, ...
'HTTP_ACCEPT_ENCODING' => string ('gzip, deflate, sdch'),
'HTTP_ACCEPT_LANGUAGE' => string ('en-US,en;q=0.8'),
'HTTP_COOKIE' => string ('JANOS-Session-Id=6fe5fd609c4abb7f ...
'REQUEST_URL' => string ('/test.php'),
'SERVER_ROOT' => string ('/flash/public'),
'REQUEST_LOC' => string ('/'),
'DOC_SPEC' => string ('/flash/public/test.php'),
'DOC_NAME' => string ('test.php'),
'FILE_SPEC' => string ('/flash/public/test.php'),
'REMOTE_ADDR' => string ('10.0.0.20'),
'REMOTE_PORT' => string ('11099'),
'TLS_SECURED' => string ('FALSE')
}
```

NOTES

You can escape a dollar sign '\$' in a double-quoted string if necessary to avoid a variable expansion. This would be required to output currency amounts.

While double-quoted strings can include variables in formatting the output string, The JANOS script engine also supports the `printf()` function providing access to C Language string formatting. This offers a much greater level of control over numeric formats for example.

SEE ALSO

HELP Topics: [STATEMENTS](#), [SCRIPT](#)

Script Statements**Scripting****DESCRIPTION**

JANOS scripting supports most of the standard control structures. The syntax are consistent with Standard C Language and PHP. Note that multiple statements may be grouped into a single statement using curly braces { }. All forms of commenting are available.

```
// Whitespace is ignored allowing you to format your code as you are
// accustomed to doing.
if (expr)
    statement;

/* Statements are terminated with a semicolon ';' just like in the C
** Language. In all of these constructs an individual statement may be
** replaced with a group of statements enclosed in curly braces '{}'.
** Format it according to your own standards.
*/
if (expr) {
    statement;
    statement;
    statement;
}

// In addition to the one-line C++ style comments the one line
// shell-style comment which starts with '#' can be used.
if (expr)
    statement; # executed when expr is TRUE
else
    statement;

# The elseif construct is supported
if (expr)
    statement;
elseif (expr)
    statement
else
    statement; /* default condition */

// switch-case statements
switch (expr) {
    case expr1:
        statement;
        statement;
        break;
    case expr2:
        statement;
        statement;
        break;
    default:
        statement;
        statement;
        break;
}
```

```

while (expr)
    statement;

// while-loops support single-level 'break' and 'continue'.
while {
    if (expr)
        break;    // exit the loop early
    statement;
}

// The do-while form is available.
do {
    statement(s)
} while (expr);

/* The for-loop follows the C Language implementation. */
for (expr1; expr2; expr3)
    statement;

/* The foreach construct provides an easy way to iterate over arrays. */
foreach (array_expression as $value)
    statement;
foreach (array_expression as $key => $value)
    statement;

/* 'echo' is a native constructs but 'print' is a function. The former
** therefore does not require parentheses although if you like them
** feel free to include them.
*/
echo expr;
echo expr1, expr2, ... ;
echo(expr1, ...);

/* 'exit' (and its alias 'die') are also native constructs and not
** functions. They therefore do not require parentheses either. With
** these constructs once the expressions have been echoed the rendering
** process terminates.
*/
exit;
exit expr;
exit expr1, expr2, ... ;
exit (expr1, ...);

die;
die expr;
die expr1, expr2, ... ;
die (expr1, ...);

```

SEE ALSO

HELP Topics: [VARIABLES](#), [SCRIPT](#)

Functions

Scripting

DESCRIPTION

Functions are sections of code that perform a specific task. A function contains program statements that while written only once can be invoked multiple times, as many as is needed. The function takes parameters which are the variables upon which the task is performed. Very importantly the function returns a value as a result.

A Function always returns a value even if none is required. In that case a value of NULL would be returned. Typically a function will return the result of a calculation or other operation.

The [CKSUMS](#) scripting example utilizes a function whose purpose is to format and output a text string as an ECHO command for proper batch operation. This function does not return anything of use. It is just used to repeat an output operation in a defined manner. This is a custom function.

USER-DEFINED FUNCTIONS

Any number of functions may be defined in developing script. Each function may have zero or more parameters and may optionally return a result. A function need not be defined in a script before it is invoked.

```
Function functionName($param1, $param2, ...) {
    ... program statements ...
    return $result;
}
```

Function names consist of one or more characters from the set [_a-zA-Z0-9] where the first character cannot be a digit [0-9]. This is similar to the restriction on variable names.

ARGUMENTS

Functions may be defined with any number of arguments or none at all. A call to the function provides values for the parameters. The call may supply fewer parameters than provided in the function definition in which case the additional defined parameters will receive a NULL value or may be defaulted in the function definition as follows. If too many arguments are supplied the additional will be ignored.

```
function foo($arg, $str = 'default')
{
    // function body
    return $ret;
}
```

RETURNED VALUES

A function may return a value using a return statement as shown in the examples above. If the function completes without executing a return statement a NULL value is returned. Any number of return statements may appear anywhere in the function body.

VARIABLE SCOPE

Each function has its own local variable scope. Variables defined in a function are available only in that function. A variable may be defined with the same name as a global variable (those available to the main program) and not affect or otherwise corrupt the global value. Global variables are not accessible by default within a function.

GLOBAL VARIABLE REFERENCES

Global variables are those defined in the top-level program. They can be accessed from a function using the global statement.

```
global $gvar1, $gvar2, [..., $gvarN];
```

The global statement creates a alias for the global variable in the local scope. Subsequent references to the variable retrieve the global variable value and the global variable may be modified. For example:

```
$a = 1;
$b = 2;

function Sum()
{
  global $a, $b;

  $b = $a + $b;
}

Sum();
echo $b;
```

The above when executed will output the value 3.

RECURSION

Functions may call other functions and may be used recursively. Functions may define other functions and may redefine themselves.

NOTES

If you need to conditionally define a function then it must be defined before it is referenced. This would assure that the proper form of the function is used. Otherwise results may not be as expected.

SEE ALSO

HELP Topics: [CKSUMS](#), [VARIABLES](#), [SCRIPT](#)

Built-In Functions**Scripting****DESCRIPTION**

Functions perform operations on a set of parameters and potentially return a result. A function is usually created when the task it performs will be required at various different points during a script. It is a write-once use-often kind of a programming feature.

Some functions perform a task so common that they are needed in script after script. These are the kind of functions where it is useful to maintain in a library. JANOS scripting does support the `include` statement which permits you to create a PHP file with such functions and to simply include that file with each script.

To support many of the very common functions JANOS scripting provides a Built-In Function library. As scripting has been modelled after public PHP many of the common PHP functions can be found in the JANOS library as well as some that are very custom. These built-in functions eliminate the need to maintain a separate library of useful functions. These are also implemented at a native level and therefore operate much more efficiently than with compile bytecode.

The Built-In Library supplies functions support a number of programming categories from string and array operations to system and Registry access.

RENDERING AND OUTPUT

The following functions generate output. When the script is referenced by the WebServer this output becomes part of the HTML stream. When the script is used in the command line batch file the output is then interpreted as a command line entry. In program execution this is simply just output.

```
int print ( mixed $var )
```

Outputs the \$var as a string. It is the functional equivalent of the ECHO statement. This always returns 1.

```
int puts ( mixed $var )
```

Outputs the \$var as a string followed by the "\r\n" sequence. In addition to generating a newline for formatting general output this appends the ENTER termination needed for command execution in batch use. This always returns 1.

```
string printf ( string $format [, mixed $param ] )
```

Outputs the formatted string defined by \$format. This uses the Standard C Library format specifiers. A variable number of \$param values may be supplied. The formatted string is also returned. The `sprintf()` function is available for formatting a string.

```
void header(string hdrline)
```

Adds the supplied \$hdrline to HTTP response headers when rendering HTML through the WebServer.

```
var_dump ( var1 [ , var2 [ , ... ] ] )
```

Outputs a useful description of each variable. If `var_dump()` is issued without a parameter it will dump ALL of the local variables excluding the predefined arrays.

STRING OPERATIONS

The following functions perform operations on string variables.

string ltrim(string \$str [, string \$character_mask])
 Strip whitespace (or other characters) from the beginning of a string.

string rtrim(string \$str [, string \$character_mask])
 Strip whitespace (or other characters) from the end of a string.

string trim(string \$str [, string \$character_mask])
 Strip whitespace (or other characters) from both the beginning and end of a string.

int strlen(string \$string)
 Returns the length of the given string.

string strtolower(string \$str)
 Returns string with all alphabetic characters converted to lowercase.

string strtoupper(string \$str)
 Returns string with all alphabetic characters converted to uppercase.

string ucfirst(string \$str)
 Returns string with the first character of the first word converted to uppercase.

string ucwords(string \$str)
 Returns string with the first character of each word converted to uppercase.

string strval (expr)
 Returns a string representation for the value of the expression or variable.

string substr (string \$str, int \$start [, int \$length])
 Returns a portion of the string specified by the start and length parameters.

int strpos (string \$haystack, string \$needle [, int \$start])
 Returns the position in \$haystack of \$needle if the string occurs at or after \$start. Returns -1 otherwise.

int stripos (string \$haystack, string \$needle [, int \$start])
 Returns the position in \$haystack of \$needle if the string occurs at or after \$start. Returns -1 otherwise. The comparison is case-independent.

int strrpos (string \$haystack, string \$needle [, int \$start])
 Returns the last position in \$haystack of \$needle if the string occurs at or after \$start. Returns -1 otherwise.

int stripos (string \$haystack, string \$needle [, int \$start])
 Returns last the position in \$haystack of \$needle if the string occurs at or after \$start. Returns -1 otherwise. The comparison is case-independent.

```
bool startsWith( string $haystack, string $needle )
    Returns TRUE if $haystack starts with the string $needle.

bool endsWith( string $haystack, string $needle )
    Returns TRUE if $haystack ends with the string $needle.

int strcmp( string $str1, string $str2 )
    Compares two strings in a binary safe manner. Returns 0 if both strings
    are equal. Returns a negative value (<0) if str1 less than str2 and a
    positive value (>0) if str1 is greater than str2.

string bin2hex ( mixed $var )
    Returns a String containing the hexadecimal representation of each
    character in $var. $var is converted to its string representation if
    not initially a String.

string hex2bin ( string $hex )
    Returns a string where the 2-byte hexadecimal representation of each
    character is supplied. Returns NULL is an the hexadecimal string
    contains an odd number of characters or any character not in the valid
    hexadecimal set [0-9a-fA-F].

string sprintf ( string $format [, mixed $param ] )
    Returns a formatted string as defined by $format. This uses the Standard
    C Library format specifiers. A variable number of $param values may be
    supplied.

string crc ( string $message )
    Returns a string of length 8 containing the hexadecimal CRC32 checksum
    calculated for the contents of $message.

string md4 ( string $message )
    Returns a string of length 32 containing the hexadecimal MD4 message
    digest calculated for the contents of $message.

string md5 ( string $message )
    Returns a string of length 32 containing the hexadecimal MD5 message
    digest calculated for the contents of $message.

string sha1 ( string $message )
    Returns a string of length 40 containing the hexadecimal SHA1 message
    digest calculated for the contents of $message.

string sha2 ( string $message )
    Returns a string of length 64 containing the hexadecimal SHA256 message
    digest calculated for the contents of $message.
```

ARRAY OPERATIONS

There are a couple of functions supporting array variables specifically.

```
int count( variable [, recursive] )
    Returns the count of elements in an array or other variable. Includes
    recursive counts for multi-dimensional arrays if the recursive option
    is set to 1.
```

```
array array_remove( array $arr, string $key )
    Returns a copy of the array $arr without an element with the
    specified $key.
```

DATA CONVERSION

```
int intval ( mixed $var )
    Returns an integer value for the variable. Returns null if a string
    cannot be interpreted as a number.
```

```
double floatval ( mixed $var )
    Alias for doubleval().
```

```
double doubleval ( mixed $var )
    Returns a double value for the variable. Returns null if a string
    cannot be interpreted as a number.
```

```
mixed unpack ( string $str, int $offset, int $length [, boolean $float ] )
    This function is used to extract data packed into the string (binary byte
    array) $str. Values are assumed to be packed in big-endian order beginning
    at the provided $offset. The size of the parameter is defined by $length.
    The optional boolean $float is FALSE by default and if set to TRUE
    indicates that data is stored in IEEE 754 floating point format.
```

With \$float set to FALSE this returns an INTEGER whose value is stored starting at \$offset in \$str for \$length bytes. This will retrieve a byte value (\$length = 1), a short value (\$length = 2) or an int (\$length = 4). 64-bit values cannot be directly retrieved as there is no 64-bit PHP integer variable type. Values less than 4 bytes in length are unsigned.

With \$float set to TRUE this returns a DOUBLE whose value is stored in IEEE 754 format at \$offset in \$str for \$length bytes. This retrieves a float value (length = 4) or a double value (length = 8).

A NULL value is returned for any invalid combination of \$length and \$float. A NULL value is also returned for any attempted out of bounds string (array) reference.

```
mixed endian ( mixed $var )
    Reverses the endian order of a numeric value. This returns a variable of
    the same type and affects only numeric values.
```

```
string urlencode ( mixed $var )
    Encodes any non-alpha characters not in the set [-_a-zA-Z] using %##
    encoding. Plus symbols ('+') replace space characters.
```

```
string urldecode ( mixed $var )
    Decodes any %## encoding in the given string. Plus symbols '+' are
    decoded to a space character.
```

```
string base64_decode( mixed $var )
    Decodes Base64 encoded string.
```

```
string base64_encode( mixed $var )
    Encodes string in Base64.
```

DATE AND TIME

```

int time ( void )
    Returns the current time in seconds since midnight Jan, 1 1970 UTC.
    Same as getutc() .

int getutc ( void )
    Returns the current time in seconds since midnight Jan, 1 1970 UTC.
    Same as time() .

string date ( string $format, [ int time ] )
    Returns a string formatted according to the given format using the
    specified timestamp or the current time if no timestamp is provided.
    If omitted the timestamp would be the value of time() . A partial set
    of PHP-like formatting specifiers are supported. Either UTC or Local
    Time may be represented depending on the occurrence of 'U' or 'L' in
    the format string. Local Time is the default. Daylight Saving Time (DST)
    is applied if appropriate for the local timezone.

                                Day
d      Day of the month, 2 digits with leading zeros (01-31)
D      A textual representation of the day, 3 letters (Mon-Sun)
j      Day of the month without leading zeros (1-31)

                                Month
m      Numeric representation of the month, with leading zeros (01-12)
M      A short textual representation of a month, 3 letters (Jan-Dec)
n      Numeric representation of a month, without leading zeros (1-12)

                                Year
Y      A full numeric representation of a year, 4 digits
y      A two digit representation of a year

                                Time
a      Lowercase Ante meridiem or Post meridiem (am or pm)
A      Uppercase Ante meridiem or Post meridiem (AM or PM)
g      12-hour format of an hour without leading zeros (1-12)
G      24-hour format of an hour without leading zeros (0-23)
h      12-hour format of an hour with leading zeros (01-12)
H      24-hour format of an hour with leading zeros (00-23)
i      Minutes with leading zeros (00-59)
s      Seconds with leading zeros (00-59)

                                Timezone
U      Represent Universal Coordinated Time (UTC)
L      Represent Local Time (default)
e      Timezone identifier, same as 'T' (EST or UTC)
T      Timezone abbreviation (EST or UTC)

string gmtime ( [ int time ] )
    Formats a time value as a string. If the parameter is omitted the current
    time is formatted. The time value is in seconds since midnight
    Jan, 1 1970 UTC. The resulting string is formatted, for example, as:

```

```
"Thu, 19 Nov 2015 13:13:12 EST".
```

This is the same as:

```
date("D, d M Y H:i:s T").
```

FILE OPERATIONS

```
int filesize(string $filename)
    Returns the length of the file in bytes.

int filemtime ( string $filename )
    This function returns the timestamp when the content of the file was last
    changed. This is the number of seconds since midnight Jan 1, 1970 in UTC.

bool file_exists(string $filename)
    Returns TRUE if the file/directory referenced by the supplied
    specification exists and FALSE otherwise.

bool is_file(string $filename)
    Returns TRUE if the file referenced by the supplied specification exists
    and is not a folder.

bool unlink(string $filename)
    Deletes the specified file. Returns TRUE if successful.

int fopen(string $filename, string $flags)
    Opens a file for reading, writing, etc. The $flags parameter defines
    the mode of access following the Standard C Library conventions. For
    reading a file would typically be opened using the flag string "rb".
    For writing the string "wb" would be appropriate.

int fread(int $handle [, int $length] )
    Returns a string containing up to $length bytes from the file. If
    $length is omitted the entire content of the file will be read.

int fread(string $filename)
    Returns a string containing the entire content of the file defined by
    the supplied specification.

int fwrite(int $handle, $string [, int $length] )
    Writes the content of $string to the associated file. If specified, a
    maximum of $length bytes will be written. Returns the number of bytes
    written or FALSE on error.

    int fwrite(string $filename, $string)
        Creates the file defined by the supplied specification containing
        the content of $string.

bool feof(int $handle)
    Returns TRUE if the file has reached the end-of-file.

int fclose(int $handle)
    Closes the file resource. It is good practice to close files that have
    been opened for reading or writing. There are only a limited number of
```

available file handles.

String getcwd()

Returns the current working directory.

bool chdir(string \$directory)

Change working directory. Returns FALSE if the new specification does not result in an existing folder.

array scandir(string \$directory)

Return an array of files and folders from the referenced directory.

bool is_dir(string \$directory)

Returns TRUE if the directory referenced by the supplied specification exists and is not a file.

bool mkdir(string \$directory)

Creates the specified folder if it does not exist. Returns TRUE if successful.

bool rmdir(string \$directory)

Removes the specified folder if it does not exist. Returns TRUE if successful.

string file_crc (string \$filename)

Returns a string of length 8 containing the hexadecimal CRC32 checksum calculated for the contents of the file.

string file_md4 (string \$filename)

Returns a string of length 32 containing the hexadecimal MD4 message digest calculated for the contents of the file.

string file_md5 (string \$filename)

Returns a string of length 32 containing the hexadecimal MD5 message digest calculated for the contents of the file.

string file_sha1 (string \$filename)

Returns a string of length 40 containing the hexadecimal SHA1 message digest calculated for the contents of the file.

string file_sha2 (string \$filename)

Returns a string of length 64 containing the hexadecimal SHA256 message digest calculated for the contents of the file.

JSON SUPPORT

Support for JSON (JavaScript Object Notation - json.org) is provided.

JSON is used in many different ways. It is also a good means of preserving a PHP array structure in file storage and in thereby implementing a rudimentary database.

array json_decode(string \$json)

Returns an array structure for the JSON object supplied in JSON string representation.

```
string json_encode( array $json )
    Returns the JSON string representation of an array object.

array json_load( string $filename )
    Returns an array structure representing the JSON object stored in the
    referenced file. The file contains the string representation of the
    JSON object.

boolean json_save( string $filename, array $json )
    Stores an array structure representing a JSON object in the referenced
    file. The file will contain the string representation of the JSON object.
    Returns TRUE when the write is successful.
```

LANGUAGE SUPPORT

There are functions provided that ascertain the status of a variable.

```
bool is_null( mixed $var )
    Tests if a variable is NULL. Returns True or False .

bool is_bool( mixed $var )
    Tests if a variable is Boolean. Returns True or False .

bool is_int ( mixed $var )
    Tests if a variable is an Integer. Returns True or False .

bool is_double ( mixed $var )
    Tests if a variable is a Double. We store all floating point values
    as Double. Returns True or False .

bool is_string ( mixed $var )
    Tests if a variable is a string. Returns True or False .

bool is_array ( mixed $var )
    Tests if a variable is an array. Returns True or False .

bool isset ( mixed $var )
    Returns TRUE is the variable has been assigned a value.

bool empty ( mixed $var )
    Determine whether a variable is considered to be empty. A variable is
    considered empty if it does not exist or if its value equals FALSE. This
    is equivalent to:
```

```
isset\(\$var\) || $var == false.
```

REGISTRY ACCESS

The Registry stores name-value data typically for configuration. A script may need access to defined settings or be able to preserve settings of its own. These function access the JANOS Registry system.

```
string getRegistryString(string $key [, string $default])
    Gets the content of the supplied Registry key. Note that this returns an
    empty string if the key has not been defined. Note also that an empty
    string is considered to be a FALSE boolean so the returned string can be
    used in a conditional statement.
```

```
bool getRegistryBoolean(string $key [, boolean $dflt])
    Returns the boolean equivalent of the Registry key value.

bool setRegistryString(string $key, string $value)
    Sets the content of the supplied Registry key. The key is deleted if
    the supplied value is an empty string.

string[] getRegistryList(string $node [, $children = False])
    Returns and array of fully qualified keys for entries (children = False)
    or child nodes (children = True) within the specified node.
```

SYSTEM FUNCTIONS

```
void syslog ( string $message )
    Enters the message in the system log jnorsys.log file.

void flush ( void )
    Flushes buffers and attempts to send any output generated to the browser
    or console.

void sleep ( int $milliseconds )
    Flushes buffers and sleeps the process for the defined number of milli-
    seconds. If a script must wait for an external event it is important to
    allow the processor to perform other tasks.

void yield ( void )
    Yields the process. This should be used by extremely lengthy procedures
    to reduce the load on the processor and avoid watchdog timeouts.
```

REGULAR EXPRESSIONS

Regular Expressions (REGEX) define string search patterns. JANOS scripting can utilize these.

```
int ereg ( string $pattern, string $substring [, array $regs] )
    Returns the position in $substring of a match with $pattern. Returns
    FALSE otherwise. If $regs is supplied on a match it is set as an array
    whose first element is the matched string.

int eregi ( string $pattern, string $substring [, array $regs] )
    Returns the position in $substring of a match with $pattern. Returns
    FALSE otherwise. If $regs is supplied on a match it is set as an array
    whose first element is the matched string. Case-independent comparisons
    are performed.

array split( string $pattern, string $substring [, int $limit] )
    Returns an array of string tokens from $substring using matches to
    $pattern as the separators. If $limit is provided the returned array
    will be limited to that number of entries where the last entry will
    contain the balance of the original string.

array spliti ( string $pattern, string $substring [, int $limit] )
    Returns an array of string tokens from $substring using matches to
    $pattern as the separators. If $limit is provided the returned array
    will be limited to that number of entries where the last entry will
    contain the balance of the original string. Comparisons are
```

case-independent.

```
string ereg_replace ( string $pattern, string $replacement, string $substring )
    Replaces all matches to $pattern in $substring with the string
    $replacement. Returns FALSE on error. Returns the original string
    if no matches are found.
```

```
string eregi_replace ( string $pattern, string $replacement, string $substring )
    Replaces all matches to $pattern in $substring with the string
    $replacement. Returns FALSE on error. Returns the original string
    if no matches are found. Comparisons are case-independent.
```

Include Statement

Scripting

DESCRIPTION

The `include` statement inserts and processes the specified file.

```
include $filename;
```

The `$filename` argument must evaluate to a string and specify a valid existing file. An absolute file specification (beginning with '/') may be used to retrieve files from anywhere in the JANOS file system. If only a file name is specified or a relative path is used the system searches for the file relative to the root of the website (typically /flash/www) using the same procedures used to retrieve standard web pages.

File contents are included in HTML Mode. If the file has a file extension other than `.PHP` the file is included in the output stream without interpretation. If the file extension is `.PHP` then PHP content in the file will be interpreted and processed in normal PHP Mode as appropriate.

Files may be included at any point in PHP code where a valid PHP statement is accepted. Files may be conditionally included. You may include a file any number of times. The content is cached. An included file may include other files.

An error encountered during the interpretation of an included file will be reported with the line number and file name of the included file.

SEE ALSO

HELP Topics: [SCRIPT](#)

Error Handling**Scripting****DESCRIPTION**

The JANOS PHP implementation compiles script to bytecode. After a reboot any PHP source file will be compiled when referenced. The compiled bytecode will be executed to render the page. The compiled code will be retained until the source file or any included files are modified or until the JNIOR is rebooted. Subsequent page references use only the cached compiled code. The bytecode contained therein executes much more efficiently. Pages render faster and more reliably.

Errors during the compilation phase are reported in three places. When an error is encountered an error page is rendered and displayed in the browser. This will define the error, display the faulty source line, and indicate the error with a pointer. The same information is appended to the `php.log` file in the file system root. An error message is also appended to the system log `jniorsys.log`. Typically these are Syntax Errors but missing parentheses or semicolons and numerous other conditions will be specifically called out. This greatly enhances the debugging experience.

The following errors are reported:

Syntax Error

There is something wrong with the program syntax. The compiler was expecting something in the PHP source that it did not find.

Undefined Function Reference

You have referenced a function but it has not been defined. The first use of the missing function will be displayed.

Expected Semicolon

There appears to be a missing semicolon. All statements need to be terminated with a semicolon. Additionally the semicolon should be properly used in the FOR statement syntax.

Illegal Break

A break statement appears outside of a FOREACH, WHILE, DO-WHILE or SWITCH structure.

Illegal Continue

A continue statement appears outside of a FOREACH, WHILE, DO-WHILE or SWITCH structure.

Expected Paren

Either an open or close parenthesis is missing.

Unusable Function Name

Reserved words or built-in function names cannot be used in the definition of user functions. You cannot override existing functions.

Function Name In Use

JANOS does not allow you to redefine a function. Standard PHP implementations may allow this. If there is a valid application for this behavior then this can be reported as a bug. INTEG may then opt to eliminate this restriction.

Illegal File Specification

A file path or name includes an illegal character.

File Does Not Exist

You attempted to include a file that cannot be located. The include statement presently requires an absolute file path. If you have an application that requires the use of a relative path or to specify a file location relative the the WebServer path, report this as a bug. INTEG may expand the functionality here.

At runtime, when compiled bytecode is executed, certain runtime errors may occur. Since a page is likely partially rendered before the error occurs it will appear to stall. The runtime error will be reported in two places. First an error message will be appended to the system log `jniorsys.log`. Secondly the same error message will be added to the `php.log` file in the file system root. In addition, the compiler is asked to locate the related line of source code. This is displayed in the `php.log` file as well. In this case the pointer indicates the rough area where execution failed.

The following runtime errors may be reported:

Stack Error

This indicates a PHP logic fault. If this occurs and the related PHP code appears to be normal then it should be reported as a bug. It indicates that the expected results of expressions or functions are missing. Normal PHP would not normally cause this to occur.

Unknown Operation

This will occur if a PHP operator has been used that has not been implemented. The JANOS implementation is a subset of standard PHP and not all operations have been implemented. This error should be extremely rare. But if you do attempt to use an operation that might be defined in the table of precedence but not logically implemented you will get this error. There should be a simple work-around. You may report this as a bug. INTEG would promptly address the issue.

Not An Array

This runtime error will occur if you attempt to reference a non-array variable using array syntax. This would be the result of an issue in the PHP source. If the program is proper and the statement would have performed in some acceptable way under standard PHP, you may report this as a bug.

Bad Bytecode

This indicates a compiler failure and should be reported as a bug. This is a good indication that system integrity has been lost. It should not happen.

Example Script**Scripting****DESCRIPTION**

The JANOS scripting language can be used in the batch environment. Here the script renders commands which are then executed. This is similar to its use in the WebServer situation where PHP renders the HTML page which then is served. The batch script renders commands which are then executed. One difference being that as each command is created it is executed. A complete batch file is not rendered and then run. This allows script to respond to the results of a previous command.

EXAMPLE

Batch files have the ability to masquerade as console commands. Here a script creates a CKSUMS command which reports general message digest and checksum information for requested files. For example:

```
bruce_dev /> cksums jniorsys.log /flash/cksums.bat
file: /jniorsys.log
date: 1624647433 2021-06-25 18:57:13 UTC
crc: f76beec3
md4: 51b9e5115b62af92df900ee7e66b4d68
md5: 6c958d3dce3edc8ef9a44e380030419b
sha1: 1b962afcd4e46e666407cd64a97ca772d4ee9a8d
sha256: 69ccdf8f3236d976e244c15994e80271eee1ff2ba72ce0f71268d51fa7357361

file: /flash/cksums.bat
date: 1614090556 2021-02-23 14:29:16 UTC
crc: 5a9ae151
md4: 2869eedfa73a81d63c99fe60899b2f87
md5: ef3121cafc74a6ffbb179806d4c7dcef
sha1: 71fa94ec88fcaaea208a2c284f16f7d59911e9ac
sha256: 44d4e35d87148c63acbfd408d4c94cbcd862d106c5d502ea6da6ba1d22535d17

bruce_dev />
```

Here we request digests for the system log and the script itself. Note that the last modified date for the file is also reported. This can be very useful in checking file validity by comparing these against digests calculated on the original file by the source.

In considering the script needed to perform this we first see that command line parameters are possible and our script needs to process 1 or more as necessary. In fact the script allows wildcards and can report for all matching files. Secondly the script is executed as a batch file but yet is outputting formatted results as opposed to executable commands alone.

The solution to the command line parameters is to loop through each available one and with each parameter gather all matching files looping through each of those. Since we had wanted to act like a built-in command we needed to work in the batch environment. So to get formatted output we employ the ECHO command. A feature of that command under JANOS is that quotation marks may be used to avoid white space trimming that can occur under other operating systems.

So here is the script for review:

```
bruce_dev /> cat flash/cksums.bat
<?
function println($s) {
    puts("@echo \" $.$.s.\"");
};

for ($n = 1; $n < count($_GET); $n++) {
    $list = scandir($_GET[$n]);
    foreach ($list as $arg) {
        if (is_file($arg)) {
            $time = filemtime($arg);
            println(" file: $arg");
            println(" date: $time ".date("UY-m-d H:i:s T", $time));
            println(" crc: ".file_crc($arg));
            println(" md4: ".file_md4($arg));
            println(" md5: ".file_md5($arg));
            println(" sha1: ".file_shal($arg));
            println("sha256: ".file_sha2($arg));
            println("");
        }
    }
}

bruce_dev />
```

The /flash/cksums.bat batch file and therefore this custom command is provided by default with JNIORs shipped from the factory.

NOTES

There are many ways to accomplish this script. Consider the following alternative. This eliminates the function println() that issued text as an ECHO command and utilizes the JANOS script printf() feature where the ECHO is handled in the format string.

```
<?
$format = "@echo \"%7s: %s\"";

for ($n = 1; $n < count($_GET); $n++) {
    $list = scandir($_GET[$n]);
    foreach ($list as $arg) {
        if (is_file($arg)) {
            printf($format, "file", $arg);

            $time = filemtime($arg);
            printf($format, "date", "$time ".
                date("UY-m-d H:i:s T", $time));

            $content = fread($arg);
            printf($format, "crc", crc($content));
            printf($format, "md4", md4($content));
            printf($format, "md5", md5($content));
            printf($format, "shal", shal($content));
            printf($format, "sha256", sha2($content));
        }
    }
}
```

```
    }  
  }  
}
```

The result is quite the same although this executes a bit faster in that it reads the file content only once.

```
bruce_dev /> cksums etc/JanosClasses.jar  
file: /etc/JanosClasses.jar  
date: 1614613137 2021-03-01 15:38:57 UTC  
crc: e352e30a  
md4: ca9352ee0b28c7ffc7986ef93c9e489b  
md5: 343527bed395496dd31e181895f4b1eb  
sha1: b1f8b5676ecfaaac5eb384a3866330add442ef12  
sha256: 79c14030548637a7009b4812fcbe50677ed89fa72b115b19ab04f9bf6ff123c8  
  
bruce_dev />
```

SEE ALSO

HELP Topics: [ECHO](#), [CAT](#)

Power Supply

JNIOR should be powered by a 12VDC regulated power supply capable of providing up to 1 AMP of current.

The Model 410, 412 and 414 can use a range of supply voltage including AC although use of a 12VDC supply is highly recommended. The flexibility is provided for applications that may need to operate in unique situations. The unit will operate reliably with voltages as low as 10VDC and as high as 24VDC. Use of voltages much above 12VDC may lead to excessive waste energy in terms of heat and perhaps reduced product life.

An AC voltage source may be used to power these models. In this case it is the peak voltage that is of concern. An AC supply in excess of 16VAC (RMS Voltage Vrms) has peaks over 24V and will exceed the rated maximum for the product. An advantage to the AC capability is that the DC supply leads may be accidentally miswired in reverse and the product will still operate.

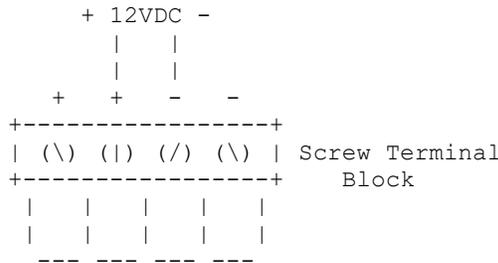
The 412DMX must use a 12VDC source.

Connector

The PWR connector is 4-pin terminal block header on a 0.200" (5.08 mm) pitch (Weidmuller 1515110000 for instance). The proper 4-pin screw terminal plug is supplied with an INTEG Power Supply or with the 5-piece connector kit.

Connections

The two left positions (closest to the corner of the JNIOR) are (+) positive voltage inputs and the two right positions the (-) voltage inputs. The pin pairs are buses (connected internally) allowing you to tap off of the power supply for additional I/O wiring. This should be done with care as switching noise and other issues may result from the external connections that can interfere with the JNIOR power quality causing reboots or other events.



NOTES

The Models 410, 412 and 414 will operate if the power supply positive and negative wires are reversed. The 412DMX requires proper wiring. Care should be taken if you plan to tap the supplied voltage for other uses. Use a voltmeter to verify proper polarity.

SEE ALSO

HELP Topics: [MODELS](#)

Relay Outputs

JNIOR models support from 4 to 12 internal SPST relays. These are small signal relays rated for a maximum current of 1A (Contact Rating). The switching voltage capability of these relays can be up to 220VDC (250VAC).

Maximum Ratings: 1A 60V

For higher currents (up to 10A) INTEG supplies the Power 4ROUT external module. One or more modules can be connected through the Sensor Port expansion bus and add to the relay complement of a JNIOR.

Relay Outputs are dry-contact outputs and do not supply voltage. An externally supplied voltage must power the circuit to be switched by the relay output. This is important when using the output to signal other equipment expecting a voltage input.

By default Relay Outputs are Normally Open (NO) not enabling the external circuit until activated. When a relay is closed by the JNIOR the associated red LED will illuminate.

Internally the JNIOR offers jumpers that can reconfigure a relay output to Normally Closed (NC) constantly enabling the external circuit being switched. In this case the relay is activated to interrupt the circuit. This may be useful perhaps to temporarily remove power from an external device effectively resetting it.

The NC option on the Model 410 is available for the top 2 relays on connector D (see [MODELS](#)). The Model 412 (and Model 412DMX) offer 4 configurable relays. These are the top 2 on connectors B and D. The Model 414 has 2 configurable relays being the top 2 on connector C.

Connector

Relays are grouped 4 to a connector. These are 8-pin terminal block headers on 0.200" (5.08 mm) pitch (Weidmuller 1510910000 for instance). The proper 8-pin screw terminal plugs are supplied with the connector kit.

Connections

Each relay uses a pair of adjacent pins. These are completely independent of the other relay connections.

SEE ALSO

HELP Topics: [MODELS](#), [INPUTS](#)

Digital Inputs

The JNIOR Digital Inputs are voltage sensing. Any voltage applied in excess of 2.5V will activate the input. The red LED will illuminate. These are not high impedance inputs and have an equivalent resistance of about 1,200 Ohms. The connected signal source must be capable of supplying at least 25ma of current in order to trigger an input.

Maximum Voltage Rating: 30V

Inputs are filtered and will detect and count transitions to a frequency of about 1,800 Hz. These inputs are also debounced by default. This is configurable by Registry setting.

Higher voltages may be sensed by inserting an additional series resistance.

Connector

Inputs are grouped 4 to a connector. These are 8-pin terminal block headers on 0.200" (5.08 mm) pitch (Weidmuller 1510910000 for instance). The proper 8-pin screw terminal plugs are supplied with the connector kit.

Connections

Each input uses a pair of adjacent pins. The (+) positive input of each pair is that closest to the top (PWR end) of the JNIOR. This is true even with Digital Inputs located on the opposite side of the product as in the Model 414.

SEE ALSO

HELP Topics: [MODELS](#), [RELAYS](#), [DIN](#)

COM Serial Port

Both the COM and AUX (when present) serial ports use a D-sub DB-9F connector defined to be compatible with a a simple M-F DB9 extension cable and connection to a standard PC serial port. Since the latter is rare these days a USB-to-Serial adapter with DB-9M connector can make the connection.

The RS-232 COM port, located at the bottom of the JNIOR next to the LAN Ethernet port, supports a 3-wire serial connection. The default is 115,200 Baud using 8 Data bits, 1 stop bit and no parity. Only software flow control is available. Flow control is disabled by default.

```

-----COM-----
\ (5) (4) (3) (2) (1) /          DB9F Connector Front View
 \ (9) (8) (7) (6)  /
-----

```

Pin Assignments

```

Pin 2 - Transmit Out (Tx) Active driver output from JNIOR
Pin 3 - Receive In (Rx) from remote system
Pin 5 - Ground reference (GND)
other - No connection.

```

NOTES

The GND is not equivalent to the (-) negative power input in all models except the 412DMX (which requires DC power). This GND floats somewhere between the (+) positive and (-) negative power connections.

The JNIOR serial ports are not isolated. Care should be taken not to create unwanted ground loops.

SEE ALSO

HELP Topics: [MODELS](#), [AUX_PORT](#), [IOLOG](#)

AUX Serial Port

Both the COM and AUX (when present) serial ports use a D-sub DB-9F connector defined to be compatible with a simple M-F DB9 extension cable and connection to a standard PC serial port. Since the latter is rare these days a USB-to-Serial adapter with DB-9M connector can make the connection.

The RS-232 AUX port is located at the top of the JNIOR next to the POWER and Sensor Port Expansion Bus connections. In addition to the 3-wire communication connections this port also supports RTS/CTS hardware handshake. The default is 115,200 Baud using 8 Data bits, 1 stop bit and no parity. Both hardware and software flow control are disabled by default. The hardware RTS/CTS lines need no connection for port operation.

```

-----AUX-----
\ (5) (4) (3) (2) (1) /          DB9F Connector Front View
 \ (9) (8) (7) (6)  /
-----

```

Pin Assignments

```

Pin 2 - Transmit Out (Tx) Active driver output from JNIOR
Pin 3 - Receive In (Rx) from remote system
Pin 5 - Ground reference (GND)
Pin 7 - Request to Send In (RTS) from remote system
Pin 8 - Clear to Send Out (CTS) Active signal output by JNIOR
other - No connection.

```

RS-422/RS-485

On the Model [410](#) the AUX port may be configured for RS-422 or RS-485 operation. The latter allowing applications to fully support 2 and 4 wire full-duplex multi-drop communication networks at up to 250 kBaud.

Early Model 410 PCBs included internal jumpers providing an easy way to bridge Receive and Transmit lines for 2-wire RS-485. A third jumper provided the necessary 120 Ohm termination resistor. For proper balancing a termination resistor should be located at both ends of an RS-485 communication line.

While the jumper location on the PCB is no longer populated it remains available and may be optionally soldered for this purpose. The bridging and termination resistor can also be externally applied.

```

-----AUX-----
\ (5) (4) (3) (2) (1) /          DB9F Connector Front View
 \ (9) (8) (7) (6)  /
-----

```

Pin Assignments (RS-422 and RS-485 Modes)

```

Pin 2 - 485TX (-) Active driver output from JNIOR
Pin 3 - 485RX (-)
Pin 5 - Ground reference (GND)
Pin 7 - 485RX (+)
Pin 8 - 485TX (+) Active driver output from JNIOR
other - No connection.

```

Proper RS-485 bridging (bi-directional 2-wire communications):

- * short Pin 2 (485TX-) with Pin 3 (485RX-)
- * short Pin 8 (485TX+) with Pin 7 (485RX+)
- * include 120 Ohm resistor between plus (+) and minus (-) lines at transmitter and farthest end of the line.

The Java `com.integpg.comm.AUXSerialPort` class provides support for configuring and controlling the AUX Serial Port. This includes the driver control necessary to support full-duplex 2-wire networking.

NOTES

The GND is not equivalent to the (-) negative power input in all models except the 412DMX (which requires DC power). This GND floats somewhere between the (+) positive and (-) negative power connections.

The JNIOR serial ports are not isolated. Care should be taken not to create unwanted ground loops.

SEE ALSO

HELP Topics: [MODELS](#), [COM_PORT](#), [IOLOG](#)

Sensor Port Expansion Bus

The Sensor Port Expansion Bus is located at the top of the JNIOR between the POWER and AUX serial port. This is a proprietary 6-wire communication bus.

INTEG provides a number of expansion modules that are connected in a daisy-chain fashion to this port. These modules include a Power 4ROUT module offering 10A relays, both 10V and 4-20ma analog modules, and a rack-mounted Control Panel. In addition there are temperature and humidity sensors available.

CABLES

Standard length cables are supplied with purchased expansion modules. Custom length cables may be requested or constructed by the customer. The maximum overall network length should not exceed 50 feet or 15 meters.

Wire - 6-conductor flat modular cable (26 AWG)
 Plug - 6p6c (RJ12) unshielded IDC (2 required)
 Tool - RJ11/RJ12/RJ45 Network & Phone Crimp Tool

```

                                     tab   ---\
/-----+                               +-----+
|       |=====|                       |       |
+-----+                               +-----/
  \--- tab

```

Note: Tab locations for proper cable construction.

NOTES

Devices generally are connected in a serial daisy-chain fashion. The network length is measured from the JNIOR to the furthest connected device. Success with various cable lengths will be highly dependent on factors many of which are not predictable. Your experiences may vary. Operation is not guaranteed with network lengths over 20 feet or 6 meters. Performance is also dependent on the number and types of modules employed.

If a sensor must be located far from the JNIOR consider placing the JNIOR closer to the sensor as opposed to a lengthy cable. This will reduce communications errors and retries which ultimately will improve performance.

SEE ALSO

HELP Topics: [MODELS](#)

ETC**Reference****DESCRIPTION**

The /etc folder is a read-only section of the File System. This presently contains the JanosClasses.jar runtime library used by the JNIOR Java Virtual Machine (JVM) in executing application programs.

The JanosClasses.jar file may be downloaded and used in compiling Java programs designed to run on the JNIOR. These program should be built with this JAR as the 'bootclasspath'. This provides the complete set of runtime classes required by JNIOR application programs.

More information on compiling applications for JNIOR can be obtained through the website at integpg.com or jnior.com .

SEE ALSO

HELP Topics: [PROGRAMMING](#), [JVM](#), [JAVA](#)

FLASH**Reference****DESCRIPTION**

The JNIOR maintains a File System in several memory areas. The contents of the /flash folder are stored in non-volatile Flash Memory. This provides safe storage for application programs, web pages and other critical data.

SEE ALSO

HELP Topics: [JRFLASH](#)

TEMP**Reference****DESCRIPTION**

The JNIOR maintains a File System in several memory areas. The /temp folder is available for temporary file storage. The contents are erased after a reboot.

JANOS can be updated by uploading the appropriate UPD file. This file is quite large and is only required during the update. The /temp folder is an ideal destination for the upload. The JRUPDATE command can then reference the file and it is removed during the reboot in completing the update.

The network PCAPNG capture file that can be generated by the NETSTAT command is quite large and is therefore placed in the /temp folder. It must be downloaded before a reboot.

SEE ALSO

HELP Topics: [JRUPDATE](#), [NETSTAT](#)

USERS MANUAL**Reference**

A complete and printable Users Manual is available when accessing the Help System through the WebUI.

DESCRIPTION

The Help System auto-generates the Users Manual specific with the content of the current JNIOR. This not only includes Help information for the version of JANOS operating system but also that available for any installed applications.

Creation of the custom Users Manual can take several seconds. The result is printable and can be saved as a PDF depending on your computer's print capabilities. When saved as a PDF the links may be active, providing an interactive manual that may be shared among JNIOR users.

SEE ALSO

HELP Topics: [HELP](#), [SUPPORT](#)

TIMEZONES**Reference**

The clock subsystem is generally configured using the [DATE](#) command. JANOS defines a set of Timezones for use in displaying local time. These timezones may or may not utilize Daylight Saving Time (DST). The DATE -T command displays the current set of available timezones.

The rules for DST may change from time to time as governments alter their policies. The default list of timezones will likely become incorrect at some point. JANOS provides a means by which you may define a custom timezone with or without a DST rule. You may even correct an existing timezone.

DESCRIPTION

The following key format is used to create a new timezone or overwrite an existing timezone. Note that timezones are identified by their standard abbreviation (ABBSTD). The timezone for Eastern Standard Time is identified as "EST". Since the default definition of this timezone includes a Daylight Saving Time (DST) rule, the DATE command can also select this timezone using the DST abbreviation "EDT".

```
reg Timezones/NAME = OFFSET, DESC, ABBSTD [, ABBDST, STMON, STDAY,  
STDOW, STTIME, ENDMON, ENDDAY, ENDDOW, ENDDTIME, DSTOFS]
```

NAME

The NAME portion of the key is arbitrary and serves only to differentiate the key from others.

OFFSET

The offset in minutes from UTC specified in military time in the format HHMM. For example -0500 subtracts 5 hours from UTC. The value 0630 adds six and a half hours to UTC.

DESC

Supplies a textual description of the timezone. For instance "Universal Coordinated" for UTC.

ABBSTD

Defines the standard abbreviation for the timezone. This is the identifier that is used with the date and time to specify the current timezone. It is used by the DATE command in setting the current timezone. If this matches an existing timezone the built-in definition will be overwritten. Otherwise a new timezone will be created.

The following parameters are required only when specifying a DST rule.

ABBDST

Defines an alternate abbreviation for the timezone. This is the identifier that is used with the date and time to specify the current timezone when Daylight Saving Time is in effect. It can be used by the DATE command in setting the current timezone.

STMON

Specifies the starting month for DST. A 3-character abbreviation is used: JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, or DEC. This field is not case-sensitive although uppercase is recommended by convention.

STDAY

Specifies the starting day of the month. This is a numeric value where 1 specifies the first day of the month. If it is necessary to specify a certain number of days before the end of the month, a negative value can be entered. Since DST usually begins (and ends) on a specific day of the week, this value is used to select the correct part of the month for that day.

STDOW

Specifies the day of the week on which DST starts. A 3-character abbreviation is used: SUN, MON, TUE, WED, THU, FRI, or SAT. This field is not case-sensitive although uppercase is recommended by convention. This defines the day of the week on or after the starting day. If it is necessary to specify the day of the week on or before the starting day, a negative sign may be prepended to the string (e.g. "-SUN").

STTIME

Specifies the starting time for DST in military time using the format HHMM. For example 0200 indicates 2 o'clock in the morning. This is the point in time when the clocks are to be adjusted.

ENDMON

Specifies the ending month for DST. A 3-character abbreviation is used: JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, or DEC. This field is not case-sensitive although uppercase is recommended by convention.

ENDDAY

Specifies the ending day of the month. This is a numeric value where 1 specifies the first day of the month. If it is necessary to specify a

certain number of days before the end of the month, a negative value can be supplied.

ENDDOW

Specifies the day of the week on which DST ends. A 3-character abbreviation is used: SUN, MON, TUE, WED, THU, FRI, or SAT. This field is not case-sensitive although uppercase is recommended by convention. This is the day of the week on or after the ending day. If it is necessary to specify the day of the week on or before the ending day, a negative sign may be prepended to the string (e.g. "-SUN").

ENDTIME

Specifies the ending time for DST in military time in the format HHMM. For example 0200 indicates 2 o'clock in the morning. This is the point in time when the clocks are to be returned to standard time.

DSTOFS

This defines in minutes the adjustment that occurs when daylight saving time is in effect. Typically this value is 60 indicating that the clocks move ahead an hour for DST.

NOTES

There are two forms to the key. The simple form requires only the first 3 fields. This defines a timezone that does not use DST. The full format requires 13 fields where the additional entries outline the use of DST in that timezone. The DST definition provides an additional abbreviation, specifies start and end timing, and defines the time offset.

This Registry key is interpreted, and therefore take effect, on boot. The new or modified timezones will appear in the table produced by the DATE -T command. The JNIOR may then be switched to the new timezone which will remain in existence until the Registry key is removed or altered. Note that when time is reported to external systems, a custom timezone may not be recognized if its abbreviation is not common and known to the rest of the world.

A Timezone key will be ignored if it contains a syntax or value error. These errors will be reported to the system log (SYSLOG).

EXAMPLES

For example, the following Registry command makes an entry that redefines the Eastern Timezone in the United States with an ego-centric description for those of us in Pittsburgh Pennsylvania.

```
reg Timezones/YinzerTime = "-0500, America/Pittsburgh, EST"
```

This would not be exactly correct as the EST timezone observes Daylight Saving Time. We need to also include the rule.

```
reg Timezones/YinzerTime = "-0500, America/Pittsburgh, EST, EDT,  
MAR, 8, SUN, 200, NOV, 1, SUN, 200, 60"
```

And perhaps instead of redefining EST we would prefer to create our own timezone, the entry would change as follows. Note that only the ABBSTD need be changed but we alter the ABBDST to be consistent.

```
reg Timezones/YinzerTime = "-0500, America/Pittsburgh, YST, YDT,  
MAR, 8, SUN, 200, NOV, 1, SUN, 200, 60"
```

SEE ALSOHELP Topics: [DATE](#)**LOGS****Reference****LOGGING**

JANOS creates a number of log files. These are text files where generally a single line represents some event. Each entry has a timestamp to the millisecond shown in the local timezone. The (Java date) format is as follows:

```
MM/DD/yy HH:mm:ss.SSS, message...  
05/28/21 09:25:52.000, Clock synchronized via NTP (+6)
```

System log files are located in the root of the File System and are limited in size. When a log file reaches approximately 64KB in size it is aged. The .LOG file is then saved as a .LOG.BAK file overwriting any previous backup and a new .LOG file is started. A SYSLOG Server may be optionally defined which will receive notice of logged events.

/jniorsys.log

This is the main system log containing general log notices. Entries appear here when the unit boots, processes are started, Registry keys are altered, etc. Any issues with the system will be reported here.

/jniorboot.log

This is a record of the most recent boot. This includes diagnostic reports. Any issue in start-up will be reported in this log. Unlike other log files this file contains only the most recent start-up detail. On the next boot the content is appended to the associated .LOG.BAK file which remains constrained to a maximum length of 64KB.

/jniorio.log

This is generated by the [IOLOG](#) command. It will contain I/O logs for all recent Digital Input and Relay Output state changes.

/auxio.log

This is generated by the IOLOG -A command. It will contain a detailed record of serial communications over the AUX port.

/sensorio.log

Also generated by the IOLOG -S command, this contains details of Sensor Port communications.

/jmpserver.log

This contains log information pertaining to access and use of the JANOS Management Protocol (JMP). [JMP](#) is a [JSON](#) based protocol current recommended for JNIOR communications.

/protocol.log

This contains log information pertaining to access and use of the legacy JNIOR Protocol.

/access.log

Contains notices of failed login attempts.

/web.log

This is a detailed WebServer log.

/tls.log

This log reports issues with SSL/TLS secure communications.

/php.log

Logs errors and event pertaining the the JANOS PHP-like scripting language.

/errors.log

Errors encountered by applications are logged here. If you understand the reason for the logged error detail you should delete this LOG. It is important to recognize when errors occur and thus want to see when this log file appears. The presence of an errors.log file sets the unit's attention flag.

/dump.log

In an extreme situation the operating system may need to shutdown and restart. A dump is generated that can be used by INTEG to further debug the situation. If you have updated JANOS since the dump file was created you should delete it. The presence of a dump.log sets the unit's attention flag.

SEE ALSO

HELP Topics: [CAT](#), [IOLOG](#)

ENVIRONMENT**Reference**

Unlike the Registry the Environment is local to and specific for each running process. This contains NAME-VALUE pairs and variables are case-dependent. When a process is started it inherits the Environment from its parent.

The System uses certain Environment variables to convey information. Applications are free to use environment variables to pass parameters or to temporarily store state information.

The SET command is used to view and define environment content.

SYSTEM VARIABLES**BKSP**

The backspace key has a different usage on Linux based systems. The command line process attempts to detect the intended use and when it does sets the BKSP variable. A value of '1' indicates that the connecting terminal is Windows based or otherwise uses the backspace similarly.

CD

This holds the Current Directory. The current working directory is also displayed as the command line prompt. File paths not beginning with the path separator '/' are relative to the current directory.

CMDLINE

Contains the command line used to execute an program. The parent process stores the command line here, executes the application and then removes it. A program can retrieve the command line used to start it.

COLUMNS

Defines the display width in characters. The default and minimum is 80. This is used in formatting output from commands such as HELP and DIR.

ERRORLEVEL

Programs generally return a numeric result. This is typically zero '0' upon successful completion. The returned value can be used as an error code or other purpose. The returned value is placed in the ERRORLEVEL variable.

RUNKEY**RUNCMD**

These variables are set when an application has been started using a Run/ Registry Key. Application programs can be started at boot using these keys. RUNKEY provides the key name. RUNCMD holds the key value which would be the command line command starting the program.

NOTES

Environment variables can be referenced by commands in batch files. A variable name surrounded by percent '%' signs in a batch command

line are replaced with the value of the variable.

SEE ALSO

HELP Topics: [SETENV](#), [BATCH](#)

Network Filtering**Reference****DESCRIPTION**

The content of a network capture can be filtered either on the incoming or outgoing side. Using the same filter syntax the remote clients allowed to interact with the JNIOR can be controlled. These filters can be quite simple or, if needed, much more sophisticated.

The [IpConfig/CaptureFilter](#) Registry key may optionally define a filter which is applied to incoming packet data prior to capture. There is limited storage for captured information and by filtering you can extend the capture period and the amount of pertinent information collected.

A filter may also be used in generating the `/temp/network.pcap` capture file from the capture buffer content using the `NETSTAT -C` command. Here the filter allows you to extract only pertinent information in order to keep the file size at a manageable level. The resulting file can be downloaded and opened directly using Wireshark <https://wireshark.org> .

The [IpConfig/Allow](#) Registry key may optionally define a filter which is applied to incoming connections. In this case the referenced IP addresses refer to the incoming source IP addresses, those of remote clients. Referenced port numbers refer only to destination ports, those available on the JNIOR.

SYNTAX

IP Addresses

To filter packets referencing a specific IP address you need only include the IP address in the format "nnn.nnn.nnn.nnn" in the filter string. Any packet that references this IP address either as the source or the destination address will be selected for inclusion. All other packets will be excluded unless covered by some other part of the filter. When filtering remote client connections this specifies a specific IP address to allow. Note that this is a dangerously limiting restriction on remote clients.

To exclude packets referencing a certain IP address you can prepend a `'!` exclamation point to the address like this `!nnn.nnn.nnn.nnn`". All packets that do reference the IP address as either a source or destination address will NOT be selected for inclusion. This can also be written as `"NOT nnn.nnn.nnn.nnn"`. This may be especially helpful to filter your IP address while debugging communications with other devices. In filtering remote client connections, the NOT syntax is ideal for blocking the client based upon IP address.

Note that an IP address is identified by its format, four decimal values between 0 and 255 separated by the '.' period.

The domain syntax allows you to define a range of IP addresses as would be associated with a netmask. The format is "nnn.nnn.nnn.nnn/mm" where 'mm' specifies the number of high order bits that would be in the netmask. For example, "10.0.0.0/24" specifies any IP address in the domain that contains IP addresses 10.0.0.1 through 10.0.0.255 and uses a netmask of "255.255.255.0". This is useful in selecting only local traffic for instance. It would also be perfect for allowing only clients from a specific network to connect to the unit.

MAC Addresses

Although less often required you can filter on a specific MAC address. The MAC address is included in the filter string in the format "hh:hh:hh:hh:hh:hh". This is six hexadecimal values (0-9 a-f) not case-sensitive separated by the ':' colon. For instance most INTEG Series 4 JNIORs have MAC address formatted as "9C:8D:1A:hh:hh:hh" where the lower three bytes are assigned uniquely in some sequence.

As with IP addressing, packets with MAC addresses may be excluded by writing the filter as "!hh:hh:hh:hh:hh:hh" or "NOT hh:hh:hh:hh:hh:hh". Again a MAC address is identified by its format. A MAC address would rarely be appropriate in filtering a remote client however.

Ports

A port is specified in the filter string as a decimal value between 1 and 65535 inclusive. No punctuation is required. The capture filter does not distinguish between a TCP or UDP port number. A port may be excluded using the negation "!nnn" or "NOT nnn". When filtering remote client connections the filter logic can use this to block the client from accessing a specific function by port.

There are standard ports assigned for various functions. The capture filter knows some of them by name. Some may be reconfigured through the Registry. As a convenience the port may be specified using its protocol name. The capture will be filtered on the port as configured at the time the filter is compiled (at boot or upon NETSTAT command). JANOS recognizes these port names where the default values are shown in parentheses: SMTP (25), NTP (123), JNIOR (9200), JMP (9220), FTP (21), HTTP (80), HTTPS (443), TELNET (23), and BEACON (4444). These ports may be excluded using the same negation syntax as previously shown.

Boolean Constants

The capture filter will also recognize the terms TRUE and FALSE. TRUE indicates that the packet is to be included and FALSE otherwise.

Logical Operations

To filter on a single IP address, MAC address or port (or to exclude a single item) the filter need only specify the address or port in the proper format. The following would select the communications involved in an email transfer. If this is used as an incoming filter, only email transactions would be captured. If this is used with NETSTAT -C in generating the PCAPNG file, the file would only include email communications.

```
NETSTAT -C SMTP
netstat -c 25
```

Note that filters (and also commands) are not case-sensitive. The forms above will create a PCAPNG file with just outgoing email communications. This assumes that you have not reconfigured the SMTP port. If you have set [Email/Port](#) to another port (587 for instance) then the first line will extract your email communications and the second will not. Although the second filter might show an application trying to use the incorrect port.

Filters often need to be slightly more complex in order to include the collection of communications needed. The syntax allows you to specify any number of addresses or ports in any combination using AND, OR and XOR logic. As an alternative you may use the notation && and || for AND or OR respectively.

As an example perhaps you want to filter only email communications with the SERVER whose IP address is 10.0.0.4

```
netstat -c 10.0.0.4 && smtp
```

If you want to also include BEACON communications you might write the filter as:

```
netstat -c 10.0.0.4 AND smtp OR beacon
```

Here you might question the order of precedence of the logical operations. The capture filters do not support an order of precedence but perform the operations from left to right. So this would be calculated as follows:

```
netstat -c (10.0.0.4 && SMTP) || BEACON
```

And this would have done what we had said. If there is some question you can use the parentheses in the filter as shown. The following will create the same subset of packets but would not if we were to exclude the parentheses:

```
netstat -c BEACON || (10.0.0.4 && SMTP)
```

A parentheses grouping can be negated as you would expect. The following will create a capture of all activity EXCEPT email communications with the SERVER.

```
netstat -c !(10.0.0.4 && smtp)
```

Finally if we had wanted to mask these email communications from the overall capture buffer we can install this filter using the command:

```
netstat -f !(10.0.0.4 && smtp)
```

This would result in the following Registry setting and would filter out matching communications until such time as the filter is removed.

```
IpConfig/CaptureFilter = "!(10.0.0.4 && smtp)"
```

NOTES

This same Filter syntax is used by the [IpConfig/Allow](#) Registry key the purpose of which is to limit access to the JNIOR. Care needs to be exercised in setting this key as you may end up preventing your own access to the JNIOR. If this occurs you must reset the filter through the COM RS-232 serial port.

SEE ALSO

HELP Topics: [NETSTAT](#), [SAFEMODE](#)

SAFEMODE**Reference****DESCRIPTION**

A JNIOR may be booted into SAFEMODE using the small jumper located between the LAN and COM RS-232 ports. A switch may be wired to the jumper and if activated briefly would reset/reboot the JNIOR. A well-behaved reboot occurs. If the switch is held through the reboot SAFEMODE is activated. This mode is noted in the command line banner.

NOTES

SAFEMODE temporarily enables the default administrator login credentials. This is to assist those who have changed and subsequently forgotten the passwords.

SAFEMODE does not automatically start application programs (RUN keys). If an application program somehow causes an issue whereby the JNIOR enters a tight reboot loop, this will regain access to the unit letting you remove or correct the faulty application.

The IpConfig/Allow Registry key is ignored in SAFEMODE. This will temporarily allow access to network services when a faulty access Filter has been set. The faulty Registry key can be removed.

JANOS registers applications during boot. SAFEMODE skips this application procedure.

SEE ALSO

HELP Topics: [FILTER](#)

REGEX

Regular Expressions

REFERENCE

Searches and replacements can be performed using Regular Expressions or REGEX.

Supported metacharacters:

.	dot	matching any character (except CR or LF)
?	question mark	previous zero or one time
+	plus sign	previous one or more times
*	asterisk	previous zero or more times
|	alternation (OR)	match either expression
[]	character class	any character listed
[^]	negated character class	any character not listed
[-]	character range	define inclusive range of characters
^	caret	matches position at the start of a line
\$	dollar	matches position at the end of the line
()	parentheses	limits scope for alternation and provides grouping for quantifiers
??	question mark	previous zero or one time - lazy
+?	plus sign	previous one or more times - lazy
*?	asterisk	previous zero or more times - lazy

A lazy operation is satisfied with the shortest match for the quantified portion of the expression. Normally the Regex engine will continue to search for a better (longer) match. That is a slower process and not always necessary.

Escaping

The backslash '\' character is used to escape a number of characters that otherwise have REGEX function. This also allows you to use non-printable characters such as tabs, backspaces, carriage returns, etc. There are macros defined that each expand into a set of characters which can be convenient.

escaped non-printable:

\a	0x07 BEL (bell)
\b	0x08 BS (backspace)
\t	0x09 TAB (tab)
\n	0x0A LF (line feed)
\v	0x0B VT (vertical tab)
\f	0x0C FF (form feed)
\r	0x0D CR (carriage return)
\e	0x1B ESC (escape)

hexadecimal entry:

\xHH where HH represents two hexadecimal digits

meta characters (macros):

\w	[a-zA-Z0-9]	word characters
\W	[^a-zA-Z0-9]	not word characters
\d	[0-9]	decimal digits
\D	[^0-9]	not decimal digits
\s	[\f\n\r\t\v]	match whitespace

`\S` `[^ \f\n\r\t\v]` not whitespace

NOTES

When including a REGEX on the command line or in a string you will need to again escape the escape character. So to include a tab the escape sequence would be `"\\t".*`

SEE ALSO

HELP Topics: [EGREP](#), [GREP](#), [REG](#), [HIST](#)

ASCII

Table

Dec	Hex	Chr	Dec	Hex	Chr	Dec	Hex	Chr	Dec	Hex	Chr
0	00	NUL (null)	32	20	(space)	64	40	@	96	60	`
1	01	SOH (start of header)	33	21	!	65	41	A	97	61	a
2	02	STX (start of text)	34	22	"	66	42	B	98	62	b
3	03	ETX (end of text)	35	23	#	67	43	C	99	63	c
4	04	EOT (end of transmission)	36	24	\$	68	44	D	100	64	d
5	05	ENQ (enquiry)	37	25	%	69	45	E	101	65	e
6	06	ACK (acknowledge)	38	26	&	70	46	F	102	66	f
7	07	BEL (bell)	39	27	'	71	47	G	103	67	g
8	08	BS (backspace)	40	28	(	72	48	H	104	68	h
9	09	TAB (horizontal tab)	41	29	)	73	49	I	105	69	i
10	0A	LF (new line)	42	2A	*	74	4A	J	106	6A	j
11	0B	VT (vertical tab)	43	2B	+	75	4B	K	107	6B	k
12	0C	FF (new page)	44	2C	,	76	4C	L	108	6C	l
13	0D	CR (carriage return)	45	2D	-	77	4D	M	109	6D	m
14	0E	SO (shift out)	46	2E	.	78	4E	N	110	6E	n
15	0F	SI (shift in)	47	2F	/	79	4F	O	111	6F	o
16	10	DLE (data link escape)	48	30	0	80	50	P	112	70	p
17	11	DC1 (device control 1)	49	31	1	81	51	Q	113	71	q
18	12	DC2 (device control 2)	50	32	2	82	52	R	114	72	r
19	13	DC3 (device control 3)	51	33	3	83	53	S	115	73	s
20	14	DC4 (device control 4)	52	34	4	84	54	T	116	74	t
21	15	NAK (negative acknowledge)	53	35	5	85	55	U	117	75	u
22	16	SYN (synchronous idle)	54	36	6	86	56	V	118	76	v
23	17	ETB (end of block)	55	37	7	87	57	W	119	77	w
24	18	CAN (cancel)	56	38	8	88	58	X	120	78	x
25	19	EM (end of medium)	57	39	9	89	59	Y	121	79	y
26	1A	SUB (substitute)	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC (escape)	59	3B	;	91	5B	[	123	7B	{
28	1C	FS (file separator)	60	3C	<	92	5C	\	124	7C	|
29	1D	GS (group separator)	61	3D	=	93	5D	]	125	7D	}
30	1E	RS (record separator)	62	3E	>	94	5E	^	126	7E	~
31	1F	US (unit separator)	63	3F	?	95	5F	_	127	7F	DEL

Morse Code

Reference

STATUS LED CODES

The orange Status LED can at times be used to convey information using Morse Code. Most notably, after disconnecting the Ethernet LAN connection the JNIOR will convey the last octet of its assigned IP address flashing each digit in Morse Code.

An application can use the Java `JANOS.morseStatusLED()` method to output and repeat any message in Morse Code. This potentially can convey a complex error message in the absence of any display and remote access.

MORSE CODE

The following is the International Morse Code implemented by JNIOR. A dot is indicated by the asterisk '*' and a dash by a series of dashes '---'. The spaces between dots and dashes in the same letter are the same length as a dot; The spaces between letters are equal to 3 dots; And, the space between two words is equal to 7 dots. Phrases are repeated with a space equal to 15 dots after the last.

Digits

1	* --- --- --- ---	6	--- * * * *
2	* * --- --- ---	7	--- --- * * *
3	* * * --- ---	8	--- --- --- * *
4	* * * * ---	9	--- --- --- --- *
5	* * * * *	0	--- --- --- --- ---

Letters

A	* ---	N	--- *
B	--- * * *	O	--- --- ---
C	--- * --- *	P	* --- --- *
D	--- * *	Q	--- --- * ---
E	*	R	* --- *
F	* * --- *	S	* * *
G	--- --- *	T	---
H	* * * *	U	* * ---
I	* *	V	* * * ---
J	* --- --- ---	W	* --- ---
K	--- * ---	X	--- * * ---
L	* --- * *	Y	--- * --- ---
M	--- ---	Z	--- --- * *

NOTES

Note the pattern used with digits. This is easily remembered and can help make the IP octet decoding useful.

The length of code to represent letters is based roughly on the frequency of the occurrence of letters in English text. As such the E is a single dot and the letter T a single dash.

The status LED on the back of the Control Panel PCB also uses Morse Code.

SEE ALSO

HELP Topics: [NETWORK ACCESS](#)

JSON

Data Format

DESCRIPTION

JSON (JavaScript Object Notation) is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate.

JSON is used by MANIFEST to save file information for use in later file verification. It is also used by JMP (JANOS Management Protocol).

Go to <https://json.org> for more information.

SEE ALSO

HELP Topics: [CAT](#), [MANIFEST](#), [JMP](#)

JNIOR

Protocol

DESCRIPTION

The JNIOR Protocol is a legacy binary protocol developed to support the Series 3 JNIOR. This is a deprecated protocol and not recommended for new development. The binary protocol supports the JNIOR internal I/O and not much beyond that.

This has been replaced with the JANOS Management Protocol (JMP) which uses the much more easily understood JSON message format. In addition the JMP Protocol is designed to provide tools for the complete management of the JNIOR.

NOTES

This protocol NOT RECOMMENDED for new development.

SEE ALSO

HELP Topics: [JMP](#), [JSON](#)

Terminal**Compatibility****CONSOLE TERMINAL**

Most operating systems, and JANOS is no exception, utilize some form of Command Line Interface. With the JNIOR, the command line can be accessed serially through the RS-232 (COM) port at 115,200 baud, 8 data bits, 1 stop bit and no parity. Typically these days this is accomplished with a USB-To-Serial adapter and a terminal program. When the JNIOR is properly configured for the network, any number of Telnet client programs can be used to access the command line. With the Series 4 JNIOR one can also open the default Dynamic Configuration Pages (WebUI) using a standard browser. In this case the command line is referred to as a Console Session and you can login via the Console tab.

The command line interface uses the standard ASCII character set and is not graphical. Telnet client programs and terminal emulators communicate on a character by character basis allowing you to utilize the features of the JANOS command line. In general a program supporting the ANSI or VT-100 escape sequences is required. While you can interact successfully with only a basic terminal passing keystrokes and displaying characters, the experience is greatly improved when the correct emulation is in place.

JANOS utilizes only a basic subset of the VT-100 codes. These will be outlined below. It is recommended that any custom terminal emulation program be written to support these sequences.

KEYBOARD EMULATION

Keystrokes are sent to the JNIOR for processing. If appropriate they are echoed for display by the JNIOR. ASCII characters fall into the range 0 to 127 which encompasses the standard character set with punctuation and a series of control characters (values less than 32). There are a number of special keys on the standard computer keyboard that do not translate into individual ASCII codes. Fortunately the JNIOR utilizes only a few special keys. With VT-100 emulation these keys are automatically translated into an escape sequence. The custom terminal emulator must enable these translations. The following are used by the command line interface:

Cursor Emulation, Positioning and Editing

Up Arrow	ESC[A
Down Arrow	ESC[B
Right Arrow	ESC[C
Left Arrow	ESC[D
Home Key	ESC[1~
End Key	ESC[4~
Page Up Key	ESC[5~
Page Down Key	ESC[6~
Ins Key	ESC[2~

Note that the Backspace Key is assumed to translate to an ASCII 0x08. The Delete Key (Del) should translate to an ASCII 0x7F (127) code. In terminal programs (e.g. PuTTY) this behavior can be customized.

CONTROL CODES

Control codes are ASCII values between 0 and 0x1F (31 decimal) inclusive. They have various meanings. In particular the following are used by the JNIOR.

Ctrl-A 0x01 (1 decimal)
toggles anchor used in text selection [2]

Ctrl-C 0x03 (3 decimal)
cancels current actions, displays the banner, editor selection copy [2]

Ctrl-H 0x08 (8 decimal)
backspace - Backspace Key

Ctrl-I 0x09 (9 decimal)
tab toggles filename auto-fill [1], advances to tab stops in editing [2] - Tab Key

Ctrl-M 0x0D (13 decimal)
Carriage return Enter Key

Ctrl-Q 0x11 (17 decimal)
Exits editor [2]

Ctrl-V 0x16 (22 decimal)
Editor selection paste [2]

Ctrl-X 0x18 (24 decimal)
Editor selection cut [2]

Ctrl-Y 0x19 (25 decimal)
Editor Redo [2]

Ctrl-Z 0x1A (26 decimal)
Editor Undo [2]

Ctrl-[0x1B (27 decimal)
Editor Escape [2] - Esc Key

[1] JNIOR Series 4 feature
[2] JANOS v2 feature.

SCREEN EDITOR

The JNIOR Series 3 and Series 4 with JANOS v1 operating code do not utilize escape sequences to manipulate displayed character data. The following are required by JANOS v2 specifically to support the the screen editor [EDIT](#) . Where shown the '#' is replaced by a numeric value represented by ASCII digits. This indicates the number of times that the action is to be repeated. If the decimal value is omitted it is assumed to be one (1).

Move cursor Up	ESC[#A
Move cursor Down	ESC[#B
Move cursor Right	ESC[#C
Move cursor Left	ESC[#D
Erase from cursor to end of line	ESC[K
Format character normal	ESC[0m
Format character reverse video (selected)	ESC[7m
Disable Line Wrap	ESC[?1

Note that the UP and DOWN arrow movements move to the same column in the line above or below on the display respectively. If the destination line is shorter and does not extend to the target column the cursor is moved to the after the last position on the new line. A RIGHT arrow is ignored once the cursor reaches the end of the line. A LEFT arrow is ignored if the cursor is positioned at the beginning of the line. In other words there is no wrap. The logic for this is handled by JANOS. So if your terminal emulation handles movements differently the result should still be as described here.

The Disable Line Wrap escape sequence is sent when the screen editor is started. Lines that wrap would cause confusion with page oriented editing. This wrapping feature is to be disabled. The character formatting is used in highlighting characters when being selected for Copy, Cut and Paste operations. The editor cannot detect the state of the Shift key and relies on dropping the Ctrl-A anchor to start highlighting. Characters are then highlighted as the cursor is moved. Terminal emulation that does not support the formatting of individual characters (e.g. HTML textarea) can accomplish the selection highlighting by some other means. The formatting escape sequences should be ignored in that case. The cursor movement and line erasure escape sequences are critical in enabling a functional screen oriented editor.

Tasker**Tasker Application****DESCRIPTION**

Tasker is an application for the Series 4 JNIOR. Tasker is a newly redesigned version of Task Manager. It is completely web based.

Tasks - Tasks are a series of Actions.

Actions - Actions can be a physical action, like pulsing a relay. They can be something non-physical like logging to a file or sending an email. They can be control structure like if or if-else blocks, for loops, and while loops. The if, is-else, and while loops also contain logical evaluations.

Devices - Devices can be used by Tasks. There are multiple type of Devices available. There are currently Ethernet devices and SNMP devices. Serial devices, Projector devices and Sound Processor devices are coming soon.

Loggers - Loggers can be used by Tasks

Signals - Signals give a name to an I/O point on the JNIOR

Triggers - Triggers are Discrete Signals, Continuous Signals, a Signal Control Panel Switch, or Multiple Control Panel Switches

Schedules - Schedules have many Rules. A Rule can be defined by time of day, on sunrise, on sunset, or on boot up. A time of day rule can also be configured with an interval. When an interval is defined, an end time will also be needed. This will allow the interval to occur between the Start Time and the End Time. There are also Daily, Weekly and soon to be Monthly options.

NOTES

Care must be taken to ensure that multiple workspaces don't conflict with each other.

The [email_block](#) is used when using the Email Profile Action

The [SNMP](#) device requires the SNMP Application to be enabled.

JBakup**Log Archiving Service****DESCRIPTION**

The JBakup service accumulates system LOG file data as it ages. Periodically new .LOG.BAK file content is concatenated to any existing LOG.BAK data located in the LOG.ZIP from the /flash/baks folder. The ZIP is updated.

These accumulations are limited in size but generally cover a long period of time.

NOTES

System LOG files age to a corresponding LOG.BAK file when they reach a maximum size (currently 64KB). JBakup generally sleeps and awakes on the quarter hour to look for new LOG.BAK files. These have a date newer than the related LOG.ZIP file located in the flash/baks folder. When found a new LOG.BAK file is appended to the content of the ZIP.

SEE ALSO

HELP Topics: [LOGS](#), [ZIP](#)

FtpClient**User Commands****NAME**

ftp

SYNOPSIS

ftp [OPTIONS] [SERVER]

DESCRIPTION

Files can be transferred on and off of a JNIOR using the File Transfer Protocol (FTP). This typically is performed by a program on a remote computer which works with the JANOS built-in FTP Server. This application allows you to work from the JNIOR Command Line with a remote FTP Server. With this tool you can transfer files to and from a remote machine.

The FTP Client has two modes of operation. In an interactive mode you can query available remote files and make transfers as needed. From the command line you can specify a command file which allows the FTP Client to perform transfers without intervention.

SERVER

If specified the FTP Client will establish the connection with the remote FTP Server. The format is as follows:

```
username:password@server
```

Where 'server' may be given as an IP address or a Domain name. If 'password' is omitted it will be securely requested. If 'username' is omitted both the username and password will be requested. You can use the OPEN command in the interactive session to specify the server.

OPTIONS

-P

Use secure connections.

-V

Verbose mode. The progress of any transfer will be displayed with additional detail.

-C FILE

Specifies a command file which will be used instead of the interactive session.

-H

Or any faulty option will display the legacy built-in Help text for the command.

NOTES

This application program was written as a command line extension and operates as if it were a built-in command.

SEE ALSO

HELP Topics: [FTP_COMMANDS](#)

FTP Client**Interactive Mode****COMMANDS**

help (or ?)
Displays legacy help information.

open SERVER
If SERVER is not specified by the command line this can be used to start a session with the remote FTP server. The format is as follows:

username:password@server

Where 'server' may be given as an IP address or a Domain name. If 'password' is omitted it will be securely requested. If 'username' is omitted both the username and password will be requested.

close
Disconnects from the remote FTP server. The OPEN command can then be used to establish a new connection.

ascii
Operate in ASCII data mode.

binary
Operate in BINARY data mode (Default).

passive
Operate in passive mode. Data is transferred by a separate data connection. In this mode the JNIOR waits for the remote FTP Server to establish the connection.

active
Operate in active mode (Default). In this mode when data is to be transferred the JNIOR works to establish a separate data connection with the remote FTP Server.

secure
Use secure data communications.

plain
Data is transferred in the clear. This is the default.

dir (or ls)
List files available in the remote directory.

cd DIR
Change the remote working directory to DIR.

pwd
Display the current remote directory.

get REMFILE LOCFILE
Copy the remote file REMFILE to the JNIOR as LOCFILE.

put LOCFILE REMFILE
Copy the local file LOCFILE to the remote server as REMFILE.

delete FILE
Remove the file FILE from the remote server.

mkdir DIR
Create the directory DIR on the remote server.

rmdir DIR
Remove the directory DIR from the remote server.

cat FILE
Requests the remote FILE and displays the content.

verbode
Show progress and additional status.

bye, exit, quite
End Session. Either will exit the interactive session and close the connection with the remote server.

SEE ALSOHELP Topics: [FTPCLIENT](#)

INDEX

[\\$BootTime](#), [80](#)
[\\$BuildTag](#), [81](#)
[\\$HOURLMETER](#), [145](#), [159](#)
[\\$LastNtpSuccess](#), [81](#)
[\\$Model](#), [80](#)
[\\$SerialNumber](#), [80](#)
[\\$Version](#), [80](#)
[/WebServer/](#)
 [Path](#), [126](#), [216](#)
 [Root](#), [126](#)
[410](#), [242](#)
[412](#), [242](#)
[412DMX](#), [242](#)
[414](#), [242](#)

-- A --

[ALARMING](#), [146](#), [111-112](#), [152-153](#)
[app](#), [49](#)
[applications](#), [212](#)
[arc](#), [38](#), [214](#)
[archive](#), [38](#)
[ARP](#), [71](#), [13](#), [28](#)
[array_remove\(\)](#), [230](#)
[ASCII](#), [263](#), [42](#), [56](#), [168](#), [172](#)
[Auth_Digest](#), [211](#)
[Authentication](#), [99](#)
[AUX](#), [247](#), [165](#)
[AUX_FLOW](#), [168](#), [169](#)
[AUX_PORT](#), [247](#), [166-169](#), [246](#)
[AUX_RS485](#), [169](#), [168](#)
[AUX_serial](#), [166](#)
[AUX_settings](#), [167](#)
[AUXSerial/](#)
 [Baudrate](#), [167](#)
 [Databits](#), [167](#)
 [Flow](#), [168](#)
 [Parity](#), [167](#)
 [RS485](#), [169](#)
 [Stopbits](#), [167](#)
[AUXSerialPort Class](#), [248](#)

-- B --

[base64_decode\(\)](#), [230](#)
[base64_encode\(\)](#), [230](#)
[BATCH](#), [32](#), [47](#), [50](#), [257](#)
[BEACON](#), [137](#), [8](#)
[Beacon/](#)
 [Announce](#), [137](#)
 [AutoAnnounce](#), [138](#), [137](#)
 [Enabled](#), [137](#), [138](#)
[bin2hex\(\)](#), [229](#)

[BLOCK_EMAIL](#), [115](#)
[bye](#), [25](#)

-- C --

[cat](#), [42](#), [241](#), [255](#), [265](#)
[cd](#), [24](#)
[Certificate](#)
 [Common Name](#), [105](#)
 [Contact Email](#), [106](#)
 [Country](#), [103](#)
 [Expiration](#), [107](#)
 [Locality](#), [104](#)
 [Organization](#), [104](#)
 [Organizational Unit](#), [105](#)
 [SHA1 Use](#), [107](#)
 [State](#), [104](#)
 [Subject Alternate Name](#), [106](#)
[certificates](#), [103](#)
[certmgr](#), [68](#), [98](#), [102-107](#), [119](#)
[CHDIR](#), [24](#)
[chdir\(\)](#), [233](#)
[CHGRP](#), [66](#), [32](#), [41](#), [65](#)
[CHMOD](#), [40](#), [32](#), [123](#)
[CHOWN](#), [41](#), [32](#)
[CKSUMS](#), [239](#), [17](#), [52](#), [217](#), [226](#)
[COM](#), [246](#), [136](#), [165](#)
[com.integpg.comm.COMSerialPort](#)
 [Class](#), [170](#)
[COM_FLOW](#), [172](#), [171](#)
[COM_PORT](#), [246](#), [169-172](#), [248](#)
[COM_SERIAL](#), [169](#), [8](#)
[COM_setting](#), [170](#)
[comment](#), [51](#)
[COMPILING](#), [213](#)
[Compression](#), [173](#), [174](#)
[COMSerial/](#)
 [Baudrate](#), [170](#)
 [BootDialog](#), [170](#)
 [Databits](#), [170](#)
 [Flow](#), [172](#)
 [Parity](#), [170](#)
 [Stopbits](#), [170](#)
[COMSerialPort.setBootDialog\(\)](#)
 [Method](#), [170](#)
[conditioning](#), [148](#), [152](#)
[configuration](#), [78](#)
[console](#), [136](#)
[control](#), [185](#)
[copy](#), [35](#), [36](#)
[count\(\)](#), [229](#)
[count trigger](#), [156](#)

INDEX (cont'd)

counting, [146](#), [154-157](#)
counts, [146](#)
cp, [35](#)
crc(), [229](#)

-- D --
DATE, [26](#), [13](#), [28](#), [81-82](#), [89](#), [254](#)
date(), [231](#)
debounce, [142](#), [143](#), [149](#)
DEFAULT_ACCOUNTS, [100](#), [61-65](#), [99-101](#)
del, [34](#)
delete, [34](#)
Device/
 Desc, [81](#)
 ResetAction, [82](#)
 Timezone, [82](#)
Devices, [207](#)
DHCP, [83](#)
diagnostic_port, [169](#)
DIN, [139](#), [145-153](#)
DIR, [33](#), [17](#), [37-38](#), [48](#), [75](#)
docs, [251](#)
doubleval(), [230](#)

-- E --
echo, [52](#), [241](#)
ed, [44](#)
edit, [44](#)
editor, [44](#)
egrep, [43](#), [262](#)
Email/
 Attachments, [116](#)
 BccAddress, [114](#)
 CcAddress, [114](#), [113](#)
 HTML, [117](#), [116](#)
 Message, [115](#), [116](#)
 MessageFile, [116](#), [115](#)
 Port, [118](#), [119](#)
 RetryCount, [120](#), [121](#)
 RetryDelay, [120](#)
 Signature, [121](#)
 SMTPS, [119](#), [118](#)
 StartTLS, [119](#), [118](#)
 Subject, [115](#), [114](#)
 ToAddress, [113](#), [117](#)
EMAIL_BLOCK, [113](#), [110](#), [114-117](#),
 [120-121](#), [153](#)
empty(), [234](#)
endian(), [230](#)
endsWith(), [229](#)
ENVIRONMENT, [256](#), [51](#)

ereg(), [235](#)
ereg_replace(), [236](#)
eregi(), [235](#)
eregi_replace(), [236](#)
errors, [237](#)
etc, [250](#)
etc/
 JanosClasses.jar, [250](#)
events, [108](#)
Events/
 OnAlarm, [111](#), [112](#), [146](#)
 OnAlarm1, [111](#)
 OnAlarm2, [111](#), [146](#)
 OnBoot, [108](#)
 OnConfig, [112](#)
 OnUsage, [112](#), [111](#), [146](#)
 Services, [108](#)
Events/OnBoot/
 Email, [109](#), [108](#)
 EmailBlock, [110](#)
 RunEnable, [110](#)
Events/OnConfig/
 Email, [112](#)
 EmailBlock, [113](#)
EventsOnAlarm1, [146](#)
exit, [25](#)
expansion_bus, [249](#)
extern, [55](#)

-- F --
factory, [14](#)
factory_reset, [17](#), [20](#)
fclose(), [232](#)
feof(), [232](#)
file_crc(), [233](#)
file_exists(), [232](#)
file_md4(), [233](#)
file_md5(), [233](#)
file_sha1(), [233](#)
file_sha2(), [233](#)
filemtime(), [232](#)
files, [32](#), [41](#), [65-66](#), [128](#)
filesize(), [232](#)
FILTER, [257](#), [67](#), [260](#)
FILTERING, [257](#), [93-95](#), [98](#)
find, [43](#)
FLASH, [250](#), [14](#)
flash/
 ftp.jar, [271](#)
 JBakup.jar, [270](#)
floatval(), [230](#)

INDEX (cont'd)

flush(), [235](#)
fopen(), [232](#)
formalities, [1](#)
fread(), [232](#)
ftp, [271](#)
ftp.jar, [271](#)
FTP/
 Port, [134](#)
 Server, [134](#), [135](#)
 UnixStyle, [135](#), [134](#)
FTP_COMMANDS, [272](#), [271](#)
FTPCLIENT, [271](#), [134-135](#), [214](#), [273](#)
functions, [225](#)
fwrite(), [232](#)

-- G --
gc, [54](#)
getcwd(), [233](#)
getRegistryBoolean(), [235](#)
getRegistryList(), [235](#)
getRegistryString(), [234](#)
Getting_Started, [6](#)
getutc(), [231](#)
gmtime(), [231](#)
grep, [43](#), [262](#)
GROUPADD, [65](#), [66](#)
GROUPDEL, [66](#), [65](#)
GROUPS, [65](#), [32-34](#), [41](#), [61](#), [66](#)

-- H --
header(), [227](#)
help, [3](#), [4-5](#), [20](#), [23](#), [251](#)
hex2bin(), [229](#)
HIST, [25](#), [23](#), [262](#)
history, [25](#)
HOSTNAME, [29](#), [24](#), [72](#), [86](#), [96-97](#), [107](#)
HourMeter, [151](#), [161](#)

-- I --
including, [236](#)
INI, [32](#)
initial_files, [15](#)
INITIALIZE, [179](#), [178](#), [182](#)
INPUTS, [245](#), [140-142](#), [148](#), [242-244](#)
intval(), [230](#)
inversion, [141](#), [148](#), [152](#)
IO/
 Inputs, [139](#)
 Outputs, [160](#)
IO/Inputs/
 Log, [145](#), [144](#), [150](#)
 IO/Inputs/[DIN]/
 \$HourMeter, [151](#)
 Alarming, [152](#)
 Conditioning, [148](#), [141](#)
 CountState, [154](#)
 Debounce, [149](#), [142](#), [148](#)
 Desc, [147](#), [140](#)
 Inversion, [148](#), [141](#)
 Latching, [149](#), [143](#)
 LatchState, [150](#), [149](#)
 LatchTime, [150](#), [149](#)
 Log, [150](#), [145](#)
 OffDesc, [147](#)
 OnDesc, [147](#)
 UsageState, [158](#)
 IO/Inputs/[DIN]/Alarm/
 Email, [153](#), [152](#)
 EmailBlock, [153](#)
 HoldOff, [153](#)
 Inversion, [152](#)
 IO/Inputs/[DIN]/Alarm[N]/
 Email, [157](#)
 EmailBlock, [157](#)
 HoldOff, [157](#)
 OnAlarm, [157](#)
 IO/Inputs/[DIN]/Count/
 Alarm[N], [156](#)
 Limit[N], [156](#)
 Multiplier, [155](#), [154](#)
 SampleTime, [155](#)
 Units, [154](#), [155](#)
 IO/Inputs/[DIN]/Usage/
 Alarm, [158](#)
 Email, [158](#)
 EmailBlock, [158](#)
 HoldOff, [158](#)
 Limit, [158](#)
 OnAlarm, [158](#)
 IO/Outputs/
 Log, [164](#)
 IO/Outputs/[ROUT]/
 \$HourMeter, [161](#)
 ClosedDesc, [160](#)
 Desc, [160](#)
 InitialState, [161](#)
 Log, [164](#)
 OpenDesc, [160](#)
 UsageState, [162](#)
 IO/Outputs/[ROUT]/Usage/
 Alarm, [162](#)
 Email, [162](#)

INDEX (cont'd)

- EmailBlock, [162](#)
- HoldOff, [162](#)
- Limit, [162](#)
- OnAlarm, [162](#)
- iolog, [56](#), [59](#), [144-145](#), [150](#),
[164-165](#), [169](#), [246](#)
- IPADDRESS, [84](#)
- IPCONFIG, [27](#), [8](#), [13](#), [46](#), [71-72](#),
[83-85](#)
- IpConfig/
 - Allow, [98](#)
 - CaptureBuffer, [93](#)
 - CaptureFilter, [95](#)
 - DHCP, [83](#)
 - DNSTimeout, [88](#)
 - Domain, [86](#)
 - EmailAddress, [88](#), [106](#), [109](#), [113](#)
 - GatewayIP, [84](#)
 - HostName, [86](#), [29](#)
 - IPAddress, [83](#)
 - LLMNR, [96](#)
 - MailHost, [87](#), [109](#)
 - MTU, [90](#)
 - NetBIOS, [97](#)
 - NTPServer, [88](#)
 - NTPUpdate, [89](#)
 - Password, [87](#)
 - PrimaryDNS, [85](#)
 - Promiscuous, [94](#)
 - SecondaryDNS, [85](#)
 - ShowPass, [96](#)
 - SubnetMask, [84](#)
 - SyslogServer, [91](#)
 - TTL, [90](#)
 - Username, [87](#)
- IpConfig/Keepalive/
 - Interval, [92](#)
 - Retry, [92](#)
 - Time, [92](#)
- IpConfig/Socket/
 - ConnectTimeout, [93](#)
- is_array(), [234](#)
- is_bool(), [234](#)
- is_dir(), [233](#)
- is_double(), [234](#)
- is_file(), [232](#)
- is_int(), [234](#)
- is_null(), [234](#)
- is_string(), [234](#)
- isset(), [234](#)
-
- J --
- JanosClasses.jar, [250](#), [213-214](#)
- jar, [38](#), [214](#)
- java, [49](#), [53](#), [212-214](#), [250](#)
- JBAKUP, [270](#), [170](#), [214](#)
- JBakup.jar, [270](#)
- JMP, [175](#), [127-131](#), [146](#), [151](#), [161](#),
[177](#)
- Block Command, [186](#)
- Close Command, [185](#)
- Console
 - Close, [203](#)
 - Open, [201](#)
 - Stdin, [202](#)
 - Stdout, [202](#)
- Digest Calculation, [179](#)
- Enumerate Devices, [205](#)
- Expansion Modules, [207](#)
- File
 - List, [189](#)
 - Mkdir, [195](#)
 - Read, [190](#)
 - Remove, [193](#)
 - Rename, [194](#)
 - Write, [192](#)
- Initial Connection, [179](#)
- Message Structure, [181](#)
- Meta Data, [182](#)
- Monitor Message, [183](#)
- Open Command, [186](#)
- Port Connection, [175](#)
- Read Devices, [206](#)
- Registry
 - List, [196](#)
 - Read, [198](#)
 - Update, [196](#)
 - Write, [199](#)
 - Write Encrypted, [200](#)
- Reset Counter, [187](#)
- Reset Latch, [187](#)
- Reset Usage, [188](#)
- Secure Connection, [178](#)
- Status Request, [184](#)
- Toggle Command, [185](#)
- Websocket Connection, [175](#)
- Write, [207](#)
- JMP_Console, [201](#)
- JMP_Externals, [205](#)
- JMP_file, [189](#)
- JMP_Logging, [210](#)
- JMP_Registry, [196](#)

INDEX (cont'd)

JMP_RTC, [209](#)
 JMP_Shutdown, [209](#)
 JMPCONNECT, [175](#), [178-182](#)
 JMPServer/
 Anonymous, [130](#), [129](#)
 Login, [129](#), [130](#)
 Port, [129](#)
 Server, [129](#)
 JniorServer/
 Anonymous, [132](#), [131](#)
 Login, [131](#), [132](#)
 Port, [131](#)
 RemoteIP, [133](#), [132](#)
 RemotePort, [133](#)
 Server, [131](#)
 JPROTOCOL, [265](#), [131-133](#), [146](#), [151](#),
 [161](#)
 JRFLASH, [77](#), [73](#), [250](#)
 JRMON, [57](#), [56](#), [144-146](#), [150-151](#),
 [156](#), [159](#)
 JRUPDATE, [76](#), [14](#), [73](#), [250](#)
 JSON, [265](#), [42](#), [75](#), [175-177](#)
 json_decode(), [233](#)
 json_encode(), [234](#)
 json_load(), [234](#)
 json_save(), [234](#)
 JVM, [212](#), [214](#), [250](#)

 -- K --
 KEYBOARD, [6](#)
 keys, [30](#)
 KILL, [53](#), [52](#), [110](#)

 -- L --
 LATCHING, [143](#), [142](#), [150-152](#)
 library, [227](#)
 Licensing, [2](#)
 locators, [126](#)
 LOGGER, [47](#), [28](#), [91](#)
 logging, [144](#), [145](#), [150](#)
 LOGS, [254](#), [109](#), [116](#), [270](#)
 LS, [33](#), [32](#), [37-38](#), [41](#), [48](#), [75](#)
 ltrim(), [228](#)

 -- M --
 man, [3](#)
 MANIFEST, [74](#), [17](#), [42](#), [265](#)
 MANUAL, [251](#), [3-5](#)
 MD, [37](#), [24](#)
 md4(), [229](#)
 md5(), [229](#)

 MESSAGING, [181](#), [180](#)
 metering, [145](#), [151](#)
 MKDIR, [37](#), [24](#), [38](#)
 mkdir(), [233](#)
 mode, [60](#), [165](#), [169-170](#)
 MODELS, [242](#), [140](#), [165](#), [243-249](#)
 monitor, [183](#)
 MORSE_CODE, [264](#), [8](#)
 MOVE, [36](#), [35-37](#)
 mv, [36](#)

 -- N --
 nbtstat, [72](#), [96-97](#)
 NETSTAT, [67](#), [22](#), [56](#), [93-95](#), [250](#), [260](#)
 NETWORK, [67](#), [8](#)
 network_access, [7](#), [265](#)
 network_basics, [9](#)
 NSLOOKUP, [72](#), [13](#), [28](#)
 nv, [54](#)

 -- P --
 PASSWD, [62](#), [20](#), [100](#)
 password, [62](#)
 permissions, [32](#), [34](#), [41](#)
 PHP, [50](#)
 PHP Script
 Array Functions, [229](#)
 Conversions, [230](#)
 Date & Time, [231](#)
 File Functions, [232](#)
 JSON Functions, [233](#)
 Language Functions, [234](#)
 Output Functions, [227](#)
 Registry Functions, [234](#)
 Regular Expressions, [235](#)
 String Functions, [228](#)
 System Functions, [235](#)
 PING, [70](#), [28](#)
 plain_text, [21](#)
 POWER_SUPPLY, [243](#), [6](#)
 print(), [227](#)
 printf(), [227](#)
 processes, [52](#)
 program, [49](#)
 PROGRAMMING, [212](#), [49](#), [213](#), [250](#)
 PROMPT, [24](#), [23-25](#)
 PS, [52](#), [49](#), [53](#), [110](#)
 puts(), [227](#)
 PWR, [243](#), [6](#), [242](#)

INDEX (cont'd)

-- Q --

quit, [25](#)

-- R --

rd, [38](#)
 REBOOT, [73](#), [18](#)
 reclaim, [77](#)
 RefPoint, [74](#)
 REG, [30](#), [18](#), [23](#), [78-79](#), [140](#), [262](#)
 REGEX, [261](#), [25](#), [43](#)
 REGISTRY, [78](#), [17](#)
 Registry_use, [79](#)
 RELAYS, [244](#), [242](#), [245](#)
 rem, [51](#)
 remark, [51](#)
 remove, [34](#)
 ren, [37](#)
 RENAME, [37](#), [36](#)
 rm, [34](#)
 RMDIR, [38](#), [37](#)
 rmdir(), [233](#)
 ROUT, [160](#)
 rsa_keys, [102](#), [103](#)
 rtrim(), [228](#)
 run, [50](#), [217-219](#)
 running, [52](#)

-- S --

SAFEMODE, [260](#), [20](#), [61-62](#), [98](#), [101](#),
[110](#)
 scandir(), [233](#)
 SCRIPT, [218](#), [52](#), [217](#), [222-226](#), [236](#)
 SCRIPTING, [217](#), [47](#), [50](#), [219](#)
 security, [178](#), [177](#), [180](#)
 SENDMAIL, [46](#), [28](#), [87-88](#), [109](#)
 sensor_port, [249](#)
 serial, [165](#)
 serial_access, [7](#)
 serial_ports, [247](#)
 set, [51](#)
 setenv, [51](#), [257](#)
 setRegistryString(), [235](#)
 settings, [30](#)
 sha1(), [229](#)
 sha2(), [229](#)
 sleep(), [235](#)
 split(), [235](#)
 spliti(), [235](#)
 sprintf(), [229](#)
 SSL/
 Enabled, [98](#), [119](#)

 Required, [99](#)
 SSL/Cert/
 C, [103](#)
 CN, [105](#), [106](#)
 Days, [107](#), [106](#)
 E, [106](#)
 L, [104](#)
 O, [104](#)
 OU, [105](#), [104](#)
 SAN, [106](#)
 SHA1, [107](#)
 ST, [104](#), [103](#)
 startsWith(), [229](#)
 STATEMENTS, [223](#), [222](#)
 STATS, [73](#)
 status, [184](#)
 strcmp(), [229](#)
 stripos(), [228](#)
 strlen(), [228](#)
 strpos(), [228](#)
 stripos(), [228](#)
 strrpos(), [228](#)
 strtolower(), [228](#)
 strtoupper(), [228](#)
 strval(), [228](#)
 SubnetMask, [84](#)
 substr(), [228](#)
 SUPPORT, [5](#), [3](#), [251](#)
 syslog(), [235](#)

-- T --

tab, [23](#), [24-25](#), [32](#), [77](#)
 Tasker, [269](#)
 telnet, [136](#)
 Telnet/
 Port, [136](#)
 Server, [136](#)
 TEMP, [250](#), [14](#)
 THD, [53](#), [49](#), [52](#)
 threads, [53](#)
 time(), [231](#)
 timezones, [251](#)
 touch, [48](#)
 trigger point, [156](#)
 trim(), [228](#)
 type, [42](#)

-- U --

ucfirst(), [228](#)
 ucwords(), [228](#)
 unlink(), [232](#)

INDEX (cont'd)

unpack(), [230](#)
 uptime, [73](#)
 urldecode(), [230](#)
 urlencode(), [230](#)
 usage, [145](#)
 USER, [64](#)
 USERADD, [64](#), [20](#), [61](#), [65](#)
 USERDEL, [65](#), [20](#), [61](#), [64](#), [100](#)
 USERMOD, [63](#), [20](#), [61](#), [64](#), [100](#)
 USERS, [61](#), [20](#), [32-34](#), [41](#), [63-65](#),
 [100](#), [123](#)
 Users/
 IgnoreDefault, [101](#)
 USERS_MANUAL, [251](#), [4](#)

 -- V --
 var_dump(), [227](#)
 VARIABLES, [220](#), [219](#), [224-226](#)
 VT100, [266](#)

 -- W --
 WebServer, [215](#), [216-217](#)
 WebServer/
 Anonymous, [123](#)
 Index, [124](#)
 Locator, [126](#)
 Login, [123](#), [124](#)
 Path, [125](#), [124](#)
 Port, [122](#)
 Public, [126](#)
 Root, [124](#), [122](#)
 Server, [122](#), [215](#)
 SSLPort, [122](#)
 website, [215](#)
 websocket, [127](#), [128](#), [215](#)
 Websocket/
 Anonymous, [127](#)
 Console, [128](#)
 Files, [128](#)
 Login, [127](#), [128](#)
 WEBUI, [216](#), [79](#), [215](#)
 WebUI_Help, [4](#)
 WHOAMI, [67](#), [20](#)

 -- Y --
 yield(), [235](#)

 -- Z --
 zip, [38](#), [124-125](#), [173-174](#), [215](#), [270](#)
 Zip/
 Depth, [173](#)
 Window, [173](#)