



AREMBEUSB REMOTE CONTROL

for Velleman K8055
USB Experiment Interface Board

Instruction Manual

10001-MNL-A

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Business Name

AREMBE is a trading name for Richard Burdett

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Introduction

Chapter 1

1.1 Overview

The AREMBEUSB Remote Control system allows remote control of up to four Velleman K8055 USB Experiment Interface Boards from any internet-enabled device that has a web browser, allowing boards to be operated over any distance, ranging from within the same room up to thousands of miles.

The system consists of a server program (figure 1-1) that is installed on the PC to which the boards are connected via their USB interfaces, and a control page (figure 1-2) hosted on the www.arembe.com website. When the server is running but offline, simple controls allow the board(s) outputs to be set, and the inputs to be displayed, directly from the server program. When the server is placed online, it communicates with the website and registers the fact that it is running. Any user who then accesses the control page via a browser, be it on a PC, Smartphone, iPad, netbook, or any other device, can operate the board(s) using the page. In addition, if an error occurs (such as the board becoming disconnected, or the server going off-line), then the web page will report this information.

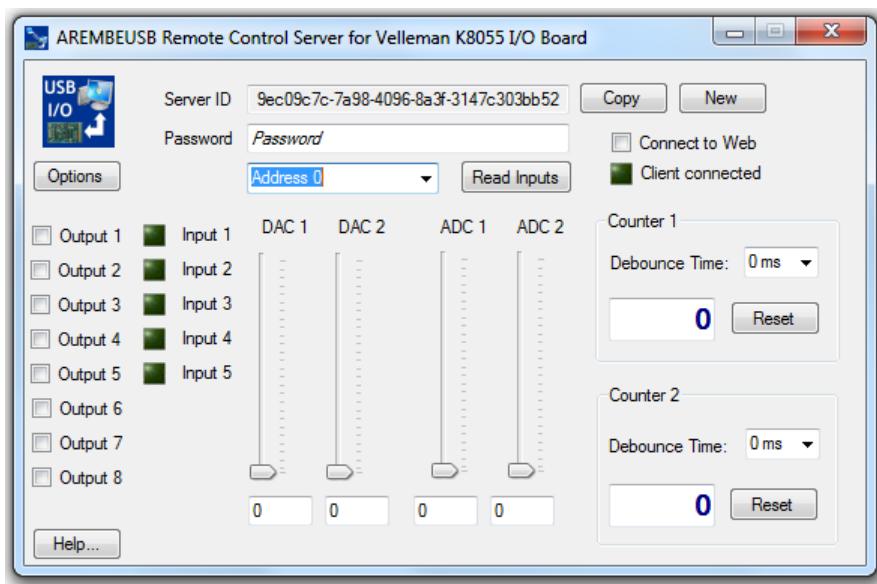


Figure 1-1, Remote Control Server Program

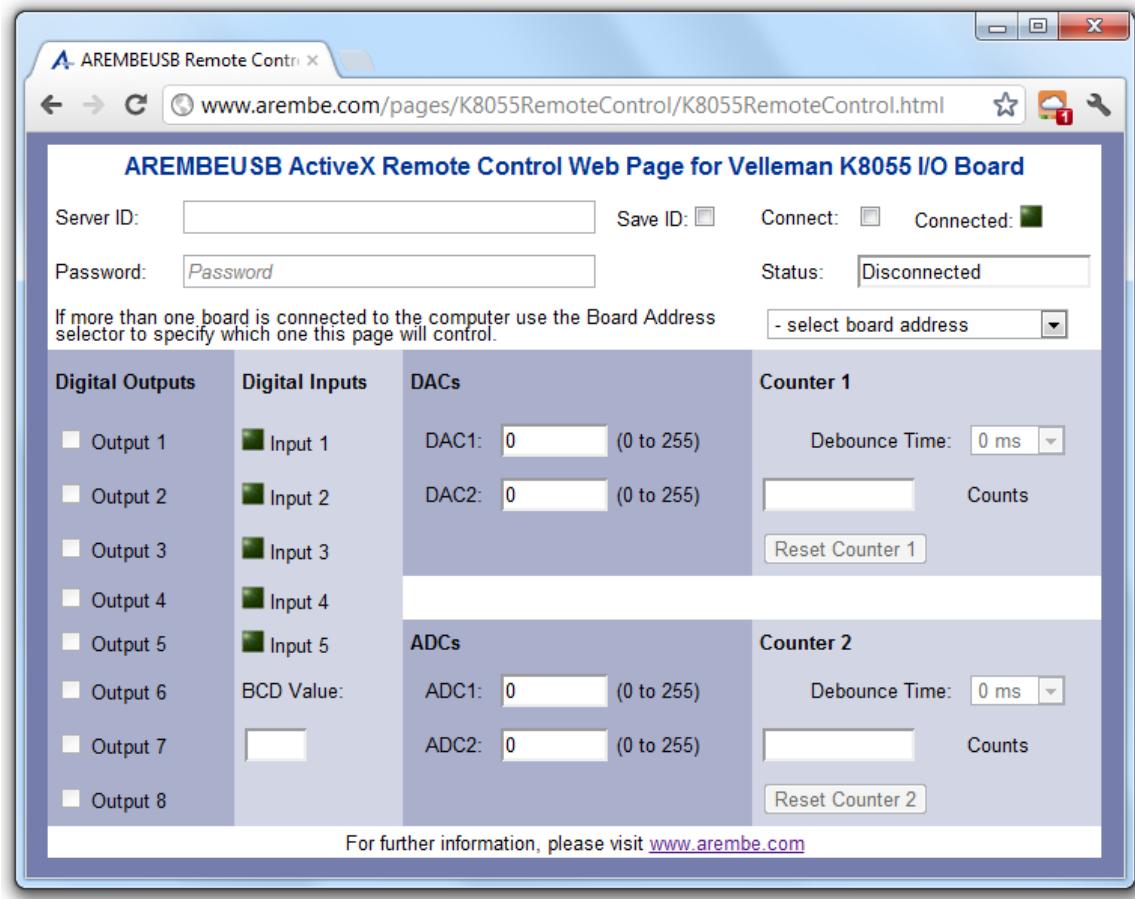


Figure 1-2, Remote Control Web Page

It is important to understand the transit time of the data sent over the internet and other factors mean that that operation is not "real-time", with typical delays between operating a control on the web page (e.g. setting a DAC output value or turning a digital output on or off) and the actual output at the board being updated being around 1 - 2 seconds. However, despite this limitation the system offers many opportunities for convenient remote control of these boards, and hence the systems or other hardware connected to them.

A great advantage over other remote control systems is that there is no need to install any special app or program on the controlling device or computer, since the control page is always available via the **www.arembe.com** website. All that is needed is an active internet connection and a web browser.

When a system is being controlled from a web page, if another attempt is made to connect to the same system from another device or browser, then the second web page can operate in a "monitoring" mode, allowing the status of the system's boards(s) inputs and outputs to be displayed but not allowing them to be controlled.

1.2 PC Requirements for Server

The server program has been verified as operating correctly on computers running Windows XP SP3, Windows Vista 32 bit, and Windows 7 (both 32 and 64 bit versions). Since it is a .net application it does require the .net framework to be installed, but this will be downloaded automatically from the Microsoft website if it is not already present. The program also uses the AREMBEUSB ActiveX control, which it will install if not already present on the target machine, to communicate with the K8055 boards. The server does not rely on any software supplied by Velleman (although this can also be

installed and used, though obviously not at the same time as the AREMBEUSB control and hence the server program, without problem).

Of course, the PC also requires an active internet connection, and free USB ports to which the K8055 boards can be connected.

1.3 Device Requirements for Web Page Control

The only requirement for operating the web page is a device with an active internet connection (fixed or wireless) and a browser with support for JavaScript enabled. Cookies do not need to be enabled but if they are then it will save having to re-enter the Server ID each time the page is accessed.

1.4 Typical Applications

Applications for remote control of hardware systems that use the K8055 boards for external interfacing are limited only by the user's imagination, but include:

- Remote security monitoring
- Building energy control and monitoring
- Remote operation of lighting systems
- Data logging for scientific experiments
- Robotics

In addition to this instruction manual, the server program has a fully compiled HTML help system. This makes it very easy to determine the function of each control and display.

1.5 Safety Warning

Although the AREMBEUSB Remote Control system provides convenient and reliable remote control of K8055 boards it must under no circumstances be used for any safety-critical application, since operation relies on the internet for data transfer and no provision is made for transferring information in the event of failure of the communication channel.

Users who design systems incorporating the control must take full responsibility for the safety implications of their system design. Under no circumstances can AREMBE be held responsible for any consequential damages of the AREMBEUSB Remote Control system's use.

Installation & Initial Checks

Chapter 2

2.1 Introduction

This chapter describes how to install the AREMBEUSB Remote Control Server on a personal computer running a Windows operating system (Windows XP, Vista, or Windows 7), and how to access it via the web control page.

2.2 Installation

2.2.01 Media and Setup Program

The AREMBEUSB ActiveX Remote Control Server software is typically supplied as a zip file containing the full setup program. Unzip the contents of this file to an empty folder. Use Windows Explorer to navigate to this folder and double-click on the file SETUP.EXE

The Setup program should start. If the User Account Control (UAC) is active a warning dialog, similar to that shown in figure 2-1, will be shown either at the start or during the installation. Click **Yes** to continue.



Figure 2-1, Setup.exe UAC Warning Dialog

The main setup dialog, figure 2-2, will then be shown.



Figure 2-2, Main Setup Dialog

Follow the instructions on this and subsequent dialogs until the software installation is complete.

2.2.02 Installed Files

The Setup program places the AREMBEUSB Remote Control Server program, supporting files and pdf instruction manual in the folder C:\Program Files\AREMBE\AREMBEUSB Remote Control Server

It also creates shortcuts to the server program and the instruction manual on the user's Start menu (figure 2-3) to give quicker access to the program.

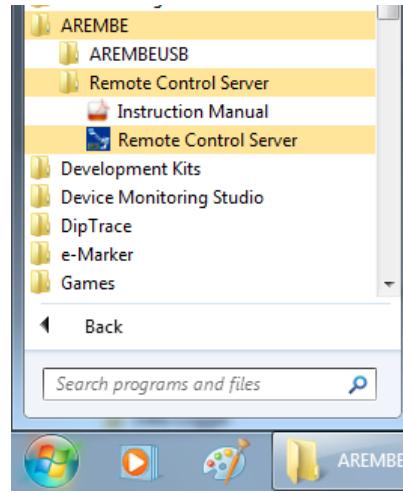


Figure 2-3, Start Menu Shortcuts to Program and Manual

2.3 Initial Checks

2.3.01 Remote Control Server Program Checks

The simplest way of checking that the AREMBEUSB Remote Control Server is properly installed is to use it to directly control a Velleman K8055 USB Experiment Interface Board. Once this has been done, remote operation can be tested by using a browser on the same computer to access the control page on the www.arembe.com website (Section 2.3.03). Finally, operation from a different computer or device can be checked (Section 2.3.04). Proceed as follows.

- 1) Take the K8055 board and connect it to a free USB port on the computer using a suitable cable. If this is the first time it has been connected then Windows will automatically install the required USB HID driver. This driver is included with Windows; it does not need loading from disk or downloading from the web.
- 2) Start the AREMBEUSB Remote Control Server by clicking on the Remote Control Server item in the AREMBE\Remote Control Server folder on the Start Menu (figure 2-3).
- 3) If you have already purchased and activated a copy of the AREMBEUSB ActiveX Control that is needed by the server program then it will start and display the main dialog (figure 2-4).

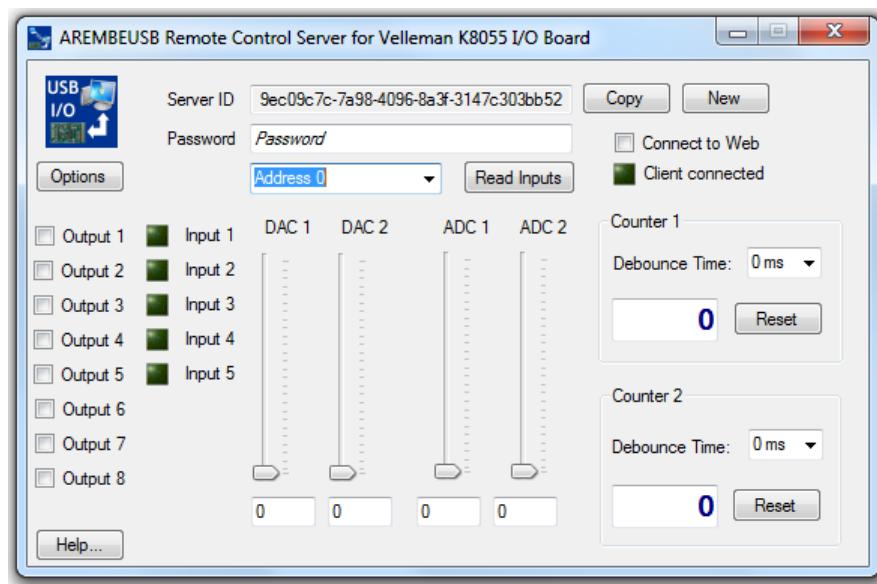


Figure 2-4, Remote Control Server Program

If, however, you have not yet bought the activation code for the AREMBEUSB ActiveX control then it will operate in a demonstration mode. In this mode it is fully functional except that there is a limit of 25 data transfers between the board and the computer before the control needs reinitializing. This allows users to check that it (and hence the AREMBEUSB Remote Control Server system) will work in the intended application before purchasing an activation code. If the demonstration mode is active, the dialog shown in figure 2-5 will be displayed.

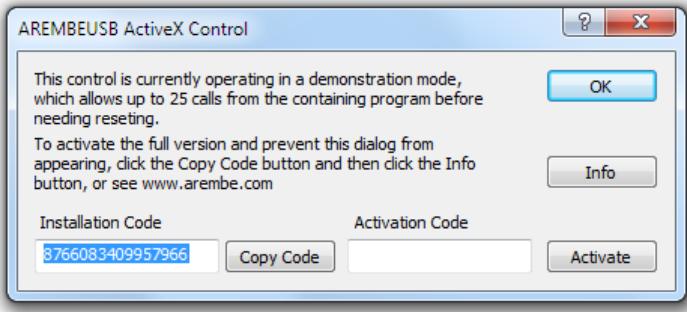


Figure 2-5, AREMBEUSB Activation Mode Dialog

Click the **OK** button to close the dialog and the Remote Control Server dialog, shown above in figure 2-4, will be displayed.

- 4) If only one board is connected then the Board Address Selector will show just the address that the board is set to (i.e. Address 0 to Address 3 as set by the jumpers address jumpers SK5 and SK6 on the board). If two or more boards are connected (each must be set to a different address) then the selector will show "**- select board address**". If necessary, set it to one of the possible addresses.

Note that during the following tests, if the AREMBEUSB ActiveX control is operating in the demonstration mode then after 25 communication cycles with the board the warning dialog, figure 2-6, will be shown. To continue testing, simply close and then re-start the Remote Control Server program.

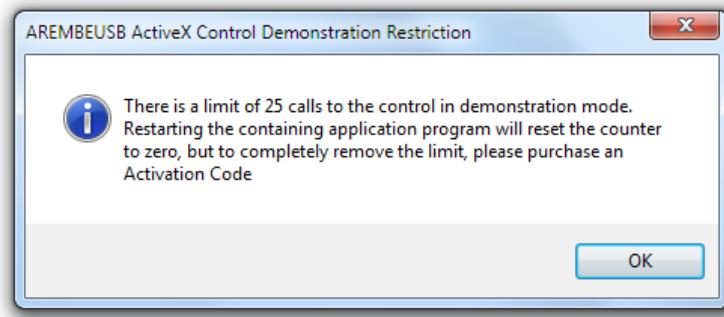


Figure 2-6, Demonstration Mode Warning Dialog

- 5) Click the **Output 1** to **Output 8** checkboxes in turn and verify that the corresponding LED's on the board light.
- 6) Press and hold the **Inp1** switch on the board and click the **Read Inputs** button. The **Input 1** indicator should change to the lighted state:
- 7) Click the **Reset Counter 1** button. The Counter 1 **Counts** indicator should read **0**
- 8) Press and release the **Inp1** switch on the board and click the **Read Inputs** button. The Counter 1 **Counts** indicator should read **1** (although if the **Inp1** switch bounced the count might be **2** or more).
- 9) Ensure that the jumpers **SK2** and **SK3** are fitted to the board. This sets the ADC1 and ADC2 input voltages to be internal test voltages set by **ATT1** and **ATT2** preset potentiometers. Using a small screwdriver, set the potentiometers to their mid positions.
- 10) Click the **Read Inputs** button. The **ADC1** and **ADC2** indicators should show values in the range 100 - 150.
- 11) Move the **DAC1** slider until the text box underneath it reads about **125**. Using a multimeter, measure the voltage between the **GND** and **DAC1** analog output

terminals on the board. It should read $2.4\text{ V} \pm 0.2\text{ V}$

- 12) Repeat test 11) for the **DAC2** output.

Assuming that above tests operate as described then you can be certain that the AREMBEUSB Remote Control Server program and underlying ActiveX control have been installed correctly and are functioning properly.

2.3.02 Web Control Using Local Browser Checks

Once the server program is installed and working, use the following test to check it supports remote operation.

- 1) Start the AREMBEUSB Remote Control Server by clicking on the Remote Control Server item in the AREMBE\Remote Control Server folder on the Start Menu (figure 2-3).
- 2) Open a browser window (e.g. Internet Explorer, Google Chrome, etc) on the same computer and navigate to the following webpage:

<http://www.arembe.com/pages/K8055RemoteControl/K8055RemoteControl.html>

or by following the links from the **www.arembe.com** homepage. The web page control window, shown in figure 2-7, will be displayed.

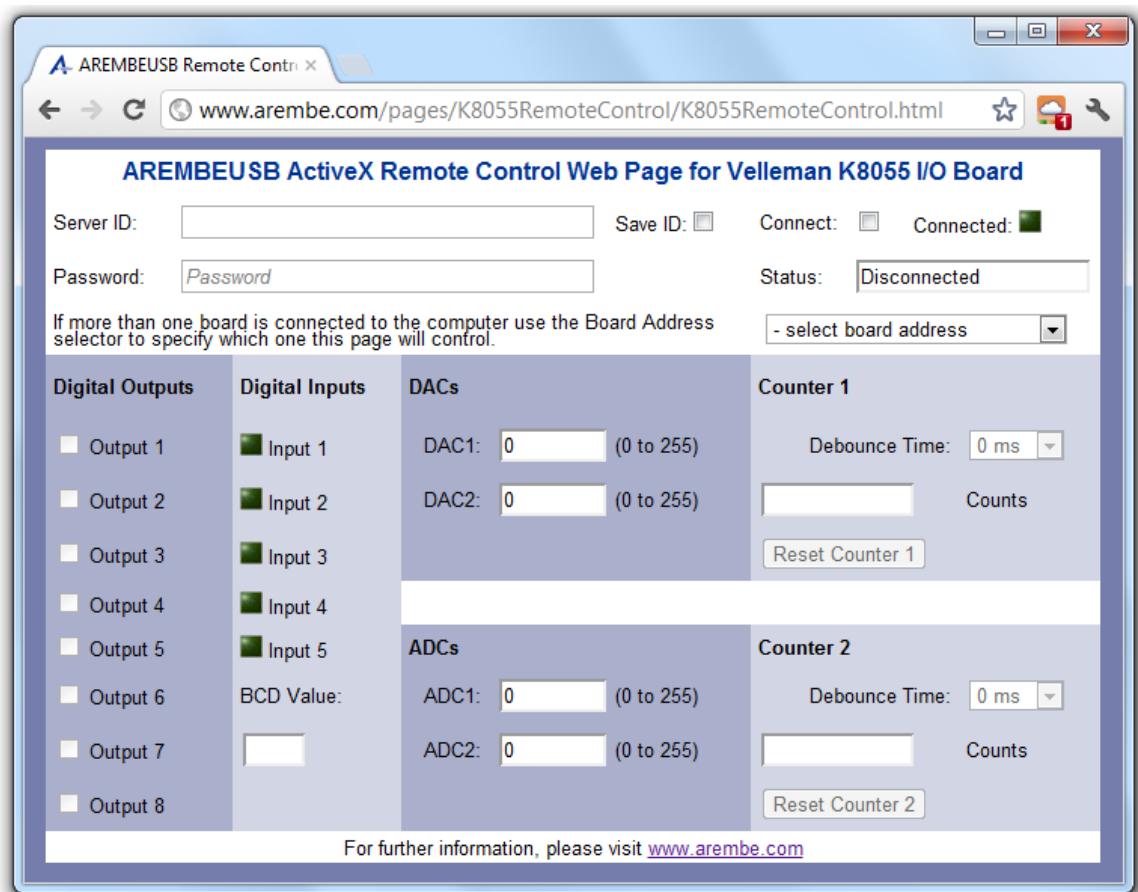


Figure 2-7, Web Control Page

- 3) The web control page Server ID text box control needs to be set to the same Server ID as displayed in the Remote Control Server. Return to that program's window and click the **Copy** button. This copies the Server ID to the clipboard.
- 4) Switch back to the web control page and click in Server ID box. Right mouse click

and select Paste. The copied Server ID from the server program will be entered into the box.

- 5) Click in the Password box. The page will now display a prompt, figure 2-8.

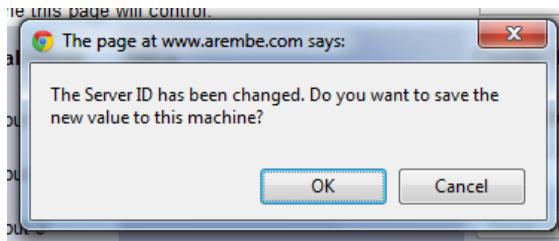


Figure 2-8, Server ID Changed Dialog

- 6) Click OK. This will save the Server ID as a cookie on this computer so that it does not need to be entered again.
- 7) Now return to the Remote Control Server program and choose a password of between 6 and 12 letters and numbers. Note that this password is not encrypted when it is sent over the internet so use a password that you will just use for this program. DO NOT USE THE SAME PASSWORD AS ANY THAT YOU MAY USE FOR INTERNET BANKING OR SIMILAR PURPOSES. Enter the password in the Password input box.
- 8) Click the **Connect to Web** checkbox. The other controls and indicators on the dialog will now be grayed out as they cannot be controlled locally while the server is online.
- 9) Switch back to the web control page and enter the same password as you used in section 7) into the Password box. Then click the **Connect** checkbox. The page will now start communicating with the server and, after a verification period the **Connected** LEDs  on both the web page and the server program will light.
- 10) If the AREMBEUSB ActiveX control is operating in the demonstration mode then the warning dialog, figure 2-6, will be shown again almost immediately. Click OK to close this. In this situation, it will not be possible to verify that the web page actually controls the hardware, but any changes made to the controls on the web page will be shown on the (dimmed) controls of the Remote Control Server dialog. If, however, the AREMBEUSB ActiveX control has been activated by purchase of an activation code then full operation will be possible and can be tested using a similar process to that outlined in section 2.3.01, except that the controls are now operated via the web page.
- 11) Return to the Remote Control Server program and uncheck the **Connect to Web** checkbox, placing the server offline. The **Connected** LEDs on both the server and web control page will be dimmed . On the web control page, the **Status** information will alternate between "Trying reconnection..." and "Connecting...".
- 12) Now click the **Connect to Web** checkbox on the server program again, placing it back on-line. After a short period communications should be reestablished and both the **Connected** LEDs should light .

If the above tests operate as described then the AREMBEUSB Remote Control Server program is operating properly and the K8055 board(s) connected to the system can be remotely controlled.

2.3.03 Web Control Using Remote Browser Checks

It will be appreciated from section 2.3.02 that in order to remotely control the K8055 boards connected to the computer running the AREMBEUSB Remote Control Server

program the user needs to be able to enter the Server ID and Password into the web control page, when this is accessed from a remote web browser. Although the password can be chosen to be easily remembered, the Server ID is unique to each installation and as it is a 36 character GUID string is not easily committed to memory.

The Server ID could be written down and manually entered into the web page, but this is very prone to error. A much better solution is to use the **Copy** button on the Remote Control Server program to copy it to the clipboard and then to paste this to the body of an e-mail message that can be accessed remotely via a web mail program, or to save it in the private area of a social networking site. Alternatively it could be saved to a text file stored on a USB memory stick, from which it can be recalled when required and pasted into the Server ID box on the web control page.

Regardless of what method is chosen for copying the Server ID string from the Remote Control Server program to the web control page, once this is done and the values saved on the device running the page, it will not normally be necessary to re-enter the value again.

2.3.04 Control Activation

As mentioned above the AREMBEUSB ActiveX control functions in a demonstration mode when first installed. To upgrade the control to the full version, proceed as follows:

- 1) When the dialog shown in figure 2.5 is displayed, write down (or click the **Copy Code** button to copy the code to the Windows clipboard, and paste into another document) the **Installation Code**
- 2) Click the **Info** button, which will open in the default web browser a registration page on the www.arembe.com website.
- 3) Use the registration page to submit the Installation Code and pay for the full version of the control.
- 4) Once the Installation Code and payment has been verified, you will receive an e-mail containing an Activation Code.
- 5) In order to activate the control, the AREMBEUSB Remote Control Server needs to be running with full administrative privileges. On Windows XP this will be achieved if the user account has such privileges, in which case simply starting the program from the Start menu will suffice.

On machines running Vista and Windows 7 with User Account Control in operation, locate the Remote Control Server item in the AREMBE\Remote Control Server folder on the Start Menu (figure 2-3). Right click and select Properties... The Properties dialog, figure 2-9, will be shown.

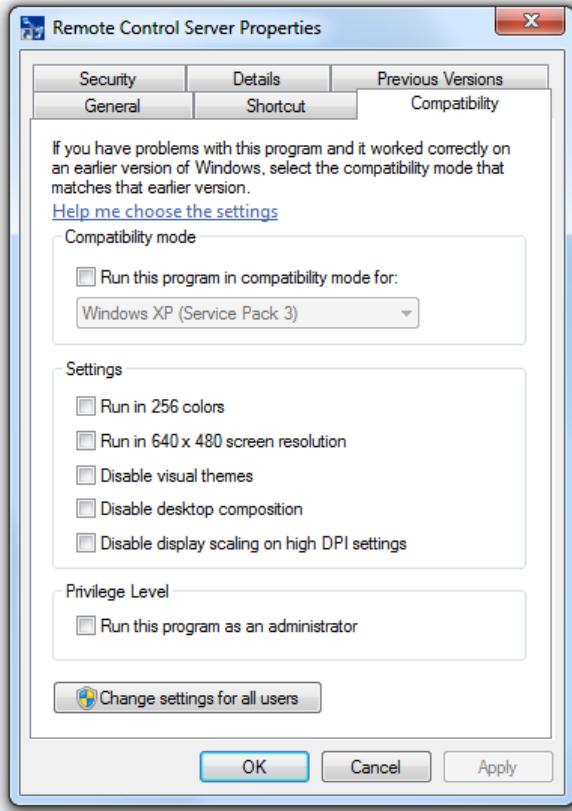


Figure 2-9, Properties Dialog

On the Compatibility tab, check the box marked **Run this program as an administrator** and then click OK to close the window.

Now start the program by clicking the Remote Control Server item in the AREMBE\Remote Control Server folder on the Start Menu, accepting the User Account Control warning dialog if it is shown.

The dialog shown in figure 2.5 will be displayed again.

- 6) Enter the **Activation Code** and click the **Activate** button. If the code is correct then the Code Accepted dialog, figure 2-10, will be shown.

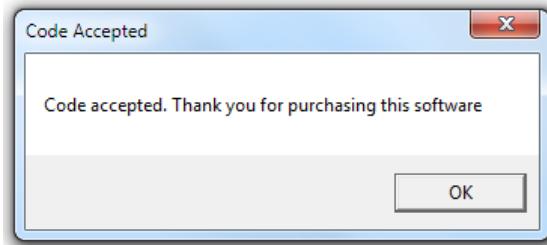
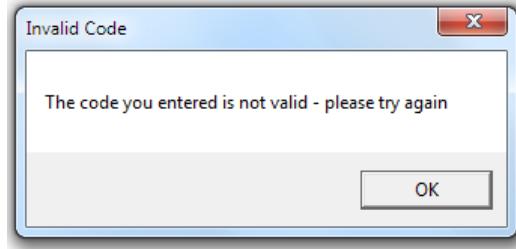
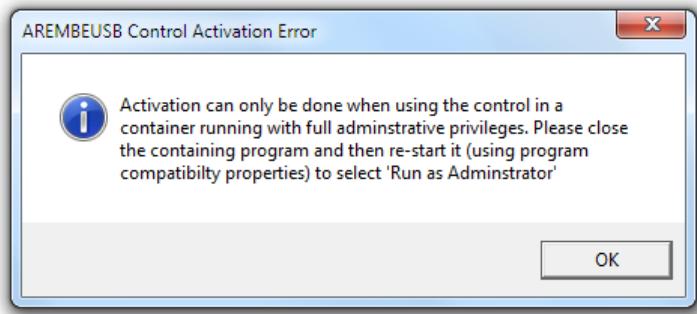


Figure 2-10, Code Accepted Confirmation Dialog

If for some reason the code is not correct, the Invalid Code dialog, figure 2-11, will be shown.

**Figure 2-11, Invalid Code Dialog**

If the Remote Control Server is not running in administrative mode then the Control Activation Error dialog, figure 2-12, will be shown.

**Figure 2-12, Activation Error Dialog**

If this occurs, click OK, close the Remote Control Server, and restart it in full administrative mode.

- 7) Once the control has been activated it is recommended that you reset the Remote Control Server program so that it does not run with full administrative privileges. To do this, repeat the procedure given as in section 5) above but uncheck the the box marked **Run this program as an administrator** in the Properties dialog.

2.3.03 Upgrading an Existing Installation

If you are upgrading from an earlier version of the Remote Control Server then you **must** remove the previous software version first. This is done by using the Windows Control Panel Programs and Features (or Add or Remove Programs) dialog. Select the **AREMBE Remote Control Server** item from the list of installed programs and click **Uninstall** or **Remove**. Removing an existing installation using this method will not delete the activation information for the AREMBEUSB control.

Operation

Chapter 3

3.1 Introduction

Chapter 2 has described how to install the AREMBE Remote Control Server software and test it using both local and remote browser sessions to access the control page on the www.arembe.com website. This chapter provides more information on the operation of the server program and the web control page.

3.2 AREMBE Remote Control Server

3.2.01 Overview

The AREMBE Remote Control Server is a simple Windows forms based program which, when run, displays a single main dialog. Controls on this dialog allow the outputs on up to four Velleman K8055 USB Experiment Interface Boards to be adjusted, while displays show the status of inputs to the board(s).

When a password is entered the program can be placed in an online mode, in which local control of the board(s) is disabled and remote operation from a web page is enabled.

The main program dialog can be minimized to the notification area, but it continues to run in the background until closed.

3.2.02 Main Dialog

The main dialog is shown in figure 3-1.

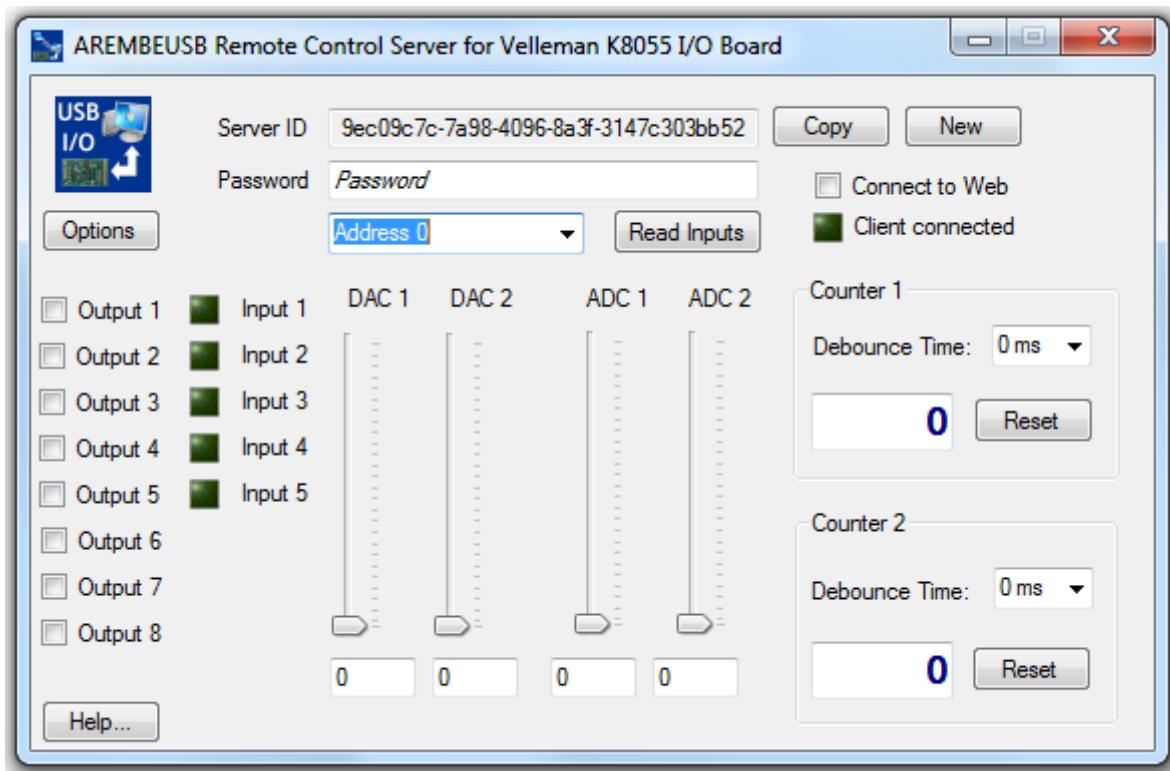


Figure 3-1, Remote Control Server Program

The controls and indicators operate as follows.

The **Output 1** to **Output 8** checkboxes set the status of the **O1** to **O8** outputs on the

board, while the **DAC1** and **DAC2** slider controls set the voltage at the DAC1 and DAC2 outputs. Each output is immediately updated when the relevant control is changed.

Inputs to the board are read only when the **Read Inputs** button is clicked, or regularly when the program is connected to the web. When the inputs are read, the present status of the five digital inputs is shown by the **Input 1** to **Input 5** indicators, the voltage at the ADC1 and ADC2 inputs by the **ADC1** and **ADC2** slider controls and numeric displays, and the present counter values by the **Counter 1** and **Counter 2** displays.

The counters can be reset to zero by clicking the corresponding **Reset** buttons, and their debounce times set by the drop-down selectors. As with the digital output and DAC controls these changes are implemented immediately.

In cases where more than one board is connected, the Board Address Selector is used to choose which board will be operated by the controls. If only one board is connected then the control is inactive.

Remote operation of the board requires that the same Server ID and Password be set in both the server program and in the web control page. The **Server ID** box in the Remote Control Server program shows the unique Server ID generated the first time the program is run. To make it easier to transfer this value to the web control page, the **Copy** button copies it to the Windows clipboard from which it can be pasted into an e-mail message, social networking site, or text file on a USB memory stick.

System security requires that the combination of Server ID and Password be unique. In the event that both of these codes were accidentally made public then anyone who obtained them would potentially be able to control the board remotely. In such cases it is desirable to use a new Server ID, which can be done by clicking the **New** button, which will display the warning dialog, figure 3-2.

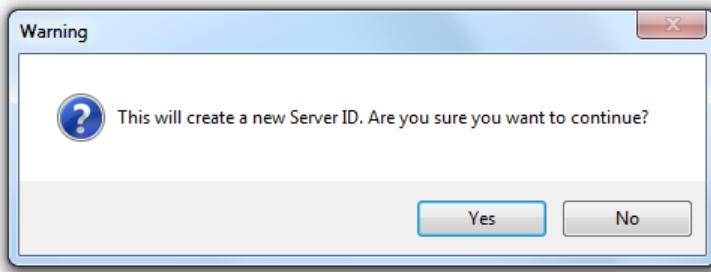


Figure 3-2, New Server ID Warning Dialog

Click the **Yes** button to create a new Server ID. The new ID must then be used for all future remote control of the system, until it is changed again.

The **Password** box is used to enter a password made up of any combination of letters and numbers that is between 6 and 12 characters long. In addition the word "Password" is not a legal password! Passwords are case-sensitive, and the same password must be used in the web control page.

The **Options** button is used to access the Options menu, figure 3-3.

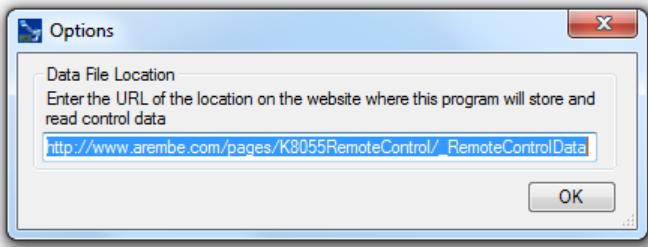


Figure 3-3, Options Menu

The Options menu is used to specify the location of the data files used to transfer data to and from the web control page. At the time of writing this is:

http://www.arembe.com/pages/K8055RemoteControl/_RemoteControlData

Assuming a valid password is entered in the password box, clicking the **Connect to Web** checkbox places the server online. The other controls and indicators on the dialog will now be grayed out as they cannot be controlled locally while the server is online.

When an instance of the control web page connects to the server, the **Client Connected** LED will be lit , and as controls on the web page are adjusted the corresponding controls on the server program will change and the board status be updated.

If communication is lost, or the controlling web page is closed, the **Client Connected** LED will be dimmed . If communications are subsequently reestablished it will light again.

The **Help** button displays the program's online help system.

The server dialog can be minimized to the notification area (typically to the right hand end of the taskbar). Clicking the notification icon restores the dialog.

When the server is online, if an attempt is made to close the program then a warning dialog, figure 3-4, is shown, which prevents inadvertent shutdown of the server.

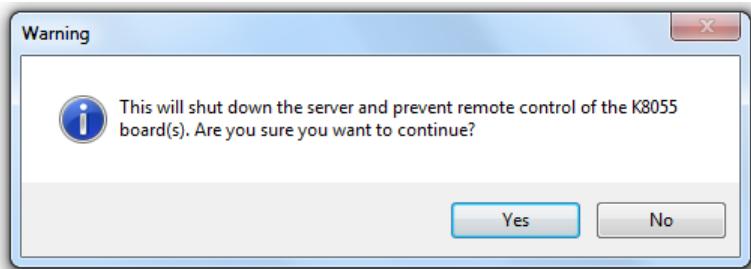


Figure 3-4, Shutdown Warning Dialog

Version information about the program can be obtained by clicking the **About...** item on the system menu, which shows the About dialog, figure 3-5.

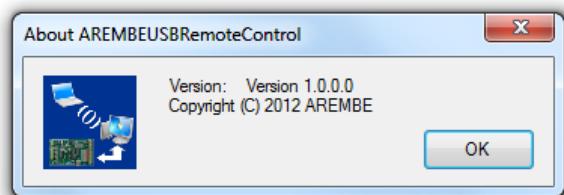


Figure 3-5, About... Dialog

3.2.03 Web Control Page

This page is shown in figure 3-6.

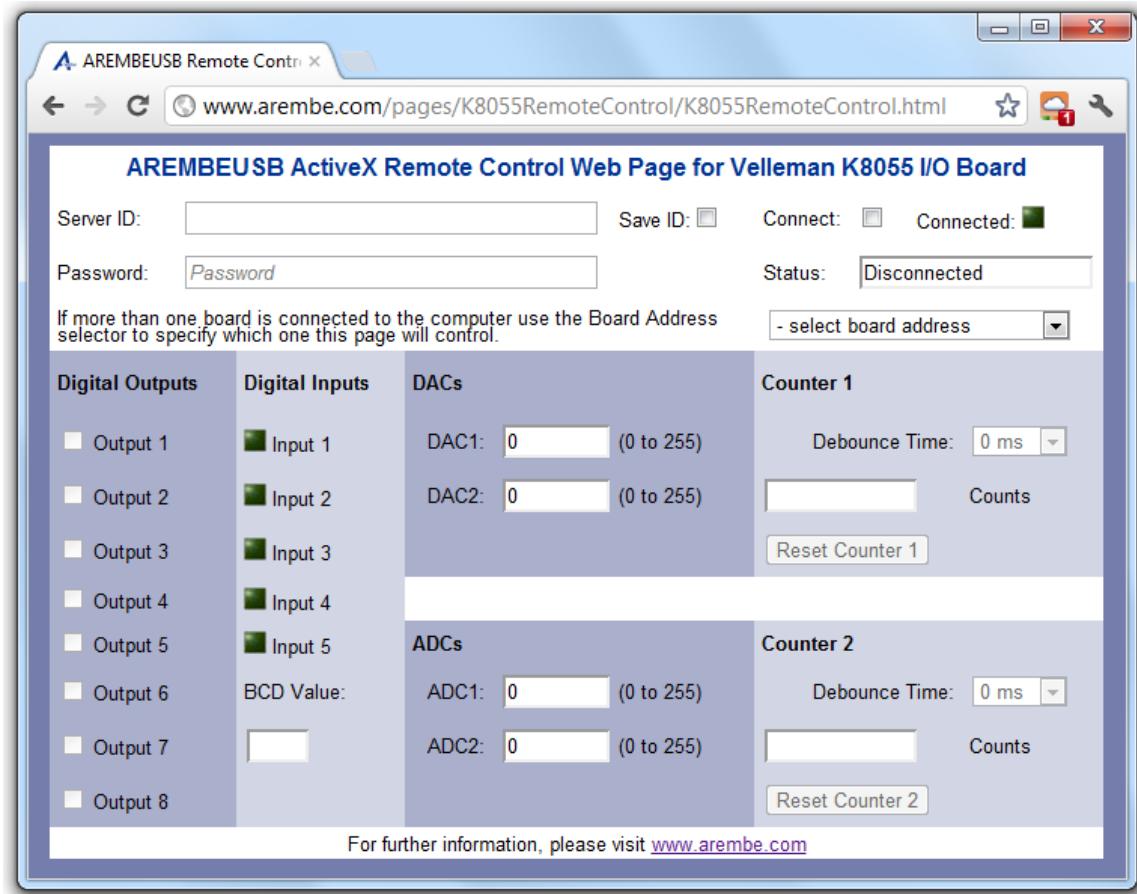


Figure 3-6, Web Control Page

The **Server ID** should be set to the same value used in the Remote Control Server. If the **Save ID** is checked then the ID is saved as a cookie and reloaded at startup; this should not, however, be done if the page is being accessed from a public computer.

The **Password** box should also be set to the same password as used at the server.

Assuming a valid password is entered in the password box, clicking the **Connect** checkbox starts the process of the page connecting to the server. If the server has never been run online with the same combination of Server ID and Password then the error message, figure 3-7, will be shown.

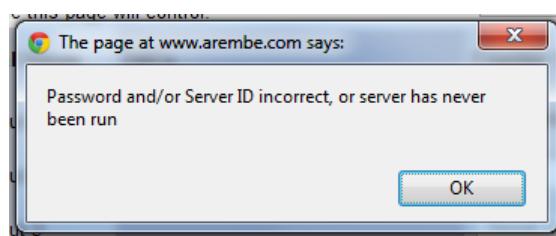


Figure 3-7, Password/Server Error Dialog

If, however, the server has been run online with the same combination of Server ID and Password, but is not currently running, then a different error message, figure 3-8, will be shown.



Figure 3-8, Server Not Running Dialog

If the server is online and the Server ID and Password match, then after a verification period the **Connected** LED will light ■, the **Status** text will change to "Connected", and the controls and indicators will be enabled.

When the page is connected and the controls and indicators are enabled, then changing a control will, after a short delay, change the setting on the board. Similarly a change in the status of an input at the board will be reflected in the indicators on the web page.

In cases where more than one board is connected, the Board Address Selector is used to choose which board will be operated by the controls. If only one board is connected then the control is inactive.

If communication is lost the **Connected** LED will be dimmed ■, and the **Status** text will alternate between "Trying reconnection..." and "Connecting...". If communications are subsequently reestablished the **Connected** LED will light again and the **Status** text will change to "Connected".

When the system is running, if a board is disconnected from the computer running the server software then an error message is sent to the web page, and a warning dialog, similar to that of figure 3-9, will be shown.

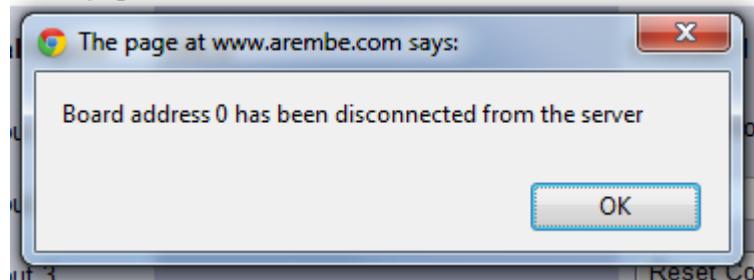


Figure 3-9, Board Disconnected Dialog

If the board is subsequently reconnected then another dialog, figure 3-10, is shown.

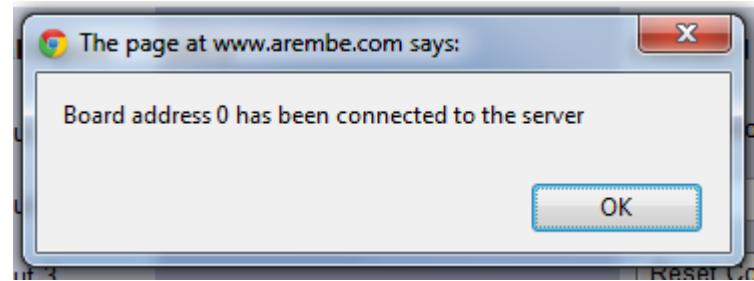


Figure 3-10, Board Connected Dialog

If a web page is controlling a system and another page is then opened, the same **Server ID** and **Password** entered, and the **Connect** checkbox checked, then a warning dialog, figure 3-11, will be displayed.

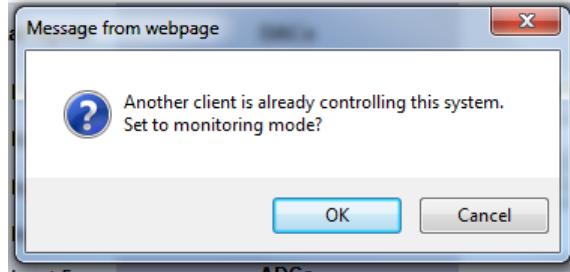


Figure 3-11, Activate Monitoring Mode

Clicking **Cancel** will cancel the attempt to connect to the server; clicking **OK** will establish connection, but in a monitoring mode. In this mode the **Status** text reads "Monitoring" and the controls and displays all operate in a "read-only" mode; in other words they correctly show the status of the board as set by the primary instance of the web control page, but it is not possible to adjust any settings.

Software License & Support

Appendix A

A.1 Introduction

This appendix provides details of the software license and support policy which applies to the AREMBEUSB Remote Control Server. AREMBE is granting you a non-exclusive license to use the software program and associated documentation (collectively, the "Software") for your internal use in accordance with the following terms:

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If you wish to incorporate the control into your own application program for sale, distribution or use by anyone other than yourself you must obtain a separate license from us to cover this distribution.

This Agreement will be governed by English law.

A.3 Software Registration

AREMBE will provide technical support in the use of the AREMBEUSB Remote Control Server and underlying AREMBEUSB ActiveX control to one registered, named, user for each activation code that is purchased. In order to allow this to operate you must therefore complete the product registration form located on our website at
www.arembe.com

Once registered, you may then e-mail any queries to AREMBE. You must give the product version, together with the registered user's name, on each occasion you contact us, or support will be denied.

Registered users of the software will also be informed of future product upgrades and enhancements.

A.4 Software Errors

The AREMBEUSB Remote Control Server has been extensively tested prior to release, but it is possible that some errors remain which were not revealed by the testing process. We would very much appreciate receiving, by e-mail to info@arembe.com, notification of any problems you discover.

When reporting problems, please try to be as specific as possible. Include details of the type of board used, the revision level of the control and the type of operating system being used.

If you feel there is a specific feature which would add to the software's functionality then please let us know. Naturally we cannot commit ourselves to adding any given new feature, but even so such suggestions are useful in identifying those areas in which the product may be improved.

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 - Your name, address and other contact details
 - Your contact details.
 - Details of the problem