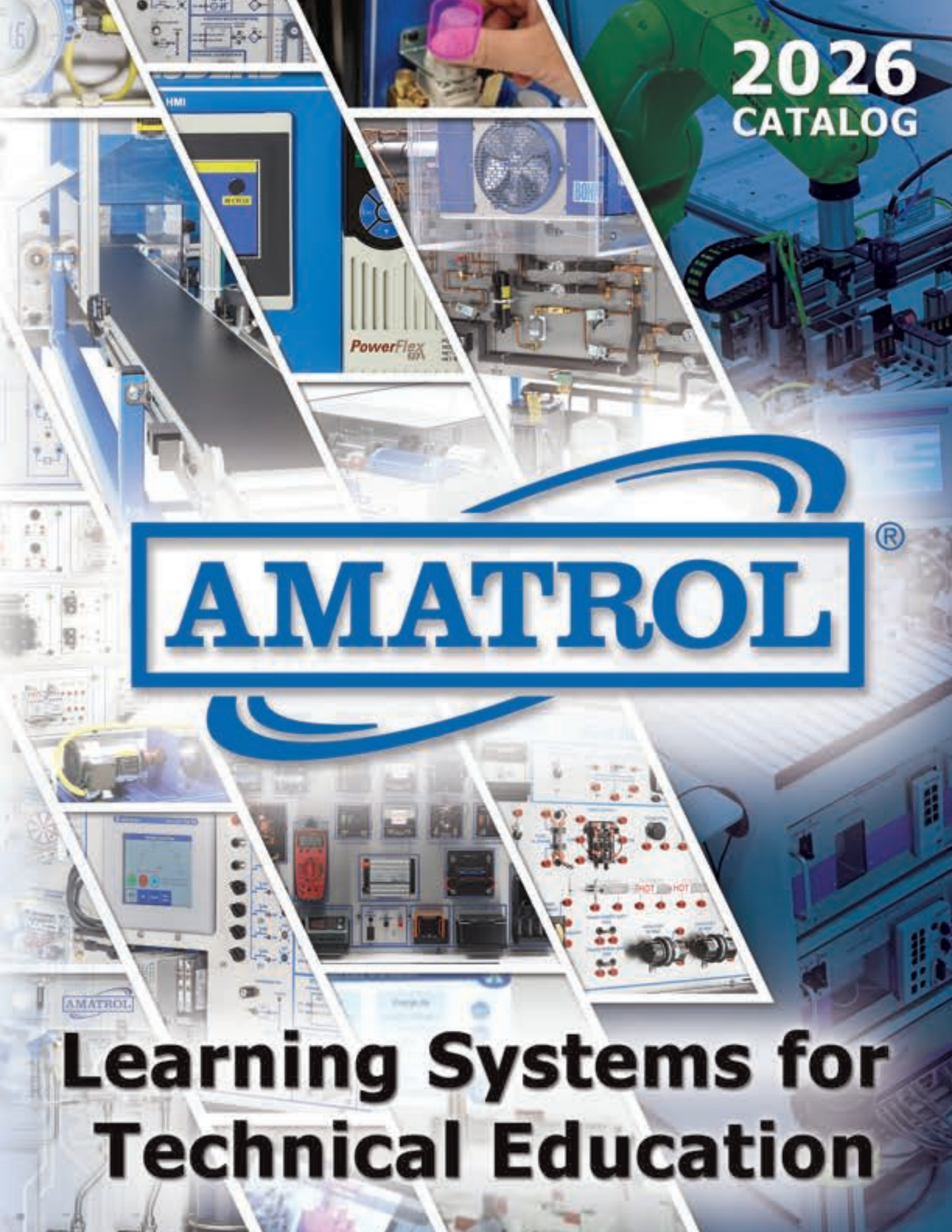

2026
CATALOG
HMI
PowerFlex
AMATROL®
Learning Systems for
Technical Education

A Systems Approach To

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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Teaching Technical Skills

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.

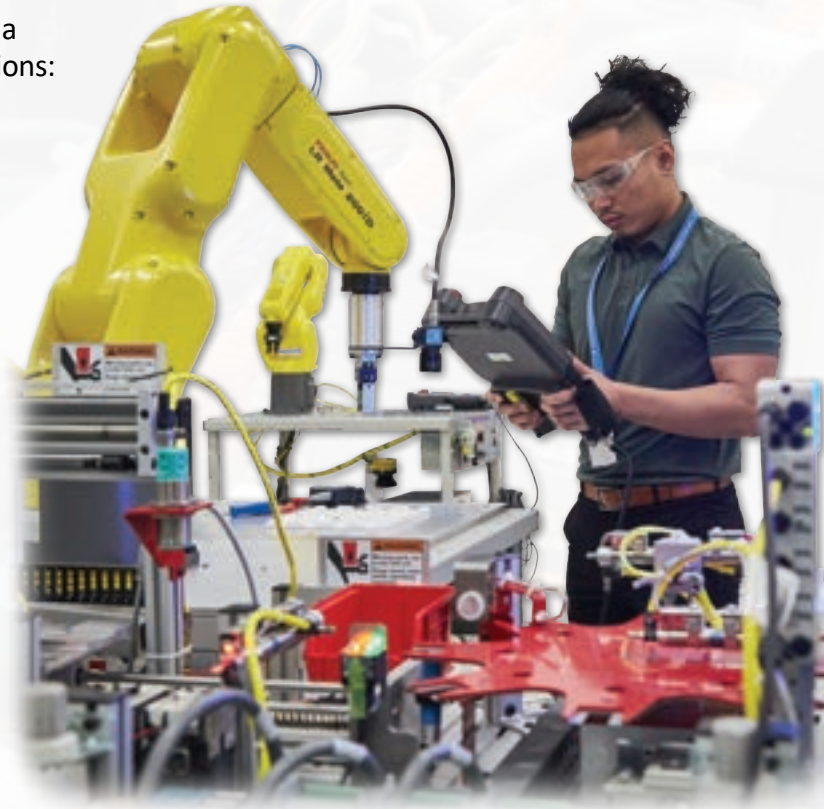


Individualized Learning Plans

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, ASQC, and HVAC Excellence.

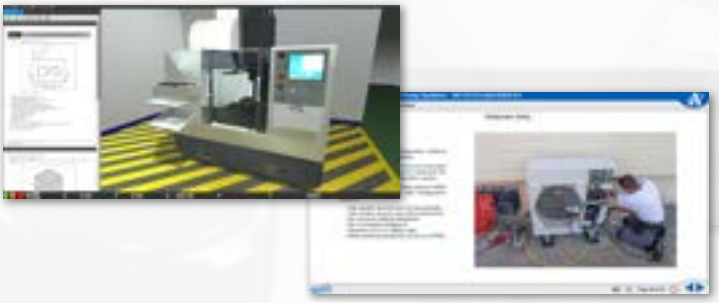


Hybrid Flexible Course Delivery

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

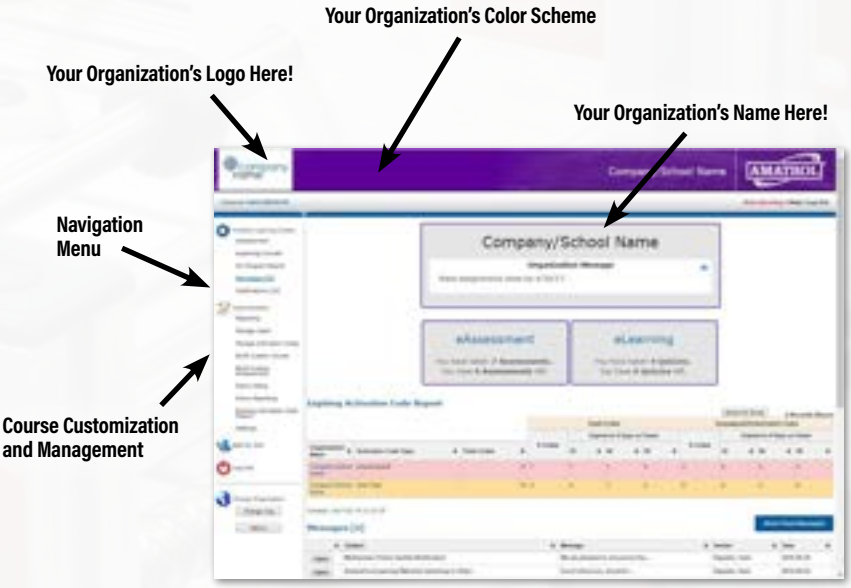
Learning Management

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.



Learning Management System

Pre-Quiz



Curriculum Library (LMS)

Custom Course Capability

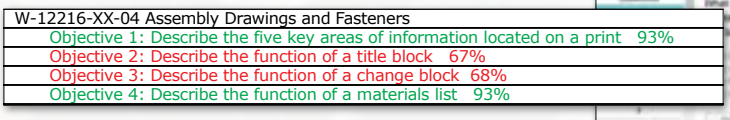
Amatrol's LMS makes it easy to customize courses. With over 10,000 hours of lesson content, Amatrol's vast curriculum library can support the technical course needs of entire degree programs.

LMS Management Tools

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

eAssessment

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



Skill Gap Identification



eAssessment Reporting



eAssessment Test

eLearning Available!

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.

Available in English and Spanish

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

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.



Hands-On Skill Procedures

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.

VR Smart Factory - Allen-Bradley

VR870-AB





**Headset Not Included*

Amatrol's VR Smart Factory was developed in conjunction with CESMII—The Smart Manufacturing Institute

Amatrol's VR Smart Factory - Allen-Bradley (VR870-AB) creates a digital twin of Amatrol's three-cart Mechatronics training system that can be explored virtually via a Meta Quest VR headset. Users can observe the operation of the system that assembles a working industrial directional control valve, including pneumatic pick and place feeding, go/no-go gauging/quality inspection (height and orientation verification), and automated inventory/parts storage.

In addition to observing the system in action, users can also interact with the virtual system, performing a variety of skills, such as: adjusting air pressure regulators for cylinders and vacuum generators; adjusting the ultrasonic sensor that regulates height measurement; viewing system information on the HMI screen; and adding parts to the gravity feeder. Several of these actions can also be performed via shortcuts using the left hand gaze controller on the VR headset.

Shortcut the Smart Factory Learning Curve with VR

Whether you already own an Amatrol Mechatronics training system or are investing in one soon, Amatrol's VR Smart Factory shortcuts the learning curve for users. Every user with a licensed VR headset can become familiar with the system's operation and practice basic adjustments to see how they affect the system's operation BEFORE working on the physical system. VR Smart Factory allows users to experiment and make mistakes in a virtual environment. Instructors can also expand the number of users learning at any particular time by allowing some users to work on the physical system while others use VR, which replicates the experience of using the real system.





Flexibility

Instructors can allow multiple users to share one headset, or multiple headsets can be used to allow several users to interact with the virtual system simultaneously. Each VR headset requires its own license. This gives instructors the flexibility to craft a unique learning experience for users.

Accessibility

Amatrol's full Mechatronics line requires a generous amount of lab space that not all facilities can accommodate. VR Smart Factory, on the other hand, requires very little space. In fact, users with accessibility issues will find that they can observe and interact with the system virtually even when seated or in a very small space.

Expand Users' Learning Experience

VR Smart Factory replicates the real three-cart Mechatronics system in such detail that it presents a unique opportunity for instructors to combine VR Smart Factory with the real physical training system and Amatrol's eLearning curriculum to create an immersive learning experience that will better prepare users with real hands-on skills relevant to modern industry needs. Industry 4.0 skills are in high demand today, and workers with experience with advanced technology, such as VR and digital twins, are highly valued in the job market.



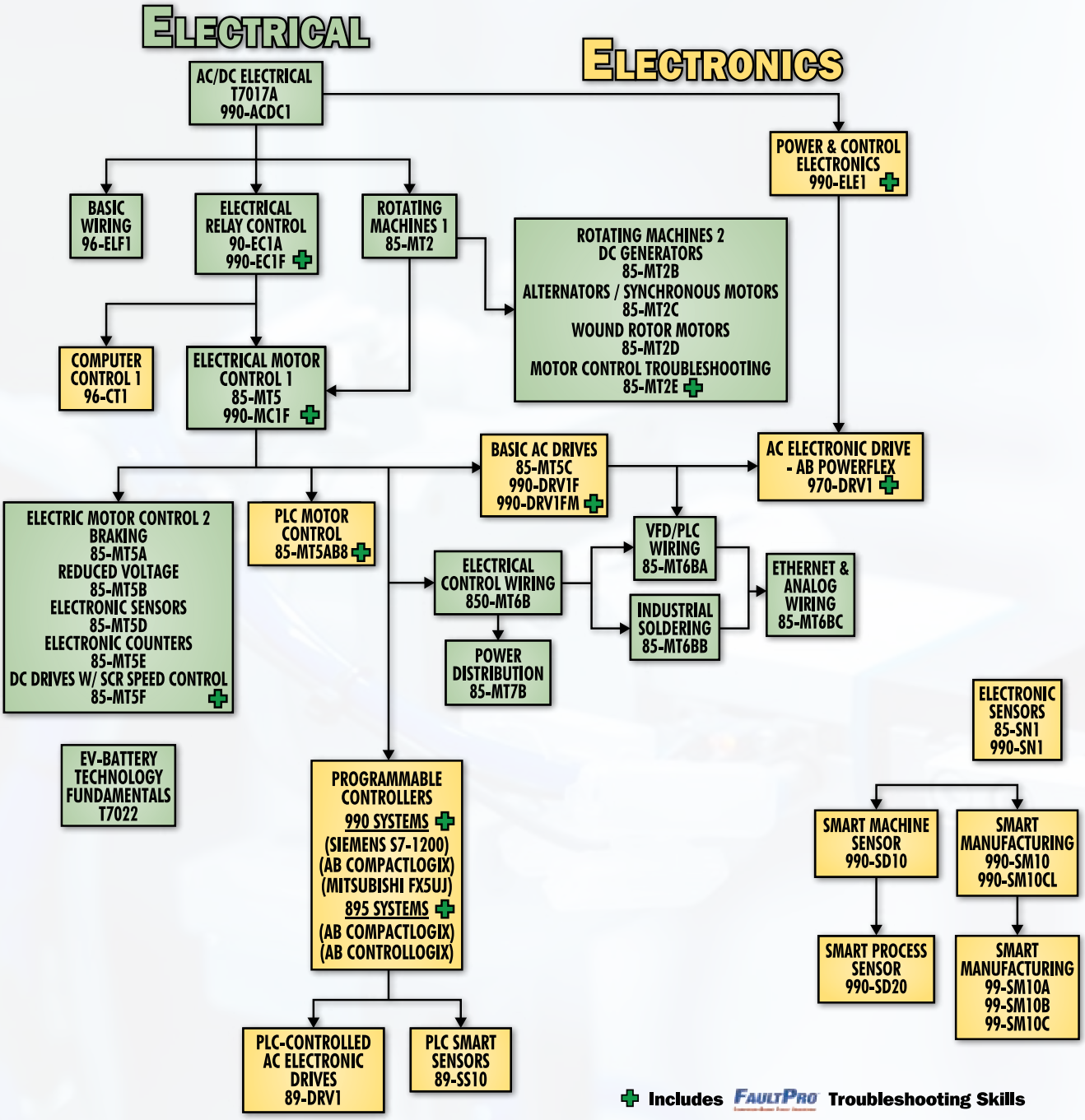




Required Hardware

Each VR Smart Factory license will require a Meta Quest 3 VR headset (purchased separately).

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

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



90-EC1A
with 96-CT1



90-EC1A Multimedia Included

Computer Control 1

- **96-CT1**

(Sold Separately)

- Basic PLC Programming
- PLC Motor Control
- Event Sequencing



990-EC1F



990-EC1F 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)

FAULTPRO
COMPUTER-BASED FAULT INSERTION

MOTOR CONTROL



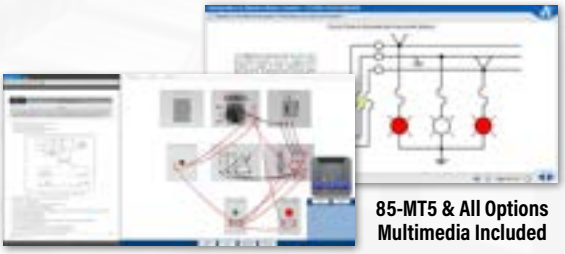
85-MT5, 85-MT5-A and Options

Base Model: 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

Options: 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
- Latching Stop Pushbutton > 85-MT5HSL



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

FaultPro Computer-Based Fault Insertion

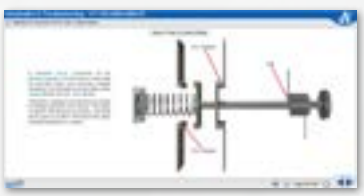
Fault Troubleshooting System **890-FTS**

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

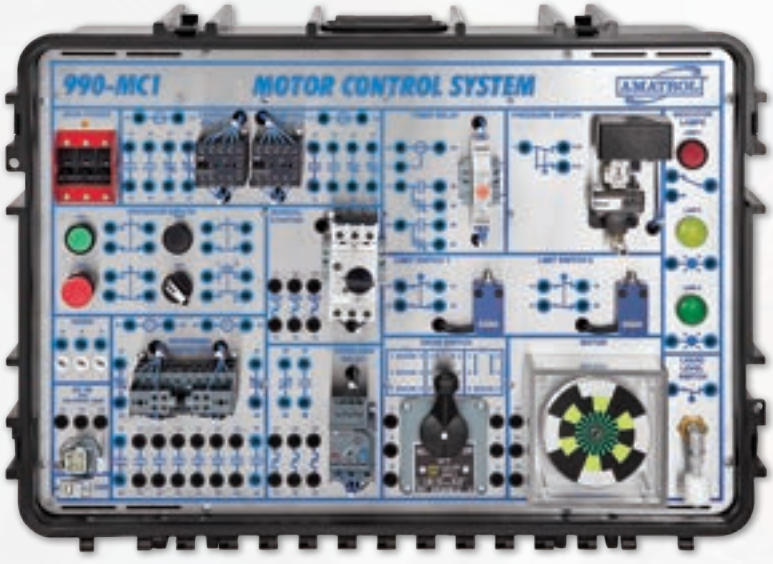
Portable Electrical Motor Control Troubleshooting
990-MC1F

- 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

FaultPro Computer-Based Fault Insertion



990-MC1F Multimedia Included



990-MC1F

ELECTRONIC DRIVES

AC Electronic Drives

970-DRV1F

- 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



970-DRV1F



970-DRV1F Multimedia Included



990-DRV1F



990-DRV1FM

Portable AC Variable Frequency Drives Troubleshooting

990-DRV1F

990-DRV1FM

- Available with either Allen-Bradley PowerFlex 525 VFD (990-DRV1F) or Mitsubishi 810 VFD (990-DRV1FM)
- 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/M Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

ROTATING MACHINES



85-MT2



85-MT2 & All Options
Multimedia Included

Base Model: 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



85-MT2-B



85-MT2-C



85-MT2-D



85-MT2-E

Options: 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



96-ELF1

Electrical Fabrication 1
▸ 96-ELF1

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



96-ELF1 Multimedia Included

INDUSTRIAL WIRING

Industrial Electrical Wiring
850-MT6B

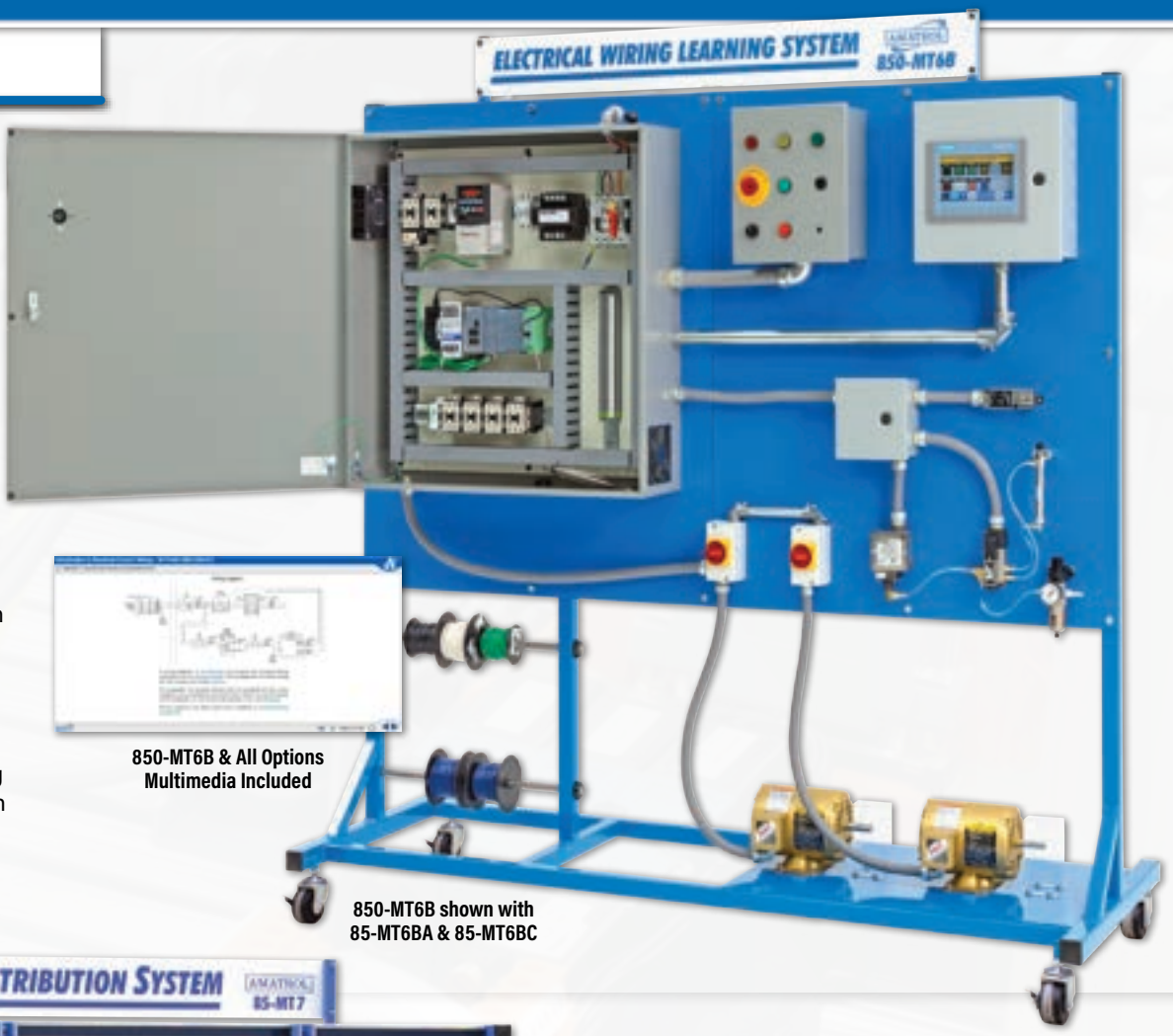
- Electrical Control Wiring
- Electrical Prints
- Panel Wiring
- Pneumatic Control Circuit Wiring
- Overcurrent Protection

VFD / PLC Wiring
85-MT6BA

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

Ethernet & Analog Wiring
85-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 - 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



990-PM5UF

Portable PLC Troubleshooting - Mitsubishi FX5U

990-PM5UF

- Introduction to PLCs
- PLC Programming & Motor Control
- PLC Timer and Counter Instructions
- HMI Operation & Application Editing
- Event Sequencing
- PLC Systems Troubleshooting



990-PS712F (Includes 990-PS712 & 99-FTSS712)

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

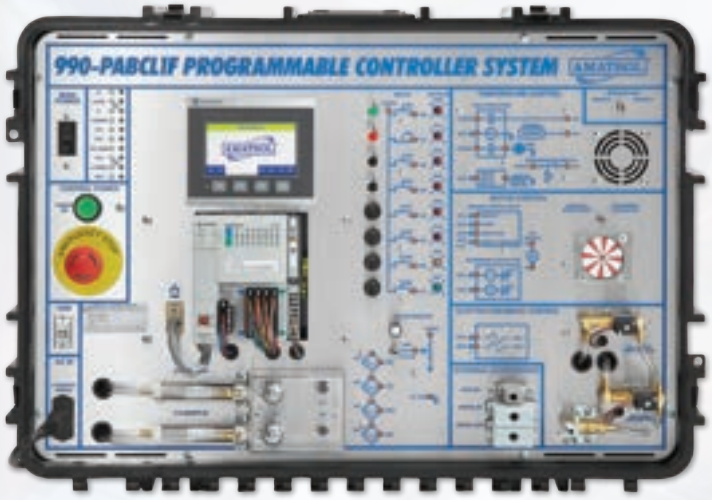
990-PABCL1F

- 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



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



EV-BATTERY SYSTEMS



T7022

EV-Battery Technology Fundamentals ▸ T7022

- Introduction to Electrical Vehicle Systems
- Voltage and Current Concepts
- Circuit Protection
- Lithium-Ion Battery Operation & Characteristics
- Battery Handling and Storage
- Battery Production and Testing
- EV Electrical System Operation



T7022 Multimedia Included

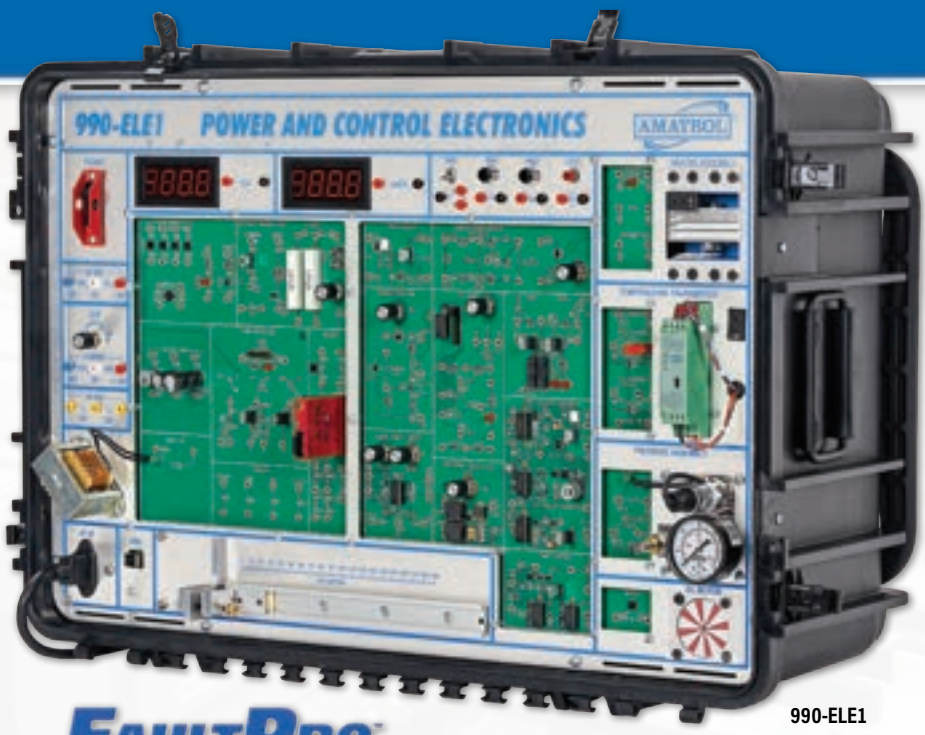
INDUSTRIAL ELECTRONICS

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

FAULTPRO
COMPUTER-BASED FAULT INSERTION

ELECTRONIC SENSORS



990-SN1



990-SN1 & 85-SN1 Multimedia Included

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

Portable Smart Manufacturing

- **990-SM10**
- **990-SM10CL**
  - Smart Manufacturing System
  - Wireless Temperature / Humidity Sensor
  - Current Transformer Sensor
  - Vibration Monitoring Application
  - PLC I/O Application
  - Cybersecurity
  - Production Monitoring

Options: Smart Manufacturing

- Data Acquisition > 99-SM10A
- Visualization & Data Analytics > 99-SM10B
- Cyber Security > 99-SM10C



990-SM10

SMART SENSORS



990-SD10

Portable Smart Machine Sensors

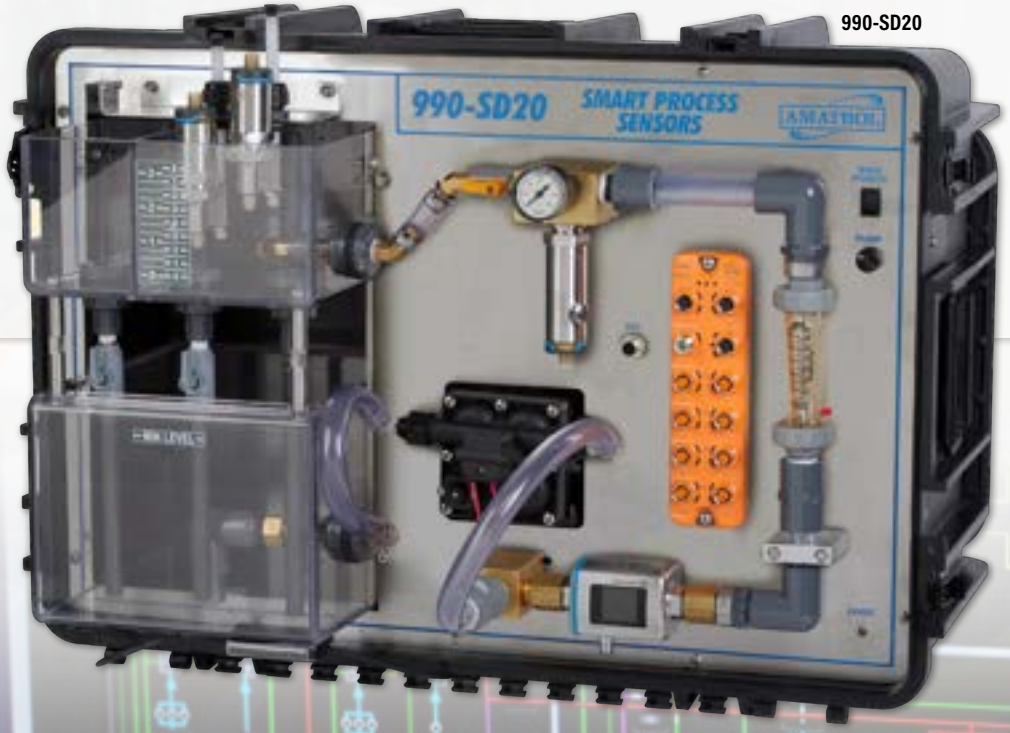
990-SD10

- 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 Multimedia Included

990-SD20



Portable Smart Process Sensors

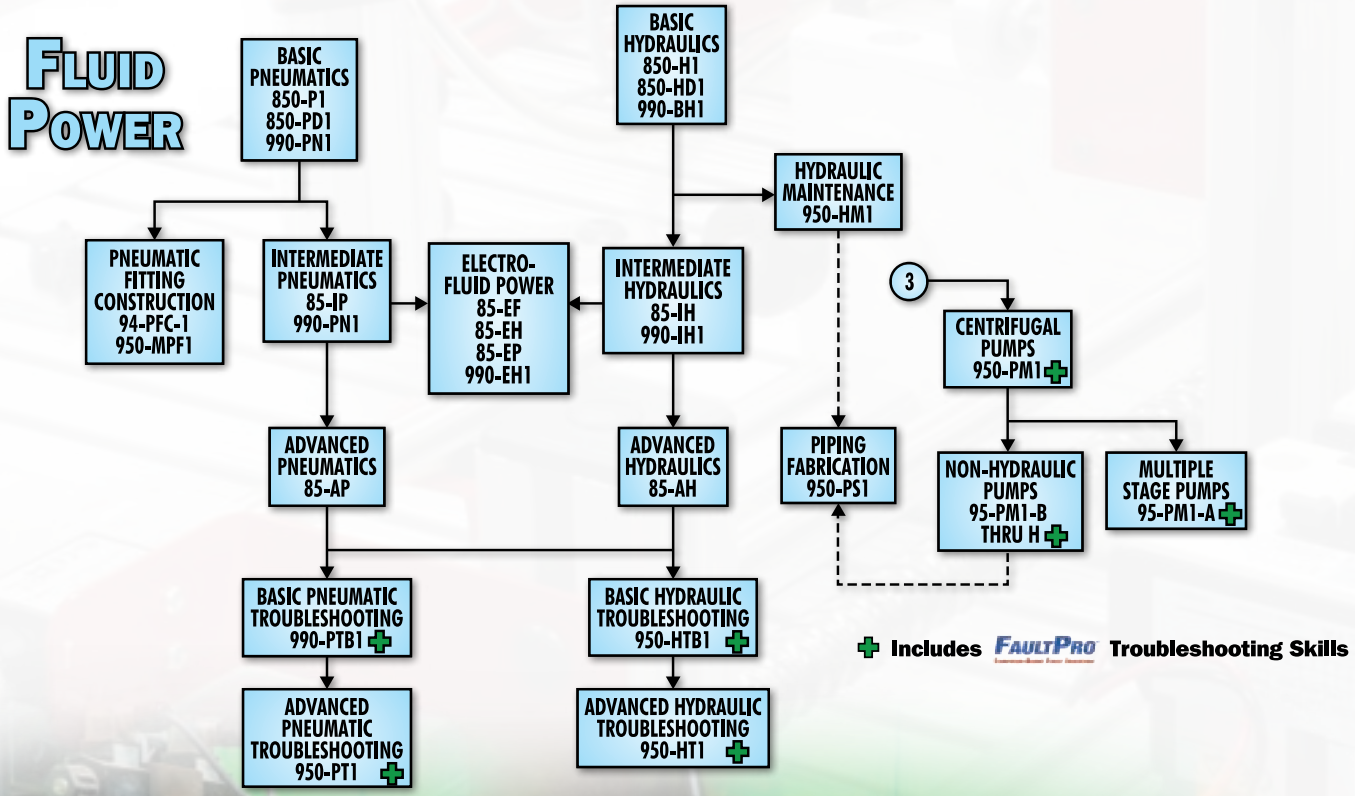
990-SD20

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



990-SD20 Multimedia Included

Fluid Power Learning Systems





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

Advanced Hydraulics ▸ 85-AH

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



85-AH Multimedia Included



85-IH



85-EH

Electro-Hydraulics ▸ 85-EH

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



85-EH 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



85-IH Multimedia Included

HYDRAULICS

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



990-EH1

Portable Electro-Hydraulics
990-EH1

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



990-EH1 Multimedia Included

Portable Intermediate Hydraulics
990-IH1

- 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



990-IH1 Multimedia Included

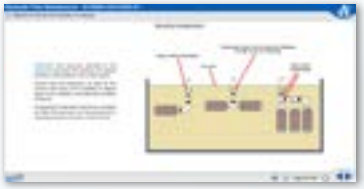


990-IH1

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



950-HM1

HYDRAULIC TROUBLESHOOTING



950-HTB1

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-HT1

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

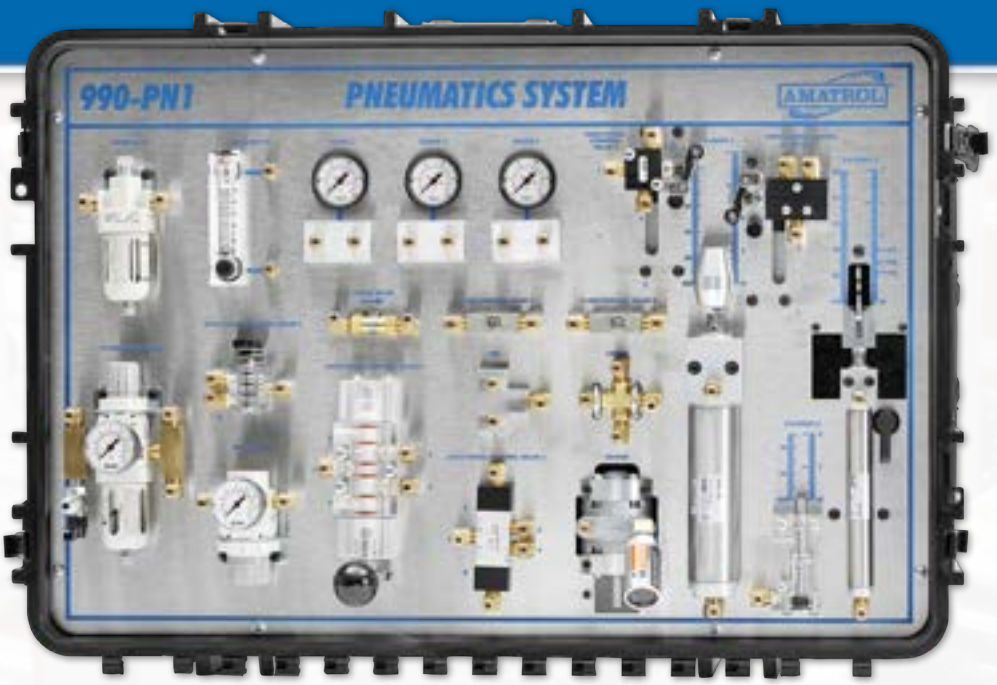
PNEUMATICS

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

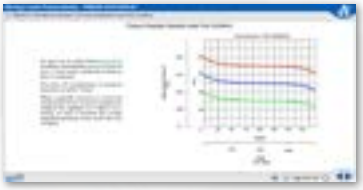
- Cam and Pilot Operated Check Valves
- Cylinders / Shuttle Valves / Air Logic
- Water Removal Techniques
- Air Dryers / After-Coolers
- Water Traps / Air Lubricators



85-IP Multimedia Included

Advanced Pneumatics ▸ 85-AP

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



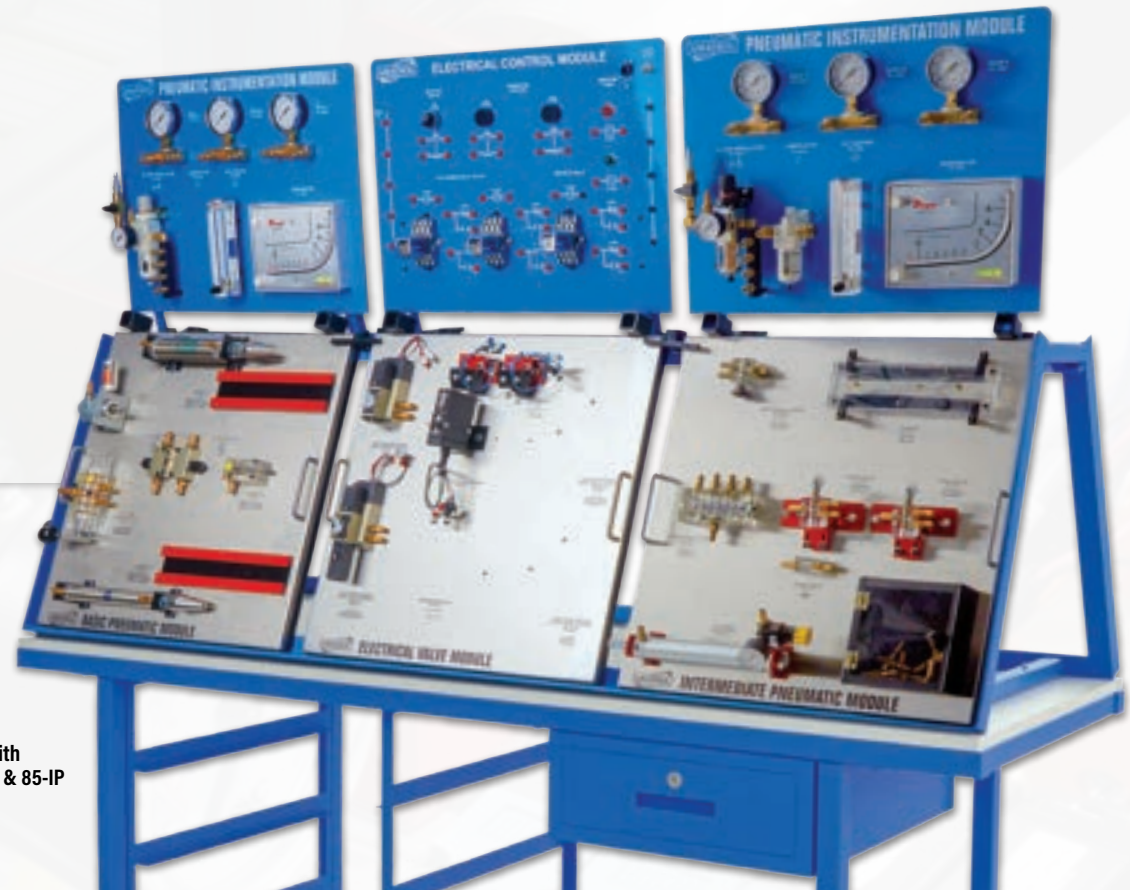
85-AP Multimedia Included

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



COMBINED FLUID POWER TRAINING

Basic Fluid Power Learning System – Double Sided A-Frame Bench with Two Hydraulic Manifolds ▸ 850-CD1

- Hydraulic Power Systems
- Basic Hydraulic Circuits
- Principles of Hydraulic Pressure and Flow
- Hydraulic Speed Control
- Pressure Control Circuits
- Pneumatic Power Systems
- Basic Pneumatic Circuits
- Principles of Pneumatic Pressure and Flow
- Pneumatic Speed Control Circuits
- Flow Control Valves



850-CD1 Multimedia Included



850-CD1
(shown with optional systems)



850-CD2
(shown with optional systems)

Basic Fluid Power Learning System – Double Sided A-Frame Bench with One Hydraulic Manifold ▸ 850-CD2

- Hydraulic & Pneumatic Power Systems
- Basic Hydraulic & Pneumatic Circuits
- Pumps
- Needle, Relief, Check, Flow Control, Sequence, & Pressure Reducing Valves
- Hydraulic & Pneumatic Schematics
- Principles of Hydraulic & Pneumatic Pressure & Flow
- Hydraulic & Pneumatic Speed Control
- Pressure Control Circuits



850-CD2 Multimedia Included

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



950-PM1

Diaphragm Pump



Turbine Pump

PIPING

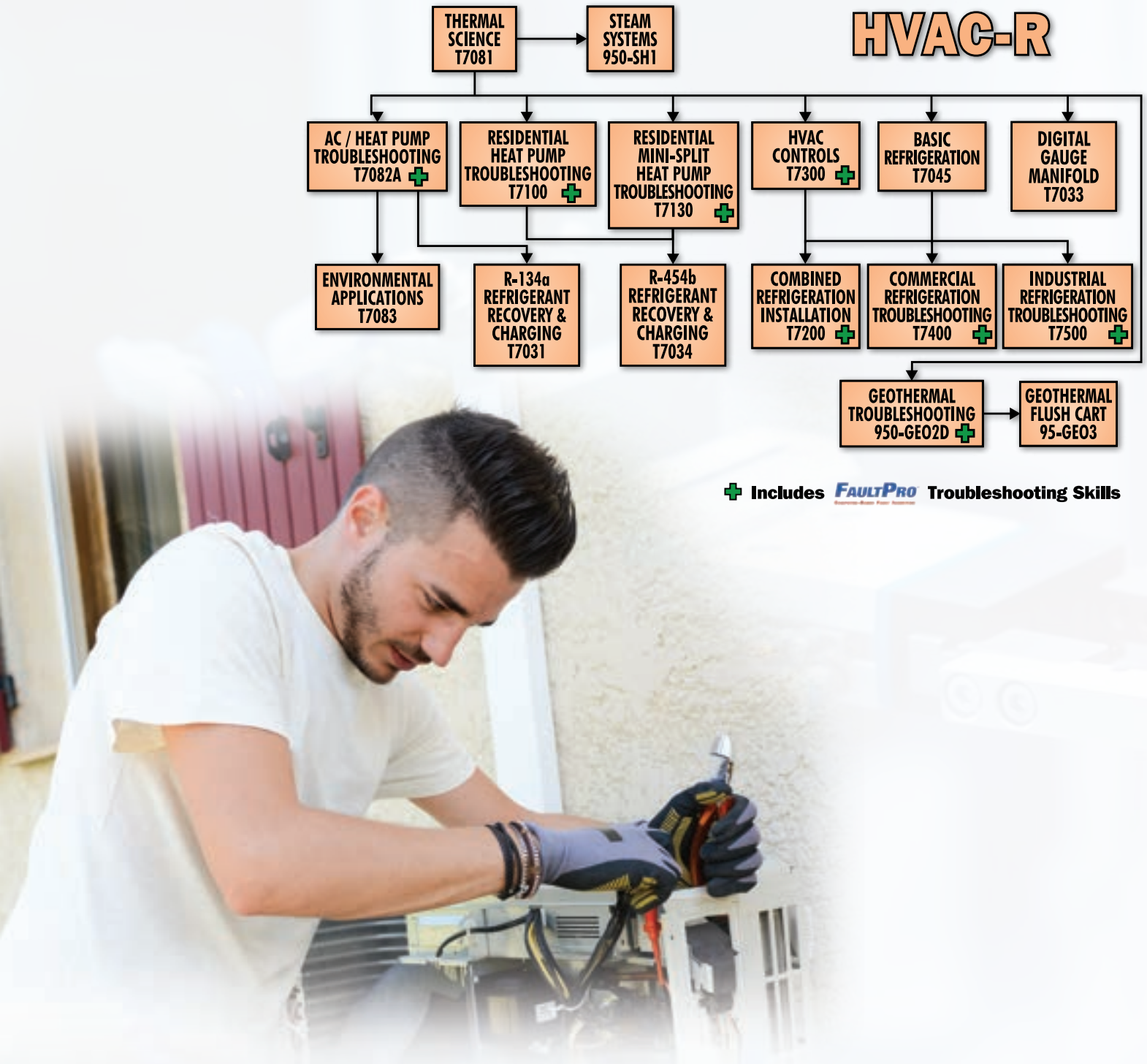
Piping Systems ▸ 950-PS1

- 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



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



T7082-A

T7083
adds to T7082-A

T7083 Multimedia Included

Heat Pump Troubleshooting ▸ T7082-A

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



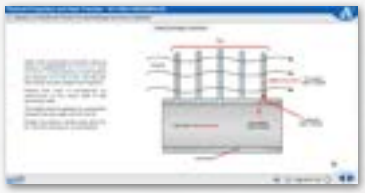
T7082-A includes
FaultPro Electronic
Fault Insertion



T7082-A

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



T7031

Refrigerant Recovery and Charging

- **T7031** (Uses R-134A Refrigerant)
- **T7034** (Uses R-454B 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/T7034 Multimedia Included



T7034



T7033

Digital Gauge Manifold ▸ T7033

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

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

FAULTPRO
COMPUTER-BASED FAULT INSERTION



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



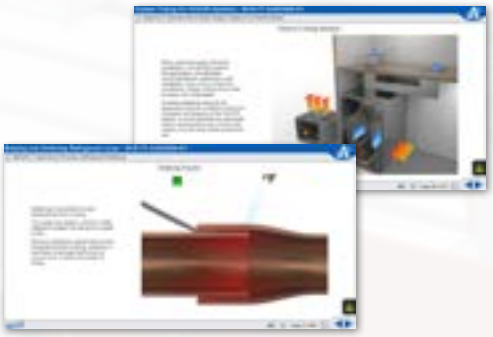
T7130 Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

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 Multimedia Included



T7200 (Front)



T7200 (Back)



INDUSTRIAL REFRIGERATION

Industrial Refrigeration ▸ T7500

- Semi-Hermetic Compressors
- Smart Refrigeration Controllers
- Defrost and Hot Gas Bypass
- Multi-Zone Industrial Refrigeration
- Systems Troubleshooting



T7500 Multimedia Included



T7500

GEOTHERMAL



95-GEO3
Shown with
950-GEO2D

950-GEO2D Multimedia Included

Geothermal Troubleshooting ▸ 950-GEO2D

- 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



95-GEO3 Multimedia Included

Geothermal Flush Cart ▸ 95-GEO3
(Adds to 950-GEO2D for Pressurized Operation)

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

FAULTPRO
COMPUTER-BASED FAULT INSERTION

COMMERCIAL REFRIGERATION



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



T7400 Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION

STEAM

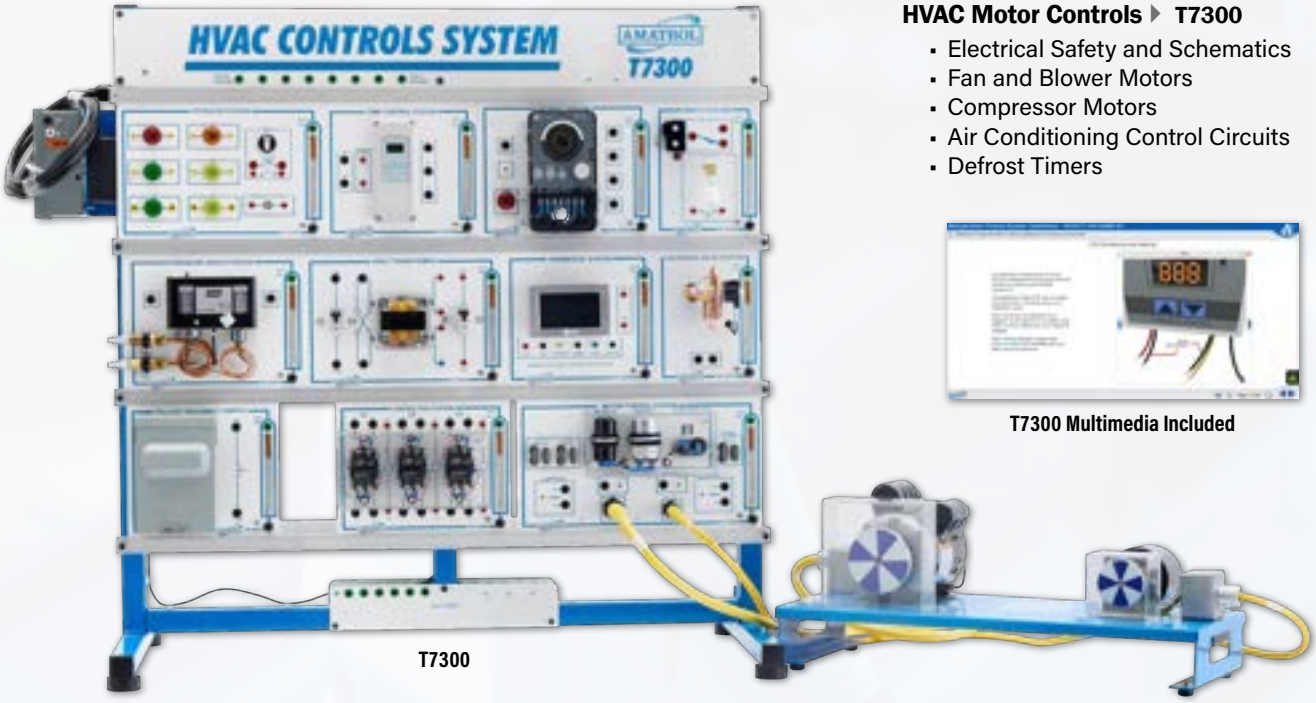
Steam Systems ▸ 950-SH1

- 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



950-SH1

HVAC CONTROLS



T7300

HVAC Motor Controls ▸ T7300

- Electrical Safety and Schematics
- Fan and Blower Motors
- Compressor Motors
- Air Conditioning Control Circuits
- Defrost Timers

T7300 Multimedia Included

IGNITE
Mastering Manufacturing

IGNITE: THE ELEMENTS

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.

eLEARNING COURSES

- Technical Skills
- Employability Skills
- Virtual Technology



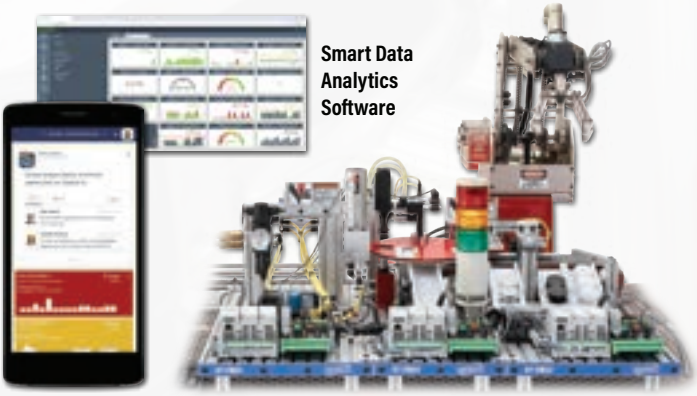
Course 1

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

HANDS-ON TECHNOLOGY



Smart Data Analytics Software

Table Top Smart Factory

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.

PROJECTS

- Team-Based Projects
- Mini-Projects



Design Briefs

Portable Solar Electric Living with Fresh Water

Autonomous Delivery Service

MATERIALS SCIENCE

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



Concepts for Next Generation Careers

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).

IGNITE Outcomes

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

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.

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.

05

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.

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.

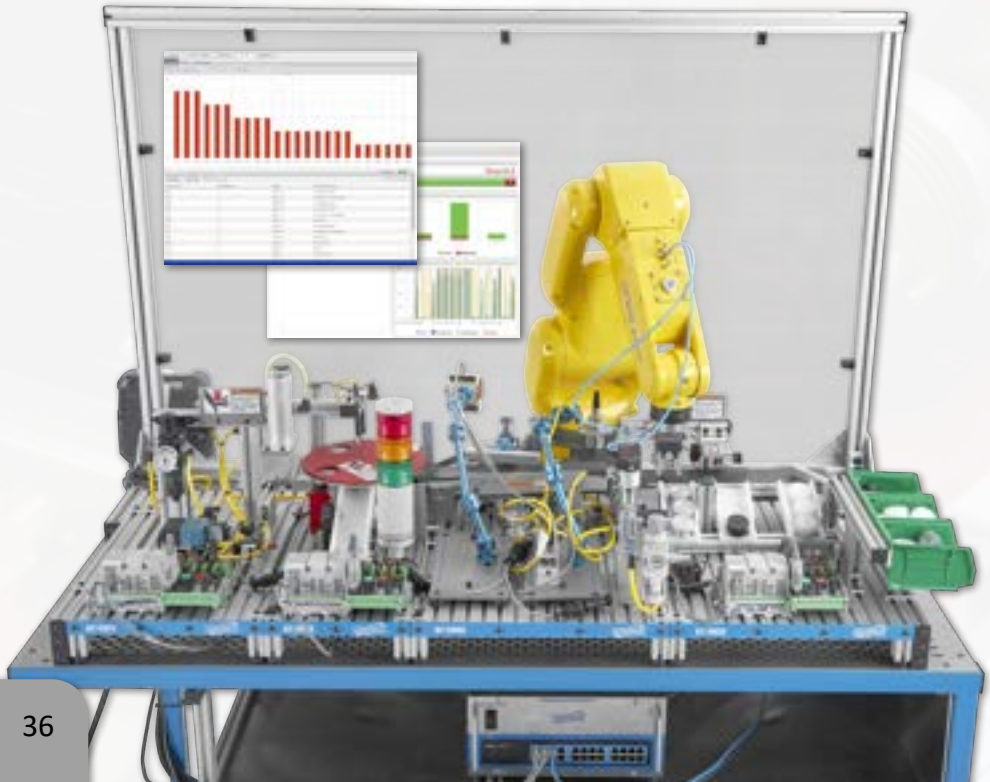
Interactive Multimedia Curriculum



Virtual Training



Hands-On Industrial Training



Course 1

Introduction to Mechatronics

38 Lessons

Topics Include:

- Introduction to Industry 4.0
- Safety
- Hand Tools
- Measurement
- Print Reading
- Precision Measurement
- Mechanical Drives
- Fluid Power
- AC/DC Electricity
- Electrical Relay Control
- Robotics Programming
- Electronic Sensors

From Training to Factory Floor





Course 2

Introduction to Industrial Control Systems

33 Lessons

Topics Include:

- Industry 4.0 Principles
- Mechanical Drives
- Hydraulics Fluid Power
- Pneumatics
- Robotics Programming
- Electrical Relay Control
- Electronic Sensors
- Ethernet Network Communications
- Programmable Controllers
- CNC Programming
- Mechatronic Systems

Course 3

Robot Operation & Programming

Topics Include:

- Robotic Safety & Components
- Frames
- Program Development
- Inputs, Outputs, and Macros

And More!

Certified Production Technician

Topics Include:

- Safety
- Quality Practices & Measurement
- Manufacturing Processes & Production
- Maintenance Awareness

And More!

Course 4

Introduction to Industrial Internet of Things

28 Lessons

Topics Include:

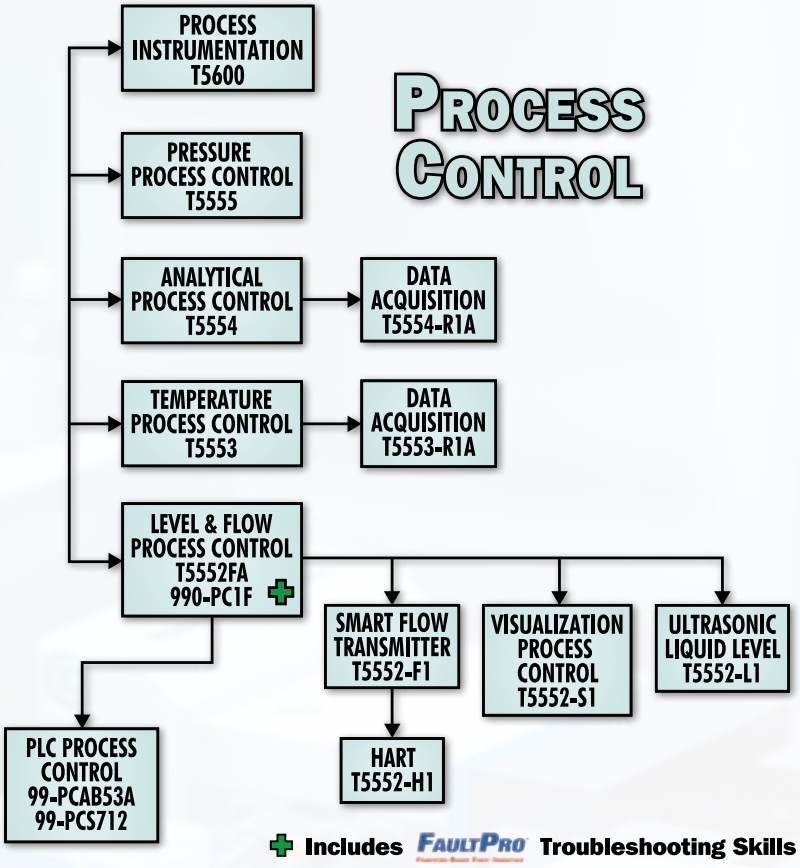
- Advanced Programmable Controllers
- Data Analytics 1
- Variable Frequency Drives
- Bar Code Production Identification
- Mechatronics: Motors & Conveyors
- Ethernet Network 2
- RFID Product Identification
- Smart Sensors
- Programmable Controllers
- System Optimization
- Mechatronics: Communication & ASRS
- PLC Troubleshooting

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

- **T5552FA**
  - P&I Diagrams
  - Flow & Liquid Level Measurements
  - Transducers / Transmitters
  - Component Level Troubleshooting
  - System Level Troubleshooting
  - In-Circuit Testing
  - Out-of-Circuit Testing



T5552FA Multimedia Included

FAULTPRO
COMPUTER-BASED FAULT INSERTION



T5552FA

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 T5552FA and 990-PAB53A Portable

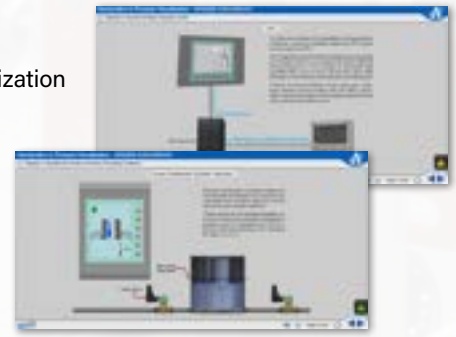
T5552FA ADD-ONS



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



T5552-H1

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 Multimedia Included



T5552-F1

Smart Flow Transmitter
T5552-F1

- Differential Pressure Type
- Digital Display, LCD
- Calibration
- Zero and Span Adjustments
- Manifold Bleeding
- Orifice Plate Meters (T5552-F1C)
- Venturi Meters (T5552-F1B)
- Pitot Flow Meters (T5552-F1A)



T5552-F1 Multimedia Included

Ultrasonic Liquid Level
T5552-L1

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



T5552-L1



T5552-L1 Multimedia Included

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
Single Loop PID Controller ▸ T5553-1A
Dual Loop PID Controller ▸ T5553-2A

- 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



T5553

Three-Channel Data Acquisition for T5553 ▸ T5553-R1A

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

ANALYTICAL PROCESS CONTROL



T5554

Analytical Process Control
Single Loop PID Controller ▸ T5554-1A
Dual Loop PID Controller ▸ T5554-2A

- 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

Connect All Four Systems to Create an Entire Process Plant!



T5552FA
Level / Flow Process Control
Troubleshooting

T5554
Analytical Process Control

T5555
Pressure Process Control

T5553
Temperature Process Control

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 Multimedia Included



T5555

INSTRUMENTATION



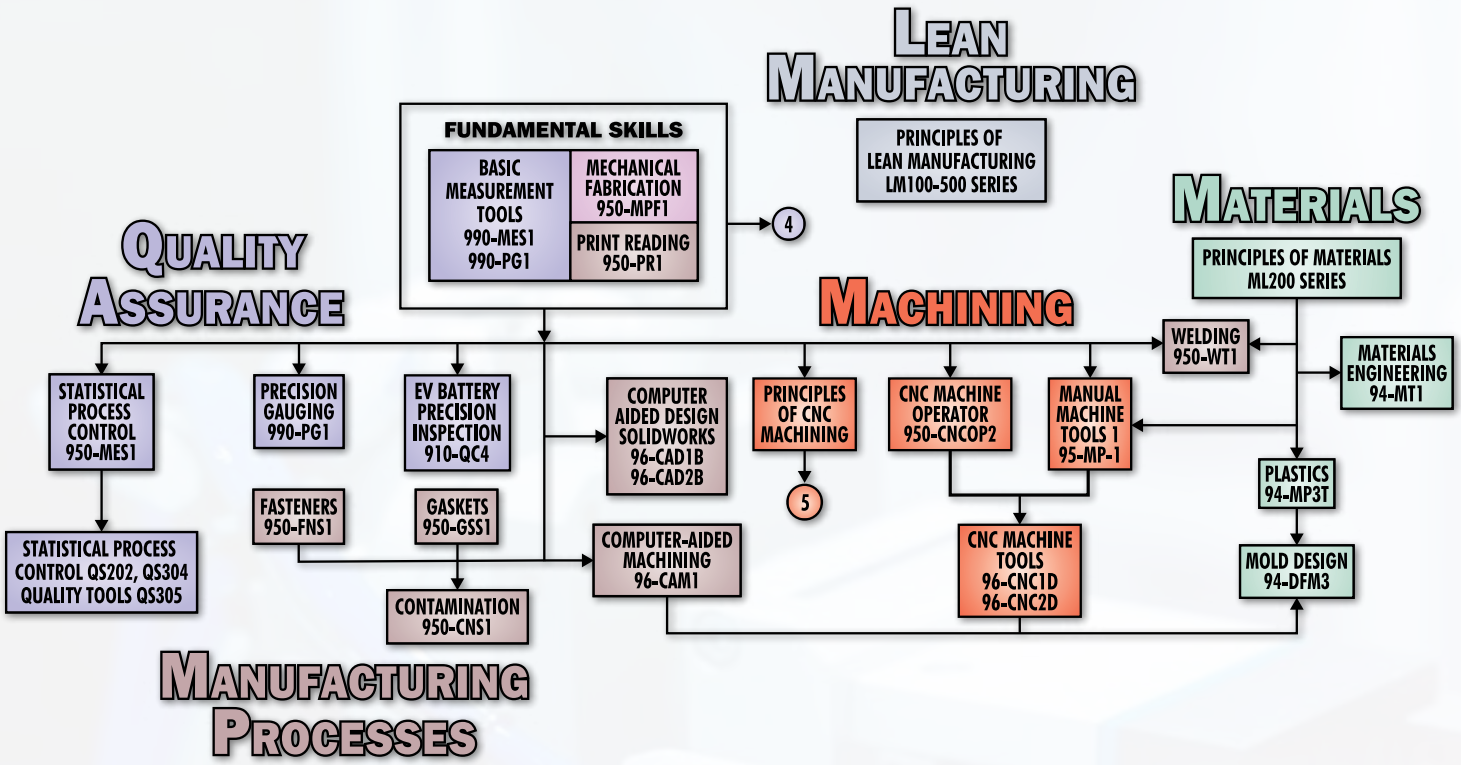
T5600

Process Instrumentation

T5600

- Process Control Operation Safety
- Process Documentation
- Level Measurement with Free Space & Guided Wave Radar Level Transmitters
- Level Detection with Point Level Vibronic Switch
- Pressure Measurement with Single-Ended & Differential Pressure Transmitters
- Temperature Measurement with RT Temperature Sensor with HART Transmitter
- Flow Measurement with Coriolis Flow Meter
- Ethernet & Transmitter Communications

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-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



950-CNCOP2 Multimedia Included

Manual Machine Tools
- **95-MP1**
  - Bandsaws
  - Drill Presses
  - Hand Tools
  - Manual Mills
  - Manual Lathe

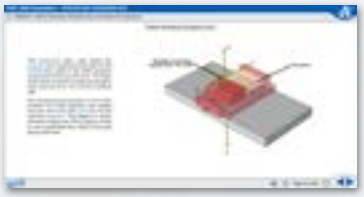
(Equipment is not shown)



CNC Machine Programming
- **96-CNC1D**
- **96-CNC2D**
  - CNC Setup
  - CNC Operation and Programming
  - Circular Interpolation
  - Speeds and Feeds
  - CNC Mill Canned Cycle
  - CNC Mill Cutter Compensation

96-CNC1D & 96-CNC2D

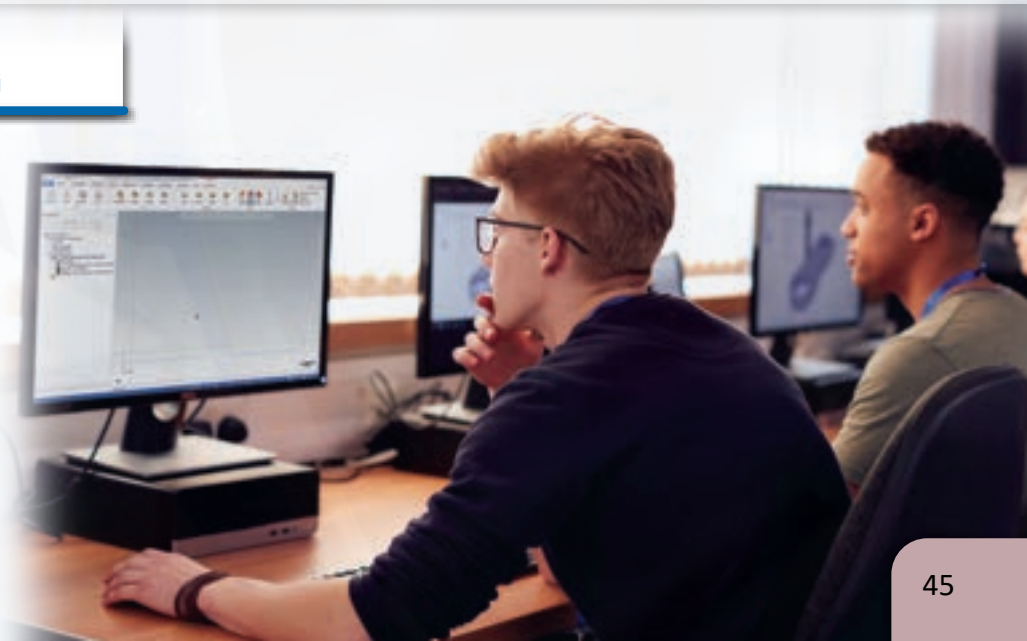




96-CNC1D & 96-CNC2D Multimedia Included

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



Plastics > ML204

PRINCIPLES OF MATERIALS

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



ISO & SPC

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



Quality Tools > QS305

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

STRUCTURAL DESIGN

Design of Structures 1 ▸ **94-DOS1**

- Moments and Bending Stress
- Bridge Design and Construction
- Structural Types, Elements, and Stability
- Properties of Materials and Design

Design of Structures 2 ▸ **94-DOS2**

- Beam Deflection
- Column Buckling
- Building Construction
- Concrete Testing



94-DOS1



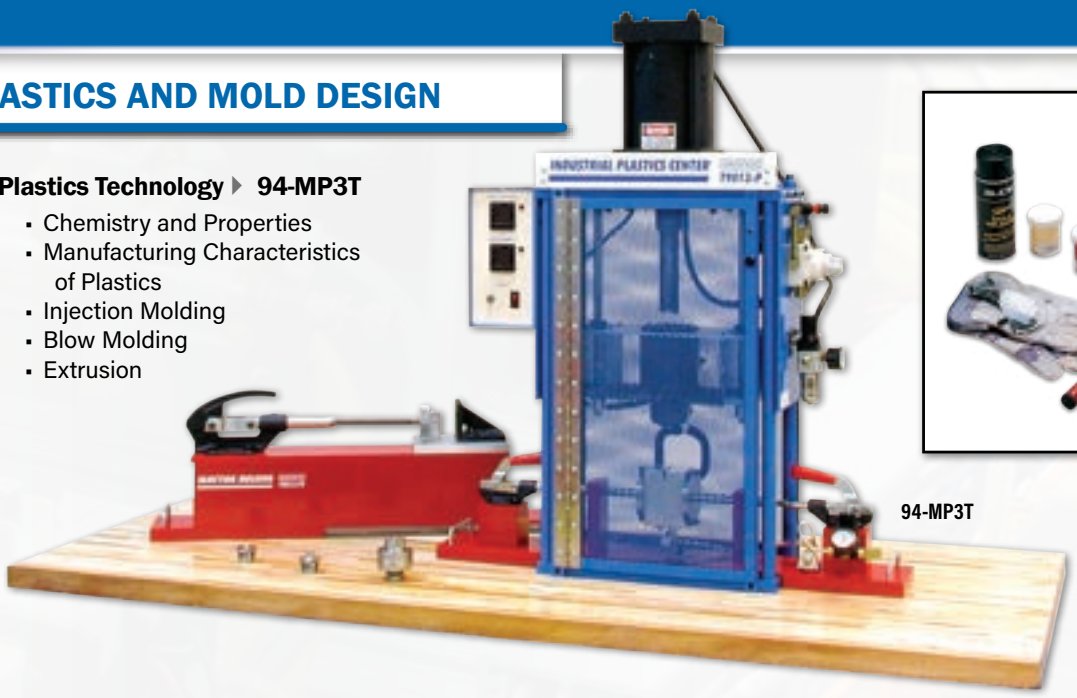
94-DOS2



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



94-DFM3 Multimedia Included

Mold Design ▸ 94-DFM3

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

WELDING TECHNOLOGY



950-WT1

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



MATERIALS ENGINEERING

Materials Engineering ▸ 94-MT1

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



94-MT1 Multimedia Included



94-MT1

EV-BATTERY



910-QC4

EV-Battery Precision Inspection ▸ 910-QC4

- EV Battery Measurements
- Digital Caliper Measurement
- Digital Data Collection
- Go-No Go Gauging
- Weight Measurement
- Digital Microscope Inspection
- Viscosity Measurement



910-QC4 Multimedia Included



950-MES1



Portable Measurement Tools

- **990-MES1**
- **950-MES1**
  - Basic Measurement
  - Tape Measurement
  - Precision Measurement Tools
  - Dial & Digital Calipers
  - Micrometers
  - Data Collection

990-MES1



990-MES1 Multimedia Included



990-PG1 shown with Optional 99-PG2

Portable Precision Gauging

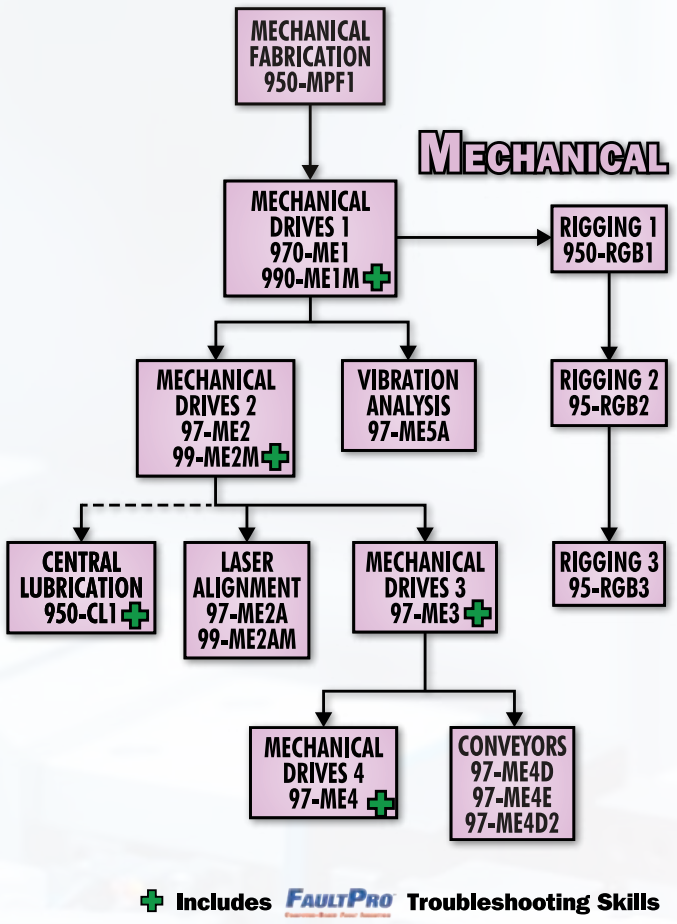
- **990-PG1**
  - Basic Measurement
  - Dial and Digital Calipers
  - US and SI Metric Micrometers
  - Introduction to Gauging
  - Indicator Measurement
  - Go / No-Go Gauging Tools
  - Indicator-Type Gauging Tools



990-PG1 Multimedia Included

Mechanical Learning Systems





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

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 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

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

CONVEYORS

Floor Standing Belt Conveyor
▸ 97-ME4D
▸ 97-ME4D2

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



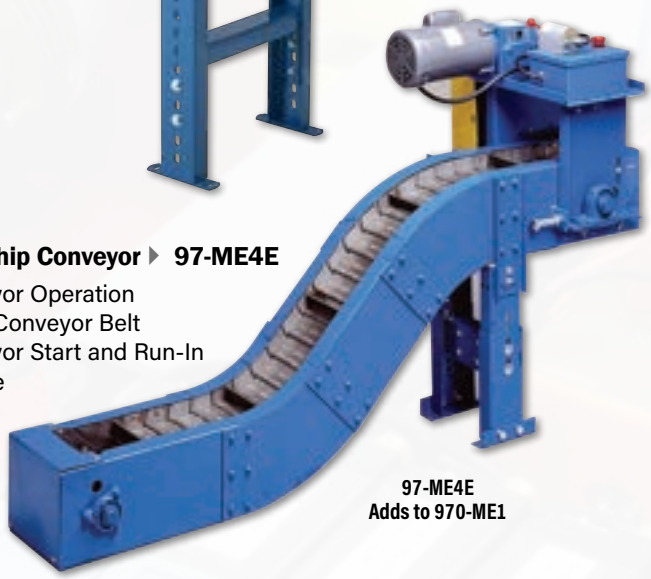
97-ME4D2
Adds to 970-ME1



97-ME4D
Adds to 970-ME1

Machine Tool Chip Conveyor ▸ 97-ME4E

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



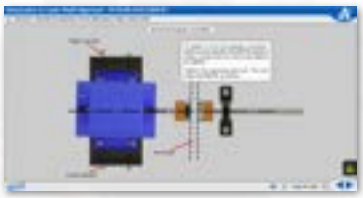
97-ME4E
Adds to 970-ME1

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



97-ME5A

Vibration Analysis
▸ 97-ME5A
(97-ME5A adds to 970-ME1)

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



Vibration Measurement

MECHANICAL SYSTEMS



Mechanical Systems 1 ▸ 96-MEC1

- Levers
- Mechanisms Concepts
- Force Measurement
- Linkages
- Cams
- Turnbuckles
- Friction
- Inclined Planes
- Fixed Pulleys
- Movable Pulleys
- Gear Drives



96-MEC1 Multimedia Included

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



950-RGB1



950-RGB1 Multimedia Included



95-RGB2 Multimedia Included

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

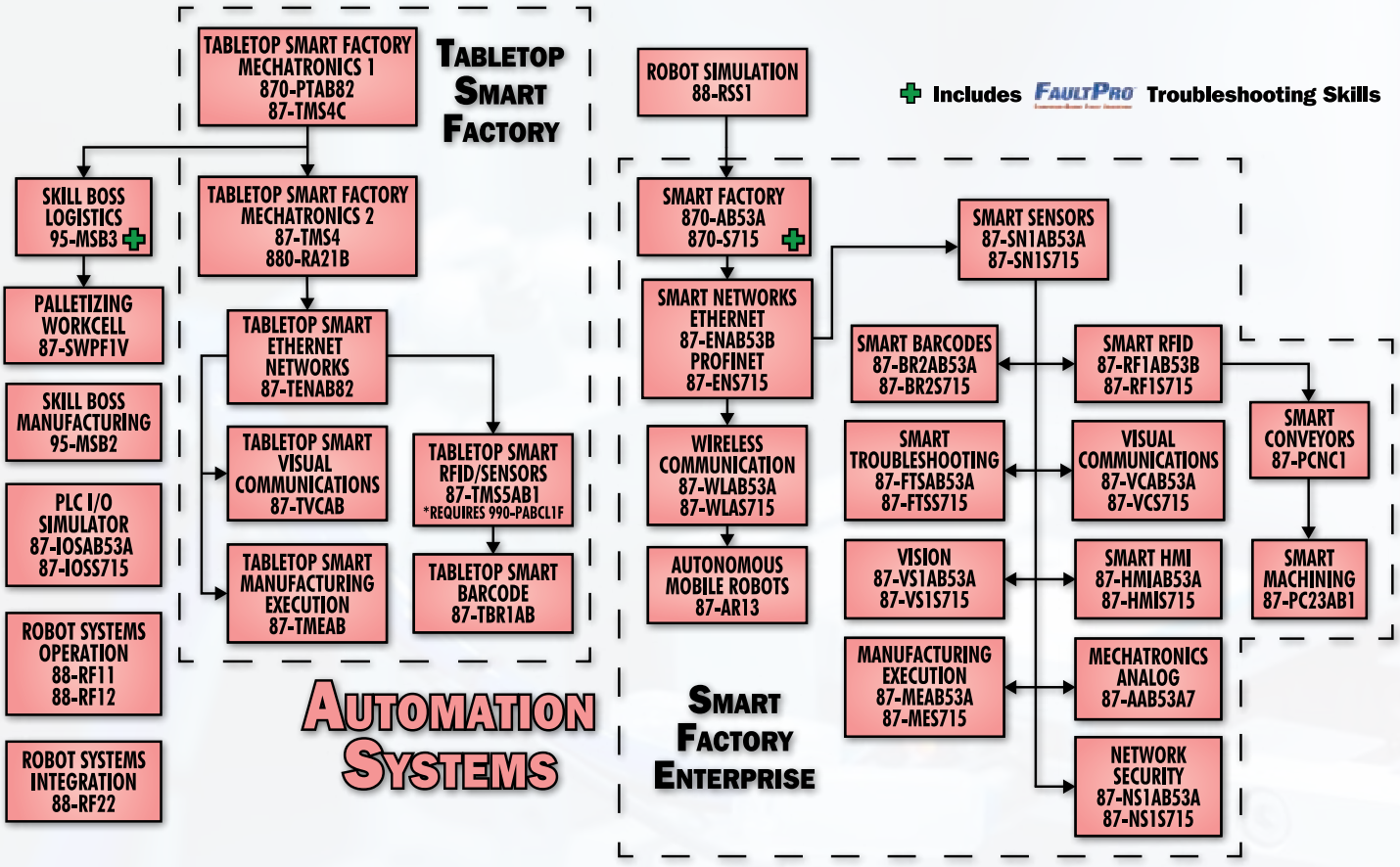
Rigging 3 ▸ 95-RGB3

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



95-RGB2

Smart Automation and Robotics Learning Systems



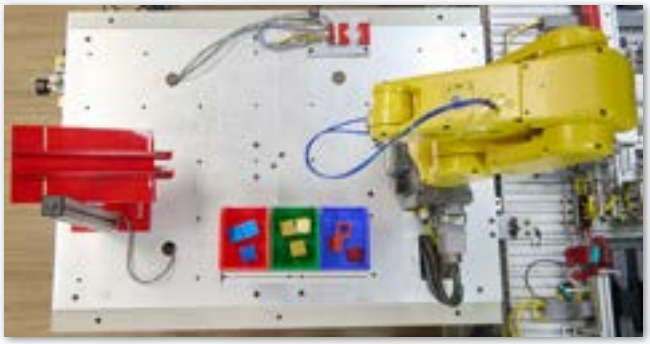


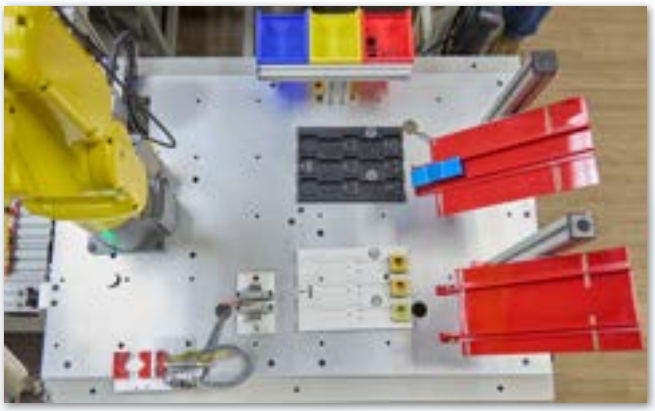
Maintain Real-World Automation Skills with Expansive Training Options

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.

ROBOT SYSTEMS







88-RF11



88-RF12



88-RF22

Robot Systems Integration

88-RF22

- Robot Program Basics
- Ethernet Communications
- Linear and Circular Robot Motion
- Robot End Effector Control
- Digital I/O Control
- PLC Workcell Control
- Branching Commands
- Data Registers and Arithmetic Operations
- Looping and Subroutine Commands
- Tool and User Frame Offsets

Robot Systems Operation 1

88-RF11

88-RF12

- Robot Concepts
- Robot Safety
- Robot Safety Inspection
- Teach Pendant Operation
- Robot Jogging
- Automatic Robot Operation
- Robot Frames
- Robot Point Adjustment
- Robot Faults

SACA

SMART AUTOMATION CERTIFICATION ALLIANCE

Aligns with SACA Robot System Operations and Robot System Integration Certifications

SKILL BOSS MANUFACTURING

Skill Boss Manufacturing – Allen-Bradley

95-MSB2AB

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



Also Available in Siemens Model

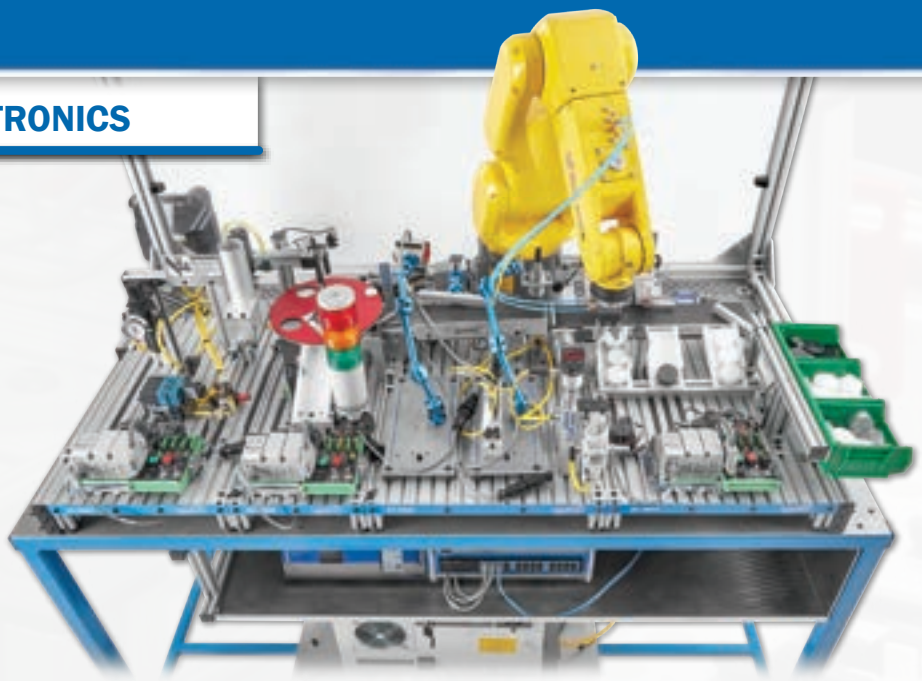
CPT+

Skill Boss Manufacturing Required by MSSC for CPT Plus Certification Assessment

TABLETOP SMART FACTORY MECHATRONICS

Tabletop Smart Factory Mechatronics

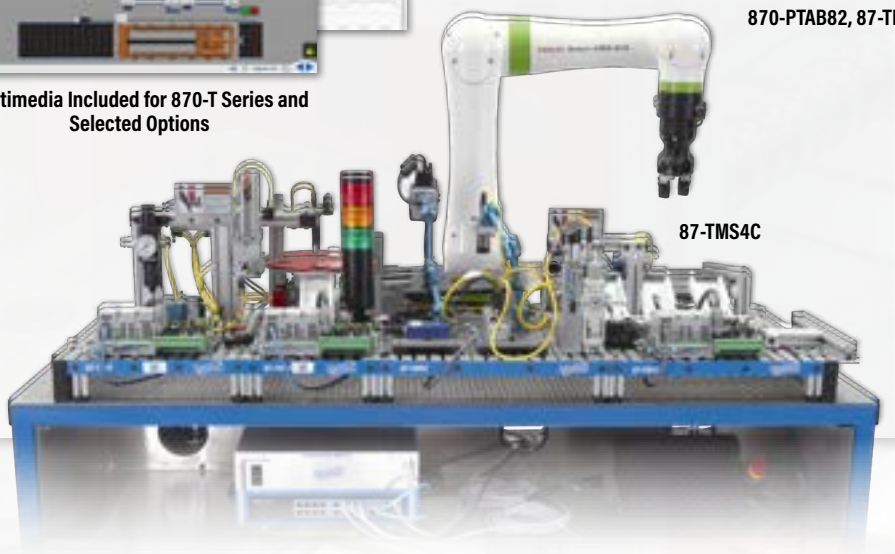
- **870-PTAB82**
- **87-TMS4C**
  - Industrial Sensors
  - I/O Link
  - Cloud-Based Software
  - Inventory Feeding
  - Inspection & Indexing
  - Sorting & Distribution



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



Multimedia Included for 870-T Series and Selected Options



87-TMS4C

The 87-TMS4C features a FANUC CRX-5iA Collaborative Robot ("cobot"), which offers an all-new FANUC programming interface with simple drag-and-drop technology on a touchscreen pendant, making it the perfect solution for users with little to no robotic experience.

TABLETOP ROBOTICS

Robotics 1 Learning System

- **96-ROB1A**
  - Basic Robot Operation
  - Power Up and Shutdown
  - Homing
  - End Effector Operation
  - Basic Robot Programming
  - Teaching Points
  - Movement and End Effector Commands
  - Looping and Speed Commands
  - I/O Interfacing
  - Material Handling



96-ROB1 Multimedia Included



96-ROB1 shown with options

Portable PLC Troubleshooting
990-PABCL1F

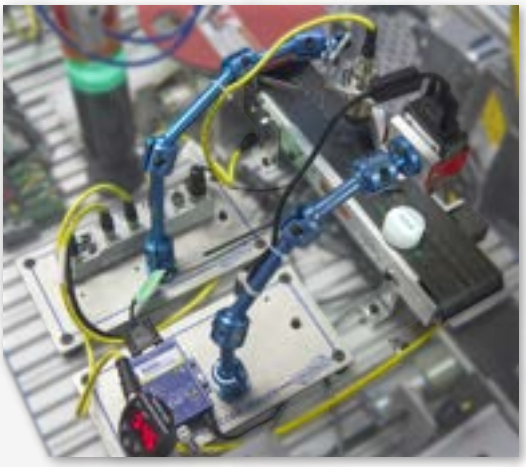
- Controller Operations
- PLC Program Operations
- PLC I/O Testing
- Event Sequencing
- Processor Troubleshooting



990-PABCL1F

Smart Sensors
87-TMS5AB1

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



87-TMS5AB1 & 87-TBR1AB

Barcode Reader
87-TBR1AB

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



Visual Communication Software

Manufacturing Execution
87-TMEAB

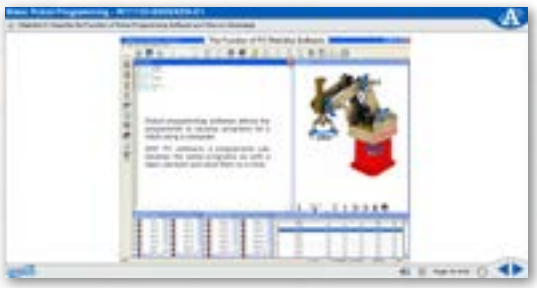
- Order Entry
- Scheduling
- Schedule Status
- Production Statistics
- Alarms



Manufacturing Execution Software

Visual Communication
87-TVCAB

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



88-RSS1 Multimedia Included

Robotics Simulation
88-RSS1

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



87-TENAB82

Ethernet
87-TENAB82

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

FAULTPRO™
COMPUTER-BASED FAULT INSERTION

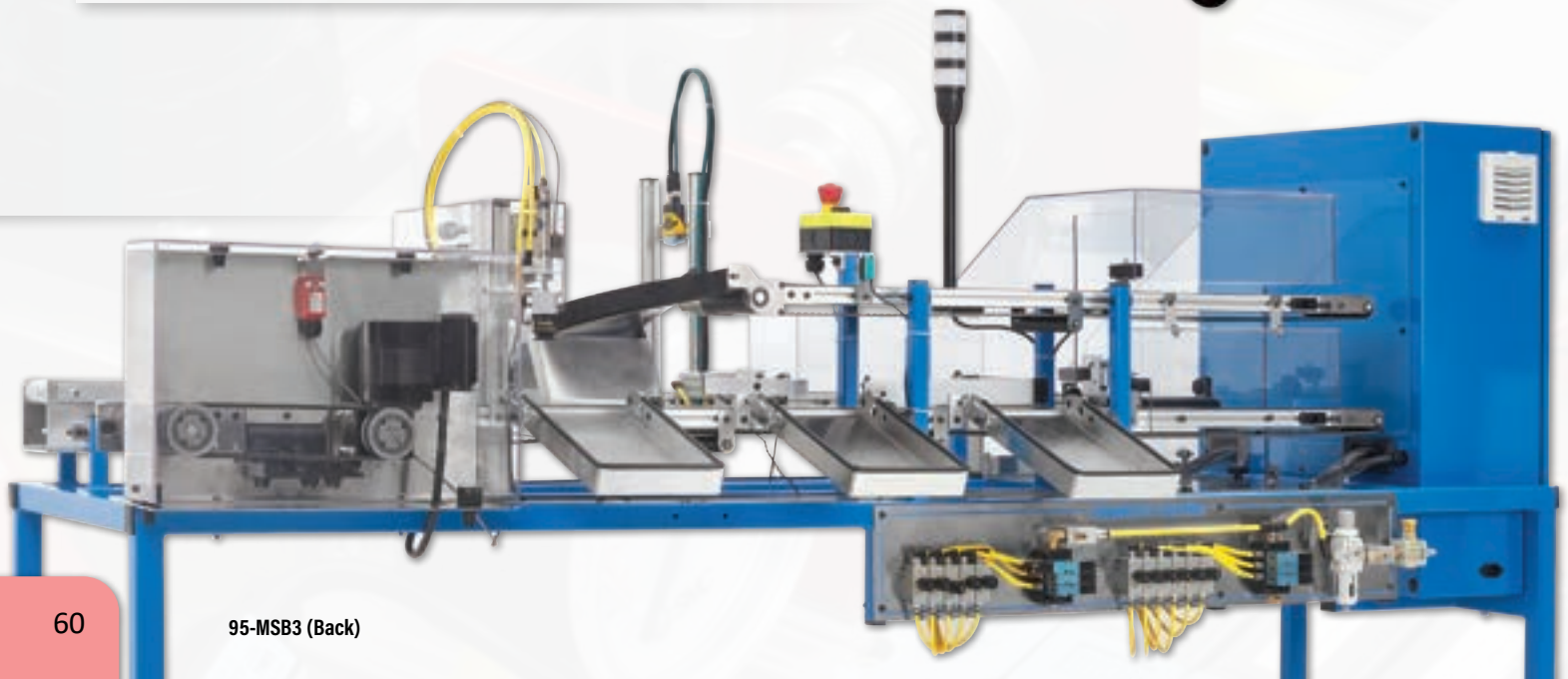
95-MSB3 with 87-SWPF1V & 87-MRL1



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

Skill Boss Logistics

- **95-MSB3**
  - Preventive Maintenance
  - System Monitoring & Operation
  - PLCs & VFDs
  - Barcode Readers
  - System Troubleshooting



95-MSB3 (Back)

Smart Robot Logistics Palletizing Workcell
87-SWPF1V

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



95-MSB3 with 87-SWPF1V & 87-MRL1

87-SWPF1V shown with 87-MRL1

Mobile Robot Logistics System **87-MRL1**

- Autonomous Mobile Robotics (AMR)
- Robot Startup
- Manual & Automatic Robot Operation
- AMR Mapping & Programming Missions

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

INDUSTRIAL SMART FACTORY MECHATRONICS



870 Series with
AB & Siemens PLCs



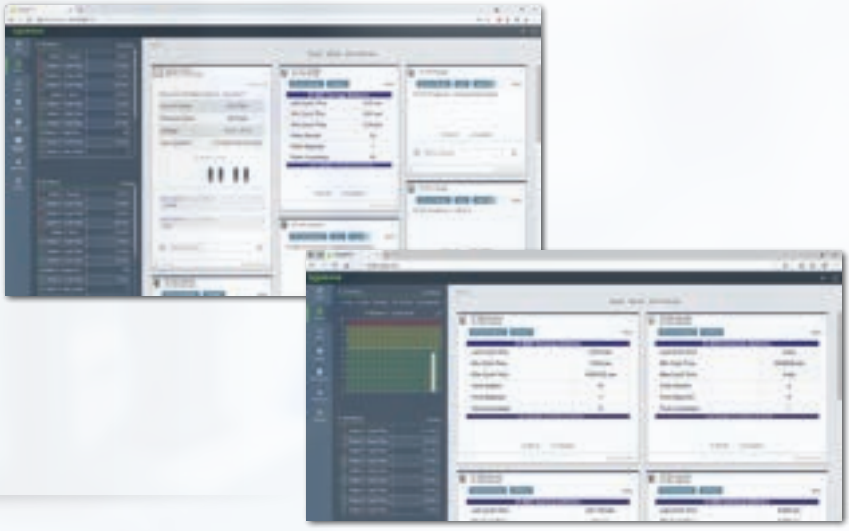
Manufacturing Execution Software (87-ME)

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



Multimedia included for 870 Series and Selected Options



Visual Communications & SCADA Software (87-VC)

SMART FACTORY OPTIONS

HMI Terminal
87-HMIAB53A, 87-HMIS715

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

Available for all Stations



Vision Inspection
87-VS1AB53A, 87-VS1S715

- 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-IOSAB53A, 87-IOSS715

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

Available for all Stations



Ethernet Communications and Networks
87-ENAB53B, 87-ENS715

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



Electronic Fault Insertion: FaultPro
87-FTSAB53A, 87-FTSS715

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

Available for all Stations

FAULTPRO
COMPUTER-BASED FAULT INSERTION



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

Machining Center

Smart Robot Workcells

Smart Production & Maintenance Software

Smart Product ID RFID/Barcode

Network Communications & Security

Smart Factory Assembly

Enterprise-Level

Smart Conveyor System





Visual Communications & SCADA Software

Autonomous Mobile Robot System

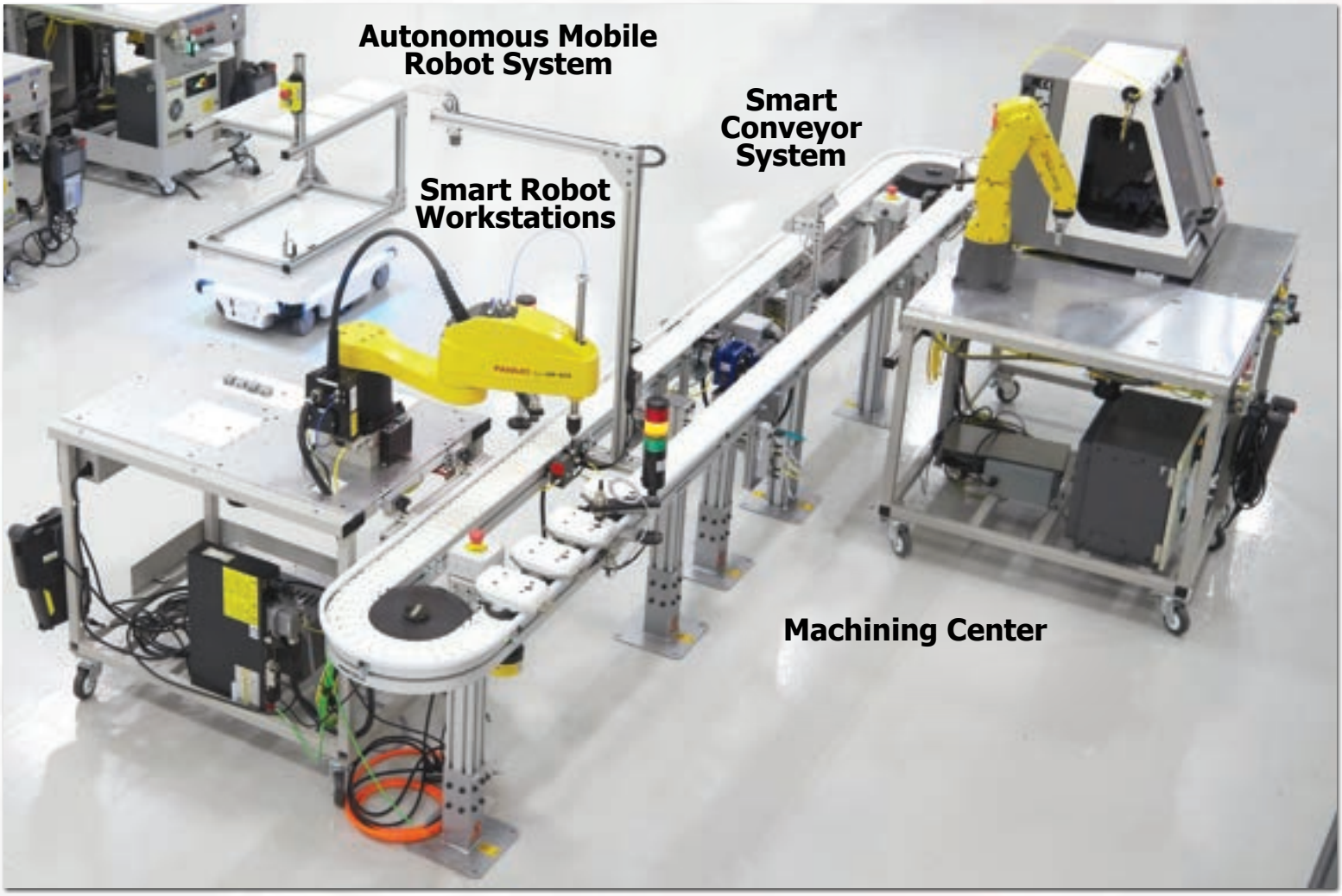
Smart Sensors

Laser Scanner System

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



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

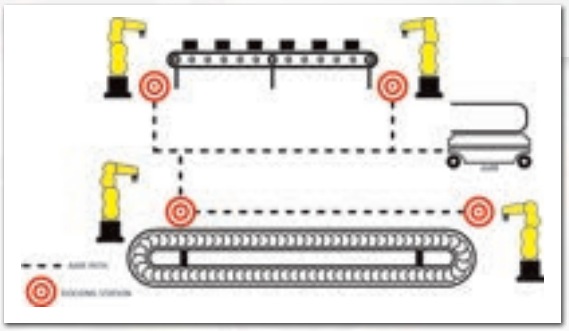
- The Smart Conveyor System integrates seamlessly with the other Enterprise components
- The conveyor and AMR can also be used as standalone systems or in other combinations

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.

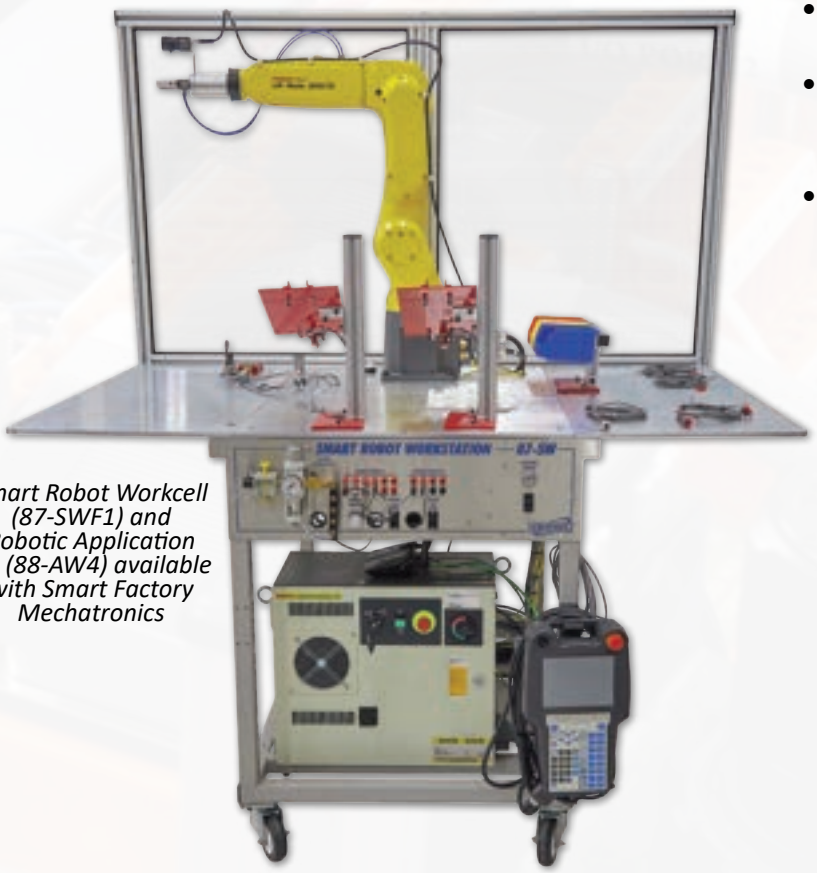
Autonomous Mobile Robot System

- 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 Workcell (87-SWF1) and Robotic Application Kit (88-AW4) available with Smart Factory Mechatronics

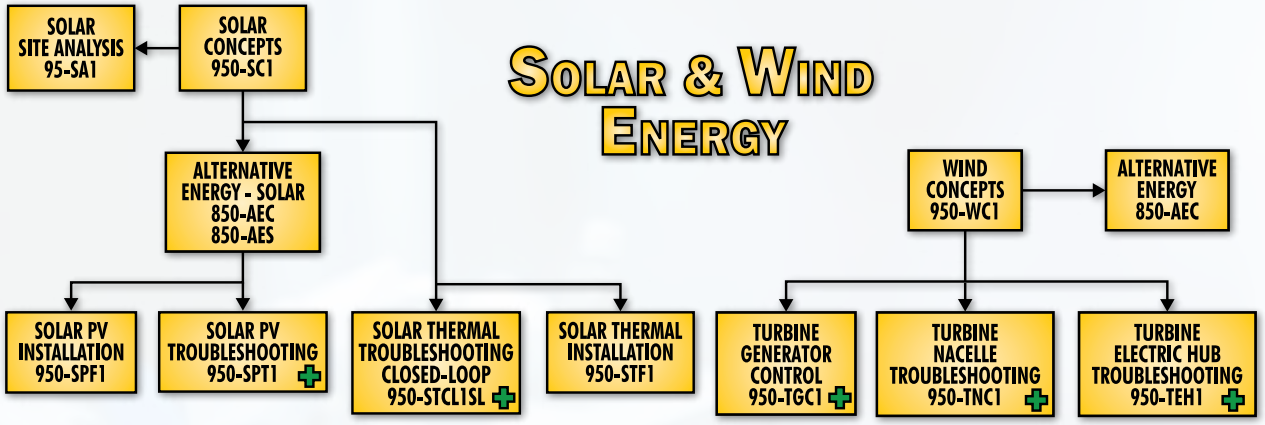
Smart Robot Workstations

- Teach industrial robot programming skills
- Variety of industrial FANUC robots, including the 200iD / 4S, 200iD, and SCARA SR-6iA 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



MechaSIM

Solar and Wind Energy Learning Systems



✚ Includes FaultPro Troubleshooting Skills

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



850-AEC



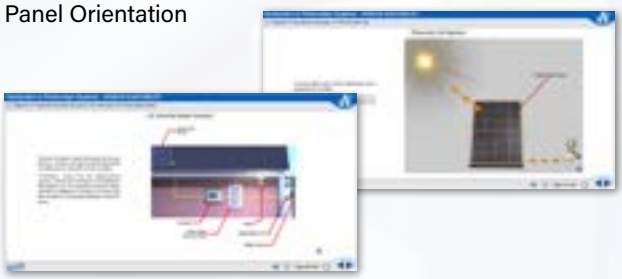
Sun Simulator and PV Panels (Back)

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



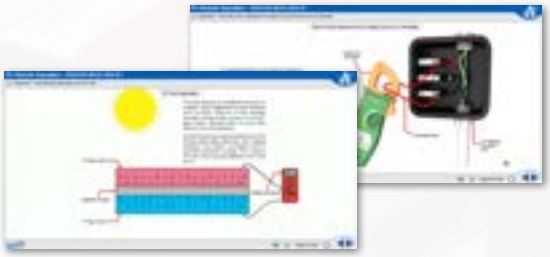
950-WC1 Multimedia Included

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

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COMPUTER-BASED FAULT INSERTION



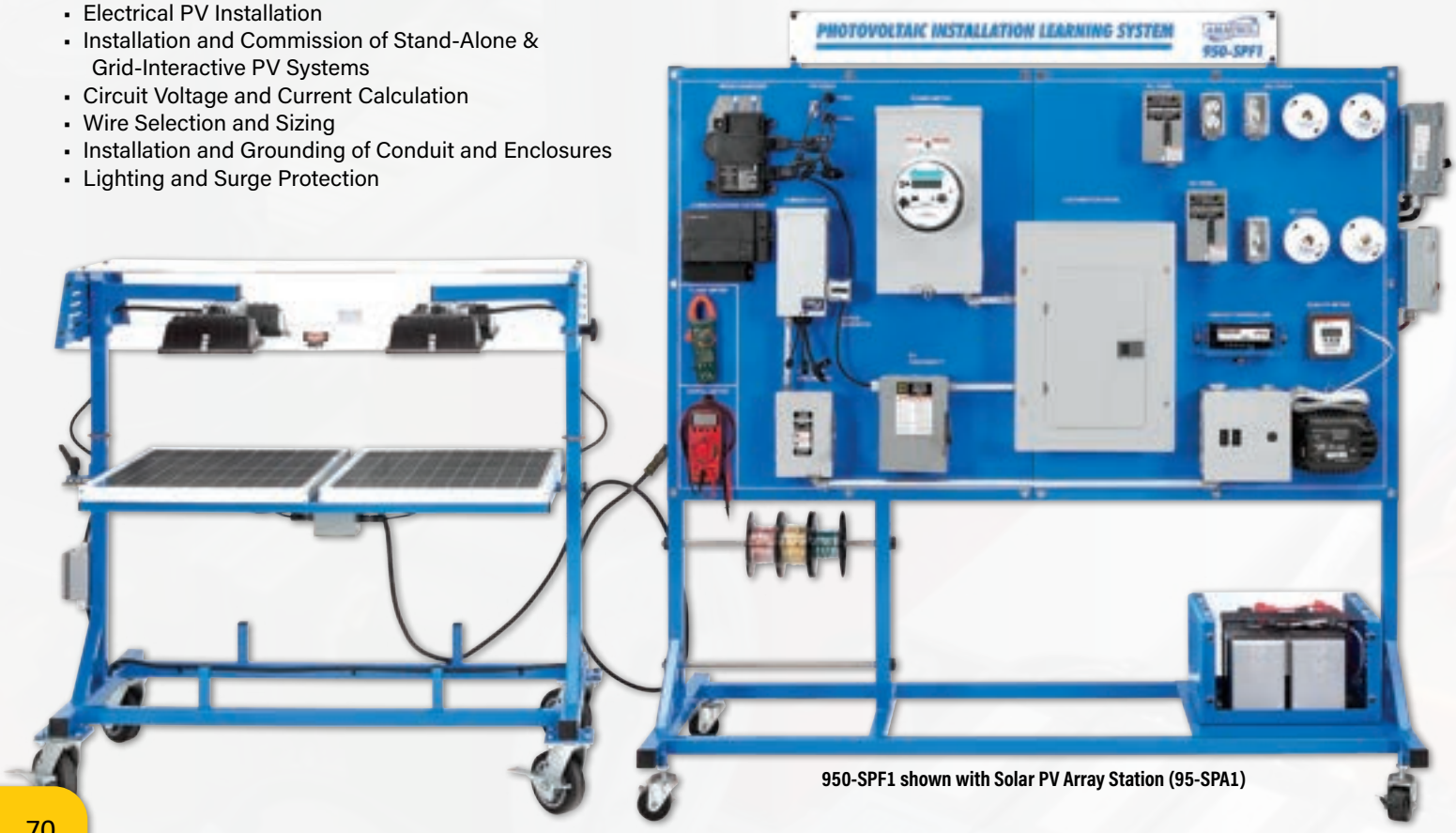
950-SPT1 Multimedia Included



950-SPT1

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
- Lighting and Surge Protection

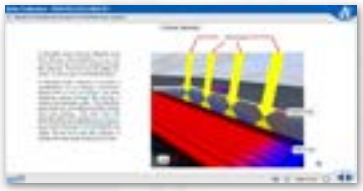


950-SPF1 shown with Solar PV Array Station (95-SPA1)

SOLAR THERMAL SYSTEMS

Solar Thermal Troubleshooting (Closed-Loop)
▸ 950-STCL1SL

- 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-STCL1SL Multimedia Included



950-STCL1SL shown with
Solar Thermal Sun Simulator (95-STS1)



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 Contractors
- 3-Phase Inverters
- Power Distribution Panel
- Pad Mounted Transformers
- Rectifiers
- Computer Control Units
- Temperature Control



950-TGC1



950-TGC1 Multimedia Included

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



950-TGC1



950-TNC1



950-TEH1

Turbine Nacelle Troubleshooting
950-TNC1

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



950-TNC1 Multimedia Included

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950-TNC1



950-TEH1

Turbine Electric Hub Troubleshooting
950-TEH1

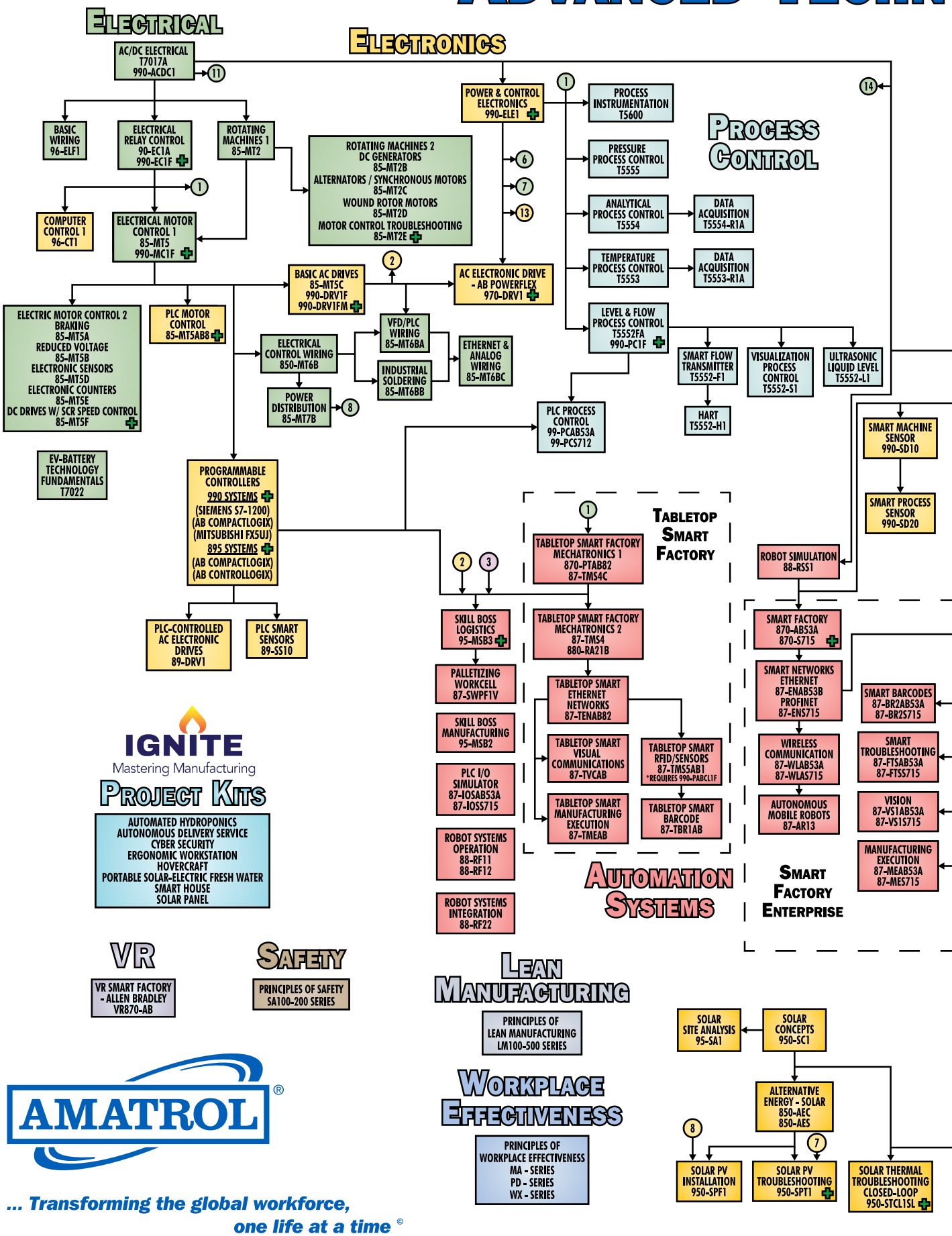
- Hub Power, Functions, and Safety
- Pitch Control Software
- Servo Pitch Operation
- Servo Reference Position Adjustment
- Sensor Operation
- Emergency Feather Operation and Control
- Battery Operation and Capacity
- Battery Types and Banks
- Battery Charging
- Power Voltage Verification
- Hub Fault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



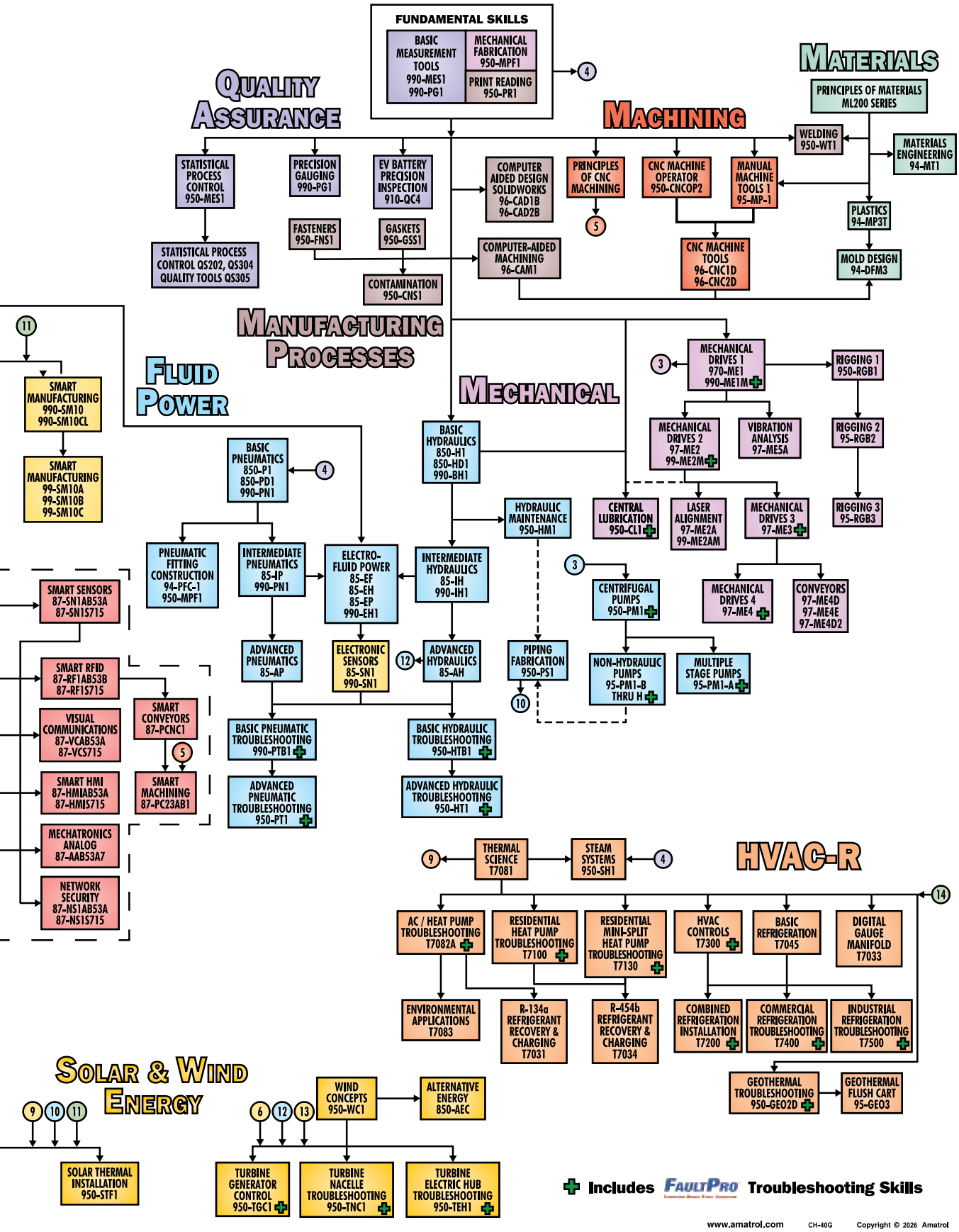
950-TEH1 Multimedia Included

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Advanced Techn



ICAL SKILLS MAP



Not sure where to start? Here are some options:

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