BCSE 1000
HARDWARE
MANUAL

THIS MANUAL CONTAINS:

INTRODUCTION TO GRAIN TEMPERATURE MONITORING SYSTEMS
BCSE 1000 INTERFACE HARDWARE INSTALLATION INSTRUCTIONS
BCSE 1000 NETWORKING INSTALLATION INSTRUCTIONS

SPECIAL NOTE

<u>READ THIS ENTIRE BOOKLET BEFORE PROCEEDING WITH THE INSTALLATION</u>

BOONE CABLE WORKS & ELECTRONICS, INC.
1773-219TH LANE - P.O. BOX 369
BOONE, IOWA 50036 USA
PHONE (515) 432-2010 FAX (515) 432-5262
TOLL FREE (800)-265-2010

INTRODUCTION TO GRAIN TEMPERATURE MONITORING SYSTEMS

1. GRAIN TEMPERATURE SYSTEMS AND THEIR USE

Stored grain is constantly threatened by the hazards of mold activity, insect infestation and moisture migration. When grain goes out of condition, regardless of the cause, there is almost always a rise in temperature in the critical areas.

1.1. HAZARDS

1.1.1. Molds

All stored grain is infected to a certain extent with various types of grain storage molds. The correct conditions of moisture and temperature will stimulate their activity. The optimum temperature is about 85°F (30°C) for most prevalent species. The growth of storage mold lowers the usefulness of grain and grain products by the development of off-odors and various types of kernel discoloration. If there are a high percentage of damaged kernels, often caused by "turning", the grain is more likely to go out of condition

1.1.2. Insects

Insect activity is also directly related to temperature and moisture content of the stored grain. Generally speaking, the dampest and warmest part of the bulk, and not the average, is the determining factor with respect to insect growth and reproduction. Infestation can be controlled by fumigants, but reduction in fumigant cost is possible if storage temperature can be maintained at a lower level. Most insects thrive in temperature above 70°F (21°C) particularly, in high-moisture grain. Insects not only consume the grain, causing damaged kernels, but generate heat and ultimately develop a temperature in the grain which may cause further serious damage. Below 50°F (10°C), most insects become dormant and may die of exposure to low temperatures after a few weeks.

When warm grain is put in storage, it is essential to reduce the temperature of the grain as soon as possible. When this cannot be done within a matter of weeks, it is wise to treat the grain with an insecticide if there is any possibility of insect infestation. If the grain is to be stored for any length of time before the temperature is reduced, further fumigation may be necessary.

1.1.3. Moisture

The moisture in a mass of grain stored at uniform moisture content may move within the mass because of differences in grain temperature. During the winter, the grain next to the bin wall becomes cooler than that at the center of the mass. Convection air currents pick up moisture from the warm areas and transfer it to cooler parts of the grain mass. The increase in moisture content may cause a corresponding increase in the respiration of the grain and associated micro-organisms, and this oxidation of the grain carbohydrates produces added moisture and heat. Heating from one cause may trigger another, which will contribute to the total heat produced; the combined action may result in serious damage, unless the heated grain is removed, or the temperature reduced. When sufficient moisture is concentrated in the top layer of the stored grain, it may mold and cake. This often occurs, even in grain which was considered to be of safe moisture content when it was stored.

1.2. **HOT SPOTS**

A *hot spot* is a location in grain mass that has experienced an active rise in temperature due to one of the hazards identified above. Consideration must be given to the duration and temperature compared to the surrounding grain in the same storage structure.

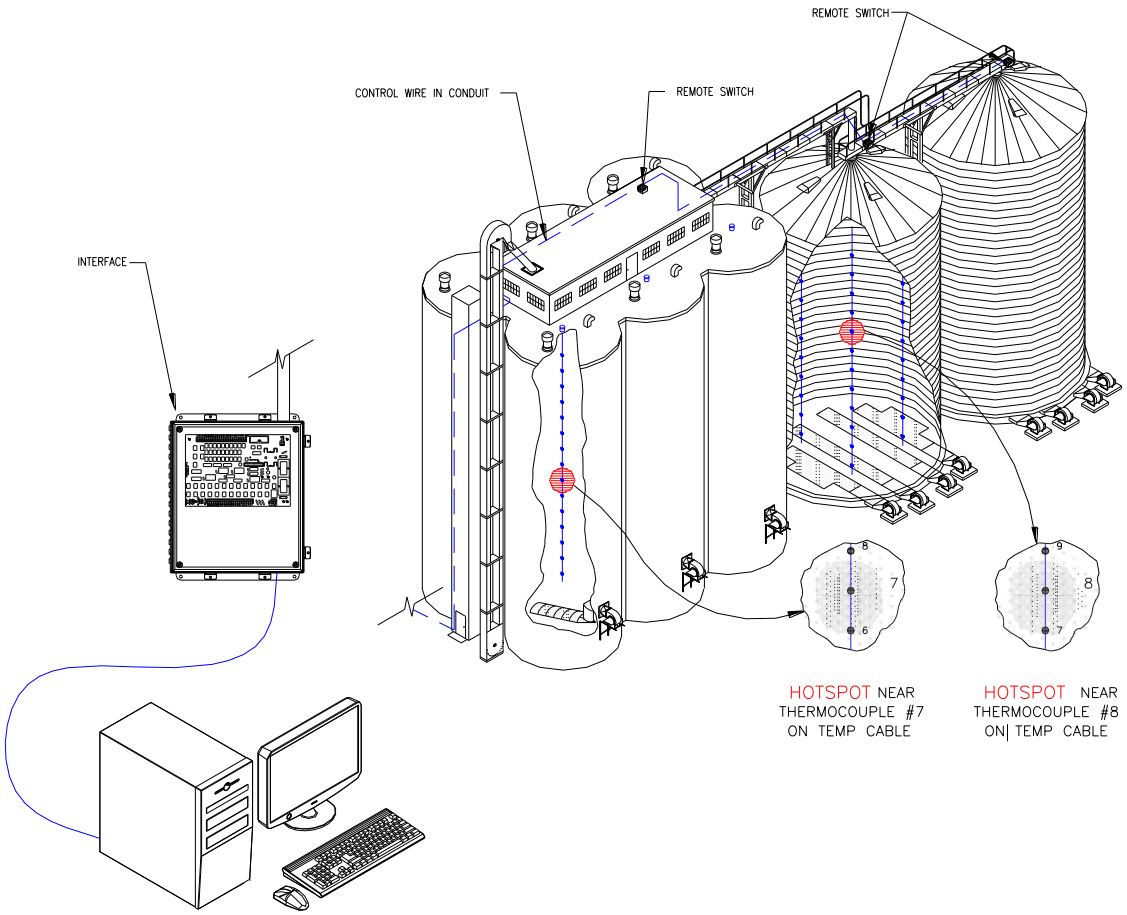


Figure 1 Several hot spots in a Grain Storage Structure

2. BACKGROUND & KEY CONCEPTS

Grain Temperature Monitoring Systems are typified by many *Sensing Points* and one *Central Driving & Read-Out Device* (electronic measuring instrument) with significant distance in between. It is not cost-effective for each *Sensing Point* to have its own dedicated read-out device. Here are some important concepts used in modern monitoring systems:

2.1. LEADWIRE SYSTEM

A straightforward and reliable type of system used in the past is called a *Leadwire System*. In its most-basic form, separate pairs of wires from each of the *Sensing Points* (thermocouples) are routed back to the *Central Read-Out Device* (instrument). If each *Sensing Point* is given its own dedicated pair of conductors, it results in a lot of duplication of wire & cable runs. Modifications to these types of systems are difficult and the redundancy unnecessarily adds to the cost and complexity.

2.2. REMOTE SWITCHING — Eliminates Redundancy

The problems associated with *Leadwire Systems* can be minimized by carefully distributing *switching devices* around the facility in strategic locations. This technique is called *Remote Switching*, which eliminates redundant wires by sharing runs of wires that all *switching devices* would have in common in order to deliver signals back to the *Central Read-Out Device* (instrument). A *Thermocouple-Common Cable* is a group of conductors that serve as a major path that interconnects all the *switching devices* in parallel. It acts as a means by which signals are carried from one place to another. When a single *switching device* is selected, it gets the chance to send signals back to the instrument. Effectively all the other *switching devices* are not part of the system. In this way temperatures from many *Sensing Points* can use the same wires at different times if there is coordinated timing of the *switching devices*. The interaction of the *Interface* and the *Remote Cable Switches* (*switching devices*) provide the coordinated timing.

2.3. SECTIONS

Anywhere there is a natural grouping of cables, such as on the roofs of tanks or interiors of Head-Houses, is an often-used location for a *switching device*. A *Section* is a particular grouping of cables within relatively close proximity of a *Remote Cable Switch*. Each *Switch* handles just the *Temperature Cables* (maximum of 24) in its *Section*; not all cables in the facility.

2.4. CABLE SELECT — BALANCING HARDWARE versus SYSTEM READ-TIME

There must be a balance to the combination of how much hardware is necessary with the total time taken to read all the temperatures in the system. The compromise is to read just one *Temperature Cable* at a time. The *Remote Cable Switch* is called as such because it sends all the signals from *Sensing Points* (thermocouples) on an individual *Temperature Cable* back to the *Interface* for read-out.

2.5. THERMOCOUPLES

A Thermocouple is made when two dissimilar (unlike) conductive metal wires are electrically joined together at both ends, making a continuous loop or circuit. This junction will produce a predictable and repeatable voltage in direct relation to its exposure to heating and cooling. The smaller the voltage the thermocouple generates, the lower the temperature. This is the essential operating principle of all thermocouple-based monitoring systems. Refer to Figure 2.

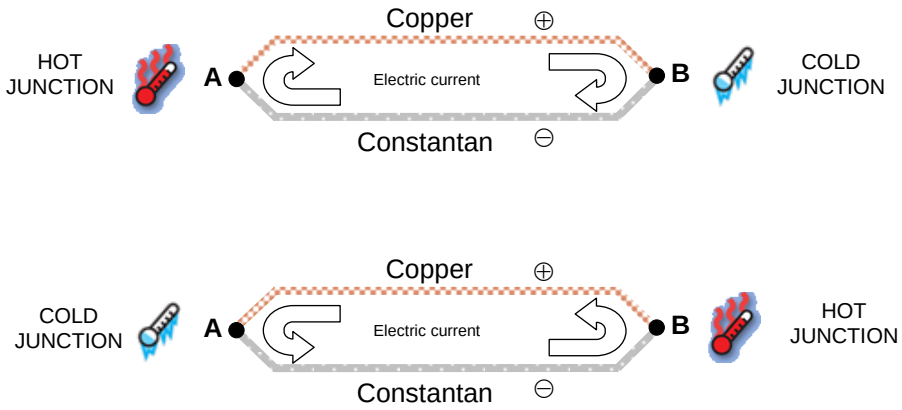


Figure 2 Thermocouple Circuit

2.5.1. Thermocouple Type

The choice of dissimilar metals in the *Thermocouple Junction Wire*, determines the "Type". The *BCS ETHERNET Temperature System* uses type "T", which is made from copper and constantan metals. They are the most practical for temperatures below 600°F (315°C) because they are affordable and easy to work with. Once twisted together so that the metals contact, the junction can be soldered, crimped or welded. It is the metal to metal contact that makes the thermocouple junction, not the solder.

2.5.2. "T"-Type Junction Metals

2.5.2.1. Copper

Simple copper wire is used as the positive lead.

2.5.2.2. Constantan

An alloy of 57% copper and 43% nickel is used as the negative lead. The resistance remains constant over a wide range of temperatures.

2.5.3. Thermo-Electric Voltage

Call the two junctions of dissimilar metals in this circuit, A and B. When one junction has a different temperature from the other, an electromotive force (voltage) is generated. The common abbreviation for ThermoCouple is TC. This voltage is very small and requires sensitive equipment to measure it.

2.5.4. Hot And Cold Junctions

Direct electric current will flow in one direction if the temperature at (A) is higher than (B). The current will flow in the opposite direction if the temperature at (B) is higher than (A). No voltage will exist and no current will flow when the temperature of junctions (A) and (B) are the same.

3. DESCRIPTION OF THE COMPONENTS

This section describes the components of a Grain Temperature Monitoring System; their basic functions and relationships. A basic system is represented in the block diagram figure below.

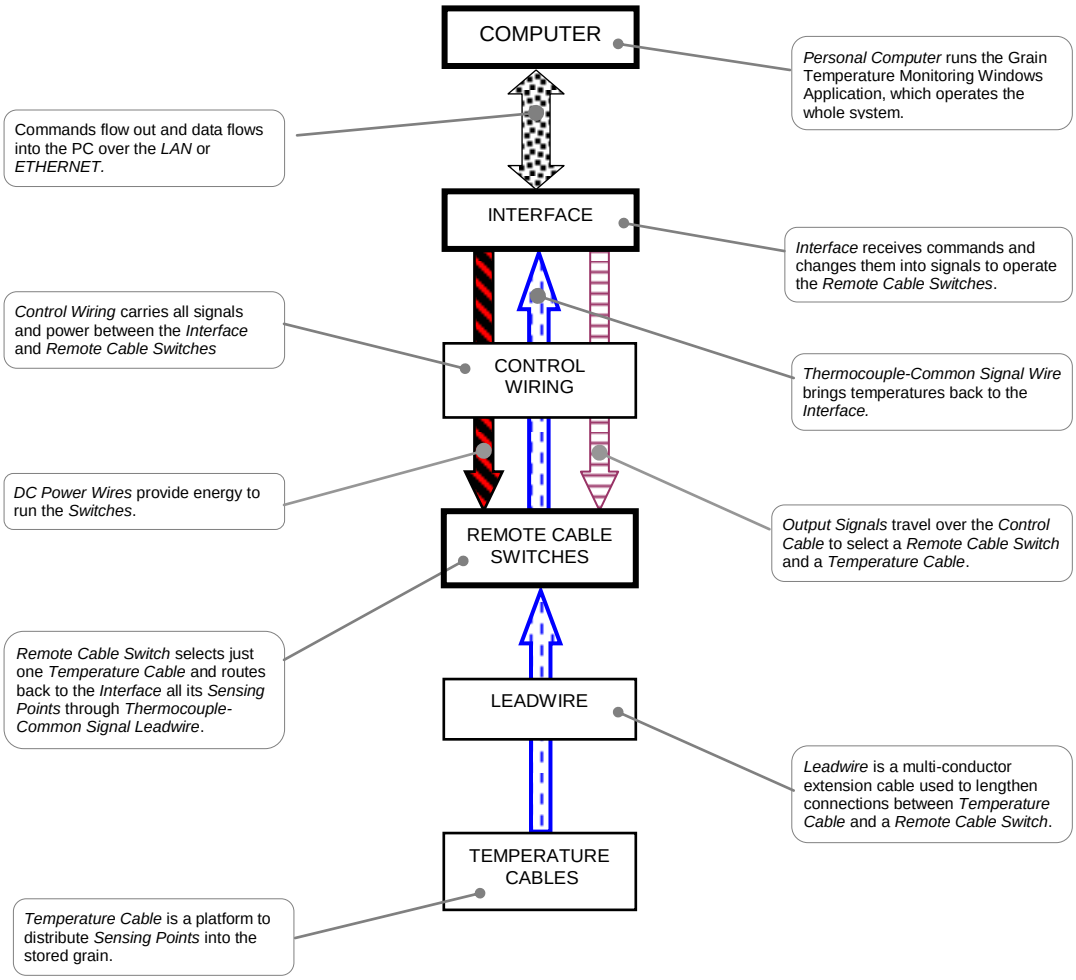


Figure 3 Block Diagram of Grain Temperature Monitoring System

3.1. TEMPERATURE CABLES

The purpose of a *Temperature Cable* is to provide a platform so that *Sensing Points* can be suspended down into the stored grain. They are usually supported by some structure under the roof of the silo or bin. For larger bins more cables are added in predetermined patterns based upon the tank diameter. Cables are made up of several components. Refer to manual 'Temperature Cable' located on the www.rolfesatboone.com website.

3.2. LEADWIRE

Leadwire is a multi-conductor extension cable used to lengthen connections between Temperature Cables and a Remote Cable Switch. Temperature signals of a single Temperature Cable are channeled through a Remote Cable Switch. Leadwire is used because it is less costly than Thermocouple Junction Wire. Modern electronic instruments are designed such that the length of the extension wire will not affect the temperature reading. Refer to manual 'Leadwire' and 'Temperature Cable' located on the www.rolfesatboone.com website.

3.3. REMOTE CABLE SWITCH

One of the most effective ways to balance the combination of how much hardware is necessary to install with time taken to read all the temperatures in the system is to read and entire Temperature Cable at one time. The Remote Cable Switch is called as such because it selects just one Temperature Cable. All the Sensing Points it has are routed back to the Central Read-Out Device through Leadwire. Refer to manual 'Model KT Multiplexer' located on the www.rolfesatboone.com website.

3.4. CONTROL WIRING

Control Wiring runs from the *Interface* to the first switch and between all subsequent switches. It carries all of the input and output signals and power, for the *Interface* to communicate to the switches and for the switches to communicate back to the *Interface*. The other leadwire is used to bring the switch select and cable select logic to the switch.

Control Cable — are further divided up into Switch Select Wire and Cable Select Wires.

Thermocouple-Common Signal Wires — the control wire also contains a thermocouple signal wire that is common to all Switches. This is because switching of the thermocouples of a cable, are done in the Interface via one leadwire.

DC Power Wires — in most cases the control wiring also includes the power wires to run the switches. The black 18 AWG is common for the power supply and the red 18 AWG is +12volts DC from the power supply at the Interface. Refer to manual 'Temperature Cable' located on the www.rolfesatboone.com website.

3.5. INTERFACE

The Interface is a boundary between the Personal Computer and the Grain Temperature Monitoring System that have very different types of electrical signals and power that do not mix. To connect between these two hardware devices, there must be interface circuits to provide compatibility between linear and digital systems. The purpose of the Interface is to provide the appropriate output signals for section selection, cable selection and thermocouple selection. In most systems the power to run the switches also comes from the Interface. In the case of PC based systems, the Interface performs the functions of the Instrument through software commands from the computer. These signals can be generated mechanically through switches and relays or through electronic components like IC's and processors.

The Interface combines all functions that used to be performed by multiple devices in older systems. It now takes the place of the Instrument, Potentiometer, and Power Supply. An Interface has traditionally been located in a central location such as an office or control room. That was because it was dependant on Input / Output Expansion Cards plugged into the PC motherboard and the limited distance transmission standards like RS-232 could go. Now that ETHERNET cabling and protocol is used, the PC and Interface can be much farther apart, freeing up the possibilities of where the Interface can be located.

3.6. PERSONAL COMPUTER

A Personal Computer runs the ROLFES @ Boone Grain Temperature Monitoring Windows Application, which operates the whole system. The PC commands the Interface to perform operations such as driving the Switches and being a Read-Out Device and Graphical User Interface on the PC Monitor. The BCS ETHERNET Temperature System puts data on the LAN or ETHERNET.

BCSE 1000 INTERFACE HARDWARE INSTALLATION INSTRUCTIONS

1. INTRODUCTION

An *Interface* is a boundary between the *Personal Computer* and the *Grain Temperature Monitoring System*. These two types of hardware systems are very different in the kinds of electrical signals each has and are therefore not compatible. To exchange information between them, there must be buffer circuits to provide separation and compatibility between linear and digital circuits.

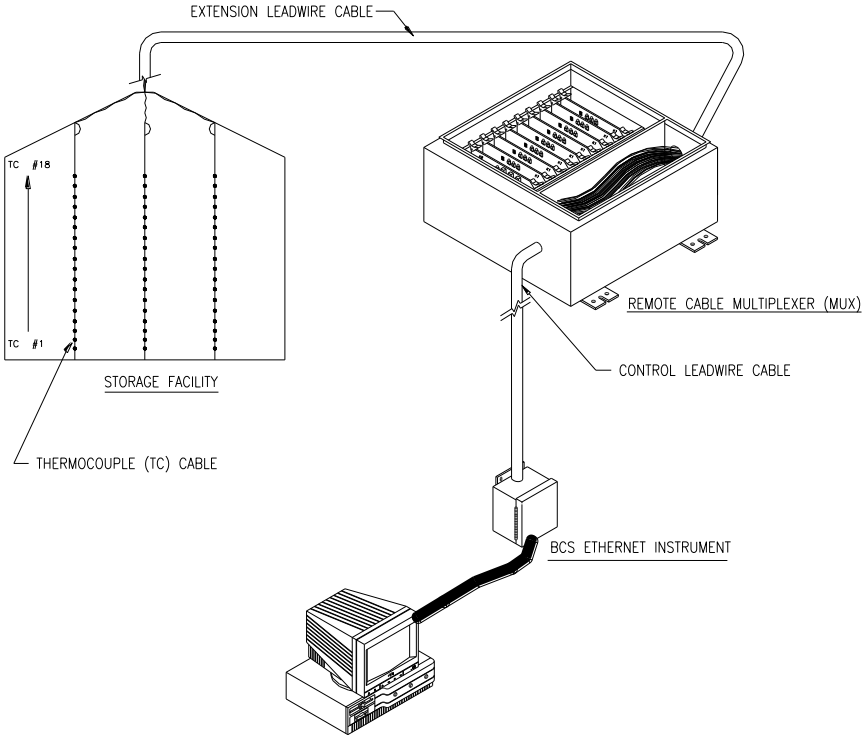


Figure 1 Typical BCSE 1000 Temperature Detection System

1.1. PURPOSE

The purpose of the *BCSE 1000 Interface* is to provide the appropriate output signals to the *KT Remote Cable Switch* for *Switch Selection* and *Cable Selection*. As part of a PC-based system, the *Interface* performs the functions of an Instrument through software commands from the ROLFES @ Boone Grain Temperature Monitoring Windows Application. Interface receives software commands and changes them into signals that can operate the *KT Switches*. The DC power to run the *Switches* is also converted from AC power at the *Interface*.

1.2. COMBINES MULTIPLE DEVICES INTO ONE

The Interface combines all functions that used to be performed by multiple devices in older systems. It takes the place of an Instrument, Potentiometer, and Power Supply.

1.3. MORE LOCATION POSSIBILITIES

Interfaces have traditionally been located in a central location such as an office or control room. That was because it was dependant on digital Input / Output Expansion Cards plugged into the PC motherboard and the limited distance transmission standards like RS-232 could go. Now that ETHERNET cabling and protocol is used, the PC and Interface can be much farther apart, freeing up the possibilities of where the Interface can be located. The *BCSE 1000 Interface* Temperature System puts data on the LAN or ETHERNET so that anywhere a network can link to is now a location to install the *BCSE 1000 Interface.*

2. ENCLOSURE COMBINATIONS

BCSE 1000 Interface can be enclosed in one box if ordering the product new from the factory or it can be a combination of the existing legacy BCS 1000 Interface along with a smaller enclosure holding the Ethernet module board. The latter will be the case if the customer wants to upgrade to ETHERNET communications.

2.1. SINGLE ENCLOSURE

All components fit in single box. AC Line power, ETHERNET, and Switch Control Wire are all that is needed for connections.

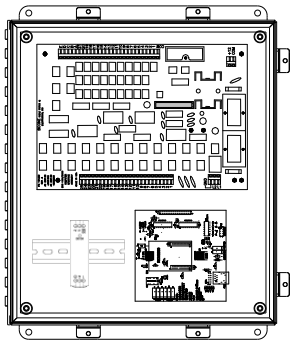


FIGURE 2 BCSE 1000 Board, +12V Industrial DIN-Rail Power Supply and Interface Board in Single Enclosure

2.2. SEPARATE ENCLOSURES

The Ethernet module board is in its own enclosure connected to the Interface by an 8-foot [2.4 meter] Round, Black, *BCS CABLE*. Connections are the same as for the single enclosure, just separated. The Retrofit Kit is basically the smaller enclosure and cable.

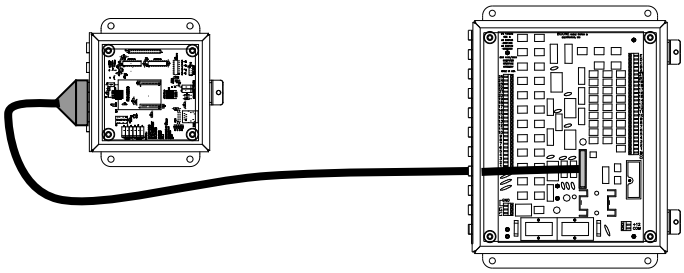


FIGURE 3 Legacy BCS1000 Interface Board with Ethernet Retrofit Kit in Separate Enclosures

3. CONNECTIONS

Make sure electrical power is OFF to the Computer and the *BCSE 1000 Interface*.

IMPORTANT NOTICE - MAKE CERTAIN the Protective Earth Ground Conductor from the 120 / 240 VOLT AC Line Supply, is connected to the to the GND terminal of the *BCSE 1000 Interface*.

In the *BCSE 1000 Interface* enclosure there are 4 terminal strips. Refer to Figure 4.

3.1. INPUTS

The Output of one device is also the Input to another device. Connections that are considered "Inputs" to the *Interface* are from the point of view of the *Interface*.

3.1.1. AC Line Supply

This is the connection to the general-purpose alternating current (AC), 3-wire, single-phase, *Mid-Point Neutral*, electric power distribution system, also referred to as the Mains. The *BCSE 1000 Interface* can be powered from one of two commonly supplied voltages. One terminal strip is for the 120 VAC (or 240 VAC, specify when ordering) connections marked L1, L2 and GND.

3.1.1.1. GROUND, GND

Connect the GREEN wire (or Green with yellow stripe) from Ground to the connector designated "GND". Also known as the Earth Wire, it connects the case or enclosure of equipment to earth ground as a protection against insulation failures. Electromagnetic interference filters and surge protectors dispose of unwanted electric charges via the earth wire.

3.1.1.2. L1, LIVE WIRE ONE

This is the energized connection to the alternating current from the electrical panel or power grid. It is also called *Line,* Phase, Active, or Hot. Connect the BLACK (often used in N. America) wire to the connector designated "L1".

3.1.1.3. L2, LIVE WIRE TWO

This wire should be treated as energized.

- 240 VAC Configuration
  If your *BCSE 1000 Interface* was configured for 240 VAC, a second live conductor from the electrical panel or power grid is brought to the connector designated "L2". *Mid-Point Neutral* is not used in this situation.
- 120 VAC Configuration
  If your *BCSE 1000 Interface* was configured for 120 VAC, then it is assumed the interface is supplied as a 3-wire, single-phase, *Mid-Point Neutral* set up. Connect the second WHITE (often used in N. America) wire from Neutral, to the connector designated "L2".

3.1.2. Thermocouple-Common Cable

The *Control Wire* also contains the *Thermocouple-Common Cable* that is common to all Switches. Switching of the thermocouples of a cable, are done in the Interface via one leadwire, not in the Switch.
The second terminal strip is labeled CON, 1 through 21. The CON stands for the *Constantan* of the 18 or 21 TC Leadwire for the TC signals coming from the switches. Use the TC color code when wiring the TC Leadwire in from 1 to 18 or 21 depending on the number of thermocouples per cable.

3.2. OUTPUTS

Connections that are considered “Outputs” from the *Interface* are from the point of view of the Interface.

3.2.1. DC Power

The Interface converts AC power into 12V Direct Current Power using its own on-board supply. This supply is dedicated to energize the Switches and is not to be confused with a different 12V, Industrial, DIN-Rail, Power Supply for the BCS1000 Ethernet Circuit Board, which is discussed in the section on “BCSE 1000 Networking Installation Instructions”.
The third terminal strip marked “KT+12” and “COM” is for the power lines that run from the Interface to the switches.

3.2.1.1. KT+12

Connect the RED insulated, 18 AWG wire to the connector designated “KT+12”. This is the positive 12 Volts DC output. This is otherwise known as the ⊕12 Volt SUPPLY at the *KT Remote Cable Switch*.

3.2.1.2. COM

Connect the BLACK insulated, 18 AWG wire to the connector designated “COM” and is short for COMMON. This is the negative 12 Volts DC, otherwise known as the ⊖RETURN at the *KT Remote Cable Switch*.

SUPPLY and RETURN conductors are connected in common and in parallel (electrically side by side) to all *KT Switches*.

3.2.2. Control Cable

The *Control Wiring* runs from the *Interface* to the first *Remote Cable Switch* and between all subsequent *Switches*. It includes wires used to select a particular *Switch* and a *Cable* within that switch.

3.2.2.1. Switch Selection

A fourth terminal strip labeled from 1 through 25. These numbers correspond to the *Remote Cable Switch* that is to be selected. Each switch must be assigned a designated number in the system.

3.3. BI-DIRECTIONAL I/O

Depending upon which Enclosure Combination your *Interface* has, you will be connecting one of two versions of cable. They perform the same function and both plug into the connector designated “TB1”. Connectors and Cables use pin and socket genders that will only allow correct connection.

3.3.1. Ribbon Cable

Connect the short 34-Conductor flat grey *Ribbon Cable* to “TB1”.

3.3.2. Round Black BCS Cable

Connect the longer round black *BCS Cable* to “TB1”

TC B

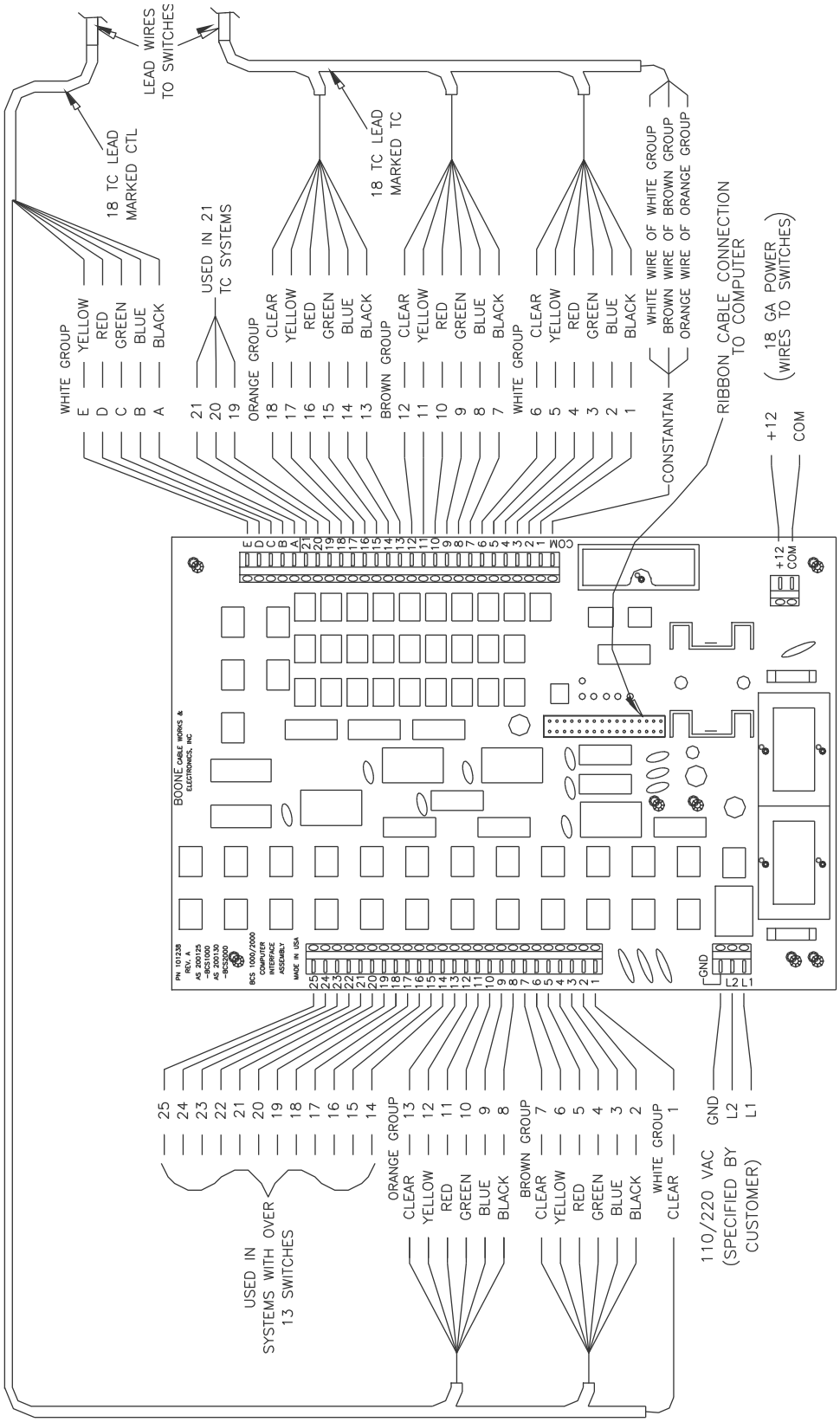


FIGURE 4 BCS 1000 Board Connections to Field Equipment using KT Switching

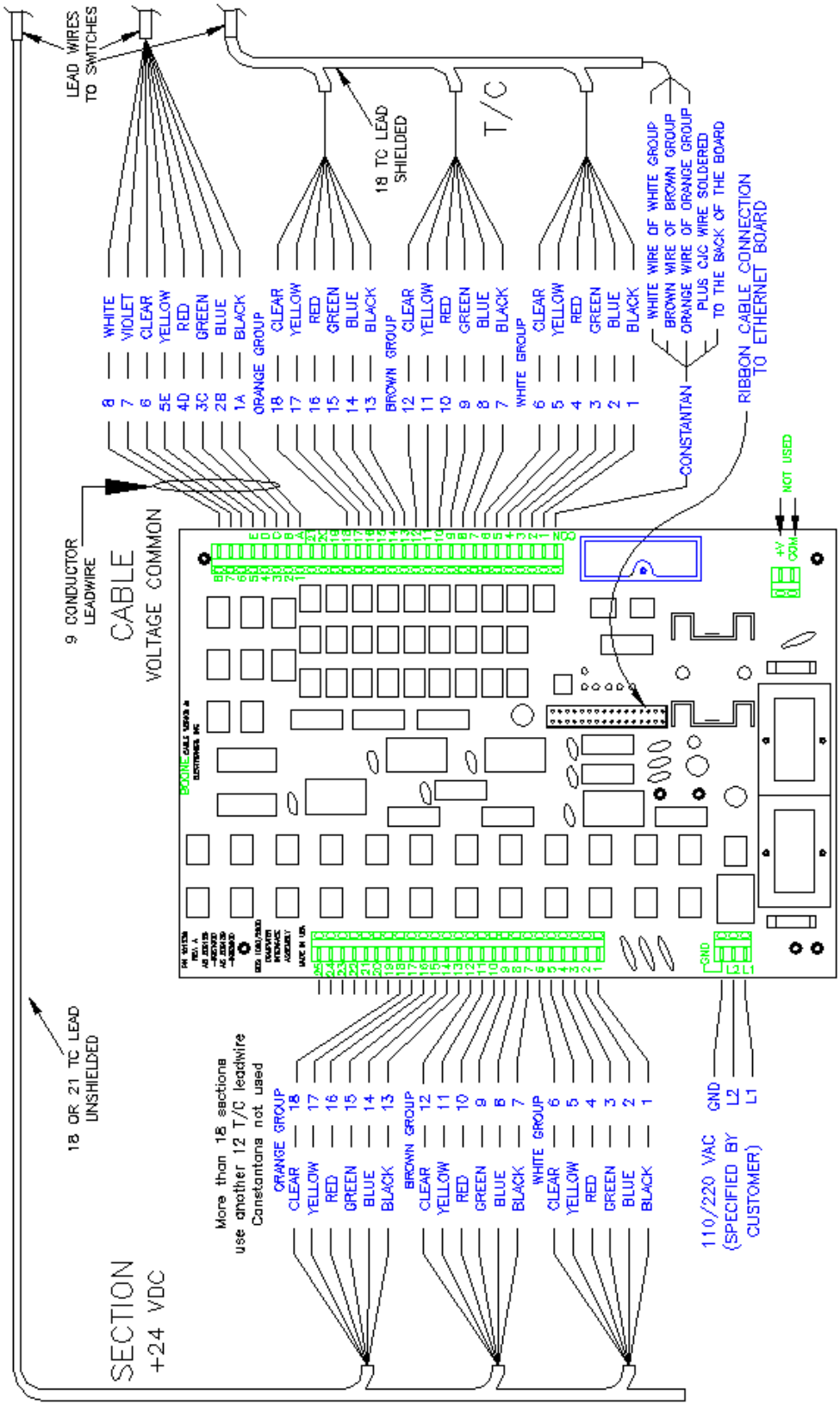


FIGURE 5 BCS 1000 Board Connections to Field Equipment using IICS Switching

BCSE 1000 NETWORKING INSTALLATION INSTRUCTIONS

1. OVERVIEW OF THE BCSE 1000 SYSTEM

The *BCSE 1000 Interface* Temperature System uses a Local Area Network or ETHERNET as the communications link to the PC. Commands come from the PC to the *Interface* to perform operations such as driving the Switches. The PC Monitor also acts as a Read-Out Device and Graphical User Interface showing data sent back on the ETHERNET. The whole system is operated by a PC running the ROLFES @ Boone Grain Temperature Monitoring Windows Application. Figure 1 shows required connections.

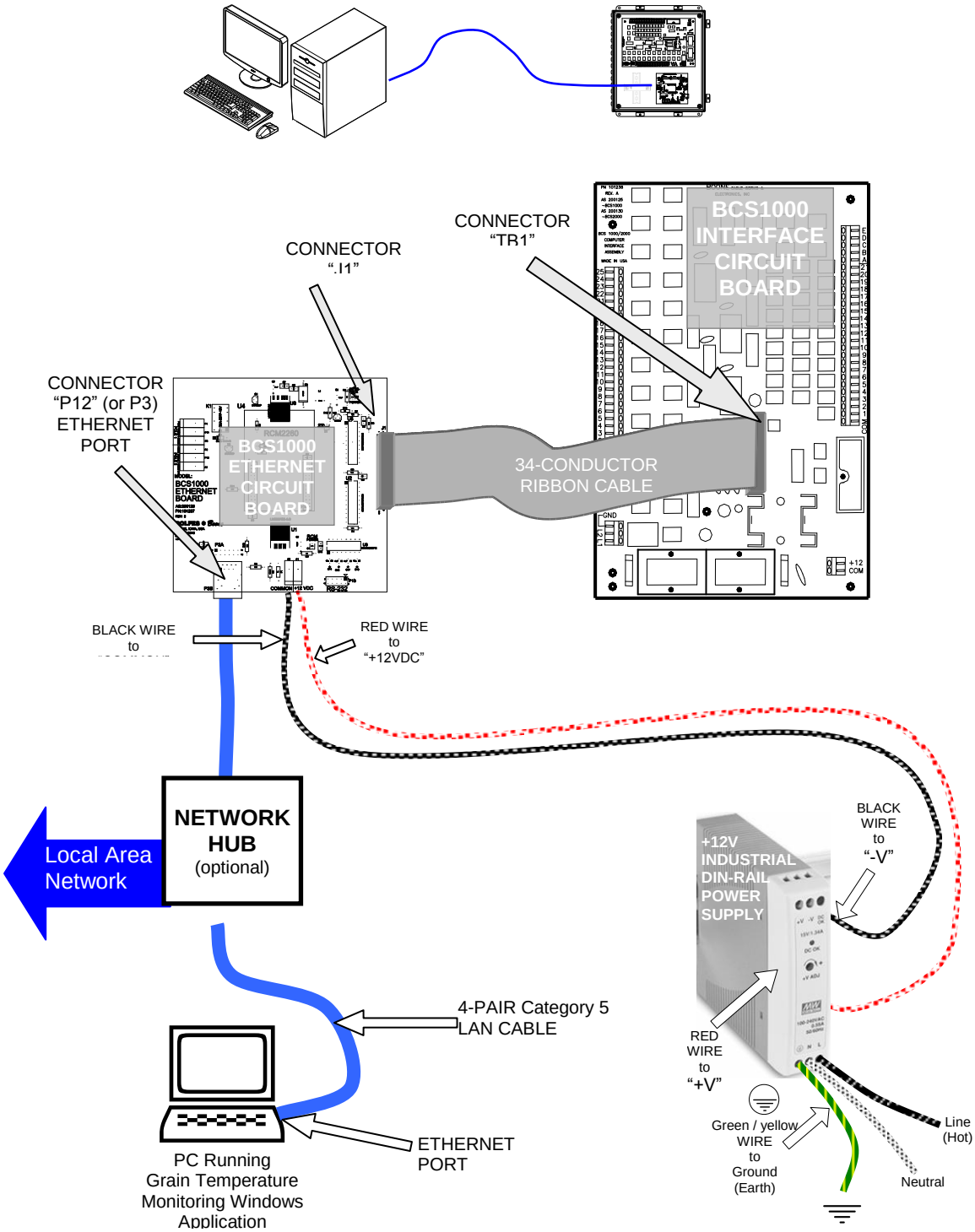


FIGURE 2 BCSE 1000 Basic Connections

2. CONNECTIONS

Refer to Figure 1.

2.1. TO A PERSONAL COMPUTER.

Make sure the *BCSE 1000 Interface* is powered up. When hooking up the Ethernet Module to a stand-alone desktop computer, make sure to use a CAT 5E crossover cable. On some Notebook computers you can use both crossover and straight through network cables.

2.2. TO A SWITCH OR HUB.

First hook up the interface to a computer, preferably a notebook connect the interface to a switch/hub.

2.3. TO BCS1000 ETHERNET BOARD

Make sure electrical power is OFF to the Computer and the BCS 1000 Computer Interface. Refer to Figures below.

2.3.1. Ribbon Cable

Connect the 34-Conductor Ribbon Cable from the CONNECTOR designated “J1” on the BCS1000 ETHERNET BOARD to the CONNECTOR designated “TB1” on the BCS1000 INTERFACE BOARD.

2.3.2. DC Power Supply

A +12V, Industrial, Din-Rail, Power Supply runs the BCS1000 Ethernet Circuit Board.

2.3.2.1. BLACK WIRE

Connect the BLACK WIRE to the connector designated “COMMON” on the BCS1000 ETHERNET BOARD to the connector designated “-V” on the Supply.

2.3.2.2. RED WIRE

Connect the RED WIRE to the connector designated “+12VDC” to the connector designated “+V” on the Supply.

2.3.3. LAN Cable

Connect the 4-PAIR Category 5 LAN CABLE to the connector designated “P12” (or P3) ETHERNET PORT on the BCS1000 ETHERNET BOARD. Connect other end of the LAN CABLE to a NETWORK HUB (optional) or directly to the ETHERNET PORT of the PC.

2.3.4. AC Line Voltage

The +12V INDUSTRIAL DIN-RAIL POWER SUPPLY requires AC Line Voltage for input power to the connectors on the front of the POWER SUPPLY.

2.3.4.1. GROUND

Connect the Green WIRE with yellow stripe from Ground (Earth), to the connector designated: 

2.3.4.2. NEUTRAL

Connect the white WIRE from Neutral, to the connector designated “N”.

2.3.4.3. LINE

Connect the black WIRE from AC Line Voltage (Hot) supply to the connector designated “L”.

BCSE 1000
SOFTWARE
MANUAL

THIS MANUAL CONTAINS:

INSTALLATION AND SETUP INSTRUCTIONS FOR BCSGRAIN
BCSGRAIN SOFTWARE MANUAL

SPECIAL NOTE

<u>READ THIS ENTIRE BOOKLET</u>
<u>BEFORE PROCEEDING WITH</u>
<u>THE INSTALLATION</u>

BOONE CABLE WORKS & ELECTRONICS, INC.
1773-219TH LANE - P.O. BOX 369
BOONE, IOWA 50036 USA
PHONE (515) 432-2010 FAX (515) 432-5262
TOLL FREE (800)-265-2010

INSTALLATION AND SETUP INSTRUCTIONS FOR BCSGRAIN

The following instructions will explain how to install the BCS Grain software package on your computer and how to set it up for its interface. The BCS Grain software is used with the BCSE1000 or the Wireless KTX-Mux.

TABLE OF CONTENTS

1. THINGS YOU MUST DO FIRST

1.1 You must be logged on to Windows as the Computer Administrator (see glossary below)

1.1.1. To check this, open Control Panel.

1.1.2. Open User Accounts, you will see a list of accounts that have Administrator privileges.

1.2 Make sure the computer is fully updated through Windows Update; Hardware, and Software. Also check for updates through the computer's manufacturer's website.

1.3 Close all other programs prior to installation.

1.4 Make sure the BCS Interface is hooked up and powered on.

1.5 If you are using a Notebook computer, disable the Wireless Connection.
For Windows XP; go to Start -> Control Panel -> Network Connections -> right click the Wireless Adapter -> Disable.
For Windows 7; go to Start -> Control Panel -> Network and Internet -> Network and Sharing Center -> Change Adapter Settings (top left corner) -> right click the Wireless Adapter -> Disable.

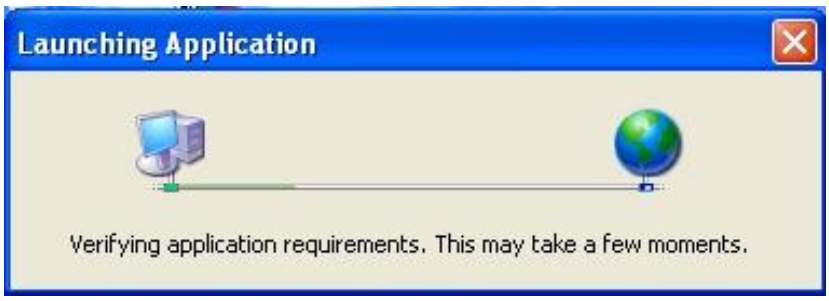
1.6 The BCS interface uses UDP port 7654. The Gateway for the KTX uses UDP port 7650. The BRX radios use UPD ports 7651 and up, depending on how many BRX units are used. Verify with your IT administrator that these ports are available on the network.

2. INSTALLING THE BCSGRAIN SOFTWARE

2.1 Insert CD into the Computers CDROM Drive.

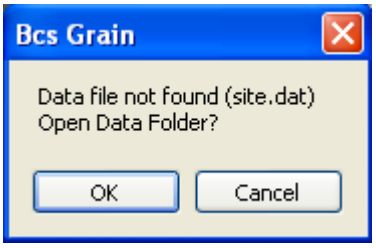
2.2 If Auto-start doesn't begin click on START, then RUN and type D:\Setup.exe. (Or use whatever is selected for CDROM/DVD Drive)

2.3 Select Run.



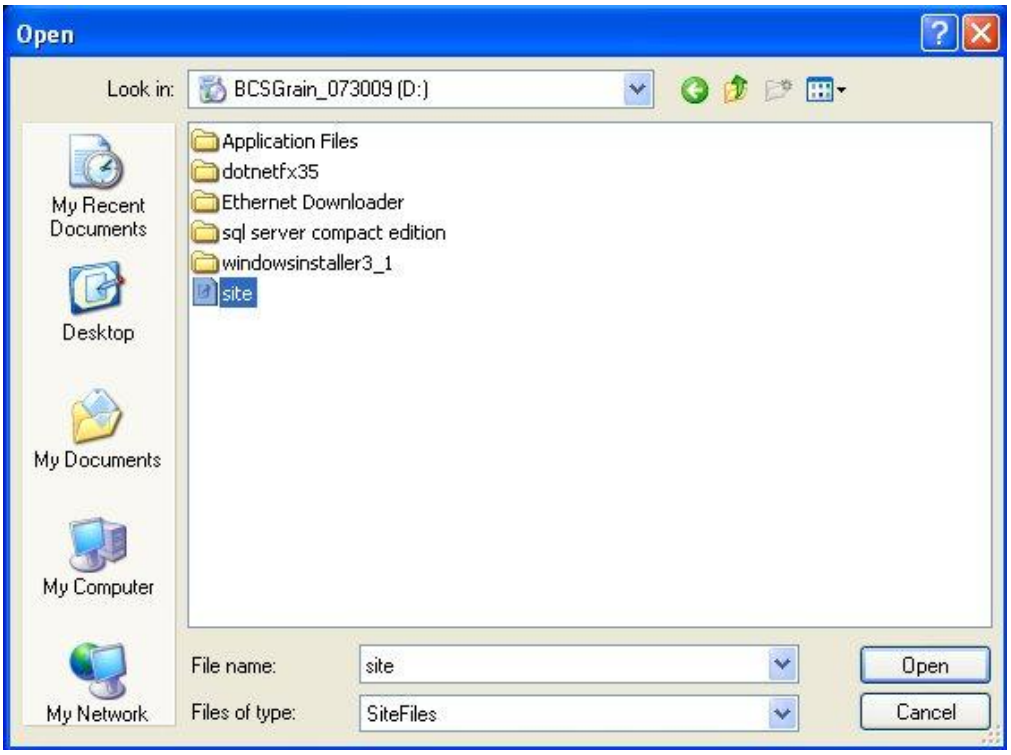
2.4 After it verifies the application requirements select Install.

2.5 After installation the following window will appear:



2.6 Click on **OK**.

2.7 Look in the CDROM location for the **Site.dat** file (for text configurations) or the **GrainSite.datx** file (for 3D configurations). Select the file and click 'Open'.



2.8 The program will now start. The following window might appear:

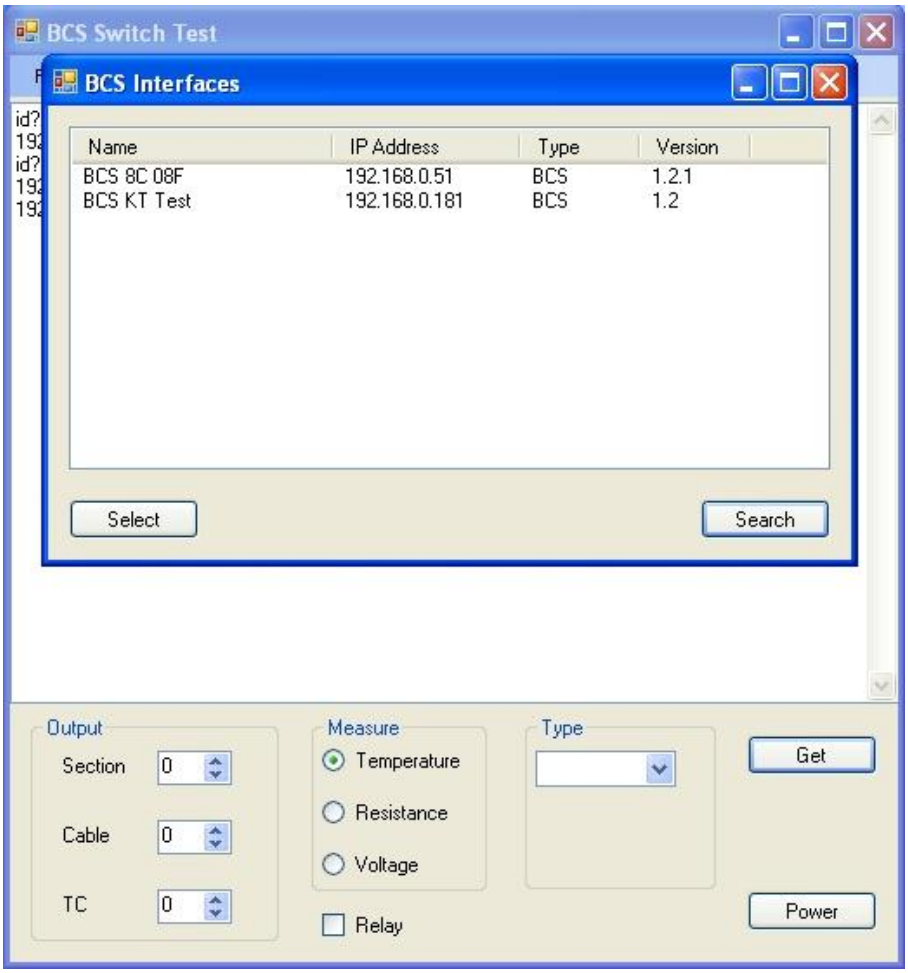
2.9 Unblock the program. When the program comes up, close it.

3. SETUP FOR A BCSE1000

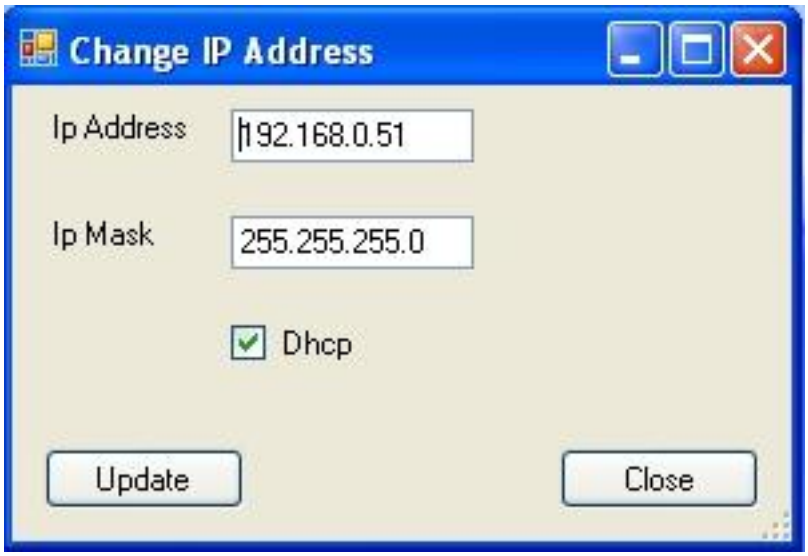
3.1 OPERATING ON A NETWORK.

The software uses DHCP to identify the Instrument on the network. It will select an available address on the network. Always make sure when you established an IP address to **disable the DHCP**.

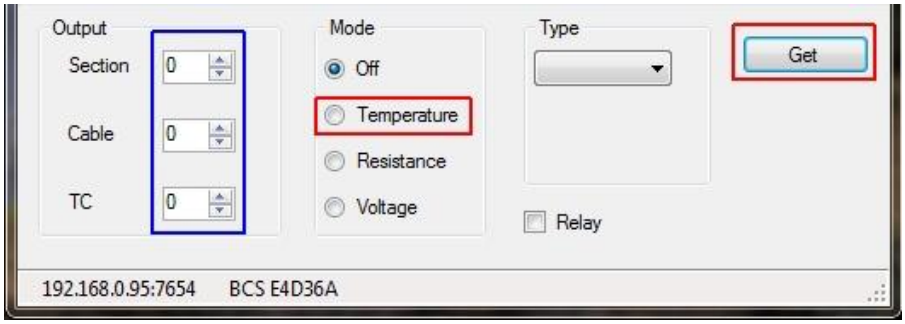
3.1.1 Make sure the software is installed and the interface is hooked up and powered on.
3.1.2 Insert CD into the Computers CDROM Drive. Close the BCSGrain program when it appears.
3.1.3 Browse the CDROM and open the Switch Test folder and run the setup.exe.
3.1.4 Run Switch Test and click on Search. The Interface will appear with an available IP address from your network scheme. It will show a Name, IP Address, Type, and (Firmware) Version.



3.1.5 If the interface(s) doesn't appear in the window check firewall settings. Make sure that UDP port 7654 is allowed through the network's Firewall.
3.1.6 Highlight the (first) Interface and click on Select.
3.1.7 Go to 'Tools' and select 'Address'.
3.1.8 A window will appear with the IP address and Subnet Mask.

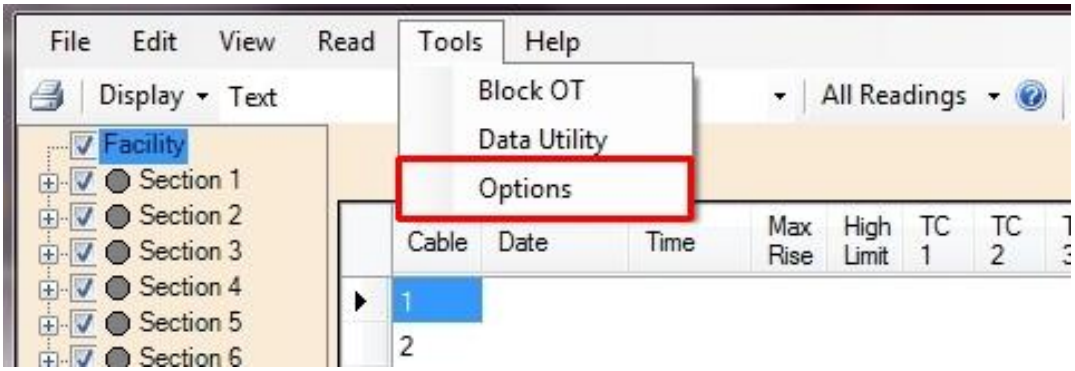


3.1.9 **Uncheck DHCP** to lock down the address and select Update. If you wish to change the address, uncheck DHCP, change the address and select Update.
3.1.10 At the main window verify communications by powering up the interface by selecting Temperature.

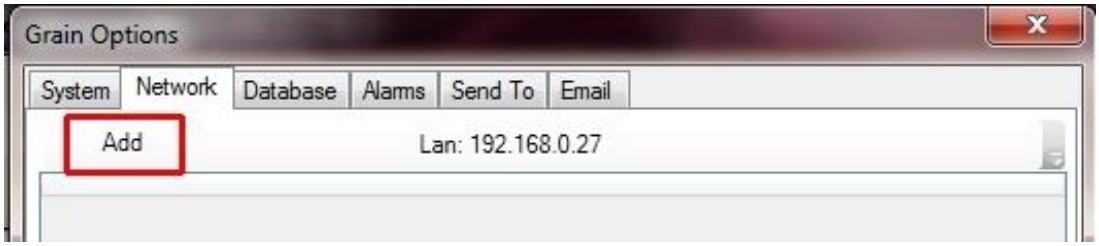


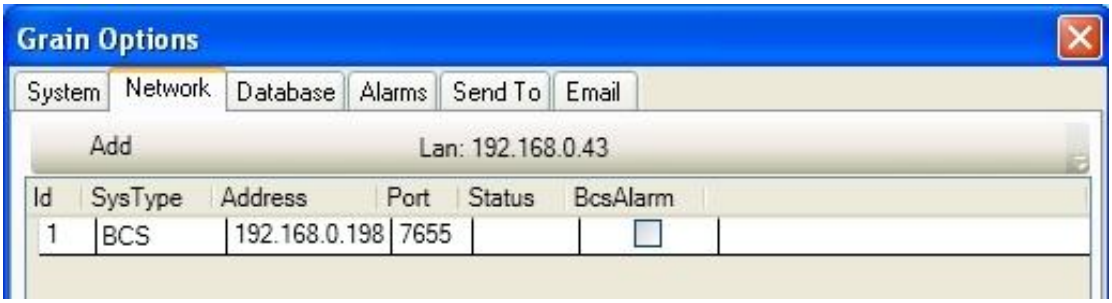
3.1.11 Close Switch Test.

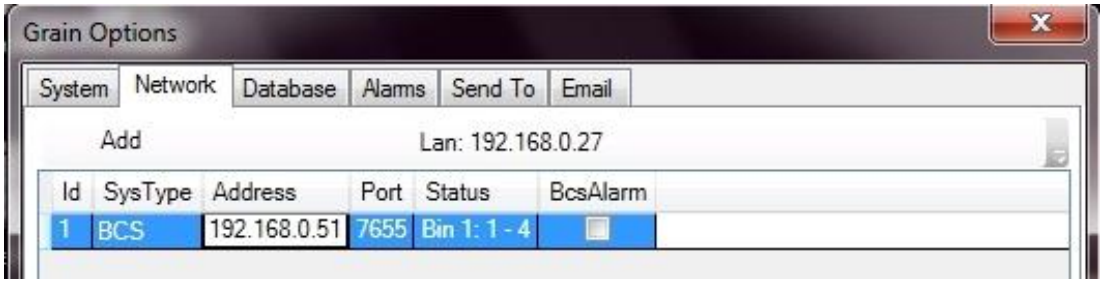
3.1.12 Open the BCSGrain program and select ‘Tools’, ‘Options’.



3.1.13 Select the Network tab and click on Add. An address will appear in the window. If it is not the address that was assigned in Switch Test, double click the address and change it. (The LAN address is the IP address of the computer you are working on.)







3.1.14 After you changed the address click OK and restart the program. Select read and begin your read.

3.1.15 If you used the Switch Test program on one computer and the BCSGrain software is on a different computer you have to recycle the power on the Interface before setting up the IP address under Network.

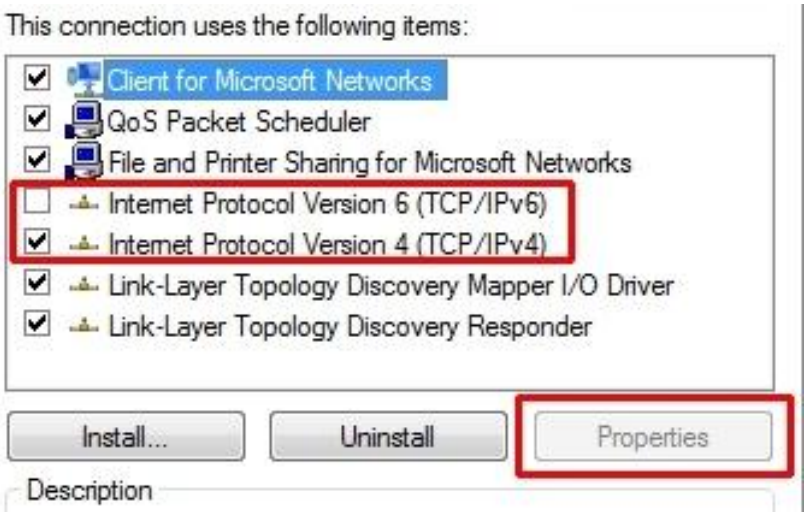
3.2 OPERATING ON A STAND-ALONE COMPUTER

The software uses DHCP to identify the Interface on the network. It will select an available address depending on the IP address set under the Local Area Connection. If you are using a Notebook computer turn of the Wireless LAN. Always make sure when you established an IP address to **disable the DHCP**.

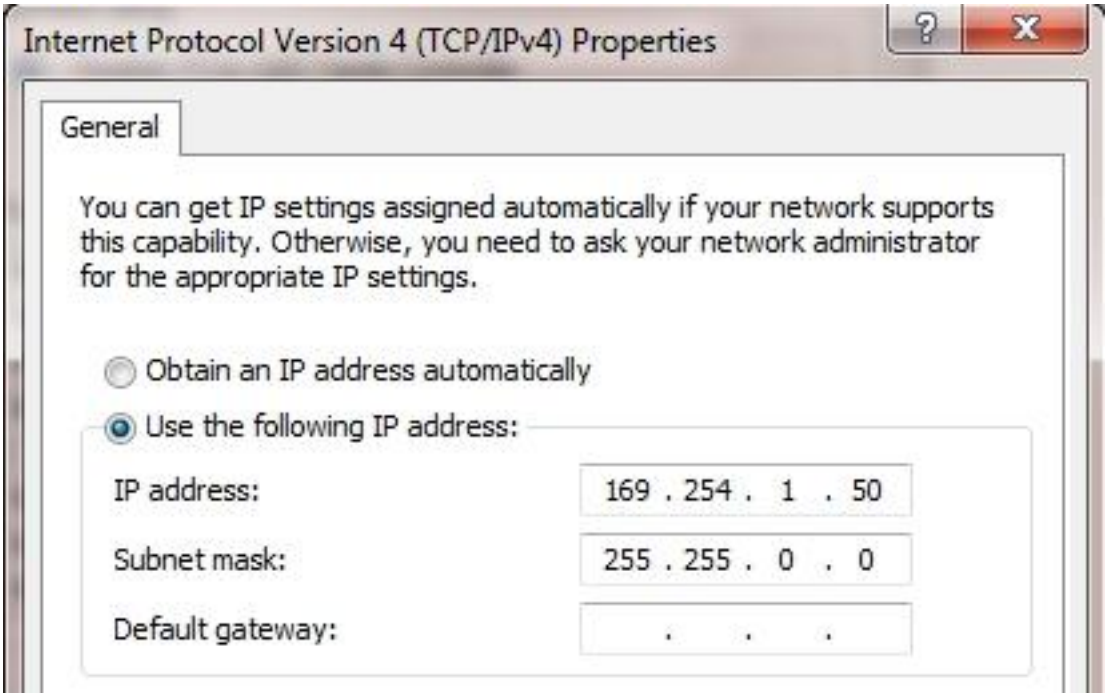
3.2.1 Make sure the software is installed and the interface is hooked up and powered on.

3.2.2 Go to the network settings and set a static IP address for the Local Area Connection. For Windows XP go to Control Panel and find the LAN under Network Connections. For Windows 7 go to Control Panel and find the LAN under Network and Internet -> View Network Status and Tasks.

3.2.3 Select the Properties of the Local Area Connection. Uncheck Internet Protocol Version 6. Select Internet Protocol Version 4 and select Properties.



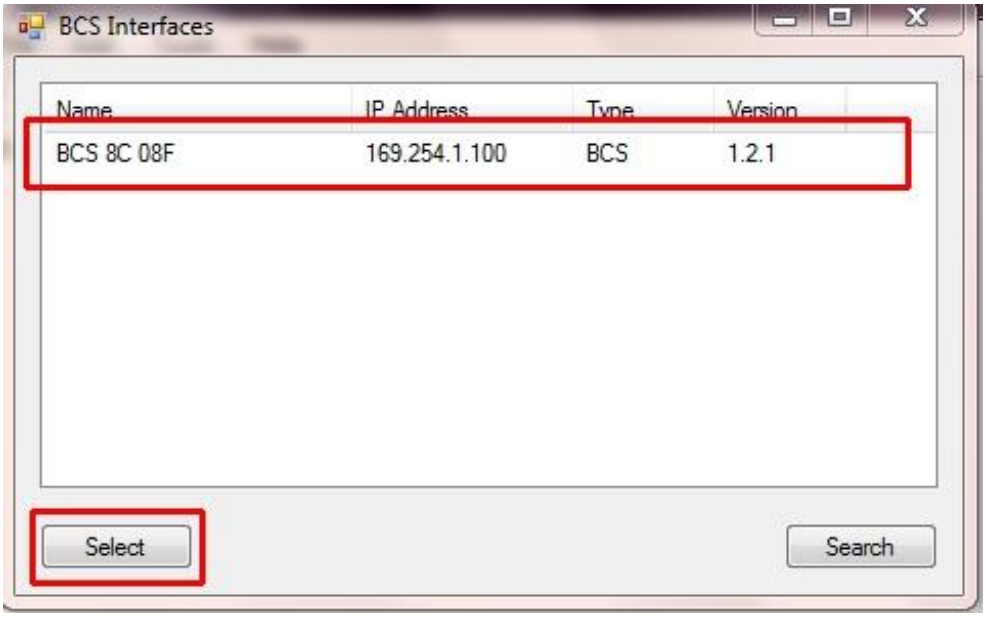
3.2.4 For Windows XP select Internet Protocol and then the Properties.



3.2.5 Select ‘Use the following IP address’ and type under IP address: 169.254.1.50 (This can be any address, as long as it doesn’t end with ‘0’, or ‘255’). Under Subnet mask type: 255.255.0.0. Do not put anything under the DNS Server. Click OK.

3.2.6 Wait for the Local Area Connection to reconnect (with 10 Mbs). Close the windows.

3.2.7 Insert CD into the Computers CDROM Drive. Close the BCSGrain program when it appears.
3.2.8 Browse the CDROM and open the Switch Test folder.
3.2.9 Run the setup.exe
3.2.10 Run SwitchTest.exe and click on Search. The BCS Interface will appear with an available IP address. It will show a Name, IP Address, Type, and (Firmware) Version.



3.2.11 If the interface(s) doesn't appear in the window, turn of the computer's firewall.
3.2.12 Select the (first) Interface and select 'Tools', 'Address'.
3.2.13 A window will appear with the IP address and Subnet Mask. **Uncheck DHCP** to lock down the address and select Update.

3.2.14 At the main window verify communications by powering up the interface.

3.2.15 Close Switch Test and open the BCSGrain program. Go to Tools and then Options.

3.2.16 Select the Network tab and click on Add. An address will appear in the window. Change the IP address to the one found in Switch Test.

3.2.17 Click OK and restart the program. Select read and begin your read.

3.2.18 If you used the Switch Test program on one computer and the BCSGrain software is on a different computer you have to restart the Interface before setting up the IP address under Network.

4. SETUP FOR A KTX

4.1 CONFIGURING THE SYSTEM

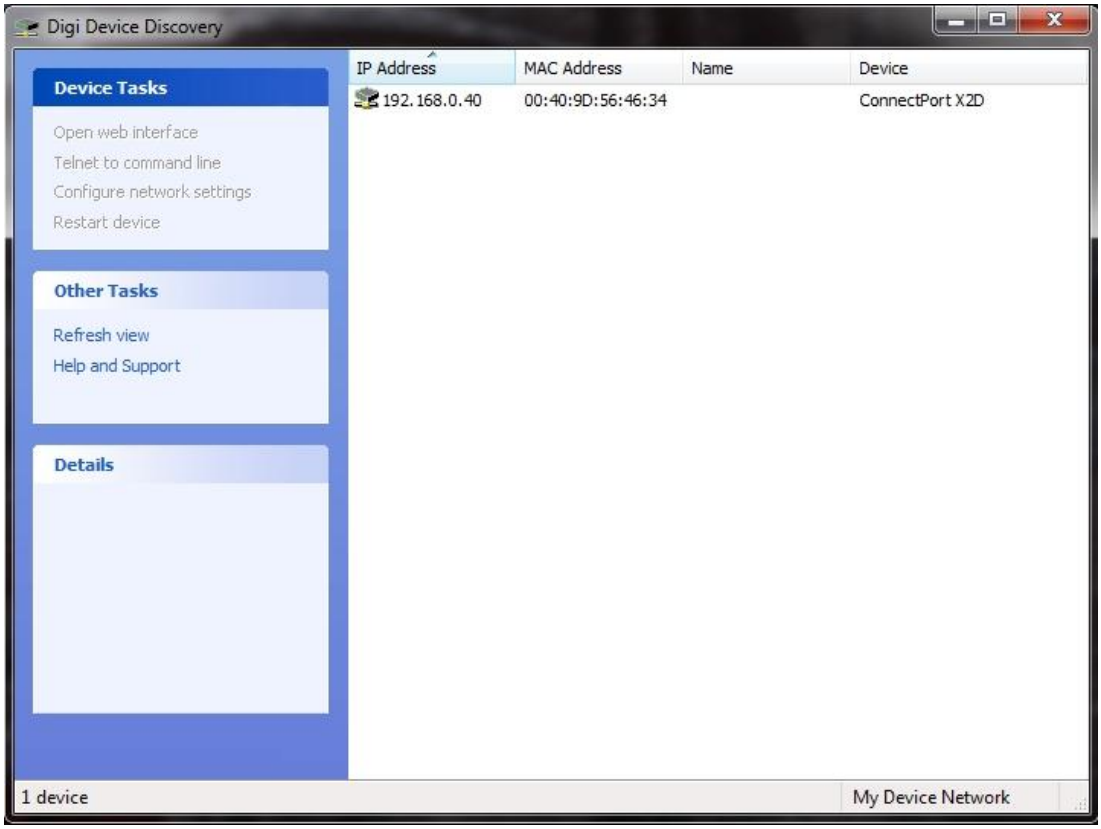
The Gateway uses DHCP to identify itself on the Network. It will create a random address available on the Network. If you wish to use your own IP address, you can change it afterwards.

4.1.1 Make sure the software is installed and that the Gateway and the BRX(s) (the radios at each Mux) are hooked up and powered on.

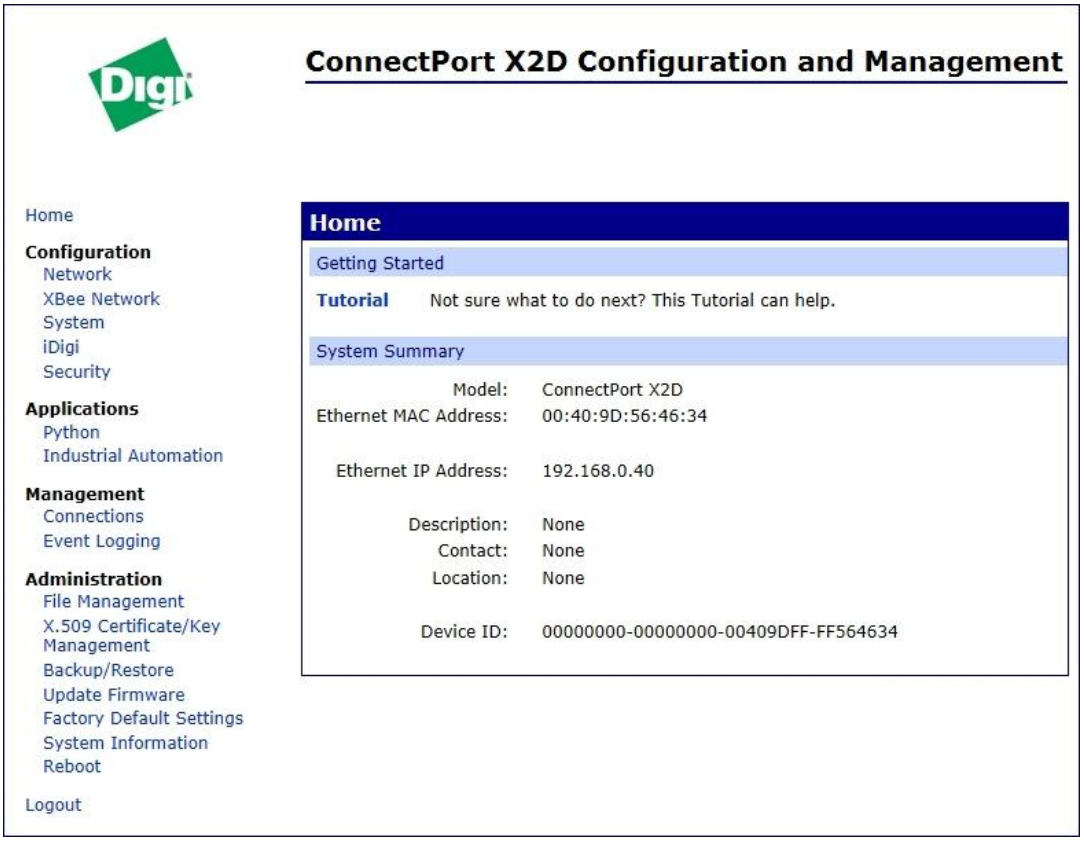
4.1.2 If the CD isn't still in the computer, insert the CD in the CD/DVD Drive. Close the BCSGrain program when it appears.

4.1.3 Browse the CDROM and open the Digi Device Utility folder and copy the Digi Device Discovery file to your Desktop.

4.1.4 Run the Utility and make sure the Gateway (ConnectPort X2D) shows up in the list with an IP and MAC address.

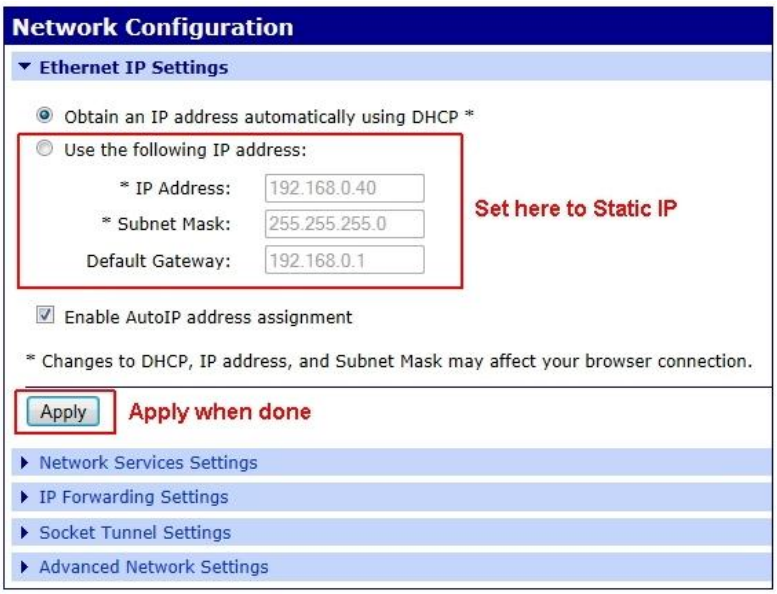


4.1.5 Highlight the IP address and select 'Open web interface' at the top left.



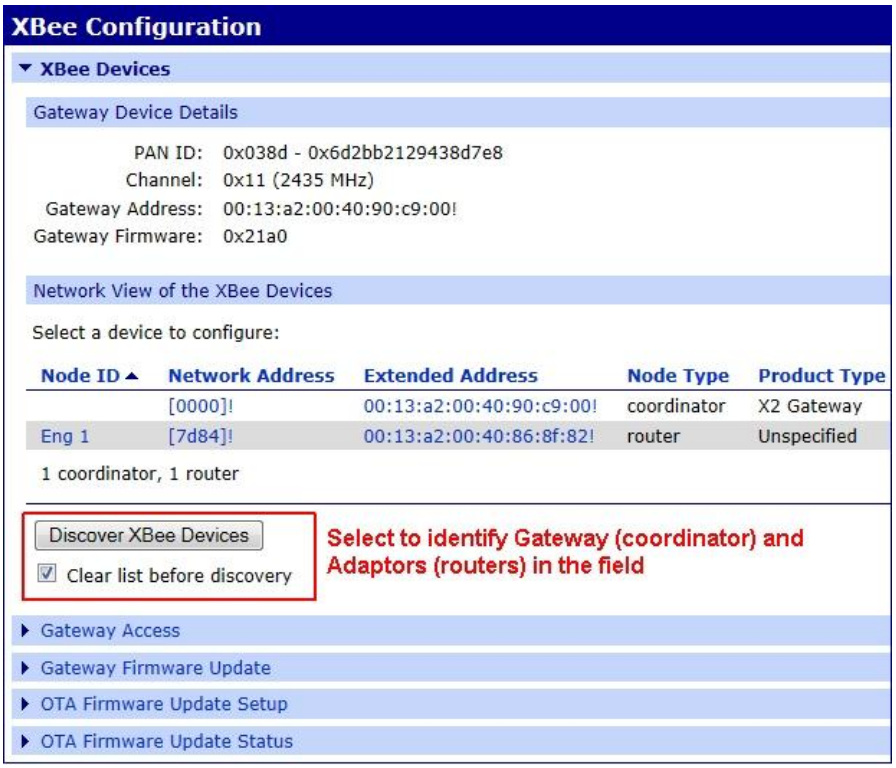
4.1.6 To change the DHCP settings of the Gateway, select ‘Network’ at the top left.

4.1.7 Select ‘Use the following IP address’ to either change the IP address or use the current IP address. Apply when done.



4.1.8 To Setup the BRX(s), select ‘XBee Network’ at the top left.

4.1.9 Select ‘Discover Xbee Device’ to refresh the list. The Gateway will show up as the coordinator. The BRX(s) will show up as router(s).

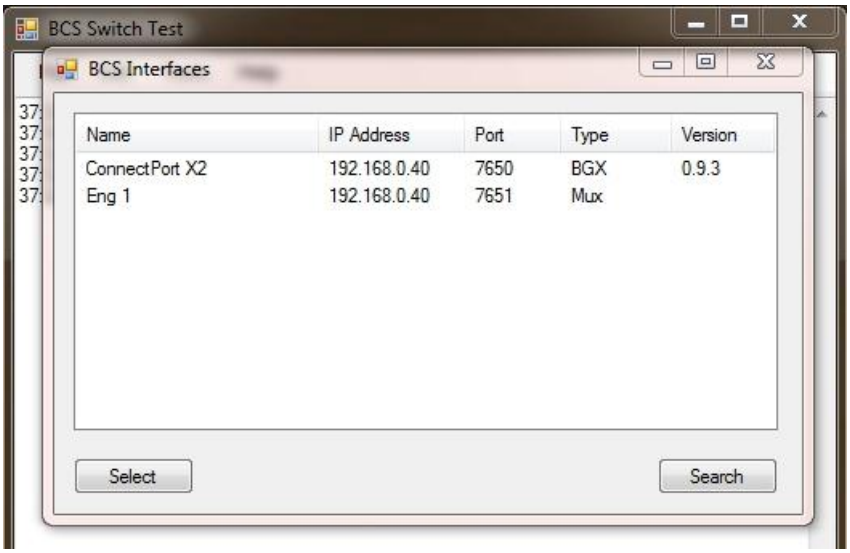


4.1.10 If the BRX(s) don’t show up or some of them do not show up in the list, verify connections to the BRX.

4.1.11 Once everything has been verified, close all windows.

4.1.12 Go back to the CDROM and run the setup.exe from the Switch test folder.

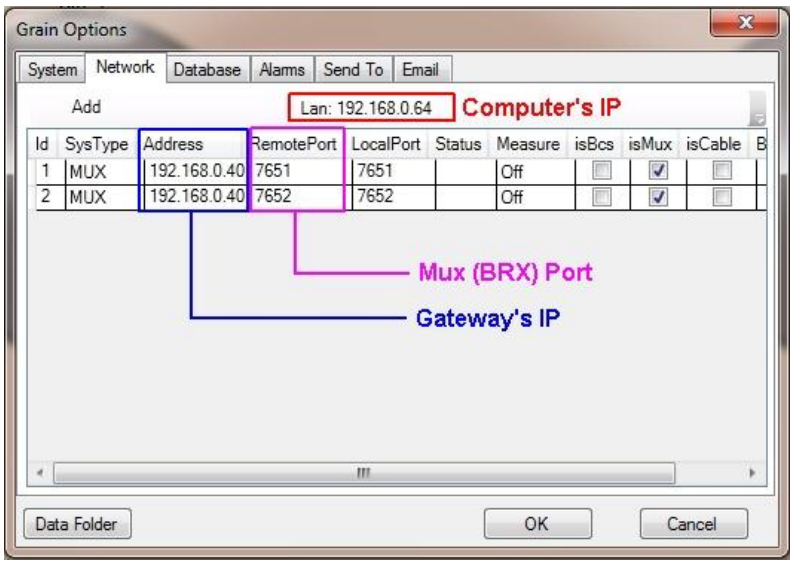
4.1.13 Run Switch Test.



4.1.14 Make sure the Gateway (ConnectPort X2) and the BRX(s) come up in the list. The BRX(s) will have the name of the Bin with the IP address of the Gateway and its own Port number.

4.1.15 Do a 'Search' to verify everything shows up, and then close Switch Test.

4.1.16 Open BCSGrain and go to 'Tools', 'Options', and then select the 'Network' tab.



4.1.17 To add the Mux(s) or BRX(s) to the list, click on 'Add'. Start with the first one and change its IP address to the Gateway's IP address. Each Mux (BRX) will have its own Remote Port, starting with 7651. **Make sure the port number matches the one found in Switch Test.**

4.1.18 Keep adding the number of Mux(s) to match the ones out in the field. Default it will come up as SysType = BCS. Make sure it is changed to MUX.

4.1.19 When all the Mux's are in the list select 'OK' and restart the program.

4.1.20 Begin a read to verify everything is working correctly.

4.1.21 When operating on a stand-alone computer follow the same instructions.

4.1.22 Make sure to set the Local Area Connection to 169.254.1.50, with Subnet Mask, 255.255.0.0. Change this under the Internet Protocol TCP/IP (version4) Settings.

4.1.23 Use a Crossover CAT5 cable from the computer to the Gateway.

5. AFTER INSTALLATION

5.1 If the program isn't already up, locate it under 'START', 'All Programs', and 'Boone CableWorks'.

5.3 To turn on the external alarm, go to Tools, select Options. Under the Alarms tab, check-mark external alarm.

5.4 When switching between computers, be sure to cycle the power to the interface.

5.5 If you have any problems installing this software, please contact Boone Cable Works & Electronics at (515) 432-2010 or 1-800-265-2010 or visit our website: http://www.rolfesatboone.com.

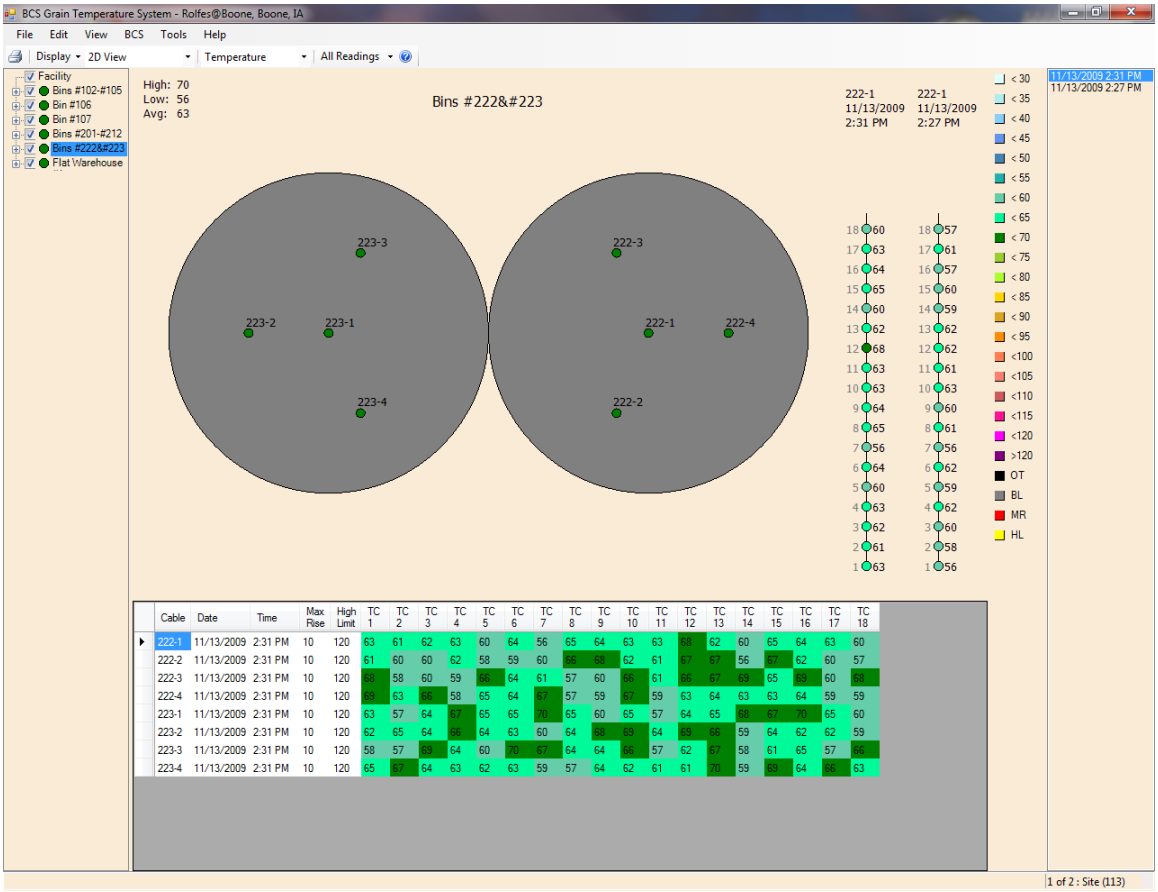
BCSGRAIN SOFTWARE MANUAL

Table of Contents

1 GENERAL

Boone Cable Works & Electronics, Inc. offers a comprehensive line of temperature monitoring equipment. Our complete product range and extensive systems experience allows us to offer effective solutions to a wide spectrum of your practical requirements. Our extensive background in temperature monitoring along with a constant program of innovation and technological development, allows us to offer cost-effective and user orientated solutions. This manual covers the Windows software version for the BCSE 1000 and KF200 Systems which are P.C. based systems of commodity temperature measurement.

1.1 Main Screen



The main screen consists of the following elements

- Menu Bar
- Tool Bar
- Facility List
- Text View
- Graphics View
- Color Legend
- Date Time List

The **Facility List** shows all bin/cable groups. The data (temperature or resistance values) can be displayed in one of three ways: A Text View, 2D overview or 3D view. The Text software package offers only the text view capability. The 3D Graphics software packages offer all three options.

To go from the facility overview to the cables in a bin/cable grouping, place the mouse arrow on the selected grouping and left click.

1.2 Menu Bar

File

Save or print data reports or exit from the program.

Edit
Select all cables.

View
Access Event Log, Terminal, Comment, and Summary Screens.

BCS/KF200
Read the cables. Schedule Reads.

Tools
Access Options screen, Block OT Sensors, and Data Utility.

Help
Program Version

1.3 Tool Bar

Print Icon
Display
View List
Temperature/Resistance
All Readings

1.4 Facility List

Tree View that lists all bins and cable in facility. The top item (Facility) is used to select the entire facility. Items in the facility list are selected by clicking on the item name. Individual bins or cables can be included in the next read by the check box next to the item.

A colored dot located by the bin/cable in the facility list is an indication of the hottest point on the cable or an alarm condition color.

1.5 Text View

Text View is a grid (spreadsheet) view of the currently selected read data. It includes the cable name, date and time of read, Max Rise, High Limit, and the data read for each thermocouple.

1.6 Graphics View

Graphics view is a 2D or 3D representation of the actual facility or bin. In the Facility list select Facility to show the overview of the entire facility or select any bin or cable to zoom into a view of an individual bin.

1.7 Color Legend

On the right side of the screen is a vertical row of colors and numbers. The colors beside the numbers indicate the color that the temperature will be displayed. Below the last temperature is OT. **OT** represents an Open Thermocouple. BL is for Blocked Cables. MR stands for

Maximum Rise alarm. HL stands for the High Limit alarm. Change the color by right clicking on the color block and selecting a new color.

1.8 Date Time List

The list of Date Times is on the far right of the screen. It is used to select the current read. The top item in the list is the last read taken.

2 Menu Bar

2.1 File

2.1.1 Save

Save current data to a text file on the computer. The file name includes the date and time of the read.

2.1.2 Save As

Save the text file to any folder on the computer.

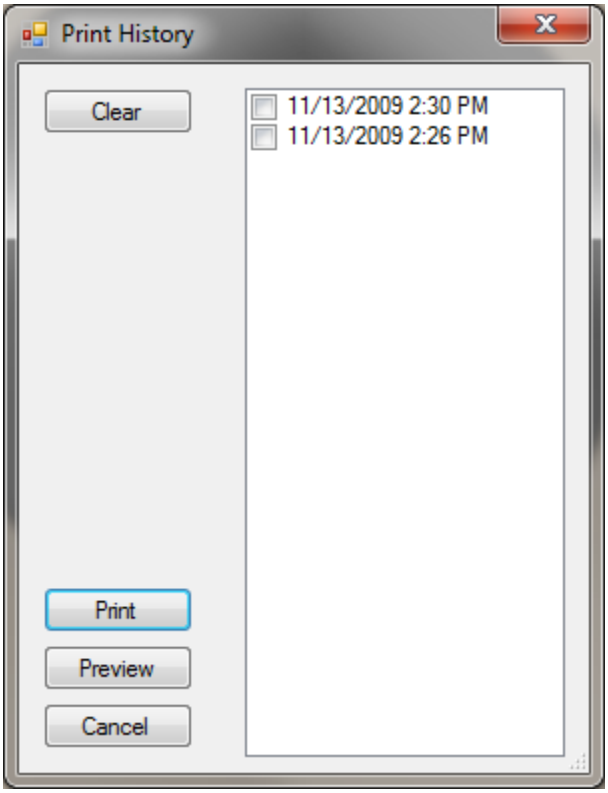
2.1.3 Page Setup

Open the standard Page Setup dialog for setting the paper size, source, orientation, and margins.

2.1.4 Print

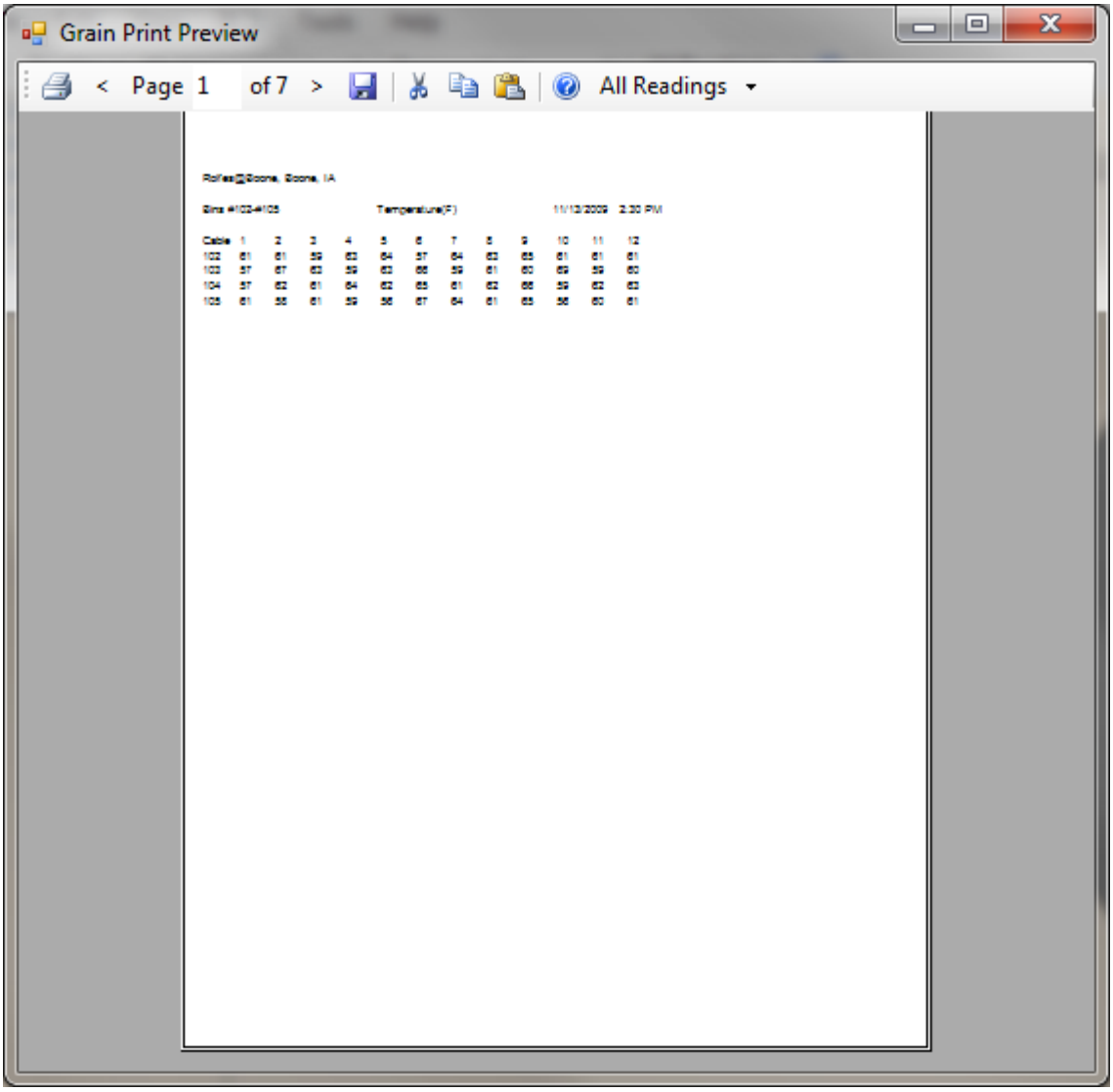
Prints the temperature or resistance of the cables enabled in the facility list. The print dialog box is used to select the current printer. In temperature mode, temperature data will be printed and in resistance mode, resistance data will be printed.

2.1.5 Print History



Prints the history data for all currently enabled bins and cables. Check the dates in the date time list, and then select Print or Preview.

2.1.6 Print Preview



Open a Print Preview Screen with the same data as the Print button. The data can be previewed before printing. Toggle between All Readings and Alarms Only by clicking on the button in the toolbar.

2.2 Edit

2.2.1 Select All

Check this to select all the bins/cable in the facility.

2.3 View

2.3.1 Event Log

All Events are displayed in this log screen. Events are temperature alarms and system events.

2.3.2 Terminal

This is a feature for Boone Cable Works & Electronics service personnel. DO NOT USE THIS FEATURE WITHOUT CONSULTING Boone Cable Works & Electronics. THIS FEATURE MAY CAUSE THE SYSTEM TO MALFUNCTION.

2.3.3 COMMENT (Cable Comment Area)

Select this option and a notepad window opens on the screen. This allows notes on each cable to be stored in the system. In the facility level the notes are about the whole facility. At the bin level the notes are for the cable displayed at the right side of the screen. The comments will be shown in the bottom right area of the screen.

2.3.4 Summary

Display summary information for the currently selected read. This is the same information that can be emailed after each read. The summary data can also be sent directly from this screen.

2.4 BCS/KF200

This menu has different functions for the BCSE 1000 System and KF200 Portable.

Using a BCS1OOO System, the **Begin Read** Button starts to read the cables that have been enabled. Enable by checking the box in the facility list. In temperature mode temperature data will be read and in resistance mode resistance data will be read. These readings will be stored in the BCS Grain database on the computer.

Using a KF200 Portable, the **Begin Read** button is used to download cable data to the computer. See the KF200 Operators Manual for directions on downloading the system configuration and data and skip the remainder of this section.

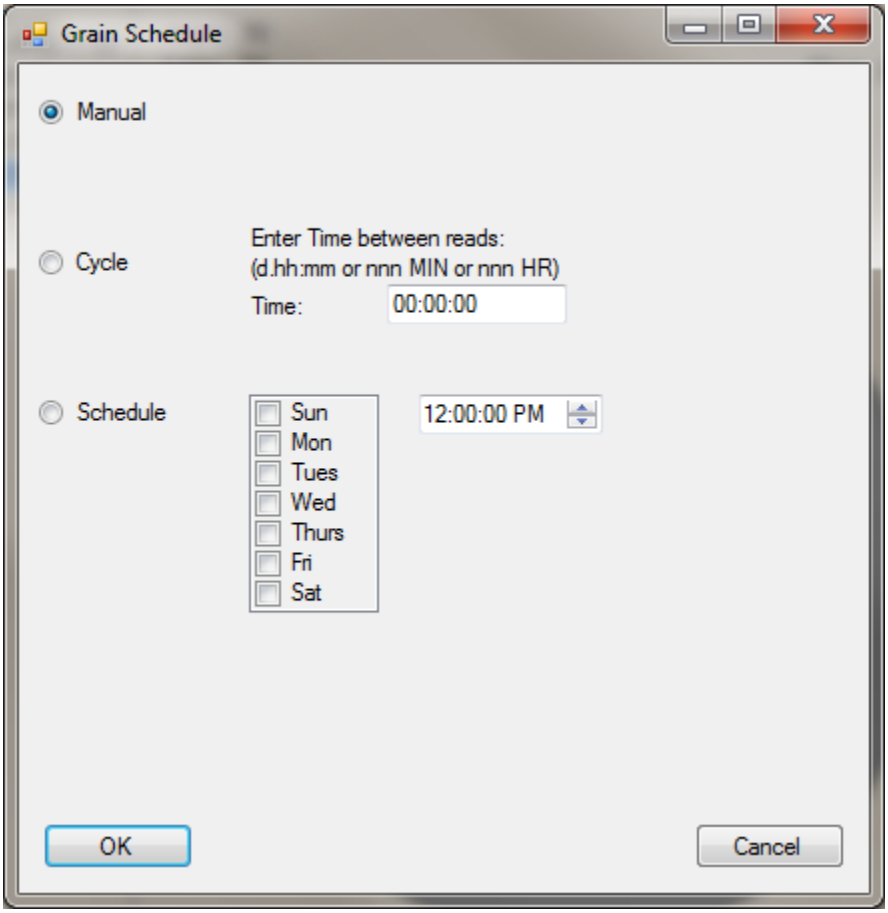
2.4.1 Begin Read

Start a read of the cables that have been enabled. A report can be printed or emailed after the read is completed. Enable these features in the Grain Options dialog box in Tools menu.

2.4.2 Halt Read

Halt the current read. The read can be restarted by selecting ***Begin Read.*** This item is only enabled while a read is in progress.

2.4.3 Schedule



2.4.3.1 Manual

The system reads all the currently enabled bins/cables.

2.4.3.2 Cycle

The system will read the cables that have been enabled at the interval time that was selected. As an example, enter 01:00:00 (one hour) and the cables that are selected will be read every hour.

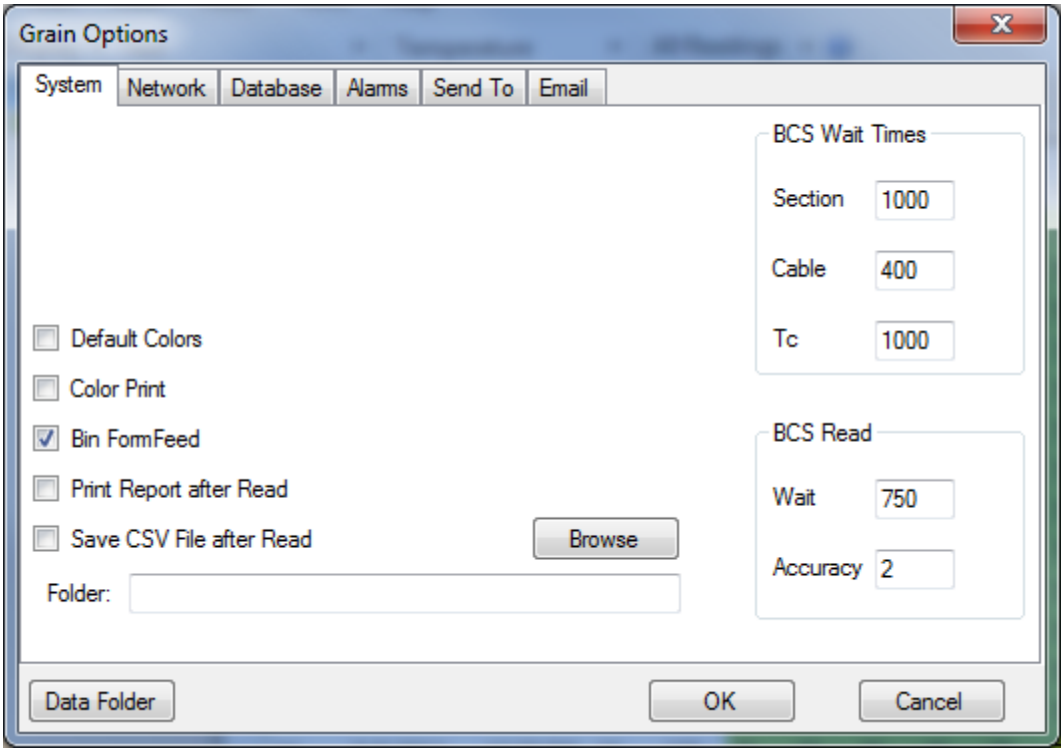
2.4.3.3 Schedule

Select what day/days in the week and at what time. The system will read the cables that have been selected at the days and times selected. As an example, input 12:00 am on Monday, Tuesday and Wednesday and the cables will be read every week at those days and times.

2.5 Tools

2.5.1 Options

2.5.1.1 System



2.5.1.1.1 Default Colors

Check this option, and then click on OK to restore default settings for all temperature, resistance, and alarm colors.

2.5.1.1.2 Color Print

Enables color printing. The default is black and white.

2.5.1.1.3 Bin FormFeed

Print a separate page for each bin. Increases the total number of pages printed.

2.5.1.1.4 Print Report after Read

Enables a report to be printed after each read.

2.5.1.1.5 Save CSV File after Read

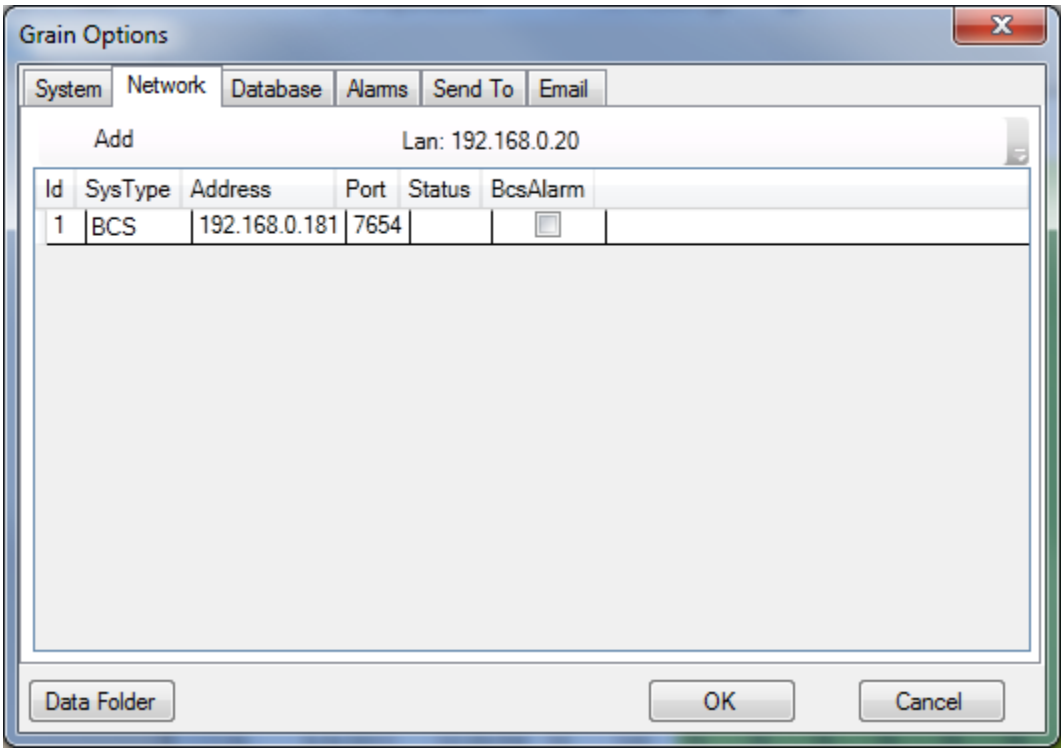
Save CSV File to folder after read is complete. Use Browse button to select folder.

The following two features are for Boone Cable Works & Electronics service personnel. DO NOT USE THIS FEATURE WITHOUT CONSULTING Boone Cable Works and Electronics. CHANGING THE VALUES MAY CAUSE THE SYSTEM TO MALFUNCTION.

2.5.1.1.6 BCS Wait Times

2.5.1.1.7 BCS Read

2.5.1.2 Network

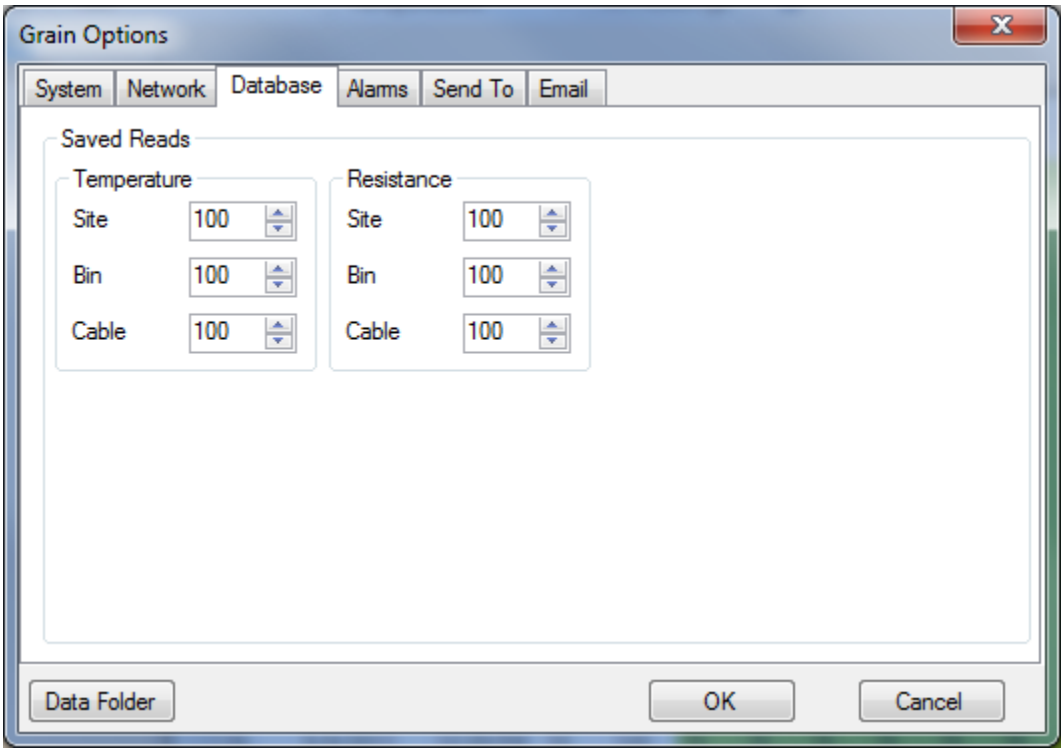


Shows network address of all interfaces currently in system.

Click Add to add new network interface.

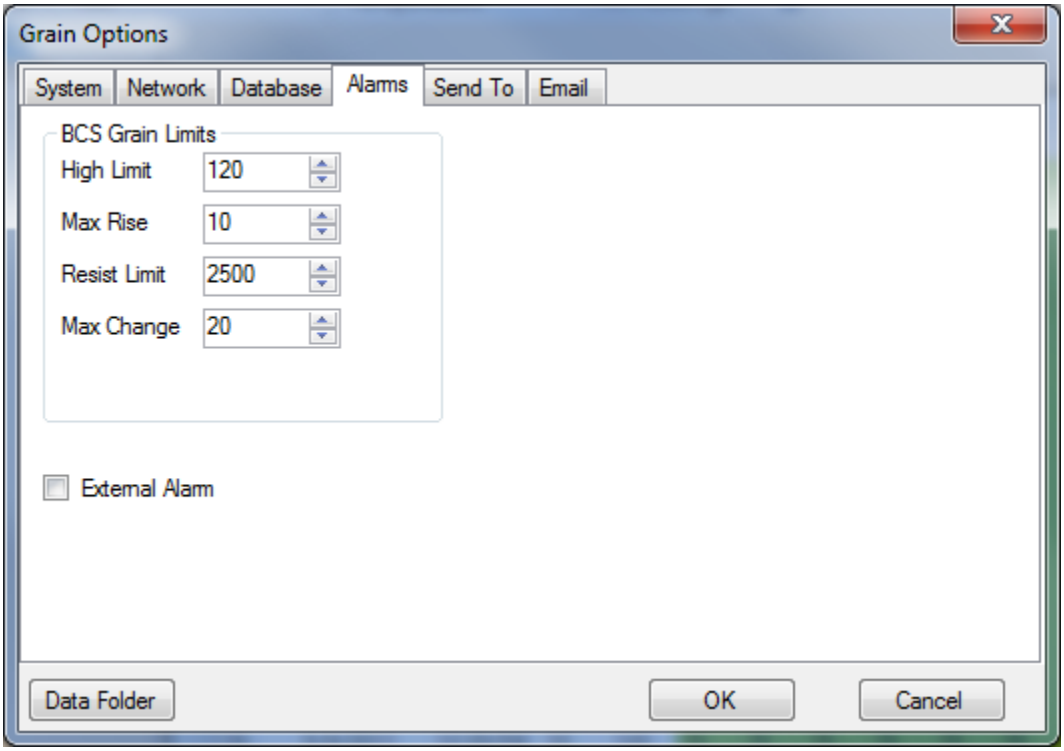
Lan is the current IP address of the computer.

2.5.1.3 Database



This option sets the number of saves that will be stored in the database.

2.5.1.4 Alarms

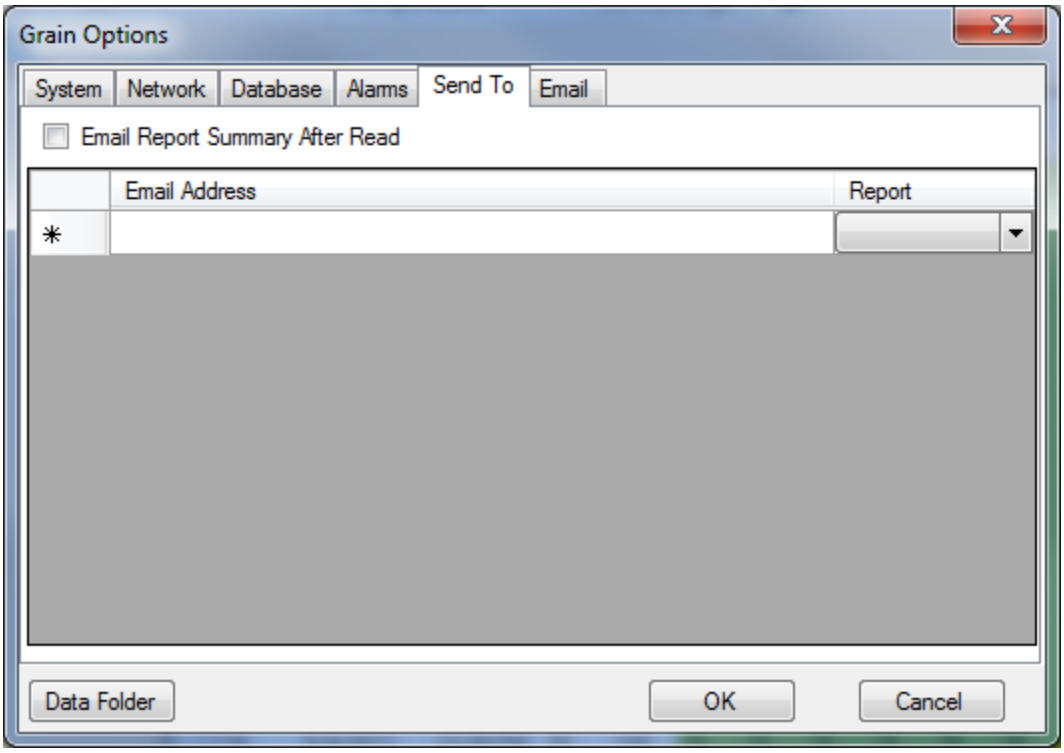


Alarm set points of high limit and maximum rise can be changed. The high limit is an absolute number; if any readings are above it an alarm will be activated. The maximum rise is a check on the temperature rise on the cable. If the temperature has risen more than the maximum rise number since the last reading an alarm will be activated.

2.5.1.4.1 External Alarm

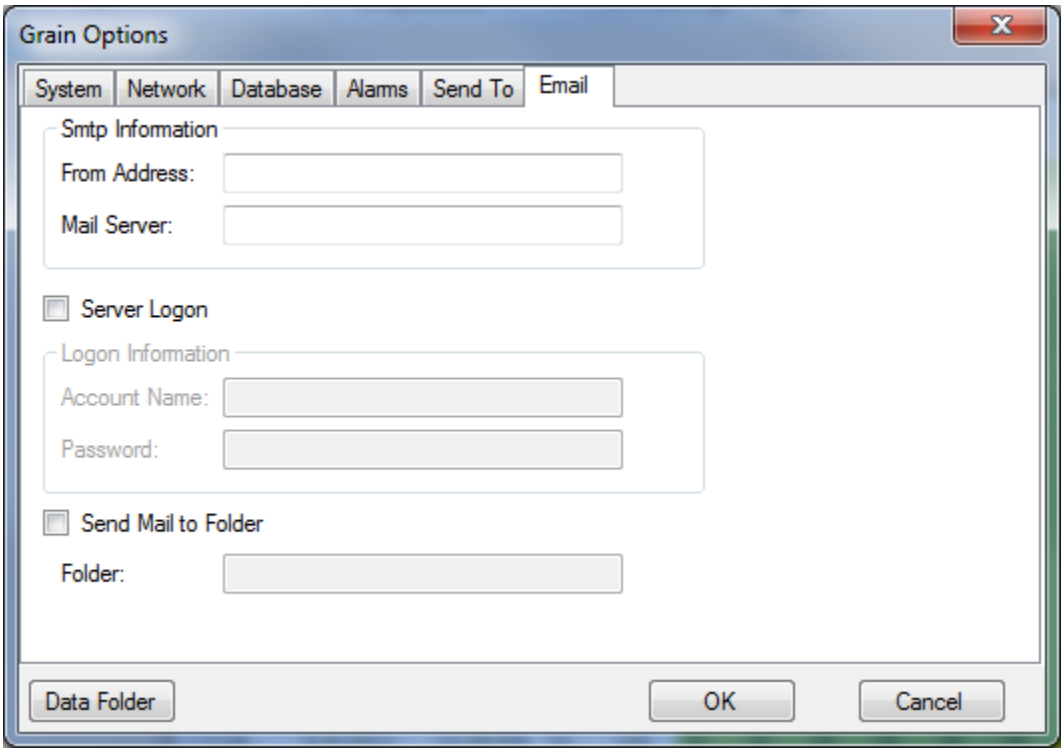
An external alarm contact on the BCSE 1000 Ethernet module can be enabled. Check to enable or uncheck to disable the external alarm.

2.5.1.5 Send To



Enable Email Report Summary After Read. Email address list for the Send to feature.

2.5.1.6 Email



Configuration information for the Send To feature.

2.5.2 Block OT

Automatically blocks all cables/thermocouples that are currently in OT.

2.5.3 Data Utility

Opens a dialog box to check, backup, or create a new database.

3 Tool Bar

3.1 Print Icon

Selecting this is the same as selecting Print in the main menu.

3.2 Display

Display a list of items and features on the screen that can be toggled Hide or Show.

3.2.1 Read in Progress

While the system is reading, the readings can be displayed in real time. To stop the readings from being displayed as they are read, click on this option and the readings will stop updating on the screen.

3.2.2 Temperature Legend

Hide/Show the temperature legend on right side of screen.

3.2.3 Date Time List

Hide/Show the Date Time list on right side of screen.

3.2.4 Cable View

Hide/Show the Cable View in Graphics View (2D or 3D only).

3.3 Tool Bar List

The temperature/resistance data can be shown in a variety of views. This list shows the current view type and allows the view to be changed.

3.3.1 Text

The Text view shows the currently selected read data in a spreadsheet type view. The data can be changed by selecting a new date time from the Date Time list on the right side of the screen.

3.3.2 2D View

On the Graphics View shows a 2D overview of the site if Facility is selected. Shows a 2D overview of the bin selected. This is only available if the 3D color overview software package was purchased.

3.3.3 3D View

On the Graphics View shows a 3D view of the site. The mouse can be used to rotate the facility and adjust the vertical viewing angle. This is only available if the 3D color overview software package was purchased.

3.3.4 Show All Cables

The cables in the selected bin/cable grouping will be displayed across the screen. (D/T buttons) up/down arrows on the top of the right hand column to scroll back and forth in time. Use the scroll bar on the bottom of the view to show more cables.

3.3.5 Show Cable History

In the graphics view, a single cable is located on the right side with its two last readings. This cable is selected by clicking on the desired cable in the facility list. Select this option, then that cable is listed across the entire screen with its readings back in history. The most current read is on the left with each previous read to the right. Use the scroll bar on the bottom of the right view to show more cables.

3.4 Temperature/Resistance

Switch between the temperature and resistance display modes. In temperature mode, temperature readings can be taken and displayed. In resistance mode, resistance readings can be taken and displayed.

3.5 All Readings/Alarms Only

Toggle between all readings and alarms only. Alarms Only shows reads that have at least one alarm in the read data.

4 Facility List

The **Facility** list allows selected cables to be read or printed. Jump around the system selecting individual cables and/or bin/cable groupings

4.1 Enable Entire Site

Check the top item in the facility list to enable all bins/cables in the entire site. To disable all bins/cables, clear the box.

4.2 Select TC(s) to Block/Unblock

Right click on any cable/thermocouple to bring up a menu. Select Block on menu to enable or disable block.

5 Text View

Text view (spreadsheet format) of all data for currently selected read.

6 Graphics View

6.1 Home 3D View

Use the mouse to rotate/zoom the view of the facility or bin. Click the H key in the center for the screen to default back to a preset rotation angle.

7 Color Legend

7.1 Change Temperature Colors

The colors associated with various temperatures, resistances and alarms can be changed by clicking on the desired color in the color legend. A standard color dialog will appear where the colors can be changed. Click **OK** to accept or **Cancel** to reject the color changes. The default colors can be restored view the Options menu.

8 Date Time List

The **Date/Time List** moves through all of the saved reads on the cables. The last read is on the top of the list. Use the mouse or arrow keys to select a new Date Time, the current view will be updated with the data from that read.

9 Help

9.1 ABOUT

Clicking on the option brings up a dialog box displaying the version, Boone Cable Work's address and phone number, user information, and serial number.

10 TYPICAL APPLICATION

To read and then print the entire facility:

Click BCS on main menu.
Click on **Begin Read.**
The system reads the entire facility.
Click on **Print.**
Verify all printer options and select printer.
Click on **Print.**
The system prints the reading for the entire facility.