

## STRIP CHART RECORDERS WITH BRILLIANT SIX-COLOR PRINTING

Why use dot-matrix or fiber-tip pen printing when Fuji Electric's patented, cutting-edge recording technology offers an affordable inkjet recorder? With an excellent rating for measuring range accuracy and analog trace accuracy, and a three-year warranty, these strip chart recorders represent the latest recording technology on the market today.

The PHC Series 100mm and the PHA Series 180mm recorders offer brilliant six color recording utilizing Fuji Electric's patented inkjet mechanism. Tiny piezo elements electronically dispense small dots of colored ink, 0.3mm in diameter, onto the chart paper. This non-contact printing advancement traces vibrant trend lines and prints sharp alphanumeric characters.

This technology, previously available on expensive printers only, now comes in a strip chart recorder at an affordable price — one that falls below the cost of most dot-matrix type printers. If you note the difference in print quality between the dot-matrix and the inkjet typefaces, you'll conclude there's simply no reason to use a dot-matrix type recorder anymore.

The inkjet cartridges can have a long life of up to 6 months of continuous operation. Each channel is assigned its own color, and reports generated in reference to that channel are printed in the corresponding color. As this method of printing requires only one mechanism, these recorders require fewer moving parts than conventional recorders — that means years of extremely reliable, trouble-free operation for you. With fewer moving parts comes a depth of less than 8", making it ideal for installation in shallow panels.

### FEATURES

- **Powerful Set of Printing and Recording Features**

Prints 7 different types of reports

- **Front Panel Programming**

Easy to program for more than 15 parameters

- **Advanced Math Functions**

Provides subtraction, logarithm, and square root functions

- **Large Fluorescent, Multi-Language Display**

Easy-to-read in either English, French, or German; 20-digit, 2-line display; 6-channel simultaneous display possible

- **Non-Contact, Inkjet Printing**

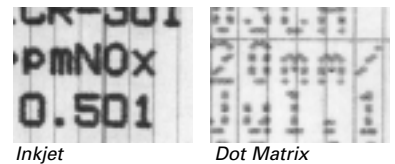
Traces trend lines and prints digital characters which are vibrant and sharp. Selectable ink color for each channel

- **One Mechanical Assembly for Printing**

Fewer moving parts for longer life and trouble-free operation

- **Side-by-Side Mounting**

Convenient placement in crowded panel environments



Inkjet

Dot Matrix



- **Logging Mode**

Print measured values at intervals ranging from 10 to 60 minutes

- **Daily Report**

Provides measured values for every hour along with maximum, minimum, and average values

- **Totalization**

Furnishes integrated values at intervals of one hour and the total value for one day

- **Zoom, Zone and Auto Range Trace**

Provides special traces that match your unique programming

- **Additional Options**

Chart illumination, alarm relays, remote control and RS485 Communications

- **Three-Year Warranty**

Protects against manufacturing defects

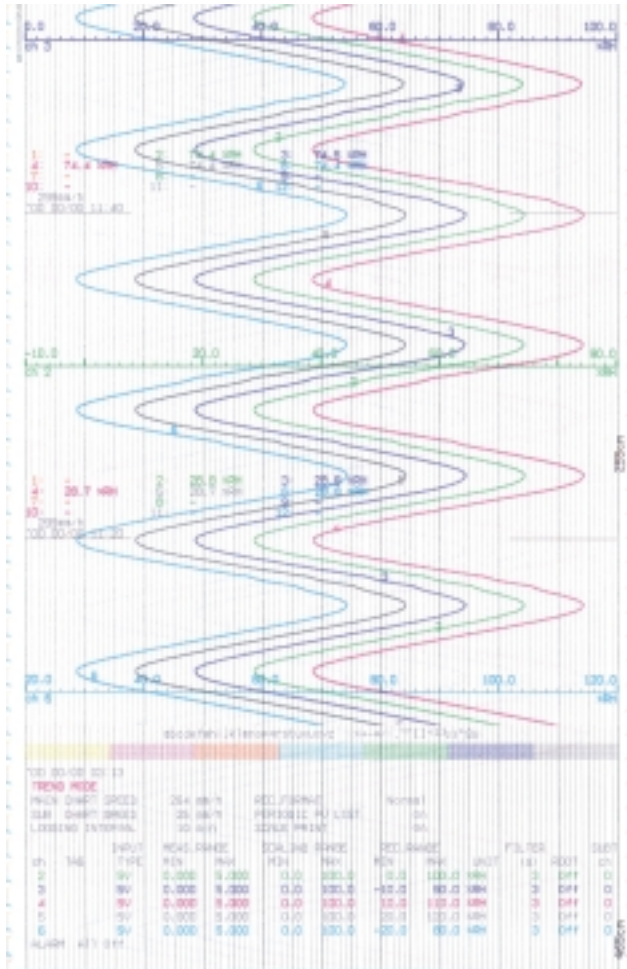


## PHA & PHC, CONTINUED

### General Capabilities

The PHC 100mm and PHA 180mm recorders offer recording in either continuous trace or intermittent (dot) printing. The PHC comes in three or six channels and the PHA comes in six or twelve channel versions. As each channel has its own 16-bit A/D converter, these instruments offer high speed sampling of the input signal. These inputs include most thermocouple and RTD types plus a wide range of DC currents/voltages; each input can be scaled for your particular application from the recorder's front panel. With advanced math functions, these recorders provide filtering, square root extraction, subtraction, and scaling for each channel.

Furthermore, these recorders are fully programmable from their easy-to-read, fluorescent front panels for a variety of parameters such as:



- **Pass Code**
- **Main and Sub Chart Speeds**
- **Record Mode — Trend/Logging**
- **Recording Range**
- **Input Signal**
- **Tag Number**
- **Communication Parameters**
- **Ink Monitor Status**
- **Language (English, French, or German)**
- **List Print Request**
- **Daily Report, Date and Time, and Alarm Settings**
- **Illumination Status**
- **And More...**

### Report Capabilities

One of the most powerful features of the PHA and PHC recorders is their ability to create a full complement of status reports — scheduled or on demand. You may specify daily and summation reports for any period of time from one to 24 hours automatically or upon demand. These reports are printed in crisp digital type and provide you with important information such as:

- **Periodic Data for Each Channel**
- **Totalized Values for Each Channel**
- **Maximum and Minimum Recorded Value for Each Channel and Time of Occurrence**
- **Average Value for Each Channel**

### Configurations

The 100mm PHC series recorders are available in three or six channel versions; the 180mm PHA series recorders come in six or twelve channel versions. Both the PHC and the PHA are available in either continuous trace or dotting print versions. The continuous trace and dotting models are nearly identical in features except that the dotting recorder has a slower sample time and has limited scale print or periodic printout capabilities. Therefore, the dotting recorder carries a lower price. Both recorders are capable of data logging in addition to trend recording and can transmit data via an RS-485 communications link.

## PHA & PHC, CONTINUED

### SPECIFICATIONS

#### GENERAL SPECIFICATIONS

<b>INDICATION</b>	Fluorescent indication (blue-green). 20 characters x 2 lines
<b>CHARACTER INDICATED (HxW)</b>	PHA: 5 x 7 dots. 0.2 x 0.13 in. (5 x 3.3 mm) PHC: 5 x 7 dots. 0.16 x 0.09 in. (4.16 x 2.25 mm)
<b>CONTENTS OF INDICATION</b>	Measurement Value: Temperature – 1 decimal place. Voltage – 6 places (including sign and decimal point). PHA – Measurement value of channel 1 to channel 6 or channel 7 to channel 12 can be indicated simultaneously. PHC – Measurement value of channel 1 to channel 6 can be indicated simultaneously Channel Number: PHA – 1 or 2 digit. PHC – 1 digit Engineering Unit: Max. 7 characters (°C, °F, %, Pa, bar, ppm, m3/h, etc.) Tag Number: 8 alphanumeric characters Time: Year, month, day, hour, minute Status Indication: Record ON, chart end, alarm, battery low alarm, burnout, carriage failure, ink low alarm
<b>CONFIGURATION</b>	These configurations can be set via the keyboard as follows: Pass code, Main chart speed, Sub chart speed, Alarm setting, Record mode (trend/logging), Recording range, Input signal, List print request, Tag number, Daily report setting, Totalization function, Communication parameter, Date and time setting, Ink monitor clear, Illumination On/Off, Message definition, Message value shift
<b>PRINTING</b>	Writing System: Inkjet system, 6 colors Periodic Data Printing: Measured value, unit, date, time, time line, chart speed, channel number List Printing: Measured value list (date, time, channel number, measured value, units). Parameter list (date, time, channel number, recording range, scaling, units, alarm set value, chart speed, tag number). Test pattern (all characters and color patterns) Message Printing: 10 messages, 16-character, user-entered messages Alarm Printing: Channel number, alarm type (H, L, RH, RL), output relay number, On/Off time Burnout Printing: Burnout channel number and time Other: Ink low message, auto-range selection mark, recording start mark, chart speed change mark
<b>TEXT PRINTING</b>	PHA: text printing is not available for more than 301mm/hour (continuous recording), or more than 51mm/hour (dotting recording) PHC: text printing is not available for more than 401mm/hour (continuous recording), or more than 51mm/hour (dotting recording)
<b>POWER REQUIREMENT</b>	Line Supply: PHA – 85 to 300V AC. PHC – 85 to 150V AC or 150 to 300V AC Frequency: 50/60Hz Power Consumption: PHA – 22VA, 100V AC, without option, approx. 37VA, 100V AC, with option, approx. PHC – 20VA, 100V AC, without option, approx. 26VA, 100V AC, with option, approx.
<b>INPUT AND ACCURACY</b>	
<b>INPUT POINTS</b>	PHA: 6 or 12 continuous recording and dotting recording PHC: 3 or 6 continuous recording and dotting recording; 3 (continuous only)

<b>INPUT SIGNAL, THERMOCOUPLES &amp; RTDS</b>	Thermocouple: B, R, S, K, E, J, T, N, W, I, U, PN RTD: Pt100 (DIN IEC 751) Note: Factory default setting for input is K thermocouple, 32 to 2192°F (0 to 1200°C)
<b>INPUT SIGNAL AND RESOLUTION, DC VOLTAGE</b>	-50 to 50mV. Resolution: 10 µV -500 to 500mV. Resolution: 100 µV -5 to 5V. Resolution: 1 mV -50 to 50 V. Resolution: 10 mV Scaling is possible within the range of -32767 to 32767 (Decimal points may be placed as necessary)
<b>INPUT RESOLUTION, THERMOCOUPLES &amp; RTDS</b>	0.1°C
<b>INPUT ACCURACY</b>	±(0.15% +1 digit) Without reference junction compensation error
<b>MAX. INPUT VOLTAGE</b>	Thermocouple, RTD and DC Voltage: ±10 VDC or less (50mV, 500mV Range) DC Voltage Input (5V, 50V Range): ±100 VDC or less
<b>INPUT SIGNAL SETTING AND CHANGING</b>	Setting and changing of input signal between thermocouple, RTD, and DC voltage (50mV, 500mV, 5V, 50V range) for each channel via jumper selection and keyboard selection
<b>SETTING OF RECORDING RANGE</b>	Setting is possible within the reference range by using the keyboard
<b>BURNOUT FUNCTION</b>	When the thermocouple or RTD input is disconnected, the recording is deflected to full scale
<b>INPUT SIGNAL — DC CURRENT INPUT</b>	4-20mA, 0-20mA, with shunt resistor
<b>ACCURACY AND RESOLUTION</b>	Performance under reference condition (23 ±2°C, 65 ±10%RH, power voltage and frequency variation ±1%, warm-up time 30 minutes or more, vertical mounting, free from the effects of external noise)
<b>RECORDING ACCURACY</b>	Indication accuracy, ±0.25% of recording span
<b>RECORDING RESOLUTION</b>	0.1mm minimum
<b>CHART SPEED ACCURACY</b>	±0.1% (expansion and contraction of paper is not included)
<b>CLOCK ACCURACY</b>	±50 ppm or less (monthly error: about 2 minutes)
<b>REFERENCE JUNCTION COMPENSATION ACCURACY</b>	K, E, J, T, N, L, U, PN: ±0.5°C R, S, B, W: ±1°C

#### RECORDING

<b>WRITING SYSTEM</b>	Inkjet system, 6 colors
<b>CHART WIDTH</b>	PHA: 180mm PHC: 100mm
<b>CHART LENGTH</b>	PHA: Z fold 65.6ft. (20m.) PHC: Z fold 49.5ft. (15.08m.)
<b>CHART SPEEDS</b>	Can be set in 1mm/hour steps. Continuous Recording: PHA – 5 to 300mm/hour. PHC – 5 to 400mm/hour Dotting Recording: PHA – 301 to 1500mm/hour. PHC – 401 to 1500mm/hour
<b>RECORDING COLOR (PHA AND PHC)</b>	Orange, green, purple, red, black, and blue. User selectable for each channel
<b>RECORDING CYCLE</b>	Dotting Recording: 30 seconds for all channels Continuous Recording: Depends on chart speed PHA: Recording cycle (seconds) = 450 ÷ chart speed (mm/hour) (not faster than 3 sec.) PHC: Recording cycle (seconds) = 400 ÷ chart speed (mm/hour) (not faster than 2 sec.)
<b>MEASURING CYCLE</b>	Up To 3 Inputs: 160ms More Than 3 Inputs: 320ms

## PHA & PHC, CONTINUED

### SPECIFICATIONS, CONTINUED

<b>SERVICE LIFE OF INK</b>	Depends on operating conditions. About 6 months for 6 points of linear recording at 25mm/hour of chart speed	<b>MESSAGE PRINTING</b>	Maximum 10 messages, 16-character, user-entered messages can be printed
<b>CHART HANDLING</b>	Possible to draw the paper out during recording	<b>ALARM PRINTING FUNCTION</b>	Time, channel number, kind of alarm, and output relay number can be printed when alarm is on or off
<b>ALARMS</b>		<b>UNITS INDICATION</b>	Engineering units such as °C, °F, %, mV, mA, Pa, liters, etc., are indicated (setting from keyboard)
<b>SETTING METHOD</b>	Setting from keyboard	<b>SCALING FUNCTION</b>	Scaling with DC voltage input is possible. (Setting of decimal point is also possible within the range of -32767 to +32767)
<b>NUMBER OF ALARMS</b>	4 per channel, selectable as high, low, rate high, and rate low	<b>SUBTRACT FUNCTION</b>	Difference between any two channels is recorded (channel is set from keyboard)
<b>ALARM INDICATION</b>	Kind of alarm and output relay number are indicated on display for each channel at occurrence of alarm	<b>AUTO-RANGE RECORDING</b>	Recording range is automatically changed for recording in the event of over-range or under-range (setting with keyboard). This function is not available for combination of zone recording and enlarged/reduced recording
<b>PRINTING</b>	Channel number, kind of alarm, output relay number and On/Off time are printed on chart paper	<b>ZONE RECORDING</b>	Recording area is divided into a maximum of 4 (PHA) or 3 (PHC) zones for recording. This function is not available for combination of automatic range selection and enlarged/reduced recording
<b>OUTPUT</b>	See optional specifications	<b>ENLARGED/REDUCED</b>	A part of recording area could be enlarged and the other reduced. This function cannot be used if auto-range recording or zone recording is used.
<b>HYSTERESIS</b>	Approximately 0.5% of recording span	<b>SQUARE-ROOT EXTRACTION FUNCTION</b>	Square-root extraction of DC voltage input is possible
<b>ALARM TIMING</b>	Recognition – 1 second (worst case)	<b>DAILY REPORT</b>	A report can be printed for a 1 to 24 hour period for any channel. Information can be stored for up to 24 hours before printing the report. Maximum, minimum, and average values are also printed at the same time. On/Off operation, On/Off of each channel, and operation start/stop time can be set from keyboard
<b>ACTION</b>	additional 1 second (worst case)	<b>TOTALIZATION FUNCTION</b>	A report of integrated values can be printed for a 1 to 24 hour period for any channel (integration in 1 second steps). Information can be stored for up to 24 hours before printing the report. Total value is also printed at the same time. On/Off operation, On/Off of each channel, and operation start/stop time can be set from keyboard.
<b>ALARM LATCH</b>	Hold the alarm display and alarm output	<b>MEMORY BACKUP</b>	Set data and clock function are protected by built-in lithium battery (expected battery life, about 10 years under normal temperature)
<b>OTHER</b>	Ink end and chart end alarm output possible	<b>INPUT FILTER</b>	Response is delayed in case of sudden changes in input of each channel (1st order lag filter). Time constant setting range: 0 to 900 seconds (in 1 second steps) (setting from keyboard)
<b>ALARM OUTPUT PACK WITH 3-POINT EXTERNAL CONTROL</b>		<b>BURNOUT FUNCTION</b>	When thermocouple or RTD input is disconnected, it is deflected to 100% full scale. Also, it is indicated and printed at the same time
<b>MOUNTING</b>	This unit is mounted on the rear side of the recorder	<b>PASSCODE</b>	4-digit passcode security available
<b>ALARM OUTPUT (DO)</b>	PHA: 6 or 12 points of relay contact N.O. (1a) output for individual channel operation or common operation. PHC: 6 points only. Maximum contact voltage 240V AC, 30V DC. Maximum contact current 3A	<b>LANGUAGE</b>	English, German, or French is selectable for display and printing
<b>EXTERNAL CONTROL (DI)</b>	The following control is possible with external contact signal: Recording start/stop – Effected by contact signal. Recording is started when contact is closed and stopped when contact is open Chart speed change – Selection between normal and remote chart speeds is effected by contact signal. Remote chart speeds are selected when contact is closed. Main chart speed is selected when contact is open Measured value printing – Measured value list printing (date, time, channel number, measured value, units) is effected by contact signal. Printing is started when contact is closed Message printing – (For external control, use a dry contact) Contact capacity – 12V DC, 0.05A, N.O. (1a) contact	<b>ALARM LATCH FUNCTION</b>	The alarm display and alarm output are held even after the cause of alarm is removed. On-Off operation can be set from keyboard. Cancellation of the held alarm can be made from external control (DI)
<b>FUNCTIONS</b>		<b>PARAMETER COPY</b>	Set parameters on any channel can be copied to any other channel
<b>RANGE SETTING</b>	Recording range can be set for each channel		
<b>INPUT SETTING</b>	Any input can be set for each channel		
<b>SKIP FUNCTION</b>	Used to skip recording, indication and alarm at any measuring point		
<b>MEASURED VALUE LIST</b>	Date, time, measured value, and units can be printed		
<b>PARAMETER LIST</b>	Date, time, recording range, scaling, units, kind of input, alarm set value, chart speed, and tag number can be printed		
<b>TEST PATTERN</b>	All characters and color patterns can be printed		
<b>PERIODIC DATA PRINTING FUNCTION</b>	Time, date, chart speed, measured value, and units can be printed at fixed intervals. Printing can be enabled/disabled from keyboard		

## PHA & PHC, CONTINUED

### SPECIFICATIONS, CONTINUED

#### OPTIONS

<b>CHART ILLUMINATION</b>	Cold cathode fluorescent lamp
<b>TRANSMISSION FUNCTION</b>	RS-485 interface for transmitting measured value and receiving the condition of setting Transmission Method: Half-duplex serial Synchronized Method: Start-stop synchronizing Code: Binary Data length – 8 bits. Parity – odd/even/none. Stop bit – 1 or 2 Transmission Speed: 2400, 4800, 9600, 19200 bps No. of Units Connected: Max. 31 units Transmission Distance: Max. 1km Remarks: When connecting through RS-232C, be sure to use an RS-485 to RS-232 converter. Model # RSFC24 recommended
<b>ADDITIONAL OPTIONS</b>	These Fuji inkjet recorders are available with a number of options in addition to its standard features: Chart illumination: Alarm module relays — six per module (the PHA has 1 or 2 modules; the PHC has 1 module); Remote control of recorder for On/Off, chart speed, PV print, and message print; RS-485 communications
<b>DELIVERY</b>	Recorder, panel mounting bracket, instruction manual, accessories — recording head (1), chart paper (1) Note: Recorder head is not mounted on the recorder at the time of delivery

#### OPERATING AND STORAGE CONDITIONS

<b>TEMPERATURE LIMITS</b>	32 to 122°F (0 to 50°C)
<b>HUMIDITY LIMITS</b>	20 to 80% RH, non-condensing (temperature x humidity <3200)
<b>VIBRATION</b>	10 to 60Hz, 0.2m/s <sup>2</sup> (0.02g) or less
<b>SIGNAL SOURCE RESISTANCE</b>	Thermocouple input: 1k $\Omega$ or less Voltage input: Less than 0.1% of input resistance RTD input: Less than 10 $\Omega$ per wire (resistance of each wire of 3-wire system should be balanced with others)
<b>WARM-UP TIME</b>	30 minutes or more
<b>SHOCK</b>	No external shock
<b>PROTECTION</b>	IEC IP50 (front door)
<b>SAFETY</b>	Conforms to EN55011:1991 class A for conducted and radiated emissions and EN500821-1:1992 for radiated immunity, ESD and FBT
<b>POWER SUPPLY VARIATION INFLUENCE</b>	Voltage Variation: 85 to 300V AC; 100V AC base. Change in indication – $\pm$ (0.1% of reference range + 1 digit)max. Change in recording – 0.2% of recording span, max. Frequency Variation: 47 to 63Hz, 50Hz base. Change in indication – $\pm$ (0.1% of reference range + 1 digit)max. Change in recording – $\pm$ 0.2% of recording span, max.
<b>INPUT SIGNAL SOURCE RESISTANCE OR WIRING RESISTANCE INFLUENCE</b>	Thermocouple: 10 $\mu$ V per 100 $\Omega$ Voltage Input: Variation of 0.1% change of resistance. Change in indication – $\pm$ (0.1% of reference range + 1 digit) max. Change in recording – $\pm$ 0.2% of recording span, max. RTD: Variations of resistance with changes in 10 $\Omega$ per wire. Change in indication – $\pm$ (0.1% of reference range + 1 digit)max. Change in recording – $\pm$ 0.2% of recording span, max. (3 wires should be balanced)

<b>TEMPERATURE INFLUENCE</b>	Change in indication: $\pm$ 0.2% of reference range/10°C, max. Change in recording: $\pm$ 0.5% of recording span/10°C, max. Reference junction compensation: $\pm$ 0.27°C/10°C, max.
<b>MOUNTING POSITION INFLUENCE</b>	Inclination within 30° Change in indication: $\pm$ (0.1% of reference range + 1 digit) max. Change in recording: $\pm$ 0.2% of recording span, max.
<b>VIBRATION INFLUENCE</b>	Linear vibration with 10 to 60Hz of frequency and 0.2m/s <sup>2</sup> (0.02g) of acceleration is applied to each of 3 directions for 2 hours Change in indication: $\pm$ (0.1% of reference range + 1 digit) max. Change in recording: $\pm$ 0.2% of recording span, max.
<b>CHART PAPER INFLUENCE</b>	Standard Temperature/Humidity: 20°C, 65% RH Expansion at 85% RH: 0.4% max. Contraction at 35% RH: 0.5% max.
<b>TRANSPORTATION/STORAGE CONDITIONS</b>	Temperature Limits: 14 to 140°F (-10 to +60°C) Humidity Limits: 5 to 90% RH, non-condensing is required Vibration: 10 to 60Hz, 2.45m/s <sup>2</sup> (0.25g) Shock: 294m/s <sup>2</sup> (30g) or less

#### STRUCTURE

<b>MOUNTING</b>	Panel (may be inclined up to 30° backwards from the vertical)
<b>MOUNTING POSITION</b>	Front inclination 0°, rear inclination 30°, left/right inclination 0°
<b>MATERIAL</b>	Case: Steel plate Front Door Frame: Polycarbonate with glass window (PHA) or plastic window (PHC)
<b>WEIGHT</b>	PHA: Approximately 13.2 lb. (6kg) (without option). Approximately 15.4 lb. (7kg) (with option) PHC: Approximately 6.2 lb. (2.8kg) (without option). Approximately 7.3 lb. (3.3kg) (with option)
<b>CASE SIZE</b>	PHA: Bezel – 11.34" x 11.34" (288 x 288mm). Depth – 7.84" (199mm). Cutout – 11.06" x 11.06" (281 x 281mm) PHC: Bezel – 5.67" x 5.67" (144 x 144mm). Depth – 7.84" (199mm). Cutout – 5.39 x 5.39" (137 x 137mm)
<b>FINISH COLOR</b>	Case and front door frame: black
<b>EXTERNAL TERMINALS</b>	Screw terminal (M4)

