

## Industrial Process Trainer

34-250



The Industrial Process Trainer provides a practical approach to understanding the way process systems work; chiefly their operation, control, maintenance and the function of system components.

There are three main areas of industrially relevant training provided by the trainer:

- Fault Finding** - Built-in switchable faults with fault diagnosis methodology. Built-in relay logic control. Components with faults supplied.
- Process control** - Study of Level and flow processes using an external industrial process controller.
- PLC control** - Control of Level and flow processes using analogue input/outputs and logic control.

**Description** - The Trainer is a bench-standing, level and flow process control system that has been specifically designed to train students in the methodology of fault-finding and fault diagnosis in a typical industrial process control environment.

**Process** - The Trainer has two tanks, one mounted above the other. Water is transferred from the lower tank to the upper tank by means of a pump. The flow of liquid can be controlled via solenoid operated valves or via a proportional control valve. Sensors are fitted to all sections of the system to give indications of liquid flow.

The level in the upper tank can be controlled using adjustable limit switches that allow the upper and lower liquid levels to be set independently. There is also a proportional level sensor that allows the level to be monitored between full and empty, producing a 4-20mA signal across that range.

The Industrial Process Trainer comprises two interconnected panels: the **Control Panel** and the **Process Panel** (see back page)

### Features

- Self contained processes
- Wide range of easy-to-apply faults
- Mechanical, electrical, electronic and process component faults
- Teaches fault diagnosis and fault-finding methodology
- May be used as part of an Industrial Maintenance programme
- May be driven from external PLC or Process Controller
- Compatible with the Feedback range of Procon controllers and software
- Fully protected for safety

## The Fault Finding Application

The Fault Finding application can be used to demonstrate a range of faults, which may be open circuit, short circuit, or faults to ground. It is also possible to introduce component faults in the sensors solenoids on the main system. The faults are introduced into the system either by switches or the simple insertion of pre-faulted relay units and faulted components supplied. The use of plug-in relay modules greatly increases the insertion speed of faults. Security of the introduced switched faults is ensured by a lockable section within the control panel. The pump may also have a range of electrical and mechanical faults applied to it. The proportional servo valve, pulsed flow meter and proportional level sensor are self-contained sub-systems. Each of these systems can have electronic faults introduced onto them. The trainees then have to identify where the faults are, either on the circuit board or the sensors and transducers.

Float switch assembly inside the top water tank



Proportional fluid level assembly operated by a float

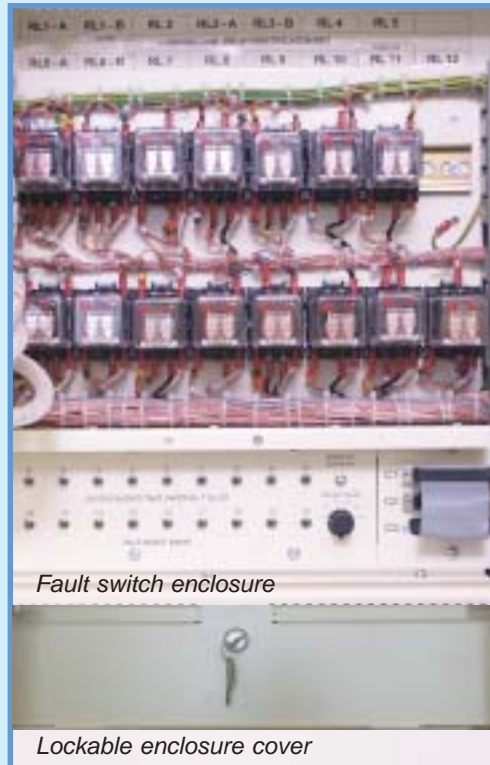


## Accessories

The accessories consist of valve solenoid coils with open and short circuit faults; relays with faulted contacts and coils, open and short circuit; and also an electronic servo valve drive that has an electronic fault. Other items include replacement fuses for the switched faulted conditions; 'O' rings for faulting float switches; a water drain pipe and two sets of keys for the fault switch enclosure and the control unit door.



Relays inside the locked front panel door



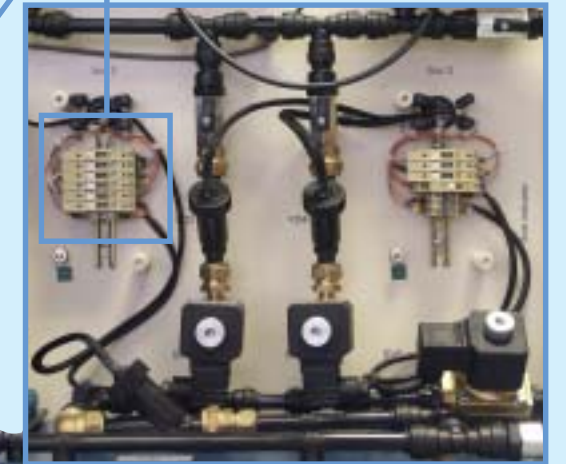
Fault switch enclosure

Lockable enclosure cover

Mains, servo valve and plc connections positioned on the side of rig



Detail showing both fuse box covers removed enabling easy access to the fuses



## Optional Process Controller Pack 34-010

The Process Control Pack is designed to demonstrate the theory and operation of level and flow control processes. In this application an industrial programmable three-term controller is used to implement the control, replacing the built-in relay control system. The 34-010 contains the industrial controller and 4-20mA interface unit including 4-20mA source with flow level and pulse flow transmitter modules and a digital display module. Control and monitoring software is also provided, along with instructions on the system use and operation.



Process Controller 38-300 above  
Process Interface 38-200 below



Flow Level Transmitter 38-401



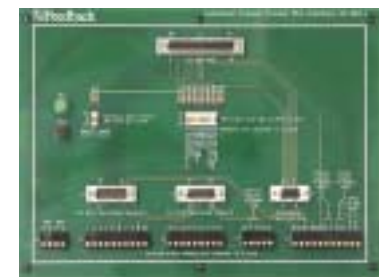
Pulse Flow Transmitter 38-421



Digital Display Module 38-490

## Optional Process Trainer PLC Interface 34-252-1

The PLC Interface board allows the internal relay logic flow switches, level switches and 4-20mA inputs and outputs of the trainer to be accessed through a multi-way connector on the side of the control cabinet. The connections are made on terminal blocks that can be easily wired to the PLC. The PLC requires both analogue I/O and switched I/O.



## The Process Control Application

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## Manuals on paper & CD

Courseware on paper and CD is an important part of the system. There are standard Instructors and Students manuals, and also an External Operating systems manual that provides information about plant interfaces and how the optional equipment shown on this page can be utilised to cover additional system curriculum.



The manual

## Manual coverage

- **Overview of the system**
- **Initial set-up of the Rig**
- **Systems description**
- **34-250 and accessories**
- **Description of key components**
  - Flow control valves
  - Flow detectors
  - System operation switches
- **P1 process**
- **P2 process**
- **The Flow process**
- **System flowcharts**
- **Test sequence**
  - Normal mode
  - Fault switches operation
- **Fault diagnosis**
  - Fault switches
  - Faulty components

## Control Panel



The Control Cabinet contains the main power input switching, power supplies and protection devices. The cabinet door, the control panel is divided into three distinct areas.

Area one houses the main ac power control that includes separate power on and off push-buttons, emergency power off button and supply earth leakage breaker.

Area two contains the process system controls and indicators for starting/stopping the process and giving a visual indication of the process status by illuminated indicators.

Area three provides digital displays and transmitters for the level and flow transducers in the system and also a 4-20mA source to control the system motorised servo valve.

The Cabinet contains the internal relay based process controller, lockable fault switch enclosure and low voltage dc power supplies to run the process.

## Process Panel



The Process Panel presents the process system components in a way that conveys the sequence in which the process is timed, from the water delivery from the sump tank through controlled flow restriction solenoids and/or motorised control valve and into the working system header tank via flow sensors. The process water is then returned into the sump tank via controlled flow restricted solenoid valves, draining the tank and enabling output from the level sensor to provide a measure of the actual controlled water level. The visible components are: Water tanks, Manual valves, Flow switches, Flow sensor, Solenoid valves, Glass flow meter, Motorised servo valve and Valve drive electronics (under removable cover).

## Power requirements

220-250V ac @ 250VA or 110-125V ac @ 250VA, 50/60Hz.  
Please specify when ordering.

## Dimensions

Height: 700mm (27 $\frac{1}{2}$ in), Length: 1450mm (57 $\frac{1}{8}$ in),  
Depth: 450mm (17 $\frac{3}{4}$ in).

## Ordering Information

Industrial Process Fault Finding Trainer	34-250
<b>Optional equipment</b>	
Industrial Process Controller pack	34-010
Industrial Process Trainer PLC Interface	34-252-1

 **Feedback**  
Feedback Instruments Limited  
Park Rd, Crowborough, East Sussex,  
TN6 2QR, England.  
Tel: +44 (0) 1892 653322  
Fax: +44 (0) 1892 663719  
E-mail: [feedback@fdbk.co.uk](mailto:feedback@fdbk.co.uk)  
Website: [www.fbk.com](http://www.fbk.com)

For further information on Feedback equipment please contact: . . . . .