LISTEN. THINK. SOLVE.®

L04 - Basic PLC Programming with Micro800® Controllers

PUBLIC

Allen-Bradley • Rockwell Software

Rockwell Automation

Agenda

Rockwell Automation

Introduction to Terms / Concepts

Micro800 Family

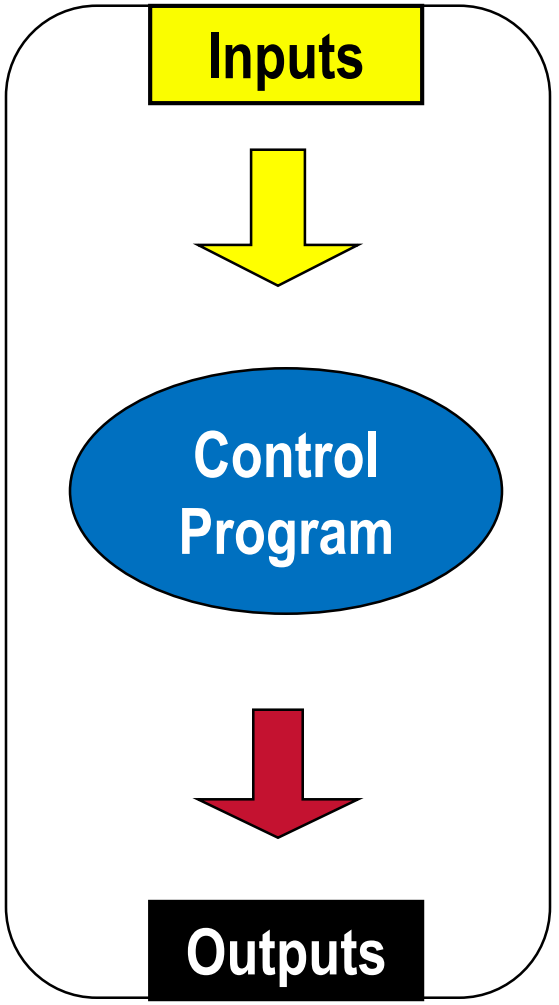
Connected Components Workbench

Application Examples

Hands-On Lab

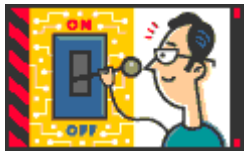
What is a PLC?

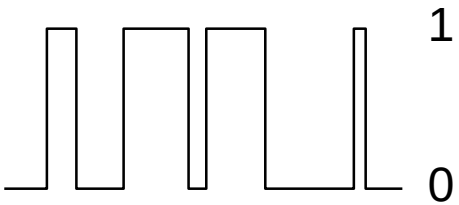
- A solid state (electronic) device that controls output devices based on control program and input signals.



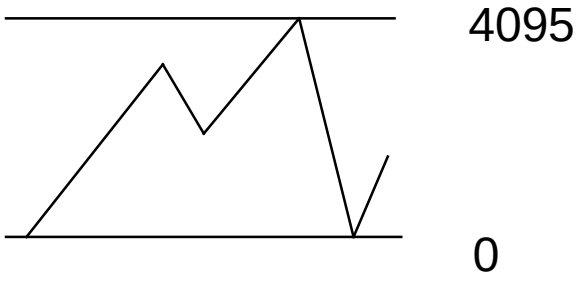
Two Types Of I/O (Inputs & Outputs)

- Digital
  - Also called Discrete
  - Has two possible states
  - Represented by “1” or “0”
  - Electrically:
    - “0” is usually 0 Volts (AC or DC)
    - “1” is a fixed voltage value such as 5VDC, 24VDC, 120VAC, etc.
  - Technology: Relays, Triac, Transistor, MOSFET, TTL





- Analog
  - Has many possible states between two values
  - Example: Temperature sensor
  - Range of values between two limits. For example:
    - 0°F represented by “0”
    - 100°F represented by “4095” (example)
  - Electrically: 4-20mA, 0-5VDC, -10 to 10VDC



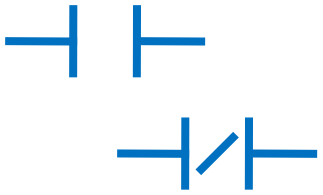
Ladder Logic Example

This is a very simple rung of logic, from a PLC program:

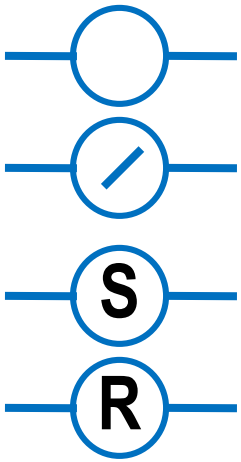
The rung is read as:
If the Start Button is on, turn ON the Light.
If the Start Button is off, turn OFF the Light.

Simple PLC Instructions (IEC 1131)

- Contacts
  - Direct
  - Reverse



- Coils
  - Direct
  - Reverse
  - Set
  - Reset



- Instruction Blocks
  - Arithmetic (+ - * / COS SIN TAN)
  - Binary (Mask, Shift)
  - Boolean (AND,OR,NOT,XOR)
  - Comparator (< > = CMP)
  - Counter (CTD, CTU, CTUD)
  - Data Conversion (ANY_TO_**)
  - Process (PID, SCALER, more…)
  - String (FIND, REPLACE, more…)
  - Time (TON,TOF,TONOFF)

PLC Control Program

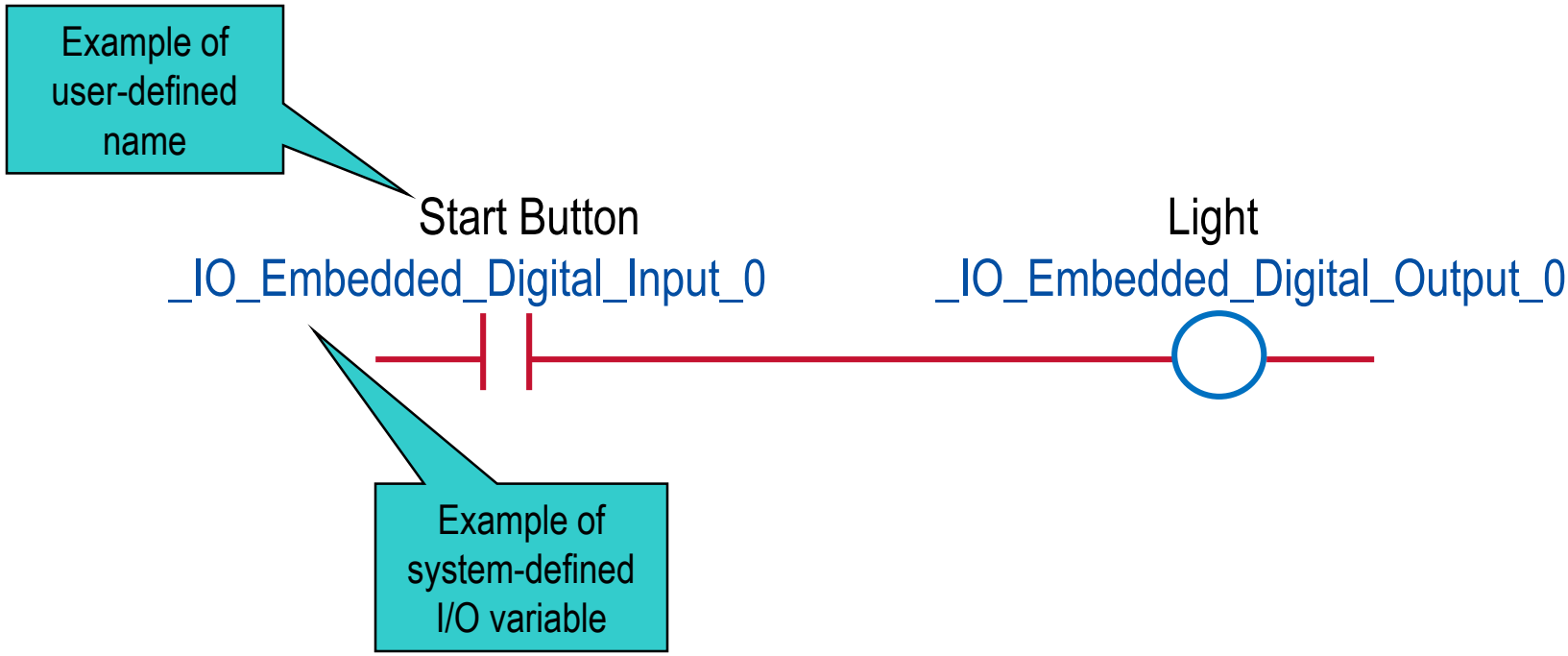
- **Program**
  - Instructions used to process inputs and set outputs
    - Primarily written as (Relay) Ladder Diagram:

    - Programs can also be written in other languages
      - Function Block or Structured Text
- **Data (Variables)**
  - Examples
    - Start_Button is assigned to a digital input
    - Light is assigned to a digital output

I/O Addressing

Rockwell Automation

Often, a descriptive name of the device connected to the I/O point is used in addition to, or in place of the I/O variable which describes the physical location on the controller.

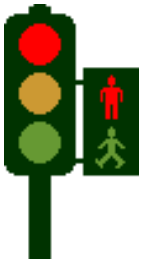


Today's applications require a high level of control capability and advanced features

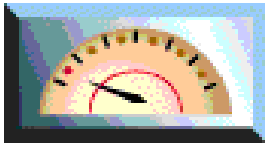
Rockwell Automation

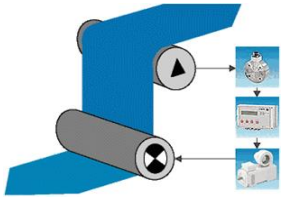
- Arithmetic (Addition, Subtraction, Multiplication, Division, etc.)
- Data Comparison (Equal, Greater Than or Equal, Less Than or Equal)
- Word Manipulation (Copy, Move, etc.)
- Communications or Messaging data between PLC's

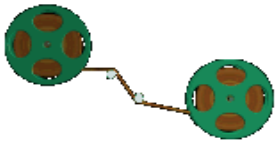
- Sequencing
- Data Manipulation



- Motion and Process Control (Used for Temperature, Pressure, Speed, Flow regulation)







Agenda

Rockwell Automation

- Introduction to Terms / Concepts
- **Micro800 Family**
- Connected Components Workbench
- Application Examples
- Hands-on Lab

Micro800 Controller Family

Rockwell Automation

Nano PLC — Micro PLC

Performance/Features

Local I/O

Each controller is cost and performance optimized for specific applications

Micro810
Programmable relay replacer and timer

Analog I/O

Micro820
For simpler standalone machines and remote automation

EtherNet/IP

Analog I/O

Micro830
For standalone machines with motion

Micro850
For standalone machines with motion and more I/O and Ethernet connectivity

EtherNet/IP

Micro800 PLCs

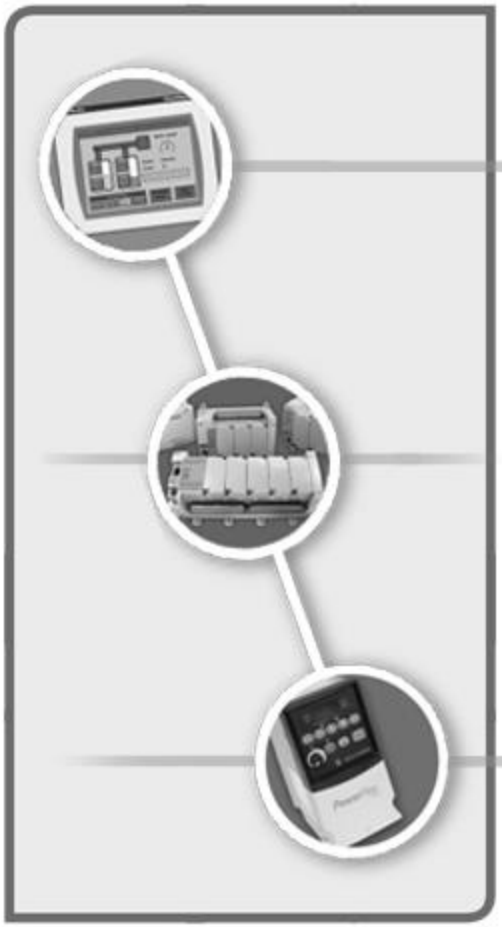
Rockwell Automation

Agenda

Rockwell Automation

- Introduction to Terms / Concepts
- Micro800 Family
- **Connected Components Workbench**
- Application Examples
- Hands-on Lab

Software Introduction



Connected Components Workbench

Release 7.00

Allen-Bradley • Rockwell Software

Rockwell Automation

Powered by Visual Studio

Connected Components Workbench™ Software

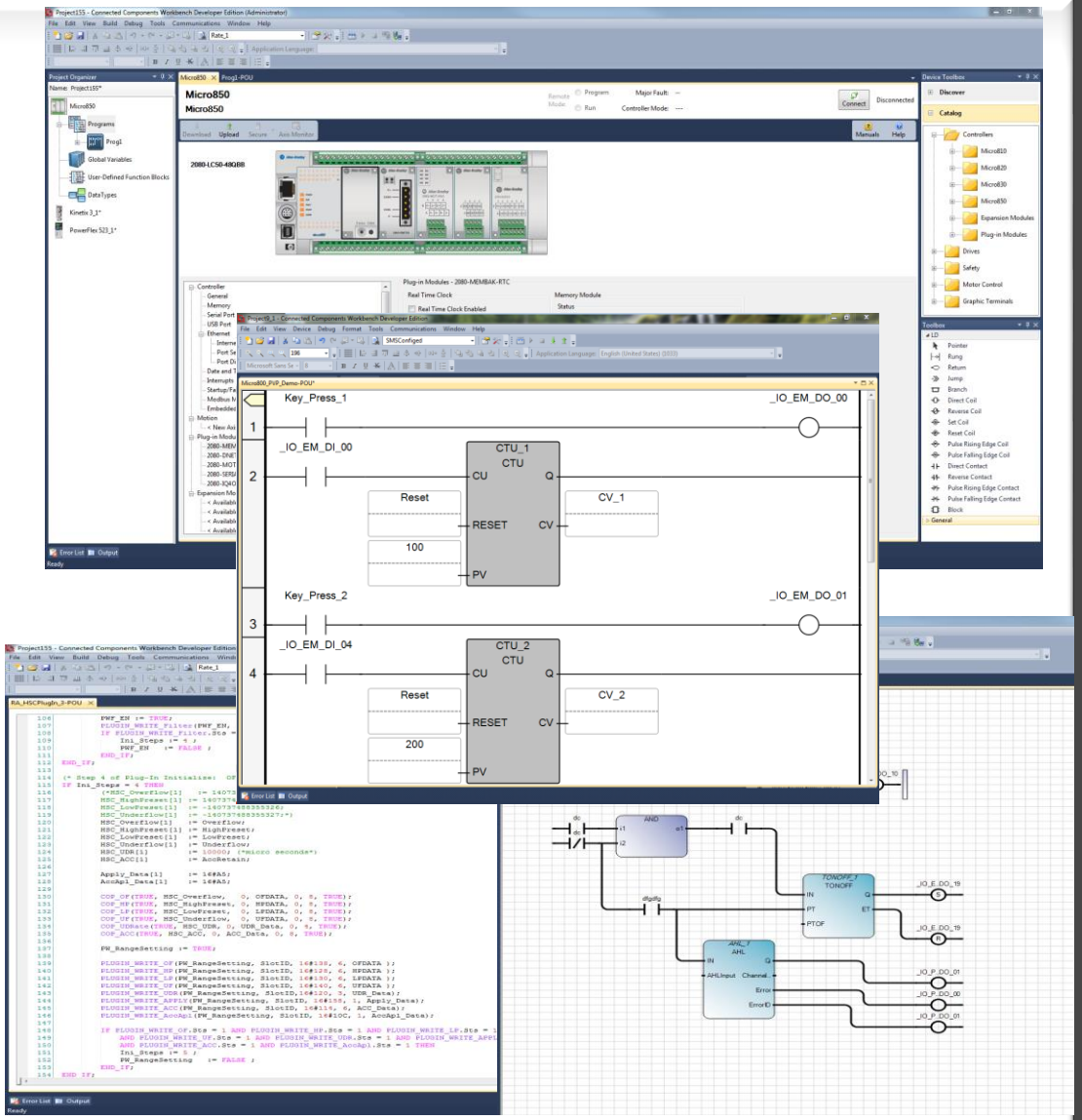
Rockwell Automation

- **Easy** to Acquire/Install
  - Free Internet download
- **Easy** to Configure
  - Single software for component class products
  - Graphical device configuration
- **Easy** to Program
  - Extensive use of Microsoft and IEC-61131 standards
  - Symbolic Programming
  - Rockwell Automation and user-defined function blocks
- **Easy** to Update
  - Software updates available via Internet

Connected Components Workbench Software

Rockwell Automation

- Graphical Micro800 controller configuration
- IEC 61131-3 editors
  - Ladder Diagram, Function Block, Structured Text
  - User-defined function blocks
  - Run-time program download
- Extensive Standard Instruction Set
  - IEC 61131-3 base instructions with Rockwell Automation extensions



Agenda

Rockwell Automation

- Introduction to Terms / Concepts
- Micro800 Family
- Connected Components Workbench
- **Application Examples**
- Hands-on Lab

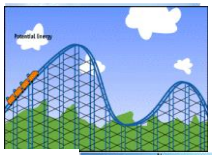
So where could you use a PLC?

Rockwell Automation

- Conveyor control
- Printed circuit board handling equipment
- SCADA(Supervisory Control And Data Acquisition)
- Remote pump/lift station (water/wastewater)
- Flow monitoring for leak detection (Oil & Gas)
- Strapping machinery / trash compactors
- Palletizers
- Compressor control
- Amusement park rides and attractions
- Hard-wired relay panels or Single Board Computers
- Many, many more…

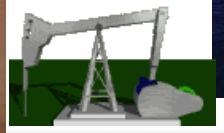


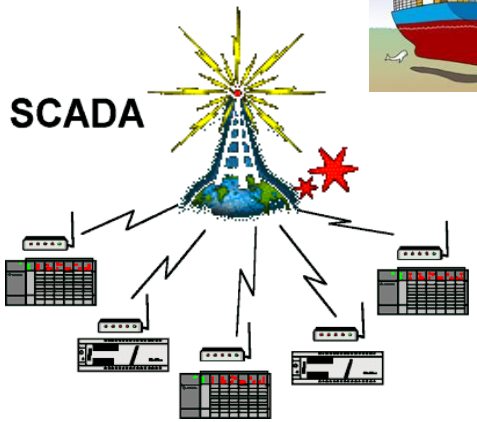











Application Animations

Virtual demo of our application includes voiceover and CC solution drawing

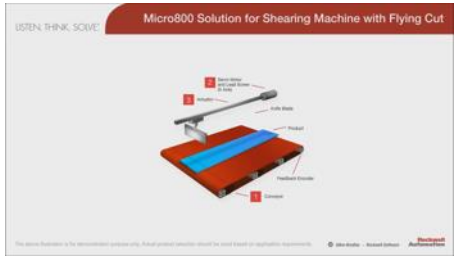
Rockwell Automation

Solar Tracking

Adhesive Labeler

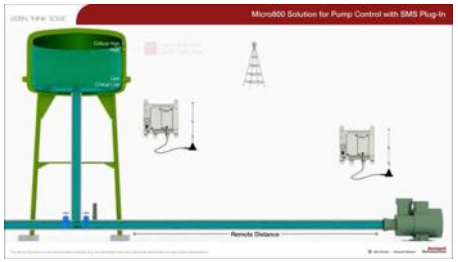
VFFS

Stretch Wrapper



Shearing Machine

Air Handling Unit



Water Pump

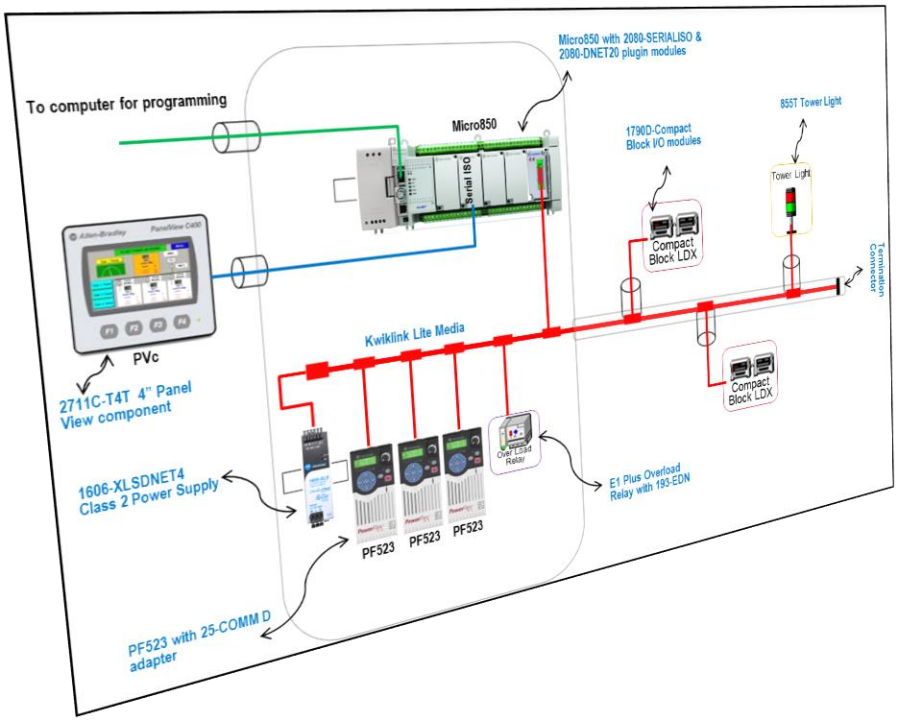
Material Handling Unit

CC Popular Drawings

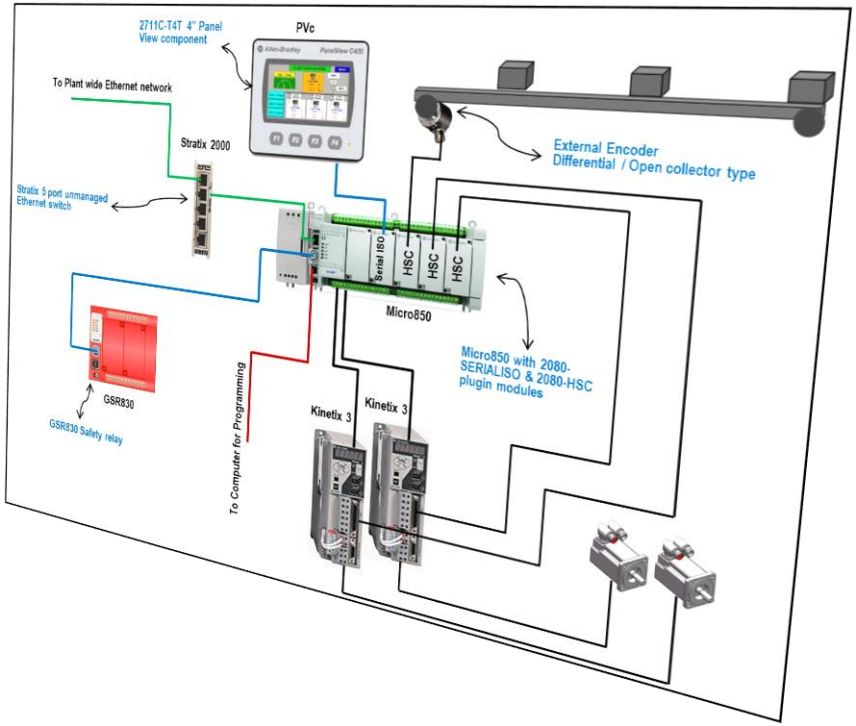
Helps OEMs size & design their machines to avoid issues before they happen

Rockwell Automation

Drives and I/O on DeviceNet



Safety and Motion



Typical Configurations including Test Data to highlight Performance Limitations

Agenda

Rockwell Automation

- Introduction to Terms / Concepts
- Micro800 Family
- Connected Components Workbench
- Application Examples
- **Hands-on Lab**

LISTEN. THINK. SOLVE.®

Basic PLC Programming with Micro800® Controllers

Follow ROKAutomation on Facebook & Twitter.
Connect with us on LinkedIn.

www.rockwellautomation.com

Allen-Bradley • Rockwell Software

Rockwell Automation