

## DR45AW Truline® Open Channel Flow Circular Chart Recorder

## Specification

### Function

The Model DR45AW is a Truline recorder that has been designed to perform as an Open Channel Flow recorder. It combines the broad capabilities of Honeywell's Truline recorders with special features needed to serve the water and wastewater industries. These features include:

- Accurate flow measurement.
- V-notch, rectangular, and Cippolletti weir calculations.
- Parshall flume calculation.
- Palmer-Bowles flume calculation.
- Up to four optional totalizers (one per input) can be automatically scrolled on the display.
- Optional NEMA4X door.
- Optional non-control pulse output counter alarm.
- Adjustable low-flow cutoff.

Honeywell's Model DR45AW Truline recorder is a one to four-channel, microprocessor-based, circular chart recorder. Its "one-pen" stylus printhead produces up to four analog traces and prints alphanumeric chart data on a blank heat-sensitive chart. All four traces share the *same timeline* reference, which the Truline prints. This eliminates the error caused by pen alignment offsets in conventional pen designs.

Since the Truline prints the chart and generates the analog traces at the same time, there is no error due to variations in chart size caused by changes in temperature and humidity.

In addition to printing informative, accurate chart records, the Truline recorder alternately displays process variable values for all channels in the selected engineering units.

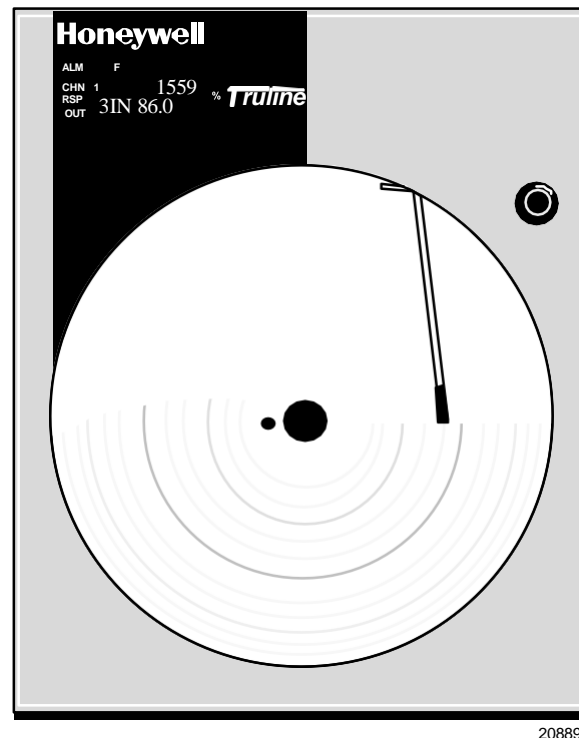


Figure 1—Truline recorder provides printed chart data and continuous digital indication of process variable value.

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## Features

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### **Five Open Channel Flow Elements** — are configurable.

They are:

- V Notch Weir
- Rectangular Weir
- Cipolletti Weir
- Parshall Flume
- Palmer-Bowles Flume

**Pulse Output Counter Alarm** — provides 2 configurable time duration relay output when a selected incremental change in volume has occurred. The pulse output relay can be reset from the keyboard.

**Low-Flow Cutoff** — available for each input being used for totalization. It allows the user to select a percent of flow range value that inhibits the totalizer's accumulator whenever the input signal is less than the selected value.

**Dual Displays** — bright, vacuum fluorescent, alphanumeric digital displays make pasteurization process data instantly available to your operation.

**User Configurable** — English language prompts, coupled with simple keystroke sequences, make configuring the recorder easy and straightforward. You can set and/or alter operating parameters to fit your requirements without recalibration.

**All Purpose Chart** — one all-purpose, blank chart eliminates the need for ordering and stocking several types of charts. Users can design the chart to match their specific application.

**Four Channel Input** — up to four channels that monitor process variables from a variety of sensor types help reduce panel space requirements.

**"One-pen" Stylus Print Head** — prints configurable alphanumeric chart data including time and trend lines. This automatically compensates for chart width variations caused by changes in the ambient relative humidity.

**Time/Date** — To guard against unauthorized chart advancement, an integral real-time clock provides accurate timing for the recorder's time and date printing, and also any operator changes. A 10-year life, battery backup assures correct timing even when power fails.

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## External Interface Selections

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- **Four Totalizers** — up to four totalizers (one for each input) are adjustable. A manually adjustable totalizer function can be selected to make corrections to the accumulated value as a result of power outage.
- **Modbus™ Communications** — option allows you to network your recorders to take advantage of overall monitoring of the system using an RS485 network.
- **Alarm Output** — Ties "soft" alarms to up to two integral SPST relays to activate user's external equipment.
- **Digital Input** — Allows users to initiate, from a remote location, through two dry contact closures, selected functions such as auto to manual control mode, direct to reverse controller action, or initiate autotune.
- **Timer** — This optional feature provides a configurable time period of 0 to 99 hours, 59 minutes or units of minutes and seconds. It can be started via the keyboard, alarm 2, or by a digital input. The timer output is Alarm 1, which energizes at the end of the Timer Period. Alarm 1 can be automatically reset. The Timer Period can be changed between each batch. Status is shown on the lower display.
- **Auxiliary Output** — there is also a 4 to 20 mA current output available.

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## Options

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- **Door Options** — Choice of gray with standard latch or optional lock. Optional UL approved NEMA4X door available.

- **Chart Illumination** — Lights the chart area to improve readability in lower light areas.

### • **Math Functions**

**Algorithms** — pre-configured algorithms for easy implementation into control loop with Ratio and Bias. *Summer* - will add three inputs with the result as the derived PV.

*Multiplier/Divider* - uses three analog inputs to calculate a derived PV with or without square root.

*Multiplier* - multiplies three inputs with the result as the derived PV with or without square root.

*Subtractor/Multiplier* - the difference between input 1 and input 2 is multiplied by input 3.

*Input High/Low Select* - specifies the PV as the higher or lower of two inputs.

**Polynomial Curve Characteristics** — A fifth order polynomial equation can be used on any one of the analog inputs.

- **Approval Body Options** — CSA certification and UL Listing or a combination is available.
- **Customer ID Tag** — (30 characters max.)
- **CE Mark** — Conformity with 73/23/EEC, Low Voltage Directive and 89/336/EEC EMC Directive.

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## User Configurable

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In the DR4500A Series recorder, microprocessor control replaces conventional electromechanical recording techniques. Its software primarily determines the recorder's capabilities. Since Honeywell has preprogrammed a variety of functional capabilities into the recorder, you only need to configure those functions that are specific for the given application. You configure the recorder using English language prompts that appear in the digital displays. The configuration data (type of input, chart speed, chart range, alarm settings, etc.) are stored in non-volatile memory for safe keeping in the event of a power failure.

## Operator Interface

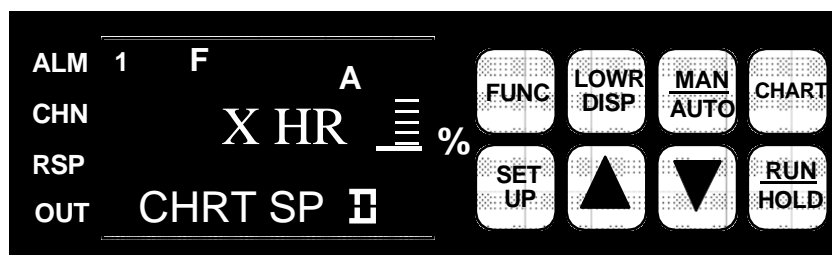
Two digital displays present the process variable (PV) value and by key selection, the deviation from reference input; totalization value; or engineering units as desired. The lower display can also be set to hold or scroll.

In configuration mode, digital displays are pre-empted by English language prompts and values that you use to enter configuration data. Indicators light to show alarm condition, which channel PV is on display, use of remote set point, and selected temperature unit.

## Input Processing

The input can be one of many standard low-level electrical signals. Since inputs are isolated, users can connect different types of input signals to multi-channel models in any combination. The input type and range are user configurable for hassle-free actuation changes in the field. Ranges are easily expanded and compressed within their span limitations to meet specific measurement needs. Users can select upscale or downscale sensor break protection for many of the actuations.

Each input is sampled at a rate of 3 times per second for 1 or 2 inputs, or 3 times in 2 seconds for 3 or 4 inputs. Each sample is amplified and then converted to a digital signal, which is isolated and passed to the microprocessor. A digital filter with configurable time constants lets users apply input signal smoothing as desired. All non-linear inputs are linearized by the microprocessor.



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Figure 2—Operator interface includes displays and keypad for comprehensive interaction with the recorder and the process.

An integral 24 Vdc power supply, along with 4-20 mA input configuration, allows direct operation with up to two transmitters without the need for any additional/ external transmitter power supply.

To totalize a variable, such as a flow signal, users select the applicable input and set the digital display scaling factor through configuration. This eliminates the need for additional integration hardware including a mechanical counter. The totalizer has an eight-digit display and 14 digit printing on the chart. A grand total can be enabled to print the sum of all the totalizers. Also, there is the capability to reset the totalizer remotely with digital inputs and a low flow cut off can be set in percent of range, below which the applicable totalizer does not increment.

## Diagnostics

All DR4500A Series recorders include self-diagnostic systems that check critical operations and provide error messages to alert users about detected faults.

Power-up self-diagnostics is a microprocessor controlled diagnostic program that runs tests on selected circuitry when the recorder is powered up. A “key” test allows a user to initiate, on demand, a self-diagnostic routine that checks the keypad and front panel displays.

## Process Interface

Power, input, and output wiring connect to terminations inside the case. Knockouts in the sides and bottom of the case accept conduit connections for convenient wire entry.

## Construction

The DR4500A Series recorder is housed in a molded case which can be panel or surface mounted. A glass or acrylic window, gasketed door protects internal components from harsh industrial environments while allowing easy access to the chart and operator interface. Circuitry is partitioned on printed circuit boards for ease of service. A UL approved NEMA4X door is also available.

## Recording and Printing

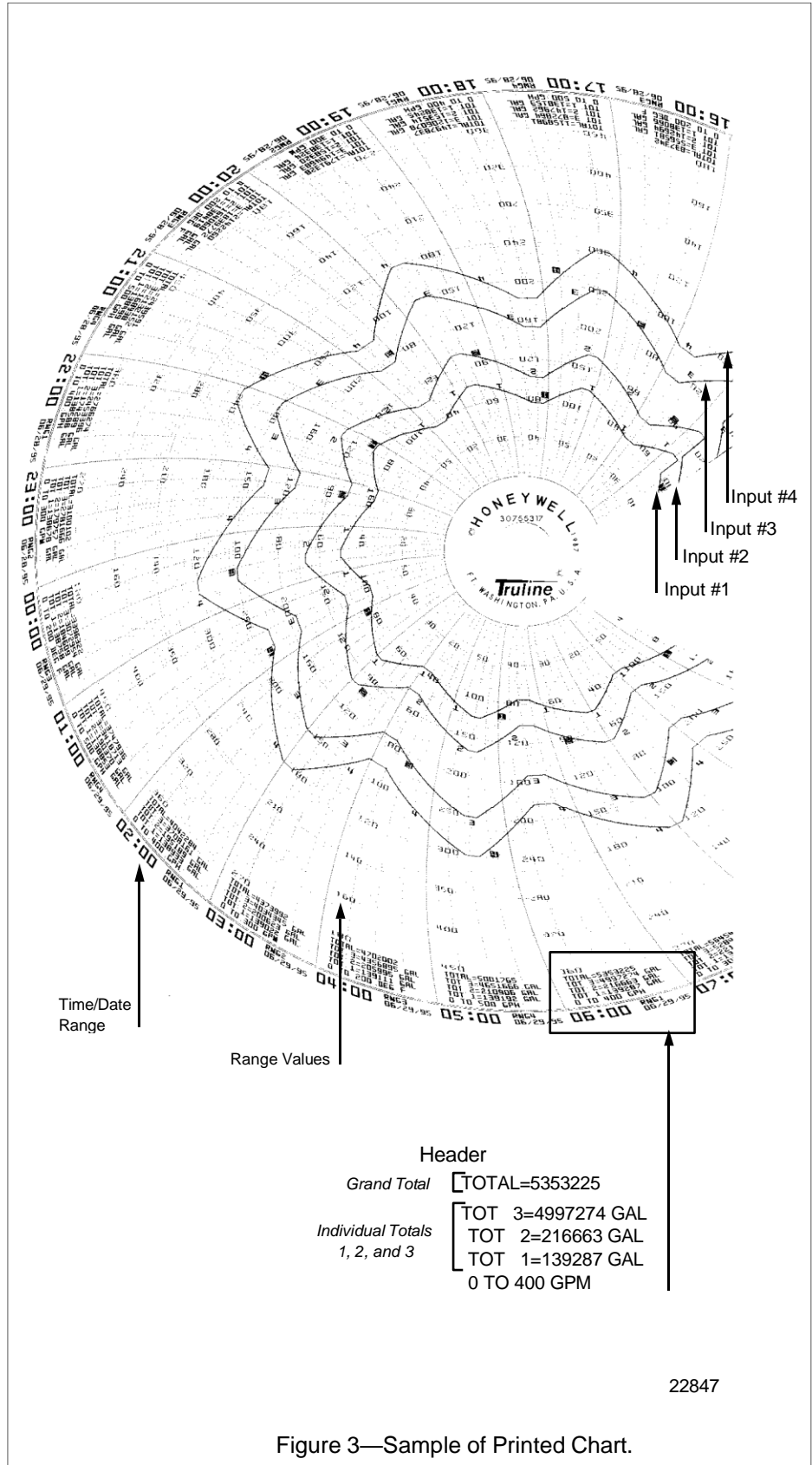
Both the chart and the printhead are driven by the stepper motors, which are controlled by the microprocessor allowing precise, maintenance free operation.

Since chart speed is configurable, users can easily alter the chart speed through the keypad. Gear changing or additional motors are no longer required.

The microprocessor uses the configured chart range data as well as the input data to determine the proper printhead position. The stepper motor accurately positions the printhead drive. By using a "one-pen" printhead that is capable of printing alphanumeric characters, users can now set various "printed" chart data through configuration. This versatile recorder automatically performs this function by printing pertinent identifying data on the border of the chart. This data can include: listing of the monitored variables, range of each variable, time references, and totalization numbers. The Figure 3 reproduction of a 12-inch circular chart illustrates some of these recording features.

This data, plus printed timelines and engineering units of scale, eliminate the need to maintain an inventory of a variety of preprinted charts.

The Truline recorder uses a dot fill technique from a microprocessor algorithm to produce a continuous analog trace of a process variable.



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Figure 3—Sample of Printed Chart.

## Specifications

<b>Design</b>	
<b>Digital Indication Accuracy</b>	1 digit
<b>Minimum Input Span</b>	Range is fully configurable with span limitation of the operating range selected.
<b>Input Impedance</b>	4-20 mA dc: 250 ohms 0-10 Vdc: 200K ohms All others: 10 Megohms
<b>Source Impedance</b>	RTD: 100 ohms per lead maximum
<b>Sampling Rate</b>	Each input sampled 3 times a second (1 or 2 inputs); 3 times in 2 seconds (3 or 4 inputs).
<b>Input Filter</b>	<i>Software</i> : Single pole low pass section with selectable time constants (off to 120 seconds).
<b>Digital Displays</b>	Vacuum fluorescent, alphanumeric. A six-digit display dedicated to the process variable. Alternate information displayed during configuration mode. An eight-digit display shows key selected operating parameters. Also provides guidance during configuration.
<b>Indicators</b>	Channel PV display (CHN 1, 2, 3, or 4) Alarm status (ALM 1, 2) Controller Output (OUT 1 or 2) Remote Set Point (RSP) Temperature unit (F or C) or Engineering units Controller's mode (A or MAN)
<b>Transmitter Supply Voltage</b>	22 to 26 Vdc at input terminals (50 mA dc at 24 Vdc)
<b>Case/Door</b>	Molded, foamed-Noryl** with gasketed door to meet NEMA 3 enclosure requirements. Panel gasket available separately. An optional UL and FM approved NEMA4X door is also available.
<b>Chart</b>	12-inch (304.8mm) diameter chart. Plain thermal-sensitive paper.
<b>Wiring Connections</b>	Terminals inside the case
<b>Color</b>	Case: Black Door (standard): Gray
<b>Approval Bodies</b>	U.L. approval depending on model. Consult Model selection Guide for information.
<b>Dimensions</b>	See Figure 4
<b>Weight</b>	13.2 lb. (6 kg)
<b>Mounting</b>	Panel or surface mounted. Some adapter kits available for existing panel cutouts.

### WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications, continued

<b>Performance</b>					
<b>Number of Inputs</b>	<i>One channel model: One input Two channel model: Two inputs Three channel model: Three inputs Four channel model: Four inputs</i>				
<b>Types of Input Actuation</b>	<b>Range</b>		<b>Reference Accuracy</b>		<b>Temp. Stability ± Degrees Error Per 1 Degree ΔT</b>
<b>Thermocouples<sup>2</sup></b>	<b>°F</b>	<b>°C</b>	<b>± °F</b>	<b>± °C</b>	
<b>B</b>	<b>105 to 3300</b> 105 to 150 150 to 500 500 to 1000 1000 to 3300	<b>41 to 1816</b> 41 to 66 66 to 260 260 to 538 538 to 1816	 42.00 14.00 3.00 1.50	 23.00 7.70 1.70 0.80	 2.00 2.00 0.50 0.20
<b>E</b>	<b>-454 to 1832</b> -454 to -202 -202 to 1832	<b>-270 to 1000</b> -270 to -130 -130 to 1000	 18.00 1.00	 10.00 0.55	 0.70 0.35
<b>E (low)</b>	<b>-200 to 1100</b>	<b>-129 to 593</b>	0.50	0.30	0.20
<b>J</b>	<b>0 to 1600</b>	<b>-18 to 871</b>	0.40	0.22	0.06
<b>J (low)</b>	<b>20 to 770</b>	<b>-7 to 410</b>	0.20	0.11	0.04
<b>K</b>	<b>-320 to 2500</b> -320 to 0 0 to 2500	<b>-196 to 1371</b> -196 to -18 18 to 1371	 1.25 0.60	 0.70 0.35	 0.18 0.09
<b>K (low)</b>	<b>-20 to 1000</b>	<b>-29 to 538</b>	0.30	0.16	0.05
<b>NNM (Ni Ni Moly)</b>	<b>32 to 2500</b> 32 to 500 500 to 2500	<b>0 to 1371</b> 0 to 260 260 to 1371	 0.75 0.50	 0.40 0.30	 0.09 0.07
<b>NIC (Nicrosil Nisil)</b>	<b>0 to 2372</b>	<b>-18 to 1300</b>	1.0	0.55	0.01
<b>R</b>	<b>0 to 3100</b> 0 to 500 500 to 3100	<b>-18 to 1704</b> -18 to 260 260 to 1704	 2.00 1.00	 1.10 0.55	 0.25 0.13
<b>S</b>	<b>0 to 3100</b> 0 to 500 500 to 3100	<b>-18 to 1704</b> -18 to 260 260 to 1704	 2.00 1.00	 1.10 0.55	 0.23 0.13
<b>T</b>	<b>-300 to 700</b>	<b>-184 to 371</b>	0.60	0.35	0.07
<b>T (low)</b>	<b>-200 to 600</b>	<b>-129 to 316</b>	0.40	0.22	0.07
<b>W5W26</b>	<b>0 to 4200</b> 0 to 600 600 to 3600 3600 to 4200	<b>-18 to 2315</b> -18 to 316 316 to 1982 1982 to 2315	 1.40 1.30 1.60	 0.77 0.70 0.90	 0.17 0.17 0.29
<b>W5W26 (low)</b>	<b>0 to 2240</b> 0 to 600 600 to 2240	<b>-18 to 1227</b> -18 to 316 316 to 1227	 1.10 1.00	 0.60 0.55	 0.14 0.10
<b>RTDs<sup>2</sup></b> Platinum 100 ohms 500 ohms	 <b>-300 to 900</b> <b>-300 to 900</b>	 <b>-184 to 482</b> <b>-184 to 482</b>	 0.40 0.20	 0.22 0.11	 0.05 0.05

<sup>2</sup>Includes reference junction calibration of ± 0.01 degrees using standard "ice bath" method of calibration. Factory calibration at reference ± 1.2°F. Note that factory calibration may vary by as much as ± 10 microvolts or ± 0.3 ohms for RTDs which means recalibration may be required to achieve stated accuracy.

**Specifications, continued**

Types of Input Actuation	Range		Reference Accuracy		Temp. Stability ± Degrees Error Per 1 Degree ΔT
	°F	°C	± °F	± °C	
<b>Thermocouples<sup>2</sup></b>					
<b>Linear</b>					
Milliamperes dc	4 to 20	--	0.10%	--	0.004% /°F
Millivolts dc	0 to 10	--	0.05%	--	0.004% /°F
	10 to 50	--	0.05%	--	0.004% /°F
Volts dc	1 to 5 (can be calibrated 0 to 5)	--	0.05%	--	0.004% /°F
	0 to 10	--	0.10%	--	0.004% /°F
<b>Relative Humidity</b>					
Platinum <b>Wet/Dry</b> 100 ohm <b>Input</b> Wet/Dry Bulb*	<b>-130 to 392</b>	<b>-90 to 200</b>	0.30	0.16	0.03
	<b>Measured %RH</b>	<b>Dry Bulb Range</b>		<b>Reference Accuracy</b>	<b>Temp. Stability</b>
		°F	°C	± °F ± °C	<b>53 to 104°F/ 12 to 40°C</b>
<b>%RH<sup>3</sup></b>	0 to <20 20 to 100	-103 to 212 35 to 40 >40 to 100 100 to 212	-75 to 100 2 to 4 >4 to 38 38 to 100	2% RH 2% RH 1% RH 1% RH	0.11% RH/°F 0.11% RH/°F 0.06% RH/°F 0.03% RH/°F

**Configurable Parameters:** These parameters can be set through the keypad.

Group	Parameters	Setting Range or Selection	Resolution
CHART	Chart speed Hours per revolution Time Div Minor Div Continue Chart Name Header Rem Chart Wake Minute Wake Hour Wake Day Wake Month	8 hrs, 12 hrs, 24 hrs, 7 days, or selected hours per rev 6 to 744 hrs** (12 hrs. for Abrasion Resistant Pen) 8 to 24 4 or 8 Yes or No (Chart rotation beyond 360 degrees) Up to six characters Yes or No None, Extsw1, Extsw2, Alarm1,2, 3, 4, 5, or 6, Time 0 to 59 0 to 23 0 to 31 0 to 12	
TIME	Minutes Hours Day Month Year Day	1 to 59 0 to 23 1 to 31 1 to 12 4-digits Monday to Sunday	
PEN 1, PEN 2, PEN3, PEN4	Pen 1 Pen 1 input  Chart 1 high range value Chart 1 low range value Major chart division Minor chart division Range 1 Tag Pen 1 On Pen 1 Off	Disable or Enable Input 12,3,4, Output, SP, Dev, Dgtl1, Dgtl2, Out2, SP2, Dev2 -999.0 to 9999 -999.0 to 9999 2 to 10 2 to 10 Up to five characters 0 to 100% of chart 0 to 100% of chart	0.1 0.1    1 1
AUX OUT 1	Auxiliary Output 4 mA Val 20 mA Val	Disable, In1, In2, PV1, PV2, Dev1, Dev2, Out 1 (2), SP 1(2) Lower Scaling Factor High Scaling Factor	

<sup>2</sup>Includes reference junction calibration of ± 0.01 degrees using standard "ice bath" method of calibration. Factory calibration at reference ± 1.2°F. Note that factory calibration may vary by as much as ± 10 microvolts or ± 0.3 ohms for RTDs which means recalibration may be required to achieve stated accuracy.

<sup>3</sup>The RH calculation is inoperative when temperature goes below 32°F (0°C) or above 212°F (100°C). However, the dry bulb temperature will be monitored to -103°F (-75°C). Accuracy stated is for Truline Recorder only and does not include remaining system accuracies.

\*IEC Alpha (α) = 0.00385 Ω/Ω°C

\*\*Below 8 hrs. chart speed and 24 hrs. chart speed with Abrasion Resistant Pen printing may be degraded.

**Specifications**, continued

<b>Configurable Parameters, continued:</b> These parameters can be set through the keypad.			
<b>Group</b>	<b>Parameters</b>	<b>Setting Range or Selection</b>	<b>Resolution</b>
INPUT 1, INPUT 2, INPUT 3, INPUT 4	Decimal point location Units Actuation type Transmitter characterization High range value Low range value Flow transmitter Flow Rate Weir type Parshall Flume size Palmer-Bowles Flume type V Notch Weir angle Weir or Flume width Weir or Flume Maximum Height Weir or Flume Minimum Height Low Flow Cutoff (% of Max. Flow) Input compensation Filter Input Sensor break protection	None, 1 (XXX.X), 2 (XX.XX), or 3 (X.XXX) – one decimal place only for non-linear inputs °F, °C or engineering units See input types All non-linear input types, linear, square root –999.0 to 9999 –999.0 to 9999 None, Height, or Flow CFS, GPS, GPM, GPH, MGD, AFD, CMS, CMM, CMH, LPS, MLD, HMD, LPM, LPH, KC/M, KG/H V Notch, Rectangular, Cipolletti 1 inch, 2 inch, 3 inch, 6 inch, 9 inch, or defined by user. 4,6,8,10,12,15,18,21,24,27,30,36,42,48,60, or 72 inch 30, 60, 90, 120 degrees 0 to 9999 inches 0 to 9999 inches (represents Max. input signal) 0 to 9999 inches (represents Min. input signal) 0 to 100% –999.0 to 9999 0 to 120 sec None, Up or Down (burnout)	1 1 1 1 1 1 1 1 1 1 1
TOTAL1, TOTAL2, TOTAL3, TOTAL4	Total Reset total Total 1(2,3,4) Total engineering units Scaling factor Resetable Totalizer adjustment Adjustment Rate (average flow) Adjustment Time Duration Execute Totalizer Adjustment	Read only Yes or No Input 1,2,3,4, PV1, Etime Desired alphanumeric title 1, 10, 100, 1000, 10,000, 100,000 or 1E6 No, Local, Ext Sw1, Ext Sw2 Yes or No (in case of power outage) 0 to 9999 (uses unit selected) 0 to 9999 (uses unit selected) Yes or No (no adjustment made until YES selected)	
PULS OUT <i>Relay Output 1</i> <i>Relay Output 2</i>	Pulse Counter Selection Totalizer Selection Pulse Setpoint Value Setpoint Scale Selection Pulse Width Pulse Counter Reset	Yes or No TOTAL 1, TOTAL 2, TOTAL 3, or TOTAL 4 0 to 9999 1, 10, 100, 1000, 10000, 100000, or 1E6 0.5 sec., 1 sec., 5 sec. Yes or No	
OPTIONS	Reject Frequency Relative Humidity Atm. Pressure Scroll Deviation Deviation Setpoint	60 or 50 Hz Yes or No 590 to 800 None, 1 sec, 2 sec, 3 sec None, SetPnt, Chan 1 -999.0 to 9999	
TIMER	Timer Period Start Ldisplay Reset Increment	Enable/Disable 0.00 to 99:59 Run/Hold Key or Alarm 2 Time Remaining or Elapsed Time Run/Hold key or Alarm 1 Minutes or Seconds	

**Specifications, continued**

**Configurable Parameters, continued:** These parameters can be set through the keypad.

Group	Parameters	Setting Range or Selection	Resolution
Input Algorithm	Input Algorithm  K Coefficient PV High Limit PV Low Limit Ratio A Bias A Ratio B Bias B Ratio C Bias C Polynomial Characterization Polynomial coefficient C0 Polynomial coefficient C1, C2, C3, C4, and C5	Summer w/ratio-bias, multiplier with or without square root, multiplier/divider with or without square root, subtractor multiplier, or High/Low Select. 72.0 . . . . . to 1000 -999 to 9999 -999 to 9999 -20 to +20 -999 to 9999 -20 to +20 -999 to 9999 -20 to +20 -999 to 9999 None, Input 1, Input 2, Input 3, Input 4 -99.99 to 99.99 -9.999 to 9 999	
ALARMS (1,2,3,4,5,6))	SP Value SP Type Alarm Type Alarm Scaling Multiplier for Totalizer Alarm Alarm Hysteresis	72.0 . . . . . to 9999 None, Input 1 (2, 3, 4), RH/PV, Dev, Output, Total 1(2,3,4) High or Low 1, 10, 100, 1000, 10000, 100000, 1E6 0.0 to 100% of span	0.1
EVNT MSG	Event 1 (2,3,4,5,6)  MESSAGE 1 (2,3,4,5,6) POSITION 1 (2,3,4,5,6)	EXTSW1, EXTSW2, ALARM 1, ALARM 2, ALARM 3, ALARM 4, ALARM 5, ALARM 6 Message for event (up to 6 characters) Chart position for message printing (0 to 100%)	
LOCKOUT	Password Lockout (software and/or hardware) Change	Up to four characters None, Calib, +Conf, Max (hardware configuration lockout—option) Used if changing Password	
STATUS	Version Failsafe RAM Test Configuration Test Calibration Test Comm Test Fact CRC Battery Test	Latest Software Version Yes or No Pass or Fail Pass or Fail Pass or Fail Pass or Fail Pass or Fail Pass or Fail	

Options	
<b>Alarm Output</b>	Two SPST electromechanical relays <i>Relay Contact Ratings:</i> Resistive Load: 1A @ 120 Vac, 1/2A @ 240 Vac.
<b>Auxiliary Linear Output (Optional)</b>	21 mA dc maximum into a negative or positive grounded load or non-grounded load of 0 to 1000 ohms. Output range can be set between 0 to 21 mA, as direct or reverse action. It can be configured to represent any one of 10 parameters, Deviation, or Control output. The range of the auxiliary output, as a function of the selected variable, can be scaled. This output can be used as a second current output for current duplex outputs. <i>Resolution:</i> 12 bits over 0 to 21 mA <i>Accuracy:</i> 0.2% of full-scale <i>Temperature Stability:</i> 0.03% F.S./°C
<b>Digital Input</b>	+20 Vdc source for external dry contacts. Selects one configured input.
<b>Totalizers</b>	Up to four totalizers on DR45AW Model. Eight digit "totals" with multiplier on digital display; 14-digit totalization printout on chart. When enabled, a grand total can be printed where total #4 is normally printed.

**Specifications, continued**

<b>Options, continued</b>																							
<b>Calculations</b>	Open channel flow calculations available.																						
<b>Math Algorithms</b>	<p>Eight algorithms available:</p> <ul style="list-style-type: none"> <li>A + B + C (summer)</li> <li><math>\sqrt{A \cdot B/C}</math> (square root multiplier/divider)</li> <li><math>\sqrt{A \cdot B \cdot C}</math> (square root multiplier)</li> <li>A • B/C (multiplier/divider)</li> <li>A • B • C (multiplier)</li> <li>(A – B) • C (difference multiplier)</li> <li>High/Low Select between Input 1 and 2</li> <li>Polynomial Equation – Fifth order provides equation</li> </ul> <p>• <i>where:</i>            A = Input 1 • ratio A + bias A            B = Input 2 • ratio B + bias B            C = Input 3 • ratio C + bias C            Limit of Ratio = -20 to +20            Limit of Bias = -999 to +9999</p>																						
<b>CE Conformity (Europe)</b>	<p>This product is in conformity with the protection requirements of the following European Council Directives: <b>73/23/EEC</b>, the Low Voltage Directive, and <b>89/336/EEC</b>, the EMC Directive. Conformity of this product with any other “CE Mark” Directive(s) shall not be assumed.</p> <p><i>Product Classification:</i> Class I: Permanently Connected, Panel Mounted Industrial Control Equipment with protective earthing (grounding). (EN 61010-1)</p> <p><i>Enclosure Rating:</i> Panel Mounted Equipment, IP 00, this recorder must be panel mounted. Terminals must be enclosed within the panel. Front panel IP 65 (IEC 529)</p> <p><i>Installation Category (Over-voltage Category)</i> Category II: Energy-consuming equipment supplied from the fixed installation. Local level appliances, and Industrial Control Equipment. (EN 61010-1)</p> <p><i>Pollution Degree:</i> Pollution Degree 2: Normally non-conductive pollution with occasional conductivity caused by condensation. (Ref. IEC 664-1)</p> <p><i>EMC Classification</i> Group 1, Class A, ISM Equipment (EN 55011, emissions), Industrial Equipment (EN 50082-2, immunity)</p> <p><i>Method of EMC Assessment</i> Technical File (TF)</p> <p><i>Declaration of Conformity</i> 51197639-000</p>																						
<b>Flow Equations</b>																							
<b>Weir and Flume</b>	<p>For the following equations, both height and width are measured in feet. (See Note.)</p> <p><u>V NOTCH WEIR</u></p> <table style="margin-left: 40px;"> <tr> <td>30 DEG</td> <td><math>Q = .676 H^{2.5}</math> cubic feet per second</td> </tr> <tr> <td>60 DEG</td> <td><math>Q = 1.42 H^{2.440}</math> cubic feet per second</td> </tr> <tr> <td>90 DEG</td> <td><math>Q = 2.49 H^{2.475}</math> cubic feet per second</td> </tr> <tr> <td>120 DEG</td> <td><math>Q = 4.33 H^{2.5}</math> cubic feet per second</td> </tr> </table> <p><u>RECTANGULAR WEIR</u></p> <p><math>Q = 3.33 (W - 0.2H) H^{1.5}</math> cubic feet per second Width must be greater than three times the height.</p> <p><u>CIPOLLETTI WEIR</u></p> <p><math>Q = 3.37 W (H)^{1.5}</math> cubic feet per second</p> <p><u>PARSHALL FLUME</u></p> <table style="margin-left: 40px;"> <thead> <tr> <th style="text-align: left;">Throat Width</th> <th style="text-align: left;">Flow (ft<sup>3</sup>/sec)</th> </tr> </thead> <tbody> <tr> <td>1 inch</td> <td><math>Q = 0.338 H^{1.55}</math> cubic feet per second</td> </tr> <tr> <td>2 inches</td> <td><math>Q = 0.676 H^{1.55}</math> cubic feet per second</td> </tr> <tr> <td>3 inches</td> <td><math>Q = 0.993 H^{1.547}</math> cubic feet per second</td> </tr> <tr> <td>6 inches</td> <td><math>Q = 2.060 H^{1.58}</math> cubic feet per second</td> </tr> <tr> <td>9 inches</td> <td><math>Q = 3.068 H^{1.53}</math> cubic feet per second</td> </tr> <tr> <td>X inches</td> <td><math>Q = 4 W H^{(1.522 W^{0.026})}</math> cubic feet per second (X is greater than 12 inches)</td> </tr> </tbody> </table> <p><i>Where:</i>            W = Width (in feet)            Q = Flow (in cubic feet per second)            H = Height (in feet)</p>	30 DEG	$Q = .676 H^{2.5}$ cubic feet per second	60 DEG	$Q = 1.42 H^{2.440}$ cubic feet per second	90 DEG	$Q = 2.49 H^{2.475}$ cubic feet per second	120 DEG	$Q = 4.33 H^{2.5}$ cubic feet per second	Throat Width	Flow (ft <sup>3</sup> /sec)	1 inch	$Q = 0.338 H^{1.55}$ cubic feet per second	2 inches	$Q = 0.676 H^{1.55}$ cubic feet per second	3 inches	$Q = 0.993 H^{1.547}$ cubic feet per second	6 inches	$Q = 2.060 H^{1.58}$ cubic feet per second	9 inches	$Q = 3.068 H^{1.53}$ cubic feet per second	X inches	$Q = 4 W H^{(1.522 W^{0.026})}$ cubic feet per second (X is greater than 12 inches)
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<b>Example</b>	<p>User has a 3-inch Parshall Flume and measures height as two feet. Flow is calculated as: <math>Q = 0.993 (2)^{1.547} = 2.9</math> cubic feet per second</p>																						

<b>Weir and Flume, continued</b>  <i>*Equations provided by Plasti-Fab Inc.</i> <i>Where:</i> W = Width (in feet) Q = Flow (in cubic feet per second) H = Height (in feet)	<b>PALMER-BOWLUS FLUME*</b>	
	<b>Type</b>	<b>Flow (ft<sup>3</sup>/sec)</b>
	4 inches	Q = 1.73 (H + .00588) <sup>1.9573</sup>
	6 inches	Q = 2.071 (H + .005421) <sup>1.9025</sup>
	8 inches	Q = 2.537 (H + .01456) <sup>1.9724</sup>
	10 inches	Q = 2.843 (H + .0161) <sup>1.9530</sup>
	12 inches	Q = 3.142 (H + .017) <sup>1.9362</sup>
	15 inches	Q = 3.574 (H + .0168) <sup>1.9062</sup>
	18 inches	Q = 3.988 (H + .01875) <sup>1.8977</sup>
	21 inches	Q = 4.223 (H + .039) <sup>1.9619</sup>
	24 inches	Q = 4.574 (H + .0408) <sup>1.9497</sup>
	27 inches	Q = 4.97 (H + .038) <sup>1.9269</sup>
	30 inches	Q = 5.022 (H + .0625) <sup>1.9663</sup>
	36 inches	Q = 5.462 (H + .08) <sup>1.991</sup>
	42 inches	Q = 6.12 (H + .078) <sup>1.9628</sup>
48 inches	Q = 6.626 (H + .085) <sup>1.9586</sup>	
60 inches	Q = 7.183 (H + .126) <sup>1.9833</sup>	
72 inches	Q = 7.839 (H + .155) <sup>1.9871</sup>	

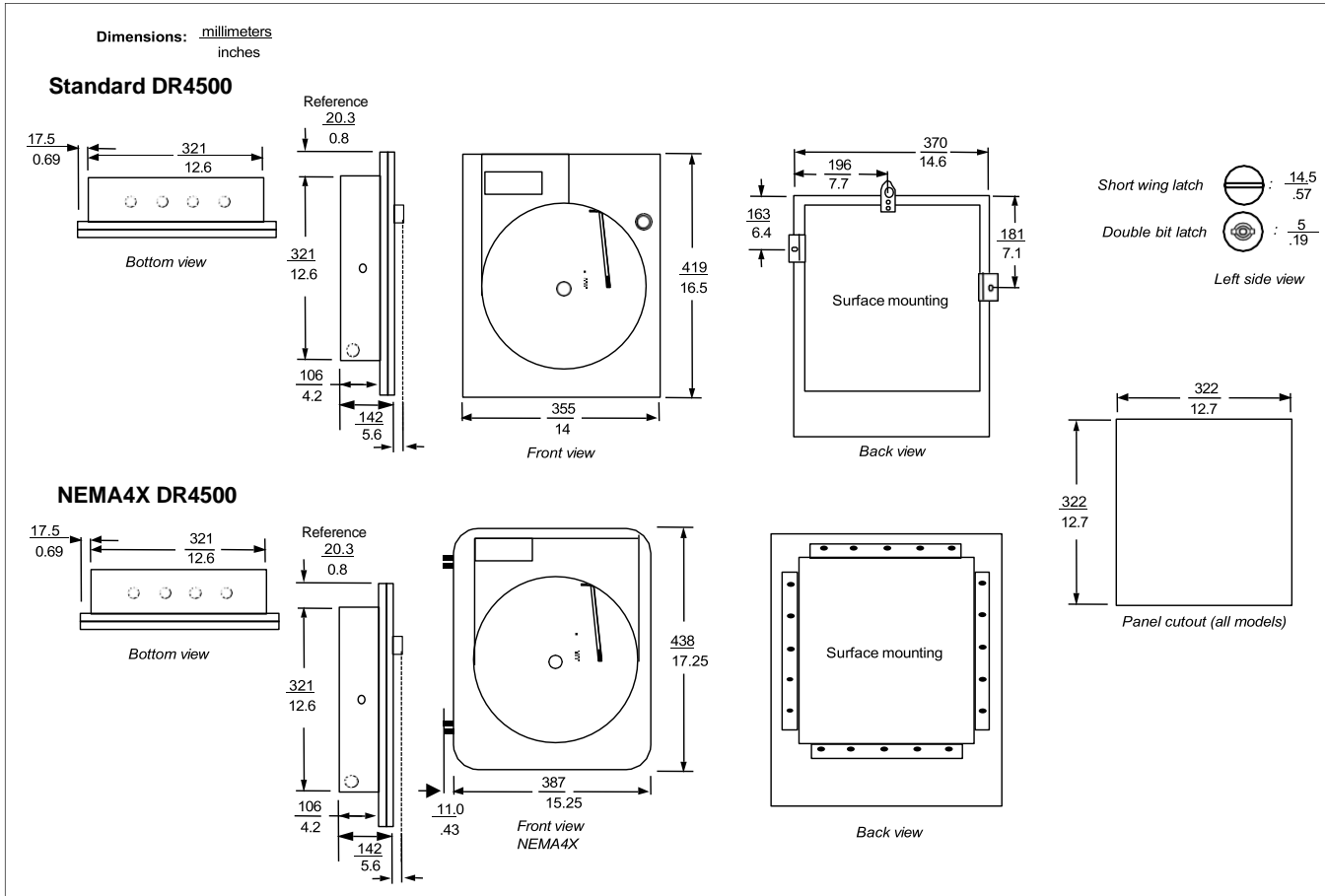
**Environmental and Operating Conditions**

Parameter	Reference	Rated	Extreme	Transport and storage
<b>Ambient Temperature</b>	67 to 77°F 19 to 25°C	58 to 131°F 15 to 55°C	32 to 131°F 0 to 55°C	-40 to 151°F -40 to 66°C
<b>Relative Humidity (%RH)</b>	0 to 55*	10 to 90*	5 to 90*	5 to 95*
<b>Vibration</b>				
Frequency (Hz)	0	0 to 70	0 to 200	0 to 200
Acceleration (g)	0	0.1	0.2	0.5
<b>Mechanical Shock</b>				
Acceleration (g)	0	1	5	20
Duration (ms)	0	30	30	30
<b>Mounting Position from Vertical</b>				
Tilted Forward	5°	5°	5°	Any
Tilted Backward	5°	30°	90°	Any
Tilted to Side (±)	5°	10°	20°	Any
<b>Power Requirements</b>				
Voltage (VRMS)	119 to 121 238 to 242	102 to 132 204 to 264	102 to 132 204 to 264	N/A N/A
Frequency (Hz)	49.8 to 50.2 59.8 to 60.2	49 to 51 59 to 61	48 to 52 58 to 62	N/A N/A
<b>Power Consumption</b>	24 watts maximum			

**General Reference Data**

<b>Stray Rejection</b>	<i>Common Mode Rejection Ratio:</i> 120dB or 1 LSB (whichever is greater) at 60 Hz with maximum source impedance of 100 ohms.  <i>Normal Mode Rejection Ratio:</i> 60dB with a 100% span peak-to-peak maximum at 60 Hz.
<b>Static Charge Effects</b>	Exposed panel surfaces capable of withstanding a discharge from a 250pf capacitor charged to 10 KV through 100 ohms.
<b>Line Noise Effects</b>	Field terminals for connecting power line to recorder can withstand the IEEE Surge Withstanding Capability Test to a level of 2.5KV.
<b>Stylus Life</b>	Typically, capable of printing one chart per day for five years under clean room conditions.
<b>Technical Assistance</b>	Toll-free 800 number puts technical assistance only a phone call away.

\* The maximum rating only applies up to 104 °F (40 °C). For higher temperatures, the RH specification is de-rated to maintain constant moisture content.



## Ordering Information

For complete ordering information, request Model Selection Guide 44-45-16-07 for DR4500A Series Circular Chart Recorder.

Honeywell offers a full line of sensors and transmitters that produce a compatible range of dc voltage or current signals which can be used as inputs to the DR4500A Series Recorder.

These devices measure:

Temperature: (Thermocouple or RTD)

Pressure

Flow {4 to 20 mA dc or 1 to 5 Vdc process transmitter}

Liquid Level

Relative Humidity

# Honeywell

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Houston, USA, TX 77042

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44-45-03-11  
November 2023  
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