ConnectReader™
Data Logger Device Server

Technical Manual

Firmware Version 1.00

For configuration, operation and maintenance of:
CR-100

Cover Page

ConnectReader^{TM}
Data Logger Device Server

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Table of Contents

PREFACE

This Technical Manual offers instructions for the setup and use of the ConnectReader Data Logger Device Server and its associated accessories. The intended audience is professionals, management, operators and technicians.

The author would like to thank colleagues for their contributions including company staff, sales dealers and end users.

Section 1 ACR Systems Inc.

1.1 Welcome

Congratulations on choosing another Proven Data Logging Solution from ACR Systems. The advanced ConnectReader™ Device Server compliments ACR's full product line bringing the convenience of establishing a network connection to a Data Logger whether it is close by or half way around the world.

The ConnectReader™ is available in one version wired for direct hookup to a LAN (Local Area Network) which in turn, can be accessed through the Internet.

This manual describes the capabilities, operation and specifications of the CR Series Data Logger Device Server.

1.2 About ACR Systems Inc.

ACR Systems offers a complete line of compact Data Loggers to measure and record temperature, relative humidity, electric current, pressure, process signals, pulse frequency, power quality and more. ACR Data Loggers have flown with airline pilots, raced with Indy drivers, driven with truckers and have even been into outer space. ACR Loggers sit on top, under and in buildings; they operate in tropical and sub-zero temperatures, in and out of water and in just about any place imaginable.

ACR Systems continues to be customer-driven, using its research and development expertise to accept challenges others prefer to avoid. As a result, ACR remains on the leading edge of technological advancements with simple, cost efficient and state-of-the-art, Technology-based products. Each ACR product will further the tradition of maximizing safety, increasing efficiency and solving problems overdue for solution. ACR products continue to be refined and improved to provide customers of every size and need with innovative ways to do the job better, faster and more efficiently.

1.3 Contact information

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1.4 Mailing Address

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Our customer support representatives are available during normal business hours, 6:30am - 4:30pm Pacific Standard Time.

Visit the ACR Web Page at www.acrsystems.com for more information. From here, it's easy to search products, learn what is new, order a catalog, or even see when our trade shows will take us to your area.

Section 2 Introduction to IP

Internet Protocol (IP) addressing is a large topic. The information in this section is provided to:

- assist users who may have little prior knowledge in this area
- give direction on how to configure the ConnectReader

Additional information on IP may be obtained on the internet by searching some of the terms mentioned below.

Specific help on configuring the ConnectReader may be obtained via ACR's customer support department, described in section 1.3.

2.1 MAC Address

Each device connected to the internet has a universal address known as the Media Access Control address, or MAC address. The MAC address has a format similar to: 12-34-56-78-90-AB. The ConnectReader's MAC address is located on the label on the side of the device.

The MAC address is used to determine the unique device to which data will be transmitted, but a the Internet Protocol (IP) address is used to direct data between devices forming the path over which data must travel to get from place to place.

This path is called a network because it may include several devices through which the data must travel between the ConnectReader and the destination computer. The network may be small as in an office or plant, known as a Local Area Network (LAN), or large as in the internet, which spans the entire world, known as a Wide Area Network (WAN).

2.2 IP Address

In order for the ConnectReader to communicate on a network, it must have an IP address assigned. In many cases, this address is assigned automatically when a device is connected to the network via a protocol called Dynamic Host Configuration Protocol (DHCP). When the ConnectReader is shipped from the factory, it is configured with DHCP enabled. If the network includes a DHCP server, it will assign an address to the ConnectReader when the ConnectReader is plugged into the network.

Under normal circumstances, the DHCP server may assign a different IP address each time the ConnectReader is powered. Since the ConnectReader's IP address must be known before communication with the device can occur, it is recommended that the DHCP server be configured to always provide the same IP address whenever the ConnectReader is connected to the network. This procedure is known as Address Reservation and is based on the ConnectReader's MAC address.

If no DHCP server exists locally in the network, the ConnectReader's IP address must be assigned manually before the ConnectReader is connected to the network. This manual configuration is known as a Static IP address. The ConnectReader provides a method to establish its static IP address, discussed in section 5.1.

The IP address can be in one of two standard formats: IPv4 and IPv6. The ConnectReader can be configured for static or DHCP addressing for each of the two schemes. IPv6 addressing can also be disabled entirely.

2.3 Static IPv4 Address configuration

IPv4 addresses have a format broken into 4 sections separated by dots, for example: "192.168.1.103". IPv4 addressing also requires a mask that tells the devices routing data which

part of the address defines the LAN and which part defines the individual device on the LAN. For example, a typical mask is: "255.255.255.0". This mask indicates that the first 3 sections of the address (192.168.1) represent the address of the network and the final section (103) is the address of the device on that network.

The gateway is used to route data to a destination address outside of the LAN. In the above example, any data destined for an address other than 192.168.1.xxx would be directed to the gateway device. If the ConnectReader's data must be transferred outside the LAN, the IP address of the gateway must be configured in the ConnectReader. The gateway MUST have an address on the LAN ("192.168.1.1" for example).

If the ConnectReader will be used to send email notifications, the IP address of the Domain Name System (DNS) server must also be supplied. The purpose of this server is to translate addresses such as "@acrsystems.com" into an IP address. This DNS Server may reside within the LAN (192.168.1.xxx) or may be external, such as the DNS server of your Internet Service Provider (ISP).

2.4 Static IPv6 Address configuration

IPv6 addresses are similar to IPv4 addresses, except they are much longer to accommodate many more addresses than could be achieved within the limits of IPv4. The mask used in IPv4 is replaced by a prefix length. These two values are the only ones that need to be configured in the ConnectReader in IPv6 static address mode.

2.5 Ports

Ports are logical connections used to send data to different applications at the same address, for example "192.168.1.103:80" refers to port 80.

The ConnectReader uses two ports.

- Port 23 is used to configure the ConnectReader.

- Port 4001 is used by TrendReader to communicate with the logger(s). This port may be changed if desired, as long as both the ConnectReader and TrendReader are updated.

Note: To allow access to the ConnectReader. these ports must be "open" on any firewall or routers through which the data must pass.

Section 3 ConnectReader

- System Overview
- Features
- Safety Precautions
- Hardware Warranty

3.1 System Overview

The ACR ConnectReader is a Device Server specifically made for communicating with Data Loggers over TCP (Transmission Control Protocol)/IP connection. The advantage to this technology is that it works seamlessly with ACR TrendReader 3 software with no need for third-party virtual COM port drivers. This increases the bandwidth of the connection with no compromises imposed by hardware or software.

The model available is Ethernet 802.3AF with either dynamic (DNS) or fixed IP address. The device is configured locally or remotely thru a Telnet interface which can be transparent to the end user using Connection Properties. Both models have the ability to directly interface to:

- SmartReader Plus
- SmartReader Plus Network
- Alarm Module

Power is derived from either 12-48VDC or 16-24VAC 50/60Hz, this allows the ConnectReader to run off:

- 12VDC Wall Adapter
- 12 or 24VDC Control Voltage
- POE Power Over Ethernet

The device has 2 different mounting options:

- Surface flange mount
- Universal DIN-Rail foot

3.2 Features

The Device Server along with Data Logger and appropriate housing form a Proven Data Logging Solution. The ConnectReader installs anywhere it is convenient to pick up power and data with hardwire option. The advantage to wiring is that the Data Logger is powered extending the battery life up to 15 years.

The main benefit is that ACR's self-contained battery operated Data Loggers is they continuously record regardless of infrastructure status. The Device Server can be offline, unpowered or disconnected in any way and the self-powered Data Loggers continue to log information according to their parameters.

When a connection is established, data is available instantaneously for graph view, data export or expert analysis using TrendReader™ running in Windows®.

Product highlights include:
- Secure communications using password protected and encrypted protocols
- Supports varying system architectures for flexible topology
- Wide power supply range including POE
- Based on ARM processing technology for reliable communications
- Interfaces using same connectors as Data Loggers and Data Logger Network
- Indicator Lamps for Power, Connect and Data
- Disconnects Alarm Module in Communicate Mode

3.3 Use and Care Information

3.3.1 Safety Precautions

CAUTION:
The following safety precautions must be followed to avoid injury and prevent damage:

- Do Not Operate with Enclosure Open – To avoid shock, damage, or loss of data, this product should operate with enclosure intact.

- Use Proper PS Adapter – Use only Power Supply Adapter model designated in accessory list.

- Observe All Ratings – Before making connections, observe all markings on the components of the system to avoid electrical shock or fire hazard.

- Do Not Operate with Suspected Failures – Have the equipment inspected by qualified service personal if damage is suspected.

- Grounding the System – This product is can be grounded thru the chassis ground screw on the Power Terminal Block. To Avoid Electric Shock when mounted inside an electrical panel, a grounding conductor of sufficient size should be bonded to earth ground. When operating on panel board, this product does not need to be grounded.

- Before making connections to third-party Power Supplies, make sure there is no voltage potential between commons.

- Do Not Install in Hazardous Location – The ConnectReader is not designed to operate in an explosive atmosphere.

3.4 Hardware Warranty

ACR Systems Inc. warrants the hardware to be free from defects in workmanship and components for one year from the date of purchase provided they are not abused or subjected to detrimental conditions. Firmware is warranted for one year from the date of purchase to operate in accordance with its programmed instructions. It is not warranted to be error-free.

If the product does not perform in accordance with this Limited Warranty, ACR will at its discretion, either repair or replace the product free of charge. There will, however, be a charge for freight and Canadian Customs clearance (if applicable). Any replacement hardware or software will be warranted for the remainder of the original warranty period. To the maximum extent permitted by applicable laws, ACR Systems Inc. disclaims all other warranties, either expressed or implied including but not limited to implied warranties of fitness for a particular application. In no event shall ACR System Inc. be liable for any inconveniences, losses, damages, etc., whatsoever arising out of the use of this product.

ACR's policy is not to proceed with any repairs or replacement unless first discussed with ACR's Technical Representative and an RMA (Return Material Authorization) number is issued.
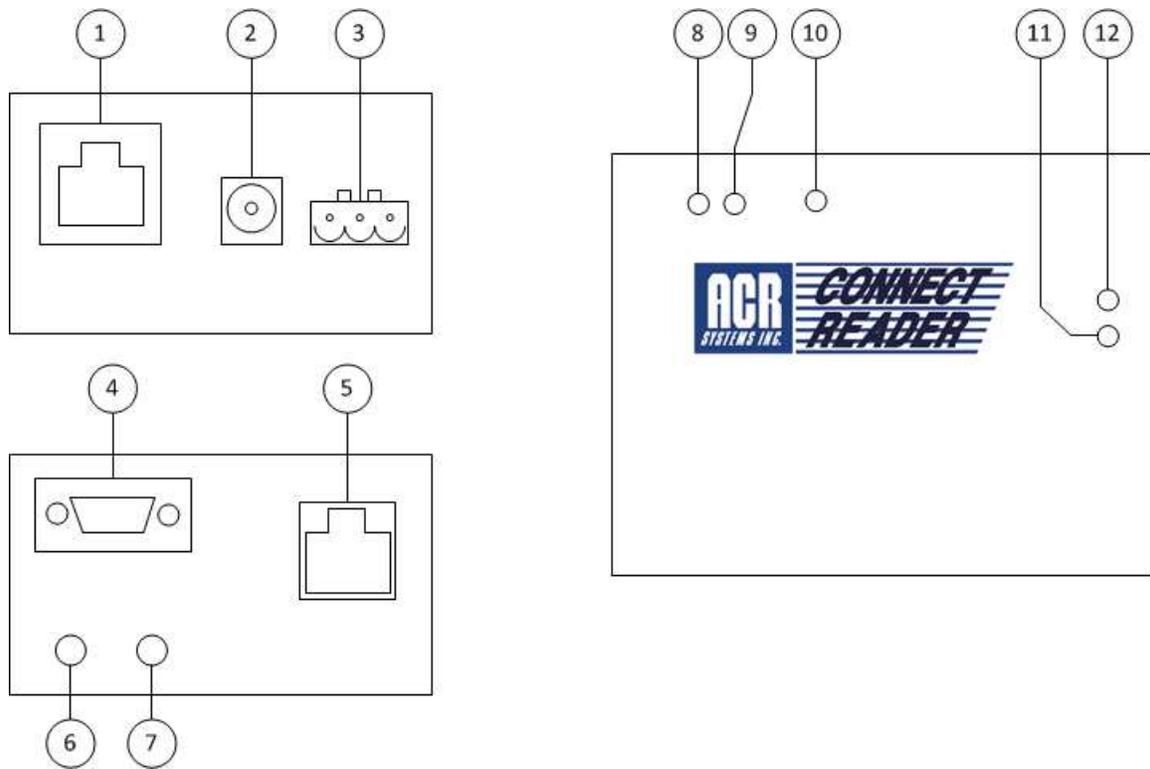
Section 4 Initial Setup

Figure 1 ConnectReader Housing

1. Ethernet RJ45 Link/Act
2. 12VDC – Wall Adapter Jack
3. 12-24 VAC/12-48VDC Terminals
4. DB9M Interface (RS-232 for ACR JR/TRH/IC101)*
5. DL Network 1W/RS485 – Data Logger Network
6. Data Logger port – Mini Phone Jack
7. Alarm Module / Data Logger port – Mini Phone Jack
8. Data – Transmission To/From Data Loggers when lit
9. LAN – Connection Established when lit
10. Power – Power Applied when lit
11. Connector (7) used for ACR Alarm module when lit
12. 1-Wire Enabled when lit (SmartButton Cable)*
    *Future considerations – not available at present.

4.1 ConnectReader Setup Utility Software Requirements

· PC running Windows XP, Windows Vista or Windows 7, Windows 8
· At least one free serial or USB port (depending on interface cable)
· A pointing device (recommended)
· 500 MB hard drive space
· 512 MB RAM

4.2 Installing ConnectReader Setup Utility

For Windows XP, Windows Vista and Windows 7, the setup dialog box will appear automatically after inserting the ConnectReader Setup Utility Software disc into the CD ROM drive.

If autorun is disabled on your computer, locate and select the CD ROM drive in Windows Explorer; Double click on the Setup icon to proceed.

1. A Setup dialog box will appear asking if you want to continue installing ConnectReader Setup Utility on your hard drive.
2. Follow the instructions on the screen to continue the ConnectReader Setup Utility installation
3. A dialog box will inform you when the software installation is complete.

4.3 Initial Configuration

Note: For an explanation of some of the terms used in this section, please refer to Section 2.

Before the ConnectReader is plugged into a LAN, its IP address must be configured to avoid potential conflicts on the LAN.

As shipped, the ConnectReader is configured for DHCP, so its IP Address will be configured automatically by the LAN's DHCP server when the ConnectReader is connected to the LAN.

If the ConnectReader will be used on a LAN that does not include a DHCP server, the IP address of the ConnectReader must be configured manually before connecting it onto the network.

If the ConnectReader is used on a LAN with an IPv6 addressing scheme, this mode will need to be enabled on the ConnectReader.

See section 5.1 for information on changing the IP Address settings.

4.3.1 Powering the Device Server

WARNING: Refer to Safety Precautions in Section 1.2 Regarding Proper Grounding

Note: When powered correctly, the Power light on the ConnectReader will come on. The LAN light will also flash 10-14 times. The LAN light will then remain on if the ConnectReader is connected to a LAN.

The ConnectReader has a variety of options for obtaining power. Choose the one that is right for the application (refer to section **Error! Reference source not found.** for a diagram of the items mentioned below).

1. Apply 12VDC to the Wall Adapter Jack connector (item 2)
2. Apply 12-24 VAC or 12-48VDC to the Power Connector (item 3)
3. POE via the Ethernet connector (item 1)

1. Wall Adapter – This is the most convenient way to power the ConnectReader when using in office setting. Plug the accessory wall adapter into a convenience outlet then plug into 12VDC Jack.

2. 12-24VAC – HVAC Systems are usually run on a 24VAC Nominal power source. These transformers are easily obtained and wire to the mains supply thru a utility box typically. Make sure that when using an existing supply that it has enough power left to run the ConnectReader.

3. POE – Power Over Ethernet eliminates the need for a power supply connection in the field. This option requires the switch or router to have the POE PS built in or alternatively use an injector module inline with the Ethernet cable. Fully compliant with 802.3at-2009 and inherently compatible with 802.3af-2003.

4.3.2 Connecting to a Data Logger

4.3.2.1 SRP or SRP network

An SRP or SRP network may be plugged into either of the stereo jacks (items 6,7 of Figure 1).

If an SRP network is used, TrendReader has to be configured with the serial numbers of the loggers in the network. If only one logger is used, TrendReader will find it automatically.

Note: If more than one SRP is plugged in, there is a possibility that an alarm email will not be sent if more than one logger sends an alarm at the same time.

4.3.3 Using TrendReader

Install TrendReader on a computer according to the installation instructions.

You will need to know the IP address of the ConnectReader. If this address is not known (address obtained from a DHCP server), it can be obtained by following the first 5 instructions in section 5.2.

See TrendReader 2 configuration document.

Section 5 ConnectReader Configuration

Follow these step by step instructions on how to configure and operate the ACR ConnectReader Device Server.

5.1 Configuration via Serial Port

Serial port connection allows the user to manually configure IP settings prior to connecting the device server to the LAN. The steps in this section need to be completed only if connecting to a LAN without a DHCP server or a LAN using IPv6 addressing.

Note: The ConnectReader's LAN light will remain on when the ConnectReader is physically connected to a LAN. It does not imply that the IP settings are correct.

The steps to configure the IP address are as follows:

1. Connect a serial cable between the computer and the ConnectReader.
    Option 1: an IC-102 cable (USB to stereo) plugged into item 6 of Figure 1.
    Option 2: a DE-9 cable from the computer to into item 4 of Figure 1.

2. Power the ConnectReader (see section 4.3.1). (If a POE adapter is used, do not plug in the LAN side before completing these steps).

3. Run the ConnectReader Setup Utility software

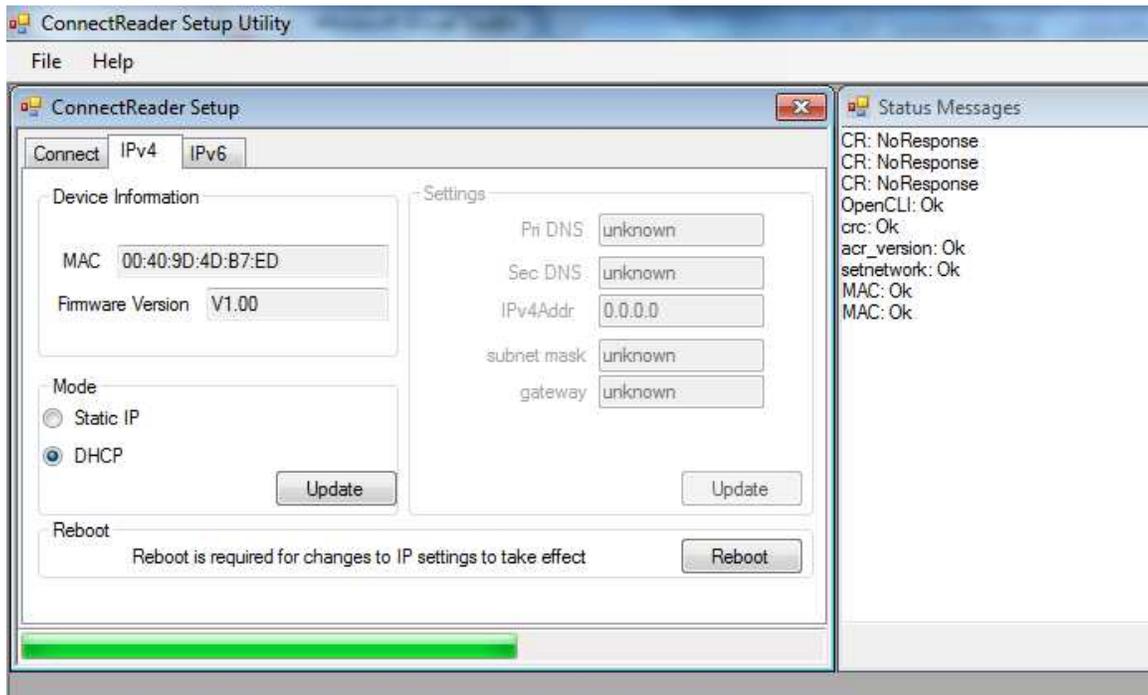4. Select File->Connect via Serial Port
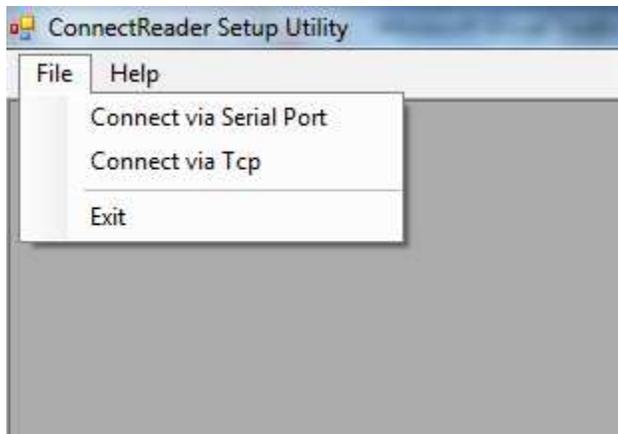

5. Select the COM port and click Open
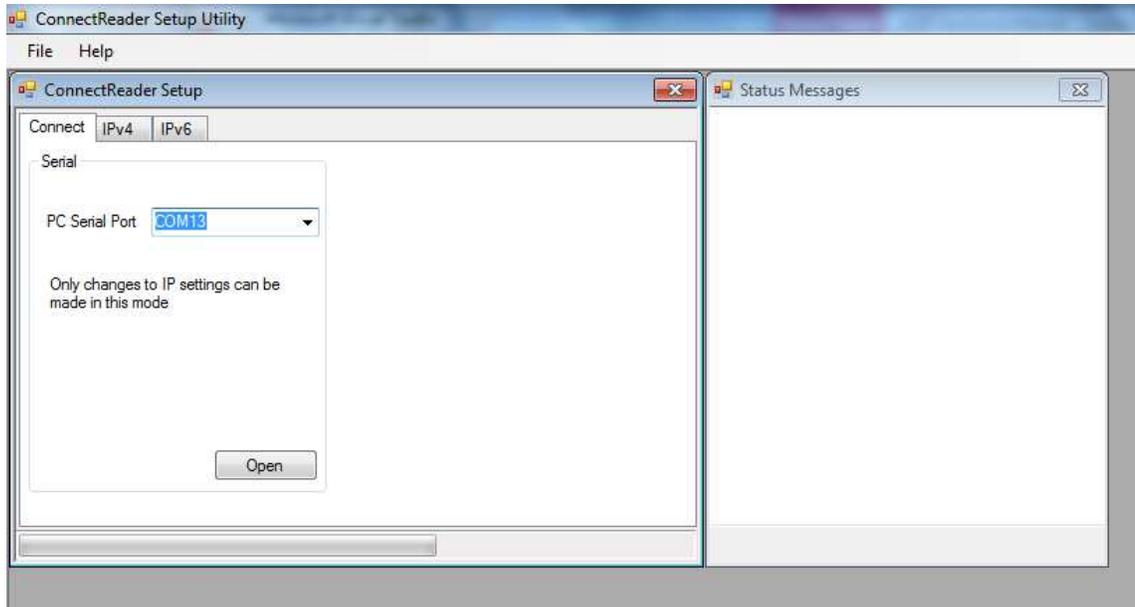
A number of messages will appear in the Status Messages window. If connected properly, the Data light on the ConnectReader should flash.
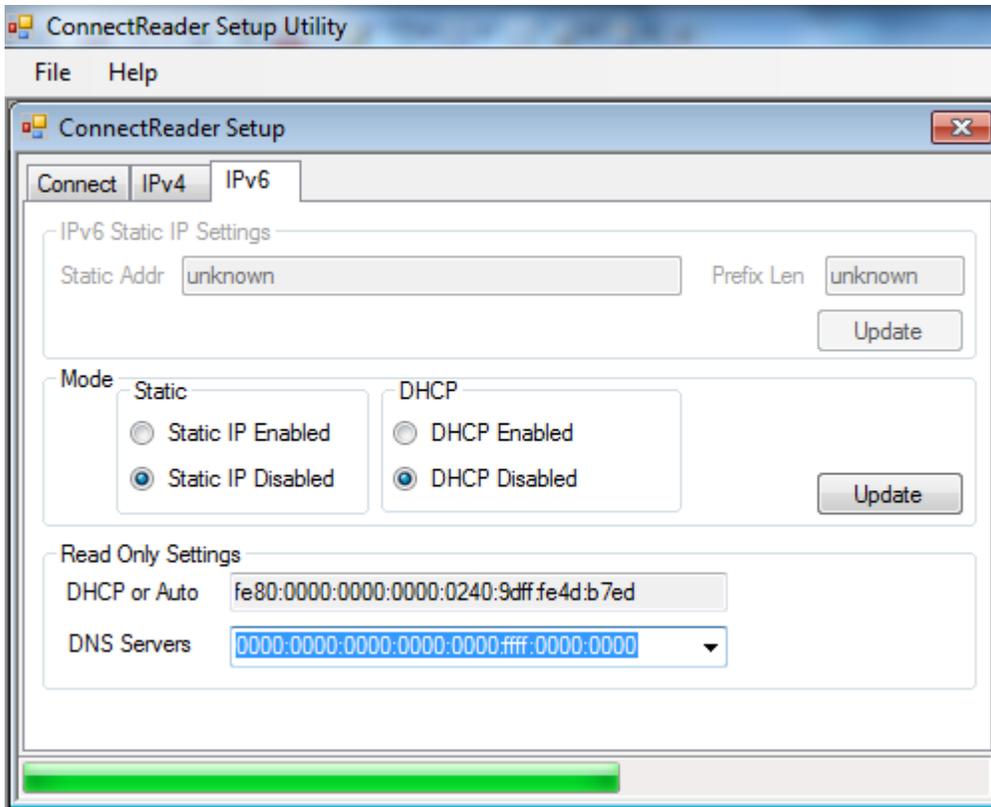
6. Change to the IPv4 tab

7. Change the Mode to Static IP and click Update
8. Fill in the information under Settings (minimum required is IPv4Addr & subnet mask). (The values shown below are an example only – the correct values should be obtained from the network administrator).
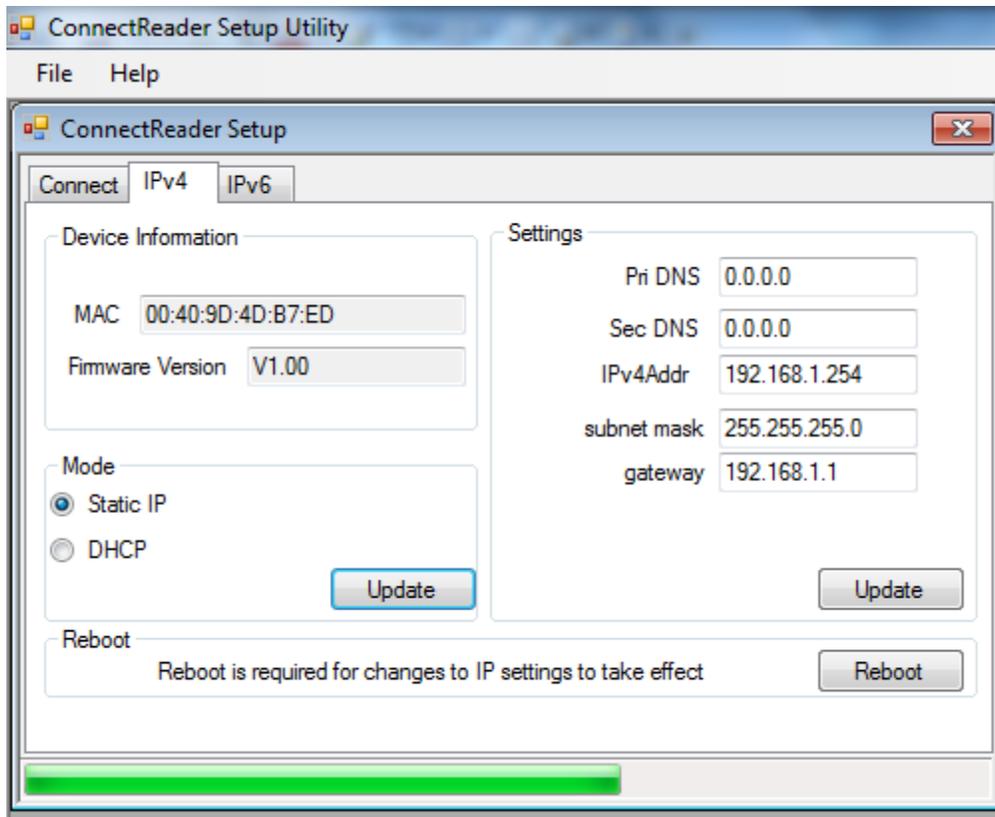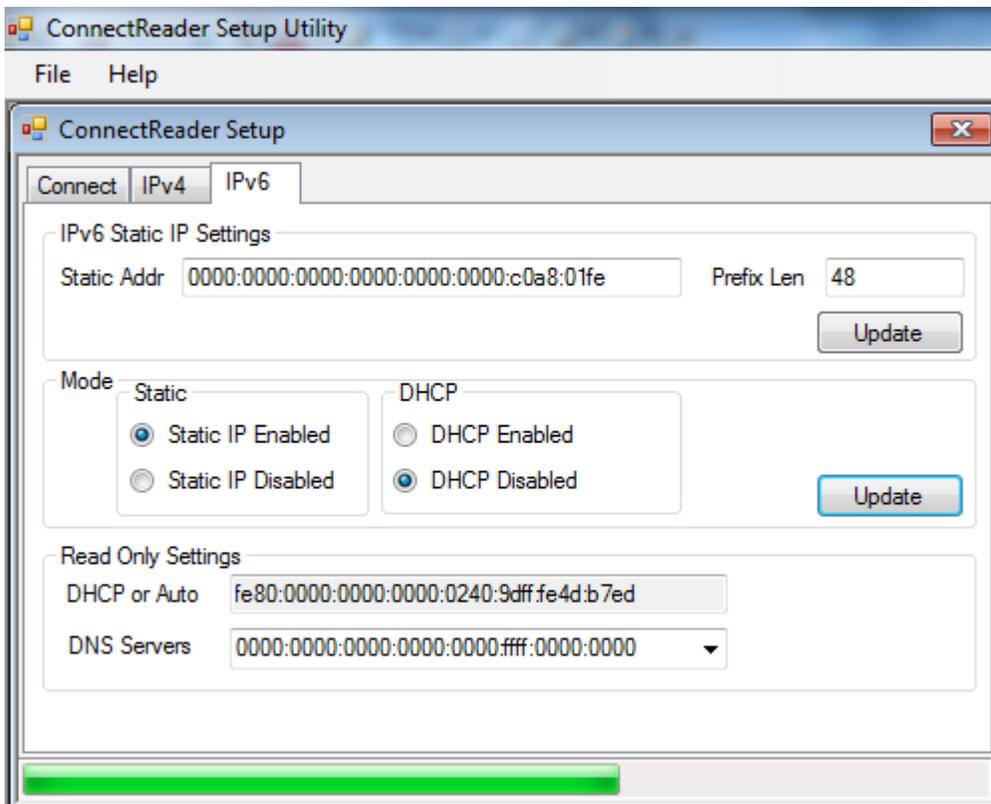
9. If the ConnectReader is <u>not</u> to be used on an IPv6 network, click Reboot.

<u>Optional IPv6 Settings</u>

10. Change to the Ipv6 tab

11. Change the Mode to Static IP or DHCP and click Update

12. For Static IP, enter the address & prefix length and click Update

13. Change to the IPv4 tab and click Reboot

5.2 Configuration via LAN

Once the ConnectReader's IP address is configured correctly, several additional configuration options become available. Follow these steps to establish communication with the ConnectReader and then refer to the sections below for specific settings.

1. Run the ConnectReader Setup Utility
2. If the serial connection window is open, close it
3. Click File->Connect via TCP
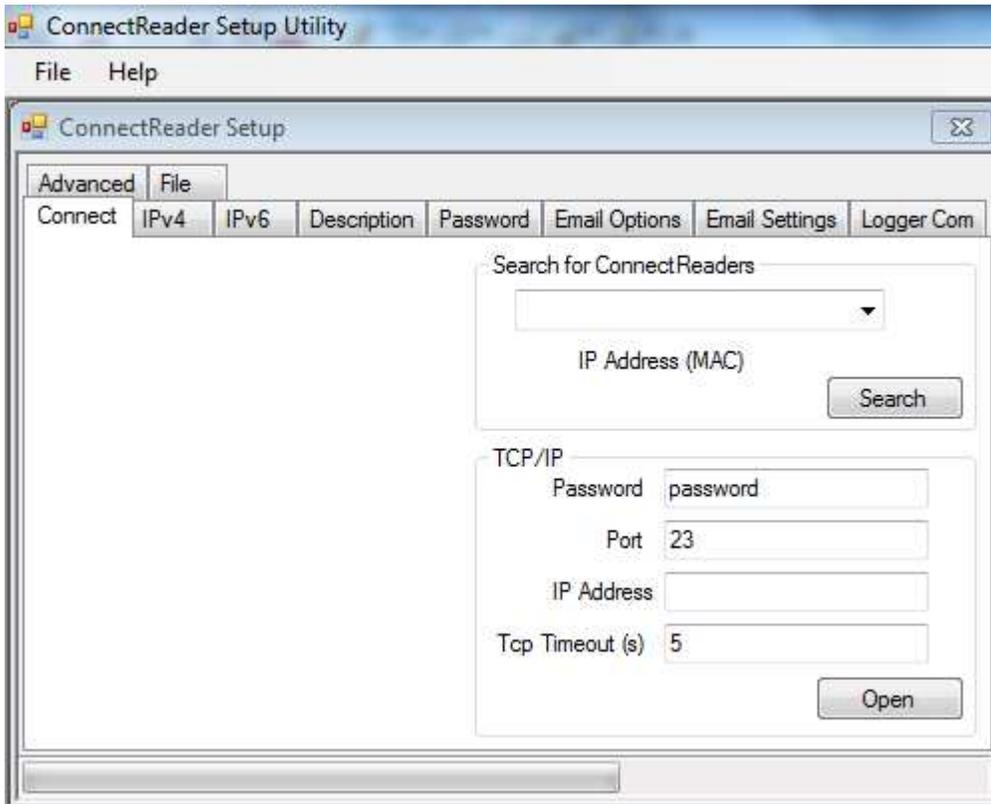
4. Connect the ConnectReader to the LAN (the LAN light on the ConnectReader should come on)
5. Click 'Search'. The list box will be populated with all ConnectReaders found on the LAN. Select the one desired – its IP address will be automatically entered in the IP Address box. Alternatively, if the IP address is known, this may be entered directly in the 'IP Address' box.
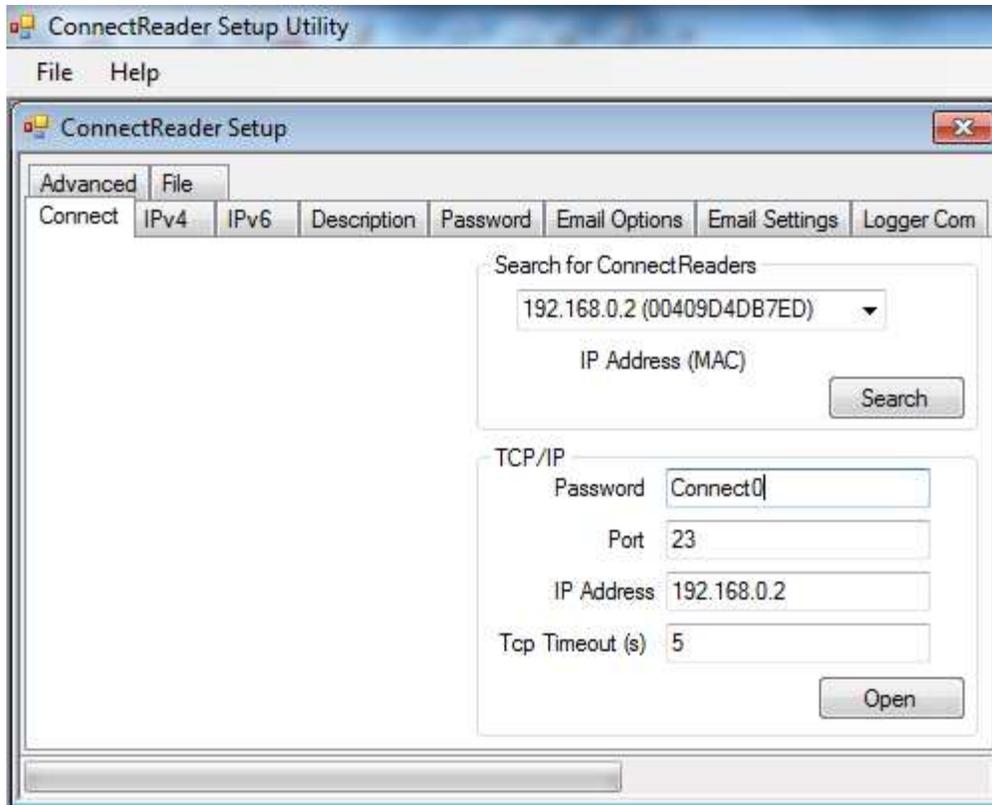
6. Enter the password into the box. The default password is "Connect0".
7. Note: For most situations, the Tcp Timeout value of 5 seconds is sufficient. If there is a long distance (many routers) between the computer and the ConnectReader, the Tcp Timeout value may need to be increased.
8. Click Open
9. After the required changes have been made, click 'Close' to end the TCP session to the ConnectReader.

5.2.1 Ipv4 and IPv6 tabs

These tabs are the same as those used in section Configuration via Serial Port5.1. It is not recommended to change these LAN settings via the LAN as it could disrupt communication with the ConnectReader.

5.2.2 Description tab

This contains two 30 character text fields available to the user for identification purposes.

To change these fields, replace the text and click Update.
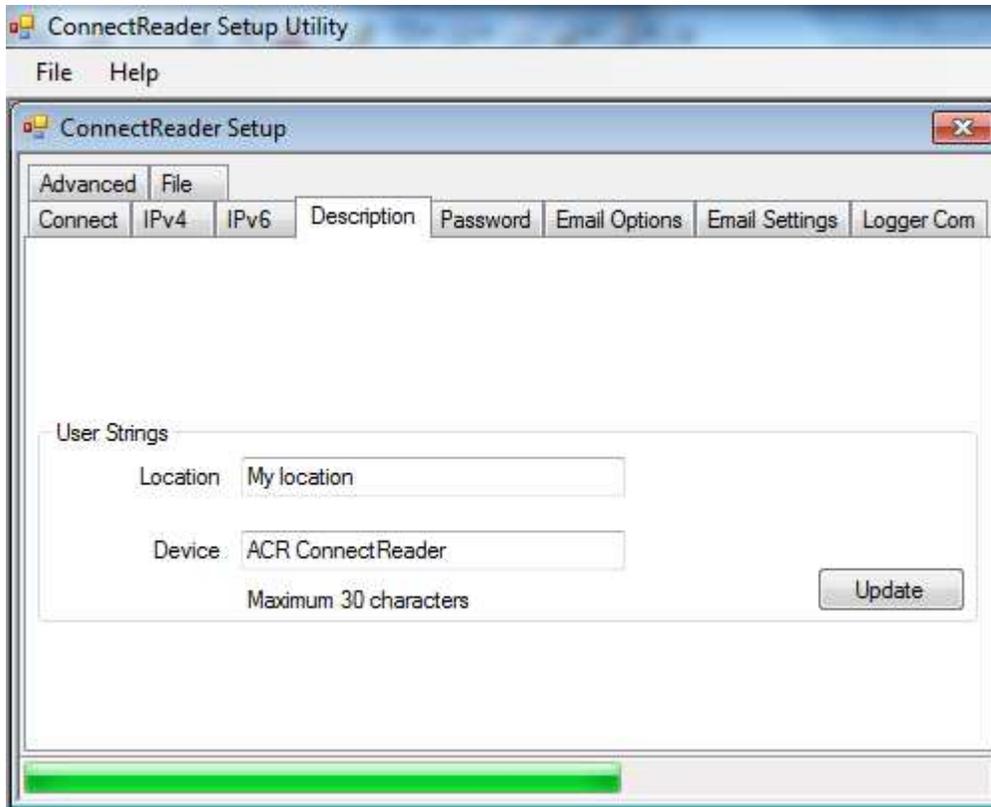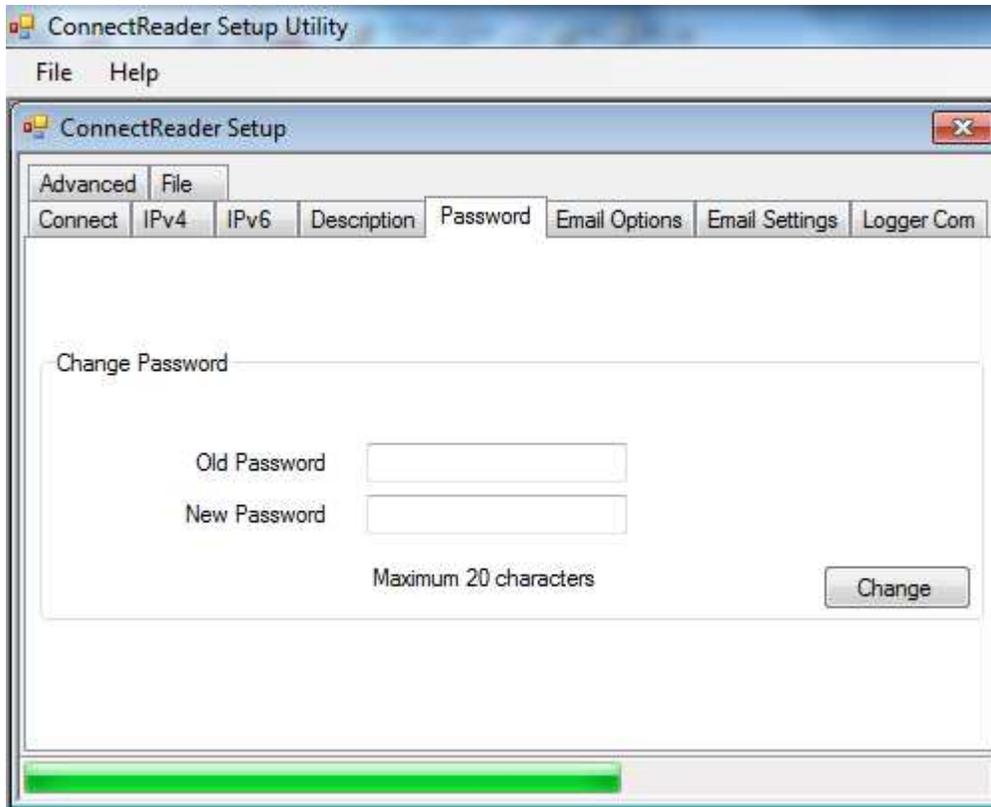
5.2.3 Password tab

The password can be a maximum of 20 characters. The default password is "Connect0".
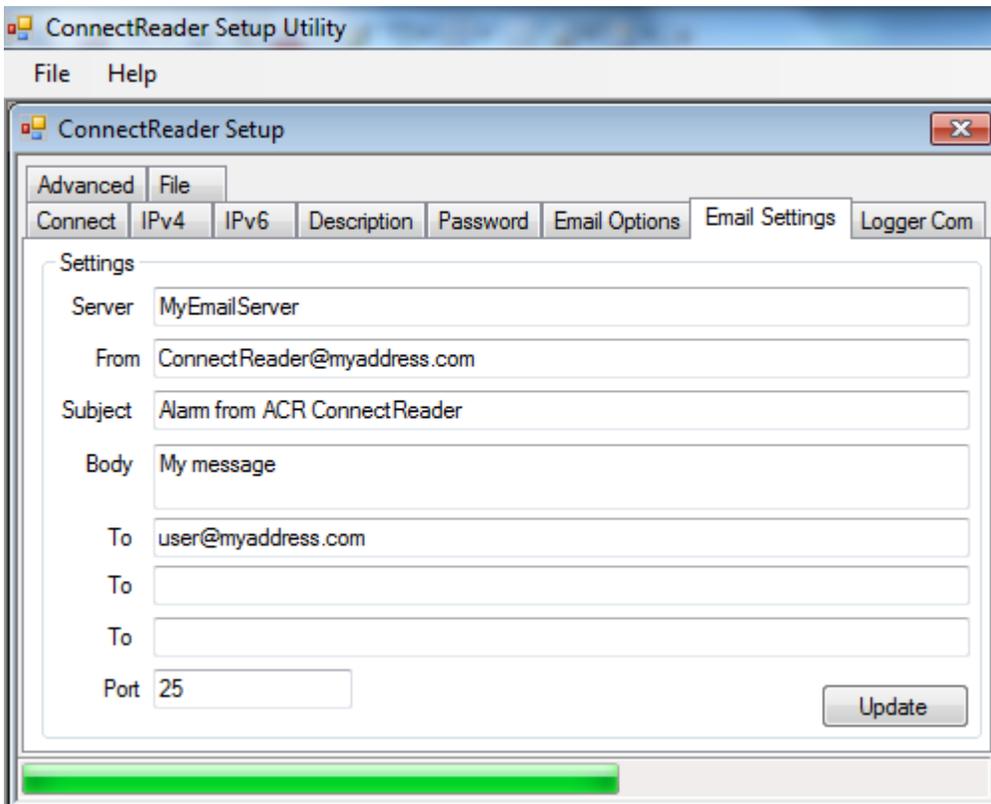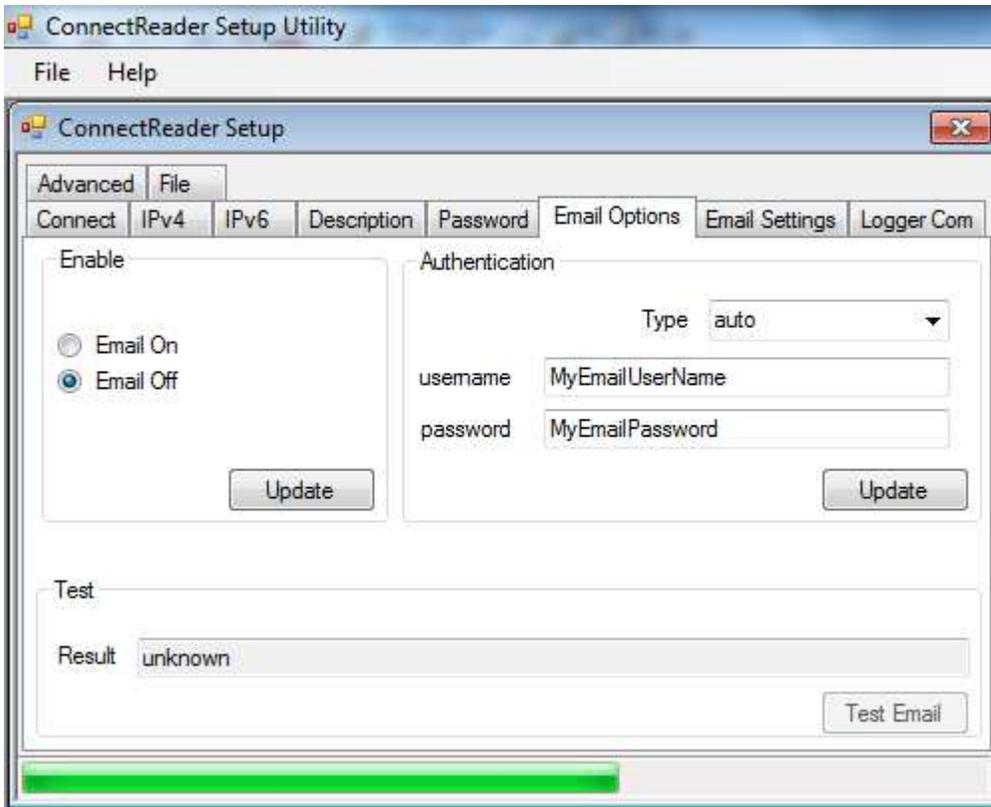
To change the password, enter the old and new passwords and click Change.

Note: The password is not encrypted when transmitted over the LAN.

5.2.4 Email Options and Email Settings tabs

It is possible to have the ConnectReader automatically send an email when the logger generates an alarm message.

TODO: Discuss how to configure the logger for alarm – maybe tell them to see their manual…

Information on Email Server Authentication

In most cases, the authentication type should be set to 'Auto'. This causes the ConnectReader to attempt to automatically determine and use the correct authentication type for the email server.

If, for some reason, automatic detection does not work, the user has the option of manually selecting an authentication method from the following types:

None – User name/password are not required to send email
Digest_MD5 / Cram_MD5 / Login / Plain – other SMTP protocols available
Auto – this should be chosen in most cases
Unknown – this is displayed prior to the software obtaining the current setting from the ConnectReader. It is not a valid setting option.

To configure the ConnectReader for email, you will need the following information:

1. Name of your email server
2. Port of your email server
3. Email server authentication type, if 'auto' cannot be used
4. Email username and password, if required for authentication
5. Email 'To' address

Follow these steps to configure email.

A. On the Email Settings tab, enter the information requested:

1. Server: Name of the email server
2. From: address to appear in the email 'from' field
3. Subject: subject of the email
4. Body: Additional text to appear in the email. Do not include '?', as this character will truncate the message
5. To: Up to 3 email recipient addresses are allowed
6. Port: Email Server's port – usually 25

B. On the Email Options tab:

1. Click Email On, Click Update
2. Enter the authentication type, username, password and click Update. Note: The username and password must contain at least 1 character, even if not needed for authentication.
3. Click 'Test Email'

Note: If more than one data logger is connected to either of the mini stereo jack ports and an alarm occurs concurrently on two or more loggers, there is a possibility that the alarm email will not be sent because the alarm messages could collide and cause errors on the port.
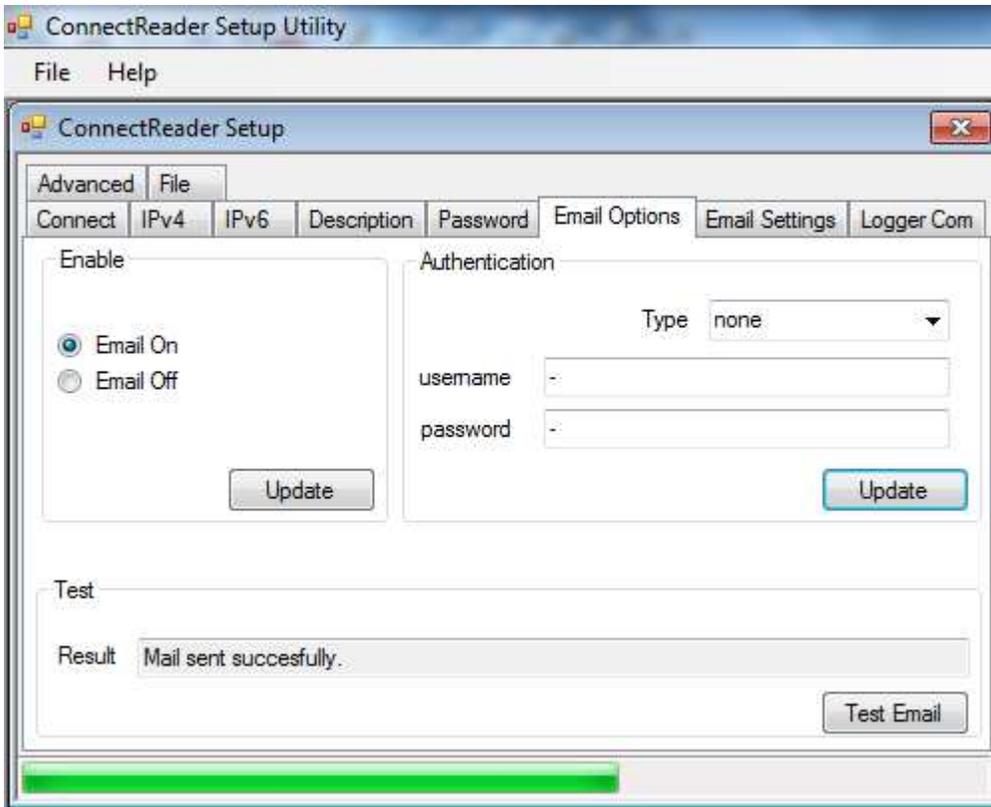
5.2.5 Logger Com tab
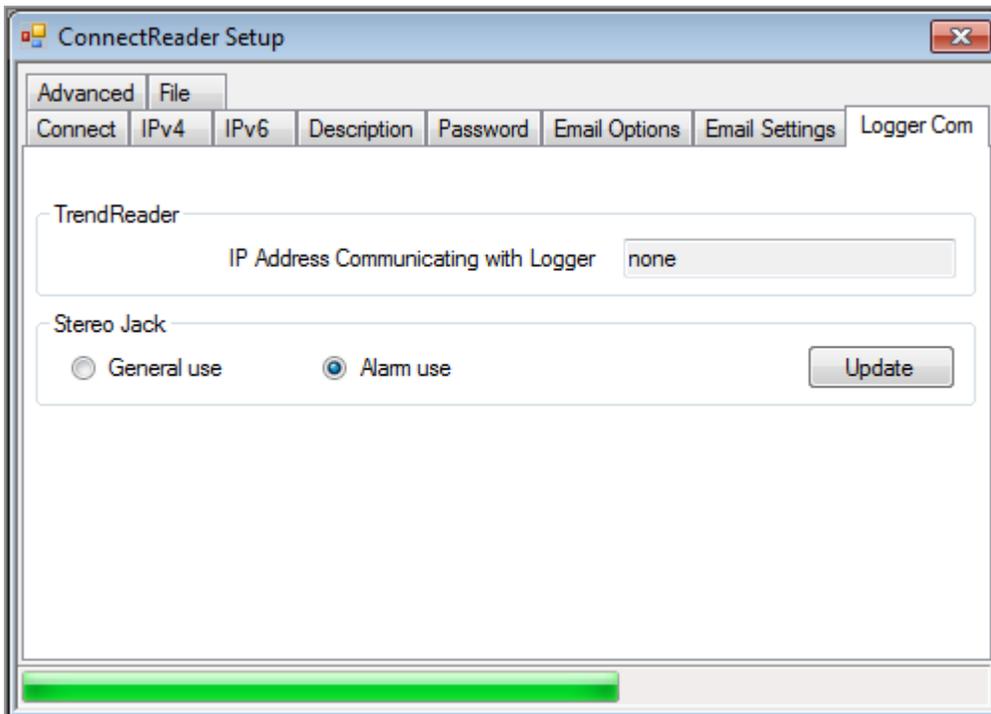
The TrendReader box is 'read only' and shows the IP address of a user that is connected to the ConnectReader's data port (see Advanced tab).

The Alarm Stereo jack (item 7 of Figure 1) can be configured for an ACR alarm module or another data logger,

When an alarm is detected from a data logger connected to the Data Logger port (item 6 of Figure 1), a message is transmitted over the alarm port to trigger the alarm module.

Note: The ACR alarm module will NOT be triggered if there is an active connection to TrendReader via the data port.

The mode can be selected by choosing the desired option and clicking Update.

The Enable light on the ConnectReader is lit when the port is configured for Alarm use.

Note: the Mode light on the ConnectReader indicates that the ConnectReader's DL network connector is configured for a one-wire^{TM} bus. This feature is not currently supported.


5.2.6 Advanced tab
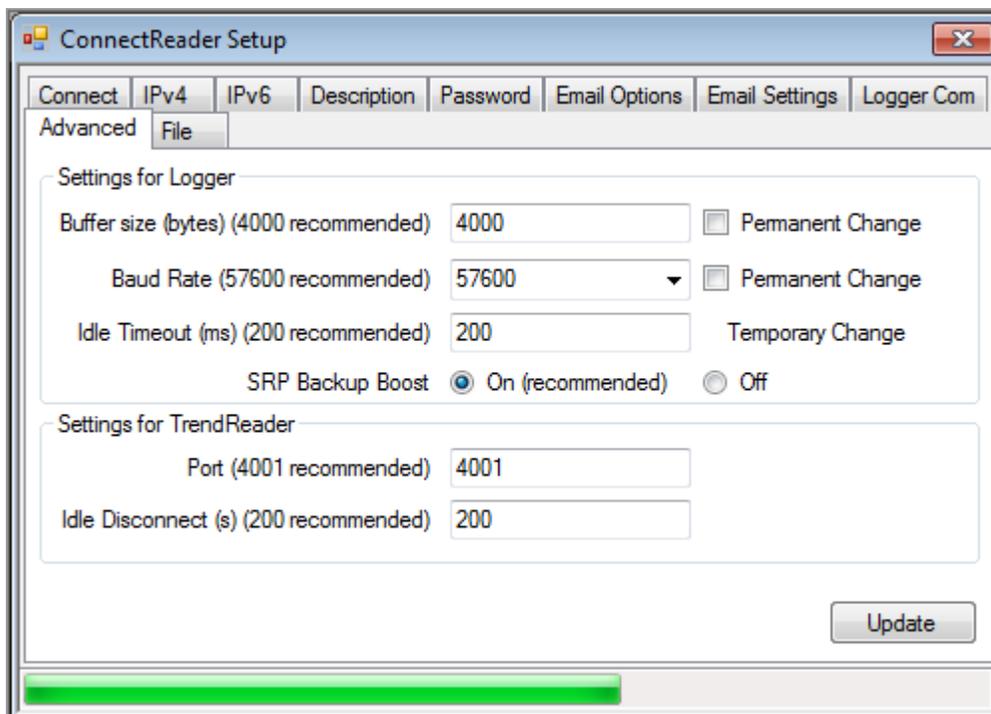
There are a number of additional settings that can be modified, but it is highly recommended that the user retain the default values for most situations.

- Buffer size – this is the amount of data that the ConnectReader sends in a single packet. Modifying this value may require changes to TrendReader's buffer size. Changes to this value will not be retained when the ConnectReader loses power unless 'Permanent Change' is checked.

- Baud rate – the baud rate used to communicate with data loggers. Changes to this value will not be retained when the ConnectReader loses power unless 'Permanent Change' is checked.

- Idle Timeout – Send data to TrendReader when the data logger has been idle for this long.

- SRP backup boost – Reduces SRP data logger download time.

- TrendReader port – the port the ConnectReader listens to for data connections from TrendReader. Changing this port also requires a change to the port setting in TrendReader.

- TrendReader Idle Disconnect – How long to wait before closing the connection to TrendReader due to idle.

5.2.7 File tab
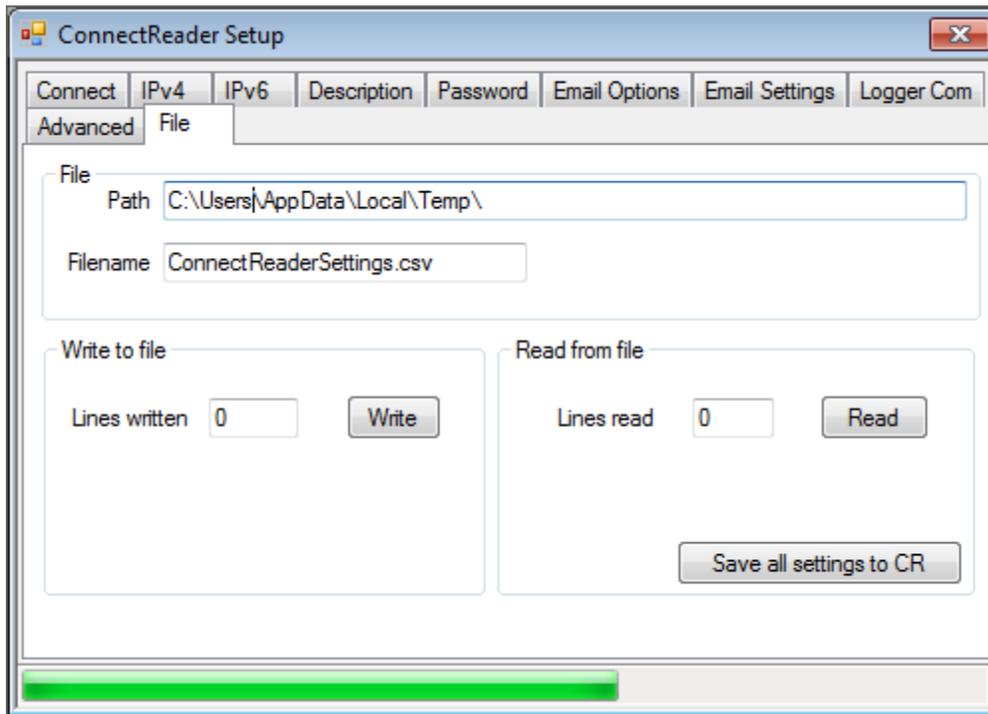
The software includes a convenient way to save and retrieve ConnectReader settings. The file name and path are chosen automatically, but may be changed by the user.

Click 'Write' to save all ConnectReader settings to the named file. The file, in standard csv format, may be modified, if desired.

Click 'Read' to import all settings. Any settings that have changed will be highlighted in blue on the various tabs. Clicking "Save all settings to CR" will transfer these changes to the ConnectReader.

Alternatively, clicking the Update button on a given tab will transfer only the changes in that area to the ConnectReader. In this case, all other changes will be lost, but the process can be repeated by clicking the 'Read' button again.