Honeywell

DPR 3000
Digital Process Reporter

Specification

Introduction

The DPR 3000 Digital Process Reporter is a multi-channel, microprocessor-based, strip chart recorder. It records up to 32 analog inputs on a 250-millimeter (10-inch) wide chart. Three data-presentation formats combine with six-color printing to produce clear and concise chart records tailored to your process recording needs. In addition, digital displays provide easy-to-read selected channel and alarm data at a glance.

Digital inputs, internal relays and external relays are available for expanded data gathering and alarm interface capabilities.

The DPR 3000 recorder accepts a variety of voltage, current and resistance type signals as analog inputs to measure process variables that are convertable to an electrical signal.

It is ideally suited for any application where legible records and dependable operation are a must.

Features

- User configurable means the users can set and/or alter operating parameters to meet their recording requirements.
- One all-purpose chart in roll or fan fold type eliminates the need for ordering and stocking several types of charts. And, users can design the chart to match their specific application.
- Six color printing, tag names, and selectable alarm trends in red all aid in visually evaluating the status of the process from the chart record.
- Three printing formats let the user select the method of data presentation.
- Thirty-two analog inputs grouped in multiples of four allow users to connect different types of input signals to the recorder in any combination.

Figure 1 -- The DPR 3000 recorder combines configurable chart formats with digital indication

- Alphanumeric printing of user defined chart speed, range values, and operational and alarm messages as well as date and time for clear reporting and operator guidance.
- Event Precursor feature prints out historical data recorded prior to the triggering of a preconfigured event. This unique reporting on exception ability optimizes chart paper usage.
- Configurable alarm flexibility provides up to 60 freely assignable soft alarms for selected announcement of or action for out-of-specification conditions. Optional Internal and external hard relay outputs expand alarm action capabilities.

- Optional digital inputs allow initiation of-selected functions through remote contact closures.
- English language prompts coupled with clear matrix tables make configuring the recorder easy and straightforward with a few keystroke sequences.
- Comprehensive operator Interface includes clear, bright alphanumeric displays, Indicators and keyboard for visual and tactile interaction.
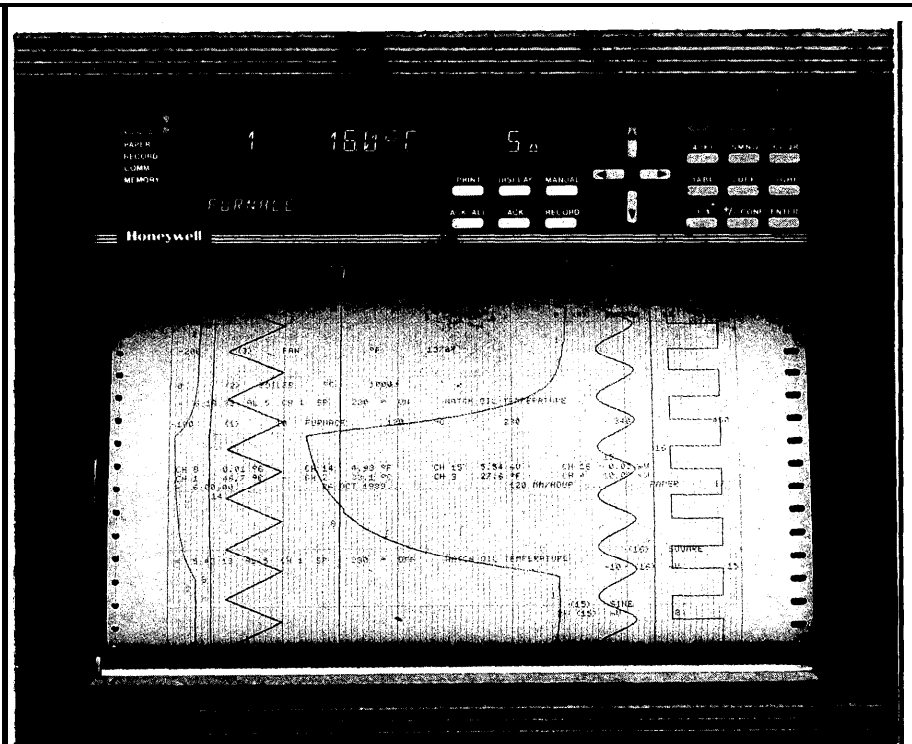
Configuration

Configuratlon defines the process by which users prepare the recorder for their needs. The user configures the recorder by following English language prompts in the digital displays for easy tailoring of recorder functions and records.

To prevent its loss in the event of a power failure, configuration data is stored in a non-volatile memory that does not require battery backup. Configuratlon data resides in a tabular matrix that includes these main selections:

- **Analog inputs**
- **Chart**
- **Analog alarms**
- **Digital inputs**
- **Message**
- **Printer**
- **Miscellaneous**

A copy function allows a configured channel database to be copied into another channel's database and edited, if required.

A lock function inhibits accidental operator changes to the stored configuratfon data.

A configuration print function provides a printout of stored configuration data in part (Figure 2) or in total for convenient cross checking or history.

Users can select French or German language prompts instead of English.

Printing Formats and Record Documentation

Trend
The Trend format shows the value of a process variable with respect to time (Figure 3a). An advanced trace shaping algorithm provides continuous recording of up to 32 analog signals without any time offset between channels.

Analog signals are converted and sent to a dynamic digital buffer to ensure that no trace data is lost during the printing of alphanumeric documentation.

Tabular
in this format, the recorder logs all process variable values periodically, according to a time interval configured by the user (Figure 3b).

Alternate
This format combines trend and tabular recording on an alternating basis (Figure 3c).

Documentation

As shown in Figure 3, the recorder provides these standard and configurable documentation features:

1. Time and date
2. Chart speed
3. Chart roll or instrument identification number
4. Channel reference number
5. Channel tag names
6. Engineering units
7. Alarm reporting line: time, alarm number, channel number, alarm set point, alarm status
8. User defined alarm message
9. Trace becomes red on alarm occurrence
10. Zoned format
11. Tabular printing
12. Chart/scaling certification marks
13. Remaining paper length

An optional digital input or alarm can trigger chart speed and range changes to "zoom in" on critical process data as required.
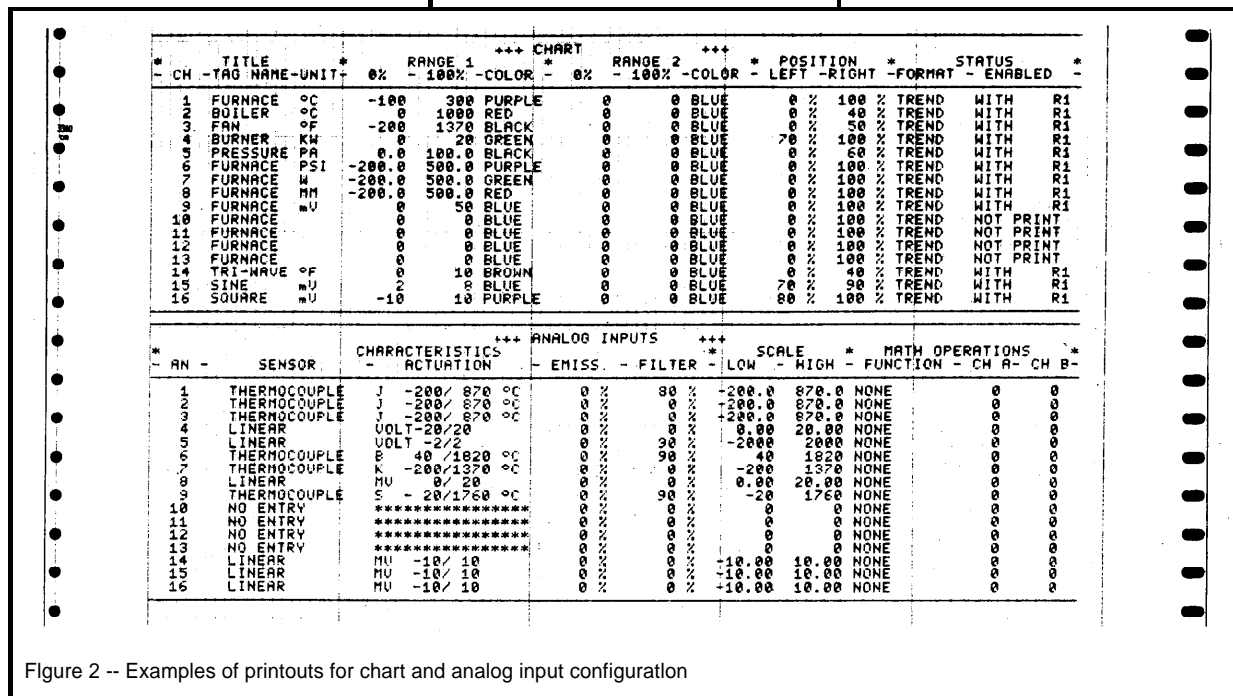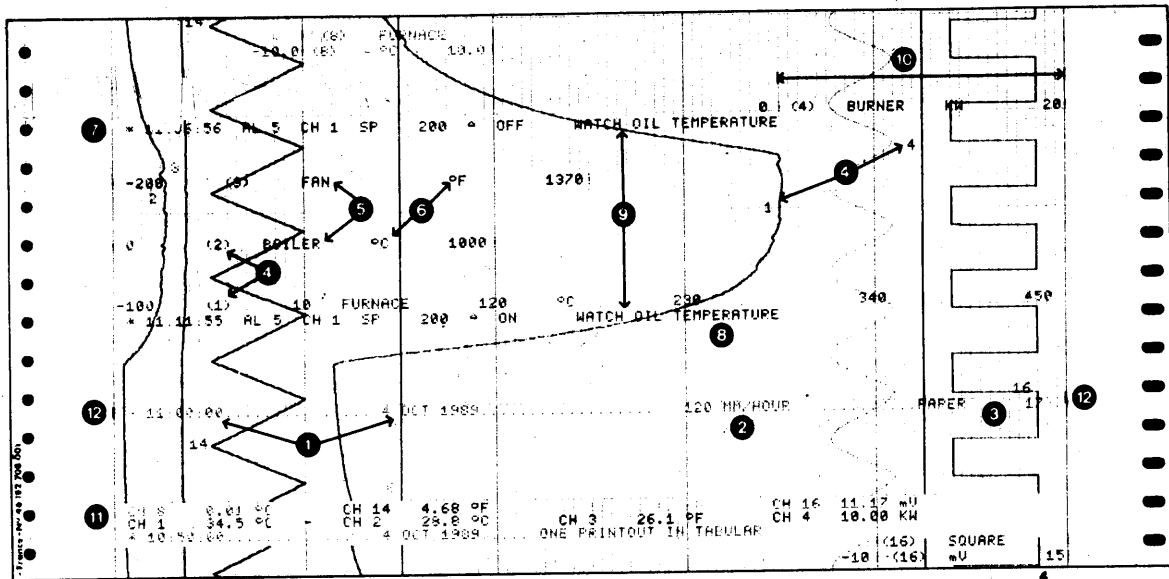

CH	TITLE TAG NAME-UNIT	RANGE 1 0% - 100% -COLOR	RANGE 2 0% - 100% -COLOR	POSITION LEFT -RIGHT	CHART -FORMAT	STATUS ENABLED
1	FURNACE °C	-100 300 PURPLE	0 0 BLUE	0 % 100 %	TREND	WITH R1
2	BOILER °C	0 1000 RED	0 0 BLUE	0 % 40 %	TREND	WITH R1
3	FAN °F	-200 1370 BLACK	0 0 BLUE	0 % 50 %	TREND	WITH R1
4	BURNER KW	0 20 GREEN	0 0 BLUE	70 % 100 %	TREND	WITH R1
5	PRESSURE PA	0.0 100.0 BLACK	0 0 BLUE	0 % 60 %	TREND	WITH R1
6	FURNACE PSI	-200.0 500.0 PURPLE	0 0 BLUE	0 % 100 %	TREND	WITH R1
7	FURNACE W	-200.0 500.0 GREEN	0 0 BLUE	0 % 100 %	TREND	WITH R1
8	FURNACE MM	-200.0 500.0 RED	0 0 BLUE	0 % 100 %	TREND	WITH R1
9	FURNACE mV	0 50 BLUE	0 0 BLUE	0 % 100 %	TREND	WITH R1
10	FURNACE	0 0 BLUE	0 0 BLUE	0 % 100 %	TREND	NOT PRINT
11	FURNACE	0 0 BLUE	0 0 BLUE	0 % 100 %	TREND	NOT PRINT
12	FURNACE	0 0 BLUE	0 0 BLUE	0 % 100 %	TREND	NOT PRINT
13	FURNACE	0 0 BLUE	0 0 BLUE	0 % 100 %	TREND	NOT PRINT
14	TRI-WAVE °F	0 10 BROWN	0 0 BLUE	0 % 40 %	TREND	WITH R1
15	SINE mV	2 8 BLUE	0 0 BLUE	70 % 90 %	TREND	WITH R1
16	SQUARE mV	-10 10 PURPLE	0 0 BLUE	80 % 100 %	TREND	WITH R1

AN	SENSOR	CHARACTERISTICS ACTUATION	EMISS.	FILTER	SCALE LOW - HIGH	MATH OPERATIONS FUNCTION - CH A- CH B-
1	THERMOCOUPLE	J -200/ 870 °C	0 %	80 %	-200.0 870.0	NONE 0 0
2	THERMOCOUPLE	J -200/ 870 °C	0 %	0 %	+200.0 870.0	NONE 0 0
3	THERMOCOUPLE	J -200/ 870 °C	0 %	0 %	+200.0 870.0	NONE 0 0
4	LINEAR	VOLT-20/20	0 %	0 %	0.00 20.00	NONE 0 0
5	LINEAR	VOLT -2/2	0 %	90 %	-2000 2000	NONE 0 0
6	THERMOCOUPLE	B 40 /1820 °C	0 %	90 %	40 1820	NONE 0 0
7	THERMOCOUPLE	K -200/1370 °C	0 %	0 %	-200 1370	NONE 0 0
8	LINEAR	MV 0/ 20	0 %	0 %	0.00 20.00	NONE 0 0
9	THERMOCOUPLE	S - 20/1760 °C	0 %	90 %	-20 1760	NONE 0 0
10	NO ENTRY	******************	0 %	0 %	0 0	NONE 0 0
11	NO ENTRY	******************	0 %	0 %	0 0	NONE 0 0
12	NO ENTRY	******************	0 %	0 %	0 0	NONE 0 0
13	NO ENTRY	******************	0 %	0 %	0 0	NONE 0 0
14	LINEAR	MV -10/ 10	0 %	0 %	-10.00 10.00	NONE 0 0
15	LINEAR	MV -10/ 10	0 %	0 %	-10.00 10.00	NONE 0 0
16	LINEAR	MV -10/ 10	0 %	0 %	+10.00 10.00	NONE 0 0

Flgure 2 -- Examples of printouts for chart and analog input configuratlon

TREND

Figure 3a

TABULAR

Figure 3b

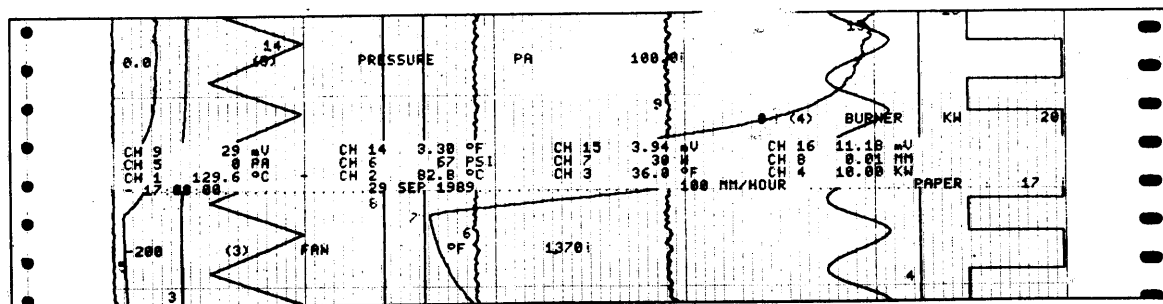

ALTERNATE

Figure 3c

Figure 3 -- Choice of printing format and alphanumeric chart data generate tailored reports

Maximum Chart Speed vs Number of Analog inputs

#Analog inputs		1	2	3	4	6	8	12	16	20	24	28	32
Max. Chart Speed*	mm/h	1500	700	400	300	200	175	125	100	80	70	65	60
	inch/h	60	28	16	12	8	7	5	4	3.2	3.2	2.6	2.4

*This is the maximum chart speed that will produce a solid trace line. Faster speeds are avallable but will result in spacing between printed dots, single color printing, and reduced chart speed progressively in that order. Max speed may vary depending on use of messages, alarms, digital inputs, fast scan cards, and type of print mode. A "temporary" higher speed may be automatically used by the recorder to download buffer memory data.

Operator Interface
Dual digital display, six status indicators and a keyboard provide comprehensive operator interaction.

Dual Display
The dual digital display presents combinations of the channel number, the process variable (PV) value, date and time, chart speed, tag name, alarm status, and digital inputs for viewing by key selection.

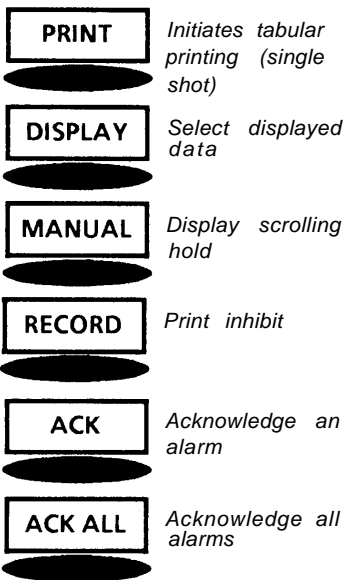In configuration mode, digital displays are pre-empted by English language prompts and values for entering configuration data.

Status Indicators
Indicators light to show alarm conditions, manual display scrolling enabled, paper out condition, record hold/print inhibit condition, digital communications active, and data stored in buffer memory.

Keyboard
The keyboard consists of:

● Six yellow keys dedicated to these run mode functions:

PRINT	*Initiates tabular printing (single shot)*
DISPLAY	*Select displayed data*
MANUAL	*Display scrolling hold*
RECORD	*Print inhibit*
ACK	*Acknowledge an alarm*
ACK ALL	*Acknowledge all alarms*

● Four blue "arrow" keys for moving across matrix menus in configuration mode or for manually scrolling through channel data in run mode.
● Twelve grey alphanumeric keys to enter configuration data.

Languages
User can select French, Italian, Spanish or German language instead of English for prompting during configuration, displaying operator information, and printing of standard messages.

Dual *Paper*
The chart cassette accepts either roll or fan fold paper. Roll paper provides more legibility during operation, easier reading of historical data during operation and is less sensitive to the environment. But, fan fold paper provides easier access to stored data.

Paper *Detection*
If the recorder runs out of paper, the paper indicator lights; recorder is put into standby mode; and measured values are stored in memory. After chart paper is loaded, recorder resumes operation and prints all the data stored in memory.

Chart Illumination (Standard)
The chart Illumination improves visibility of trend and current values in low ambient light conditions.

Operating Modes
Besides the normal run mode, users can select one of two configuration modes to enter/edit or view configuration data.

Configuration Enter/Edit Mode
This mode halts all run mode operations so users can enter/edit configuration data.

Configuration View Mode
This mode lets users access all stored configuration data as well as edit some parameters without interrupting run mode data collection and printing operations.

Run Mode
This mode provides these operations:

● Collection of analog and logic process data;
● Formation and transmission of data;
● Display of values and alarm status;
● Execution of intermediate calculations;
● Printing of data as required by the configured chart format.

Event Precurs
When configured for Precursor record monitors DPR 3000 monitors the process continuously with its printing system in standby. It stores process data in memory and prints out only when triggered by a preconfigured event.

When triggered, the entire memory content is printed on the chart, together with configured chart data, detailing the behavior of the monitored process prior to the event and thereafter.

Depending on the chart speed selected by the user, the memory printout can be many hours of historical data or very detailed minutes before the event was activated.
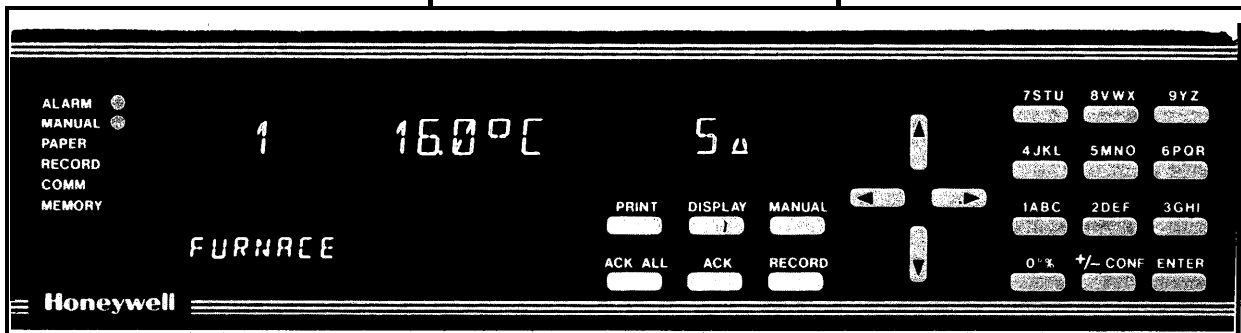

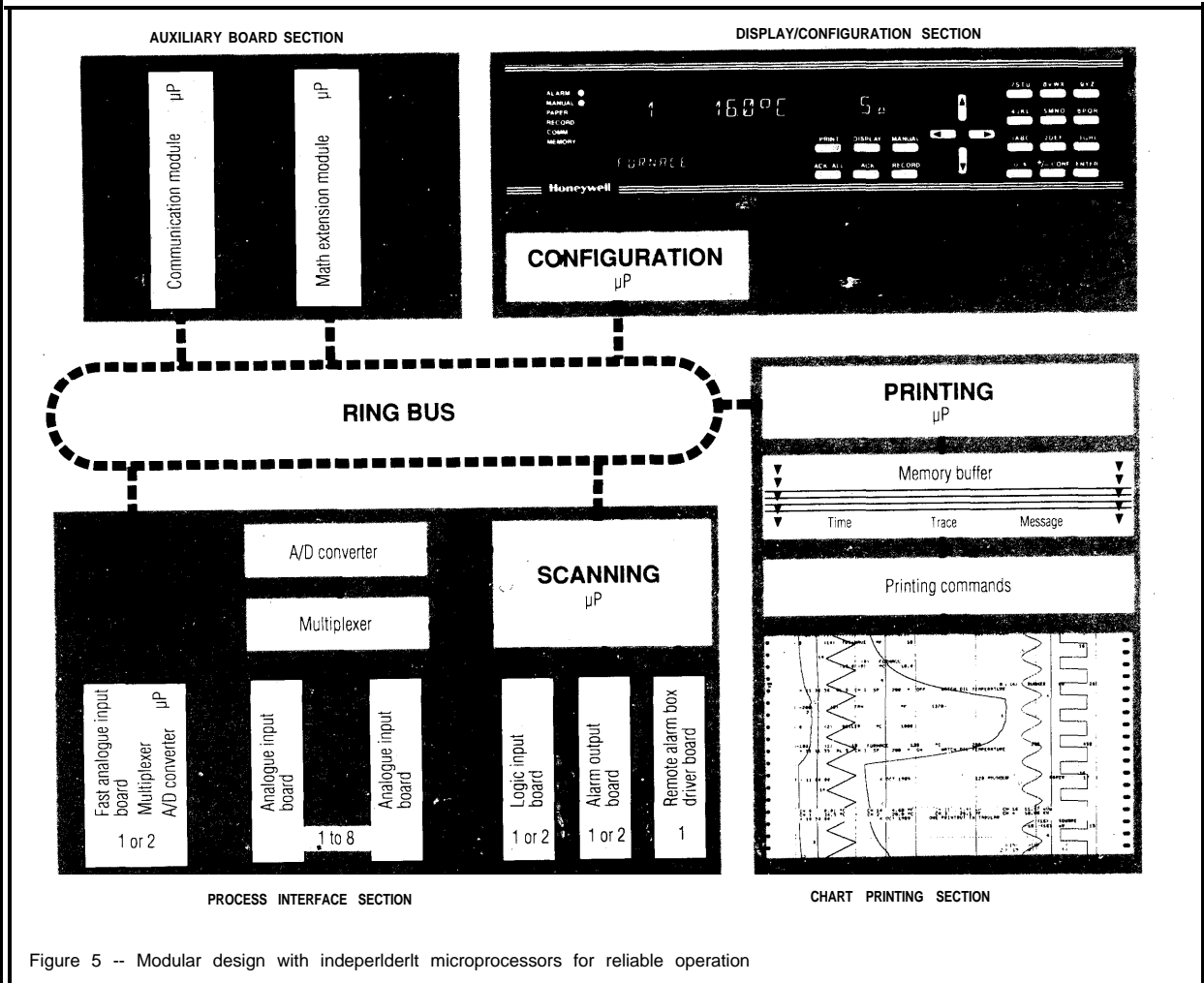Figure 4 - - Displays and keyboard for comprehensive operator interface

AUXILIARY BOARD SECTION — DISPLAY/CONFIGURATION SECTION

Communication module µP — Math extension module µP

CONFIGURATION µP

RING BUS

PRINTING µP

Memory buffer

Time — Trace — Message

Printing commands

A/D converter

Multiplexer

SCANNING µP

Fast analogue input board / Multiplexer / A/D converter µP — 1 or 2

Analogue input board — Analogue input board — 1 to 8

Logic input board — 1 or 2

Alarm output board — 1 or 2

Remote alarm box driver board — 1

PROCESS INTERFACE SECTION — CHART PRINTING SECTION

Figure 5 -- Modular design with indeperlderlt microprocessors for reliable operation

Hardware Structure

The DPR 3000 features a modular design that partitions major functions among printed circuit boards to readily tailor recording capacity and functions to process needs. It uses an internal ring bus to exchange data between the independent sections which have their own microprocessor, random access memory and read only memory.

Process Interface Section

The structure of this section depends upon the number of analog inputs, digital/loglc inputs, and alarm output relays required as well as the need for high speed data acquisition. It includes the required combination of these boards:

- Analog Input (4 per board)
- Standard 5 second scan time
- Digital/Logic Input (6 per board)
- Alarm Output (6 relays per board)
- Fast Analog Input (4 per board) one second scan time

Note that one fast analog input board takes the place of two analog input boards. A fast analog input board allows analysis of four inputs per second.

Display/Configuration Section

This section consists of the operator interface which includes two 16-character, Light Emitting Diode (LED) displays, six LED status indicators, and the keyboard. All operation and configuration interaction is through the displays and built-in keyboard.

Chart Printing Section

This section collects measured, computed, and transmitted data through the ring bus, analyzes it, and prints it according to the configured chart format.

In addition, the section manages the configured alarms to print alarm messages, show trends in

red, and initiate alarm indication and outputs as appropriate.

Auxiliary Board Section

This section lets user expand recorder functions by adding these optional boards.

- RS232/RS422/RS485 ASCII communication mode
- DMCS communication link (Honeywell proprietary)

Math extension module

Analog Data Management

Analog inputs processed at the normal scanning rate are sent to the multiplexer for transmission to the A/D converter. Inputs are converted to digital format, linearized, digitally filtered and expressed in engineering units for scanning via the ring bus. Inputs for fast scanning are collected, converted and transmitted over the ring bus through the fast scan analog input board.

Inputs identified as parameters for math calculations are processed by the math extension module.

Alarm flags are set where appropriate and alarm messages are printed by an alarm algorithm.

Scanned data is analyzed by an advanced trace shaping algorithm that insures accurate reproduction of the original signal, then loaded into the memory buffer along with the related alarm messages and chart format identifiers, and finally converted into print head and paper drive commands for accurate signal tracing and documentation.

Construction

The recorder is housed in a metal case which can be panel mounted. A removable chart cassette makes chart replacement a snap. The chart is accessible through a gasketed, cast aluminum door.
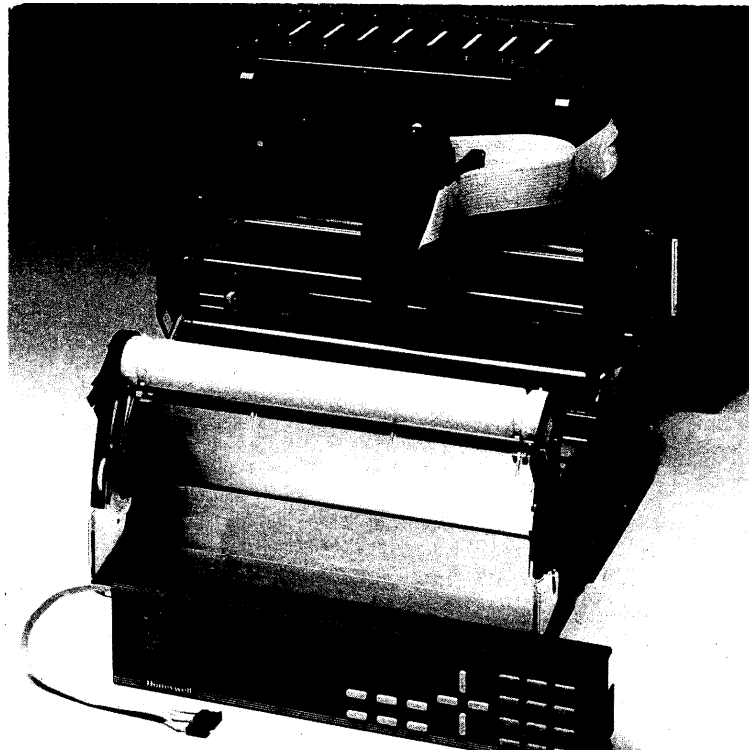

Figure 6 -- DPR 3000 is easily dismantled into just 7 replaceable modules

Specifications

Analog Inputs **Number of Inputs**	4, 8, 12, 16, 20, 24, 28 or 32
Input Boards	Board for thermocouple, mV, Volts, mA and Radiamatic pyrometer (4 inputs/board) Board for Resistance Thermometer and Ohms (4 Inputs/board)
Signal Source	Thermocouple with cold junction compensation or without for remote compensation at 50°C, upscale or downscale burnout or none. mV, volts, mA into 250 ohms, Radiamatic pyrometer. Resistance Thermometer and ohms
Scanning	5 sec. for all 32 inputs. Or, optional 1 sec. for 4 or 8 inputs and 5 sec. for the remaining 28 or 16 inputs respectively.
Input Impedance	>5 megohm for thermocouple and mV inputs. 1 megohm for volt inputs.
Stray Rejection (IEC 484)	*Series mode:* 67 dB, 1 x span peak to peak. *Common mode:* 130 dB, 250 Vat.
Digital Filter	Configurable per input. Minimum falter value provides no filter action.
Logic Inputs (optional) **Number of Inputs**	6 or 12 dry-contact inputs (2 mA, 12 Vdc), with 1 or 2 logic input boards.
Function	Configurable for event marking (in step like traces) and relay output activation. Provides remote control for speed change, range change, print inhibit and tabular printing. Can trigger a message or start memory downloading in Event Precursor Mode.
Recording Spans **Scaling**	Analog inputs can be expressed in engineering units (and displayed with unit symbols). Configurable square root extraction of inputs, and deviation between 2 inputs.
Dual Range	Two ranges can be established for each channel. Range switching is made automatically through internal alarm set points, logic inputs or communication.
Alarms (optional) **Standard Alarms**	60 alarm set points, freely assignable to any channel and output relay. Full configurability of set point, hysteresis and alarm type (PV, rate of change, deviation).
Function	Can trigger a message, print channel in red on alarm or print only on alarm, change range, change speed or trigger memory downloading in Event Precursor Mode.
Relay Outputs	6 or 12 SPST relays (5A, 250 Vac) with 1 or 2 relay output boards. Contacts normally closed in alarm condition -- configurable to normally open.

Alphanumeric Documentation **Messages**	20 freely assignable messages of 30 characters each, configurable through front keyboard. Include time of triggering and type. Can be printed over trend traces or between interrupted traces, or in a mixed format. Printing triggered through internal alarms, logic inputs or communication.
Process Variable Tabular Printing	Instantaneous values are printed in channel color. Periodical printing at time intervals configurable from 1 to 1440 minutes. Printing triggered through keyboard, logic input or communication.
Tag Name	Each channel can be assigned an 8 character tag periodically printed with range marking.
Event Precursor **Standby**	With the writing mechanism in standby, data is stored in memory with the oldest data being discarded when the memory buffer is full (F1F0) with a standby message periodically printed.
Downloading	This mode can be triggered by internally generated alarms, or logic inputs, or communication. On event occurrence, memory is downloaded to the chart at configured printing speed.
Digital Communication (optional) **Protocols**	RS232/RS422/RS485 ASCII communication mode. OR DMCS Honeywell Communication.
Function	Reading of measured values (analog and logic inputs, alarms). ASCII mode provides capability to: write analog and logic traces transmitted through communication, print messages and reports, upload and download configuration information, with basic application software available.
Data Protection **Memory**	Non-volatile memory for all configuration data (no batteries). Recorder calibration can be fine turned but resident calibration is never lost or destroyed.
Keyboard Access	Password protection to lock/unlock configuration access levels.
Math Package (optional)	Many functions available, such as: Basic arithmetic, Averaging, Totalization, Sterilization, Mass flow, RH, etc.
Chart Speed	Speed setting from 1 to 1500 mm/hr. or from 0.1 to 60 inch/hr. (configurable), depending on number of inputs (see Table on page 3). Dual chart speed with automatic changeover (or remove control changeover). Chart speed change is printed at time of occurrence.

Ranges	**Total Range**		**Reference Range**	
	°C	**°F**	**°C**	**°F**
B T/C	40 to 1820	104 to 3308	800 to 1820	1472 to 3308
E T/C	-200 to + 990	-328 to + 1814	110 to 990	230 to 1814
J T/C	-200 to + 870	-328 to + 1598	−170 to + 870	−270 to + 1598
K T/C	-200 to + 1370	-328 to + 2498	−170 to + 1370	-270 to + 2498
N T/C	-20 to + 1300	4 to + 2372	0 to 1300	32 to 2372
NiNiMo T/C	0 to 1400	32 to 2552	0 to 1400	32 to 2552
PR20-40 T/C	0 to 1800*	32 to 3272*	600 to 1800*	1100 to 3272*
R T/C	-20 to + 1760	4 to + 3200	100 to 1760	212 to 3200
S T/C	−20 to + 1760	4 to + 3200	100 to 1760	212 to 3200
T T/C	−200 to + 400	-328 to + 752	−150 to + 400	−240 to + 752
W-W26 T/C	−20 to + 2320	4 to + 4208	500 to 2100	930 to 3810
W5W26 T/C	-20 to + 2320	4 to + 4208	0 to 1800	32 to 3270
KPV5 AU7FE T/C	0 to 300°K		0 to 300°K*	
	Calibrated to IPTS 68 (developed by NBS)			

Pyrometer **Radiamatic RH**	760 to 1880	1400 to 3416	1400 to 1870	2500 to 3400
Resistance Thermometer **Pt100 (DIN, IEC & JIS)**	-200 to + 500	-328 to + 930	-200 to + 500	-328 to + 930
Ni: 50 ohms	-80 to + 320	-112 to +608	100 to 320	212 to 608
Ni: 508 ohms	-50 to + 250*	-58 to + 482*	100 to 250*	200 to 482*
Cu: 10 ohms	−20 to + 250*	-4 to + 482*	-20 to + 250*	-4 to + 482*

Other Inputs (Total and Reference Range)	**mV**		**Volts**		**mA**	**Ohms**
	0 to 20	-10 to + 10	0 to 5	-5 to +5*	4 to 20	0 to 200
	0 to 50	-50 to +50**	1 to 5	-2 to +2*	0 to 20	0 to 2000*
	0 to 100	−200 to + 200**	0 to 10	-20 to + 20**		
				-50 to + 50**		

See Performance Specifications for variations in display accuracy.
**With divider bridge*

Performance **Display accuracy and tabular process variable printing accuracy**	*Standard D3 Model:* ±0.1% of total range, valid within reference range (or <0.4% for ranges marked *) *Optional D4 Model:* ±0.05% of total range, valid within reference range (or < 0.2% for ranges marked *) ±0.5°C for built in cold Junction compensation ±1 least significant digit

Analog trace printing accuracy	±0.2 mm/0.008 inch (chart certification)

Reference Conditions	*Temperature:* 20 ±2°C/68 ±3.6° F *Humidity:* 65% ± 5% RH *Supply voltage:* 99 to 121 vac or 198 to 243 Vac	*Frequency:* Rated frequency ± 1% *Source resistance:* 0 ohm *Common mode:* 0 volt *Series mode:* 0 volt

Rated Limits and associated Drifts	**Parameter**	**Rated Limits**	**Influence on Accuracy**
	Temperature	0 to 50 °C/32 to 122°F (roll paper) 0 to 40 °C/32 to 104°F (fan fold paper)	<0.2% per 10°C or per 18°F or < 0.4% for ranges marked*
	Humidity	10% to 90% RH non-condensing	0.2% of total range
	Voltage	85 to 264 Vac (50/60 Hz)	No influence
	Vibration (IEC 873)	*Frequency:* 0 to 70 Hz *Acceleration:* 0.1 g	No influence No influence
	Source resistance *TIC and mV:* *RTD and Ohms:*	0 to 1000 ohms 0 to 15 ohms	1.2 μV per 100 ohms with burnout 0.1 °C per ohm (3 balanced leads)

Extreme Conditions Operating	*Roll Paper:* Temperature: -10 to + 50°C/14 to 122°F -- Humidiy: 5% to 90%. RH non condensing *Fan fold* paper: 0 to + 40°C/32 to 104°F -- 10% to 90% RH non condensing *Vibration (IEC 873):* Frequency: 0 to 200 Hz -- Acceleration: 0.2g
Storage	*Temperature:* -25 to + 70°C/-13 to + 158°F *Humidity:* 5% to 95%. RH non condensing

General Reference Data

|	
Chart Paper	Roll or fan fold (35m/115 ft), calibrated width 250 mm/10 in. Paper detection alerts end of chart.
Ink Cartridge	6 color disposable ribbon cartridge, 5 million dots per color
Power Supply	*Voltage.* 85 to 264 Vac *Frequency:* 50/60 Hz, configurable. Consumption 100 VA maximum.
Safety	Complies with IEC 414, IEC 348 and CSA safety requirements for personnel protection.
Isolation	*Inputs to ground:* All circuits tested at 1500 Vac for continuous operation at 250 Vac (IEC 348) *Input to input:* Functional isolation for continuous operation at 250 Vac
Noise Immunity	*Electric discharge:* Up to 8000 volts *Electromagnetic interference:* Up to 10 volts per meter (3 feet) *Electrical fast transient:* Up to 2000 volts on power supply and 1000 volts on input/output *Line voltage surge:* Common mode: Up to 2000 volts; Normal mode: Up to 1000 volts
Enclosure	*Mounting:* Panel mounting or portable case, permissible tilting angle ±30° from horizontal *Protection:* Front face: IP54 *Door:* Cast aluminum with key lock or latch *Color:* Door gray (available 1993), black or carribean blue, case black *Weight:* 28 Kg max (62 lb)
Warranty and Technical Assistance	The DPR 3000 carries a one year warranty and toll-free 800 number for technical assistance.
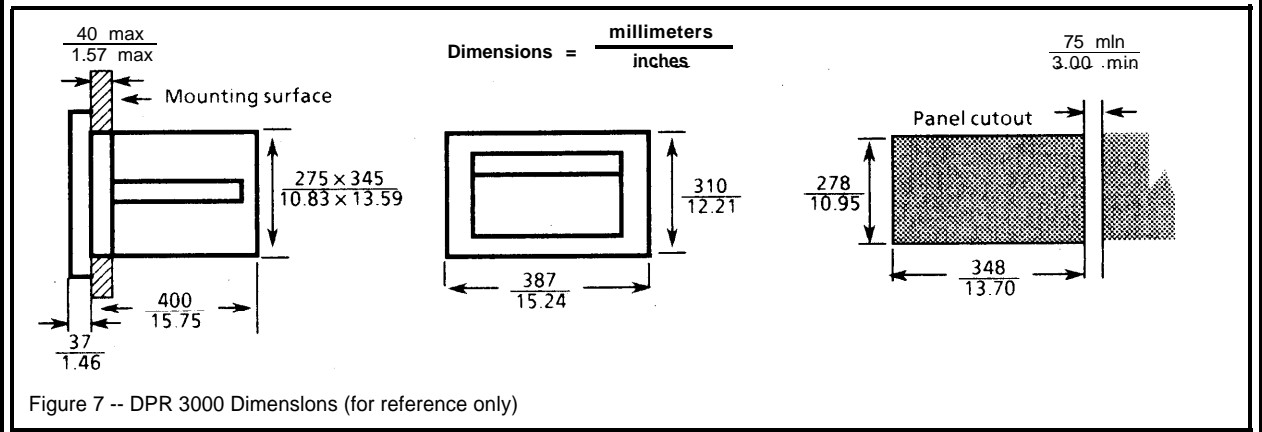
Figure 7 -- DPR 3000 Dimensions (for reference only)