

**CONTROL**  
**CONTRACTORS**

  
smart building solutions

# *Training Handbook*

2009

ControlContractors, Inc. reserves the right to change any information contained herein at any time without notice.  
Contents may be copied and/or transmitted at any time.

Copyright Control Contractors, Inc. 2009

# Control Contractors Offices

## **Seattle**

**1128 Poplar Place South  
Seattle, WA 98144  
(206) 238-1730      FAX (206) 328-0829  
Attn: Jon Unger**

## **Portland**

**5000 SE 25<sup>th</sup> Ave.  
Portland, OR 97202  
(503) 231-0421      FAX (503) 238-1138  
Attn: Molly McDaniel**

## **Anchorage**

**566 "B" Street  
Anchorage, AK 99518  
(907) 561-3044      FAX (907) 561-4225  
Attn: Susan Hauth**

## **Fairbanks**

**1853 Standard Ave.  
Fairbanks, AK 97701  
(907) 457-3044      FAX (907) 457-1620  
Attn: Bryan Huwe**

## **Juneau**

**9482 Eagle St.  
Juneau, AK 99803  
(907) 790-3589      Cell (907) 209-4559  
Attn: Mike Moffitt**

## **El Paso**

**7362 Remcon Circle  
El Paso, TX 79912  
(915) 581-0809  
Attn: Albert Flores**

# Table of Contents

To Our Customers.....	3
Curriculum 2009	4
Curriculum Listing	5
<b>Fundamental Courses</b>	<b>6-8</b>
HVAC	6
DDC	7
DDC Troubleshooting	8
<b>NW8000 Courses</b>	<b>9-15</b>
NW8000 Operations	9
NW8000 Programming	10
ASD/PSI Operations/Programming	11
NW8000 Advanced Programming	12
NW8000 / Signal Operations	13
NW8000 / Signal Programming	14
<b>I/A Courses</b>	<b>15-16</b>
I/A-LON Controller Operation and Programming	15
I/A-BACnet Controller Operation and Programming	16
<b>Controller/Niagara Courses</b>	<b>17-19</b>
NW8000 / Niagara Operations and Programming	17
I/A-LON / Niagara Operations and Programming	18
I/A-BACnet / Niagara Operations and Programming	19
<b>Graphic User Interface Courses</b>	<b>20-21</b>
Signal Operations and Programming	20
IA-Niagara Operations and Programming	21
CCI Professional Training	22
Company Histories	23

# To Our Customers

This edition of our **CCI Training Handbook** is dedicated to all the customers whose support of our organization - through periods of growth, product changes, and personnel expansion over the past 33 years - has made Control Contractors one of the world's largest suppliers of TAC HVAC products, and a pre-eminent environmental controls contractor in the Western United States.

**Service** has always been an important element of our business, but with the advent of LON and BACnet, "commodity" DDC controllers, sensors, and actuators, an even greater emphasis will be placed on it.

As we approach our first third-of-a-century of operation, we are taking steps to ensure your continued satisfaction with Control Contractors by increasing our communication with customers. One of these steps is embodied in this handbook: our investment in locally presented, professional caliber training capability.

We are interested in your input. If there is any area in which we can do a better, more complete job of meeting your controls needs, please let us know!

## Curriculum

Control Contractors provides a wide range of training programs, from the generic "Basics of Direct Digital Control" to advanced programming classes for each of the automation lines we handle.

Most courses are presented in a 4.5 day format, although any can be customized for content and duration.

Programs are offered periodically (see the insert for the current local schedule) at convenient locations in metropolitan Anchorage, Fairbanks, Juneau, Seattle, and Portland. However, we also offer the same courses at specific customer sites, if desired. Courses may contain a mix of different customers, or can be limited to your personnel alone.

All coursework is reinforced with ample hands-on experience using the same type of controls and interface installed in your own building(s), maximizing the carryover from

classroom to workplace. Classes are kept small (no more than 12 students grouped in 2s) to allow more individual time with the instructor.

Computers, control system simulation, overhead and video projection are all used to enhance the learning experience. Much of the presentation takes place with the students following on the operating control equipment.

## 2008 Curriculum Listing

These courses are open to our customers, as well as other interested parties in the HVAC allied fields of design, contracting, and consulting. CCI reserves the right to limit class size and specific attendance.

**The list below contains the general subject matter. We present this subject matter in a variety of formats identified in the list of classes. Custom formats are also available on request.**

### **Fundamental**

- ◆ Basics of Direct Digital Control
- ◆ HVAC Fundamentals
- ◆ DDC Networking, Wiring and Troubleshooting

### **Network 8000 Controllers**

- ◆ NW8000 Operation
- ◆ NW8000 Programming
- ◆ NW8000 Advanced Programming

### **I/A Controllers (LON)**

- ◆ IA-LON Operations and Programming

### **I/A Controllers (BACnet)**

- ◆ IA-BACnet Operations and Programming

### **Graphic User Interfaces**

- ◆ Signal Operations and Programming
- ◆ IA-Niagara Operations and Programming

**Upon successful completion of each course, students will receive a certificate. We also maintain a database of classes taken, which is available as a transcript, upon request.**

## **Fundamental - Heating, Ventilating, and Air Conditioning #11.2-5**

### **Description**

This course presents the major areas encountered in working with HVAC equipment and systems today. Some of the basic physics of thermodynamics is included, along with illustrated discussions of heating, cooling, and air distribution equipment. Finally, control theory and typical control sequences are added - something that is frequently left out of HVAC courses.

Representative topics are:

- |                        |                      |
|------------------------|----------------------|
| -the basic HVAC system | -refrigeration cycle |
| -chillers              | -boilers             |
| -air handlers          | -ductwork            |
| -dampers               | -coils and valves    |
| -filters               | -fans                |
| -humidity              | -unitary equipment   |
| -control theory        |                      |

### **Duration / Class Size**

3-4.5 days (24-36 hours)

Up to 12

### **Intended For**

Anyone entering the HVAC field today, or requiring general exposure to these basic concepts.

### **Prerequisites**

None

## **Fundamental - Basics of Direct Digital Control**

#12.1-2

### **Description**

This course presents the concept of digital control in a straightforward, easy to understand manner. What is digital information, what is a microprocessor, how do these work to control the environment in a building? Major features found in typical direct digital control systems are described and illustrated using hands-on exercises with operating digital controllers.

Some representative topics included are:

- Components of a building automation system
- Types of programming
- Program storage
- HVAC Control
- Energy Management
- Facilities Management
- Safety/Security

### **Duration**

2 days (16 hours)

### **Class Size**

Up to 12

### **Intended For**

Anyone entering the HVAC field today, or those who have been in the field working with component controls and wish to broaden their perspective of today's controls equipment.

### **Prerequisites**

None, although a basic understanding of HVAC control theory and standard practices would be helpful.

## **DDC Networking, Wiring, and Troubleshooting**

**#13.5**

### **Description**

This course introduces the building operator/programmer to the concepts of point wiring, network wiring, communication checkout and troubleshooting the installation and operation of a building automation system. Information is presented through both lecture and hands-on application.

As part of the class, a controller network is built, and a variety of hardware inputs and outputs are examined.

Point checkout and ringing out of communication lines are accomplished. The course then turns to software interpretation and troubleshooting, with control loop tuning, diagnostic tree analysis, and other exercises.

### **Duration**

3 - 4.5 days (36 hours)

### **Class Size**

Up to 12

### **Intended For**

Anyone responsible for the installation and/or maintenance of building automation systems.

### **Prerequisites**

A solid understanding of NW8000 operations and block architecture, around which this course is designed.

Note: This course can be reconfigured using LON or BACnet controllers on request. However, an additional reconfiguration charge will apply.

## **NW8000 - Controller Operation**

**#21.5**

### **Description**

This course covers the range of NW8000 controllers - how they fit together to make up a network, how to access them, how to use their menu structure, how to generate operational reports, and more.

Topics included:

- |                              |                             |
|------------------------------|-----------------------------|
| -Global Control Module       | -Global Control Satellite   |
| -Local Control Module        | -Terminal Access Programs   |
| -Microzone 2                 | -Microflo 2                 |
| -Package Equipment Module    | -Lighting Interface Module  |
| -Personal System Interface   | -Micronet VAV Controller    |
| -Micronet Unitary Controller | -Micronet Interface Program |

### **Duration**

4.5 days (36 hours)

### **Class Size**

Up to 12

### **Intended For**

Customers who already have NW8000 equipment, but are new to its operation.

### **Prerequisites**

A basic knowledge of HVAC; building automation a plus.

## **NW8000 - Controller Programming**

#22.5

### **Description**

This course covers the range of NW8000 controllers - but from the point of view of programming the individual controllers and setting up a network.

Topics included:

- Block Programming Concept
- Terminal Access of GCM/LCM for setup and block programming. Setup of alarms, print groups, and other types of GCM/LCM reporting
- PSI/XPSI access of MZ2/MF2/PEM and LIM. Setup, block programming, and interface to GCM for trending, MTRs, and alarm reporting.
- Micronet VAV Controller
- Micronet Unitary Controller
- Micronet Interface Program

### **Duration**

4.5 days (36 hours)

### **Class Size**

Up to 12

### **Intended For**

Customers who already have NW8000 equipment, but are new to its operation.

### **Prerequisites**

A basic knowledge of HVAC; some practical experience with NW8000.

**NW8000 - Application Specific Devices  
and Personal System Interface Program**

**#23.5**

**Description**

This course provides information and practice on programming the ASD devices:

- MicroZone 2 (multipurpose controller)
- Microflo 2 (VAV controller)
- Package Equipment Module (smaller MZ2)
- Lighting Interface Module (GE Lighting Interface)

Tools used for the programming include:

- Terminal Emulation Program
- Personal System Interface (PSI)
- Extended PSI (XPSI)

Included in the course are:

- Block programming for the devices
- Interface to the Parent Area Controller (GCM)
- Sharing of information between ASDs

**Duration**

4.5 days (16 to 36 hours)

**Class Size**

Up to 12

**Intended For**

Customers who already know how to operate the ASD controllers but wish to progress into programming.

**Prerequisites**

Practical operational experience with NW8000 GCM and some ASD devices.

## **NW8000 - Advanced Programming**

**#24.5**

### **Description**

This course delves into the details of block programming and system setup programming for the NW8000 BAS. Attendees are encouraged to bring their own projects for engineering, or may use a project developed for the course.

Topics covered include:

- Concept of block programming
- Block programming to meet specific or general applications
- Network programming between the GCM, LCM and other NW8000 controllers
- Open-ended exploration based on attendees needs

### **Duration**

2.0 - 4.5 days (16 - 36 hours)

### **Class Size**

Up to 12

### **Intended For**

Customers who already have NW8000 equipment, and have worked at the programming level, but are now interested in taking more “ownership” of their system.

### **Prerequisites**

Course 22.5 or a basic programming knowledge of NW8000 operations.

## **NW8000 / SIGNAL - Controller Operation**

**#31.5-N**

### **Description**

This course covers the range of NW8000 controllers - how they fit together to make up a network, how to access them, how to use their menu structure, how to generate operational reports, and more. In addition, the Windows based **SIGNAL** is used as the interface.

#### Topics included:

- GCM / GCS / LCM
- Terminal Access Programs
- MZ2 / MF2 / PEM / LIM
- Personal System Interface / Extended PSI
- Micronet VAV Controller
- Micronet Unitary Controller
- Micronet Interface Program
- Signal Menu Structure and Project
- Signal Monitor Screens
- Signal Trending, Calendar, and Alarming

#### **Duration**

4.5 days (36 hours)

#### **Class Size**

Up to 12

#### **Intended For**

Customers who already have NW8000 equipment and Signal, but are new to its operation.

#### **Prerequisites**

A basic knowledge of HVAC; building automation a plus.

## **NW8000 / SIGNAL - Controller Programming**

**#32.5-N**

### **Description**

This course covers the range of NW8000 controllers - but from the point of view of programming the individual controllers and setting up a network. It includes adding points and monitor screens to **Signal**.

Topics included:

- Block Programming Concept
- Terminal Access of GCM/LCM for setup and block programming. Setup of alarms, print groups, and other types of GCM/LCM reporting
- PSI/XPSI access of MZ2/MF2/PEM and LIM. Setup, block programming, and interface to GCM for trending, MTRs, and alarm reporting.
- Micronet VAV Controller
- Micronet Unitary Controller
- Micronet Interface Program
- Signal Project setup
- Signal Monitor Screen creation
- Adding Users
- System Backup

### **Duration**

4.5 days (36 hours)

### **Class Size**

Up to 12

### **Intended For**

Customers who already have NW8000 equipment and Signal, and have operational experience with it.

### **Prerequisites**

Course 31.5 or equivalent

## **IA-LON Controller Operations and Programming**

**#82.5-L**

### **Description**

This course covers the hardware and software setup of I/A-LON controllers, plus use of LonMaker for Windows, a LON networking tool. No GUI included.

Topics included:

- Review of controller hardware and LON architecture
- LON communication concepts including SNVTs, SCPTs, and binding
- Setup of controllers including loading profiles and custom programming with Workplace Tech
- Setup of LON and binding of network variables using LonMaker for Windows

### **Duration:**

3.0 to 4.5 days (24 - 36 hours)

### **Class Size:**

Up to 12

### **Intended For**

Customers and IFO personnel who have a basic under-standing of I/A and the basic interface tools, and want to progress to controller/network setup and programming

### **Prerequisites**

A general knowledge of Building Automation.

## **IA-BACnet Controller Operations and Programming**

**#82.5-B**

### **Description**

This course covers the hardware and software setup of I/A-BACnet controllers, plus use of Workplace Tech, and the controller commissioning tool. No GUI included.

Topics included:

- Review of controller hardware and BACnet architecture
  - MS/TP
  - Ethernet
  - IP
- Setup of controllers including loading profiles and custom programming with Workplace Tech
- Network sharing of values.

### **Duration:**

3.0 to 4.5 days (24 - 36 hours)

### **Class Size:**

Up to 12

### **Intended For**

Customers and IFO personnel who have a basic understanding of I/A and the basic interface tools, and want to progress to controller/network setup and programming

### **Prerequisites**

**A general knowledge of building automation.**

## **NW8000 / IA-Niagara – Oper. and Programming**

**#84.5-N**

### **Description**

This course covers the web enabled GUI Niagara, including its Workplace Pro programming and commissioning tool. Added to this are one or more of the following Building Automation Systems: IA-LON, IA-BACnet, NW8000.

Topics included:

- Review of controller hardware and NW8000 architecture options
- Setup of controllers including loading block programming and shared values
- Setup of the Niagara station and both GcmComm Service and ibsAsd Service
- Creating logic pages
- Creating graphical creation and web pages
- Setup of logging, archiving, and internet viewing
- alarm creation, routing, and internet viewing.

### **Duration:**

4.5 days (36 hours)

### **Class Size:**

Up to 8

### **Intended For**

Customers and IFO personnel who have to work with the NW8000 and Niagara graphic interface.

### **Prerequisites**

A general knowledge of building automation.

### **Prerequisites**

Basic HVAC experience. BAS and GUI exposure a plus. NW8000 experience helpful.

## **IA-LON / Niagara Operations and Programming**

**#84.5-L**

### **Description**

This course covers the web enabled GUI Niagara, including its Workplace Pro programming and commissioning tool. Added to this are one or more of the following Building Automation Systems: IA-LON, IA-BACnet, NW8000.

Topics included:

- Review of controller hardware and LON architecture
- Setup of controllers including loading profiles and custom programming with Workplace Tech
- Setup of the Niagara station and LonWorks Service.
- Creating logic pages
- Binding SNVTs, commanding SCPTs
- Creating graphical creation and web pages
- Setup of logging, archiving, and internet viewing
- alarm creation, routing, and internet viewing.

### **Duration:**

4.5 days (36 hours)

### **Class Size:**

Up to 8

### **Intended For**

Customers and IFO personnel who have to work with the IA-LON controllers and Niagara graphic interface.

### **Prerequisites**

Basic HVAC experience. BAS and GUI exposure a plus. IA-LON experience helpful.

## **IA-BACnet / Niagara Operations and Programming**

**#84.5-B**

### **Description**

This course covers the web enabled GUI Niagara, including its Workplace Pro programming and commissioning tool. Added to this are one or more of the following Building Automation Systems: IA-LON, IA-BACnet, NW8000.

Topics included:

- Review of controller hardware and BACnet architecture options
- Setup of controllers including learning network and custom programming with Workplace Tech
- Setup of the Niagara station and BACnet Service.
- Creating logic pages
- Creating graphical creation and web pages
- Setup of logging, archiving, and internet viewing
- alarm creation, routing, and internet viewing.

### **Duration:**

4.5 days (36 hours)

### **Class Size:**

Up to 8

### **Intended For**

Customers and IFO personnel who have to work with the IA-BACnet controllers and Niagara graphic interface.

### **Prerequisites**

Basic HVAC experience. BAS and GUI exposure a plus. IA-BACnet experience helpful.

## **GUI - Signal Operations and Programming**

**#92.5**

### **Description**

This course presents the Windows based Signal graphic user interface for NW8000, DMS, and many other automation systems. Subjects covered represent the range of Signal operational and programmable characteristics.

Some topics included are:

- Signal Control Panel Menu
- Use of Signal Graphics
- Setup and Override of Calendars
- Alarm Exception Handling
- Using and Modifying the Signal Project
- Terminal Access
- General Overrides
- Trending
- Generating Reports
- Windows Interface
- Backup

### **Duration**

4.5 days (36 hours)

### **Class Size**

Up to 12

### **Intended For**

Customers who already have NW8000, and either have, or are considering, the Signal GUI.

### **Prerequisites**

A basic knowledge of HVAC; building automation a plus. Some instructional or practical exposure to NW8000 is a must.

## **GUI – IA-Niagara Operations and Programming**

**#94.5**

### **Description**

This course covers the gamut of Niagara features, from sign-on to program backup. It includes general information about interfacing with the NW8000 / DMS / Lon / BACnet panels, use and creation of graphic screens, controller programming interface, setup of web pages, reports, and more.

Topics covered include:

- Workplace Pro Engineering Tool
- Realtime Display
- Alarm Handling
- Block, Point and Workplace editing
- Overrides
- Graphic Development
- Point Logging
- Data Trending

### **Duration**

4.5 days (36 hours)

### **Class Size**

Up to 8

### **Intended For**

Customers who have, or interested in adding the Niagara graphic user interface.

### **Prerequisites**

Practical experience working with HVAC and building automation. Some coursework or practical work with an Invensys BAS is strongly recommended. Computer experience is helpful but not essential.

# Professional Training

Control Contractors has a long history of providing professional product training to our customers. This began in 1989 when we were one of the first Siebe representative offices to “bring the factory to the field” with four weeks of training on NW8000. This training was presented by the then Manager of Siebe’s Rockford, Illinois Training Center, **Bill Sterr**.

In 1994, Bill joined CCI to provide local in-house and customer training. Most classes are a week long, but some are of 2-3 days duration. Many are on customer sites and specifically tailored to their needs. These are things we could never do using Siebe’s Training Center services.

Bill is a graduate of the University of Wisconsin, with graduate training from the UW, University of Illinois, and Northwestern University. After five years as a high school science instructor, he joined the Barber-Colman (Siebe) Training Department. He continued there for fourteen years, eventually managing the department for the last five. He is a member of ASHRAE and ASTD (American Society for Training and Development).

Bill has made presentations to employees, customers, and industry groups throughout the United States and overseas, and is now happy to call the Northwest home. We have now extended this training service to all major areas from Point Barrow Alaska to San Diego California, as well as the states of Utah and Nevada.

# Company Histories

Our “Flagship Partner” .....

## **TAC - IBS**

TAC is a global electronics and engineering company created by the merger of purchase of Invensys Intelligent Building Systems by **Schneider Electric** in 2006. Schneider had earlier purchase Tour Andover, and renamed it TAC.

## **Invensys**

Invensys plc is a global electronics and engineering company created by the merger of **BTR** plc and **Siebe** plc in 1999. With its head office in London, England and over 100,000 employees it operates globally through four divisions - Intelligent Automation, Industrial Drive Systems, Power Systems and Controls. The Invensys vision is to be the global leader in the automation and controls industry, until the divested themselves of their Intelligent Building Systems segment last year.

## **Siebe**

At the end of the Napoleonic Wars, Austrian **August Siebe** emigrated to England where, in 1832, he formed a company to develop and manufacture diving equipment. The Siebe design was to remain dominant well into this century.

Since 1962 Siebe has aggressively assembled companies forming a core business of “sensing, controlling, and actuating”. To that end, Siebe purchased the American controls firm, Robertshaw, in 1986, following with Barber-Colman in 1987. The environmental controls product divisions of these two companies were combined as Siebe Environmental Controls (SEC) in 1991. Other familiar names that are now part of Siebe are Foxboro Instrumentation, Paragon Timers, Ranco Controls and Wonderware.

## **Barber-Colman**

**Howard Colman** of Beaver Dam, Wisconsin, began his company with inventions for improving the textile industry. Backed with a \$100 investment by lumberman **W. A. Barber**, he formed Barber-Colman in Rockford, Illinois, in 1894.

Mr. Coleman’s inventions included electric controls for temperature and humidity - both important to quality textile manufacturing. By the 1970s the firm had grown to many divisions beyond textiles, producing medical equipment, electric motors, and computer based environmental controls. The 1980s saw a shift toward controls, specifically industrial and HVAC. In 1987 Siebe, plc purchased the privately held Barber-Colman. However, manufacturing remains in Howard Colman’s adopted home, Rockford.

## **Control Contractors, Inc.**

Control Contractors began in 1976 in Seattle, Washington. The company was formed by **Al Lucas**, as an independently owned representative of Barber-Colman Co. A branch office was opened in Anchorage, Alaska in 1977. By 1985 CCI was one of the largest independent controls contractors in the U.S. Since then, we have been involved in some of the largest building automation jobs on the West Coast. Mr. Lucas passed away in 2007. The company continues to operate under Lucas family ownership.

In 1986 a Portland, Or. office was added to the CCI family, with an office in San Diego, Ca. in 1989. Since then, offices have opened in Fairbanks and Juneau, Ak. Today, CCI represents the entire Invensys Environmental Controls line throughout its territory: NW8000, DMS, and the LON-based IA Building Automation Systems.

In 2000 we were chosen over all the controls contractors in the U.S. to install the Building Automation System for the new **Echelon Corp.** headquarters in San Jose, Ca. This ongoing project is a showcase for LON-based controls, representing the future of "interoperability" in our industry.

It is internet accessible, with multiple "thin client" computers on-site, and controls running the gamut: Lighting Dimming Ballasts, Power Monitoring System Current Transformers, Air Terminal VAV controls, Intelligent valve and damper actuators, Roof Top Packaged Units with LonMark Controls, Packaged Hot water Boilers with LonMark Controls, LonMark Variable Speed Drives, LonMark Card Access System, LonMark Motorized Blinds and Shades, LonMark Fiber Optics from the Parking Garage Cameras and Lighting Controls, LonMark Weather Station, Elevator and Fire Alarm LonMark interfaces.

Today, Control Contractors offers a wide variety of services to our customers in the western U.S., including the complete line of Invensys HVAC controls, mechanical maintenance solutions, an **OnPoint**, our building supervision and energy management service. **OnPoint** offers our customers a four-part solution to managing utility costs: discovery phase auditing and analysis of current energy usage), behavior and procedure changes, capital improvements, and operations and maintenance.

Since the very beginning Control Contractors has held a very simple goal: "**Put the Customer in Control**" We have created many innovations over the years to realize this goal and continue to focus squarely on customer needs. At Control Contractors we believe we are in a partnership with our customers to build control systems that meet their needs exactly. The control systems we create are not ours, and therefore we endeavor to give the customer as much capability and knowledge about their system as they wish. We have no desire to keep proprietary information or the customer in the dark about the inner workings of their controls investment. We work diligently to achieve this simple goal in many ways such as providing truly Interoperable Control Systems

Complete Training and a Fully Staffed Service Department with everything engineered to  
**"Put the Customer in Control"**.