dB BROADCAST

INNOVATE | COLLABORATE | DELIVER

Cardinal Intelligent MDU Range

This handbook applies to models iMDU12B-S

iMDU12B-D

Handbook Version 1.0

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Contents

Introduction

The Cardinal range of intelligent mains distribution units provide 12 separate outputs, an SNMP interface, email messaging, a choice of single or dual inputs, with optional external temperature and humidity sensing in a 1RU rack.
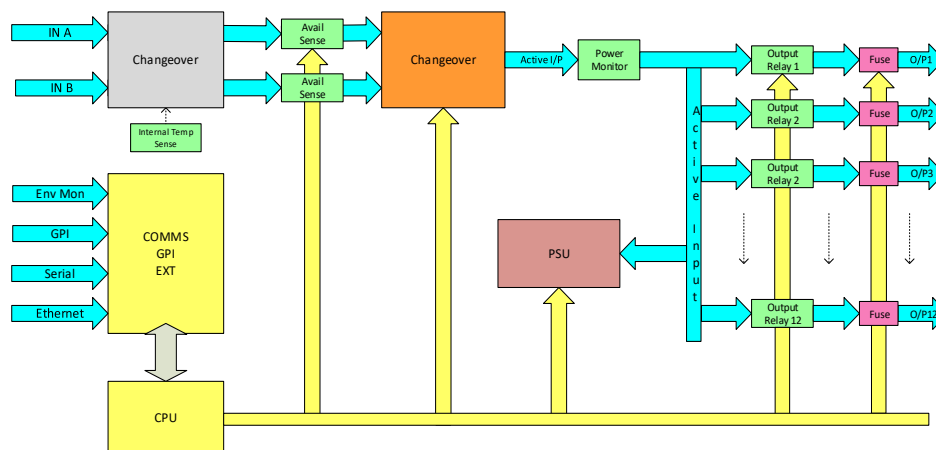

Figure 1: Cardinal iMDU block diagram (dual input version)

The dual input version enables main and back-up power sources to be connected to a single Cardinal unit.

Main features

- Single and dual input versions with Neutrik Powercon inlets
- 12 fused IEC outputs with LED fuse failure indication
- Automatic power shedding
- Sequential power on/off (some models)
- Input Power Monitoring
- Network interface with web configuration via web browser
- Serial interface for initial IP address configuration as well as optional Environmental Monitoring (external temperature/humidity sensor)
- Optional integral temperature/humidity sensor.
- SNMP interface
- Email alerts
- Logging
- Sixteen GPIs (general purpose inputs)
- Over current trip
- Turn on sequentially or with all outputs on (fail safe option)
- Cable tie bar included at rear

Dual input version

The dual input version enables main and back-up power sources to be connected to a single Cardinal unit. Switching to the back-up input supply is automatic on power fail of the main source. The changeover system allows non phase inputs to be switched up to 650V.

Automatic power shedding

If a backup power supply is selected, it may be necessary to switch off non-critical equipment by shedding several iMDU outputs. Power shedding is configured for automatic operation in the iMDU configuration page.

Sequential power on/off

All outlets are individually switched enabling sequential switching to prevent an excessive current surge on start-up and an orderly power-down when shedding outputs. This does not apply to fail safe models, where outputs are ON at power up.

Input Power Monitoring

Input power monitoring of Power, Current, Voltage and Power Factor.

Network interface

The dB Cardinal intelligent mains distribution unit provides fully featured web and SNMP interfaces giving easy access to sophisticated remote control and configuration facilities.

Email/SNMP alerts

The Cardinal range can be configured to provide email and SNMP alerts for various conditions including; loss of input mains power, blown fuses, output status changing (i.e. relay on or off).

Power-off fault alerts

On loss of mains input capacitors sustain the microcontroller sufficiently (around 10 seconds) to record the fault and send SNMP traps and/or emails to alert the management system of the loss.

Logging

As well as error logging the iMDU records five days of the following:

- Peak input voltage per input
- Minimum input voltage per input

Fail safe

Fail safe ensures that all outputs are ON at power up. If the control system were to fail, all outputs remain ON and can no longer be controlled.

Temperature and Humidity sensing

An optional temperature and humidity sensor can be fitted either integral or added remotely for environmental monitoring at any position within the equipment bay.

General purpose inputs

Each iMDU includes 16 general purpose inputs for connection of alarms from other equipment. These alarms can be reported in the same way as those for the iMDU.

Thermal breaker

The front panel on-off switch acts as a thermal breaker set to operate when a load of approximately 12A occurs.

Variants

iMDU12A-S

A single input iMDU with 12 independent outputs. It can be configured to send SNMP traps and email alarms when faults occur, including loss of input mains power and blown fuses. The unit includes an error log to record trends on equipment failure.

iMDU12A-D

A dual input iMDU with 12 independent outputs. If input 1 fails the unit automatically connects input 2 to the 12 outputs. It can be configured to send SNMP traps and email alarms when faults occur, including loss of input mains power and blown fuses. It includes an error log.

IMDU12-F

Failsafe (instead of sequential start). Includes inrush current protection if fitted to iMDU12A-D

IMDU12-H

Integral humidity & temperature sensor

IMDU12-R

Controller reset, -H & -R are mutually exclusive

IMDU12-O-H

External humidity & temperature sensor, requires cable iMDU12-O-C-3

iMDU12-O-C-3

Cable for sensor, serial screened, length 3m

Software and hardware control

The front panel provides monitoring of each output's availability as well as both access and monitoring of each output fuse. For full configuration and monitoring, each Cardinal unit has its own web-based configuration tool, which is accessed from its IP address.

The default IP address configured at the factory is 192.168.0.161. The first step in configuring multiple units is to ensure that each Cardinal unit has its own unique IP address.

Refer to the [Configuration and Operation](#) chapter for further detail.

Installation

Rack mounting and ventilation

⚠️ **Warning, installation instructions are for trained personnel. To avoid electric shock do not attempt service or internal configuration unless qualified to do so. Always disconnect all applicable mains supplies before removing any covers.**

Install Cardinal iMDUs in a standard 19 inch rack as follows:

- install each unit into its own support tray to help bear the combined weight of the unit and any cables attached to the rear tie-bar

- ensure an adequate supply of forced cool air

- before powering the unit, ensure that the protective earth terminal of the unit is connected to the protective conductor of the mains cord

- if necessary, connect one of the earth screw terminals points to a technical earth

- connect the supplied power cord(s) to the Neutrik Powercon connectors at the rear of the frame and to a suitable mains supply

- connect the Network interface to a PC via a LAN and optionally connect the 6 way RJ11 serial interface to the serial port of a PC (may be required for initial configuration)

- if required connect GPI external control and monitoring using the 26 way GPIO port

- connect to 12 mains loads to the fused IEC connectors at the rear of the frame

- ensure that no single load exceeds the current rating for a single output (normally 6A) or for the installed fuse in that output (default 5A slow-blow) if lower

- Ensure that the inrush current for an output does not exceed 60A or permanent damage may occur.

- ensure that the total current from all outputs does not exceed the total current specification for the unit (12A). It is not recommended that the unit be used continuously above 10A.

- Fit the **iMDU12-O-H** Temperature and Humidity sensor with Cardinal powered off.

- power the unit when ready and monitor the unit using the LEDs on the front panel and via the unit's web interface

Refer to factory before installing multiple units without gaps.

Refer to the Operation chapter for system and configuration settings.

Rear I/O

Figure 2: Single and Dual input version rear panel view

RJII 6-way serial/ext temp port showing null modem cable wiring

Pin	Signal	Destination (i.e. RS232 9 pin male)
1	0V	Pin 5 - GND
2	TXD	Pin 2 - RX
3	RXD	Pin 3 TX
4	NC	
5	RC2	Use only for optional external temp sensor
6	+5V	Do not use as a supply

Note

Use null modem wiring shown to connect to serial PC port.

RJ45 8-way Ethernet port

Pin	Signal
1	TPOUT+
2	TPOUT-
3	TPIN+
4/5	NC
6	TPIN-
7/8	NC

Note

Use a standard Ethernet cable to connect to a network.

26 way GPI port

Pin	Signal	Pin	Signal	Pin	
1	0V	10	+5V	19	GPI I/P 1
2	GPI I/P 2	11	GPI I/P 3	20	GPI I/P 4
3	GPI I/P 5	12	GPI I/P 6	21	GPI I/P 7
4	GPI I/P 8	13	GPO 1A	22	GPO 1B
5	GPO 2A	14	GPO 2B	23	Spare P1
6	Spare P2	15	0V	24	+5V
7	GPI I/P 9	16	GPI 10	25	GPI 11
8	GPI I/P 12	17	GPI 13	26	GPI 14
9	GPI I/P 15	18	GPI 16		

Note

GPI inputs may be ground or pull ups and GPI outputs may be normally closed or normally open by internal jumper selection as described in [Hardware setup] on page9.

Hardware setup

The only user configurable settings inside the unit are to select GPI inputs between active low and active high and the GPI output contacts between normally closed and normally open.

Since access requires that covers be removed, the warning about disconnecting all mains inputs needs to be repeated.

⚠️ **To avoid electric shock do not attempt service or internal configuration unless qualified to do so. Always disconnect all applicable mains supplies before removing any covers.**
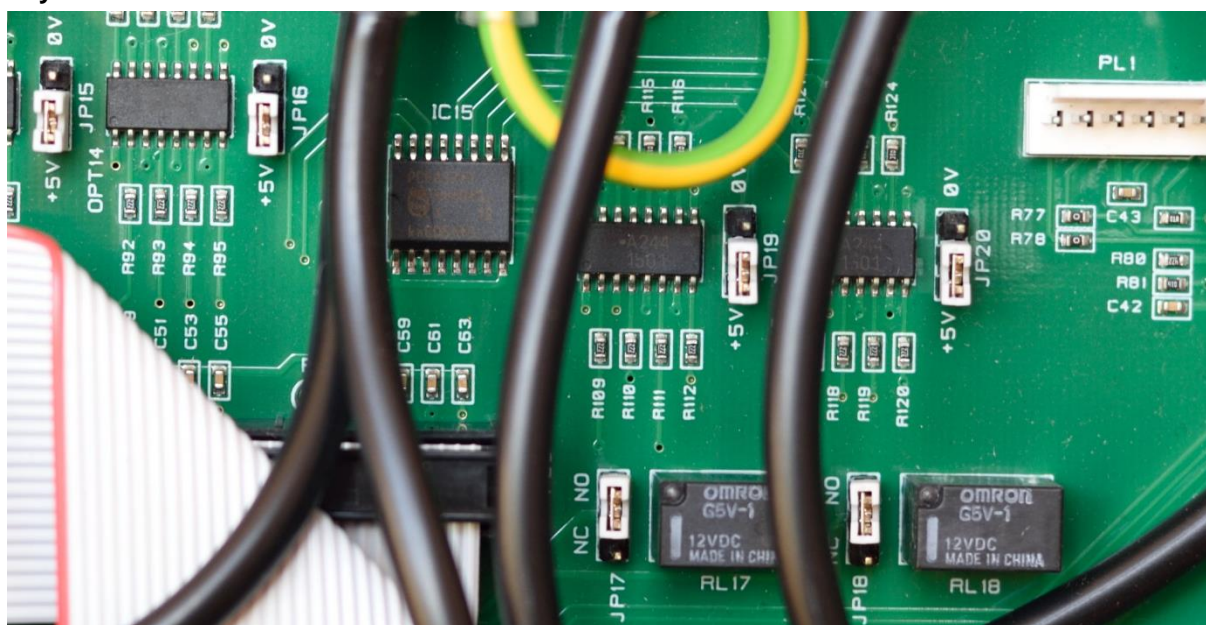

Figure 3: The Cardinal iMDU with the top cover removed showing GPI jumper links

GPI function	Jumper	Comment
Inputs 1 to 4	JP15	For active high select 0V For active low select +5V
Inputs 5 to 8	JP16	For active high select 0V For active low select +5V
Inputs 9 to 12	JP19	For active high select 0V For active low select +5V
Inputs 13 to 16	JP20	For active high select 0V For active low select +5V
Outputs 1A and 2A	JP17	GPI O/P 1A and 2A For normally closed select NC For normally open select NO
Outputs 1B and 2B	JP18	For normally closed select NC For normally open select NO

📝 Note

GPI specifications are given in the [Specification](#) chapter.

Getting Started

Front panel controls and LEDs

The front panel allows basic supply and output availability to be monitored.

The following parameters can be monitored immediately using the LEDs fitted.

Function	LED	Comment
Supply availability	Supply, Green	Shows if the single input iMDU is switched on with power connected
	Active A/B, Green	Shows that the indicated input is currently in use
	Available A/B, Green	Shows if the indicated input of a dual input iMDU is connected (with the unit switched on)
Network	Activity, Yellow	Shows data transfer
	Link, Yellow	Shows basic cable integrity
Fuse	Fuse, Red	Indicates blown fuse
Output	Output, Green	Indicates output is ON

Serial control

Serial control via the six way RJ11 is provided to allow the unit's IP settings to be initially configured as an alternative to using a PC. In normal use the serial port is provided to connect an environmental (temp/humidity) monitoring sensor.

The use of the serial port from a terminal or terminal emulator to set the IP address is covered in the section entitled, Connecting to a unit for the first time.

The web interface

Full control and configuration of a selected Cardinal unit is accomplished via its web interface as described in Using the Web Interface.

Connecting to a unit for the first time

The web interface for configuration and monitoring is obtained by typing a unit's IP address into a browser. The means that the control PC and the Cardinal units must all have IP addresses in the same subnet range.

When a Cardinal iMDU is connected to a network for the first time, its IP address must be changed to a unique address that matches the network it is connected to.

Note

The iMDU can be configured to accept an IP address from a DHCP server, however fixed addressing is normally preferred as it enables specific units to be associated with specific addresses.

There are two ways an iMDU can be configured for network connection.

1. By changing a control PC's IP address to that of the Cardinal unit, configuring its IP settings and then restoring the PC's address
2. By using a serial command to change the IP settings of the Cardinal unit

Which method is used is a matter of convenience. The first method does not require a cable other than a LAN patch cable to be used, whereas the second method requires a null-modem cable with an RJ11 end to be made.

Using a PC

To use a PC to change a unit's IP address, the IP address of the iMDU must first be known. The default IP address of new units shipped from the factory is 192.168.0.161.

Note

If the IP address is no longer known, proceed to the serial setup method.

1. Connect a PC to the iMDU to configure via the network (or via a crossover Ethernet cable)
2. Change the IP address of the PC to the same range as the iMDU (i.e. 192.168.0.160), taking care not to choose an IP address that is already in use
3. Type the current iMDU address into a browser on the PC
4. When the iMDU web page opens enter the new IP address and click on submit
5. Change the PC's IP address to match the iMDU subnet range to regain the unit's web page

Note

Communication with the unit will be lost until the PC's IP address is changed to match the iMDU network

6. Continue configuration as required

Using the serial port

Note

> ***To use the serial port a null-modem cable will be required made according to the table for the [RJ11 6-way](#) connector on page 7.***

Start a terminal session using an emulator such as Hyper Terminal or Putty

Note

> ### *Hyper Terminal*
>
> 1. Use the following port settings, 19,200 Baud, 8 data bits, no parity, 1 stop bit and set flow control to none
> 2. The terminal emulation is not critical, but try VT52 or VT100 if available
> 3. Use the following ASCII setup; Send line ends with line feeds, Echo typed characters locally, Append line feeds to incoming line ends and Wrap lines that exceed terminal width. Leave other settings at their default.
> 4. To discover or specify an IP address use the CLIENT command followed by <CR>

Note

Putty

1. *Set connection type to "serial"*

2. *Category, serial. Port settings. 19,200 Baud, 8 data bits, no parity, 1 stop bit and set flow control to none*
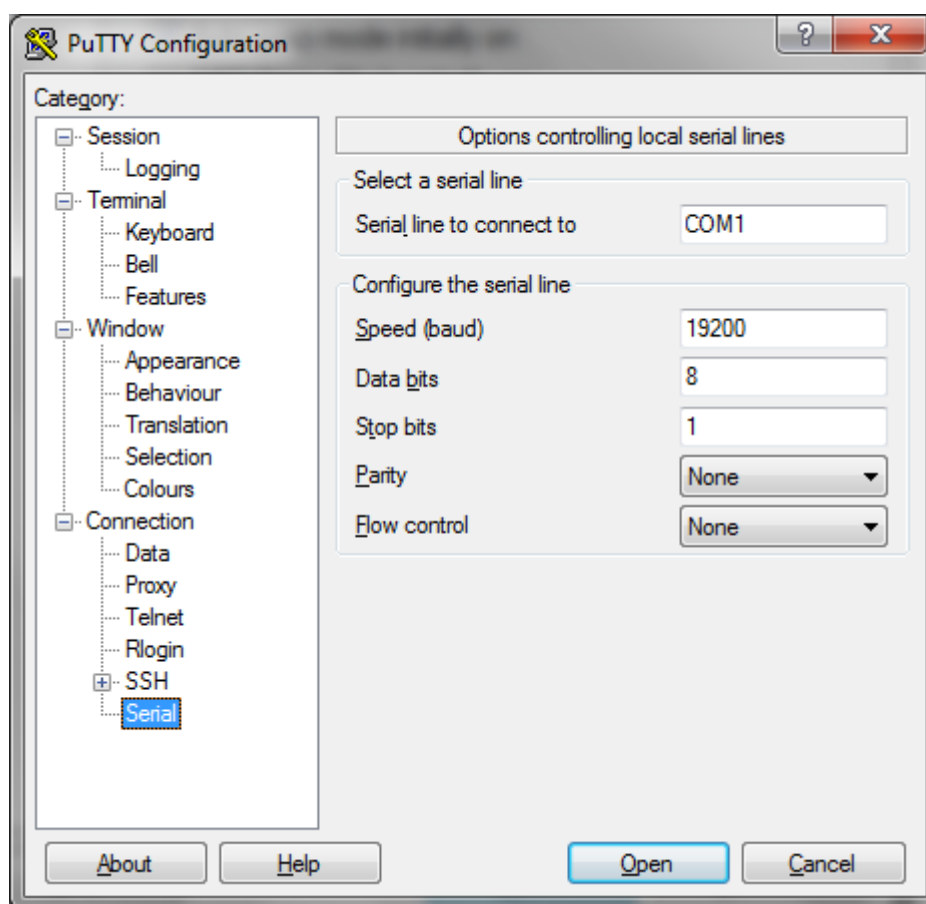
3. Terminal
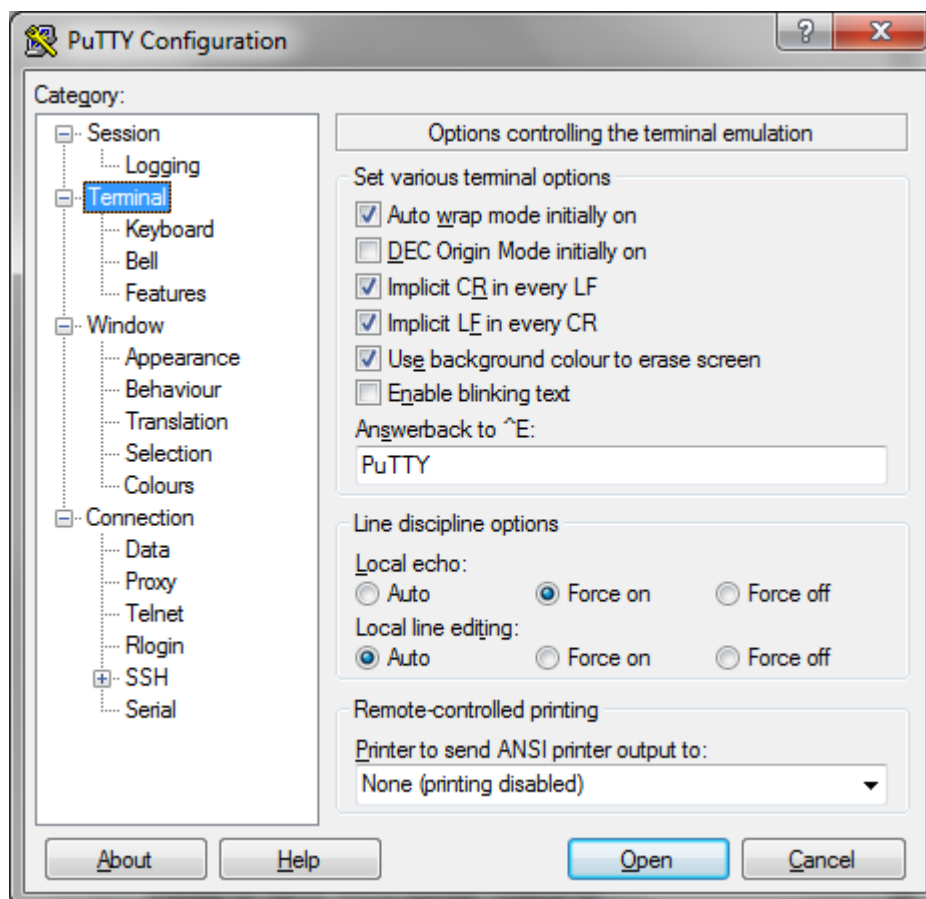
Note: With MDU firmware version 1.0.14 and above implicit CR in every LF and Implicit LF in every CR should be deselected.

4. To discover or specify an IP address use the CLIENT command followed by <CTRL> J

Note

A question mark turns a command into a query

- To display the current address type CLIENT? The IP address will be displayed.
- To specify IP settings type the following:
- CLIENT 192 168.0.49 (or whatever the desired IP address happens to be)
- SUBNET 255.255.255.0 (limits subnet to 256 devices)

Once the IP settings have been entered, the iMDU can be fully configured as explained in Using the Web Interface.

Further serial commands that can be used over the serial interface are described in the Appendix.

Using the Web Interface

Introduction

The web interface is designed to allow users to configure and monitor selected iMDU units over a network using a browser. All users can access status pages but password access is required for configuration pages.

Status information

The *System Status* tab provides Input/output iMDU status while the *About* tab provides read-only details of IP configuration and iMDU unit name, location, firmware and serial number. The System Status tab can allow control of mains output and GPI output relays, see *MDU Configuration* tab for more details

System Status

The web interface opens with the Status tab selected to provide an at-a-glance view of the status of the active mains input, the twelve outputs, the sixteen GPI inputs and the two GPO output relays.

System Status	IP Config	MDU Config	Event Log	Power Log	About

MDU: Cardinal   Date: Tue Feb 11 2020 16:47:28
IP:192.168.137.162   Temp: 30 C
Control: ENABLED   Humidity: 21 %

Input

Input	A	B
Status	Active	Available

Power Monitoring

Voltage	246.5 V
Current	0.1 A
Active Power	0.01 kW
Energy	6.43 kWh (Since 00:19:57 01/01/1970)
Power Factor	-0.65

Output

Number	1	2	3	4	5	6	7	8	9	10	11	12
Name	Out 1	Out 2	Out 3	Out 4	Out 5	Out 6	Out 7	Out 8	Out 9	Out 10	Out 11	Out 12
Switch	T	T	T	T	T	T	T	T	T	T	T	T
Status	On	On	On	On	On	On	On	On	On	On	On	On
Fuse	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

General Purpose Inputs

GPI	1	2	3	4	5	6	7	8
Name	GPin 1	GPin 2	GPin 3	GPin 4	GPin 5	GPin 6	GPin 7	GPin 8
State	Open	Open	Open	Open	Open	Open	Open	Open
GPI	9	10	11	12	13	14	15	16
Name	GPin 9	GPin 10	GPin 11	GPin 12	GPin 13	GPin 14	GPin 15	GPin 16
State	Open	Open	Open	Open	Open	Open	Open	Open

General Purpose Outputs

Relay	1	2
Name	Relay 1	Relay 2
Switch	Relay 1	Relay 2
Status	Off	Off

> *A valid date requires a connection to an NTP server. At first switch-on, the date may appear with the year 1970. Check the NTP server setup if this condition persists.*

Input

Input selected – shows selected input

Power Monitoring

Power Monitoring - shows Input Voltage, Current, Active Power, Energy and Power Factor

Output

Number – output number 1-12 (non-editable field)

Name – output name (editable under MDU Config)

Switch - to operate an output relay, click on the Switch **T** icon. The 'pop up' below is seen.

192.168.137.2 says

Output will be toggled!
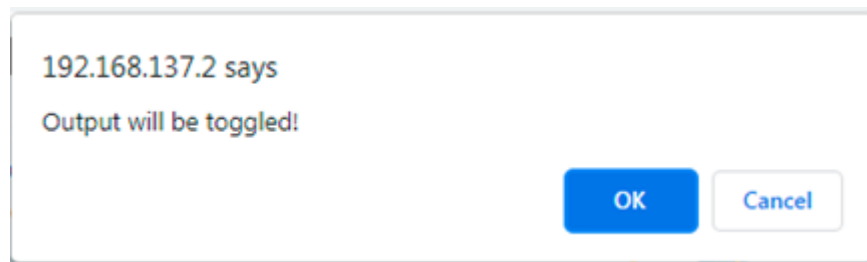
OK   Cancel

'Confirm' to make the change or cancel.

> *A greyed out mains output switch relay indicates it has been locked.*

Output status

Output status is indicated using the following colours.

Status Indication	Description
Off	Off in black against a grey background indicates output is switched off.
On	On in black against a green background indicates output is switched on.
Starting	Starting in black against an orange background indicates an initial start delay is active. Where a start delay has been configured, it occurs during power up and when recovering from a shed output when the mains power is restored. When the start delay ends that output will switch on.
Shedding	Shedding in black against a red background indicates an initial stop or power down delay is active for an output with shedding enabled. When the stop delay ends that output will switch off. Shedding does not occur if the stop delay is zero.

Fuse

If a fuse blows, Failed will appear in black against a red background.

General Purpose Inputs

GPI – up to sixteen GPI inputs (non-editable field)

Name – GPI name (editable under MDU Config)

State – open or closed

General Purpose Outputs

Relay – GPO output relays

Name – GPO name (editable under MDU Config)

Switch - to operate a GPI output relay, click on the Switch **Relay** icon.

Status – Off or on

Temperature and Humidity

If the temperature and Humidity Sensor Option **iMDU12-O-H** is fitted, Temperature and Humidity information appears at the top of the **System Status** web page.

Date: Tue Feb 11 2020 16:47:28
Temp: 30 C
Humidity: 21 %

IP Configuration and MDU Details

The *About* tab provides additional status only information about IP configuration and unit details. It is particularly useful for users without access to password protected configuration screens.

System Status	IP Config	MDU Config	Event Log	Power Log	About

MDU: Cardinal
IP:192.168.137.162

Date: Tue Feb 11 2020 16:43:20
Temp: 30 C
Humidity: 21 %

MDU

Name	Cardinal
Model	Cardinal iMDU12B-D-F-H
Firmware version	1.0.7-H9
Serial number	1
Hardware version	Dual, Failsafe (PCB Rev 0)
External device present	False
Thermometer present	True
Humidity sensor present	True

IP Config

DHCP Settings

DHCP Enabled	False

Current IP Settings

MAC address	00:11:11:11:11:11
IP address	192.168.137.162
Subnet mask	255.255.255.0
Default gateway	192.168.137.10
DNS server 1	192.168.0.2
DNS server 2	192.168.0.3

NTP Settings

NTP server	178.79.152.182

SNMP Settings

SNMP trap destination 1	192.168.137.1
SNMP trap destination 2	192.168.0.6

Email Settings

Email address for alarms	message@gmail.com
SMTP server	192.168.137.1

The unit name and IP configuration data are read only in the **About** tab.

IP Configuration

Access to configuration screens requires a user name and password. The default is 'admin' and 'admin'.

System Status	IP Config	MDU Config	Event Log	Power Log	About

MDU: Cardinal
IP:192.168.137.162
Logout

Date: Tue Feb 11 2020 16:48:55
Temp: 30 C
Humidity: 21 %

Name	Enabled
DHCP	☐

Static IP Settings

MAC address	00:11:11:11:11:11
IP address	192 . 168 . 137 . 162
Subnet mask	255 . 255 . 255 . 0
Default gateway	192 . 168 . 137 . 10
DNS server 1	192 . 168 . 0 . 2
DNS server 2	192 . 168 . 0 . 3

NTP Settings

NTP server	178 . 79 . 152 . 182

SNMP Settings

SNMP trap destination 1	192 . 168 . 137 . 1	☑
SNMP trap destination 2	192 . 168 . 0 . 6	☐
SNMP trap community	trap	
SNMP write community	private	

Email Settings

Email address for alarms	message@gmail.com	☑
Reply email address (from)	cardinal_192@gmail.com	
SMTP server	192.168.137.1	
Email username	message@gmail.com	
Email password	••••••••••	

Submit All

DHCP

Enables or disables DHCP. A reboot is required to make the change.

MAC Address

Displays the MAC address of the iMDU. It is configured at the factory.

IP Address

The IP address currently in use. Changing the address takes effect immediately regardless of the DHCP configuration but will be ignored at boot if DHCP is enabled.

Subnet Mask

The IP subnet mask currently in use. Changing the subnet mask takes effect immediately regardless of the DHCP configuration but will be ignored at boot if DHCP is enabled

Default Gateway

The IP address of the default gateway used for routing. Changing the gateway address takes effect immediately regardless of the DHCP configuration but will be ignored at boot if DHCP is enabled

DNS Servers

The DNS servers are required if any named addresses are used. When DHCP is used these are assigned by the DHCP server.

SNMP Interface

The SNMP interface supports SNMP V1 only. For this reason there is no support for locking and unlocking outputs using the MIB, this has to be carried out using the web page.

Please contact support@dbbroadcast.co.uk to obtain the latest MIB; there are no special states or sequences required for accessing the MIB.

SNMP Trap Destination

The numbered IP addresses of the SNMP trap destinations. The SNMP traps are delivered on a best effort basis via UDP so it is possible traps can be lost in the network.

The Trap IP addresses must be valid IP addresses. If a trap is enabled, the trap must have a valid IP address. Traps will not operate correctly with an enabled invalid IP address.

Communities

The read community is public; write is private.
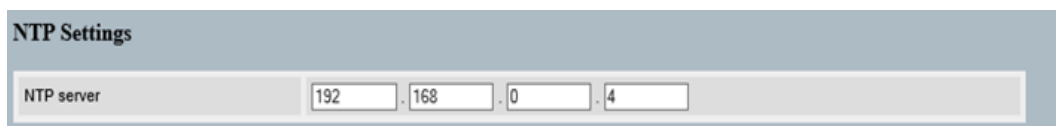
Browsing

Some MIB browsers (such as MG-Soft) use a contact MIB for initial communications. In the case of the Cardinal iMDU the model object in infoGroup is recommended.

NTP Server
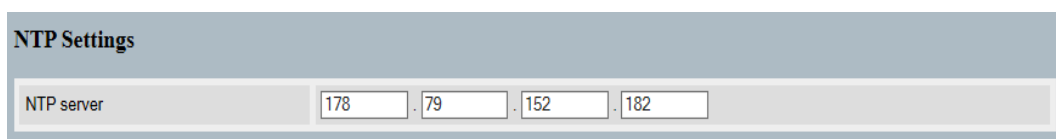
The numbered IP address for the Network Time Protocol server used to set the time in the iMDU. There is no hardware real time clock, so it is necessary to configure an NTP time server for date-stamped event logging.

When Cardinal is connected to a server, NTP IP address will be provided by your IT manager. The NTP server shown below is for the dBBroadcast NTP server which is 192.168.0.4 and is shown as an example.

NTP Settings

NTP server	192	.	168	.	0	.	4

If there is not an NTP server on your Network, an external server will need to be used. An example of an external server is shown below. You must check the owner of the NTP server before use.

NTP Settings

NTP server	178	.	79	.	152	.	182

Cardinal is used without a Network

If Cardinal is connected directly to a PC via its LAN and Wi-Fi used to connect to the internet, the Network Adapter will need to be changed.

Select "wireless Network connection Status" and select "Properties"
Select "Sharing" tab
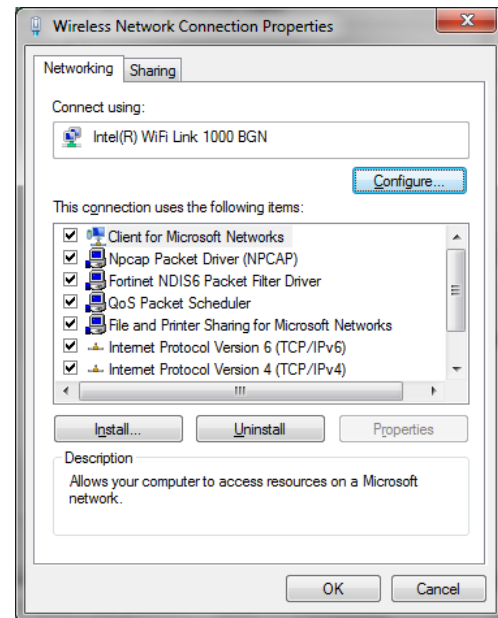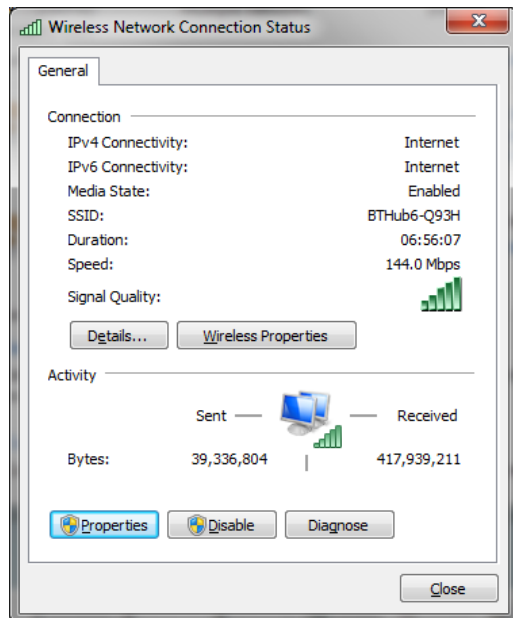
Enable "Allow other network users to connect through this computers internet connection"

In this instance, "Local area connection" and then "OK".
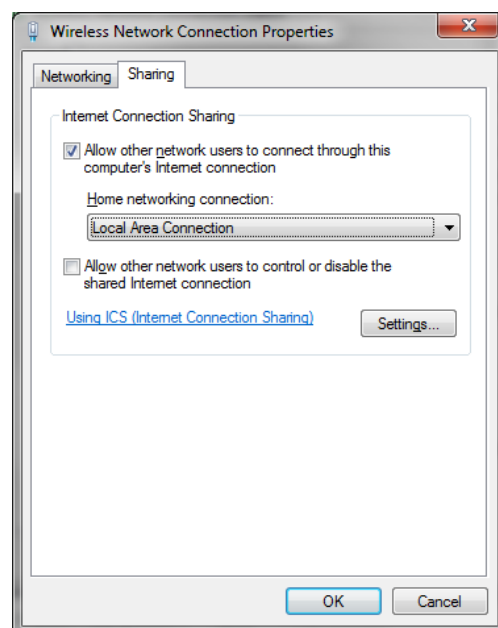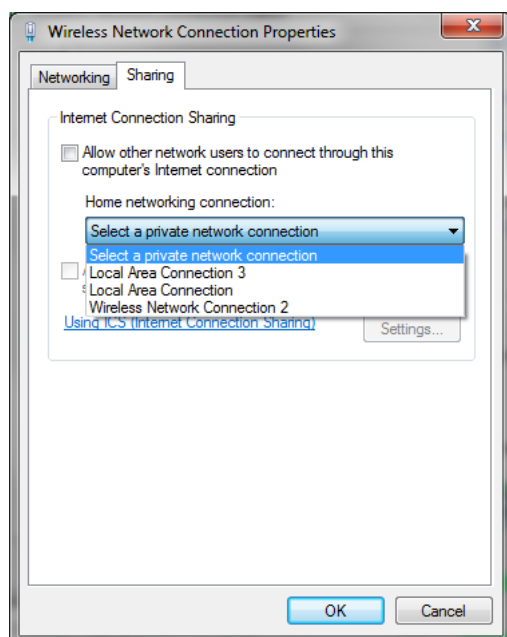
The pop up below will appear, in this instance the LAN is set to 192.168.137.1, adjust the client address of Cardinal using the serial port
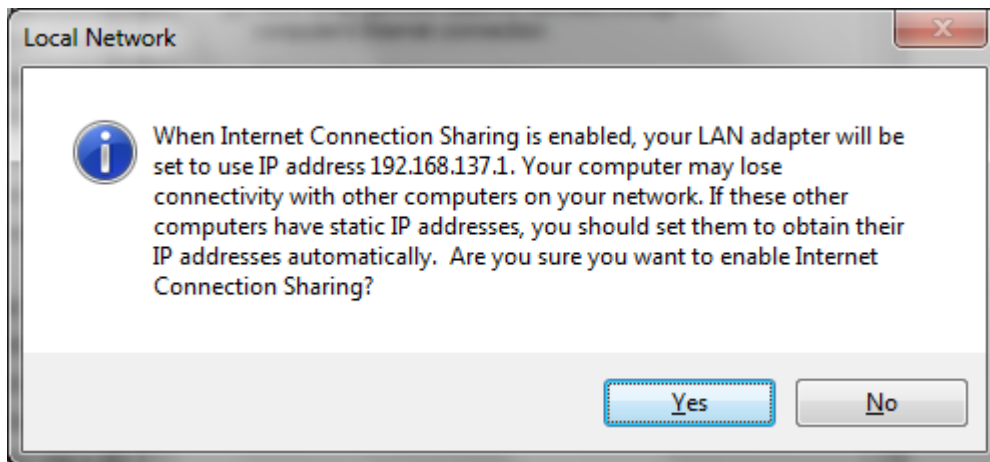
This allows Cardinal to communicate with the Internet via the local area connection.

dB recommends that Cardinal is used in a correctly configured network.

Email Configuration

Email messages can be triggered by any of the following events:

- Input supply voltage moving outside predefined thresholds

- Input supply selection changing

- Output status changing (i.e. relay on or off)

- Output fuse state changing

Since some of these events may be the result of configuration, multiple emails may be sent from an iMDU while it is configured.

Take care when setting thresholds for input voltage to prevent unwanted emails.

To reduce the number of emails sent and therefore the load on the iMDU processor (and email system) the events cause a flag to be set to send an email rather than generating the

email immediately. On generation of the email the state of each quantity is tested before the email is being generated rather than its state when the flag was set.

Email Address

This is the address alarm emails will be sent to. The maximum length is 63 characters.

The email check box must be enabled.

Reply Address

The reply email address. This does not have to be the named address of the iMDU but some email servers will reject a mismatched address. The maximum length is 31 characters.

Note   ***There is no facility for the iMDU to handle incoming mail.***

SMTP Server

The address of the SMTP server. This is in the domain name with a maximum length of 31 characters.

If the SMTP server is a local attached network, then alpha numeric can be used.

If the NTP is external, the numerical address of the server must be entered. Names are not supported.

TLS/SSL is not currently permitted.

Username

The username required to connect to the SMTP server. The maximum length is 29 characters; it's long because many email providers use the reply address as the user name.

Password

The password required to connect to the SMTP server. The maximum length is 29 characters. The password is restricted to alpha-numeric, upper and lower case characters.

Example 1 Exchange Server

In the example below, the SMTP server is dB's own exchange server. This will be replaced by your own organisations exchange sever.

Email Settings

Email address for alarms	fred.blogs@dbbroadcast.co.uk	☑
Reply email address (from)	cardinal_192_168.0.163@gmail.com	
SMTP server	Exchange.dbbroadcast.co.uk	
Email username	fred.blogs	
Email password	••••••••••	

Submit All

The message below is seen.

From: cardinalMachine_192.168.0.163@dbbroadcast.co.uk [mailto:cardinalMachine_192.168.0.163@dbbroadcast.co.uk]
Sent: 12 February 2020 09:40
To: Fred Blogs
Subject: EVENT FIRED ON iMDU

Output 1 (Out 1), State: On

Emails can be also set as below; the email username is then in full.

Email Settings

Email address for alarms	fred.blogs@dbbroadcast.co.uk	☑
Reply email address (from)	cardinal_192@gmail.com	
SMTP server	exchange.dbbroadcast.co.uk	
Email username	fred.blogs@dbbroadcast.co.uk ✕	
Email password	••••••••••	

Submit All

Example 2 No SMTP Server available on network.

Note   ***dB recommends a properly provisioned Network with a SMTP server is utilized***.

SNMP Settings

SNMP trap destination 1	192 . 168 . 137 . 1	☑
SNMP trap destination 2	192 . 168 . 0 . 6	☐
SNMP trap community	trap	
SNMP write community	private	

Email Settings

Email address for alarms	info@jerrydomain.com	☑
Reply email address (from)	cardinal_192_168.0.163@jerrydomain.com	
SMTP server	198.168.137.1	
Email username	info@jerrydomain.com	
Email password	••••••••••	

Submit All

In the above example, "jerrydomain.com" is a SMTP server located on an attached PC. 192.168.137.1 is the IP address of that PC.

The server used was "hmailserver" and the email server "Mozilla Thunderbird" to obtain the above.

MDU Configuration

The iMDU configuration page is password protected, the default username and password is "admin". The username is not configurable, but the password is using the Set 'admin' password box.

General Purpose Inputs

Number	1	2	3	4	5	6	7	8
Name	GPin 1	GPin 2	GPin 3	GPin 4	GPin 5	GPin 6	GPin 7	GPin 8
Alarm enabled	☐	☐	☐	☐	☐	☐	☐	☐
Number	9	10	11	12	13	14	15	16
Name	GPin 9	GPin 10	GPin 11	GPin 12	GPin 13	GPin 14	GPin 15	GPin 16
Alarm enabled	☐	☐	☐	☐	☐	☐	☐	☐

Submit

General Purpose Relays

Number	1	2
Name	Relay 1	Relay 2
Alarm enable	☐	☐

Submit

Temperature and Humidity

Temperature alarm enable	☑
Temperature lower threshold (C)	30
Temperature upper threshold (C)	38
Humidity alarm enable	☐
Humidity lower threshold (%)	10
Humidity upper threshold (%)	90

Submit

Log Reset

Reset Event Log	Reset Power Log

Name

The name or location of the iMDU. This appears in emails so is useful in identifying the device but is not related to network names or any other parameter.

Characters allowed – the password name is to 10 alpha-numeric characters may be used and the following !#$^*()_-{}[]@~;:,.'?.

Password

This is used to set the configuration password. This password provides access to both the MDU and IP configuration tabs.

Characters allowed – the password name is to 10 alpha-numeric characters may be used and the following !#$^*()_-{}[]@~;:,.'?.

Tip

If the admin password is lost it may be reconfigured using the serial protocol command "PASSWORD" (for which no password is needed).

Password Protect System Status Controls – Enabling the check box, the user must enter the password to change an output relay.

Password Protect all Web Pages- Enabling the checkbox, an operator must enter the password before a web page is displayed.

Input configuration

Input Voltage alarm enable - used to enable the input voltage alarm. Note that once an event is triggered, there is a hysteresis of 5V. The hysteresis is to prevent small voltage changes sending too many events to the Event Log.

It is recommended that there is a minimum of 5V between the upper and lower voltage thresholds.

Input Voltage lower threshold - the input voltage below which an alarm is raised, sending a trap or email if enabled.

Input Voltage upper threshold - the input voltage above which an alarm is raised, sending a trap or email if enabled.

Shed Outputs on first input lost - if the first power supply is removed outputs are shed for which shedding has been enabled.

Power Monitoring

Power alarm enable – used to enable the power monitoring alarm.

Power upper threshold (Watts) - the input power wattage above which an alarm is raised, sending a trap or email if enabled.

Output configuration

Name - the label for the output. Up to 7 alpha-numeric characters may be used and the following !#$^*()_-{}[]@~;:,.'?.

Switch lock - allows the switch to be locked on or off. When password protection is applied to this screen it will prevent unauthorised users from altering the status of a locked output.

Selection alarm – an event is created once enabled when an output is toggled from the System Status page or from the SNMP MIB.

Fuse alarm - enables or disables the fuse failed alarm for this output.

Can shed - In some systems, a secondary input (a backup generator for example) may only be able to supply a limited load current. For this reason, when the back-up supply is selected it may be necessary to lose certain outputs. Enabling *Can Shed* for an output indicates it can be shed when the main power supply is lost.

Shed on overheating - If an internal or external temperature and humidity option is fitted, then enabling will cause the output to shed when the upper temperature is reached.

Startup delay (sec) - the time to wait before initialising the output. (on some models only) This allows outputs to be turned on in a sequence reducing alarms or reducing start up current surges. Valid times are between 0 to 15 seconds (9999 seconds with firmware 1.0.14 and above).

Stop delay (sec) - determines how long to wait before shedding or switching off the output. This is intended to power down outputs in an orderly way, helping to prevent unnecessary

alarms. The permitted delay is 0 to 15 seconds (9999 seconds with firmware 1.0.14 and above).

General Purpose Inputs

Name – the label for the output. Up to 7 alpha-numeric characters may be used and the following !#$^*()_-{}[]@~;:,.'?.

Alarm Enabled – When ticked enables an alarm

General Purpose Relays

Name – the label for the output. Up to 7 alpha-numeric characters may be used and the following !#$^*()_-{}[]@~;:,.'?.

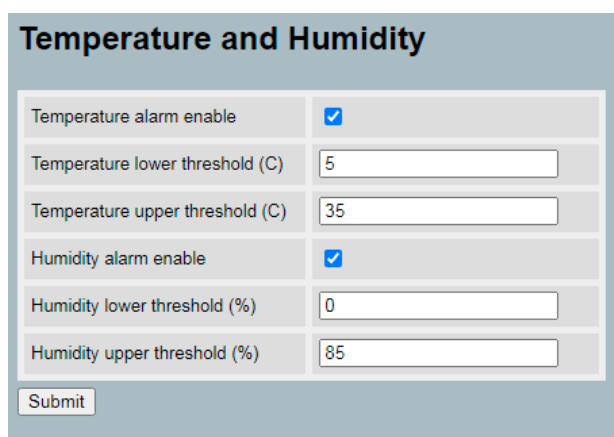**Alarm Enabled** – When ticked enables an alarm

Temperature and Humidity

If the temperature and Humidity Sensor Option **iMDU12-O-H** is fitted, an additional menu appears.

Temperature and Humidity

Temperature alarm enable	☑
Temperature lower threshold (C)	5
Temperature upper threshold (C)	35
Humidity alarm enable	☑
Humidity lower threshold (%)	0
Humidity upper threshold (%)	85

Submit

System Status with temperature and Humidity Sensor

Temperature alarm enable – When ticked, enables the temperature alarm.

Temperature lower threshold – Set the lower temperature for alarm

Temperature lower threshold - Set the upper temperature for alarm

Humidity alarm enable – When ticked, enables the Humidity alarm

Humidity lower threshold – Set the lower humidity for alarm

Humidity lower threshold - Set the upper humidity for alarm

Event Log

The event logs are read only and provide a list of events where event 0 is the most recent.

System Status	IP Config	MDU Config	Event Log	Power Log	About

MDU: Cardinal
IP:192.168.137.162

Date: Tue Feb 11 2020 17:07:12
Temp: 29 C
Humidity: 21 %

`0` (Max: 999) Set pos | << | < | > | >>

Index	Time/Date	Details
0	17:01:30 11/02/2020	Temperature under threshold measured at: 29C
1	16:14:22 11/02/2020	Output 11 (Out 11), State: On
2	16:14:22 11/02/2020	Output 11 (Out 11), State: Off
3	16:13:52 11/02/2020	Output 12 (Out 12), State: On
4	16:13:50 11/02/2020	Output 12 (Out 12), State: Off
5	16:12:42 11/02/2020	Output 12 (Out 12), State: On
6	16:12:41 11/02/2020	Output 12 (Out 12), State: Off
7	16:12:41 11/02/2020	Output 12 (Out 12), State: On
8	16:12:40 11/02/2020	Output 12 (Out 12), State: Off
9	16:12:39 11/02/2020	Output 12 (Out 12), State: On

Use the 'Set pos' (Set position) and fast forward/forward/fast reverse/reverse controls to move quickly through the logs.

Tip

Time stamping requires a valid connection to an NTP server. At first switch-on, time stamps may appear with the year 1970. Check the NTP server setup if this condition persists.

Power Log

The power logs record the minimum and peak figures for voltage, current, power and power factor as supplied to all outputs every hour along with temperature and humidity (if the sensor is fitted).

System Status	IP Config	MDU Config	Event Log	Power Log	About

MDU: Cardinal
IP:192.168.137.162

Date: Tue Feb 11 2020 17:08:06
Temp: 29 C
Humidity: 21 %

`0` (Max: 158) `Set pos` `<<` `<` `>` `>>`

		Volts		Amps		kW		Power Factor		Temp (C)		Humidity (%)	
Index	Time/Date	Min	Peak	Min	Peak	Min	Peak	Min	Peak	Min	Peak	Min	Peak
0	17:07:40 11/02/2020	242	249	0.1	0.1	0.00	0.02	-0.70	-0.53	29	30	20	21
1	16:07:39 11/02/2020	243	249	0.1	0.3	0.00	0.01	-0.66	-0.51	30	30	21	22
2	15:07:37 11/02/2020	244	250	0.1	0.1	0.00	0.00	-0.63	-0.51	30	31	21	24
3	14:07:36 11/02/2020	0	249	0.0	0.1	0.00	0.00	-0.62	0.00	30	30	21	22
4	12:30:34 11/02/2020	0	252	0.0	0.1	0.00	0.00	-0.57	0.00	29	30	22	23
5	10:38:06 11/02/2020	246	251	0.1	0.1	0.00	0.00	-0.56	-0.53	28	29	22	24
6	09:38:09 11/02/2020	0	250	0.0	0.1	0.00	0.00	-0.63	0.00	28	28	23	25
7	17:13:37 01/01/1970	243	250	0.1	0.1	0.00	0.00	-0.55	-0.51	28	28	23	23
8	16:13:35 01/01/1970	243	253	0.1	0.1	0.00	0.00	-0.57	-0.51	28	28	23	23
9	15:13:33 01/01/1970	243	249	0.1	0.1	0.00	0.00	-0.55	-0.51	28	28	23	23

Time stamping requires a valid connection to an NTP server. At first switch-on, time stamps may appear with the year 1970. Check the NTP server setup if this condition persists.

About

The *About* tab provides **read-only** details of IP configuration and iMDU unit name, location, firmware and serial number.

| System Status | IP Config | MDU Config | Event Log | Power Log | About |

MDU: Cardinal
IP:192.168.137.162

Date: Tue Feb 11 2020 17:09:04
Temp: 29 C
Humidity: 21 %

MDU

Name	Cardinal
Model	Cardinal iMDU12B-D-F-H
Firmware version	1.0.7-H9
Serial number	1
Hardware version	Dual, Failsafe (PCB Rev 0)
External device present	False
Thermometer present	True
Humidity sensor present	True

IP Config

DHCP Settings

DHCP Enabled	False

Current IP Settings

MAC address	00:11:11:11:11:11
IP address	192.168.137.162
Subnet mask	255.255.255.0
Default gateway	192.168.137.10
DNS server 1	192.168.0.2
DNS server 2	192.168.0.3

NTP Settings

NTP server	178.79.152.182

SNMP Settings

SNMP trap destination 1	192.168.137.1
SNMP trap destination 2	192.168.0.6

Email Settings

Email address for alarms	message@gmail.com
SMTP server	192.168.137.1

MDU

All MDU settings are factory set, read only. The connection of an external will change the status of "External Device Present".

External Device Present

External Device Present	= True
No External Device Present	= False
Thermometer Present	= True
No Thermometer Present	= False
Humidity sensor present	= True
No Humidity sensor present	= False

IP Config

On this page, these settings are Read only but may be set using the "*IP Config*" tab. The *IP Config* tab requires the user to login. The MAC address is factory set and cannot be changed.

Appendix

Please contact support@dbbroadcast.co.uk to obtain the latest MIB.

Serial Commands

The following table summarises the commands available at the serial interface

Serial commands	
CLIENT?	Queries IP address
NETMASK?	Queries subnet mask
GATEWAY?	Queries gateway address
DHCP?	Queries if DHCP is enabled or disabled
CLIENT <IP address>	Set IP address
GATEWAY <IP address>	Set gateway IP address
DHCP ENABLE	Enables DHCP
DHCP DISABLE	Disables DHCP
PASSWORD <password>	Set password required to access the IP and MDU configuration pages
RESETEVENTS	Resets the events log
RESET	Resets Cardinal
RESETPOWERLOG	Resets the Power Log
RESETENERGYMETER	Resets the Energy Meter
SERNO?	Query the serial number of the MDU
MACADDR?	Query the MAC address of the MDU
FIRMWARE	Displays the MDU firmware version

The serial interface maybe required when establishing communication with an iMDU frame for the first time as explained in Connecting to a unit for the first time in the Getting Started chapter on page 10.

Trouble Shooting

Frequently asked questions

How does shedding work?

The Cardinal iMDU allows for each output to be designated as a load that can be disconnected in the event of an automatic switchover to a backup supply.

In addition, a disconnection delay can be associated with each output to allow outputs to be disconnected in an orderly manner rather than simultaneously.

Can the default fuse value of 6.3 Amps slow-blow be changed?

Yes, the fuse value can be selected for each output's maximum load. For example, 10 outputs could be fitted with fuses to suit individual loads of 0.5A, one at 2.0A and one at 5.0 A for a total of 12.0A.

⚠️ **Take care that the total load does not exceed the total maximum safe load for the Cardinal iMDU of 12A. See the <u>Specification</u> chapter for maximum ratings.**

⚠️ **With INRUSH LIMITED models the inrush current at power on is limited to 40A, through a current limiting circuit. When the unit is powered, the maximum inrush current should be limited to 60A.**

What safe guards are there besides fuses that the Cardinal iMDU is not overloaded?

Besides output fuses, there are two mechanisms to prevent overload.

1) The unit is fitted with a combined ON/OFF switch and over current trip on the front panel. At room temperature, the current trip is at 12A to prevent overload. The 12A over current switch derates with temperature, at an internal temperature of 60°C the trip current is 9.7A which prevents heat damage.

How do I find out what the IP address of a unit is?

There are two methods for finding the IP address.

1) Connect a terminal or terminal emulator to the 6 way RJ11 serial port and enter the command CLIENT? The current IP address will be displayed.
2) If you know, or expect, that the IP address lies in the same subnet range as a PC connected to the network, a port scanning utility (such as netscan.exe or similar) could

be used to scan all devices in the network. Look for a device with the same MAC address as the unit being searched for to find the IP address.

Tip

The MAC address is printed on a label near the tie bar at the rear of the unit.

Can units be stacked in a rack without vertical spacers?

Yes, provided that forced air cooling within the rack can reach all units. Note that when units are stacked, the internal temperature of the stacked units can reach 60°C when the current rating is reduced to 9.7A.

Why is a rack tray recommended?

The unit itself weighs approximately 3 kilograms plus the weight of cable attached to the tie-bar at the rear of the unit.

Do both supplies in a dual input Cardinal iMDU need to be the same phase?

No, the input selector method employed allows non-phase inputs to be switched safely.

What safeguards are there to prevent unwanted alert chatter when configuration limits are momentarily breached?

A tag and re-test system is used so that after an event is created following the breach of a set parameter, an alert is only created after the re-test delay. This means that the breach must be persistent for an alert message to be created.

Tip

If necessary, re-configure MDU settings with slightly higher maximum parameters to prevent excessive alerts.

How can alerts be sent to inform a user of a power out?

The Cardinal PSU is designed to maintain internal power rails for 10 seconds after input power loss. This provides time for alerts to be sent following total loss of input mains power.

Note

This also explains why LEDs remain lit for a while after switching off the unit.

Ordering Information

Model variants

iMDU12A-S	Cardinal intelligent MDU with single input and 12 outputs, SNMP and sequential turning on/off of outputs
iMDU12A-D	Cardinal intelligent MDU with dual input and 12 outputs, SNMP and sequential turning on/off of

Options

iMDU12A-O-F	Fail safe option. Outputs remain on if control fails. (no sequential start)
iMDU12A-H	Integral Temperature and Humidity sensor
iMDU12A-R	Controller reset, -H & R are mutually exclusive
iMDU12A-O-H	External Temperature and Humidity sensor
iMDU12A-O-C-3	Cable for sensor, serial screened, length 3m (custom cable up to 5m – specify length on order in 0.5m increments)
iMDU12A-O-G	Switch guard

Software Download

Warnings

⚠️ **Warning, "Fail Safe Cardinals" will have their outputs "ON" during download, even if the Output had been set "OFF".**

dB recommends that all loads physically removed from the outlets or the equipment switched OFF before a local download of software takes place.

dB Broadcast cannot be held responsible for damage to either the Cardinal iMDU12B or connected equipment if this warning is ignored.

Download Procedure

All loads must be physically disconnected from the iMDU12B. Connect a suitable serial cable, see page 6.

Load the application "PIC32UBL" from the microchip website on to a suitable PC or laptop. The application can be found under the dB website.

Download the required software from the dB Broadcast website and store on the PC.

Set Cardinal into Boot Load mode

Using a suitable serial port handler such as "Putty",

Type "STARTLOADER A" Carriage Return. The message below should be seen.
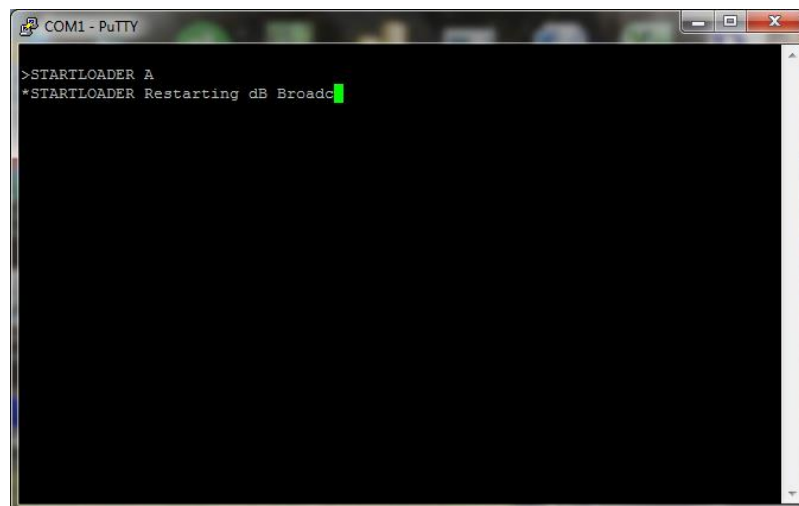
Close "PuTTy" or similar application.

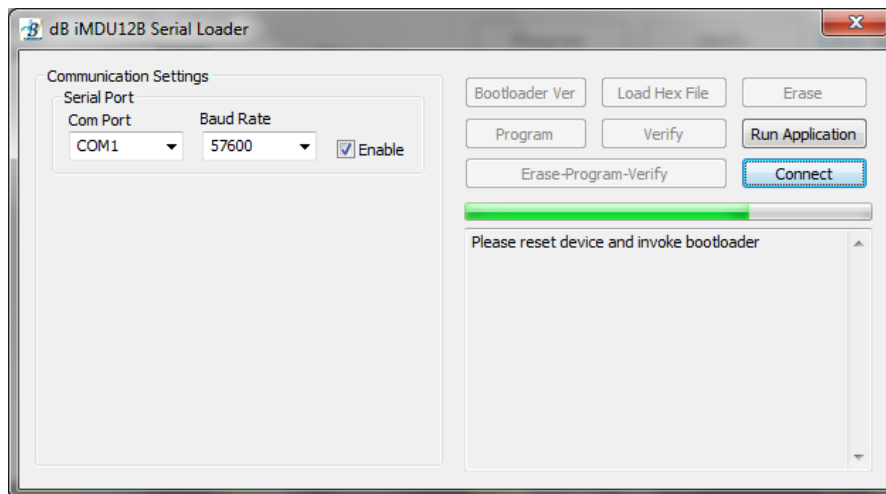Open the application "iMDU12B_Serial_loader" and the screen below will appear.
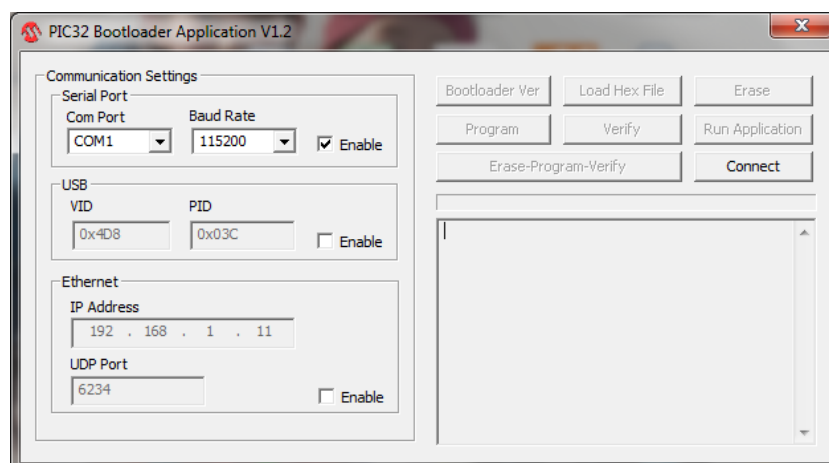

Select "57600" baud rate.
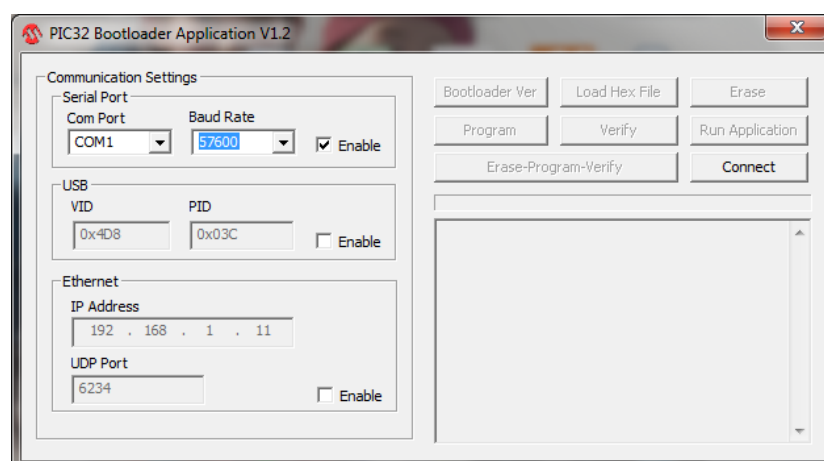
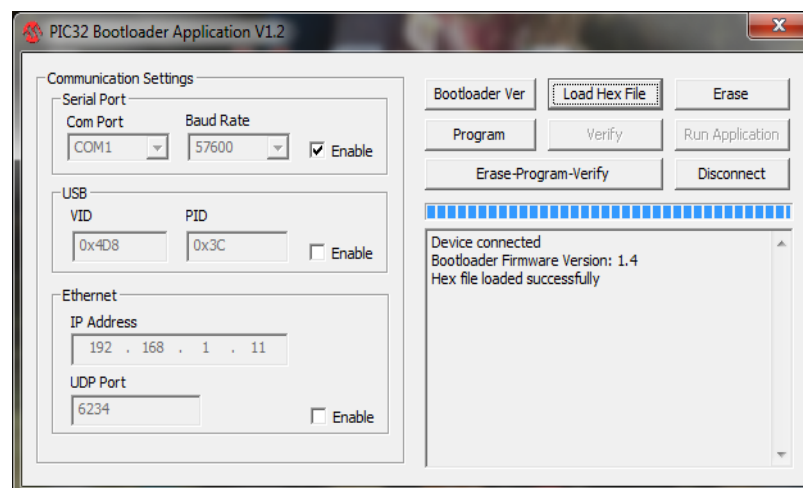"Click" on "connect" and the message below is seen.
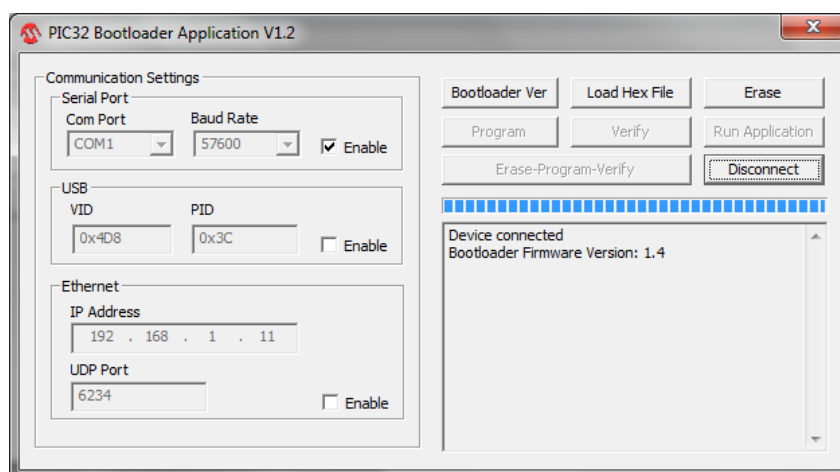
If the message below is seen, close the Serial loader and check that PUTTY is closed, if PUTTY is not closed, CLOSE PUTTY. The serial loader must be opened again and click on "connect"
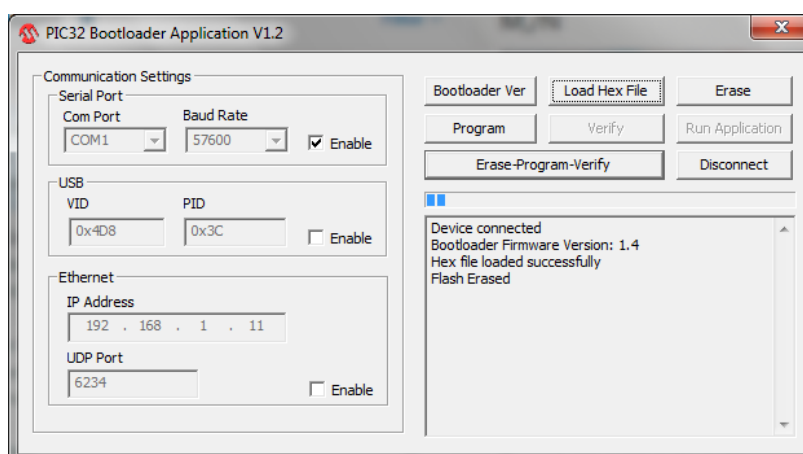

Click on "Load Hex File", and the message below will pop up. The directory where the software is stored is selected then "Open" the required file. In this instance the file is "MDU12B-1.0.14.5-H13.production.hex" and is located in directory "Release 1.0.14H13".
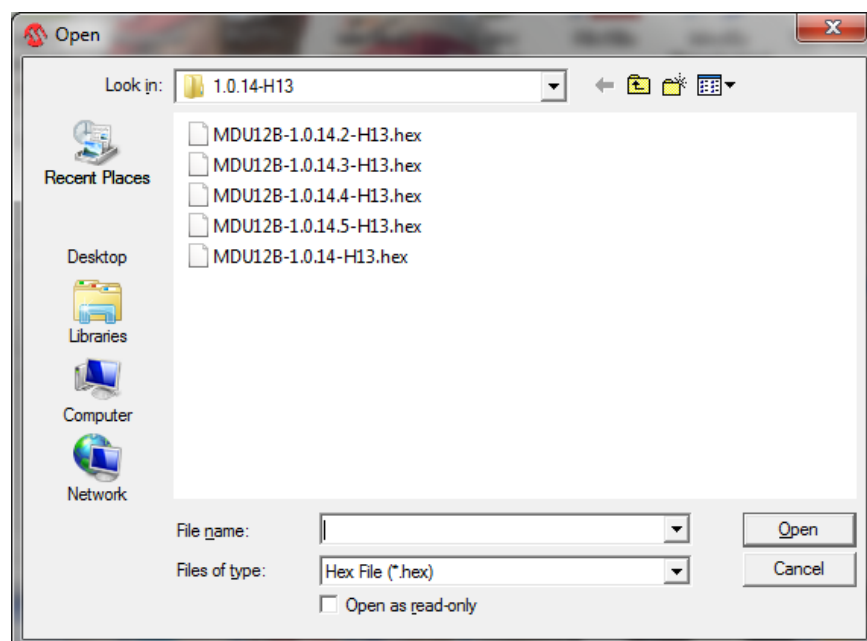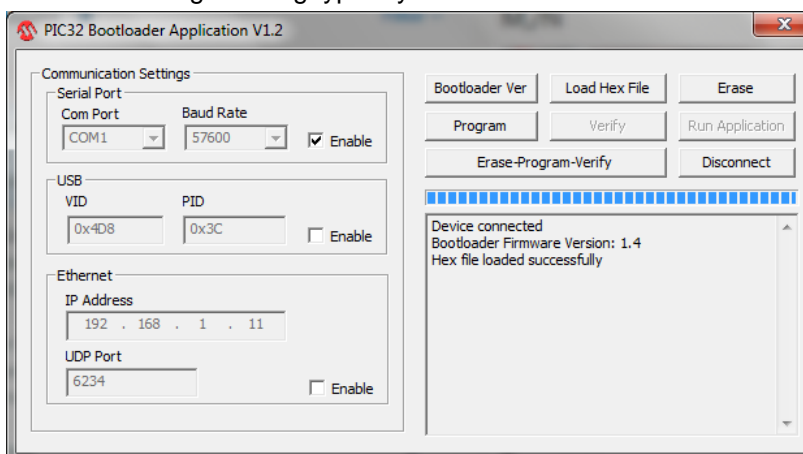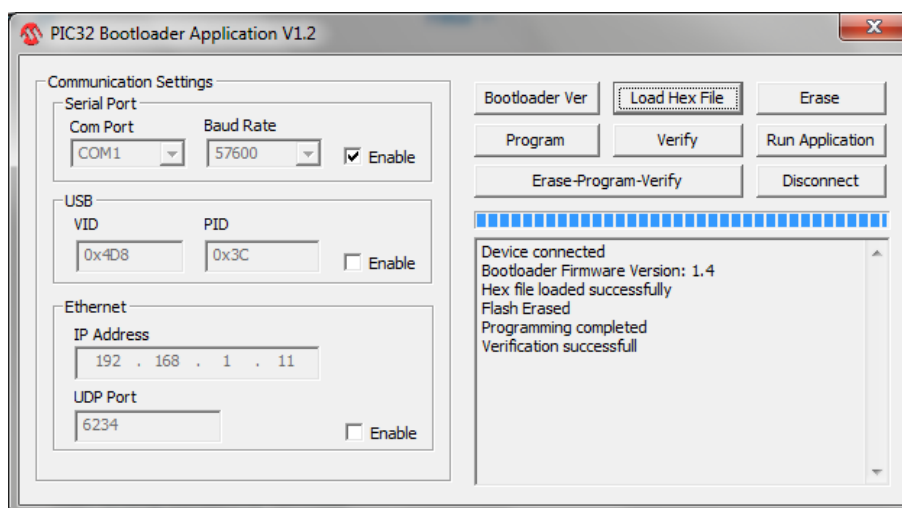

The message below is seen.

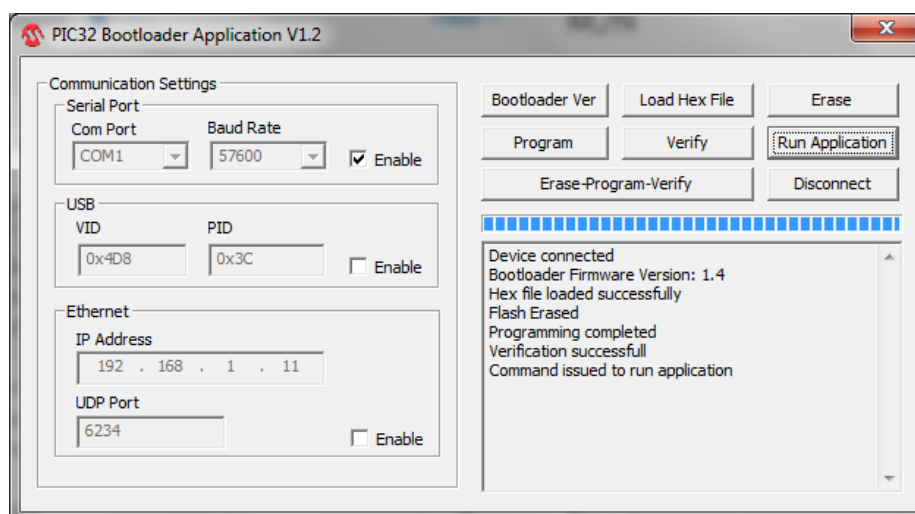Click on "Erase-Program-Verify" and the message below is seen.

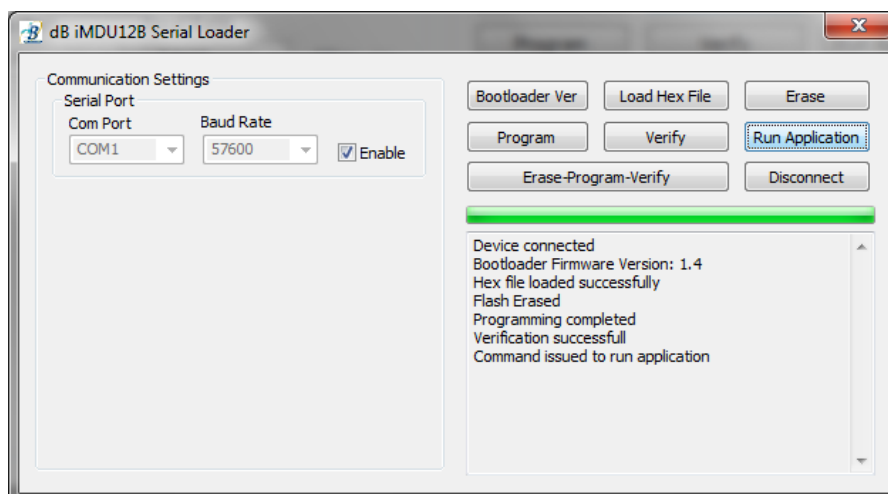Programming typically takes several minutes.

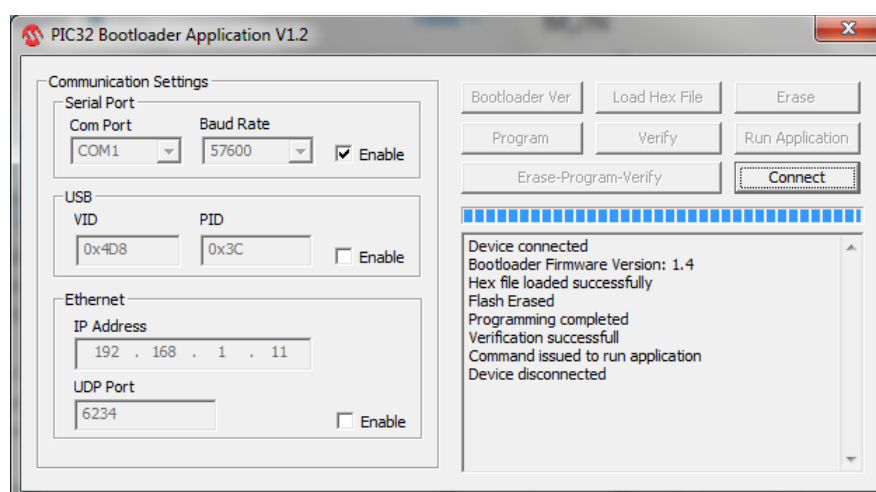The message below is seen when the erase, program and verification is complete.

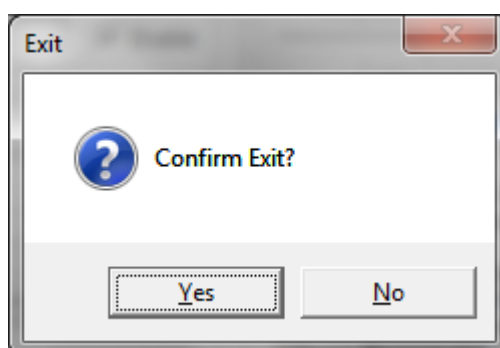Click "Run Application". Cardinal will now be operating normally.

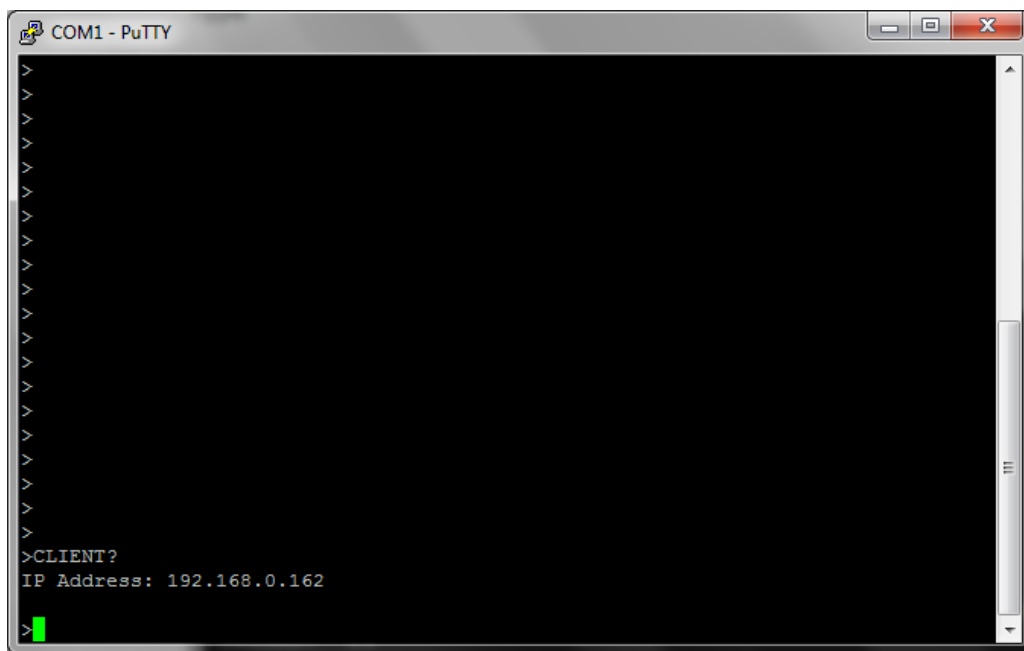Click "Disconnect" and the message below is seen.

Close application.

Click "Yes"

Check operation using "PuTTy".

Type

"CLIENT?"

The download is now complete, and the serial lead may be disconnected.

Specification

Input

Connector:	1 or 2 Neutrik Powercon inlets (depending on model type)
Voltage:	230V +/- 10%
LEDs:	Single I/P: Supply LED (green)
	Dual I/P: Supply Active/Available LEDs per I/P (green)

Outputs

Connector:	12 x IEC sockets on the rear panel
Fuse rating (max):	T6.3 A per output (5A fitted)
Total load:	Up to 12A at 230V
LEDs:	2 per output for "on/off" (green) and "fuse blown" (red)

Control/monitoring

Network:	Ethernet RJ45
Serial:	RS232 via 6 way RJ11 Modular Jack
GPI I/O:	26 way 'D' type. 16 inputs and 2 dry contact outputs
LEDs:	Network Activity and Link (yellow)

Physical

Height:	44mm (1RU) bay mounted unit
Width:	483mm (standard 19 inch rack) Depth: 380mm (including tie bar)
Switch:	Front panel switch is also an over-current circuit breaker
Tie Bar:	At the rear for cable retention
Weight:	2.9 Kg (single input version)

Environmental

Operating temperature:	5°C to 40°C non-condensing.
Operational humidity:	Up to 85% Relative Humidity
Storage temperature:	0°C to 80°C