Brainboxes Ethernet to Analogue IO

Contents

1 Introduction

The Brainboxes Ethernet to Analogue products are a range of Ethernet devices controlled by a host computer which provide analogue inputs for high-precision measuring of voltages and currents. The ED-549 has 8 analogue inputs which are independently configurable as differential voltage inputs or current inputs.

The ED range is designed and built on-site at the company's headquarters in Liverpool, England, with close collaboration between the hardware and software teams to deliver a product that is both user-friendly and has plenty of functionality.

2 Before you start

2.1 Box Contents

The following items are included with your product:

- Ethernet Analogue Input Device
- Boost.IO Installation CD including manual, Microsoft signed drivers and utilities
- Quick Start Guide

Optional Items:

- Global mains power supply unit - PW-600
- USB port power supply cable – PW-650 – Ideal for powering your ED device from anywhere using your laptop

If any of the items are missing from your box or damaged in anyway please contact support@Brainboxes.com

2.2 Requirements

Supported Operating Systems

The Ethernet to Analogue product range can be used in the following Microsoft Operating Systems with the supplied Boost.IO drivers:

- Windows Server 2012
- Windows 8.1 32-bit
- Windows 8.1 64-bit
- Windows 8 32-bit
- Windows 8 64-bit
- Windows 2008 R2
- Windows 7 32-bit
- Windows 7 64-bit
- Windows Server 2008 32-bit
- Windows Server 2008 64-bit
- Windows Vista 32-bit
- Windows Vista 64-bit
- Windows Server 2003 32-bit
- Windows Server 2003 64-bit
- Windows XP 32-bit
- Windows XP 64-bit
- Windows 2000

Brainboxes Boost.IO drivers have undergone extensive Microsoft testing with the ED range. Upon passing these tests, the drivers were signed by Microsoft, as an indication of their quality and stability.

System Requirements

Components: Microsoft .NET Framework 2.0 (installed automatically with Boost.IO package)
Windows Installer: Windows Installer 3.1 or later (Recommended)
Internet Explorer: If you are running Internet Explorer, then Internet Explorer 7.0 or later is required
Processor: 400 MHz Pentium processor or equivalent (Minimum); 1GHz Pentium processor or equivalent (Recommended)
RAM: 96 MB (Minimum); 256 MB (Recommended)
Hard Disk: Up to 500 MB of available space may be required
CD or DVD Drive: Not required
Display: 800 x 600, 256 colours (Minimum); 1024 x 768 high colour, 32-bit (Recommended)

Network Requirements

Ethernet network connection (wired).

3 Hardware Features

3.1 ED Range – Industrial

Analogue Inputs 0-3

RS485 Gateway for NuDAM/ADAM Modules

Ethernet port

LED Status Indication

Analogue Inputs 4-7

DIN rail mount

+5V to +30V Power Supply
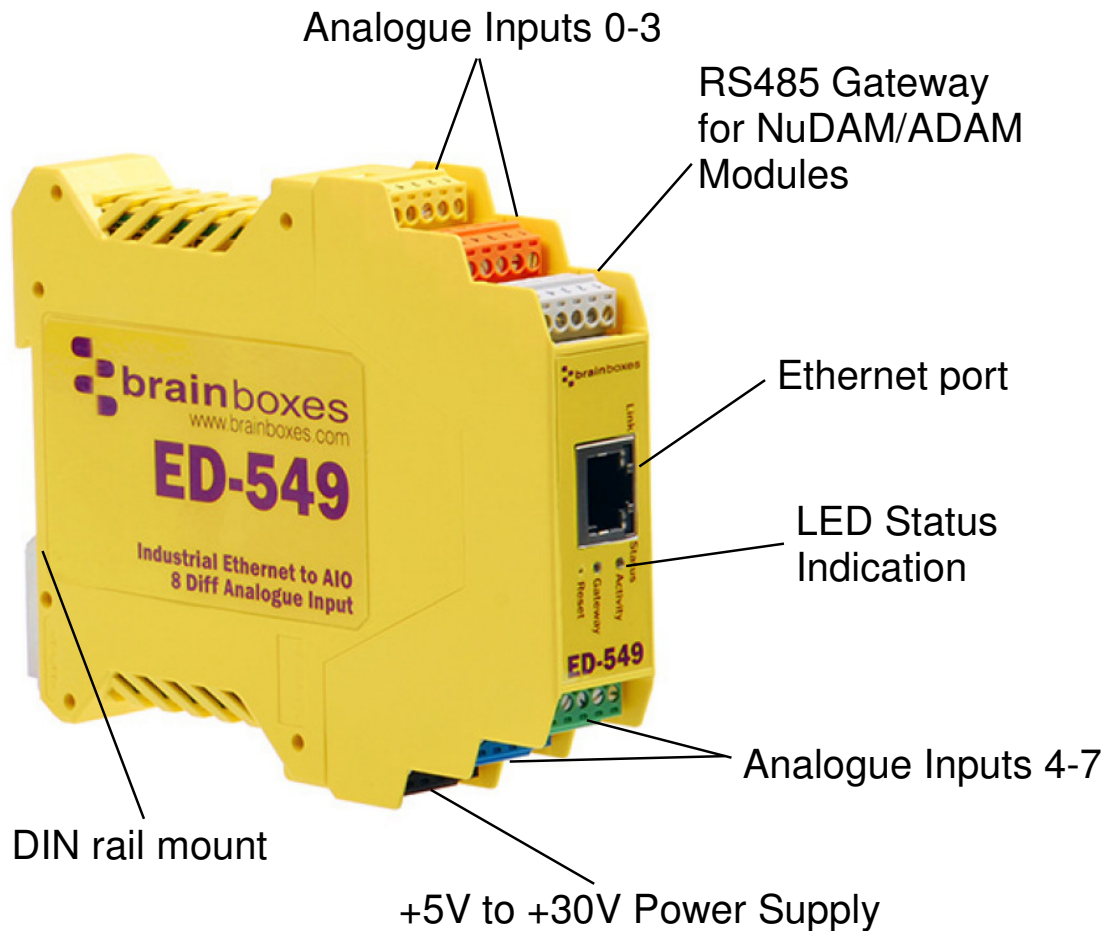
3.2 Usability Features

The ED range has been designed so that it is as easy as possible to wire up the input, serial gateway and power wires to the terminal blocks and to connect the network cable:

- Removable screw terminal blocks make installation easier and quicker.

- Colour coded terminal blocks and ports prevent an incorrect connection. (Industrial only)

- Individually numbered pins simplify the wiring and removes confusion. (Industrial only)

- Smart Ethernet which automatically detects the polarity of the Ethernet connection so either a straight through or crossover Ethernet cable can be used.

- Functional ground to DIN rail.

- Can use the 5 Volt power from any computer USB port via the optional cable accessory PW-650.

3.3 Technical Specifications

Network connection

- 10Base-T or 100Base-TX Ethernet connection
- Standard 8P8C ("RJ45") socket connector
- TCP/IP protocol stack
- DHCP or static IP address
- Automatic transmit/receive crossover detection
- 1500V magnetic isolation

Power

- Wide-range +5 to +30V DC 60mA@24V 1.4W Typical 120mA@24V 2.9W Max
- Reverse voltage protected
- ESD and surge protected
- Earthing connection point

!	**Caution -** Do not attempt to operate this product with any other power supply/rating than that specified.

3.4 Storage and Operating Environment Guidelines

	ED Range – Industrial
Operating Temperature:	-30°C to +80°C
Storage Temperature:	-40°C to +85°C
Humidity:	5% to 95% non-condensing
Housing:	IP 30 rated non-conducting polyamide case with integrated DIN rail mount

LED indicators

There are 4 LED's on the ED devices representing the status, gateway, Ethernet link and the activity. The table below lists these LEDs, the colours of them and the meaning of the colours.

Status LED	Green	Device Ready
	Flashing Yellow	Changing Settings
	Flashing between Red & Green	Querying IP
	Flashing Green and Red	User performing Hard Reset
	Flashing between Green & Red/Yellow	IP address diagnostic
	Flashing between Green & Yellow	Initialization diagnostic
Gateway	Flashing Red	RS-485 Comms error
	Flashing Green	RS-485
Link LED	Green light on	Network Link Established
	Flashing Green	Network Data RX/TX
Activity	Flashing Green	Input Read
	Flashing Red	Input Error

3.5 Circuit Diagrams

3.5.1 ED-549
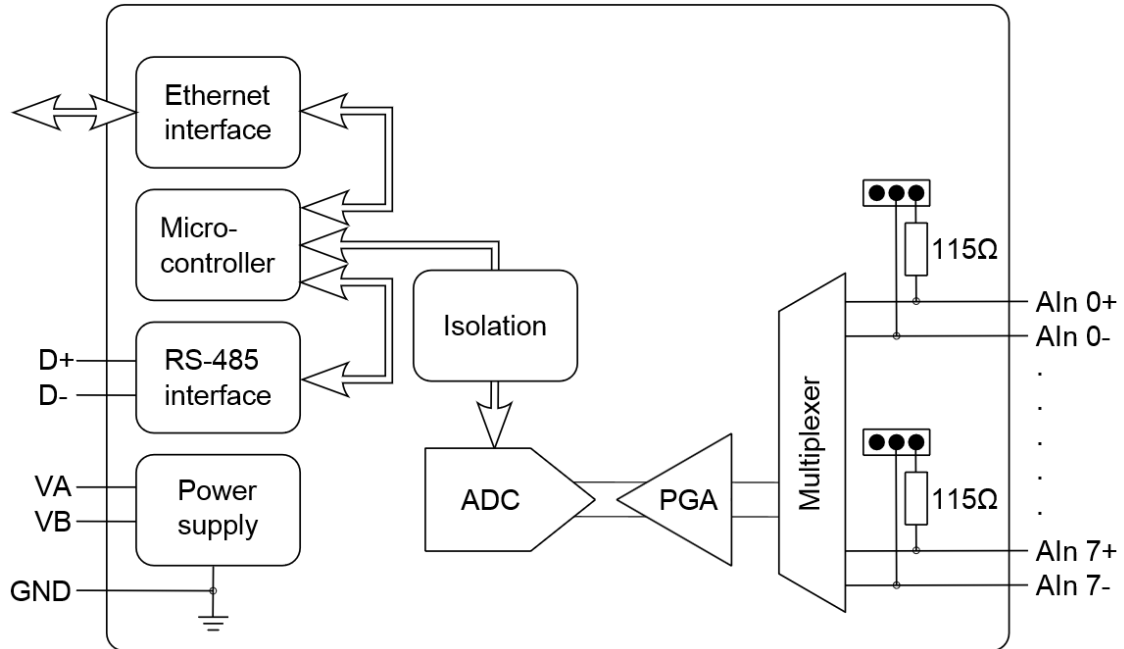
3.6 Pin Outs: ED-549

Functional Ground is the EARTH connection through the DIN rail that the ED-5xx is attached to. This Functional Ground (EARTH) on the ED-5xx is on PIN 5 of the BLACK power connector. It is directly connected to the FUNCTIONAL EARTH metal tab on the DIN rail clip. Thus the FUNCTIONAL EARTH electrically connects the metal DIN rail to PIN 5 of the BACK power Connector. The customer can choose to wire or not wire to PIN 5 on the Black power input.

Power Ground is the low side (0V) of the power input. The GND on the schematic is connected directly to PIN 1 and PIN 4 of the BLACK power input connector and is thus connected to the low side of the customers power supply.

Analogue Ground is applicable to the ED analogue range (ED-549, ED-560) and is the ground for the analogue input circuitry. It is isolated from power ground to reduce noise and prevent ground loops. The analogue measurements are not directly dependent on the AGND connection (voltage mode measures the voltage between the AIn+ and the AIn- terminals, and current mode measures the current flowing through the AIn+ and AIn- terminals) – but there are limitations on how much voltage there can be between the AGND and AIn terminals (see the manual for details). AGND is the terminal that should be used for the shield connection of analogue signal cables, if present. For current mode, AGND can either be connected to the negative side of the sensor power supply or left disconnected. AGND is meant to be used as a connection for a cable shield or drain wire. AGND is isolated from GND and power GND.

Terminal Block	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
Yellow	AGND	AIn 0-	AIn 0+	AIn 1-	AIn 1+
Orange	AGND	AIn 2-	AIn 2+	AIn 3-	AIn 3+
Grey	GND	RS-485 D-	RS-485 D+	RS-485 D+	RS-485 D-
Green	AGND	AIn 4-	AIn 4+	AIn 5-	AIn 5+
Blue	AGND	AIn 6-	AIn 6+	AIn 7-	AIn 7+
Black	Power GND	+Vin A	+Vin B	Power GND	Func GND
Input +5V to +30V DC 100mA@24V 2.5W Max					

3.7 Device Dimensions

102.0mm

22.5mm

128.8mm
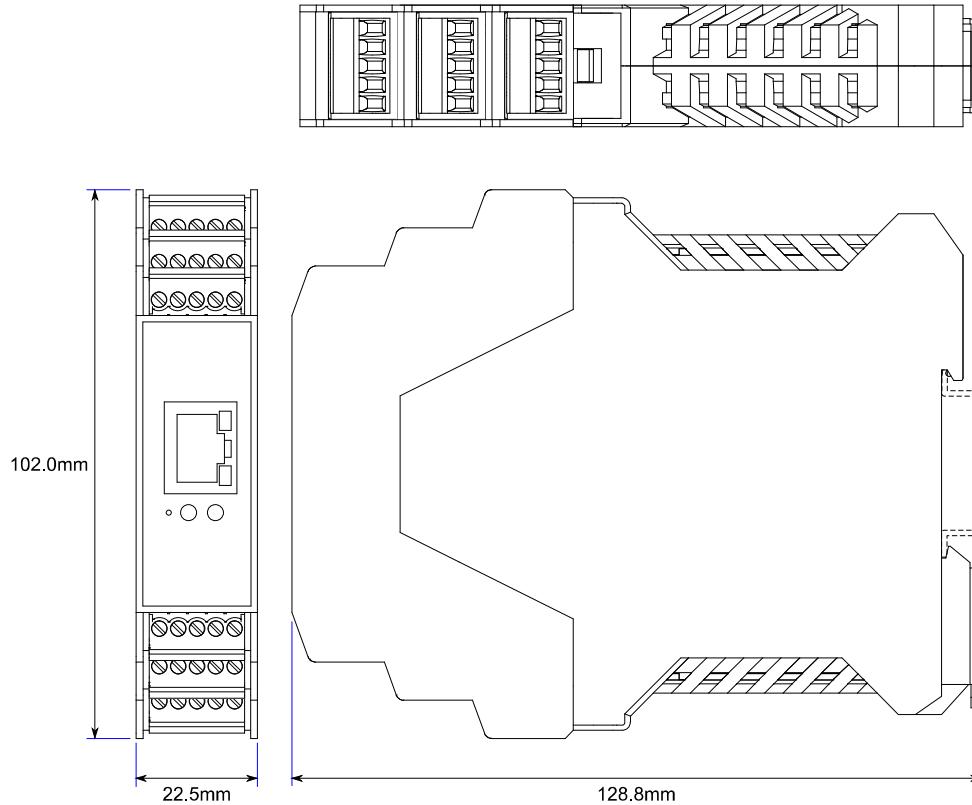
3.8 Reset Button

3.8.1 Manual Reboot

1) Press the reset button once.

2) The status LED will flash and after 5 seconds the device will reboot.

3) When the device is restarted, any connections you have had to the COM ports will need to be re-established.

3.8.2 Manual Hard Restore

1) Press and hold the reset button on the device for 5 seconds.

2) The status LED will flash red/green and the device will be restored to factory default settings. For the factory settings, see **Factory Default Settings** section.

3.9 Input Specification

Each analogue input is independently jumper-configurable as either a differential voltage input or a current-sense input.

In voltage input mode, input impedance is 10MΩ minimum. The full scale range can be configured as ±10V, ±5V, ±2.5V, ±1V, ±500mV, ±250mV, ±150mV or ±75mV using either an ASCII command or by selecting the range on the web configuration pages.

In current input mode, input impedance is 115Ω. The full scale range can be set to either ±20mA, 0-20mA or 4-20mA.

Each channel has a jumper block that allows it to be individually set for either voltage input mode or current input mode. By default, the factory fitted configuration is that all 8 channels are set to voltage input mode. When the jumper is across the left hand and central pins the channel is in voltage input mode and when the jumper is across the right hand and central pins the channel is in the current input mode. In the picture AIn1 is set for current input mode, all other channels are in voltage input mode.
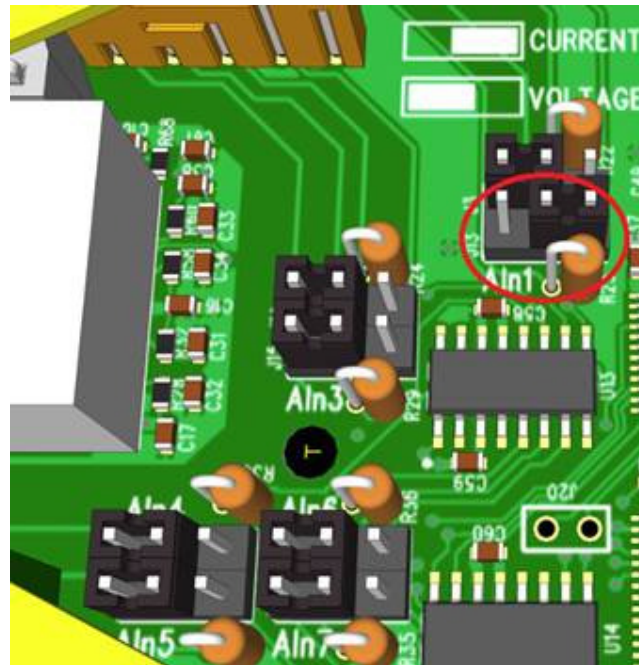
The device can make 12 measurements per second, divided between all the enabled inputs and reports the measurements with 16-bit resolution.

The allowed single-ended voltage of any analogue input pin is within ±11V of the ISOGND pins.

Measurement accuracy for the inputs on the device is within 0.1% of the full scale range at 25°C and 0.3% of the full scale range over -30°C to +80°C. The common-mode rejection ratio (CMRR) of the analogue inputs is over 120dB and the normal-mode rejection ratio (NMRR) of the inputs is greater than 100dB at 50Hz and 60Hz.

3.10 Firewall Exceptions and Port Numbers

When using the ED Devices with a firewall you may need to manually add the exception entries and port numbers to the firewall list.

Below are the default port numbers and the firewall exceptions.

Program Name	Default Port Number
Device Web Server	80
TCP Port	9500
Firmware Upgrade	67 (BOOTP Server) 68 (BOOTP Client) 69 (TFTP Port)

Below are listed the Windows Firewall Exception entries which are added by default during the installation of Boost.IO Manager.

- Brainboxes Boost.IO Suite
- Brainboxes Boost.IO Suite (Device Discovery)
  (Except Windows XP32 & 64 bits)
- UPnP Framework (Windows XP32 & 64 bits)
- Network Discovery (Windows 7 or later)

Name	Program	Protocol	Local Port
Brainboxes Boost.IO Suite	C:\Program Files (x86)\Brainboxes Ltd\Brainboxes Boost.IO Suite 3.2\EDManager.exe	TCP	Any
Brainboxes Boost.IO Suite	C:\Program Files (x86)\Brainboxes Ltd\Brainboxes Boost.IO Suite 3.2\EDManager.exe	UDP	Any
Brainboxes Boost.IO Suite (device discovery)	Any	UDP	19000

If you are using other anti-virus or firewall software you may need to add these exceptions into the anti-virus and firewalls you have installed.

4 Getting Started

4.1 Connecting your ED device

1. Connect the ED device to your local network using an Ethernet cable and plug into the Ethernet port connection on the device. The ED Ethernet port will automatically detect the polarity of the Ethernet connection so either a straight through or crossover Ethernet cables can be used.

2. Connect a suitable power supply to the ED removable power terminal block.

   The optional PW-600 power supply allows the device to be plugged into a standard power socket. Alternatively, the device can be plugged into any USB using the optional PW-650 power cable. ED devices require a power supply providing a minimum of 1.1 watts with an output voltage between + 5VDC and +30VDC.

   <div>

   ED Industrial Range

POWER TERMINAL PIN OUTS					
PIN	1	2	3	4	5
FUNCTION	GND	$+V_A$	$+V_B$	GND	EARTH

   The ED device is fully operational when only one power supply is attached. When only one power supply is being used connect the positive terminal of the power supply to either +VA or + VB pin and the negative terminal to one of the GND pins.

   Two separate sets of power supply input terminals are available; one to +VA and GND and the other to +VB and GND providing redundancy when both are connected. The higher voltage of the two power supplies is selected by the device and in the event of a failure the other supply automatically takes over to keep the device running. The status of the two power supply inputs can be monitored visually via a browser from the ED devices home page and also programmatically.

   </div>

3. On connecting to the network, the device automatically checks if it is connected to a DHCP Server. If this is the case, the DHCP server will allocate an IP address automatically to the ED device.

4. If no DHCP Server is detected (e.g. you have the ED device plugged directly into the PC), the ED device will default to an IP address of 192.168.127.254 after 60 seconds. If connecting directly to a PC, make sure the PC is on the same 192.168.127.xxx subnet in order to find your device.

5. The LED's will flash when the power is first applied. When the status LED turns a steady green (after 5-60 seconds) the device is ready to use.

   Make a note of device MAC address (on the side of the ED device, 00-0A-4F-XX-XX) as you will need it to identify the device on your network later.

4.2 Configuring your device settings

There are three methods to view and configure your ED device. Which method to use depends on personal preference and convenience.

■ **Boost.IO Manager:** This is the Windows application that is installed initially to find the device and install the COM port drivers if required. Configuring from here is the recommended option for ease and convenience, as it centralises all Ethernet to Analogue devices in one window.

However, not all of the settings of the ED device can be configured from the Boost.IO Manager. See **Section 5** for information about Boost.IO Manager.

■ **Web Page Interface:** This allows the Ethernet to Analogue device to be accessed from any PC within your network as it does not require Boost.IO Manager. Unlike Boost.IO Manager, every setting can be configured using the web configuration pages. See **Section 6** for more information about the web page interface.

■ **ASCII Protocol:** The ASCII protocol is a query-response communication protocol which can be used to set all of the protocol settings of the device, send and read data, and get status information from the devices. To send the commands and receive responses a connection to the device needs to be set up. This can be done using either a TCP connection or through the COM port.
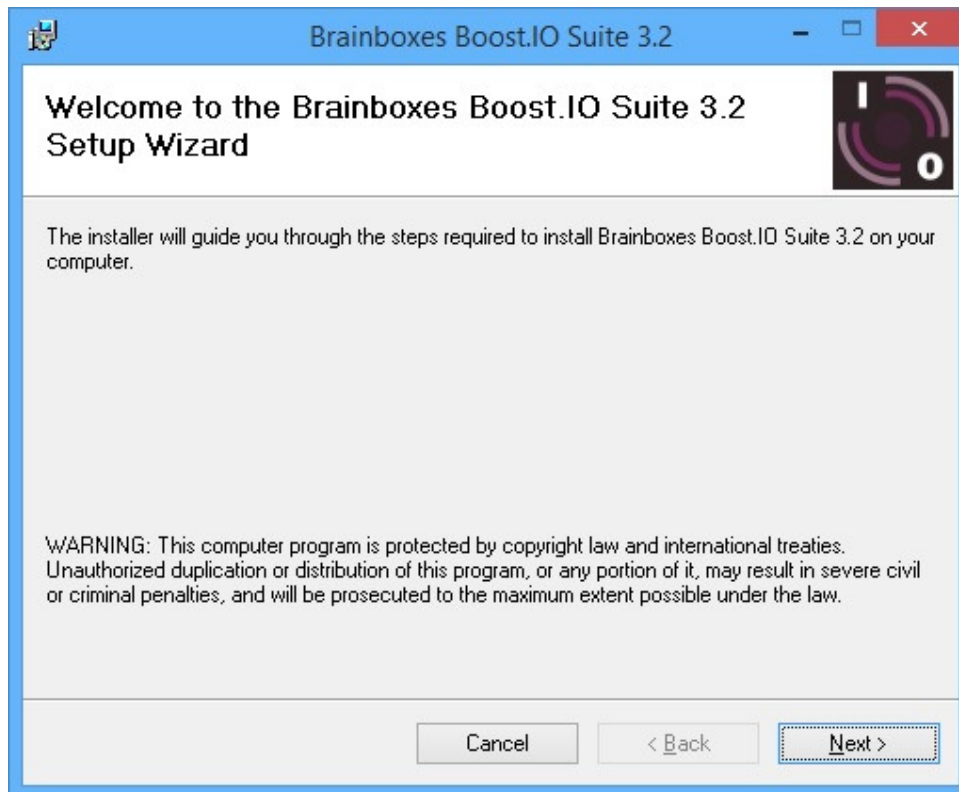
5 Boost.IO Manager

5.1 Introduction

Boost.IO Manager is a graphical user interface application which will allow you to find your Brainboxes ED device on a network and then configure some of the settings in Windows. As part of the Boost.IO application a COM port can be installed which allows communication with the device using the ASCII protocol.

Boost.IO Manager is not required if you want to communicate with the device using just the IP address or if you want to configure the device only using the web configuration pages.

Boost.IO Manager can be found on the CD that was packaged with your device.

5.2 Installing Boost.IO Manager

1. Insert the CD into your PC

2. Browse the contents of the CD and locate the "Setup" program on the CD and double click to launch.

3. Click 'Install' to launch the Boost.IO setup program.

4. Follow the on screen instructions to install the Boost.IO application.

5. Once the installation process is complete you will see the setup wizard now says "Installation Complete" and there will be a Boost.IO Manager icon on your desktop.
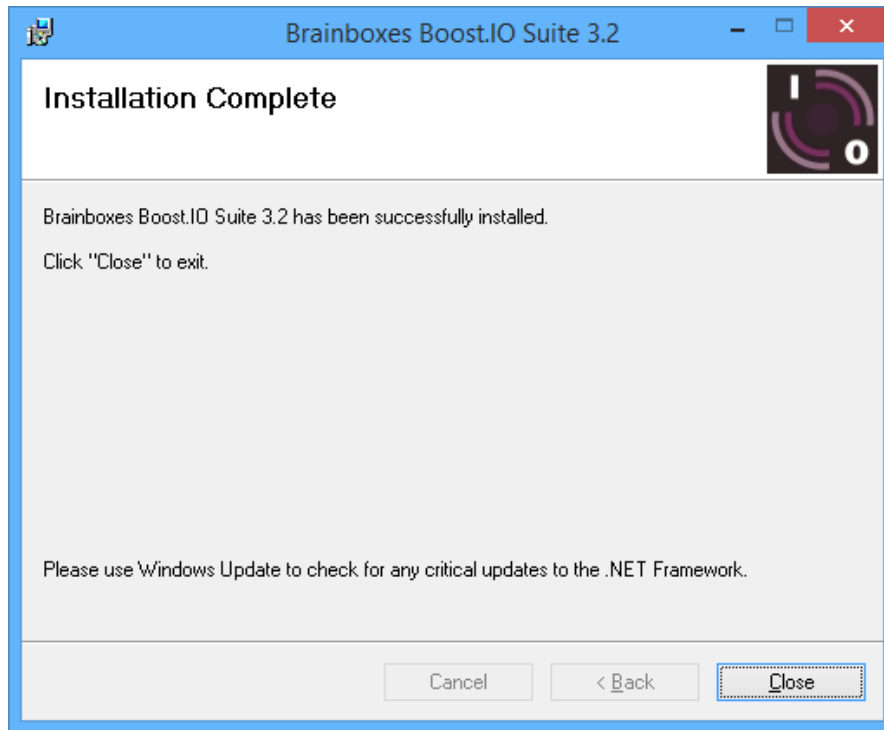
5.3 Finding and Installing an ED device

When using the ED device with Boost.IO Manager a COM port can be installed which allows the user to send ASCII commands to the device using a COM port connection.

1. Open Boost.IO Manager by double clicking the Boost.IO Manager icon on your desktop.

2. Click 'File' > 'Find Devices' to search for devices on the network (or press F5). This will find any ED devices on the same subnet as your PC. If your device is on a different subnet, please see the section entitled "Adding a Device by IP Address".
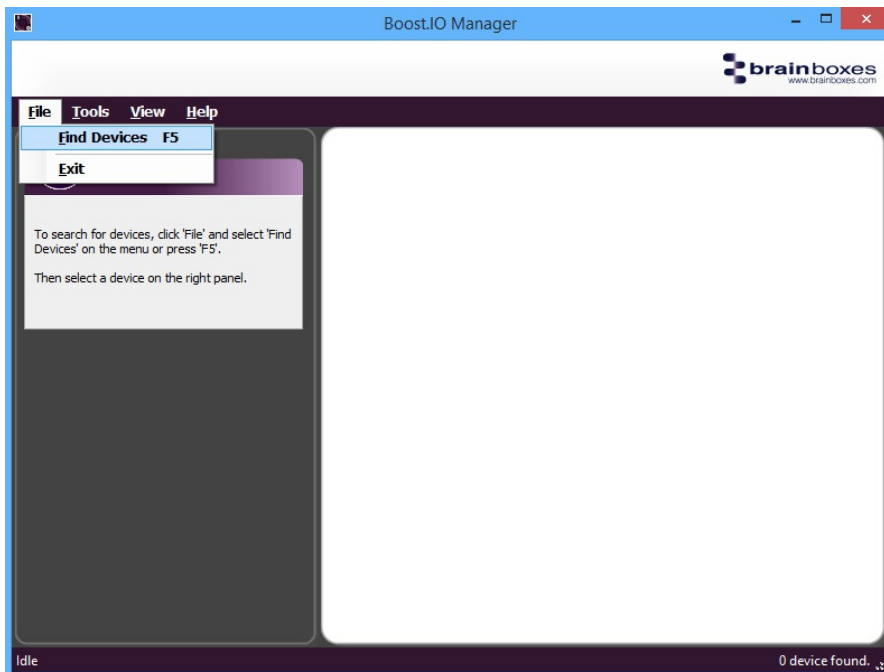
3. Once the search is complete, all the devices that have been found on the network will be displayed in the main window of Boost.IO Manager. When you select a device, the information and settings options for that device will appear in the left column.

4. You can identify your ED device by matching the MAC address in the left panel of Boost.IO Manager with the MAC address on the sticker of your ED device's case.
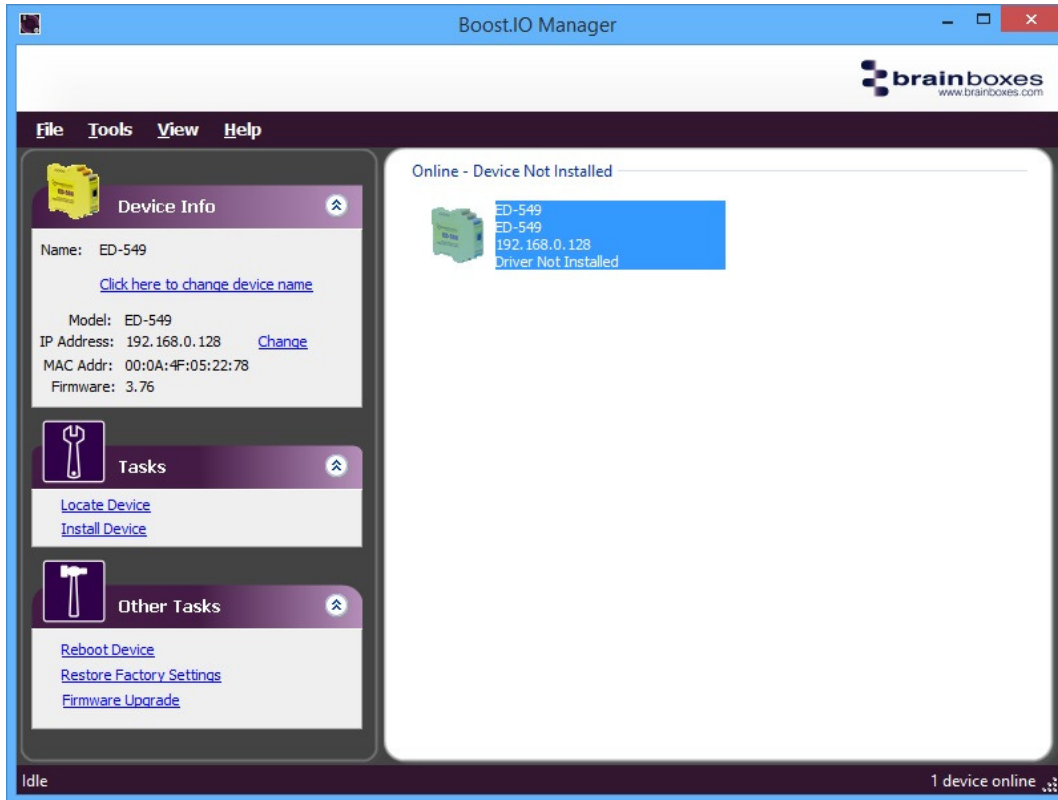
5. When you have found your device in Boost.IO Manager, in the left panel under 'Tasks' click 'Install Device'.
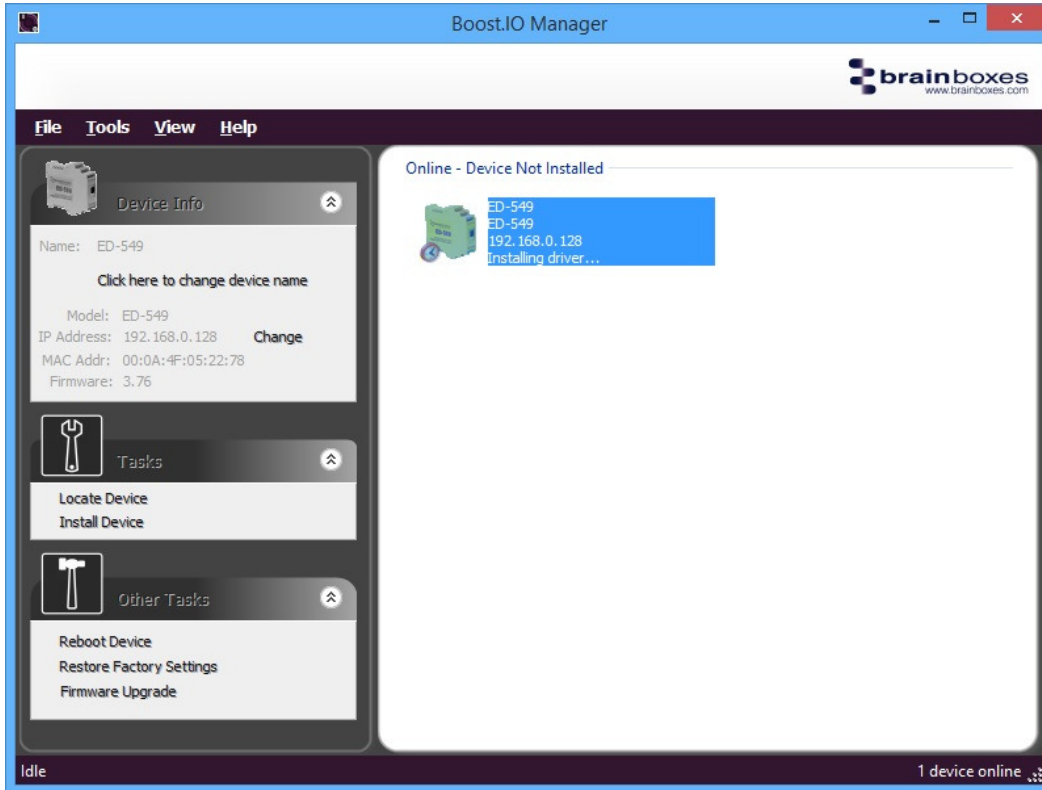
6. The driver for the device will be installed and, when complete, the icon in Boost.IO Manager will have a blue tick next to it and the status will be 'Ready'.
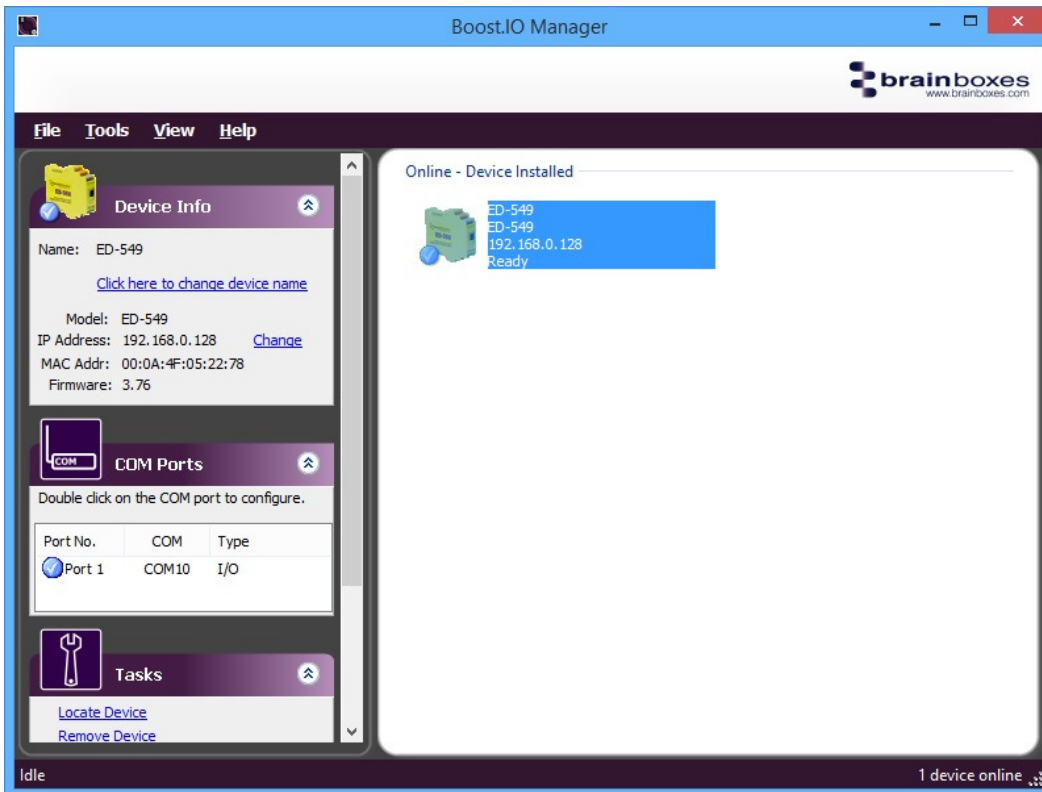
7. There will now be a COM Ports section in the left panel which allows you to change the settings of the installed COM Port such as baud rate and COM label. For details on how to do this please see the COM Port Settings section.

5.4 COM Port Settings

To change the COM Port settings of an installed ED device, follow the steps below.

1. Open Boost.IO Manager, if it is not already open, by clicking the Boost.IO icon on your desktop.

2. Select the installed device which you want to configure by clicking on it.

3. In the left panel find the 'COM Ports' section and double click on the port which you want to configure.
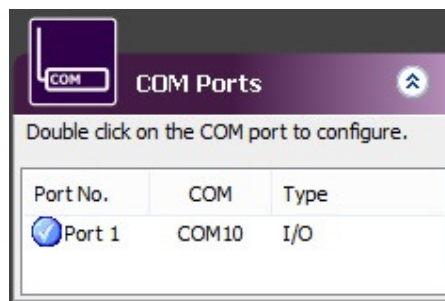
4. You will then see the port properties dialog box. Click on the 'Port Settings' tab, then click the 'Configure Settings.' button.
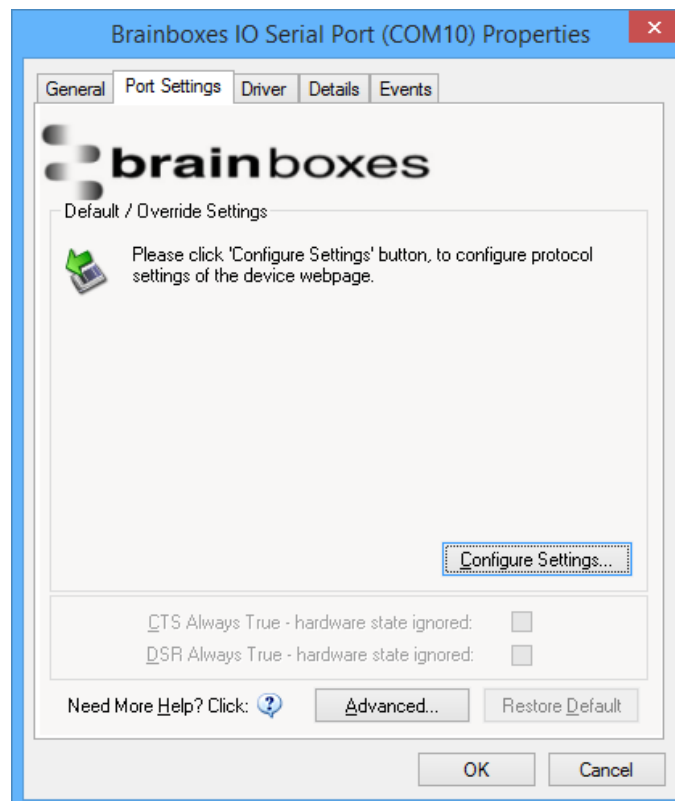
5. A webpage will be opened which allows you to configure all of the devices settings. For more information on configuring the device using the web configuration pages please see section 7. Web Configuration Pages

5.4.1 Advanced COM Port Settings

From the Port Settings tab, you can get to the advanced settings for the COM port by clicking the 'Advanced…' button. This will open another dialog window allowing you to change the advanced settings for the COM port.

COM Port Number

The COM Port Number is changed using the drop down box on this page. Click the drop down box and select a COM Port Number from the list. If the COM Port number is labelled "(*in use)*", it is either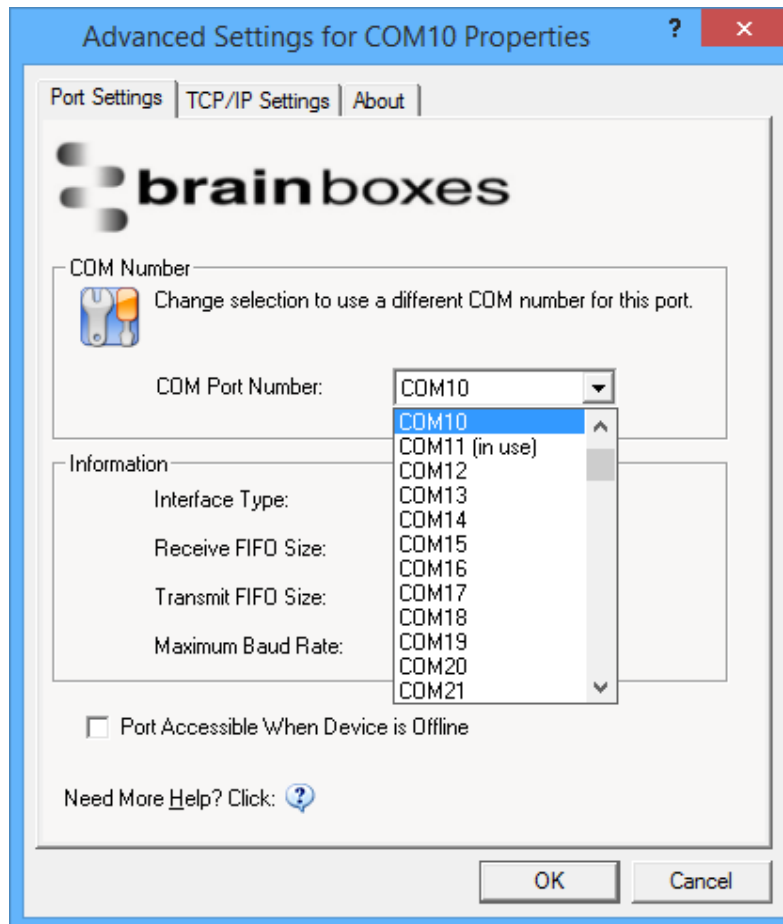 currently used by a COM Port present on the system, or is reserved for a device which is not currently present. It is possible to select this COM number and force the change if you are sure it is not required by any other device. Click the 'OK' button to apply the changes.

Port Accessible When Device is Offline

With ED devices being connected through a network, whenever a device is unplugged the device will go offline in Boost.IO Manager and any COM ports that are installed will become unavailable. By ticking this checkbox, it will keep the COM port available to use the port, even if the ED device is offline. This is useful if the device is being used in an application that requires a constant connection to a COM port.

5.4.2 TCP/IP Settings

Under the 'TCP/IP Settings' tab is information about the ED device. There is also a connection attempt timeout field. This value is the time that the driver will attempt to connect to the device COM port before giving up. For example, if this value is set at 5 seconds, the driver will attempt to connect to the COM port for 5 seconds. If no connection could be made after 5 seconds, then the driver will stop attempting to connect.

If this value is set to 0, the driver will attempt to connect without ever giving up.
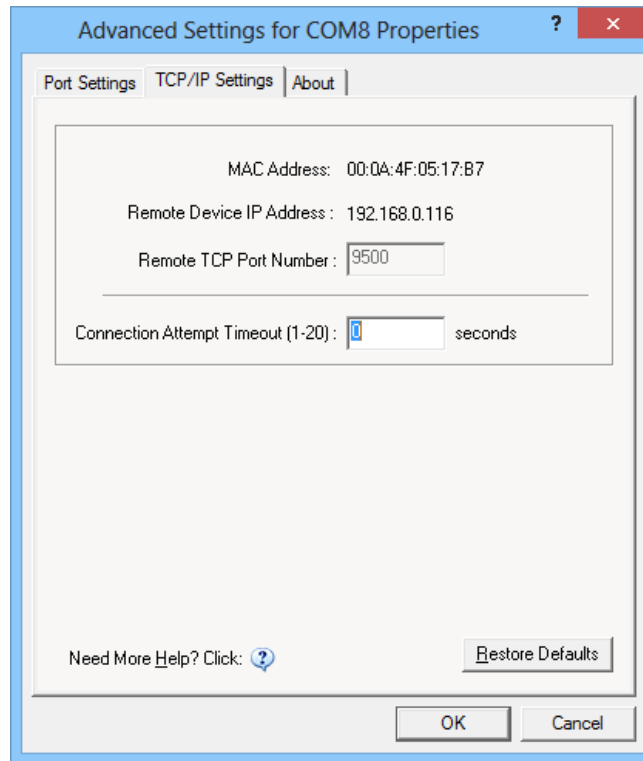
5.5 Adding a Device by IP Address
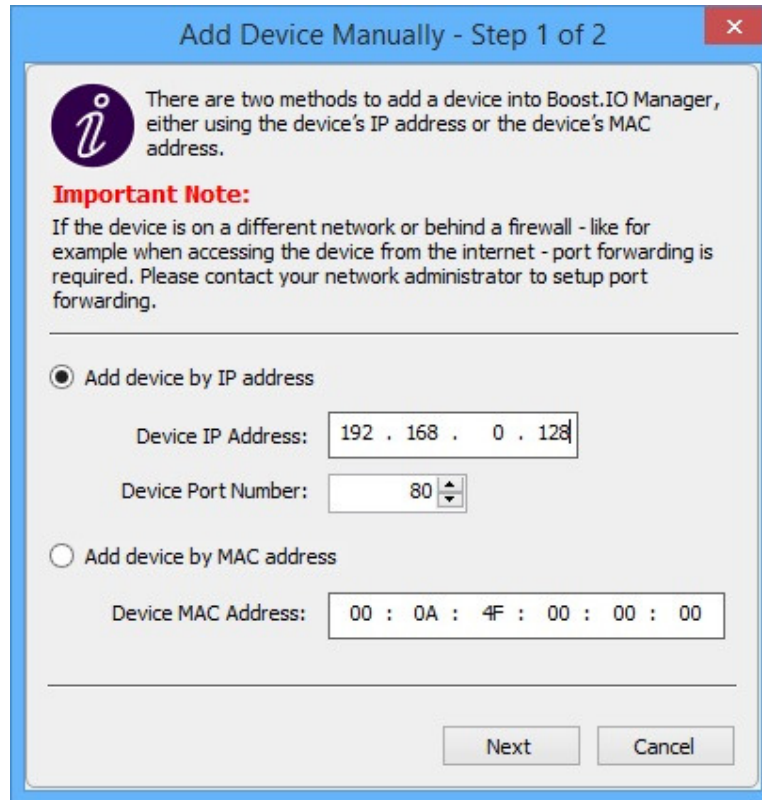
You may already know the IP address of the device that you are using. This might be because the device has had an IP address reserved for it by a system administrator or you are remotely connecting to the device. Using the IP address of the device, you can add it manually into Boost.IO Manager.

1. Open Boost.IO Manager by clicking the icon created on the desktop when the application was installed.

2. Select 'Tools' and then click 'Add Device Manually'.
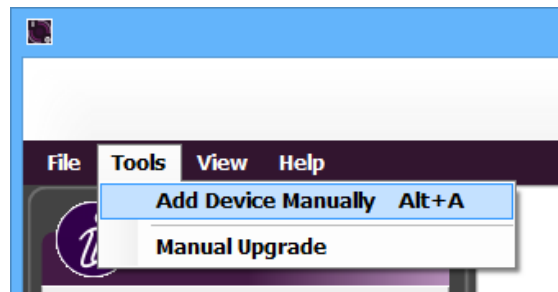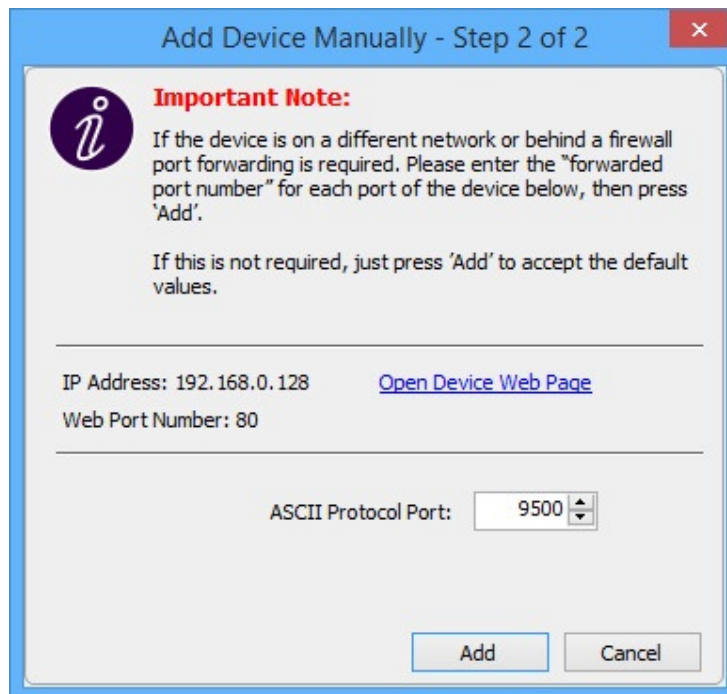
3. Enter the IP address and port number of the device into the Device IP Address box the click the 'Next' button.

4. Enter the ASCII Protocol Port number into box. The default Port Number is 9500.

5. Click 'Add' and the device will be added to the Boost.IO Manager window.
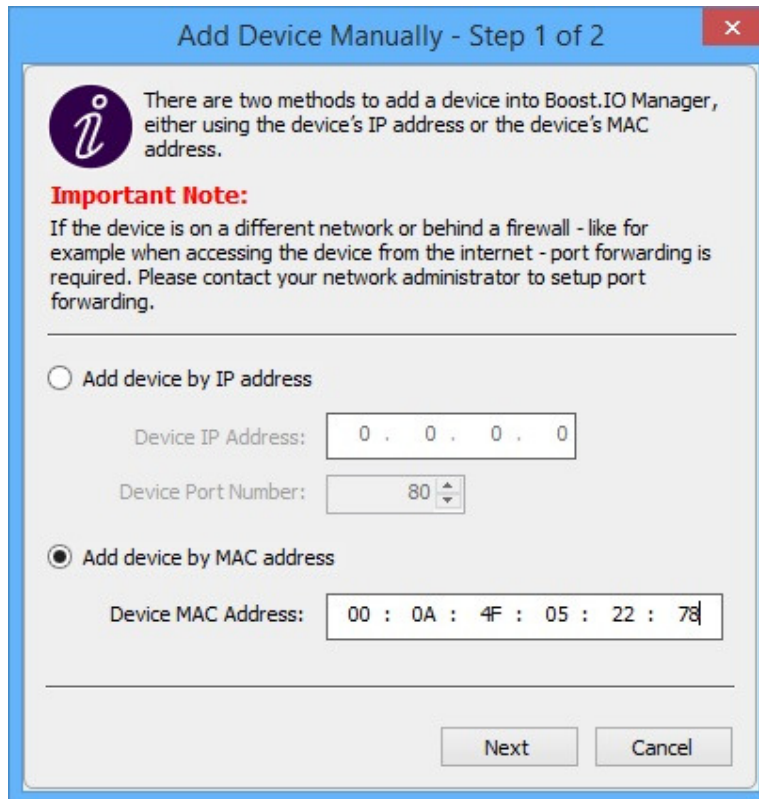
5.6 Adding a Device by MAC Address

A device can be added into Boost.IO Manager by entering the MAC address. The MAC address of a device can be found on the sticker of the device. Follow the instructions below to add the device using the MAC address.

1. Open Boost.IO Manager by clicking the icon created on the desktop when the application was installed.

2. Select 'Tools' and then click 'Add Device Manually'.
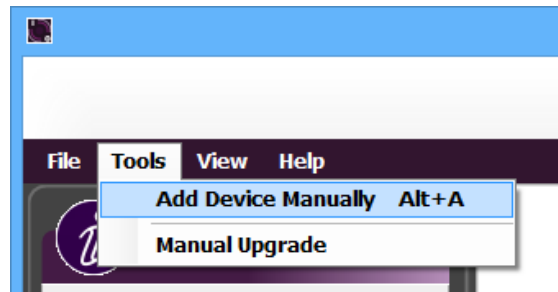
3. Select the 'Add device by MAC address' radio button then enter the MAC address of your device.

4. Enter the MAC address of your device into the text box and click the 'Next' button.
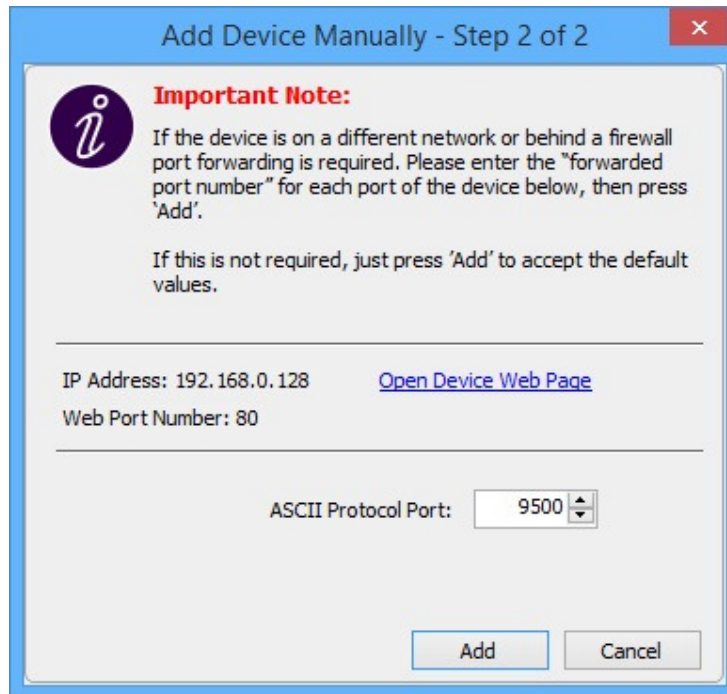
5.7 IP Addressing

The IP address settings can be easily changed using Boost.IO Manager.

1. Click on the device of which you want to change the settings.

2. In the 'Device Info' section on the left hand side, click the 'Change' link next to the current IP address.

3. Click 'OK' to confirm that you do want to change the IP address of your device
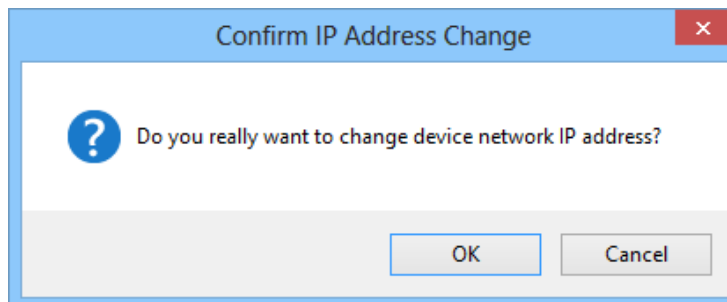
4. Select the 'Assign Static IP Address' radio button and enter an IP Address, Subnet Mask and Gateway Address then click 'Apply'.
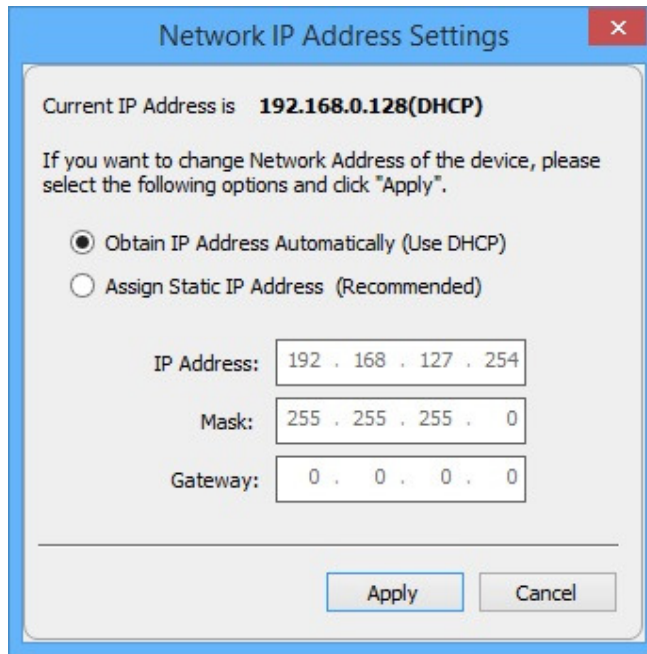
5. The ED device will reboot itself and have the new IP address once it has booted back up.

5.8   Rebooting Device

Note: Please ensure your device is not in operation before rebooting it to prevent data loss.

1. To reboot your device, firstly open Boost.IO Manager and select the device you wish to reboot.

2. On the left side of Boost.IO Manager under the 'Other Tasks' section, click 'Reboot Device'.
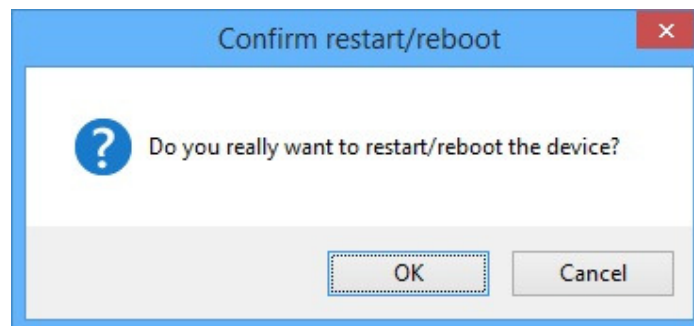
3. Confirm that you want to reboot your device.

4. The device will then reboot. Once the LED's on the device are green it is ready to use again.

5.9   Restoring Factory Settings

Note: Restoring the Factory Settings will erase any current settings that you have on your ED device. Please ensure your device is not in operation before rebooting it to prevent data loss.

1. To restore the factory settings of your device, open Boost.IO Manager and select the device which you want to restore.

2. On the left side of Boost.IO Manager, under the 'Other Tasks' section, click the 'Restore Factory Settings' link.
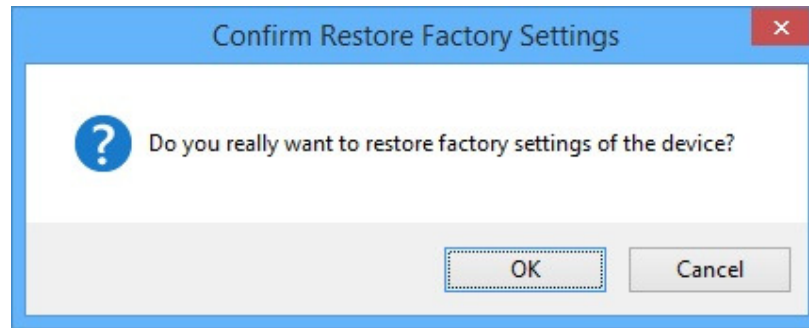
3. Confirm that you want to restore factory settings of the ED device.

4. The device will be rebooted and the factory settings will be restored.

5.10 Firmware Upgrade

Note: Before upgrading your firmware, please ensure your device is not in operation.

1. Open Boost.IO Manager and select your device in the window.

2. On the left side of Boost.IO Manager, under the 'Other Tasks' section, click the 'Firmware Upgrade' link.

3. When the message box appears confirm that you have selected the correct device. If you wish to restore the device to default settings click the tick option and then click 'Upgrade'. Otherwise just click 'Upgrade'
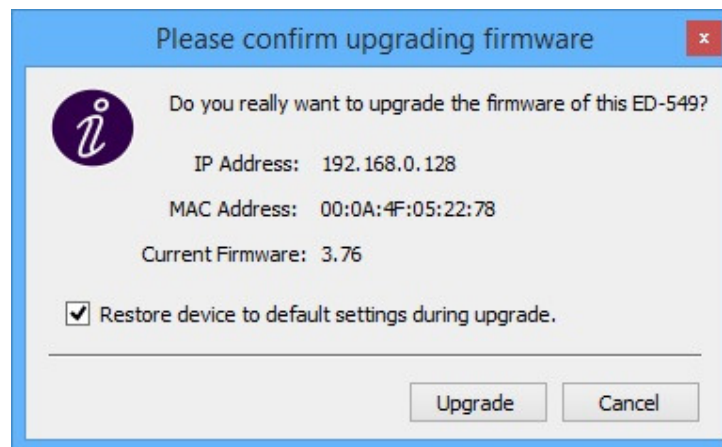
4. Navigate to the location that saved the new firmware efw file and open it.
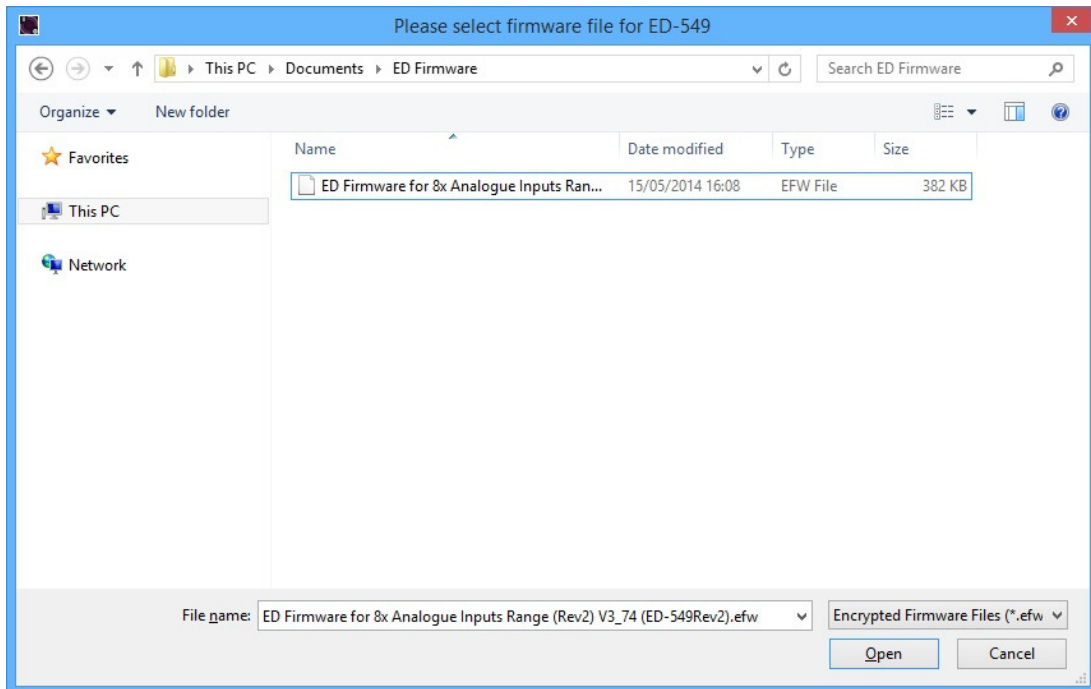
5. The ED device will be upgraded with the firmware file you selected and then will reboot.
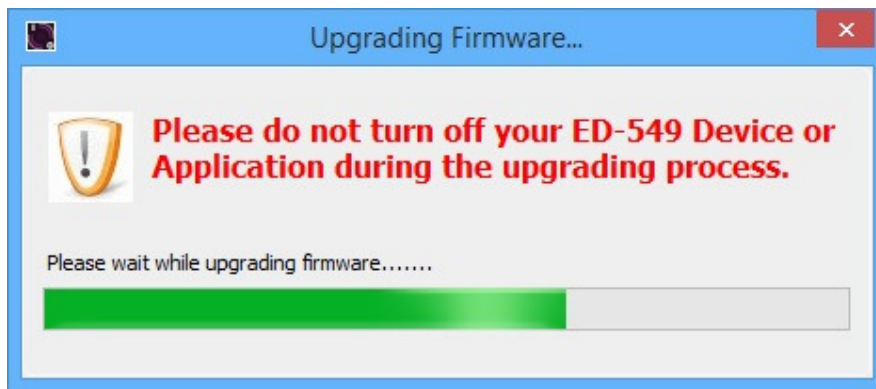
6. Click 'OK' when the upgrade success dialog box appears.
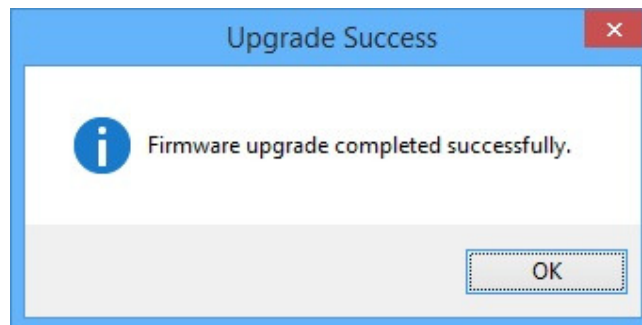
5.11 Proxy Server Settings
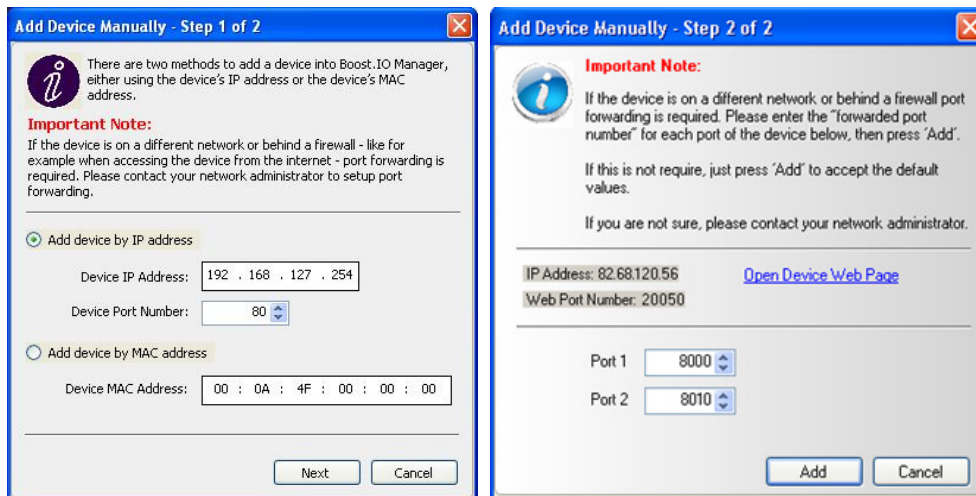
If you have a proxy server enabled on your PC this will restrict access to the web page interface. You may need to add the ED device to the Proxy Server's exceptions list. If you need help doing this contact your network administrator.

5.12 Device Swapping

In the unlikely event of a device failing, it can be easily replaced by swapping it with a device which has the same IP address. This is particularly useful when using a large number of ED devices together which have already been installed and setup and are already communicating with peripherals. The faulty device can be replaced without having to set up and install a new device. To set the device to the same IP address use the web page interface or Boost.IO to set the IP address to the static address of the device you are replacing.

5.13 Adding a Remote Device Using Boost.IO

1. To access the device through Boost.IO go to Tools and then click 'Add Device Manually'.

2. Enter the public IP address of your router into the Device IP Address field, and the port forwarding number into the Device Port Number field.

3. Click the 'Next' button.

4. Enter the port forwarding number for Port 1 and then click the 'Add' button. The device will then appear in the Boost.IO manager window. It can then be installed and used as if it were on a local network.

5.14 Remote Access

The Remote access feature of the ED devices allows access to the device over the internet or from a different network. The device can be accessed either through the webpage interface, or through Boost.IO Manager. To access the ED device remotely, you will need the IP address of the router and have port forwarding set up on your router for the device and the ports on your device. If you need assistance setting up port forwarding on your network, contact your network administrator.

Once you have the IP address and port forwarding numbers of the device and the ports, you can either access the device through the webpage or add the device manually using Boost.IO Manager.

The ED devices store their settings in one place, inside the device. When accessing the device either from the web configuration pages or using Boost.IO Manager, it will get and set the settings inside the device itself.   Therefore, if Boost.IO Manager is closed and a setting is updated using the web configuration pages, Boost.IO won't know that any settings have changed until it is opened. When the application opens, it will automatically get the settings of any installed devices.

6 Web Configuration Pages

6.1 Introduction
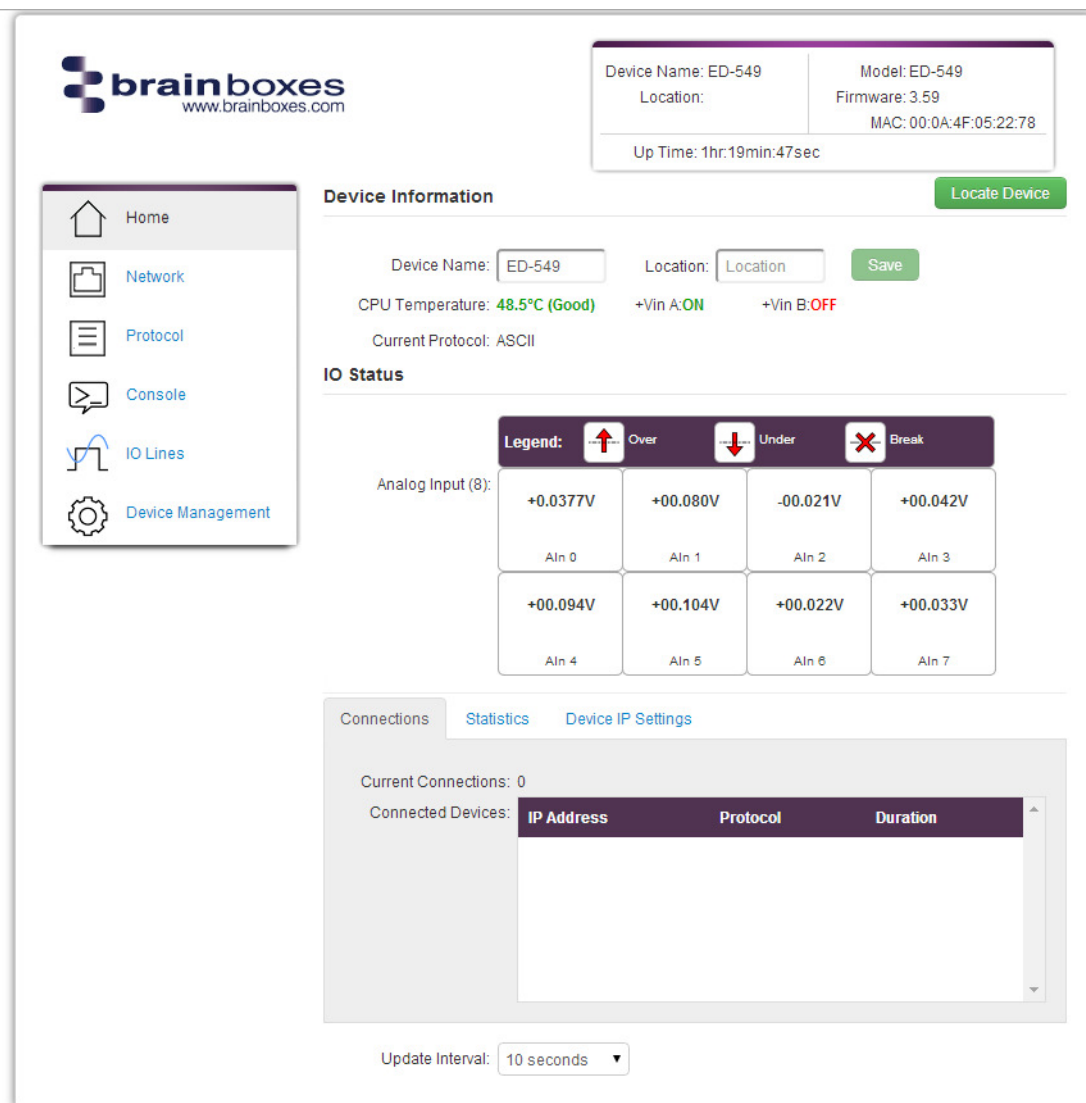
The web configuration pages for the ED device allow you to configure all the settings on the device and view the status of the device. To access the web configuration pages, type the IP address of the device into a web browser. To find the IP address of your device, see section 6.3 Finding and Installing an ED Device.

In the top right corner of every page there will be a box that displays information about your device. It will show you the model, firmware version, MAC address, device name a location (if entered) and how long the device has been powered on for.

Note: We recommend that you use Internet Explorer Version 7 and above

6.2 Home page

The Home page is the default page that loads when you enter the IP address of the device into a web browser. This page mainly displays information about the device and a visual display of the states of the input lines.

Locate Button

When the Locate Device button is pressed, all the LED's on the front of the device will flash for 10 seconds. If you have a number of devices next to each other on a DIN rail, you may not be able to see the sticker on the side to identify the devices. Using the Locate button will allow you to clearly see which device you are configuring on the DIN rail without having to remove the device.

Device Information

Under the Device Information section is a text box which shows the current device name. This is the name that you can use to identify the device on your network. By default the device name is set to the product name but this can be changed by typing the name you would like into the text box and clicking 'Save'.

To the right of the Device Name is the Location. The Location is blank by default but the location of the device can be added to help identify where the device is physically located.

Below this is the CPU temperature and status of the power supplies. The temperature will be displayed in green unless the CPU is getting hotter than it should, in which case the temperature will be displayed in red.

Also displayed is the state of both power inputs, Vin A and Vin B. The state will either be on or off, depending on whether they have power or not.

IO Status

The IO Status section displays the state of the Analogue Inputs.

If the value read from the channel is within the full scale range then that value will be displayed in the appropriate position for that channel. If the value is over the full scale range then the over symbol will be displayed for that channel, if the value is under the full scale range the under symbol will be displayed and if the line is broken the break symbol will be displayed.

Connections

The Connections tab displays information about any active connections to the device including the protocol being used to connect and the length of time the connection has been established.

Also, when a connection is made there will be a warning at the top of every page. When changing some of the settings, the device is required to be restarted for the settings to be applied and the ED device cannot be restarted while a connection is being made to it.

Warning! There is an active connection to the device. Close all connections before changing any settings.

Statistics

The Statistics tab will display information about the protocol commands that have been sent to the device since it was powered on, including a history of all the commands sent and the response of each command.

Device IP Settings

Under the Device IP Settings tab there is information about the device's network settings. These settings can be changed on the Network page. See section 6.3 Network page.
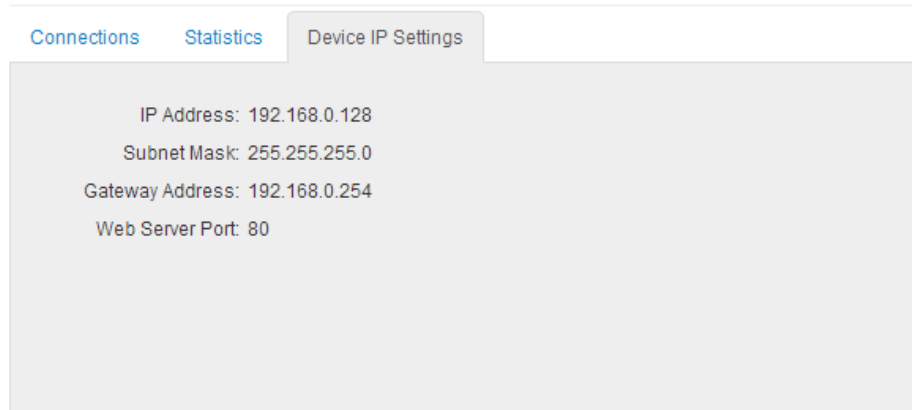
Update Interval

The Update Interval dropdown box controls how often the device information on the web configuration pages will be refreshed. For example, if set to 5 seconds, the web page will update all the information on the web pages every 5 seconds. If set to 'Disabled', the web page will not update these settings and you will have to refresh the page manually.
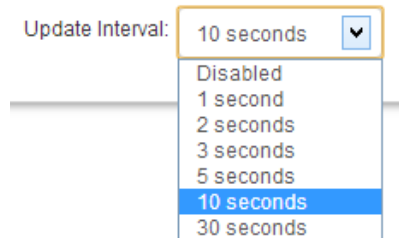
6.3 Network page

The Network page allows you to configure all of the network settings of the ED device.

Network IP Address

In the Network IP Address tab you can select whether the device is using DHCP or a static IP address which you specify. By default the ED device is set to use DHCP to obtain an IP address automatically.

If there is no DHCP server present, after 60 seconds the device will switch to a static IP address of 192.168.127.254.

Web Server/UPnP

Please consult the Network Administrator before changing any settings.

Network IP Address | Web Server/UPnP

Web Server Port: 80
(1-65535)

UPnP: ● On
○ Off

Save | Cancel Changes
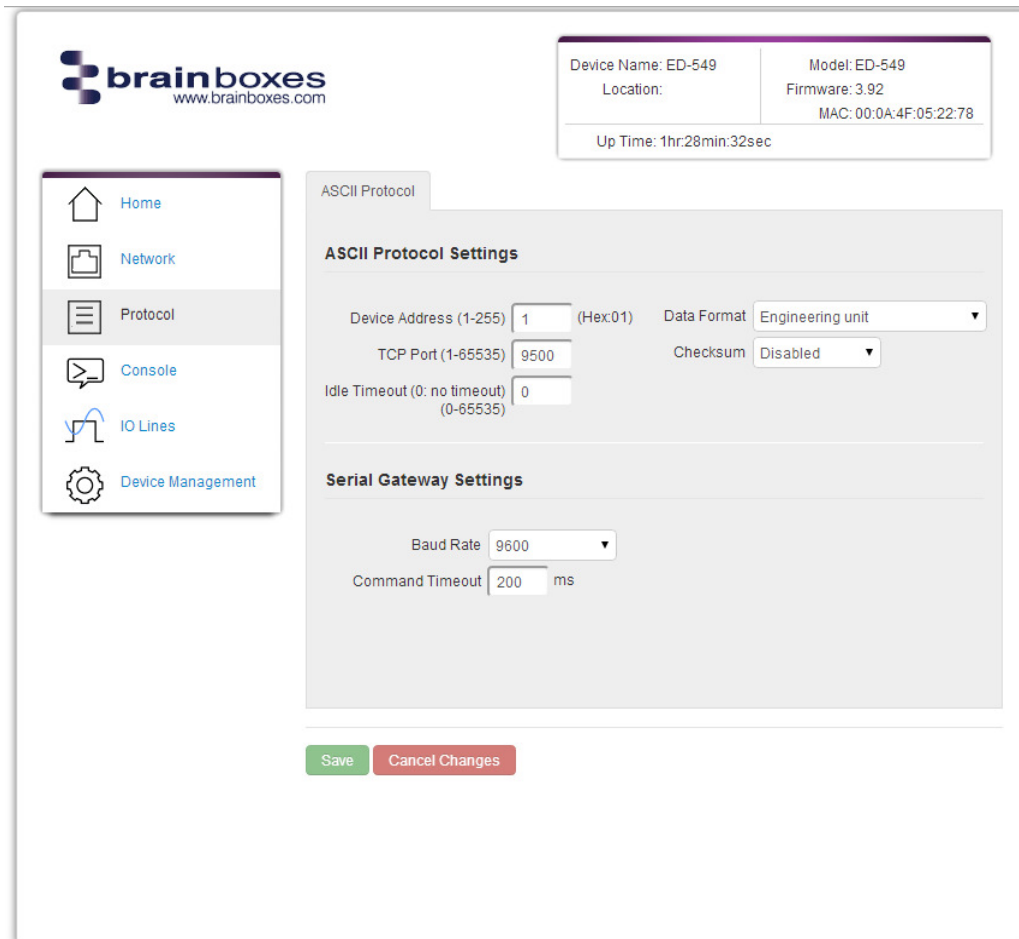
Under the Web Server/UPnP tab you can change the Web Server Port number and also turn UPnP on or off. The default Web Server Port number is 80.

6.4   Protocol page

The protocol page has all of the ASCII settings and serial gateway settings.

brainboxes
www.brainboxes.com

Device Name: ED-549   Model: ED-549
Location: Firmware: 3.92
MAC: 00:0A:4F:05:22:78

Up Time: 1hr:28min:32sec

Home
Network
Protocol
Console
IO Lines
Device Management

ASCII Protocol

ASCII Protocol Settings

Device Address (1-255) 1   (Hex:01)   Data Format Engineering unit ▼
TCP Port (1-65535) 9500   Checksum Disabled ▼
Idle Timeout (0: no timeout) 0
(0-65535)

Serial Gateway Settings

Baud Rate 9600 ▼
Command Timeout 200   ms

Save | Cancel Changes

6.4.1 ASCII Protocol Settings

Device Address

The device address is a hexadecimal value which specifies the target device. If an ASCII command is being sent to a specific device, this address is used to specify which device the command is sent to. Also, some of the responses from the commands will contain a device address to indicate which device sent the response.

Device Address (1-255) | 1 | (Hex:01)

The number entered into the text box should be a decimal number between 1 and 255. Any decimal numbers entered will have their Hex value displayed to the right of the text box.

TCP Port
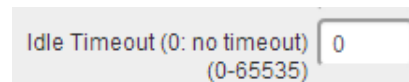
The TCP port is the network port that is used to connect to the device at the IP address that it's using. The default port number is 9500.

TCP Port (1-65535) | 9500

Idle Timeout

When the idle timeout is set, if there is no communication to the device for the specified period of time, the connection will be closed. The default idle connection is 0, meaning the connection will never be dropped automatically.

Idle Timeout (0: no timeout) | 0
(0-65535)
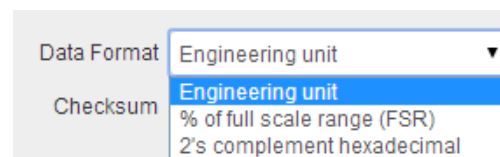
Data Format

The data format can be set to 3 options – Engineering unit, % of full scale range (FSR) or 2's complement hexadecimal.

The engineering unit is the actual value that is read from the analogue input line of the device and is displayed as either a voltage or a current depending on the FSR setting.

The % of the full scale range is the actual value as a percentage of the full scale range and the value will be displayed as a percentage.

The 2's complement hexadecimal is the actual value converted into 2's complement hexadecimal. The value will be displayed as a 4 character hexadecimal value.

Data Format | Engineering unit ▼
Engineering unit
Checksum | % of full scale range (FSR)
2's complement hexadecimal

For more information on the data format and FSR ranges see the section Analogue input type settings.

Checksum

The purpose of the checksum is to help the PC and devices detect the communication errors that have corrupted the command strings. When the checksum is enabled all commands from the PC to the devices and all responses from the devices must contain a valid checksum otherwise the data is discarded. When the checksum is enabled, commands sent without a valid checksum will be ignored by the devices and the device will not respond to the host PC. By default, the checksum is disabled.
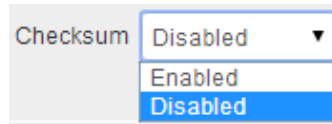
6.4.2   Serial Gateway Settings

The Serial Gateway feature (available on ED-5XX models) turns the ED device into a serial gateway which allows it to send the commands out the gateway port to another ASCII protocol compatible device such as NuDAM, eDAM and ADAM modules. The gateway port uses half duplex RS485 with 8 data bits, no parity and 1 stop bit.

Baud Rate

The baud rate of the Serial Gateway can be changed using the drop down box. The default baud rate is 9600.
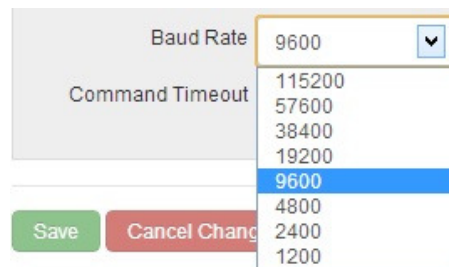
Command Timeout

The Command Timeout option determines how long the ED device will wait for a response from the Serial Gateway once a command has been sent. If, after the specified time no response has been received through the gateway port then the ED device will stop waiting for a response. If a response does come in after the timeout value, the response will be discarded. The default timeout is 200 milliseconds.
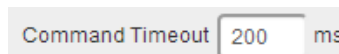
6.5   Console page

The Console Page contains the console window which allows ASCII commands to be sent straight to the device and be executed immediately. The response of the command is displayed in the console window in green. This is the simplest way to send ASCII commands to the ED device to either set or read settings.

Terminal Console

To communicate with the device, please enter any valid ASCII command.
Please click here to view a list of ASCII Protocol commands.

```
ASCII Command Console
> $01F
!013.59
> $01M
!01ED-549
> #010
>+0.0367
>
```

Note:Please type 'clear' to clear the console screen.

Also on the Console page is a link to a web view of all the ASCII protocol commands that can be sent to the device and a description of what each command does.

ASCII Command Summary

Command	Response	Description
%AANNTTCCFF	!AA	Set Device Configuration
#**	No Response	Synchronized Sampling
#AA	>(Data)	Reads analogue input of all channels
#AAN	>(Data)	Read the analogue input of the specified channel
$AA2	!AANNTTCCFF	Read the device configuration
$AA4	>AAS(Data)	Read synchronized data
$AA5VV	!AA	Enables/disables the channel
$AA6	!AAVV	Read the channel enable/disable status
$AA7CiRrr	!AA	Sets the single channel range configuration
$AA8Ci	!AACiRrr	Reads the single channel range configuration
$AAA	>(Data)	Reads the analogue inputs of all the channels
$AAB	!AANN	Reads the channel diagnostic status
$AAF	!AA(Data)	Read the firmware version
$AAM	!AA(Data)	Reads the device name
$AAM0	!AA(Data)	Reads the device model
$AAM1	!AA(Data)	Reads the device location
$AARS	No Response	Reset the module to power on state

%AANNTTCCFF

Description:

Command to set the analogue device configuration.

Command Syntax:

AANNTTCCFF[CS](CR)

%	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
NN	New device address in hexadecimal format (00 to FF)
TT	Type code (ignore for ED-549)
CC	New Baud Rate code.
FF	Used to set filter settings, module settings, data format and checksum
[CS]	Checksum
(CR)	Carriage Return

CC — New Baud Rate code.

Code:	03	04	05	06	07	08	09	0A
Baud Rate:	1200	2400	4800	9600	19200	38400	57600	115200

FF —

7	6	5	4	3	2	1	0
FS	CS	MS	Reserved		DF		

FS: Filter Setting
0: 60Hz Rejection
1: 50Hz Rejection

CS: Checksum Setting
0: Disabled
1: Enabled

MS: Module Settings
0: Normal mode (16 bits)
1: Fast mode (12 bits)
DF: Data format
00: Engineering unit
01: % of FSR
10: 2's complement hexadecimal

6.6 IO Lines page

The IO Lines page lists all the input lines on the device and allows you to change their settings and calibrate them individually.

Channel Name

The channel name box allows you to give a name to each of the channels individually. The name given to each of the channels will appear on the Home page of the web configuration pages in the IO status section.

Channel Enable

When the enable box is ticked then the channel is enabled and the value can be read from the channel. When the channel is disabled there will be no value displayed on the IO Lines page or in the IO Status section of the Home page.

Full Scale Range

The full scale range is the range of voltages or currents that the value will be displayed in.

Value

In the value column is the value which is read from each of the analogue lines. This is the same value that is displayed on the Home page and is adjusted according to the FSR and Data Format settings. The value is updated

User Calibrated

Indicates which FSR range of the channel has been calibrated by the user and which channels have the factory calibration. A channel with "No" is using the factory calibration for the current FSR and channels with "Yes" have been calibrated by the user.

Calibrate

The calibrate button allows you to calibrate a specific channel of your ED device at the Full Scale Range that the channel is set to. The channel has to be calibrated for each FSR separately. You can look at the "User Calibrated" channel to see which channels and FSR's have been calibrated manually and which are at the factory calibration.

Before you calibrate a channel the FSR needs to be set to the correct value. Once the FSR is set follow the steps below to calibrate a channel.

Note: The following steps have the FSR set to ±10V.

1. Click the "Calibrate" link on the channel that you want to calibrate and the following dialogue box will appear.

Analog Channel 'AIn 0' - Zero Calibration (Step 1 of 2)   ×

Info Please apply the zero calibration voltage (0V) to channel 'AIn 0' and then press 'Next'.

Cancel   **Next**

---

2. Apply the zero calibration voltage specified in the dialogue box to the channel and then press "Next". In this case the zero calibration voltage will be 0V.

Analog Channel 'AIn 0' - Zero Calibration (Step 1 of 2)   ×

Info Please apply the zero calibration voltage (0V) to channel 'AIn 0' and then press 'Next'.

Cancel   **Calibrating....**

---

3. The channel will then be calibrated to the zero calibration voltage supplied.

Analog Channel 'Aln 0' - Span Calibration (Step 2 of 2)   ✕

Info Please apply the span calibration voltage (+10V) to channel 'Aln 0' and then press 'Next'.

Cancel   Next

4. Once the first stage is calibrated then the span calibration voltage needs to be applied to the channel. In this example the voltage required is +10V. Once the voltage is applied click "Next".

Analog Channel 'Aln 0' - Span Calibration (Step 2 of 2)   ✕

Info Please apply the span calibration voltage (+10V) to channel 'Aln 0' and then press 'Next'.

Cancel   Calibrating....

5. The channel will be calibrated to the span calibration voltage.

Analog Channel 'Aln 0' - Success   ✕

Info Successfully calibrated channel 'Aln 0'. Press 'Finish'.

Cancel   Finish
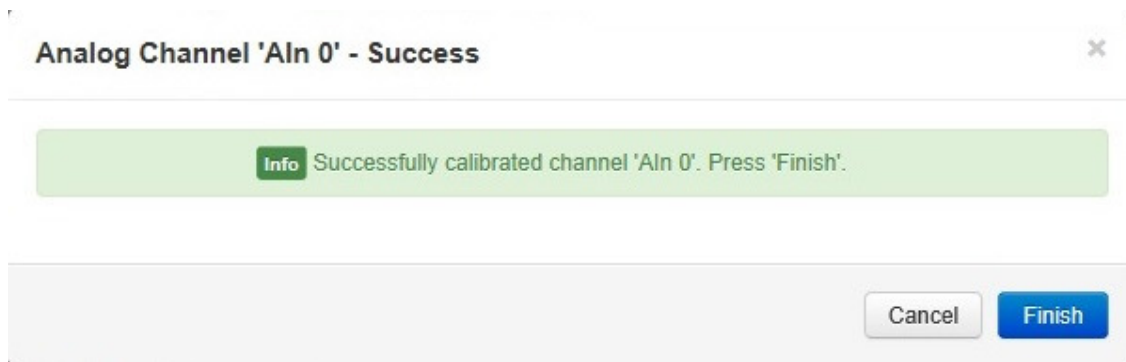
6. Once the calibration is complete the success message will then show in the dialogue box. Click "Finish" to close the box. The channel will now be calibrated at that FSR range

Restore Factory Calibration

The restore factory calibration button will erase any user calibration that has been applied to any of the channels and restore the factory calibration on all channels.

6.7 Device Management page

The Device Management page has 2 options. The first is to restart your device and the second to restore the factory default settings of the device.
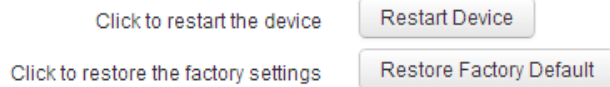
Restart Device

Clicking the 'Restart Device' button will power cycle the device. In order to restart the device, there must be no connections being made to it. If there is a connection being made to the device, a warning message will be displayed asking you to close the connection before restarting the device.

Restore Factory Default

Clicking the 'Restore Factory Default' button will revert all the settings on the device back to their factory default. Just like restarting the device, in order to restore the factory settings, there must be no connection to the device active. For a list of the factory settings of the device please see section 6.8 Factory Default Settings.

6.8 Factory Default Settings

Network Settings	
Network IP Address	DHCP Mode
Web Server Port	9500
ASCII Protocol Settings	
Device Address	01
TCP Port	9500
Idle Timeout	0
Data Format	Engineering unit
Checksum	Disabled
Serial Gateway Settings	
Baud Rate	9600
Command Timeout	200ms

7 Configuration Tables

7.1 Baud Rate Settings (CC)

Code:	03	04	05	06	07	08	09	0A
Baud Rate:	1200	2400	4800	9600	19200	38400	57600	115200

7.2 Data Format Settings (FF)

7	6	5	4	3	2	1	0
FS	CS	MS	Reserved			DF	

FS: Filter Settings
0: 60Hz Rejection
1: 50Hz Rejection
The ED devices are designed to filter interference at both 60Hz and 50Hz.

CS: Checksum Setting
0: Disabled
1: Enabled

MS: Module Settings
0: Normal mode (16 bits)
1: Fast mode (12 bits)

DF: Data Format
00: Engineering unit
01: % of FSR
10: 2's complement hexadecimal

7.3 Analogue input type settings (TT)

Type Code	Input Type	Data Format	+ Full Scale	- Full Scale
05	±2.5V	Engineering unit	+2.5000	-2.5000
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000
06 or 0D	±20mA	Engineering unit	+20.000	-20.000
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000
07	+4 to +20mA	Engineering unit	+20.000	+04.000
		% of FSR	+100.00	+000.00
		2's complement hex	FFFF	0000
08	±10V	Engineering unit	+10.000	-10.000
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000
09	±5V	Engineering unit	+5.0000	-5.0000
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000
04 or 0A	±1V	Engineering unit	+1.0000	-1.0000
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000
03 or 0B	±500mV	Engineering unit	+500.00	-500.00
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000
0C	±150mV	Engineering unit	+150.00	-150.00
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000
1A	+0 to +20mA	Engineering unit	+20.000	+00.000
		% of FSR	+100.00	+000.00
		2's complement hex	FFFF	0000
3A	±75mV	Engineering unit	+75.000	-75.000
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000
3B	±250mV	Engineering unit	+250.00	-250.00
		% of FSR	+100.00	-100.00
		2's complement hex	7FFF	8000

8 ASCII Protocol

8.1 Introduction

The ASCII protocol is a query-response or a question and answer communication protocol in which a host PC uses ASCII characters to send commands to a device and then receives responses back from that device. The ASCII command set is used to configure devices, send data to devices and to read data and status information back from devices.

Command Format

The command string is made up of several different parts. For example, the command $AA5VV can be broken down into as many as 6 separate parts.

$	AA	5	VV	[CS]	(CR)
Delimiter	Address	Command	Parameters	Checksum*	Carriage Return

* Optional parameter for the command.

Every ASCII command sequence is a series of ASCII characters starting with a prefix delimiter and terminating with a carriage return character. All of the ASCII characters used are easily entered from a PC keyboard and every ASCII command is terminated with a Carriage Return character; hex 0D, denoted by (CR). All commands being sent to the device must be in uppercase characters.

Prefix or Delimiter: Each ASCII command starts with a single character command prefix or delimiter. The prefix will be one of the following five characters:-

#	the hash or pound sign, ASCII value hex 0x23
%	the percentage sign, ASCII value hex 0x25
$	the dollar sign, ASCII value hex 0x24
@	the at sign, ASCII value 0x40
~	the tilde or approx. sign, ASCII value hex 0x7E

These prefix signs cannot be used interchangeably but are particular to the command string which follows.

Address: The ASCII protocol was first introduced in the 1980s by Analog Devices with its RS485 Half Duplex connected 6B Series modules and digital I/O boards and has been adopted and adapted by many other companies since. It is the de-facto communication protocol on the widely used RS485 Half Duplex connected ADAM/NuDam/eDAM modules. A very wide range of PC based data acquisition packages have support for this command protocol communicating over PC COM port. The Brainboxes ED-xxx range of devices are completely backwards compatible with these devices.

Since it was initially developed for an RS485 bus system containing many devices, each ASCII command must include the address of the particular device the command is directed to. The address is a two character field giving the hexadecimal address of the device (00-FF). The default address is 01. The address field is written as AA in the examples that follow.

A few commands do not have an address as these are broadcast commands that go to all the devices. Here the address field AA is replaced by the wildcard two star signs **. Two such examples are #** and ~**.

Command: The command field contains the command that you want to send to the device. The next section (Command List) gives a detailed description of how to use each command and what the commands do.

Data: The data being sent to the device which is required in the command. Depending on the command this data is in different formats.

Checksum: An optional two character checksum denoted **[CS]** can be included immediately before the terminating **(CR)**. The purpose of the checksum is to help the PC and devices detect the communication errors that have corrupted the command strings. When the checksum is enabled all commands from the PC to the devices and all responses from the devices must contain a valid checksum otherwise the data is discarded. When the checksum is enabled, commands sent without a valid checksum will be ignored by the devices and the device will not respond to the host PC. By default the checksum is turned off. To turn checksum on, you must configure the device via its webpage using a browser.

In the following sections of this chapter, those parts of the command string in bold and underlined are parameters that the user must enter. Those parts of the command string in normal text are to be used literally in the command without replacement by the user.

Additionally, any parts of the command string that are in square brackets are optional. The checksum is an example of this as it is only required when the checksum is enabled in the firmware of the device.

Example Commands: Assuming that the checksum has not been turned on by the user, one of the simplest commands is:

`$AAM(CR)`

This command reads the status of the digital input port. Assuming the ED devices address is 01, that is **AA**=01, then the command the user would issue would be:

`$01M(CR)`

The response to this command from an ED-549 device at factory default settings would be:

`!01ED-549(CR)`

Response Format

The response received from the device will depend on the ASCII command that has been sent. The response for each command is detailed in the Command List Section.

!	**AA**	**(Data)**	**[CS]**	**(CR)**
Delimiter	Address	Data*	Checksum**	Carriage Return

* Only applicable for certain commands that return data.

** Optional parameter for the command.

Prefix or Delimiter: Each ASCII response starts with a single character prefix or delimiter. The prefix will be one of the following three characters:-

>	Greater than sign, ASCII value hex `0x3E`
!	Exclamation sign, ASCII value hex `0x21`
?	Question mark sign, ASCII `0x3F`

Address: The address is a two character field giving the hexadecimal address of the device (`00-FF`). The default address is `01`. The address field is written as AA in the examples that follow.

Data: The data being sent from the device in response to the command sent.

Checksum: Optional 2 character checksum.

8.2 Command List

Command	Response	Description	Supported Devices
%AANNTTCCFF	!AA	Set device configuration	ED-549
#**	No Response	Synchronized sampling	ED-549
#AA	>(Data)	Reads analogue input of all channels	ED-549
#AAN	>(Data)	Read the analogue input of the specified channel	ED-549
$AA0Ci	!AA	Performs span calibration on the specified channel	ED-549
$AA1Ci	!AA	Performs zero calibration on the specified channel	ED-549
$AA2	!AANNTTCCFF	Reads the device configuration	ED-549
$AA4	>AAS(Data)	Reads the synchronized data	ED-549
$AA5VV	!AA	Enables/disables the channel	ED-549
$AA6	!AAVV	Reads the channel enable/disable status	ED-549
$AA7CiRrr	!AA	Sets the single channel range configuration	ED-549
$AA8Ci	!AACiRrr	Reads the single channel range configuration	ED-549
$AAA	>(Data)	Reads the analogue inputs of all the channels	ED-549
$AAB	!AANN	Reads the channel diagnostic status	ED-549
$AAF	!AA(Data)	Reads the firmware version	ED-549
$AAM	!AA(Data)	Reads the device name	ED-549
$AAM0	!AA(Data)	Reads the device model	ED-549
$AAM1	!AA(Data)	Read Device Location	ED-549
$AARS	No Response	Reset the device	ED-549
$AAS0	!AA	Internal Calibration	ED-549
$AAS1	!AA	Reloads the default calibration settings	ED-549
~AAEV	!AA	Enables/disables calibration	ED-549
~AAL(Location)	!AA	Set device location	ED-549
~AAO(Name)	!AA	Set device name	ED-549
~**	No Response	Host OK	ED-549
~AA0	!AASS	Read the watchdog status	ED-549
~AA1	!AA	Reset watchdog status	ED-549
~AA2	!AAVV	Read watchdog settings	ED-549
~AA3ETT	!AA	Set Watchdog Timeout Value	ED-549

8.3 %AANNTTCCFF

Description:

Command to set the analogue device configuration.

Command Syntax:

%AANNTTCCFF[CS](CR)	
%	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
NN	New device address in hexadecimal format (00 to FF)
TT	Used to set the new type code (See Analogue Input Type Settings)
CC	Used to set the new baud rate code. (See Baud Rate Settings)
FF	Used to set the data format, checksum and filter settings. (See Data Format Settings)
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device in hexadecimal format (00 to FF)
[CS]	Checksum
(CR)	Carriage Return

Examples:

Change the device address from 01 to 02. The device returns a valid response.
Command: %0102080682(CR)
Response: !02(CR)

Change the Baud Rate of device 01 to 115200. Device returns a valid response.
Command: %0101080A82(CR)
Response: !01(CR)

Change the Baud Rate of device 01 to 115200. Device returns invalid command because the baud rate code is incorrect.
Command: %010108FF82(CR)
Response: ?01(CR)

Note: Any change to the address and counter update direction take effect once the command has been received. Changes to the Baud Rate and checksum settings take effect the next time the device is restarted.

8.4 #**

Description:

Allows the device to read and store the current line data for later retrieval.

Command Syntax:

#**[CS](CR)	
#	Delimiter character
**	Synchronized Sampling Command
[CS]	Checksum
(CR)	Carriage Return

Response:

There is no response for this command. The data stored using the #** command can be retrieved using the command $AA4.

Examples:

Send synchronized sampling command.
Command: #**(CR)
No Response

8.5 #AA

Description:

Command to read data from all the analogue input channels.

Command Syntax:

#**AA[CS]**(CR)	
#	Delimiter character
AA	Address of the device in hexadecimal format (00 to FF)
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: >**(Data)[CS]**(CR)
Invalid Command: ?**AA[CS]**(CR)

>	Delimiter for a valid command
?	Delimiter for an invalid command
(Data)	Data from the analogue input channels
AA	Address of the device which responded
[CS]	Checksum
(CR)	Carriage Return

Examples:

Read the analogue values of the all the lines with the data format set to engineering unit.
Command: #01(CR)
Response: >+00.156+00.165-00.038+00.049+00.078+00.111+00.015+00.004(CR)

Read the analogue values of all the lines with the data format set to % of full scale range.
Command: #01(CR)
Response: >+000.69-001.39+002.30+004.59+009.17+023.14-046.10+092.00(CR)

8.6 #AAN

Description:

Command to read the analogue input of the specified channel.

Command Syntax:

#AAN[CS](CR)	
#	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
N	The channel to be read
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: >(Data)[CS](CR)
Invalid Command: ?AA[CS](CR)

>	Delimiter for a valid command
?	Delimiter for an invalid command
(Data)	Data returned from the analogue channel specified.
AA	Address of the device which responded
[CS]	Checksum
(CR)	Carriage Return

Examples:

Read the analogue value of the first channel which has the data format set to engineering unit.
Command: #010(CR)
Response: >+00.144(CR)

Read the analogue value of the fifth channel which has the data format set to 2's complement.
Command: #014(CR)
Response: >0BBC(CR)

8.7 $AA0Ci

Description:

Command to perform a zero calibration on a specified channel.

Command Syntax:

$AA0Ci[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
0C	Command to perform the zero calibration
i	Channel on which to perform the zero calibration
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device which responded
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send the command to set the zero calibration of channel 0 to the voltage being applied to the line.
Command: $010C0(CR)
Response: !01(CR)

Note: Calibration must be enabled using ~AAEV before using this command.

8.8 $AA1Ci

Description:

Command to perform a span calibration on a specified channel.

Command Syntax:

$AA1Ci[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
1C	Command to perform the span calibration
i	Channel on which to perform the span calibration
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device which responded
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send the command to set the span calibration of channel 0 to the voltage being applied to the line.
Command: $011C0(CR)
Response: !01(CR)

Note: Calibration must be enabled using ~AAEV before using this command.

8.9 $AA2

Description:

Command to read the device configuration.

Command Syntax:

$**AA**2**[CS]**(CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
2	Command to read the device configuration
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !**AATTCCFF[CS]**(CR)
Invalid Command: ?**AA[CS]**(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device (00 to FF)
TT	Device type settings (See Analogue Input Type Settings)
CC	Baud Rate of the device (See Baud Rate Settings)
FF	Data Format settings (See Data Format Settings)
[CS]	Checksum
(CR)	Carriage Return

Examples:

Read the configuration of device 01. Response shows that the devices address is 01, the device type is 08 which is ±10V, baud rate is 06 which is 9600 and the configuration value is 00 which means checksum is disabled, data format is engineering, mode settings is normal mode and the filter setting is 60Hz rejection.
Command: $012(CR)
Response: !01080600(CR)

8.10 $AA4

Description:

Command to read the synchronized data that is stored on the device from the last #** command.

Command Syntax:

$AA4[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
4	Command to read the synchronized data from the device.
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: >AAS(Data)[CS](CR)
Invalid Command: ?AA[CS](CR)

>	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device which responded
S	Status of synchronized data: 1 = First read of data 0 = Data has been at least once before
(Data)	Synchronized data
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send a command to read the synchronized data that is stored in the device.
Command: $014(CR)
Response: >01100E2FE3802F105E00BBC1D9EC4FD75C2(CR)

Note: If the #** command hasn't been sent since the device was powered on then the $AA4 command will return ?AA

8.11 $AA5VV

Description:

Command to enable or disable a specific channel

Command Syntax:

$AA5VV[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
5	Command to enable or disable the channel
VV	Two digit hexadecimal value. Bit 0 is channel 0, bit 1 is channel 1 etc.
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !**AA[CS]**(CR)
Invalid Command: ?**AA[CS]**(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device (00 to FF)
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send a command to enable only the first channel on the device.
Command: $01501(CR)
Response: !01(CR)

Send a command to enable all the channels on the device
Command: $015FF(CR)
Response: !01(CR)

8.12 $AA6

Description:

Command to read the channel enable/disable status.

Command Syntax:

$AA6[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
6	Command to read the enable/disable status
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AAVV[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device (00 to FF)
VV	Two digit hexadecimal value. Bit 0 refers to channel 0, bit 1 refers to channel 1 etc. If the bit is 0, the channel is disabled, if the bit is 1 the channel is enabled.
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send a command to read the enable/disable status of the channels. Response means all the channels are enabled.
Command: $016(CR)
Response: !01FF(CR)

8.13 $AA7CiRrr

Description:

Command to set the specified channel full scale range configuration.

Command Syntax:

$AA7CiRrr[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
7	Command to set the channel range code
Ci	Command to specify the input channel where i is the input channel
Rrr	Command to specify the type code where rr is the type code to be set
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device which responded
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send command to set the first channel to ±5V Full Scale Range.
Command: $017C0R09(CR)
Response: !01(CR)

Send command to set the fourth channel to ±500mV
Command: $017C3R0B(CR)
Response: !01(CR)

8.14 $AA8Ci

Description:

Command to read the specified channels full scale range configuration.

Command Syntax:

$**AA**8C**i**[**CS**](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
8	Command to read channel range configuration
C**i**	Command to specify the channel to read where **i** is the input channel
i	Channel to be read
[**CS**]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !**AA**C**i**R**rr**[**CS**](CR)
Invalid Command: ?**AA**[**CS**](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device which responded
C**i**	Specifies the channel that the data was read from where **i** is the channel
R**rr**	Type code data from the specified channel where **rr** is the type code
[**CS**]	Checksum
(CR)	Carriage Return

Examples:

Read the range configuration of the first channel
Command: $018C0(CR)
Response: !01C0R09(CR)

Read the range configuration of the fourth channel
Command: $018C3(CR)
Response: !01C3R0B(CR)

8.15 $AAA

Description:

Command to read the data from every analogue input channel in hexadecimal format.

Command Syntax:

$AAA[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
A	Command to read from every analogue input channel in hexadecimal format
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: >(Data)[CS](CR)
Invalid Command: ?AA[CS](CR)

>	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device which responded
(Data)	Data from all the analogue channels in hexadecimal format
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send command to read the analogue data.

Command: $01A(CR)

Response: >200004E42000055C200005D42000064C200006C42000073C200007B42000082C(CR)

8.16 $AAB

Description:

Command to read the channel diagnostic status of the analogue inputs to show whether the channel is within range, over or under.

Command Syntax:

$AAB[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
B	Command to read the channel diagnostic status
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AANN[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device which responded
NN	Diagnostic result of all the analogue input channels.
[CS]	Checksum
(CR)	Carriage Return

Examples:

Read the channel diagnostic status of the channel and response shows all the channels are within the full scale range.
Command: $01B(CR)
Response: !0100(CR)

8.17 $AAF

Description:

Command to read the firmware version on the device

Command Syntax:

$AAF[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
F	Command to read the firmware version
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA(Data)[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device which responded
(Data)	Firmware version of the responding device.
[CS]	Checksum
(CR)	Carriage Return

Examples:

Reads the firmware version of the device and shows it as version 3.65.
Command: $01F(CR)
Response: !013.65(CR)

8.18 $AAM

Description:

Command to read the name of the device.

Command Syntax:

$<u>AA</u>M<u>[CS]</u>(CR)	
$	Delimiter character
<u>AA</u>	Address of the device to be configured in hexadecimal format (00 to FF)
M	Command to read the device's name
<u>[CS]</u>	Checksum
(CR)	Carriage Return

Response:

Valid Command: !<u>AA(Data)[CS]</u>(CR)
Invalid Command:?<u>AA[CS]</u>(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
<u>AA</u>	Address of the responding device
<u>(Data)</u>	Name of the device
<u>[CS]</u>	Checksum
(CR)	Carriage Return

Examples:

Reads the device name. Command sent to the ED-549 and a valid response is returned with the device's name, ED-549.
Command: $01M(CR)
Response: !01ED-549(CR)

8.19 $AAM0

Description:

Command to read the device model

Command Syntax:

$AAM0[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
M0	Command to read the device's model
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA(Data)[CS](CR)
Invalid Command:?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the responding device
(Data)	Model of the device
[CS]	Checksum
(CR)	Carriage Return

Examples:

Reads the device model. Command sent to the ED-549 and a valid response is returned with the device's model, ED-549.
Command: $01M0(CR)
Response: !01ED-549(CR)

8.20 $AAM1

Description:

Command to read the device location

Command Syntax:

$AAM1[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
M1	Command to read the device's location
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA(Data)[CS](CR)
Invalid Command:?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the responding device
(Data)	Location of the device
[CS]	Checksum
(CR)	Carriage Return

Examples:

Reads the device location. Command sent to the ED-549 and a valid response is returned with the device's location.
Command: $01M1(CR)
Response: !01machine1(CR)

8.21 $AARS

Description:

Command to reboot the device.

Note: The device can take a number of seconds to reboot. Close all connections to the device after sending the command. Connection can be re-established once the device has rebooted.

Command Syntax:

$**AA**RS**[CS]**(CR)	
$	Delimiter character
AA	Address of the device to be reset in hexadecimal format (00 to FF)
RS	Command to reset the device
[CS]	Checksum
(CR)	Carriage Return

Response:

No response

Examples:
Send a command to reset the device. No response is expected.
Command: $01RS(CR)
No Response

8.22 $AAS0

Description:

Command to perform internal calibration on the device.

Command Syntax:

$AAS0[CS](CR)	
$	Delimiter character
AA	Address of the device to be calibrated
S0	Command to perform internal calibration
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the responding device
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send a command to perform internal calibration of the device and valid response is returned.
Command: $01S0(CR)
Response: !01(CR)

Note: There is no response from the device in three circumstances. If the command syntax is incorrect, there is a communication error or if no device with the address in the command can be found.

8.23 $AAS1

Description:

Command to reset the calibration parameters back to the factory default.

Command Syntax:

$AAS1[CS](CR)	
$	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
S1	Command to reset the calibration on the device
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the responding device
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send a command to set the device back to the factory default calibration settings and a valid response is returned.
Command: $01S1(CR)
No response: !01(CR)

Note: There is no response from the device in three circumstances. If the command syntax is incorrect, there is a communication error or if no device with the address in the command can be found.

8.24 ~AAEV

Description:

Command to enable/disable device calibration

Command Syntax:

~<u>AA</u>E<u>V</u><u>[CS]</u>(CR)	
~	Delimiter character
<u>AA</u>	Address of the device to be configured in hexadecimal format (00 to FF)
E	Command to enable or disable the calibration
<u>V</u>	1: Enable calibration 0: Disable calibration
<u>[CS]</u>	Checksum
(CR)	Carriage Return

Response:

Valid Command: !<u>AA</u><u>[CS]</u>(CR)
Invalid Command: ?<u>AA</u><u>[CS]</u>(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
<u>AA</u>	Address of the responding device
<u>[CS]</u>	Checksum
(CR)	Carriage Return

Examples:

Send a command to enable the device to be calibrated using the ASCII commands.
Command: ~01E1(CR)
Response: !01(CR)

Send the command to disable device calibration.
Command: ~01E0(CR)
Response: !01(CR)

8.25 ~AAL(Location)

Description:

Command to set the device location.

Command Syntax:

~AAL(Location)[CS](CR)	
~	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
L	Command to set the location of the device
(Location)	New device location (10 characters max)
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !**AA[CS]**(CR)
Invalid Command: ?**AA[CS]**(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the responding device
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send command to set the device location.
Command: ~01LRoom1(CR)
Response: !01(CR)

8.26 ~AAO(Name)

Description:

Command to set the name of the device.

Command Syntax:

~**AA**O**(Name)[CS]**(CR)	
~	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
O	Command to set the name of the device
(Name)	New device name (10 characters max)
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !**AA[CS]**(CR)
Invalid Command: ?**AA[CS]**(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the responding device
[CS]	Checksum
(CR)	Carriage Return

Examples:

Set the name of the device to 549Device.
Command: ~01O549Device(CR)
Response: !01(CR)

8.27 ~**

Description:

Command sent to all devices to say the host is OK.

Command Syntax:

~**[CS](CR)	
~	Delimiter character
**	Command to check the host is OK
[CS]	Checksum
(CR)	Carriage Return

Response:

No Response

Examples:

Send a "Host OK" command to all the devices
Command: ~**(CR)
No Response

8.28 ~AA0

Description:

Command to read the watchdog status of the device.

Command Syntax:

~**AA**0**[CS]**(CR)	
~	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
0	Command to read the device watchdog status
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !**AASS[CS]**(CR)
Invalid Command: ?**AA[CS]**(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device
SS	Two Hexadecimal digits indicating the host watchdog status SS=00 – Watchdog timeout is cleared SS=04 – Watchdog timeout is set
[CS]	Checksum
(CR)	Carriage Return

Examples:

Read the host watchdog status and response is 00 meaning the host watchdog is disabled
Command: ~010(CR)
Response: !0100(CR)

Read the host watchdog status and response is 04 meaning that a host watchdog timeout has occurred.
Command: ~010(CR)
Response: !0104(CR)

8.29 ~AA1

Description:

Command to reset the watchdog timeout status of the device.

Command Syntax:

~**AA**1**[CS]**(CR)	
~	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
1	Command to reset the watchdog timeout status
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !**AA[CS]**(CR)
Invalid Command: ?**AA[CS]**(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send command to reset the watchdog status and return valid response.
Command: ~011(CR)
Response: !01(CR)

8.30 ~AA2

Description:

Command to read the watchdog timeout value of the device.

Command Syntax:

~**AA**2**[CS]**(CR)	
~	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
2	Command to read the watchdog timeout value
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !**AAEVV[CS]**(CR)
Invalid Command: ?**AA[CS]**(CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device
E	Watchdog enabled status E=1 – Watchdog enabled E=0 – Watchdog disabled
VV	Two hexadecimal digits representing watchdog timeout value in tenths of a second 01 = 0.1 seconds, FF=25.5 seconds
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send command to read the watchdog timeout value return valid response with FF meaning the watchdog timeout value is 25.5 seconds.
Command: ~012(CR)
Response: !011FF(CR)

8.31 ~AA3ETT

Description:

Command to enable/disable the watchdog and set the watchdog timeout value.

Command Syntax:

~AA3ETT[CS](CR)	
~	Delimiter character
AA	Address of the device to be configured in hexadecimal format (00 to FF)
3	Command to read the watchdog timeout value
E	Watchdog enabled status E=1 – Watchdog enabled E=0 – Watchdog disabled
TT	Two hexadecimal digits representing watchdog timeout value in tenths of a second 01 = 0.1 seconds, FF=25.5 seconds
[CS]	Checksum
(CR)	Carriage Return

Response:

Valid Command: !AA[CS](CR)
Invalid Command: ?AA[CS](CR)

!	Delimiter for a valid command
?	Delimiter for an invalid command
AA	Address of the device
[CS]	Checksum
(CR)	Carriage Return

Examples:

Send command to enable watchdog and set the timeout value to 25.5 seconds.
Command: ~0131FF(CR)
Response: !01(CR)

9   Lifetime Warranty and Support

To receive the lifetime Warranty, you need to register your product with us using our online form.

NB: this must be done within 28 days of Purchase.

Lifetime Warranty Sign up

* Terms and Conditions are available online. Standard warranty period is 3 years if a product is not registered.

Since 1983, Brainboxes have designed, tested and manufactured our products all under one Roof. One of our greatest strengths is in after sales service. Technical Support is provided by members of our Test Team, who know our products inside out and have direct access to the chip and board designers as well as the technicians who built and tested your product.

If you have any issues, questions or suggestions about our Products and Services, then please contact us.

Technical Support is free*. As long as you have a Brainboxes Product we will be happy to help, even if it's discontinued or out of warranty. Excellent Customer Service, just as it should be.

For the quickest solution to your issue, if you email us, please include as much detail of your setup and the fault you are experiencing.

* Standard rate call charges for phone support apply.

Email

Technical Support:	support@Brainboxes.com
Sales Enquiries:	sales@Brainboxes.com

Telephone

You can speak to Brainboxes Support or Sales teams direct,

Monday – Friday, 9am to 5pm (UK time)

Tel: +44 (0)151 220 2500

10 Regulatory Approvals / Compliance

For up to date details of global certifications, please check the product datasheet on the Brainboxes website: www.brainboxes.com

10.1 Company Accreditation

Brainboxes is accredited to internationally recognised standards for our Quality and Environmental Management Systems. Our ISO9001 Quality System was first accredited in 1994, followed by our ISO14001 Environmental System in 2008. These standards help ensure we can demonstrate effective management of all our quality systems and our environmental impacts, together with a process of continuous improvement.

All our Quality systems are subject to internal and external assessment on a regular basis. Copies of Certificates are available for download from our website: www.brainboxes.com

Linked with our Lean and Six Sigma techniques, we believe we have the most reliable products on the market, and to back this up we are offering a Lifetime Warranty* on all our Serial Products.

10.2 Europe – EU Declaration of Conformity

Brainboxes products are designed to conform to the protection requirements of European Council Directive 2004/108/EC and its subsequent revisions.

A Declaration of Conformity and supporting Technical Construction File is available by request from Brainboxes, and will identify any updated legislation that may have been introduced since the publication of this Manual.

Warning: This is a Class A Product. In a domestic environment this product may cause interference in which case the user may be required to take adequate measures to address this.

10.3 WEEE Directive (Waste Electrical and Electronic Equipment)

The Waste Electric and Electronic Equipment (WEEE) Regulations 2013 became law in the UK on the 1st of January 2014 and replaced the 2006 Regulations. Brainboxes is fully compliant with this legislation.

Customer Responsibilities

You are encouraged to dispose of WEEE in an environment friendly way.

This can be done through your local civic amenities site, an approved treatment facility or alternatively through a relevant compliance scheme.

Brainboxes' Responsibilities

Brainboxes has a legal responsibility, as producer, to provide a free of charge collection service to our customers for our obligated WEEE.

Brainboxes is defined as a producer under the WEEE regulations because we sell own brand Electrical & Electronic Equipment (EEE) in the UK. Our WEEE Producer Registration Number is WEE/AH0004XR.

For details of our WEEE recovery service options, please see our Website, or email us at:

weeerecovery@Brainboxes.com

10.4 RoHS Compliance

All Brainboxes Serial and Bluetooth products are fully RoHS compliant.

Brainboxes identified at an early stage the importance of rapid compliance to RoHS guidelines and established a project team to actively manage the transition. The initial step in the process was to use our close relationships with suppliers to ensure early access to RoHS compliant components for all of our Bluetooth and Serial Products. In addition, the project team worked to ensure that our manufacturing processes meet all RoHS requirements well in advance of the deadline.

To verify supplier declarations on RoHS compliancy, we have also sent fully built products to an external test house for X-Ray system XDAL. This technique is capable of determining percentages of different elements and is accurate to 0.1% Wt.

RoHS Compliant Brainboxes products have been available since January 2005.

What is the RoHS Directive?

The Restriction of the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment (EEE) Directive (2011/65/EU) was transposed into UK law on 2 January 2013.

This legislation bans the placing on the EU market of new EEE containing more than the agreed levels of:

- lead (Pb)
- cadmium (Cd)
- mercury (Hg)
- hexavalent chromium (Cr6+)
- polybrominated biphenyls (PBB)
- polybrominated diphenyl ethers (PBDE)

Any future revisions to this legislation will be complied with, and identified in a Declaration of Conformity, available on request.

11 Copyright

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