



AMATROL

**2023
CATALOG**

**Learning Systems for
Technical Education**

A Systems Approach To Teaching Technical Skills

Industry 4.0 and other new technologies are helping industry advance at a rapid pace, creating a huge growth in the need for individuals with technical skills. The modern versions of technical occupations, such as technicians, technologists, engineers, and operators, all require individuals who possess technical depth and breadth, along with the ability to problem solve and optimize systems.

To address this demand, the Amatrol Learning System enables industry and educational organizations to rapidly implement high quality modern technical skills courses and training programs. The Amatrol Learning System includes all of the tools instructors need to be effective, including:

The Amatrol Learning System

- **Hands-On Workstations With Industrial Quality Equipment**
- **Task-Based Hands-On Exercises**
- **Interactive Multimedia Curriculum With Virtual Simulation**
- **Computerized Assessments With Pre- And Post- Testing**
- **Instructor Guides**
- **Instructor Training Courses**
- **Instructor Support Services**

The elements of the Amatrol Learning System have been designed to work seamlessly with each other. The multimedia lessons directly apply to the hands-on skill exercises, and the computerized assessments directly tie to the objectives of the multimedia lessons. This makes it easy for instructors to implement even if they are new to the technology or even teaching itself.

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Key Learning System Features

These key features have made the Amatrol Learning System a success for thousands of industry and educational organizations:

Industry-Driven - Relevant and Effective

Amatrol hands-on workstations and learning content have been designed in partnership with major companies using task analyses of incumbent workers.

Real World Hands-On Training

Heavy duty training equipment uses industrial quality components and a variety of brands to ensure learners have the skills for today's jobs.

Competency-Based Curriculum

Competency-based curriculum teaches real world industry tasks with a Just-In-Time design that accelerates learning.

Problem Solving / Computer-Based Troubleshooting

For systems equipped with FaultPro, problem solving exercises challenge learners to analyze systems and troubleshoot faults. Amatrol's FaultPro computer-based fault insertion system safely inserts faults and tracks learner progress.



Individualized Learning Plans

Amatrol's eAssessment computer-based software accelerates learning by creating individual learning plans based on prior learner knowledge.

Industry Recognized Credentials

Amatrol programs are aligned with industry-recognized credentials provided by leading credentialing organizations such as SACA, MSSC, PMMI, NIMS, and ASQC.

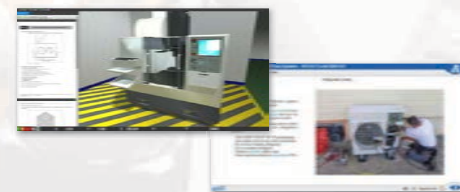


Hybrid Flexible Course Delivery

Curriculum is delivered in interactive multimedia format with virtual hands-on simulators and integrated hands-on equipment exercises. This unique design supports both self-paced and group course delivery.

Modularized Learning

Curriculum consists of a series of short lessons that can be easily customized into short courses to meet specific needs.



Teacher Support

Amatrol offers year-round instructor schools, detailed instructor guides, and unparalleled client service.

Use The Most Engaging eLearning Available!

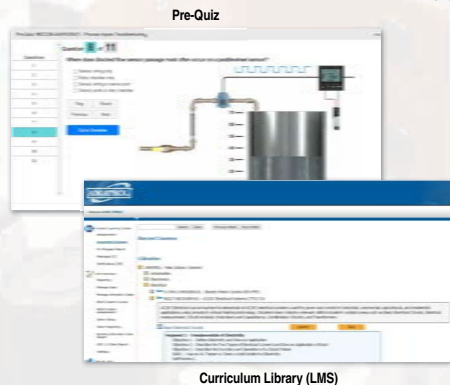
Learning Management

Pre- and Post- Lesson Tests

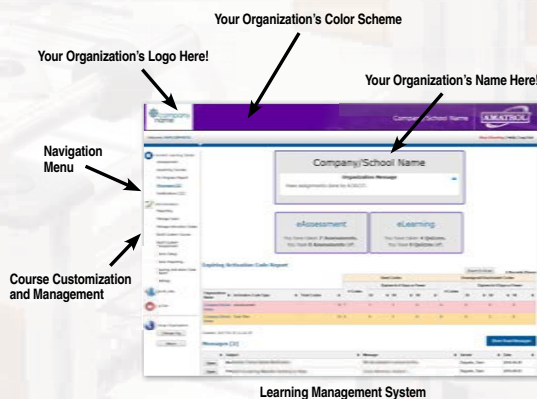
The LMS includes pre- and post- tests that measure learning gains and provide learner feedback for remedial study.

Flexible Course Delivery

Learners can access the interactive multimedia curriculum using Amatrol's free learning management system, a SCORM interface to another LMS, or a local server.



Curriculum Library (LMS)



Learning Management System

Custom Course Capability

Amatrol's LMS makes it easy to customize courses. With over 10,000 hours of lesson content, Amatrol's vast curriculum library can support the technical course needs of entire degree programs.

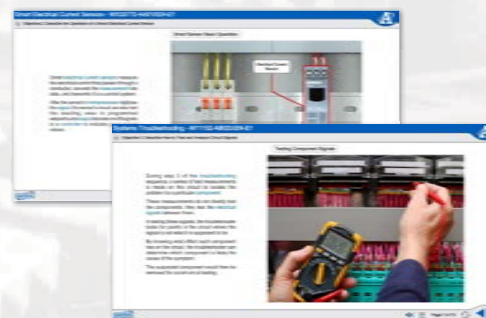
LMS Management Tools

Navigation is very user-friendly and many reports are available to analyze learner results.

Engaging Interactive Multimedia Curriculum

True Multimedia

Amatrol curriculum includes an extensive library of interactive multimedia courses that engage learners, making learning fun and easier. Multimedia lessons use a combination of voice, text, and many types of graphics including 3D animations, videos, photos, and colorful graphics.

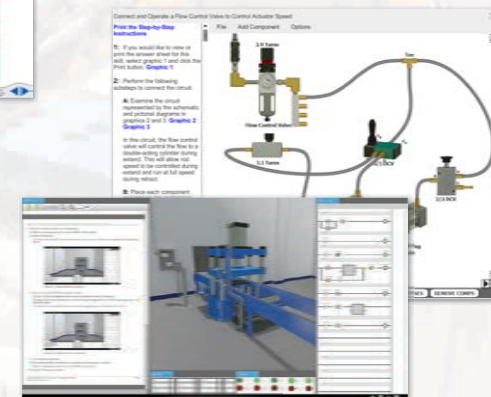


Highly Interactive

Amatrol multimedia courses are unparalleled in their interactivity. Learners operate machines, analyze circuits, and perform troubleshooting exercises.

Virtual Hands-On Trainers

Many courses include online virtual trainers, which are digital twins of hands-on training workstations. Learners can perform the same exercises as on actual training equipment with the same behaviors.



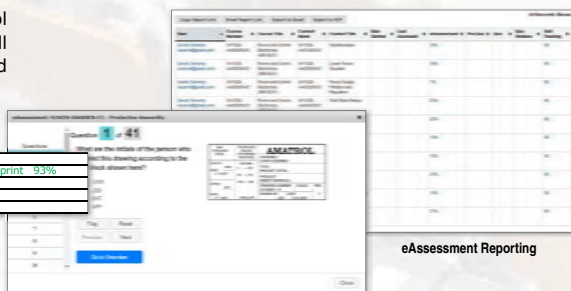
Virtual Trainers

eAssessment

Amatrol's eAssessment online software tool reduces training time by identifying skill gaps and producing customized accelerated learning plans for each individual.

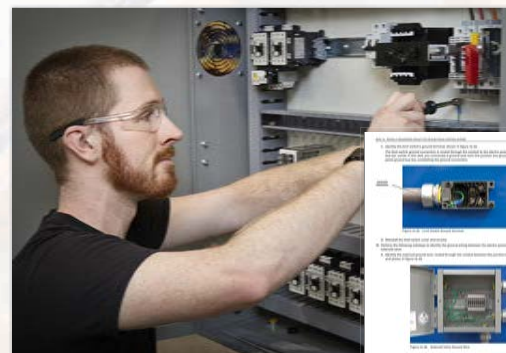
W-12216-XX-04 Assembly Drawings and Fasteners
Objective 1: Describe the five key areas of information located on a print. 93%
Objective 2: Describe the function of a title block. 67%
Objective 3: Describe the function of a change block. 68%
Objective 4: Describe the function of a materials list. 93%

Skill Gap Identification



eAssessment Reporting

eAssessment Test

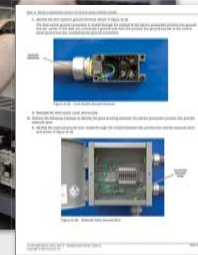


Integrated Hands-On Option

Interactive multimedia courses include an option for integrated skill procedures using hands-on training workstations to provide a seamless eLearning and hands-on experience.

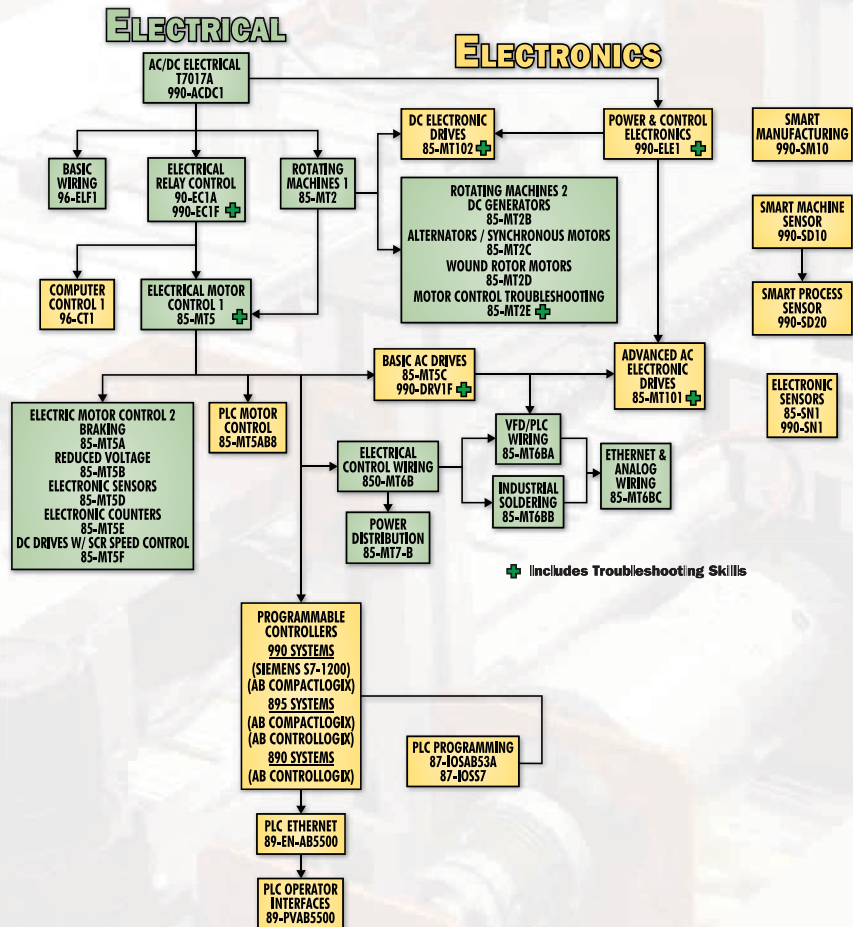
Safety and Workplace Effectiveness Skills

The Amatrol interactive multimedia library includes extensive safety and workplace effectiveness topics, including: communications, conflict resolution, teamwork, problem solving, and applied math.



Hands-On Skill Procedures

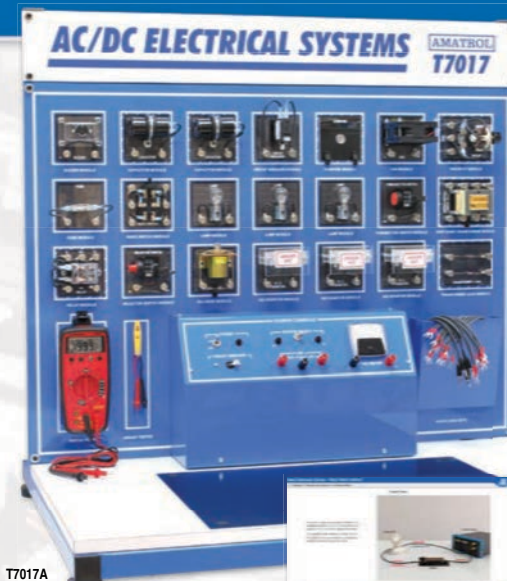
ELECTRICAL-ELECTRONICS LEARNING SYSTEMS



Knowledge Building & Hands-On Electrical-Electronics Skills

Amatrol's electrical-electronics learning systems start with basic electricity and continue to more advanced topics, such as power distribution, motor control, electronic drives, and PLC programming. Only Amatrol offers this full range of multi-discipline, hands-on skill training and thorough eLearning curriculum.

If you need the ability to teach electrical-electronics troubleshooting, look for the FaultPro logo, which indicates the system is equipped with Amatrol's computer-based fault insertion system. FaultPro is the industry's only realistic fault troubleshooting system.



T7017A

T7017A Multimedia Included

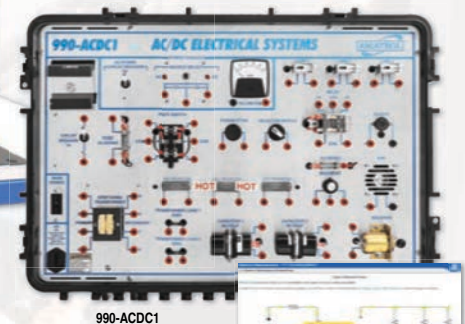
BASIC ELECTRICITY

AC / DC Electrical

► T7017A

► 990-ACDC1 Portable

- AC / DC Voltage and Current Principles
- Resistance, Inductance, and Capacitance
- Series and Parallel Circuits
- Multimeters / Manual Switches
- Circuit Protection, Breakers, and Testers
- Fuses / Resistors / Capacitors / Inductors
- Potentiometers / Solenoids / Control Relays



990-ACDC1

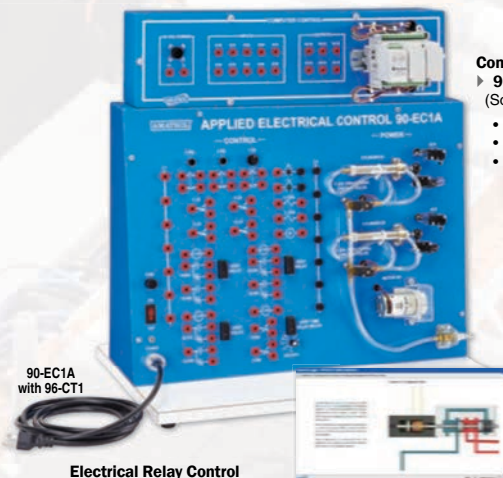
990-ACDC1 Multimedia Included

Computer Control 1

► 96-CT1

(Sold Separately)

- Basic PLC Programming
- PLC Motor Control
- Event Sequencing



90-EC1A
with 96-CT1

90-EC1A Multimedia Included

Electrical Relay Control

► 90-EC1A

► 990-EC1F Portable

- Digital Logic / Relay Control
- Ladder Diagrams / Control Circuit Design
- Seal-in Holding, Relay Sequence, and Timer Relay Circuits
- Electric Motor and Electro-Fluid Power Control
- Input / Output Troubleshooting (990-EC1F)
- Relay Troubleshooting (990-EC1F)



990-EC1F

990-EC1F Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

MOTOR CONTROL



85-MT5, 85-MT5-A and Options

FAULTPRO
COMPUTER-BASED FAULT INSERTION

Fault Troubleshooting System ▶ 890-FTS

- Adds Electronic Fault Insertion to 85-MT5
- Performance Tracking

Level 1 Electrical Motor Control

▶ 85-MT5

- Ladder Diagrams
- Control Relay Circuits
- Control Relays / Manual Switches
- Float, Limit, Pressure, Liquid Level Switches
- Magnetic Motor Starters
- Control Transformers
- Lockout / Tagout
- Reversing Motor Control

Level 2 Electrical Motor Control

- Motor Braking > 85-MT5-A
- Reduced Voltage Starting > 85-MT5-B
- Variable Frequency AC Drive > 85-MT5-C
- Electronic Sensors > 85-MT5-D
- Electronic Counter > 85-MT5-E
- DC Drive with SCR Speed Control > 85-MT5-F



85-MT5 & All Options
Multimedia Included

PLC Motor Control ▶ 85-MT5AB8

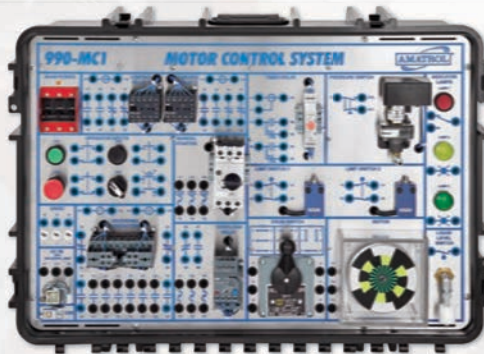
- PLC Orientation
- PLC Operation
- Motor Control Basics
- Timer Instructions
- Time-Driven Sequencing
- Count Up Instructions



85-MT5AB8 Multimedia Included



85-MT5AB8 Adds to 85-MT5



990-MC1F

Portable Electrical Motor Control Troubleshooting

▶ 990-MC1F

- Ladder Diagrams
- Control Relay Circuits
- Control Relays / Manual Switches
- Float, Limit, Pressure, Liquid Level Switches
- Magnetic Motor Starters
- Control Transformers
- Lockout / Tagout
- Reversing Motor Control



990-MC1F Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

ELECTRONIC DRIVES

AC Electronic Drives ▶ 85-MT10-1

- Inverter-Rated and Servo AC Motors
- Inverter and Vector (Spindle) Drives
- Servo Axis Drives
- Resolvers and Encoders
- Velocity and Position Servo Control
- Torque Control
- Parameters and Configuration
- Drive Troubleshooting

DC Electronic Drives ▶ 85-MT10-2

- Servo Axis Drives
- Spindle Drives
- PWM Drives
- SCR Drives
- DC Permanent Magnet Motors
- Inner Loop Compensation
- Torque Control
- Position and Velocity Servo Control
- Tachometers, Resolvers and Encoders
- Parameters and Configuration
- Drive Troubleshooting



85-MT10-1



990-DRV1F

Portable Variable Frequency AC Drives Troubleshooting ▶ 990-DRV1F

- AC Variable Frequency Drive Operation
- 2 & 3 Wire Motor Control
- Jogging Control
- Motor Ramping
- Drive Input Troubleshooting
- Motor Input Troubleshooting
- Drive Relay Troubleshooting
- Parameters and Configuration



990-DRV1F Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

ROTATING MACHINES



85-MT2 & All Options
Multimedia Included

Level 1 Rotating Machines ▶ 85-MT2

- DC Series, Shunt, & Compound Motors
- Split Capacitor 1-Phase AC Motors
- Two Capacitor 1-Phase AC Motors
- Three-Phase AC Motors

Level 2 Rotating Machines

- DC Generators > 85-MT2-B
- Alternators / Synchronous Motors > 85-MT2-C
- Wound Rotor Motors > 85-MT2-D
- Electric Motor Troubleshooting > 85-MT2-E

RESIDENTIAL WIRING



950-ELF1

Electrical Fabrication 1

▶ 950-ELF1

- Introduction to Electrical System Wiring
- Residential Wiring System Components
- Service Connection and Circuit Protection



950-ELF1 Multimedia Included

INDUSTRIAL WIRING

Industrial Electrical Wiring

▶ 850-MT6B

- Electrical Control Wiring
- Electrical Prints
- Panel Wiring
- Pneumatic Control Circuit Wiring
- Overcurrent Protection

VFD / PLC Wiring

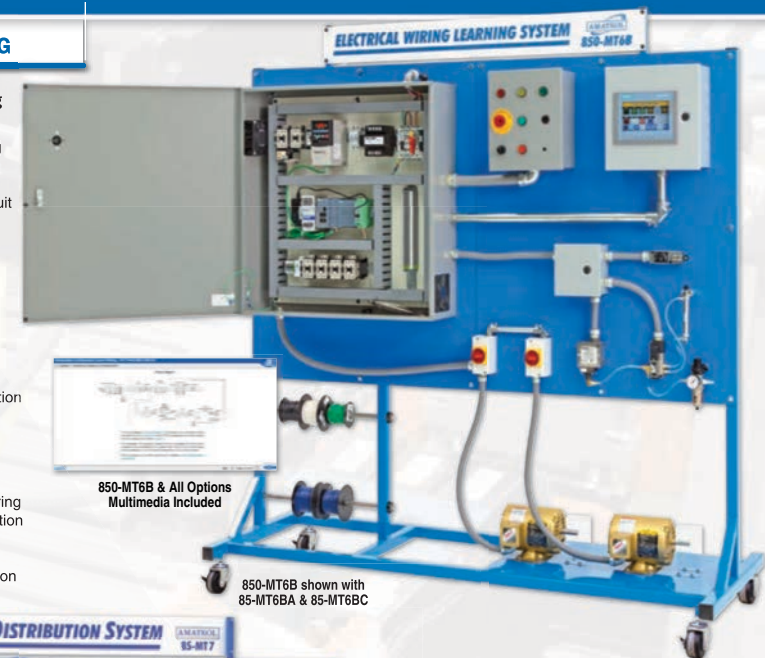
▶ 850-MT6BA

- PLC Installation
- VFD Installation
- VFD Motor Control
- VFD / PLC Communication

Ethernet & Analog Wiring

▶ 850-MT6BC

- Ethernet Installation Wiring
- Ethernet Switch Installation
- HMI Installation
- Analog Transmitter / Thermocouple Installation



850-MT6B & All Options
Multimedia Included

850-MT6B shown with
85-MT6BA & 85-MT6BC



85-MT7B

Industrial Soldering

▶ 85-MT6BB

- Soldering Basics
- Soldering Inspection
- Solder Wick
- Electrical Panel Soldering Applications



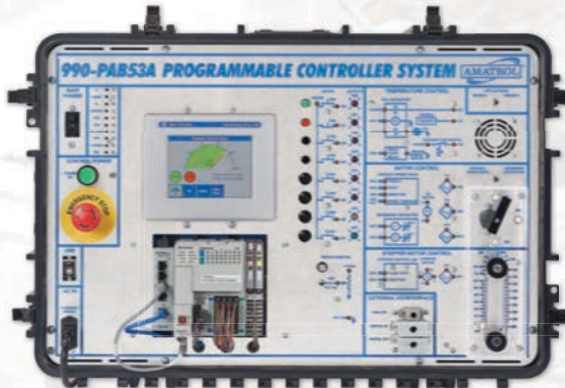
85-MT7B Multimedia Included

Electrical Power Distribution

▶ 85-MT7B

- Raceways
- Conduit Bending and Sizing
- Conductors / Disconnects
- Circuit Protection
- Wire Pulling Techniques

ADVANCED PROGRAMMABLE CONTROLLERS



990-PAB53AF (Includes 990-PAB53A and 99-FTSAB53A)

Portable PLC Troubleshooting - Siemens S7-1200 ► 990-S712F

- Introduction to PLCs
- Basic HMI Panel Operation
- PLC Programming
- PLC Motor Control
- Event Sequencing
- PLC Motion Control

Portable PLC Troubleshooting Siemens S7-1200 ► 99-FTSS712 Allen-Bradley AB5300 ► 99-FTSAB53

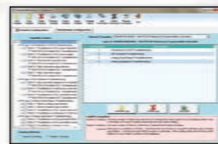
- Introduction to PLC Troubleshooting
- PLC Systems Troubleshooting
- Analog Input / Output Troubleshooting
- Analog Application Troubleshooting



990-P5712F (Includes 990-P5712 & 99-FTSS712)

Portable PLC Troubleshooting ► 990-PABCL1F

- Controller Operations
- PLC Program Operations
- PLC I/O Testing
- Event Sequencing
- Processor Troubleshooting



Electronic Fault Troubleshooting System for Portable 990 PLC Systems

FAULTPRO
COMPUTER-BASED FAULT INSERTION

990-PABCL1F

Portable PLC Troubleshooting - Allen-Bradley CompactLogix ► 990-PAB53AF

- Introduction to PLCs
- PanelView Plus
- Terminal Operation
- PLC Programming
- PLC Motor Control
- Event Sequencing



990-PAB53AF Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

SMART CONTROLS TROUBLESHOOTING SYSTEM 895



895 shown with optional panels



895 Multimedia Included

PLC Applications and Troubleshooting ► 895 Smart Controls Troubleshooting System

- PLC Troubleshooting
- PLC Programming
- ControlLogix Configuration
- CompactLogix Configuration
- Analog I/O Control
- PLC Motor Control
- Math and Data Instructions
- PID Temperature Control
- Ethernet/IP Communication
- IIoT Smart Sensors with IO-Link
- Ethernet/IP Communication
- Distributed I/O

PLC Applications and Troubleshooting ► 890-PECB Plus Controller (Requires 890 Controller and Panels)

- Operation
- Programming
- System Troubleshooting
- PLC Motor Control
- Boolean Algebra / Logic
- Ladder Logic
- Discrete I/O Interfacing
- Timer Instructions
- Counter Instructions
- Event Sequencing
- Application Development
- Program Control

FAULTPRO
COMPUTER-BASED FAULT INSERTION



890-PECB shown with 89-MIP Expansion Panel, separately supplied

Computer not included

OPTIONS FOR 890-BASED PLC SYSTEMS

Allen-Bradley ControlLogix (AB5500)

- Analog Application ► 89-AS-AB5500
- ControlNet ► 89-CN-AB5500
- EtherNet ► 89-EN-AB5500
- Process Control ► 89-PC-AB5500
- PanelView Plus ► 89-PVAB5500

INDUSTRIAL ELECTRONICS

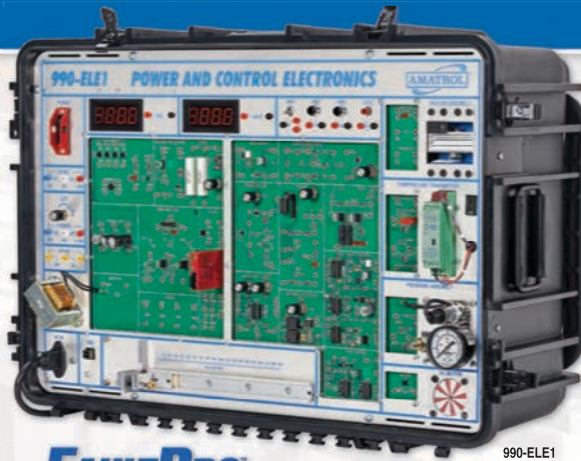
Portable Power & Control Electronics

► 990-ELE1

- Oscilloscopes
- Power Supply Filtration & Regulation
- Discrete Sensing Devices
- Thermal Sensing Devices
- Analog Sensing
- Amplifiers and Op Amps



990-ELE1 Multimedia Included



990-ELE1

ELECTRONIC SENSORS

990-SN1



Electronic Sensors

► 990-SN1 Portable

► 85-SN1

(85-SN1 may be used with 850-P1 and 850-H1)

- Sensor Applications
- Inductive and Capacitive Sensors
- Magnetic Reed and Hall Effect Sensors
- Photoelectric Sensors



990-SN1 & 85-SN1 Multimedia Included

Portable Smart Manufacturing

► 990-SM10

- Smart Manufacturing System
- Wireless Temperature/ Humidity Sensor
- Current Transformer Sensor
- Vibration Monitoring Application
- PLC I/O Application
- Cybersecurity
- Production Monitoring



990-SM10

SMART SENSORS

Portable Smart Machine Sensors

► 990-SD10

- Industrial Internet of Things
- Cloud Computing
- Smart Photoelectric Sensor Configuration
- Bluetooth Sensor Communication
- Smart Analog Pressure & Position Sensors
- Smart Condition Monitoring Sensors
- Smart RFID Readers

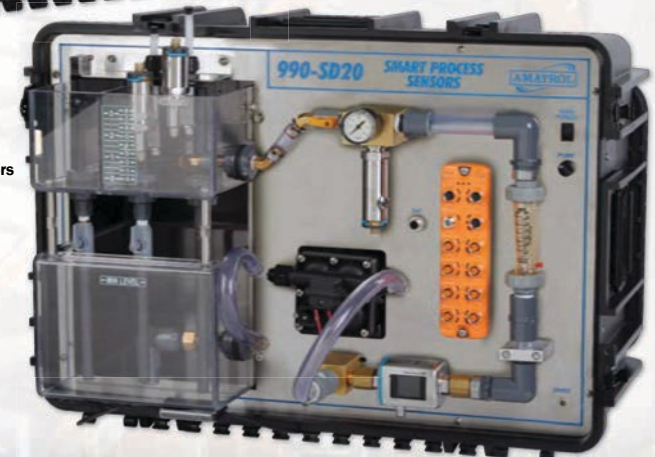


990-SD10

Portable Smart Process Sensors

► 990-SD20

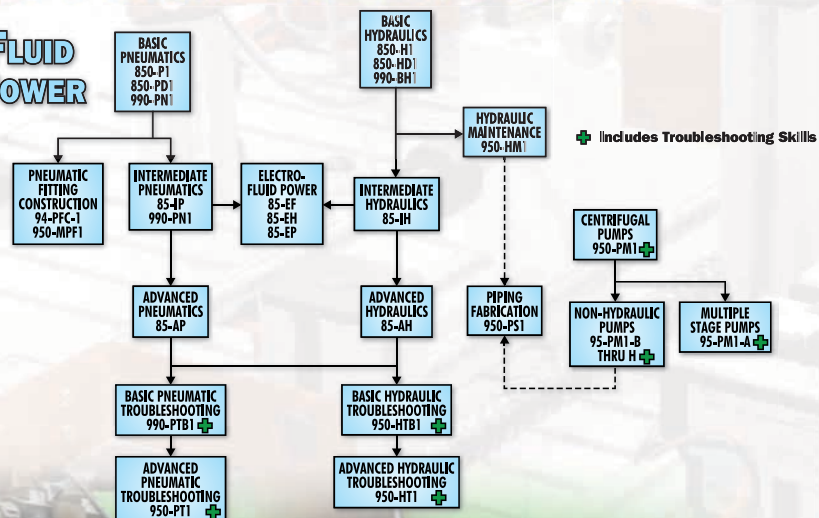
- Smart Pressure Sensor
- Smart Flow Sensor
- Smart Liquid Level Sensor
- Ethernet Data Transfer
- Fluid Circulation System



990-SD20

FLUID POWER LEARNING SYSTEMS

FLUID POWER



Fluid Power Training for Every Need

Amatrol's fluid learning systems provide learners of all skill levels with the opportunity to develop and enhance their knowledge and hands-on skills in the fluid power industry. These training solutions cover basic to advanced hydraulics and pneumatics, as well as pumps and piping. Multiple options include FaultPro, Amatrol's computer-based fault insertion system.

HYDRAULICS



850-HD1 with 85-EF and 85-BP

Basic Hydraulics – Double-Sided

► **850-HD1**
(Single-Sided 850-H1 model also available)

- Pumps / Cylinders / Motors
- Directional Control Valves
- Check, Relief, and Pressure Reducing Valves
- Sequence and Flow Control Valves
- Hydraulic Circuit Applications



850-HD1 Multimedia Included



85-IH Multimedia Included

Intermediate Hydraulics

► **85-IH**

- Accumulators
- Pilot-Operated DCVs and Check Valves
- Direct-Operated Relief Valves
- Rapid Traverse Slow Feed Circuits
- Cylinder Sequencing CAM-Operated DCVs
- Remote Pressure Control / Pump Unloading Circuits

Electro-Hydraulics

► **85-EH**

- Basic Control Devices
- Power Devices
- Control Relays
- Multiple Cylinder Control
- Sensor Applications
- Circuit Protection



85-EH Multimedia Included

Advanced Hydraulics

► **85-AH**

- Motor Applications
- Hydraulic Pump and Motor Performance
- Fluids and Conditioning
- Heat Exchangers
- Motor Circuits



85-AH Multimedia Included

Portable Basic Hydraulics

► **990-BH1**

- Pumps / Cylinders / Motors
- Directional Control Valves
- Check, Relief, and Pressure Reducing Valves
- Sequence and Flow Control Valves
- Hydraulic Circuit Applications



990-BH1 Multimedia Included



990-BH1

HYDRAULIC MAINTENANCE

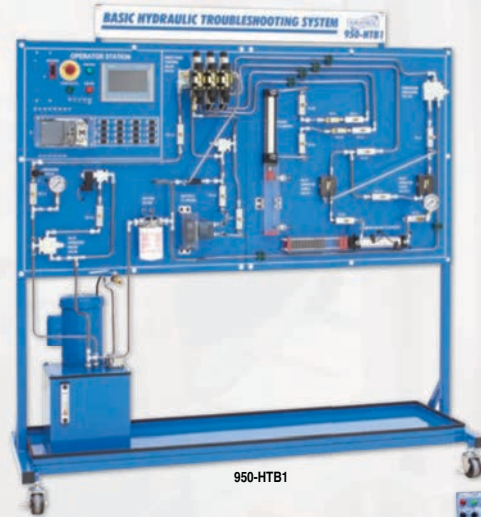
Hydraulic Maintenance ▶ 950-HM1

- Hydraulic Filter Maintenance
- Hydraulic Fluid Maintenance
- Flushing Hydraulic Fluid
- Fittings & Seals
- O-Ring Seals
- Hose & Clamping Devices
- Cylinder Bleeding
- Tubing & Component Inspection
- Component Replacement



950-HM1 Multimedia Included

HYDRAULIC TROUBLESHOOTING



950-HTB1

Hydraulic Troubleshooting ▶ 950-HT1

- Valves: Unloader, Pilot-Operated, Counterbalance, Subplate Mounted, Pressure Compensated Flow Control
- Pilot-Operated DCVs
- Pressure-Compensated Pump
- Gear Pump
- JIC Tie-Rod Cylinders
- Maintenance
- Troubleshooting



Unloader Valve on 950-HT1



2-Stage Directional Control Valve on 950-HT1



950-HT1

Basic Hydraulic Troubleshooting ▶ 950-HTB1

- Hydraulic Pump Troubleshooting
- Hydraulic Actuator Troubleshooting
- DCV Troubleshooting
- Hydraulic System Troubleshooting
- Machine Sequence Troubleshooting
- Machine Performance Troubleshooting



950-HTB1 Multimedia Included



950-HM1

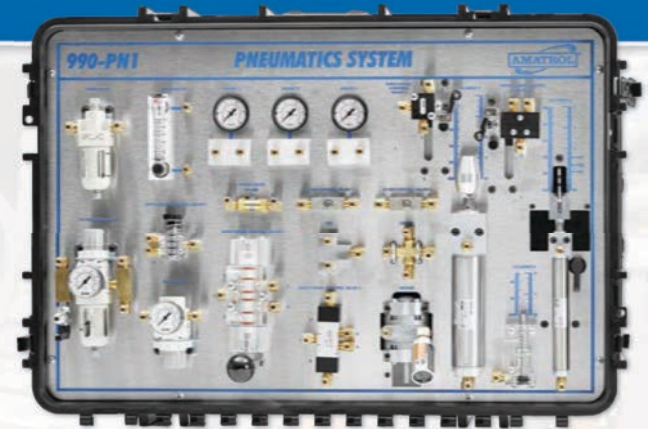
PNEUMATICS

Portable Pneumatics ▶ 990-PN1

- Pneumatic Power Systems
- Pneumatic Circuits
- Pressure and Flow Principles
- Speed Control Circuits
- Air Logic
- Schematics
- Pneumatic Maintenance



990-PN1 Multimedia Included



990-PN1

Basic Pneumatics ▶ 850-PD1

(Single-Sided 850-P1 model also available)

- Pressure, Force, Power, Work
- Pascal's and Gas Laws
- Cylinders / Motors
- Directional, Check, Pressure, & Flow Control Valves



850-PD1 Multimedia Included

Intermediate Pneumatics ▶ 85-IP

- Cam and Pilot Operated Check Valves
- Cylinders / Shuttle Valves / Air Logic
- Water Removal Techniques
- Air Dryers / After-Coolers
- Water Traps / Air Lubricators



85-IP Multimedia Included

Advanced Pneumatics ▶ 85-AP

- Pneumatic Cylinder Loads and Applications
- Quick Exhaust Valves
- Motor Loads / Air Bearings / Filtration
- Flow Measurement



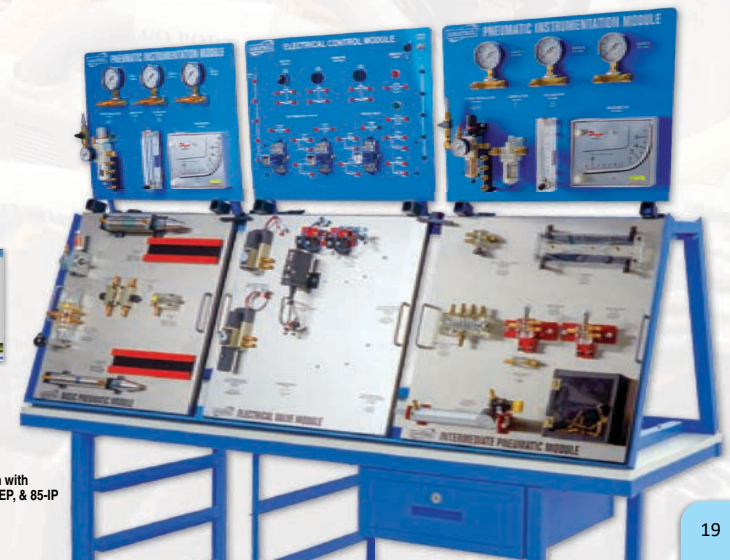
85-AP Multimedia Included

Electro-Pneumatics ▶ 85-EP

- Electrical Control Systems
- Basic Control Devices
- Power Devices
- Control Relays
- Sequencing Control
- Timer Control
- Pressure Control Applications
- Circuit Applications



85-EP Multimedia Included



850-PD1 shown with additional 85-BP, 85-EP, & 85-IP

PNEUMATIC TROUBLESHOOTING

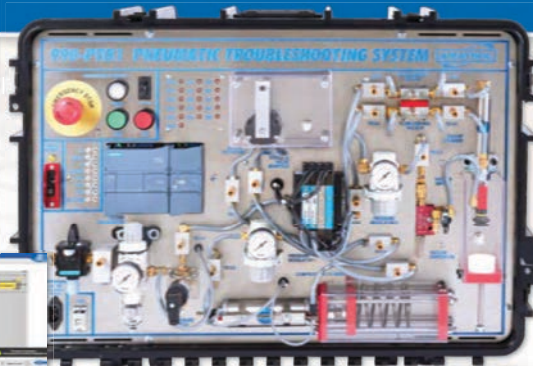
Portable Basic Pneumatic Troubleshooting ► 990-PTB1

- In-Circuit Pneumatic Component Testing
- Air Preparation Troubleshooting
- Regulator Troubleshooting
- Vacuum System Troubleshooting
- Quick Exhaust Valves

FAULTPro
COMPUTER-BASED FAULT INSERTION



990-PTB1 Multimedia Included



990-PTB1



950-PT1

Pneumatic Troubleshooting ► 950-PT1

- Air-Over-Oil Systems
- Pilot-Operated DCVs
- Rodless and JIC Tie-Rod Cylinders
- Subplate-Mounted and Sandwich Valves
- Cylinders
- Shock Absorbers
- Vacuum Systems
- Lockout / Tagout

FAULTPro
COMPUTER-BASED FAULT INSERTION

PNEUMATIC CONSTRUCTION

Pneumatic Fitting Construction ► 94-PFC-1

- Air Supply Installation
- Control Air Connections
- Power Air Installation



94-PFC-1 Multimedia Included

94-PFC-1 Fitting Panel and Component Kit



PUMPS

Centrifugal Pump Systems ► 950-PM1

- Pump Operation and Troubleshooting
- Flow Meters and Measurement
- Pressure / Flow Characteristics
- Pump Head
- Performance, Efficiency, Priming
- Cavitation and Pseudo-Cavitation

Pump Learning System Options

- Multiple Pump > 95-PM1-A
- Turbine Pump > 95-PM1-B
- Diaphragm Pump > 95-PM1-C
- Peristaltic Pump > 95-PM1-D
- Piston Pump > 95-PM1-E
- Gear Pump > 95-PM1-F
- Magnetic Pump > 95-PM1-G
- Centrifugal Pump > 95-PM1-H



Turbine Pump



Diaphragm Pump



PIPING

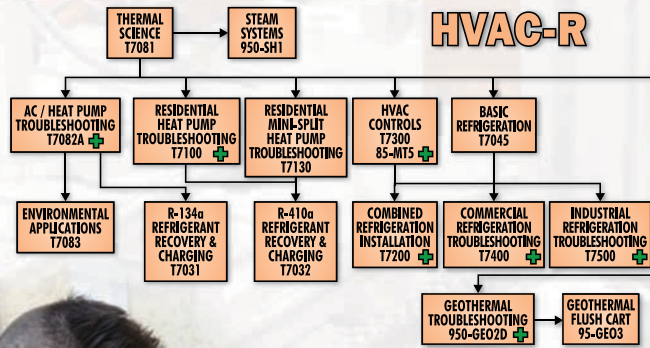
Piping Systems ► 950-PS1

- Plastic Piping Installation
- Iron Piping Installation
- Hose Installation
- Tubing Installation
- Sloan Valve Maintenance
- Fitting & Piping ID
- Schematic Reading
- Cutting & Bending



950-PS1

HVAC-R LEARNING SYSTEMS



✚ Includes Troubleshooting Skills

HVAC-R Skills Are Vital for Industrial & Residential Applications

Heating, ventilation, air conditioning, and refrigeration (HVAC-R) skills, including thermal, geothermal, and steam power, are a unique skill set that demands a firm understanding of the principles involved. Amatrol's HVAC-R learning systems start with the basics, such as phase change, and continue into more advanced concepts such as enthalpy and the laws of thermodynamics. These systems teach hands-on skills related to pressure measurements, preventive maintenance, and troubleshooting.

THERMAL SCIENCE

Thermal Science ▶ T7081

- Temperature and Pressure Measurement
- Thermal Expansion
- Enthalpy, Phase Change
- Heat Transfer, Thermodynamic Laws
- Gas Laws and Phase Equilibrium



T7081 Multimedia Included



T7081

HEAT PUMPS AND REFRIGERATION

Environmental Applications ▶ T7083

- Insulation
- Psychrometrics
- Residential Heating and Cooling
- Thermal System Performance

Heat Pump Troubleshooting ▶ T7082-A
(Also available as a T7082 without Troubleshooting)

- Thermal Energy and Heat Transfer
- Thermodynamic Laws and Properties
- Refrigeration Thermodynamics
- Heat Pump Operations
- Thermal System Troubleshooting
- Phase Diagrams
- Property Tables
- Refrigerant Types

Environmental Application System T7083

T7083 adds to T7082-A

T7083 Multimedia Included

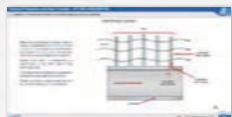
T7082-A includes FaultPro Electronic Fault Insertion

Thermal Troubleshooting System T7082-A

FAULTPRO
COMPUTER-BASED FAULT INSERTION

Basic Refrigeration ▶ T7045

- Temperature and Pressure Measurement
- Refrigeration Energy
- Compressors
- Heat Transfer
- Phase Change Effects
- Condensers and Evaporators
- Auxiliary Refrigeration Components
- Refrigeration System Performance



T7045 Multimedia Included



T7045

REFRIGERANT RECOVERY AND CHARGING

Refrigerant Recovery and Charging

- ▶ T7031 (Uses R-134A Refrigerant)
- ▶ T7032 (Uses R-410A Refrigerant)

- Refrigerant Fundamentals
- Environmental Regulation of Refrigerants
- Ultrasonic, Dye, & Halide Leak Detectors
- Gas Pressurization and Soap Leak Detection
- Refrigerant Recovery & Recycling
- Refrigerant Handling & Storage Procedures
- Refrigerant Charging Methods
- Charging Blended Refrigerants



T7031/T7032 Multimedia Included



T7031



T7032

Digital Gauge Manifold ▶ T7033

- Bluetooth Probes for Wireless Measurement
- Results via Smart App
- Pressure and Temperature Measurement
- Superheat and Subcooling Measurement
- Vacuum Measurement



T7033

RESIDENTIAL HEAT PUMPS

Residential Heat Pump Troubleshooting ▶ T7100

- Introduction to Residential Heat Pump Systems
- Heat Pump Thermostat Operation
- HVAC Pressure and Temperature Measurements
- Heat Pump Component Tests
- Troubleshooting Residential Heat Pump Systems



T7100 Multimedia Included



T7100



T7130

Residential Mini-Split Heat Pump Troubleshooting ▶ T7130

- Introduction to Residential Mini-Split Heat Pump Systems
- Mini-Split Heat Pump Operation
- HVAC Pressure and Temperature Measurements
- Mini-Split Heat Pump Component Tests
- Troubleshooting Residential Mini-Split Heat Pump Systems



T7130 Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

REFRIGERATION INSTALLATION

T7200

Combined Refrigeration Installation ► T7200

- Fluid Conductors / Tubing / Piping
- Fitting Selection and Sizing
- Soldered / Brazed Connections
- Circuit Breakers
- Wiring Selection and Sizing
- Testing System Operation

T7200 (Back)

T7200 Multimedia Included

T7200 (Front)

COMMERCIAL REFRIGERATION

COMMERCIAL REFRIGERATION

T7400

T7400

Commercial Refrigeration ► T7400

- Mechanical and Electrical Control Components & Connection
- Semi-Hermetic Compressors
- Smart Controllers
- Electronic Expansion Valves
- Multi-Zone Refrigeration
- Defrost Control
- Programming Commercial Refrigeration Systems
- Troubleshooting Commercial Refrigeration Systems

FAULTPRO
COMPUTER-BASED FAULT INSERTION

STEAM

Steam Systems ► 950-SH1

- Steam System Operation
- Temperature Measurements
- Pressure Measurements
- Thermal Expansion
- Steam States
- Internal Energy & Enthalpy
- Steam Tables & Diagrams
- Boiler Operation
- Boiler Subsystems
- Stem & Yoke Valve Operation
- Strainer Inspection
- Preventive Maintenance

STEAM SYSTEMS

950-SH1

950-SH1

GEOHERMAL

GEOHERMAL LEARNING SYSTEM

950-GE0

950-GE02 Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

95-GE03
Shown with
950-GE02D

Geothermal Troubleshooting ► 950-GE02

- Geothermal Heat Pump Systems
- System Performance
- Components and Operation
- Component Troubleshooting
- System Troubleshooting
- Coefficient of Performance
- Source Circuit Piping and Components
- Energy Units of Measure
- Phase Change Effects
- Heat Transfer

Geothermal Flush Cart ► 95-GE03

(Adds to 950-GE0 for Pressurized Operation)

- Circulator Pump
- Control Unit
- Control Valves
- Hose Set
- Water Tank

95-GE03 Multimedia Included

MASTERING INDUSTRY 4.0 & ADVANCED MATERIALS CONCEPTS FOR NEXT GENERATION CAREERS



IGNITE: THE ELEMENTS

eLEARNING COURSES

- Technical Skills
- Employability Skills
- Virtual Technology



HANDS-ON TECHNOLOGY

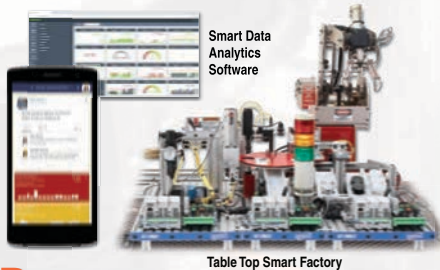


Table Top Smart Factory

PROJECTS

- Team-Based Projects
- Mini-Projects



Portable Solar Electric Living with Fresh Water

Autonomous Delivery Service



CAREER EXPLORATION

IGNITE is a foundational skills development program designed to stimulate learner interest in today's Advanced Manufacturing/ Industry 4.0 careers. Learners learn about the many careers and experience them firsthand by performing tasks with hands-on Industry 4.0 / IIoT technology & virtual environments.



PROJECT-BASED LEARNING

IGNITE's curriculum is the perfect blend of career exploration, creative learning, & skill development. IGNITE develops critical skills in systems-thinking & team problem solving through creative project-based learning activities and a structured curriculum.



SKILL CERTIFICATIONS

IGNITE is a competency-based program that develops skills. IGNITE aligns with industry-recognized 3rd party occupational certifications including the Smart Automation Certification Alliance (SACA) & the Manufacturing Skills Standards Council (MSSC).



- Inspiration
- College Credit
- Career Exploration
- Industry-Recognized Certifications
- Collaborative & Creative Thinking

Course 1
INTRODUCTION TO ADVANCED MANUFACTURING
Introduces fundamental concepts in advanced manufacturing, designed to ignite interest and develop basic skills. Technical Highlights: Smart Automation, CNC, Robotics, CAD, Additive Manufacturing, and Safety.

01



02

Course 2
INTRODUCTION TO SYSTEMS
Projects applying team concepts and problem solving to basic systems. Expands on Course 1 technical topics in Smart Automation.

Course 3
MECHATRONIC SYSTEMS
Projects in mechatronic systems combining computer-based controllers with electrical, mechanical, and fluid technologies. Introduces Programmable Controller (PLC) programming and applications.

03

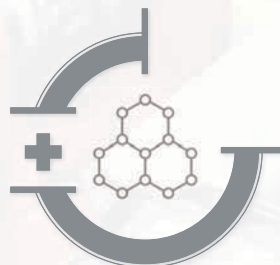


04

Course 4
DIGITAL MANUFACTURING SYSTEMS
Projects in Digital Enterprise Systems combining PLCs, Robotics, and Cloud Technologies. Introduces Networking, CAM, Cloud-Based Data Collection, and Lean Manufacturing.

MATERIALS SCIENCE

IGNITE includes additional project-based learning activities to connect advanced manufacturing to materials science and the engineering design cycle.



Course 5 ADVANCED MATERIALS & DESIGN

A capstone course that deepens technical skills in advanced manufacturing processes, materials, and design while completing an advanced team project. Features CAD / CAM, CNC, welding, plastics, and materials engineering.

05



06

Course 6
IIoT, DATA ANALYTICS, & NETWORKING
A capstone course that enriches technical skills in Industry 4.0 systems and the Industrial Internet of Things using managed networks, data analytics software, cybersecurity, variable frequency drives, RFID, barcode, and smart sensors.

COLLEGE & CAREER SUCCESS!



INDUSTRY 4.0 FUNDAMENTALS

Industry 4.0 Fundamentals (I4F) teaches basic manufacturing skills and builds industrial competencies in areas like PLC troubleshooting, mechatronics, and data analytics, as well as how to program and operate a FANUC robot. I4F was developed by subject matter experts with real-world feedback from industry and educational institutions. This program for secondary or post-secondary education is divided into four major course areas.

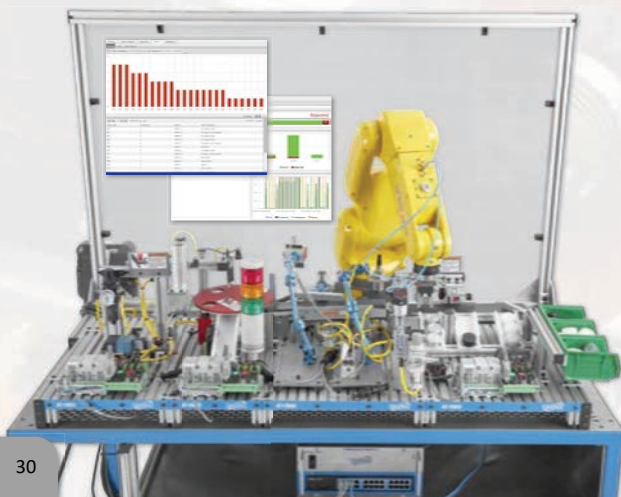
INTERACTIVE MULTIMEDIA CURRICULUM



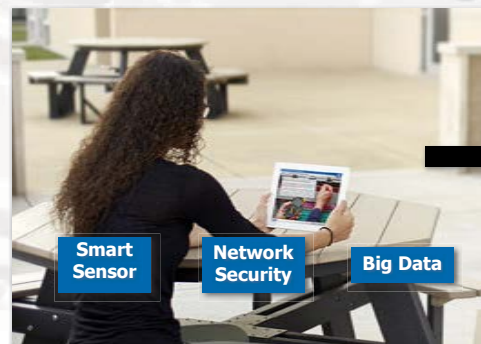
VIRTUAL TRAINING



HANDS-ON INDUSTRIAL TRAINING



From Training to Factory Floor



Smart Sensor

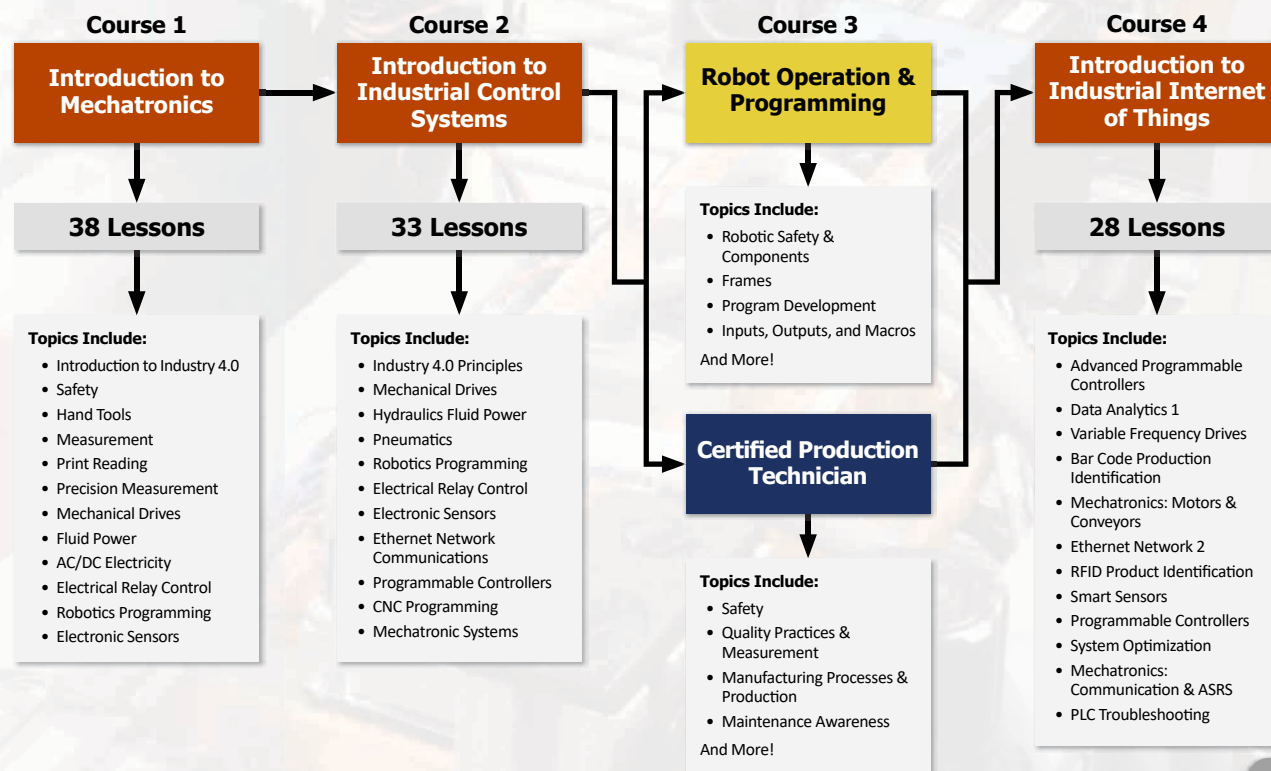
Network Security

Big Data



Interconnected Components

Cloud-Based Analysis

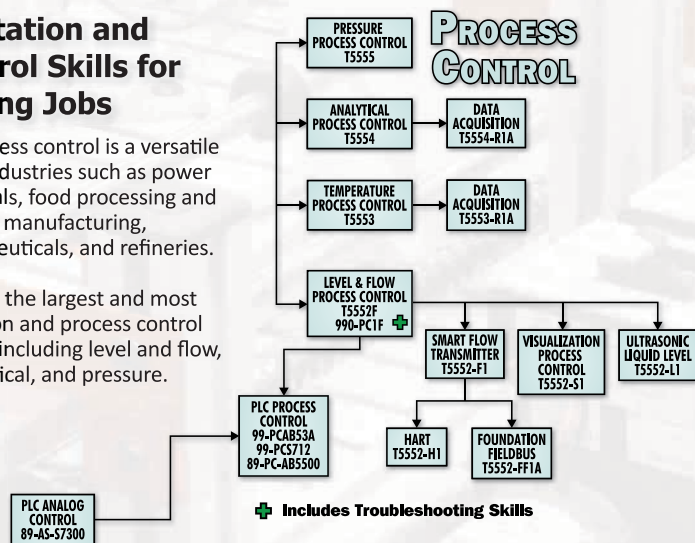


INSTRUMENTATION & PROCESS CONTROL LEARNING SYSTEMS

Instrumentation and Process Control Skills for Rewarding Jobs

Instrumentation and process control is a versatile and vital part of major industries such as power generation, petrochemicals, food processing and bottling, chemical manufacturing, bio-technology, pharmaceuticals, and refineries.

Amatrol has developed the largest and most in-depth instrumentation and process control training options available including level and flow, temperature, analytical, and pressure.



PROCESS CONTROL TROUBLESHOOTING

Level / Flow Process Control Troubleshooting

T5552F

- P&I Diagrams
- Flow & Liquid Level Measurements
- Transducers / Transmitters
- Component Level Troubleshooting
- System Level Troubleshooting
- In-Circuit Testing
- Out-of-Circuit Testing



T5552F Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

ControlLogix Process Control

89-PC-AB5500

(Connects to the T5552 and T5553)

- On / Off Control with Discrete and Analog Input
- Open Loop PLC Control
- Closed Loop PLC Control



T5552F

89-PC-AB5500
PID Control

PLC PROCESS CONTROL

PLC Process Control

- ▶ 99-PCAB53A
- ▶ 99-PCS712

- On / Off Control with Discrete & Analog Input
- Open & Closed Loop Control
- Closed Loop Performance
- Closed Loop Tuning



99-PCAB53A shown with T5552F
and 990-PAB53A Portable

T5552F ADD-ONS

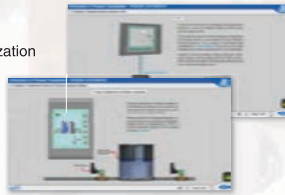


T5552-S1 and Software

Visualization Process Control

► T5552-S1

- Introduction to Process Visualization
- UDC Controller Configuration
- Application Editing
- Input & Output Objects
- Two-State Output Objects
- Symbolic I/O Field Output
- Alarms



T5552-S1 Multimedia Included

HART ► T5552-H1

- HART Components
- HART Networks
- System Integration
- HART Device Calibration
- Monitoring Current Loops
- Process Control Loop Operation
- Burst Mode on a Parked Field Device



T5552-H1



T5552-H1 Multimedia Included



T5552-L1 Multimedia Included

Ultrasonic Liquid Level System

► T5552-L1

- Ultrasonic Transducer
- Transmitter Connection
- Ultrasonic Level Measurement
- Sensor Calibration



T5552-L1

Foundation Fieldbus

► T5552-FF1A

- Foundation Fieldbus Technology
- Fieldbus DCS Operation
- Communication Protocols
- Foundation Fieldbus Wiring
- Device Configuration
- Fieldbus Diagnostic & Maintenance Capability



T5552-FF1A Multimedia Included



T5552-FF1A

PORTABLE PROCESS CONTROL

Portable Process Control Troubleshooting ► 990-PC1F

- Level & Flow Sensor Troubleshooting
- Flow Transmitter Troubleshooting
- I/P Converter Troubleshooting
- Diaphragm-Actuator Valve Troubleshooting
- Controller Troubleshooting
- On / Off & Closed Loop Control System Troubleshooting



990-PC1F Multimedia Included



990-PC1F

TEMPERATURE PROCESS CONTROL

Temperature Process Control ► T5553

- Process Safety / P and I Diagrams
- Temperature Measurement
- Heat Transfer / Temperature Control
- PID Operating and Tuning
- 3-Way Control Valves
- Heat Exchangers and Chillers
- RTD, Thermocouples, Thermistors
- Controller / Axis Calibration



T5553-R1A

Three-Channel Data Acquisition for T5553 ► T5553-R1A

- Chart Recorder Applications
- Managing Chart Recorder Data
- Special Chart Recorder Functions
- Chart Recorder Software



T5553

ANALYTICAL PROCESS CONTROL



T5554

Analytical Process Control

T5554

- Analytical Control Concepts
- Chemical Pumps / pH Measurement
- Loop Controllers / Control Loop Performance
- Discrete and Closed Loop pH Control
- Alarms / Discrete Inputs
- Batch and Continuous pH Control Systems
- Proportional, Integrative, and Derivative Automatic Control

Three-Channel Data Acquisition for T5554

T5554-R1A

- Electronic Data Recorder
- Touchscreen LCD Monitor
- Paperless Chart Recording



T5554-R1A

PRESSURE PROCESS CONTROL

Pressure Process Control

T5555

- Simultaneous Liquid Level and Tank Pressure Control
- Electric Proportional Valve
- Piezoelectric Pressure Sensor
- Open and Closed Loop Tuning
- HMI Panel Operation
- Block Diagrams
- Automatic Control Methods
- Control Loop Performance
- Process Systems Alarms



T5555



T5555 Multimedia Included

Connect All Four Systems to Create an Entire Process Plant!



T5552F
Level / Flow Process Control Troubleshooting



T5554
Analytical Process Control

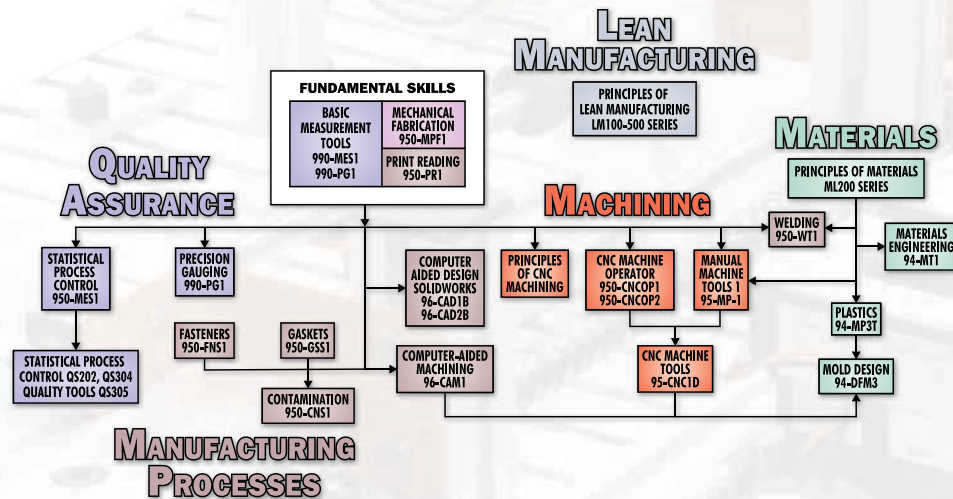


T5555
Pressure Process Control



T5553
Temperature Process Control

MANUFACTURING MATERIALS AND PROCESSES LEARNING SYSTEMS



From Design to Deliverable - A Spectrum of Manufacturing Skills

Today's high standards for production require a solid grasp on a wide range of skills, including CAD and CAM design, material properties, product assembly, and quality assurance. Amatrol's learning systems provide the knowledge and hands-on experience that will prepare learners to work in these different areas of machining and manufacturing processes.

MANUAL AND CNC MACHINE TOOLS

CNC Machine Operator

- 950-CNCOP1 (FANUC)
- 950-CNCOP2 (HAAS)

- CNC Mill, Lathe, and Grinder Set-up and Operation
- Tool Identification, Set-up, Use and Management
- Fixture Set-up and Operation
- CNC Troubleshooting and Maintenance for Operators
- Precision Measurement and Gauging
- Print Reading
- Geometric Dimensioning and Tolerancing
- Machining Processes
- Statistical Process Control
- Quality and Cycle Time Optimization
- CNC Program Operation

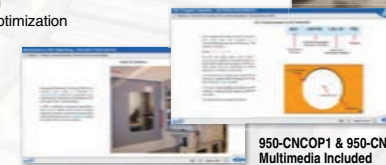


Manual Machine Tools

- 95-MP1

- Bandsaws
- Drill Presses
- Hand Tools
- Manual Mills
- Manual Lathe

(Equipment is not shown)



950-CNCOP1 & 950-CNCOP2 Multimedia Included

95-CNC1D Micromill and Tooling



CNC Machine Programming

- 95-CNC1D

- CNC Setup
- CNC Operation and Programming
- Circular Interpolation
- Speeds and Feeds
- CNC Mill Canned Cycle
- CNC Mill Cutter Compensation



95-CNC1D Multimedia Included

PRINCIPLES OF CNC MACHINING

- CNC > CN101
- Tooling > TL101
- Grinding > PE203
- Tooling for Grinding > TL204
- Coolants & Oils > PT202
- Work Holding > PT201
- Gear Manufacturing > PT404
- Tooling for Tapping > TL307
- Turning > PE101
- Machining Centers > PE102
- Tooling for Machining Centers > TL203
- Tooling for Turning Centers > TL202
- Fanuc CNC Control > CN102



CAD & CAM

Computer Aided Design 1 ▶ 96-CAD1B
Computer Aided Design 2 ▶ 96-CAD2B
Print Reading 1 ▶ 950-PR1
Computer-Aided Machining ▶ 96-CAM1



Computer-Aided Machining ▶ 96-CAM1

ISO & SPC

ISO 9000 ▶ QS101
Statistical Process Control 1 ▶ QS202
Statistical Process Control 2 ▶ QS304
Quality Tools ▶ QS305



Quality Tools ▶ QS305



Plastics ▶ ML204

PRINCIPLES OF MATERIALS

Ferrous Metals ▶ ML201
Non-Ferrous Metals ▶ ML202
Heat Treatment ▶ ML203
Plastics ▶ ML204
Composites ▶ ML205
Ceramics ▶ ML206

ASSEMBLY

Gaskets ▶ 950-GSS1
Fasteners ▶ 950-FNS1
Contamination ▶ 950-CNS1



Gaskets ▶ 950-GSS1

LEAN MANUFACTURING

Lean Overview ▶ LM100
Introduction to Lean ▶ LM101
5S ▶ LM102
Total Productive Maintenance ▶ LM103
Poka-Yoke ▶ LM104
Lean Theory ▶ LM203
Lean Process Flow ▶ LM204
Visual Workplace ▶ LM205
Standardized Work ▶ LM206
Kaizen ▶ LM307
Value Stream Mapping ▶ LM308
Set-Up Reduction ▶ LM409

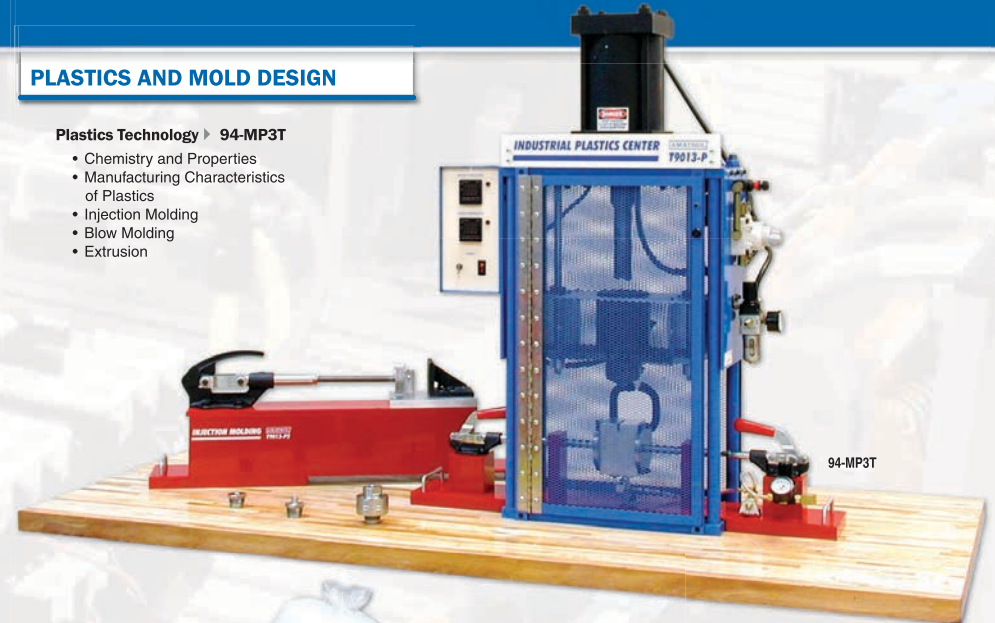


Kaizen ▶ LM307

PLASTICS AND MOLD DESIGN

Plastics Technology ▶ 94-MP3T

- Chemistry and Properties
- Manufacturing Characteristics of Plastics
- Injection Molding
- Blow Molding
- Extrusion



94-MP3T



94-MP3T Accessories

Mold Design ▶ 94-DFM3

- Injection Mold Design / Part Design
- Multi-Cavity Molds
- Inserts & Undercuts
- Thermoplastics
- Molding Materials
- Blow Molding Design



94-DFM3 Multimedia Included



MATERIALS ENGINEERING

Materials Engineering ▶ 94-MT1

- Tensile Strength Analysis
- Data Acquisition Systems
- Compression Testing and Analysis
- Shear Testing & Analysis
- Hardness Testing & Analysis



94-MT1A Multimedia Included



WELDING TECHNOLOGY

Welding Technology ▶ 950-WT1

- Welding Safety / Metal Preparation
- Basic Welding / Welding Symbols
- Welded Joints: Lap, Butt, T, and Corner
- Welding Analysis
- Destructive and Non-Destructive Testing



950-WT1 Multimedia Included



MEASUREMENT

Portable Measurement Tools ▶ 990-MES1

950-MES1

- Basic Measurement
- Tape Measurement
- Precision Measurement Tools
- Dial & Digital Calipers
- Micrometers
- Data Collection



950-MES1



990-MES1 Multimedia Included



990-MES1

Portable Precision Gauging ▶ 990-PG1

990-PG1

- Basic Measurement
- Dial and Digital Calipers
- US and SI Metric Micrometers
- Introduction to Gauging
- Indicator Measurement
- Go / No-Go Gauging Tools
- Indicator-Type Gauging Tools

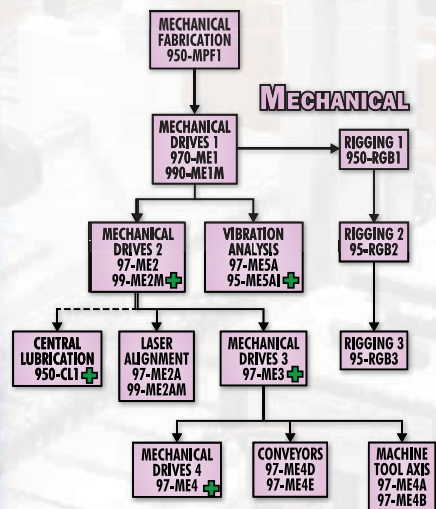


990-PG1 Multimedia Included



990-PG1 shown with Optional 99-PG2

MECHANICAL LEARNING SYSTEMS



+ Includes Troubleshooting Skills

MECHANICAL DRIVES

Mechanical Drives 1

970-ME1

- Motor Mounting
- Soft Foot
- Chain and Belt Drives
- Spur Gear Drives
- Gear Trains
- Basic Shaft Alignment



970-ME1



Mechanical Drives 2

97-ME2

- Bushings, Idler Systems
- Heavy-Duty Chain and Belt Drives
- Timing / HTD Belt Drives
- Variable Pitch Sheaves
- Reverse Indicator Shaft Alignment
- Lubrication



97-ME2 Multimedia Included



970-ME1 Multimedia Included

Mechanical Skills are Essential to Manufacturing

Amatrol's mechanical learning systems are truly unique in that they provide knowledge and hands-on skill building opportunities. The skills taught in these systems, whether how to assemble a belt drive or rig a load, are derived from task analyses that identify skill sets desperately needed by employers.

As an example, Amatrol's 970 Mechanical Drives Level 1 Learning System contains seven modules providing approximately 65 hours of hands-on training. Moreover, this base learning system can be expanded to a staggering 34 modules providing over 300 hours of step-by-step, hands-on training to make learners job-ready on Day 1.

Mechanical Drives 3

97-ME3

- Plain, Ball, Roller, Tapered Bearings
- Angular Contact Bearings
- Seals and Gaskets
- Miter, Helical, and Worm Gears
- Gearboxes



97-ME3 Multimedia Included



Mechanical Drives 4

97-ME4

- Precision Ball Screws
- Linear Ball Bearings
- Linear Axis Slides
- Cam Clutches
- Electric Clutches
- Electric Brakes



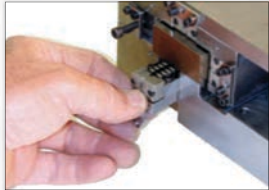
MACHINE TOOL MAINTENANCE

Roller Pack Machine Tool Axis

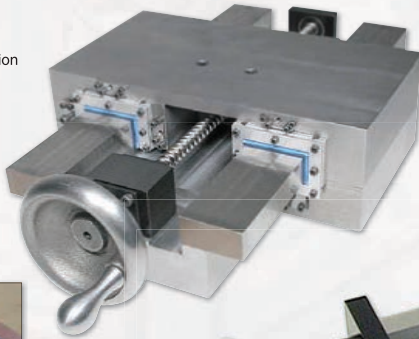
► 97-ME4-A

- Linear Roller Bearings Operation
- Roller Pack Installation
- Tapered Gib Adjustment
- Preload Setting

97-ME4-A
Adds to 970-ME1

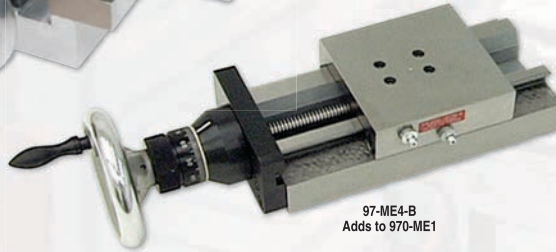


97-ME4-A Roller Pack Installation



Plain Bearing Machine Tool Axis ► 97-ME4-B

- Dovetail Slide Operation
- Tapered Gibs Installation
- Dovetail Slide Maintenance
- Micrometer Dial / Slide Operation



97-ME4-B
Adds to 970-ME1

CONVEYORS

Floor Standing Belt Conveyor ► 97-ME4-D

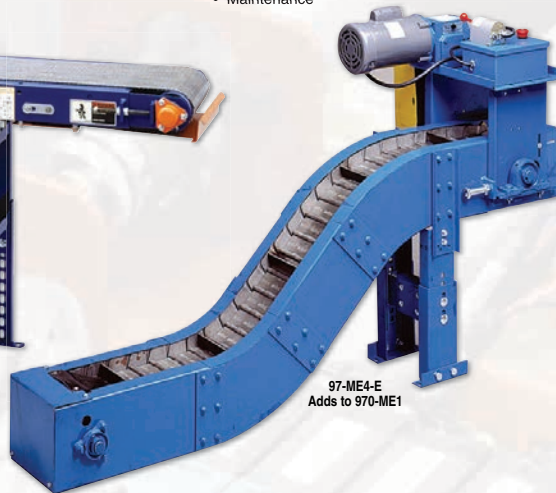
- Belt Installation
- Belt Speed Calculation
- Belt Length Calculation
- Belt Maintenance



97-ME4-D
Adds to 970-ME1

Machine Tool Chip Conveyor ► 97-ME4-E

- Chip Conveyor Operation
- Install Chip Conveyor Belt
- Chip Conveyor Start and Run-In
- Maintenance



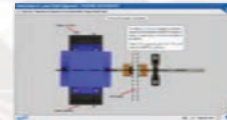
97-ME4-E
Adds to 970-ME1

LASER ALIGNMENT

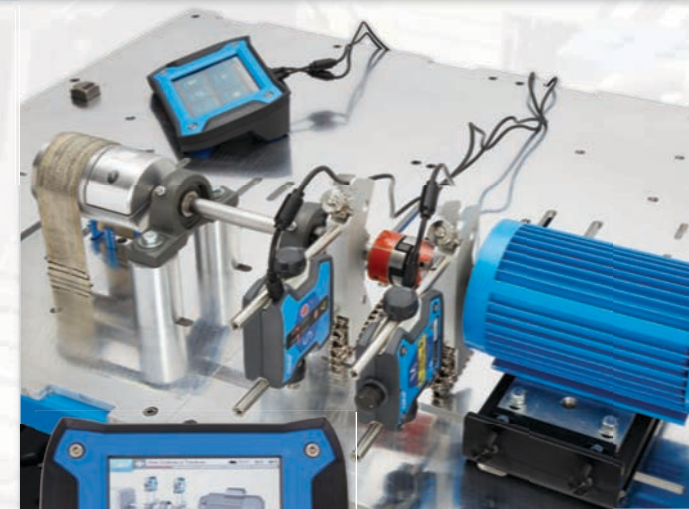
Laser Alignment ► 97-ME2A

(Adds to 970-ME1)

- Principles, Operation, Setup
- Soft-Foot Correction
- Parallel and Angular Alignment
- Data Collection, Error Analysis
- Laser Safety
- Motor Base Adjustments



97-ME2A Multimedia Included



97-ME2A shown with 970-ME1

97-ME2A Display Unit

VIBRATION ANALYSIS



95-ME5A-I

Vibration Analysis

► 95-ME5A-I

► 97-ME5A

(97-ME5A adds to 970-ME1)

- Vibration Concepts & Analysis
- Resonant Frequency
- Sympathetic Vibration
- Velocity, Acceleration, Spike Energy
- Vibration Dampening, Isolation
- Severity Charts, Troubleshooting



Vibration Measurement

PORTABLE MECHANICAL DRIVES

Portable Mechanical Drives 1 ▶ 990-ME1M

- Introduction to Mechanical Drives
- Shaft Speed Measurement
- Shaft Alignment
- V-Belt Drives
- Chain Drives
- Gear Drives



990-ME1M Multimedia Included

Portable Mechanical Drives 2 ▶ 99-ME2M

- Bushings
- Heavy-Duty Chain & Belt Drives
- Timing / HTD Belt Drives
- Reverse Indicator Shaft Alignment



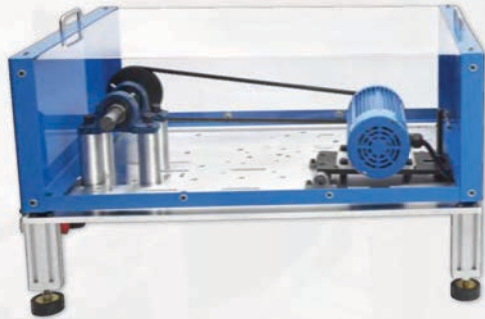
99-ME2M Multimedia Included

Portable Laser Shaft Alignment ▶ 99-ME2AM

- Introduction to Laser Alignment Systems
- Rough Alignment
- Laser Shaft Alignment Installation, Operation, & Analysis
- Soft Foot Correction



99-ME2AM Multimedia Included



990-ME1M



MECHANICAL FABRICATION

Mechanical Fabrication ▶ 950-MPF1

- Assembly Concepts
- Pipe Thread Components
- Torque Wrenches
- Portable Power Tools
- Threaded Fasteners
- Wrenches
- Pneumatic System Fabrication
- Screwdrivers
- Pliers and Locking Devices



950-MPF1 Multimedia Included



950-MPF1

CENTRAL LUBRICATION

Central Lubrication ▶ 950-CL1

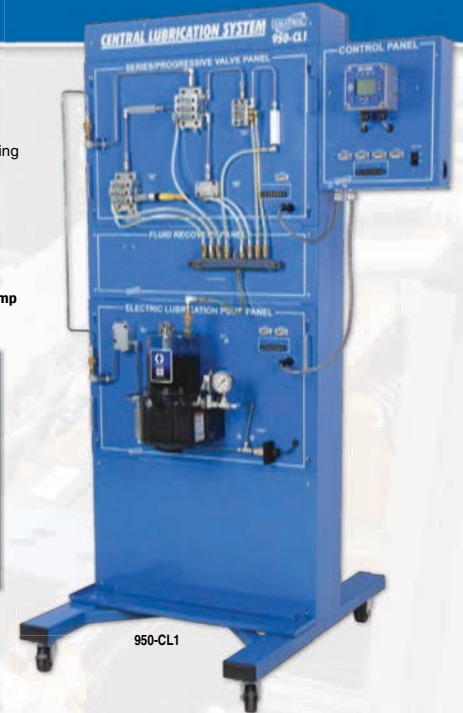
- Central Lubrication System Operation
- Maxi-Monitor Controller Operation
- Viscometer Operation

- Divider Valve Servicing
- Troubleshooting

Includes These Panels

- Series Progressive Valve
- Piston Distributor

- Fluid Recovery
- Pneumatic Lubrication Pump



950-CL1

RIGGING

Rigging 1 ▶ 950-RGB1

- Rigging Concepts
- Load Weight Calculations
- Hoists
- Slings & Lifts

Rigging 2 ▶ 95-RGB2

- Synthetic Slings
- Sling Operation
- Sling Maintenance
- Equipment Movement
- Cranes

Rigging 3 ▶ 95-RGB3

- Wire Mesh Slings
- Fiber Rope
- Load Turning
- Wire Rope Termination
- Rigging Knots



950-RGB1 Multimedia Included



95-RGB2 Multimedia Included

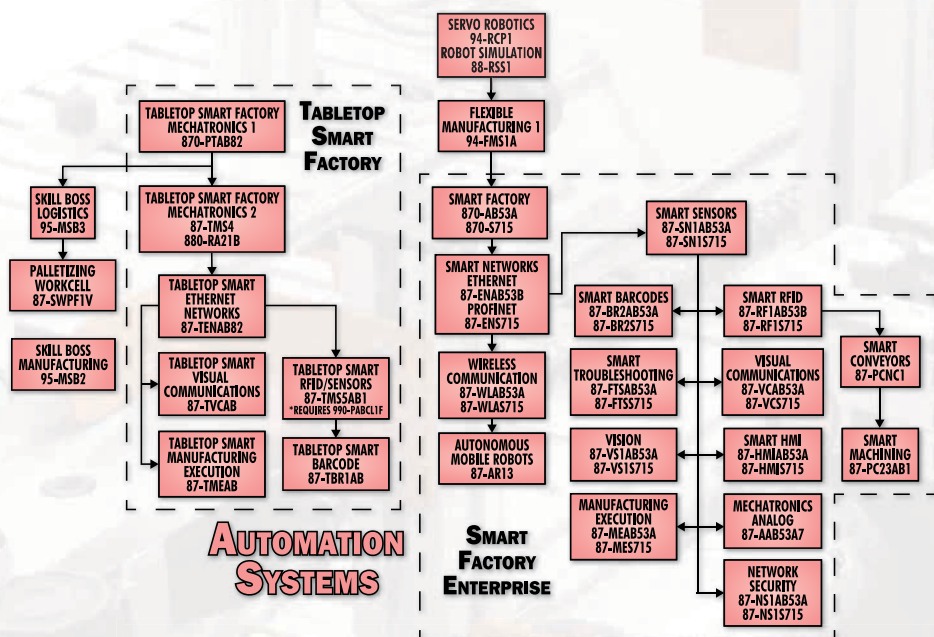


950-RGB1



95-RGB2

SMART AUTOMATION AND ROBOTICS LEARNING SYSTEMS



Maintain Real-World Automation Skills with Expansive Training Options

Amatrol's smart automation and robotics learning systems are constantly evolving to allow learners to gain hands-on experience with the technology they will see on the plant floor. With these systems, learners can develop skills in many areas of automation, including mechatronics, logistics, RFID, network security, and smart manufacturing.

Technology continues to advance, and Amatrol's incredible range of learning solutions ensures that you will be able to provide a seamless learning experience.

TABLETOP ROBOTICS

Robotics and Computer Programming

► **94-RCP1**

- Basic Robot Operation and Programming
- Interfacing and Material Handling
- Application Development
- Flexible Manufacturing Cells
- Quality Control
- Production Control

Flexible Manufacturing

► 94-FMS1A

- Robotic Assembly / Linear Motion
- Point Arrays / Palletizing
- World & Tool Coordinates
- Servo Traverse Axes
- CNC / FMS I/O Interfacing
- Serial Communications
- Barcode Readers
- ASCII Data Manipulation
- Digital Indicators / Automated Gauging
- Multitasking / Program Interrupts



Robotics Simulation ▶ 88-RSS1

- Basic Robot Operation

- Movement & End Effector Commands
- Interfacing
- Flexible Manufacturing Cells
- Cartesian Coordinate Programming

SKILL BOSS MANUFACTURING

Skill Boss Manufacturing ► 95-MSB2

- Safety
- Quality Practices & Measurement
- Production & Processes
- Machine Operation
- Maintenance Awareness



Skill Boss Manufacturing Required by MSSC for CPT Plus Certification Assessment



TABLETOP SMART FACTORY MECHATRONICS

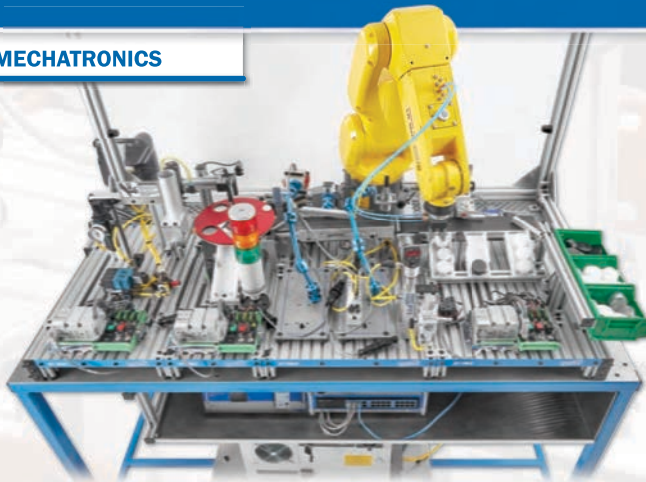
Tabletop Smart Factory Mechatronics

► 870-PTAB82

- Industrial Sensors
- I/O Link
- Cloud-Based Software
- Inventory Feeding
- Inspection & Indexing
- Sorting & Distribution



Multimedia Included for 870-T Series and Selected Options



870-PTAB82, 87-TMS1, 87-TMS2, 87-TMS3, 87-TMS4F, & 87-TMS5

Smart Sensors

► 87-TMS5AB1

- RFID Programming
- RFID Operation
- Photoelectric Sensors
- Pressure / Vacuum Sensors

Portable PLC Troubleshooting

► 990-PABCL1F

- Controller Operations
- PLC Program Operations
- PLC I/O Testing
- Event Sequencing
- Processor Troubleshooting



990-PABCL1F

Manufacturing Execution

► 87-TMEAB

- Order Entry
- Scheduling
- Schedule Status
- Production Statistics
- Alarms



Manufacturing Execution Software

Barcode Reader

► 87-TBR1AB

- Barcode Operation
- Scan Accuracy
- Ethernet-to-Serial Interface
- Barcode Programming
- Function Blocks



Visual Communication Software

Visual Communication

► 87-TVCAB

- Cloud-Based Data Acquisition
- SCADA Operation
- Configuring Cloud-Based SCADA
- Maintenance Management Operation
- Configuring Maintenance Management



87-TENAB82

Ethernet ► 87-TENAB82

- Industrial Networks
- Ethernet IP Addresses
- Network Performance
- Managed Switch Ethernet
- Switch Diagnostics

SUPPLY CHAIN AUTOMATION

Skill Boss Logistics

► 95-MSB3

- Preventive Maintenance
- System Monitoring & Operation
- PLCs & VFDs
- Barcode Readers
- System Troubleshooting



Smart Robot Logistics Palletizing Workcell

► 87-SWPF1V

- Logistics Palletizing Operation
- Robot Workcell Operation and Programming
- Safety PLCs
- Robot Vision Guidance
- Robot Vision Barcode



Warehouse Control Software
PC Based –
Human Machine Interface (HMI)



Skill Boss is the required assessment device for the following MSSC's Certified Technician – Supply Chain Automation (CT-SCA) certifications:

CTSCA-EM - Equipment Maintenance

Maintaining, Operating, & Adjusting Equipment

CTSCA-ER - Equipment Repair

Installing, Troubleshooting, & Repairing Equipment

CTSCA-NR - Network Repair

Installing, Troubleshooting, & Repairing Basic Controllers & Networks

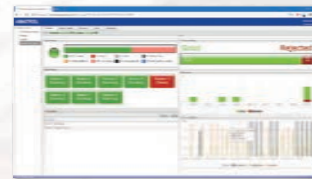


95-MSB3 (Back)

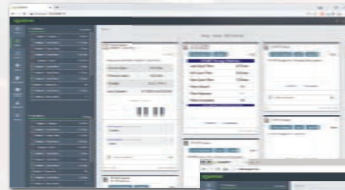
INDUSTRIAL SMART FACTORY MECHATRONICS



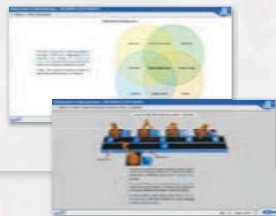
870 Series with
AB & Siemens PLCs



**Manufacturing Execution
Software (87-TMEAB)**



**Visual Communications &
SCADA Software (87-TVCAB)**



Multimedia Included for 870-T Series
and Selected Options

Level 1 Mechatronics

► 870 Series

- Introduction to Mechatronics / System Concepts
- Safety / Machine Operation
- Sequencing and Programming
- Sensors / Discrete I/O Handshaking
- Pneumatic / Electrical Pick & Place
- Integration Skills
- System Start-up / Halt, Stop / Reset
- FMS Programming
- Available with Siemens or Allen Bradley Processors or a Combination

SMART FACTORY OPTIONS

HMI Terminal

► 87-HMIS7A, 87-HMIAB53, 87-HMIAB53A

- HMI Configuration
- HMI Operation
- Project Transfer
- Application Editing
- Field Objects
- Multi-Point Network Applications

Available for all Stations



Vision Inspection

► 87-VS1

- Vision Camera
- Vision Programming
- Output Discrete Signals
- Part Inspection



87-VS1 Multimedia Included

Available for all Stations

Barcode Learning System

► 87-BR2AB53A, 87-BR2S715

- Barcode Reader Operation
- Serial Communications
- PLC Data Instructions
- Barcode Reader Interface
- PLC Programming

Available for
Individual Stations 4, 7 or
Combination of 3 & 5



87-BR2 Multimedia Included

RFID Learning System

► 87-RF1AB53B, 87-RF1S715

- RFID Function
- RFID Operation
- RFID Applications
- RFID Components

Available for
Individual Station 5 or
Combinations of 3 & 4,
5 & 7, or 6 & 7



PLC Learning System

► 87-IOSS715, 87-IOAB53A

- Introduction to Programmable Controllers
- Basic Programming
- PLC Motor Control
- PLC Timer Control
- Event Sequencing

Available
for all Stations



MechaSIM

► 87-MSSAB53A

- PLC CIM Simulation
- MechaSIM Software Navigation
- Multiple Station Simulation

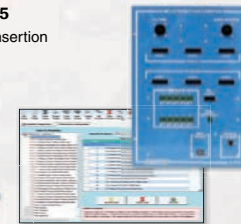


Electronic Fault Insertion: FaultPro

► 87-FTSAB53A, 87-FTSS715

- FaultPro Electronic Fault Insertion
- Single Fault Mode
- Random Fault Mode
- Data Tracking

Available for all Stations



Ethernet Communications and Networks

► 87-ENAB53A, 87-ENAB53B, 87-ENS715

- Network Operation
- Network Installation
- Configuration
- Produced / Consumed Data & Messages
- Data Transfer



SMART FACTORY ENTERPRISE

Smart Factory Enterprise teaches hands-on Industry 4.0 skills at the enterprise level via a fully-functional smart manufacturing system with secure communications and data analysis capabilities.



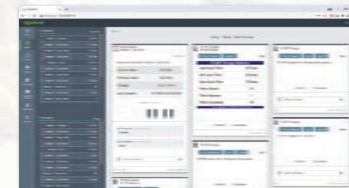
Manufacturing Execution Software

Smart Production & Maintenance Software

Machining Center

Smart Conveyor System

Smart Robot Workcells



Visual Communications & SCADA Software

Autonomous Mobile Robot System

Smart Product ID RFID/Barcode

Smart Sensors

Network Communications & Security

Smart Factory Assembly

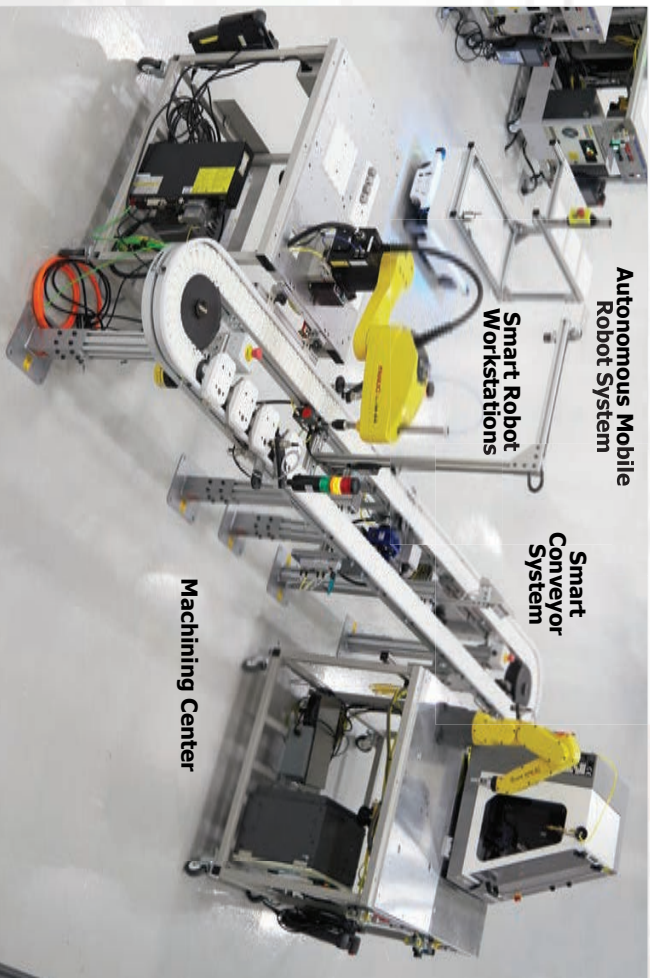
Laser Scanner System

Enterprise-Level Industry 4.0 Training

SMART FACTORY ENTERPRISE

The Smart Factory Enterprise system seamlessly Mobile Robot System, and Machining Centers to with the Autonomous Mobile Robot System and

connects a Smart Conveyor System with multiple Smart Robot Workstations, an Autonomous create a smart manufacturing & material handling system. The Smart Robot Workstations work Smart Conveyor System to move materials efficiently between stations.



Autonomous Mobile Robot System

Smart Robot Workstations

Smart Conveyor System

Machining Center

Smart Conveyor (87-PC23AB1) shown with Smart Machining (87-PCM), Smart Robot Workstation (87-SWF), and Autonomous Mobile Robot (87-AR13)

Smart Product ID

- Smart product identification integrated with the Smart Conveyor System
- Multiple RFID sensors
- Pallet tracking capabilities

Ethernet Communications & Network Security

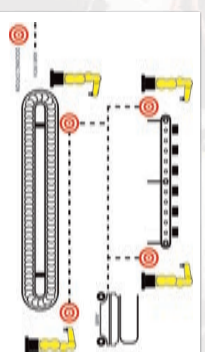
- Ethernet communications with network security are integrated with the Smart Conveyor System, which can be located in a different room - or even building
- Enables networked, secure communications all the way down to the pneumatic valves

Integration & Flexibility

- The Smart Conveyor System integrates seamlessly with the other Enterprise components
- The conveyor and AMR can also be used as standalone systems or in other combinations

Autonomous Mobile Robot System

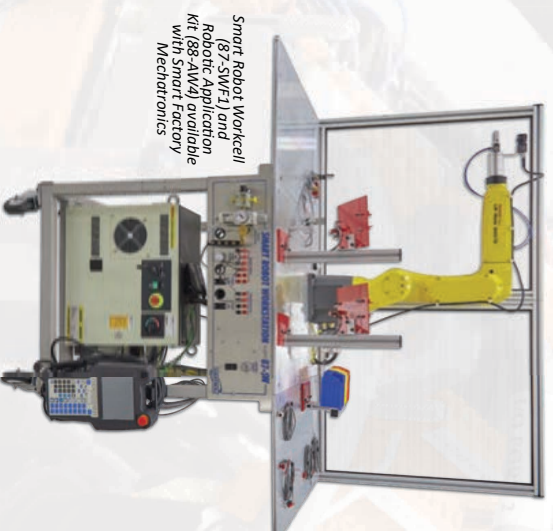
- Teach autonomous mobile robot (AMR) programming skills
- Automated internal transportation of materials, parts, & inventory between Smart Factory Manufacturing & Assembly systems, which can be located in different rooms or buildings
- Create & configure custom applications to learn how to optimize processes & improve workflows in a Smart Factory environment
- Use as a standalone system or integrate in various combinations with other Smart Factory Enterprise components



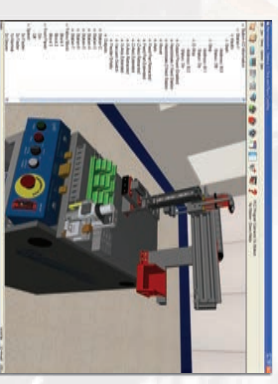
Sample AMR Path

Smart Robot Workstations

- Teach industrial robot programming skills
- Variety of industrial FANUC robots, including the 200ID / 45, 200ID, and SCARA SR-61A available
- Laser scanners allow safe operation without bulky guards
- Optional vision system cameras for advanced pick and place applications
- Discrete I/O, pneumatics, Ethernet, & Lockout / Tagout controls on front interface panel for easy access & use
- Can be integrated in various combination with other Smart Factory Enterprise components

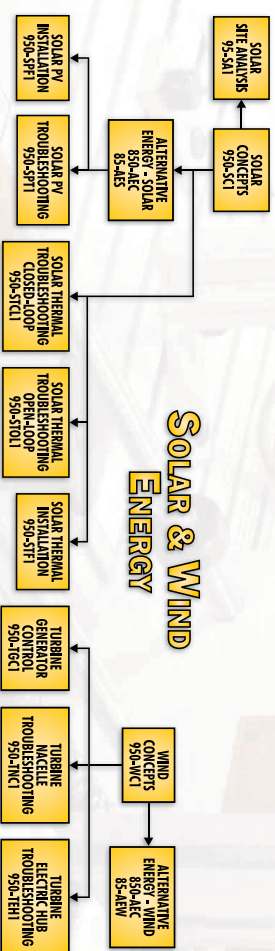


Smart Robot Workcell (87-SWF) and Robotic Application Kit (88-AWA) available with Smart Factory Mechatronics



MechasIM

SOLAR AND WIND ENERGY LEARNING SYSTEMS



Solar and Wind Energy Skills for a Growing Field

Renewable energy sources, like solar and wind energy, are becoming more popular every year, creating a high demand for green energy technicians. Amatrol's solar and wind energy learning systems teach the skills needed for success in this field through a combination of eLearning and hands-on training. These learning solutions cover basic alternative energy concepts as well as more advanced topics, including troubleshooting for solar photovoltaic and thermal systems and wind turbine systems.



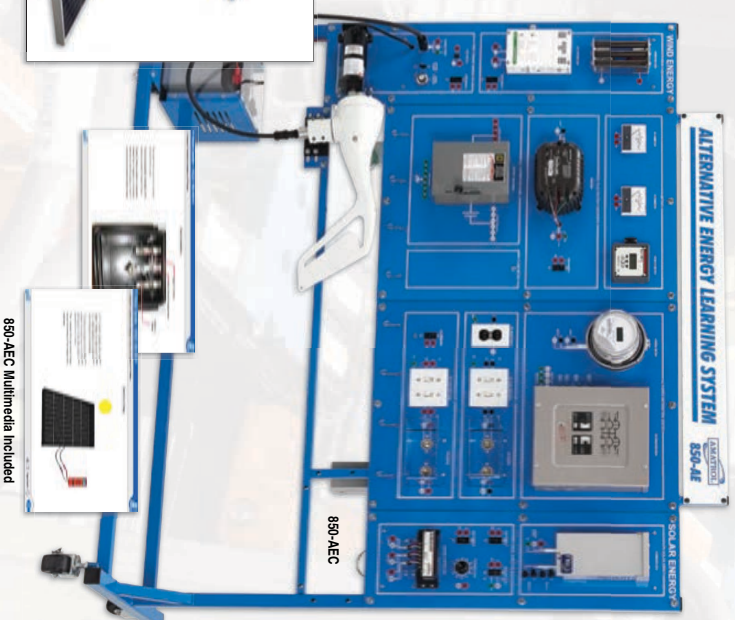
SOLAR AND WIND SYSTEM PRINCIPLES

Alternative Energy ▶ 850-AEC

- Solar Panel Operation and Performance
- PV Array Connection
- Wind Turbine Operation, Performance, and Connection
- Solar and Wind Batteries
- Charge Controllers
- Inverters
- Balance of System Components
- AC / DC Solar Systems
- AC / DC Wind Systems
- Energy Conservation and Demand
- System Performance



Sun Simulator and PV Panels (Back)



850-AEC Multimedia Included

SOLAR AND WIND CONCEPTS SOFTWARE

Solar Concepts ▶ 950-SC1

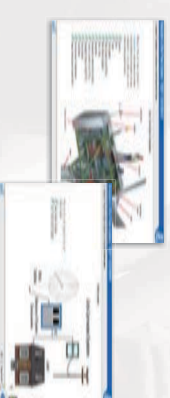
- Introduction to Photovoltaic Systems
- Introduction to Solar Thermal Systems
- Solar Radiation Fundamentals
- Sun Path Characteristics
- Solar Panel Orientation



950-SC1 Multimedia Included

Wind Concepts ▶ 950-WC1

- Introduction to Wind Power Systems
- Wind Turbine Production
- Wind Turbine Siting



950-WC1 Multimedia Included

SOLAR PHOTOVOLTAIC SYSTEMS

Solar PV Troubleshooting ▶ 950-SPT1

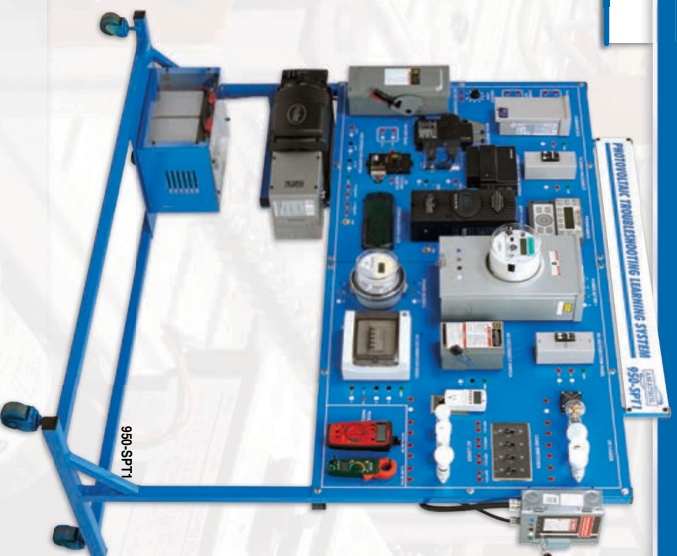
- PV Module Construction, Operation, and Performance
- I-V Characteristics
- PV Array Connection and Inverters
- Solar Batteries
- Charge Controllers
- AC / DC Solar PV Systems
- Stand-Alone PV Systems
- Grid-Connected PV Systems
- Troubleshooting Components
- System Troubleshooting

FAULTPRO™

COMPUTER-BASED FAULT INSERTION



950-SPT1 Multimedia Included

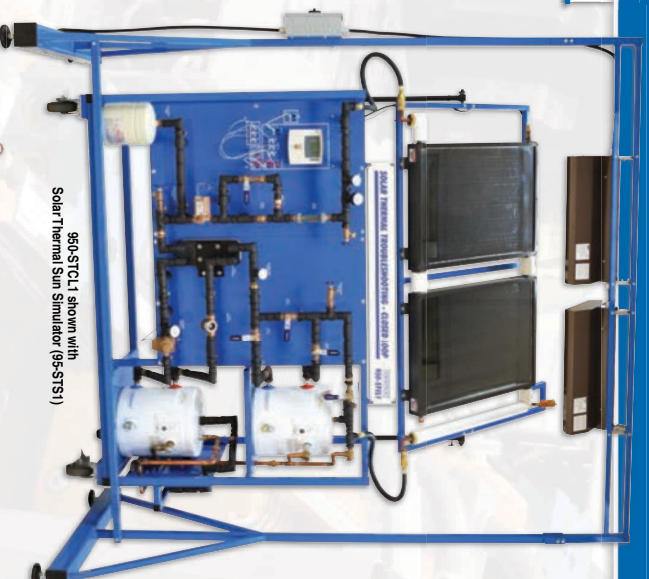


SOLAR THERMAL SYSTEMS

Solar Thermal Troubleshooting (Closed-Loop)

- ▶ **950-STCL1**
 - (Also Available as Open-Loop)
 - Balance of System Components
 - Digital Differential Controllers
 - Collectors
 - Pressurized Closed-Loop Solar Thermal Systems
 - System Operation and Adjustment
 - Drainback Solar Thermal Systems
 - Solar Storage Tanks
 - Heat Exchanger and Pumps
 - System Charging, Programming, and Troubleshooting

950-STCL1 Multimedia Included



**950-STCL1 shown with
SolarThermal Sun Simulator (95-STSI1)**

Solar PV Installation ▶ 950-SPF1

- Mechanical PV Installation
- Electrical PV Installation
- Installation and Commission of Stand-Alone & Grid-Interactive PV Systems
- Circuit Voltage and Current Calculation
- Wire Selection and Sizing
- Installation and Grounding of Conduit and Enclosures
- Lightning and Surge Protection



950-SPF1 shown with Solar PV Array Station (95-SPA1)



950-STF1

Solar Thermal Installation ▶ 950-STF1

- Copper Tubing Assembly
- Tubing Specifications and Preparation
- Soldering
- Tubing Installation, Routing, and Insulation
- Plastic Pipe Assembly
- Fitting Installation
- Piping Assembly
- Mechanical Installation
- Fluid System Installation
- Electrical Installation
- System Startup



950-STF1 Multimedia Included

UTILITY SCALE WIND TURBINES

Turbine Generator Control Troubleshooting

► 950-TGC1

- Generation System Operation
- Commissioning Tests
- Troubleshooting
- Grid Power Interface
- Fiber Optic Communications
- Generator Control Software
- Revenue Meters
- Shunt Trip Circuit Breakers
- Line Contactors
- 3-Phase Inverters
- Power Distribution Panel
- Pad Mounted Transformers
- Rectifiers
- Computer Control Units
- Temperature Control



FaultPro
Computer-Based Fault Injection

950-TGC1

950-TGC1 Multimedia Included

Connect All Three Systems to Create a
Comprehensive Wind Turbine Troubleshooting Program!



Turbine Nacelle Troubleshooting

► 950-TNC1

- Turbine Control Systems, Safety, and Troubleshooting
- Yaw Drive, Brakes, and Troubleshooting
- Parking Brakes
- Floor Lock
- Twist Box
- Meteorological System
- Turbine Communications
- Hydraulic Power Troubleshooting



950-TNC1 Multimedia Included



950-TNC1

FaultPro
Computer-Based Fault Injection



950-TEH1

FaultPro
Computer-Based Fault Injection

Turbine Electric Hub Troubleshooting

► 950-TEH1

- Hub Power, Functions, and Safety
- Pitch Control Software
- Servo Pitch Operation
- Servo Reference Position Adjustment
- Emergency Feather Operation and Control
- Battery Operation and Capacity
- Battery Types and Banks
- Battery Charging
- Power Voltage Verification
- Hub Fault Messages
- Individual Blade Troubleshooting
- System Troubleshooting
- Battery Troubleshooting



950-TEH1 Multimedia Included

ELECTRONICS



Not sure where to start?

Here are some options:

- ▶ Visit Amatrol.com for additional product information and fill out a contact form
- ▶ Request a 30-day eLearning demo
- ▶ Visit Jeffersonville, Indiana to tour Amatrol's manufacturing facility and meet the curriculum developers
- ▶ Inquire about Amatrol's In-House or On-Site Instructor Training courses

Contact Amatrol Today

Email: Contact@amatrol.com
Phone: 800-264-8285



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