



PEOPLE YOU CAN RELY ON:
R&D: Hardware Department

BUILDING ENERGY EFFICIENCY:
Urgent Need for Green Building



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RUNtime

The Official Quarterly Newsletter of Reliable Controls® Corporation

Q1 - 2018

Reliable Controls Introduces
Operator Certification Program



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controls

INTRODUCING OPERATOR TRAINING

Reliable Controls Introduces New Certification Program



Reliable Controls is pleased to announce the release of our new Operator Certification Program, following successful completion of a month-long Beta test completed by 21 operators located around the globe.

Reliable Controls knows full well that it isn't enough to design and manufacture cutting edge, rock solid building controls. If the controls are installed improperly, or if building operators don't understand how to use their MACH-System™, their budget and sustainability goals will quickly slip out of reach. Reliable Controls has always required dealer personnel to be technically certified before installing products; the next logical step is clearly to provide a technical certification program for operators.

The main purpose of the new program is to help building operators learn how to get more value from their MACH-Systems. They can use the new information to increase occupant comfort, save energy, and reduce maintenance costs in buildings under their control.

The program includes multiple levels of short online videos capped off by an advanced classroom course. To complete levels 1 through

4, students simply view a series of videos, then a short online exam. After each level, students can print out a certificate to confirm their achievement. Level 5 is achieved by participating in an Advanced Operator Training classroom course.

The images (below and opposite page) show the current Operator Certification course curricula, as viewed by an operator signed on to the Customer Support Center, with their personal myProfile page displayed.

Users simply click on any course title in any order to launch a video. Videos can be rewatched at any time, and from any PC or mobile device. Access to certification level exams is provided to enrolled students only, after all videos in that level have been viewed.

Future additions to the course line-up will include the planned Level 4 RC-Studio® videos, and the posting of dates for the Level 5 Advanced Operator Training classroom course. After that, we will be creating Level 3 and Level 4 videos for other operator interfaces, including RC-WebView®, MACH-ProWeb™, and the MACH-ProView™ at minimum.

OPERATOR		Current Status: Level 1		my Certificate
Level 1: Building Automation System Basics				
BAS-1000	What is a Building Automation System?	✓	November 24, 2017	
BAS-1010	HVAC Resources	✓	November 24, 2017	
BAS-1020	BAS Point Types	✓	November 24, 2017	
BAS-1030	BACnet Introduction	✓	November 24, 2017	
BAS-1040	Devices and Networks	✓	November 24, 2017	
BAS-EXAM	Level 1 Exam	✓	Nov 24, 2017	
Level 2: The MACH-System				
MS-2000	MACH-Pro Controller Family	Available		
MS-2005	MACH-System Wiring	Available		
MS-2010	SMART-Sensors	Available		
MS-2020	SPACE-Sensor Temperature	Available		
MS-2030	Software Introduction	Available		
MS-EXAM	Level 2 Exam	Prerequisites Not Met		

Level 3: BASIC RC-Studio Operation			
RCS-3100	Signing On and Signing Off	Available	
RCS-3101	Navigating RC-Studio	Available	
RCS-3102	RC-Studio Help Files	Available	
RCS-3103	Introduction to Worksheets	Available	
RCS-3110	Managing Alarms	Available	
RCS-3111	Email Alarms	Available	
RCS-3120	Working with Inputs	Available	
RCS-3125	Overriding an Output and the Outputs Worksheet	Available	
RCS-3130	Adjusting Setpoints	Available	
RCS-3135	Changing a Calendar	Available	
RCS-3140	Changing a Schedule	Available	
RCS-3141	Schedule Special Events	Available	
RCS-3145	Historical Data	Available	
RCS-3146	Viewing Multipoint Trend Logs	Available	
RCS-3147	Creating and Editing Multipoint Trend Logs	Available	
RCS-3148	Creating and Editing Single-Point Trend Logs	Available	
RCS-3149	Runtime Reports	Available	
RCS-3150	Point Reports	Available	
RCS-3155	Introduction to Control-BASIC	Available	
RCS-3156	The Control-BASIC Program Editor	Available	
RCS-3160	Manual Points Report	Available	
RCS-3165	Backing up a System	Available	
BAS-EXAM	Level 3 Exam	Prerequisites Not Met	
Level 4: Advanced RC-Studio Operations			
RCS-4100	PID Loops	Not Available	
RCS-4110	Alarm Configuration	Not Available	
RCS-4120	Direct Access	Not Available	
RCS-4130	Passwords	Not Available	
RCS-4140	Access Levels	Not Available	
RCS-4150	Preferences	Not Available	
RCS-4160	Network Status Worksheet	Not Available	
RCS-4170	Descriptors	Not Available	
RCS-4180	Tables	Not Available	
ADV RCS-EXAM	Level 4 Exam	Not Available	
Level 5: Advanced Building Operator			
ADV-5000	Advanced Operator Training (classroom)	Not Available	

Access and Enrollment

Although access to the videos is free and available right now for all Reliable Controls customers that have access to the Customer Support Center, there is a charge for enrolling in the Operator Certification Program. Enrollment adds the ability to take online tests, print out

certificates, and register for advanced classroom courses. The enrollment fee for each operator is set by, and payable to your local Reliable Controls Authorized Dealer.

PEOPLE YOU CAN RELY ON

Research & Development: Hardware Department

How to Enroll

STEP 1: The procedure for enrolling a new operator starts by obtaining access to the Customer Support Center. Many Reliable Controls customers already have this access, but if not, they can request it by selecting the 'Apply for an Account' option on the main webpage.

Support Center Login

As a Customer, Consultant, or Dealer of Reliable Controls use the secured login to access software updates, product info, and more.

Apply for an Account

Support Center Login 'Apply for an Account'.

As part of the application, you will be required to select your preferred dealer, thereby generating an email asking them to approve your new account. After you are approved, you will automatically be emailed credentials to sign on to the Customer Support Center.

STEP 2: An operator can request enrollment in the Operator Certification Program by signing in to the Customer Support Center, then navigating to Training>Certification Program>Enrollment

and selecting a contact with your Reliable Controls dealer to send an email request.

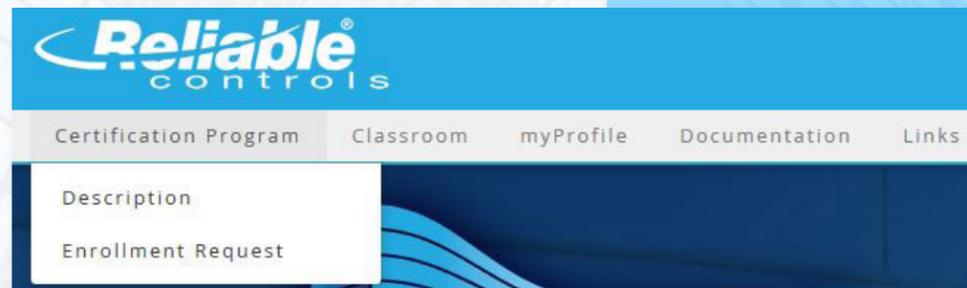
STEP 3: The dealer will send you a quotation covering the cost of the operator(s) you would like to enroll. Should you decide to proceed, you will need to send the dealer a purchase order for the quoted amount.

STEP 4: After receiving a purchase order, the dealer contact will enroll you in the Operator Certification program, and you will receive an email notifying you that you are ready to get started!

you that you are ready to get started!

In 2018, look for a new Level 5 Advanced Operator Training classroom course, available to operators holding a current Level 4 certification in the Operator Certification Program. This course will answer the question:

If an advanced operator had the time to use the power of a MACH-System to make improvements to save energy, increase occupant comfort, and reduce maintenance costs... what would they do, and how would they do it?



Certification Program drop-down for enrollment.



Operator Certification Enrollment Request page.

The Reliable Controls hardware development team, part of Research & Development (R&D), is responsible for the design and development of all Reliable Controls hardware products. This compact team is responsible for circuit design, mechanical design, product implementation, production test equipment, and certification.

Once the concept for a new product design is ready, the team researches its viability. This includes a detailed review of applicable resource constraints, certifications, packaging, design for manufacturability, and market competitiveness. The hardware team at Reliable Controls prides itself on delivering a quality product that works well and looks great. The team is guided by the corporate hallmarks of "simple, flexible, and sustainable". Additionally other key criteria include: the product must be manufacturable for ten years, must be RoHS2 compliant, UL certified, backward compatible, cost effective, and last, but not least... dependable.

The electrical engineering team designs and develops a schematic that will be able to achieve the end functionality as described in the product specification documents. At first, the development focuses on selecting all the various sub-components, and verifying each individual function. This involves prototyping, troubleshooting, and experimentation. The hardware team then begins working closely with



Gus Mercer, Electronics Engineering Technologist, and Rudolf Erasmus examine a prototype MACH-ProView™ LCD PCB and Mechanical Design

the firmware team to develop firmware code that verifies the main circuits will perform as expected. Once the circuit design has been roughed out, it is refined through iterative rounds of component optimization to achieve a balance of quality, manufacturability, and cost effectiveness.

The component selection process is the most critical step in a successful product design. When selecting the components, the team has to look at many specification items, including packaging, longevity, function, reliability, RoHS2 compliance, availability, and price. After finalizing the components, a prototype of the complete product is built. This includes developing a prototype Printed Circuit Board (PCB) and assembling/soldering all the components, then testing all desired functions. Once a functional prototype has been completed, the team begins the process of developing the packaging which must be both appealing and easy to work with. The packaging design is often referred to as mechanical design. The mechanical design begins with the team consulting with the Art Director in the marketing department to rough out the concept of the enclosure packaging.

Concepts are created and refined by the marketing department then brought under critical review for final consideration. When the



Rudolf Erasmus, Hardware Design Engineer, works on the development of hardware product circuit board layout

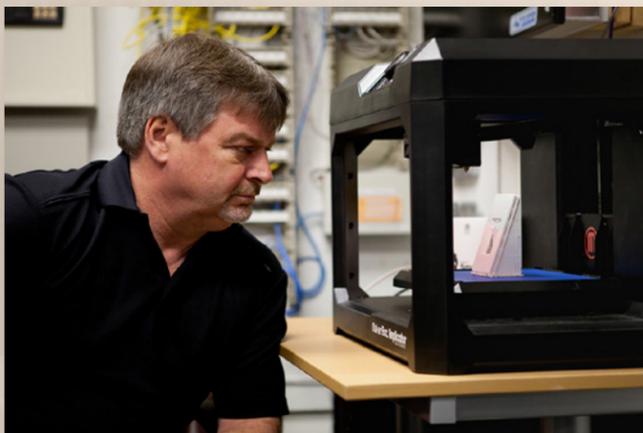
Department Profile

concept is agreed on, the mechanical designer will then program it in a 3D Computer Aided Drawing (CAD) software called SolidWorks. The mechanical design must balance the form and function of the product. Once in CAD, the team can examine the design ergonomics and get an idea of how the product will feel. The CAD model is then integrated with the PCB model to review all the fittings and clearances.



Solid Works 3D CAD software displaying the latest SMART-Sensor

The mechanical design can be brought to realization using a Maker Bot 3D printer. The 3D print-out quickly exposes many of the design strengths and weaknesses. The design is iterated with several print-outs until a level of satisfaction of form and fit are achieved. The CAD is then exported to the "tooler" to make the injection mold tool that will enable mass production of the final enclosure. The first "shots" from the injection mold tool can have unexpected surprises and often require a number of iterations to the tooling before the mold is finished. There are an enormous number of design details that must be reviewed and tested to ensure the tool design is ready for final production.



Jim Ward with the Maker Bot 3D Printer

After the tool is signed off, the mechanical designer begins to focus on the shipping box, assembly hardware, and final finish of the product, color matching, texture, and artwork.

In addition to the mechanical design, an automated production testbed is developed to provide functional testing of each unit during production. Depending on the anticipated future sales volumes the testbed can be highly automated and sophisticated or very simple and manual. The testbed design starts with determining all the end tests required for that product and the connectivity needed to achieve them.

Testbed designs are typically based around a fixture called a bed of nails that can load several completed boards at once and pick up the electrical connections with gold-plated, spring-loaded pins (nails). Testbeds can have hundreds of pins. These pins are then connected to specially designed circuits that are driven by Reliable Controls MACH-System controllers which carry out end-to-end tests. One can truthfully say that Reliable Controls products test themselves!



MACH-ProLight Testbed

An enormous amount of Control BASIC code is programmed into the controller to carry out all the tests. Finished products are tested very quickly and with a very high degree of accuracy.

This production-ready board design still has a few remaining hurdles to pass, such as: design for manufacturability, design for safety compliance, and design for Electromagnetic Compatibility (EMC) compliance. First revision production boards are sent to Underwriters Laboratories (UL) and EMC test labs to undergo rigorous testing.

Design for manufacturability testing and verification occurs on the Reliable Controls manufacturing line. Design changes may be required pending the test results. Once compliance is verified, the product undergoes a last set of changes to document wiring guides, user manuals, and product safety markings. The automated testbed is commissioned, documented, and turned over to the manufacturing team.

The last step for the hardware team is to work closely with manufacturing and the repair department to further monitor the product as it deploys. If deficiencies are found, these may be corrected through revisions and engineering change orders. Board revisions accommodate significant design changes, while engineering change orders accommodate minor improvements. Changes can be made to the mechanical design, the PCB, and the testbed. Products are considered mature after about two years, and seldom see any design changes from the hardware team beyond that time.



James Puritch, VP, Research & Development

To remain an industry leader with state-of-the-art product capabilities the hardware platform must be updated every seven to ten years. This keeps the hardware team always looking at new frontiers and continually rolling out new product to replace previous generations and complement the existing hardware offering.

Our building automation products are meticulously engineered to provide convenient access, flexible application, and easy installation and expansion capability. All Reliable Controls building controllers are BACnet Listed with the BACnet Testing Laboratory (BTL).



David Gates, Electronics Engineering Technologist, developing a testbed



WELCOME TO NEW DEALERS

New Reliable Controls Authorized Dealers

ControlCo Ltd.
Dursley, Gloucestershire, UK



Fox Building Automation Ltd.
Lethbridge, AB, Canada



Fox Building Automation Ltd.

RGB Mechanical Contractors, Inc.
Jonesboro, AR, USA



**Mechanical
Contractors, Inc.**

Setefa Cleanroom Solutions S.A.
Santa Ana, San Jose, Costa Rica



TRADE SHOWS

Visit Reliable Controls at these Upcoming Trade Shows

SEE US AT BOOTH 3809



CHICAGO JAN 22-24 2018

AHR EXPO 2018

January 22 - 24, 2018
McCormick Place
Chicago, IL, USA
Booth #3809

ACREX-India 2018

February 22 - 24, 2018
Bangalore International Exhibition Centre
Bangalore, India
Hall# 3A, Stand A-22



MCE - 2018: Milano

March 13 - 16, 2018
Fieramilano
Milano, Italy
Booth #Hall 4, Stand M17

BUILDING OPERATING MANAGEMENT'S

NFMT

NFMT 2018

March 20 - 22, 2018
Baltimore Convention Center
Baltimore, MD, USA
Booth #2421



BUILDING ENERGY EFFICIENCY

UN & IEA Report Finds Urgent Need for Green Building

According to a report by the International Energy Agency (IEA) and UN Environment, near-zero energy, zero-emissions buildings must become the global construction standard within the next ten years for the world to be able to adequately fight climate change.

The Global Status Report 2017 was released by the Global Alliance for Buildings and Construction (GABC), prepared by the International Energy Agency (IEA) and coordinated by the United Nations Environment Programme. It states that the floor area of buildings worldwide was 235 billion m² (2.5 trillion ft²) in 2016. By 2060, 230 billion m² (2.475 trillion ft²) will be added.

“The building sector is seeing some progress

in cutting its emissions, but it is too little, too slowly,” said UN Environment executive director Erik Solheim. The report says more than half of buildings that will exist in 40 years will be constructed during the next 20 years, and two-thirds of those will be in countries that currently do not have adequate building energy codes in place. “Over the next 40 years, the world is expected to build 230 billion square metres in new construction – adding the equivalent of Paris to the planet every single week,” IEA executive director Faith Birol said. “This rapid growth is not without consequences.”

The increase in demand is caused by population growth but also greater demand per capita for floorspace and a greater demand for energy services. “While the energy intensity of the



buildings sector has improved it is not enough to offset rising energy demand,” Faith Birol said at the launch of the Global Alliance for Buildings and Construction’s Global Status Report 2017.

Carbon dioxide (CO₂) emissions from buildings and construction rose by almost one per cent a year between 2010 and 2016, with the report saying a dramatic increase in energy intensity was necessary to arrest this. The report goes on to demonstrate many opportunities to install energy efficient and low carbon features and buildings, supported by many examples across the globe. Four things are needed to achieve these goals, the report said:

- 1 **AMBITIOUS AND TRANSPARENT COMMITMENT WITH POLICIES AND MARKET INCENTIVES THAT ENCOURAGE THE CONSTRUCTION SECTOR TO MEET THE SUSTAINABLE DEVELOPMENT GOALS.**
- 2 **MUCH BETTER BUILDING ENERGY CODES AND CERTIFICATION, LABELLING AND INCENTIVE PROGRAMS, EVERYWHERE, WITH RIGOROUS ENFORCEMENT.**
- 3 **WIDE-SCALE ADOPTION AND INVESTMENT IN HIGH-PERFORMANCE, LOW-CARBON, ENERGY-EFFICIENT SOLUTIONS.**
- 4 **A MAJOR SHIFT IN FINANCING AND INVESTMENTS, WITH A SOLID BUSINESS CASE FOR INVESTORS, INFORMATION AND FINANCING TOOLS THAT MINIMISE RISK AND UNCERTAINTY.**

While the Paris Agreement marked a turning point in the call to limit global warming, that momentum must now be seized with a rapid deployment of energy-efficient and low-carbon solutions for buildings and construction, helping to put the world on a sustainable trajectory.



HVAC components consume almost 40% of the electricity used in commercial buildings, and thus, control systems can significantly reduce energy

consumption, increase return on investment, and reduce energy costs. The measurement, verification, and controllability of mechanical and electrical systems are critical aspects in the design and operation of sustainable buildings, and as a result, Reliable Controls is uniquely positioned to deliver long-term solutions to these important requirements.

HVAC engineers use CO₂ level transmitters to regulate airflow in modern office buildings. CO₂ measurement is primarily used to estimate the number of occupants in a defined space. CO₂ sensing is featured in many Reliable Controls MACH-System™ controllers and peripherals, including the SMART-Sensor, SPACE-Sensor, and MACH-ProView controllers. The CO₂ sensor used in these products has a convenient auto-calibration feature that establishes a baseline level for any space.

The Reliable Controls MACH-System provides the capability to measure, verify, and control the systems which are critical to meeting these stricter global standards that are necessary for green buildings. The Global Status Report 2017 reconfirms the significance of the building and construction sector’s energy consumption and related emissions. It also shows that efforts to decarbonize the sector are progressing, thanks to implementation of policy frameworks and deployment of low-carbon and energy-efficient technologies like Reliable Controls provides.



PHILIP J. CURRIE DINOSAUR MUSEUM

GRANDE PRAIRIE, AB, CANADA

MUSEUM

OVERVIEW

The Philip J. Currie Dinosaur Museum is a world-class facility in the heart of Peace Country and honors Canada's leading palaeontologist, Philip J. Currie. The project has attracted the attention of multiple celebrities, including Dan Aykroyd, Matthew Gray Gubler, Robert F. Kennedy Jr., and mystery writer Patricia Cornwell.

PROJECT DETAILS

Reliable Controls Authorized Dealer, Serv-All Mechanical Services Ltd., completed this new construction project in 2015. The Philip J. Currie Dinosaur Museum rests on the ancient Pipestone Creek, the world's richest dinosaur bone bed, near Grande Prairie, Alberta, Canada.

Designed as a metaphorical reference to the dinosaur bones that reside within, the museum features a geometrically complex roof supported by exposed timber beams. With a total area of 2,713 m² (29,200 ft²), the museum's mechanical equipment includes a boiler, chiller, HVAC, and VAV. The networked MACH-System™ hardware consists of one MACH-ProWebSys™ controller, one MACH-ProSys™ controller, 26 MACH-ProAir™ controllers, and one MACH-ProZone™ controller. The network topologies are EIA-485 and Ethernet, and the protocol integration is BACnet®. There are 344 system points and the project is LEED® Silver certified. Strict air quality, temperature, and humidity control were achieved with the Reliable Controls MACH-System.

Serv-All Mechanical Services Ltd. has had an office in Edmonton, Alberta since 1978. The company opened additional offices in Grande Prairie in 2007 and Calgary in 2016, recognizing the needs of their customers all across the province. The company provides HVAC installation, maintenance, and service, as well as building automation system expertise.

To learn more about projects using Reliable Controls® visit www.reliablecontrols.com/projects/overview



PROJECT TYPE:
New Construction

INSTALLATION TYPE:
Boiler, Chiller, HVAC, VAV

TOTAL AREA:
2,713 m² (29,200 ft²)

NETWORK:
BACnet, EIA-485, Ethernet

POINTS:
344

EQUIPMENT INSTALLED:
1 MACH-ProWebSys™
1 MACH-ProSys™
26 MACH-ProAir™
1 MACH-ProZone™

RELIABLE CONTROLS® DEALER:
Serv-All Mechanical Services Ltd.

