

# Selecting A Recorder



## GETTING STARTED-A CHECKLIST

- How many inputs need to be recorded?
- What types of inputs need to be recorded?
- Voltage and sensitivity
- Thermocouples
- RTD's
- Do different input types need to be recorded in the same unit?
- What type of recording is required?
- Continuous
- Multiplex scanning (what minimum scan cycle is required?)
- Is a communication interface required?
- To transmit measured data to a computer
- For remote setup of recorder
- To connect to an external printer
- Is recorder to be bench style or panel mounting?
- What type of instrument power is available?
- Is log-type recording desirable instead

- of/in addition to trend recording?
- Is color differentiation available for trend lines?
- Is message printing required?
- Is the recorder to perform alarm functions?
- How many setpoints per channel?
- What types of alarms: threshold, rate delta?
- Are physical relay contacts available for external alarm output?
- Number required

## SIGNAL INPUTS

### Available input types

Typical process recorders accept analog dc voltage inputs, thermocouple, or RTD temperature inputs or dry contact status input.

### Signal processing

Linear scaling (conversion to engineering units)  
 Thermocouple characterization  
 Difference calculation  
 Square root calculation

## HIGHER-LEVEL FUNCTIONS

### Intelligence

Math functions: +, -, x, ÷, square root, absolute value, logarithm, exponential functions, max, min, time average, group average, summation, (max-min), standard deviation, and integration.

### Programming method

Front panel  
 Remote (downloaded)

### Communications

RS-232C: serial point to point, 50 feet cable length maximum at 9600 baud;  
 GPIB (IEEE-488): parallel (20 meter system cable length maximum, 2 meter

distance between devices, up to 14 devices per controller);  
 RS-422A/RS-485:  
 Balanced/unbalanced, serial, up to 32 devices per system, cable length can extend to 1.2 km at 9600 baud.

## HARD COPY AND DISPLAY

### Recording method

Galvanometer movement  
 Servo  
 Stepper-driven

Fixed array

### Writing method

Capillary ink

Disposable felt-tip ink cartridges

Dot printing: ink ribbon cassette or pressure-sensitive paper  
 Thermal-moving head or stationary linear array  
 Rotating ink wheel

The most popular methods have become disposable ink cartridges for continuous (drag pen) recording, and multicolor ink ribbon cassette for dot-printing multipoint recording. These writing methods use an economical type of paper which is not sensitive to routine handling and does not require special storage considerations.

### Chart types

For process recorders there are basically two types of charts, Z-fold or roll. Z-fold has become a predominant choice for process applications due to the ease of review of past traces without disrupting active recording.

### Chart speeds

Fixed or programmable

Features	Continuous Writing		Multipoint		
	Wet ink	Thermal	Mechanical		Thermal
Printing method	Wet ink	Thermal	Mechanical		Thermal
Marking element	Felt-tip or capillary drag pen	Thermal array with heat-sensitive paper	High-speed wire dot with multicolor ribbon	Impact dot matrix with pressure-sensitive paper	Thermal matrix with heat-sensitive paper
Multicolor trending	Multicolor trending enhances chart readability	Single color trending makes readability difficult when trend lines cross or are in close proximity	Multicolor trending enhances chart readability	Single color trending makes readability difficult when trend lines cross or are in close proximity	Single color trending makes readability difficult when trend lines cross or are in close proximity
Ability to capture fast-changing signals	Yes	Yes	No	No	No
Special chart paper required	No	Temperature-sensitive nature of paper can cause problems in application of recorder and storage of charts	No	Pressure-sensitive nature of paper can create problems in handling and storage of charts	Temperature-sensitive nature of paper can cause problems in application of recorder and storage of charts

## Chart annotation

Tag printing  
Digital printing  
List printing  
Alarm printing  
Prints in engineering units  
Message printing  
Scale printing  
Channel identifier (numeric or alphanumeric)  
Date and time  
Chart speed  
Snapshot digital measured values

For continuous writing recorders, the annotation is accomplished by a separate writing pen so that trace information is not lost.

For dot-printing recorders, the annotation is done by the dot-printer, with either single-dot or full character printing with each traverse of the printhead, depending on whether the instrument is performing analog trending or log reporting.

## Chart widths

100 mm  
180 mm  
250 mm

## Visual indicators

Analog bargraph indication (% of full scale)  
Analog scale indication (% of full scale)  
Digital channel number and measured value  
Alarm status  
Engineering units

## Recorder setup

Until the advent of the microprocessor, recorders were dedicated to measuring only the type of input signal and only the span specified at the time of order. To change input signal type and/or measuring span, hardware changes were required. Presently, recorders are available in which input signal type, measuring span, tag and unit designators can conveniently be set in by the user. The recorder setup is done by a keypad or, if the instrument has a communication interface, by means of a computer keyboard or downloading of a computer file.

## Modes

Normal: Monitoring at set scan interval and trending at set chart speed, or logging at set intervals

Print on alarm: Monitoring at set scan interval but not trending or logging until an alarm condition occurs

Change on alarm: Trending or logging at a base chart speed or log

internal when no alarm condition exists, automatically switching to alternate chart speed or log interval when an alarm condition exists

## RECORDER DEFINITIONS

**Hybrid recorder:** A recorder that combines analog trend representation and digital measured value printing on the same chart paper, without disruption of trend



printing.

**Servo balancing:** A means of positioning the pen of a drag pen recorder. Null-balance operation has no current flow at balance, nullifying the effect of lead resistance. Conventional servo balancing recorders use contact mechanisms in the feedback loop and brushes in the servo motor. New technology allows the use of a noncontact pen positioning transducer and a brushless dc servo motor.

**Scanning recorder:** A multi-point recorder that scans all of its inputs to obtain new measured data every set time period (usually 2 to 6 seconds). Printing for all points is often



performed during each cycle of the printing mechanism.

**Multi-color printing:** A recorder that records trend traces in more than one color to make traces easier to differentiate. Drag pen recorders use a different color for each pen (usually four pens maximum). Multi-point recorders typically record in six colors.

**Linear scaling:** Recording of a voltage input in terms of the engineering variable, such as temperature, that the voltage represents. Transformation is  $Y$  (variable to be recorded) =  $mX$  (slope x input signal) +  $b$  ( $Y$  intercept).

**Pen offset compensation:** In traditional multiple input drag pen recorders, each pen can travel the full width of the recording chart. In order to do so, the pens must be physically offset from one another. This puts the different pen traces on different time lines of the chart. By placing the measured data of the front-most pen(s) into a buffer and delaying their printing, the traces can be synchronized to the same time line, thereby compensating for their offset.

**Accuracy:** The closeness to the actual signal that the measured value or trend position takes, stated as either a percentage of full scale or percent of reading. Separate accuracy statements are typically provided for measuring and recording functions.

**Tag ID:** A means of designating a trace or digital measured value by an alphanumeric identifier instead of a numeric identifier. Typically available with up to seven characters.

**Digital printing:** Printing of the precise measured numerical values for the various channels, along with their channel identifiers. Digital printing usually occurs in a margin of the chart so as not to interrupt trend recording.

**Log report:** A printout of precise measured numerical values for the various channels, along with their channel identifiers. Typically prints in full character height per print cycle. During trending, prints on demand, resuming trending automatically. When trending is not being used,



prints at a preselected time interval. May also include alarm status indication.

Courtesy of Johnson Yokogawa Corporation.





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