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

<table>
<thead>
<tr>
<th>Features</th>
<th>Continuous Writing</th>
<th>Multipoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing method</td>
<td>Wet ink</td>
<td>Thermal</td>
</tr>
<tr>
<td>Marking element</td>
<td>Fell-tip or capillary drag pen</td>
<td>Thermal array with heat-sensitive paper</td>
</tr>
<tr>
<td>Multicolored trending</td>
<td>Multicolored trending enhances chart readability</td>
<td>Single color trending makes readability difficult when trend lines cross or are in close proximity</td>
</tr>
<tr>
<td>Ability to capture fast-changing signals</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Special chart paper required</td>
<td>No</td>
<td>Temperature-sensitive nature of paper can cause problems in application of recorder and storage of charts</td>
</tr>
</tbody>
</table>

Z-149
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 interval when an 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 + 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,
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