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 waste water industries. These features include:

- accurate flow measurement
- V-notch, rectangular, and Cipolletti weir calculations
- Parshall flume calculation
- Palmer-Bowles flume calculation
- up to four optional totalizers (one per input) that 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 time line* 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.

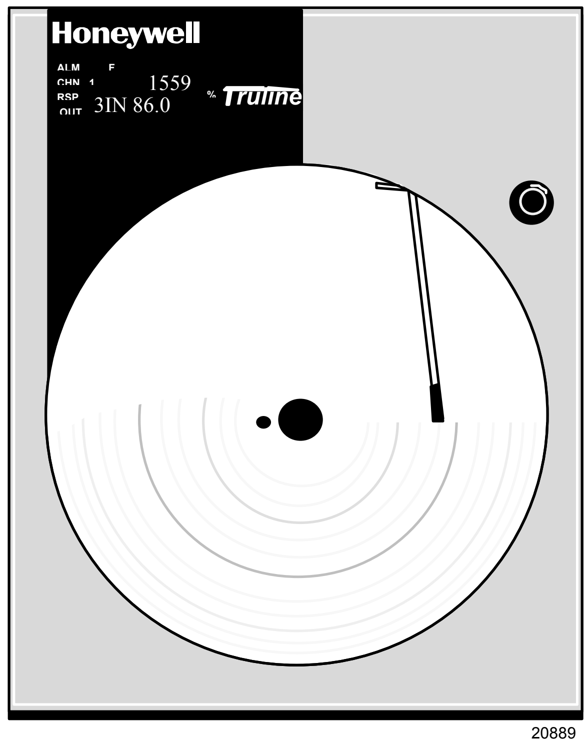


Figure 1—Truline recorder provides printed chart data and continuous digital indication of process variable value.

Features

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 re-calibration.

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.

External Interface Selections

- ***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.

Options

- ***Door Options*** — Choice of gray, black or blue doors with standard latch or optional lock. Optional UL and FM 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 other 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/Multipler - 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*** — FM approval, 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.

User Configurable

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 have 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.

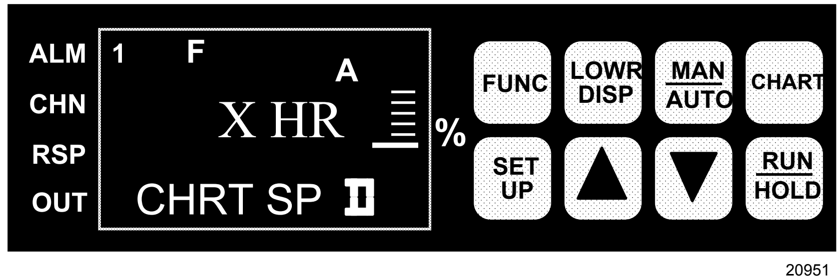


Figure 2—Operator interface includes displays and keypad for comprehensive interaction with the recorder and the process.

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.

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 and FM 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 time lines 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.

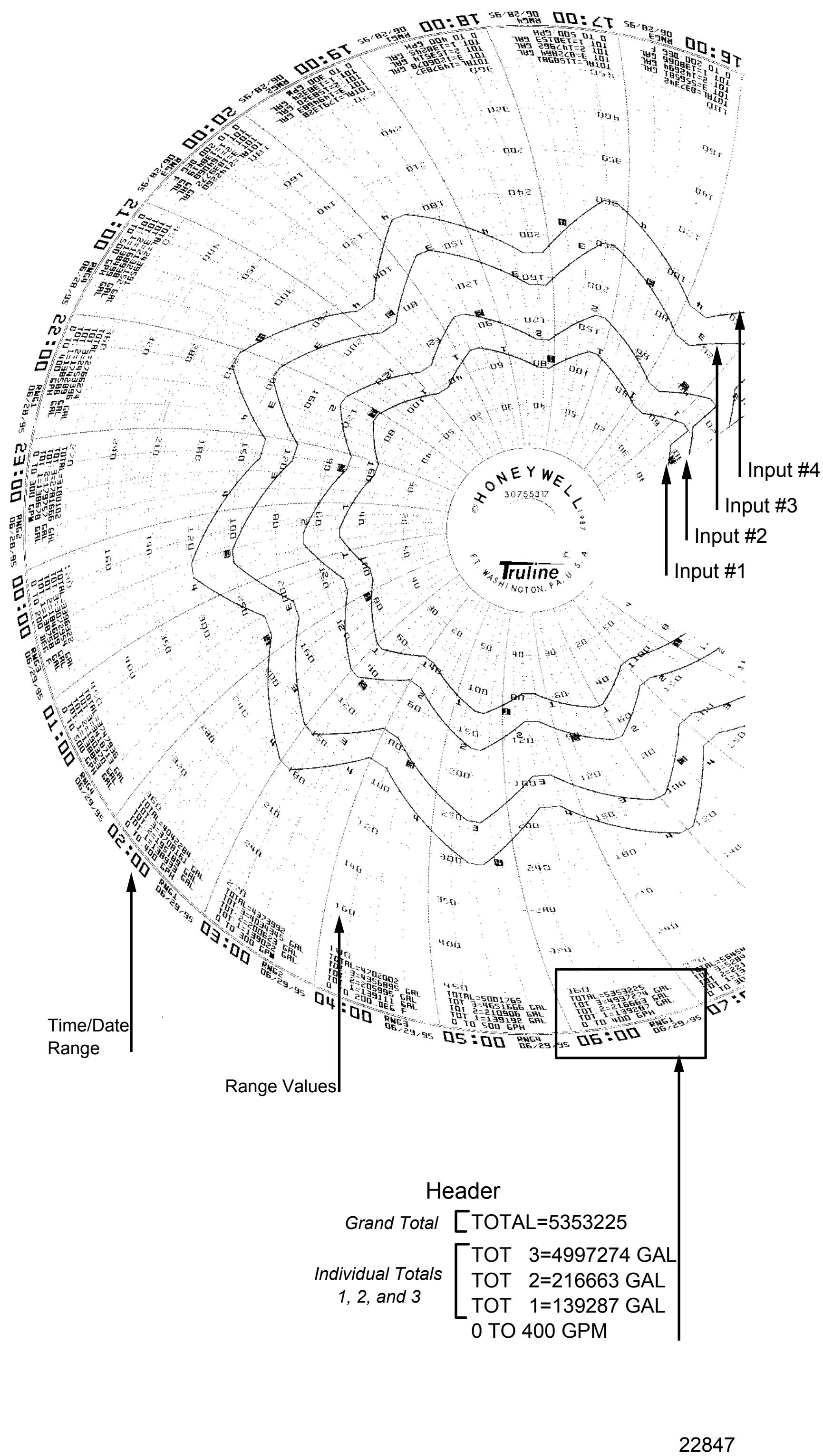


Figure 3—Sample of Printed Chart.

Specifications

Design	
Digital Indication Accuracy	1 digit
Minimum Input Span	Range is fully configurable with span limitation of the operating range selected.
Input Impedance	*4-20 mA dc:* 250 ohms *0-10 Vdc:* 200K ohms *All others:* 10 Megohms
Source Impedance	*RTD:* 100 ohms per lead maximum
Sampling Rate	Each input sampled 3 times a second (1 or 2 inputs); 3 times in 2 seconds (3 or 4 inputs).
Input Filter	*Software:* Single pole low pass section with selectable time constants (off to 120 seconds).
Digital Displays	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.
Indicators	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)
Transmitter Supply Voltage	22 to 26 Vdc at input terminals (50 mA dc at 24 Vdc)
Case/Door	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.
Chart	12-inch (304.8mm) diameter chart. Plain thermal-sensitive paper.
Wiring Connections	Terminals inside the case
Color	*Case:* Black *Door (standard):* Caribbean Blue, Black or Gray
Approval Bodies	U.L. approval depending on model. Consult Model selection Guide for information. FM approved for Class I, Div 2, Groups A, B, C, D areas depending on model.
Dimensions	See Figure 4
Weight	13.2 lb. (6 kg)
Mounting	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

Performance					
Number of Inputs	*One channel model:* One input *Two channel model:* Two inputs *Three channel model:* Three inputs *Four channel model:* Four inputs				
Types of Input Actuation	**Range**		**Reference Accuracy**		**Temp. Stability ± Degrees Error Per 1 Degree ΔT**
Thermocouples[2]	**˚F**	**˚C**	**± ˚F**	**± ˚C**	
B	**105** to **3300** 105 to 150 150 to 500 500 to 1000 1000 to 3300	**41** to **1816** 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
E	**-454** to **1832** -454 to -202 -202 to 1832	**-270** to **1000** -270 to -130 -130 to 1000	 18.00 1.00	 10.00 0.55	 0.70 0.35
E (low)	**-200** to **1100**	**-129** to **593**	0.50	0.30	0.20
J	**0** to **1600**	**-18** to **871**	0.40	0.22	0.06
J (low)	**20** to **770**	**-7** to **410**	0.20	0.11	0.04
K	**-320** to **2500** -320 to 0 0 to 2500	**-196** to **1371** -196 to -18 18 to 1371	 1.25 0.60	 0.70 0.35	 0.18 0.09
K (low)	**-20** to **1000**	**-29** to **538**	0.30	0.16	0.05
NNM (Ni Ni Moly)	**32** to **2500** 32 to 500 500 to 2500	**0** to **1371** 0 to 260 260 to 1371	 0.75 0.50	 0.40 0.30	 0.09 0.07
NIC (Nicrosil Nisil)	**0** to **2372**	**-18** to **1300**	1.0	0.55	0.01
R	**0** to **3100** 0 to 500 500 to 3100	**-18** to **1704** -18 to 260 260 to 1704	 2.00 1.00	 1.10 0.55	 0.25 0.13
S	**0** to **3100** 0 to 500 500 to 3100	**-18** to **1704** -18 to 260 260 to 1704	 2.00 1.00	 1.10 0.55	 0.23 0.13
T	**-300** to **700**	**-184** to **371**	0.60	0.35	0.07
T (low)	**-200** to **600**	**-129** to **316**	0.40	0.22	0.07
W5W26	**0** to **4200** 0 to 600 600 to 3600 3600 to 4200	**-18** to **2315** -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
W5W26 (low)	**0** to **2240** 0 to 600 600 to 2240	**-18** to **1227** -18 to 316 316 to 1227	 1.10 1.00	 0.60 0.55	 0.14 0.10
Radiamatic (RH)	**1400** to **3400**	**760** to **1871**	1.00	0.55	0.10
RTDs[2] Platinum 100 ohms 500 ohms	 **–300** to **900** **–300** to **900**	 **–184** to **482** **–184** to **482**	 0.40 0.20	 0.22 0.11	 0.05 0.05

[2] 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
Thermocouples[2]	**˚F**	**˚C**	**± ˚F**	**± ˚C**	
Linear					
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
Relative Humidity Platinum 100 ohm Wet/Dry Bulb* **Wet/Dry Input**	**–130** to **392**	**–90** to **200**	0.30	0.16	0.03
	Measured %RH	**Dry Bulb Range ˚F**	**Dry Bulb Range ˚C**	**Reference Accuracy ± ˚F ± ˚C**	**Temp. Stability 53 to 104˚F/ 12 to 40˚C**
%RH[3]	0 to <20	–103 to 212	–75 to 100	2% RH	0.11% RH/˚F
	20 to 100	35 to 40	2 to 4	2% RH	0.11% RH/˚F
		>40 to 100	>4 to 38	1% RH	0.06% RH/˚F
		100 to 212	38 to 100	1% RH	0.03% RH/˚F

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

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

[2] 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.

[3] 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 $\Omega/\Omega/$˚C

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

Specifications, continued

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

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

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 PolynomialCharacterization 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.[illegible] 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.[illegible] 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

Alarm Output	Two SPST electromechanical relays *Relay Contact Ratings:* Resistive Load: 1A @ 120 Vac, 1/2A @ 240 Vac.
Auxiliary Linear Output (Optional)	21 mAdc 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. *Resolution:* 12 bits over 0 to 21 mA *Accuracy:* 0.2% of full scale *Temperature Stability:* 0.03% F.S./°C
Digital Input	+20 Vdc source for external dry contact or isolated solid state contacts. Selects one configured input.
Totalizers	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

Options, continued	
Calculations	Open channel flow calculations available.
Math Algorithms	Eight algorithms available: A + B + C (summer) √A • B/C (square root multiplier/divider) √A • B • C (square root multiplier) A • B/C (multiplier/divider) A • B • C (multiplier) (A – B) • C (difference multiplier) High/Low Select between Input 1 and 2 Polynomial Equation – Fifth order provides equation • *where:* *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*
CE Conformity (Europe)	This product is in conformity with the protection requirements of the following European Council Directives: **73/23/EEC**, the Low Voltage Directive, and **89/336/EEC**, the EMC Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.
Product Classification:	Class I: Permanently Connected, Panel Mounted Industrial Control Equipment with protective earthing (grounding). (EN 61010-1)
Enclosure Rating:	Panel Mounted Equipment, IP 00, this recorder must be panel mounted. Terminals must be enclosed within the panel. Front panel IP 65 (IEC 529)
Installation Category (Over-voltage Category)	Category II: Energy-consuming equipment supplied from the fixed installation. Local level appliances, and Industrial Control Equipment. (EN 61010-1)
Pollution Degree:	Pollution Degree 2: Normally non-conductive pollution with occasional conductivity caused by condensation. (Ref. IEC 664-1)
EMC Classification	Group 1, Class A, ISM Equipment (EN 55011, emissions), Industrial Equipment (EN 50082-2, immunity)
Method of EMC Assessment	Technical File (TF)
Declaration of Conformity	51197639-000
Flow Equations	
Weir and Flume **Note: When a metric flowmeter is selected, height and width parameters are read as centimeters.**	For the following equations, both height and width are measured in feet.(See Note.) <u>V NOTCH WEIR</u> 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 <u>RECTANGULAR WEIR</u> $Q = 3.33\ (W – 0.2H)\ H^{1.5}$ cubic feet per second Width must be greater than three times the height. <u>CIPOLLETTI WEIR</u> $Q = 3.37\ W\ (H)^{1.5}$ cubic feet per second <u>PARSHALL FLUME</u> **Throat Width** **Flow (ft^3/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)* *Where:* W = Width (in feet) Q = Flow (in cubic feet per second) H = Height (in feet)
Example	User has a 3-inch Parshall Flume and measures height as two feet. Flow is calculated as: $Q = 0.993\ (2)^{1.547} = 2.9$ cubic feet per second

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

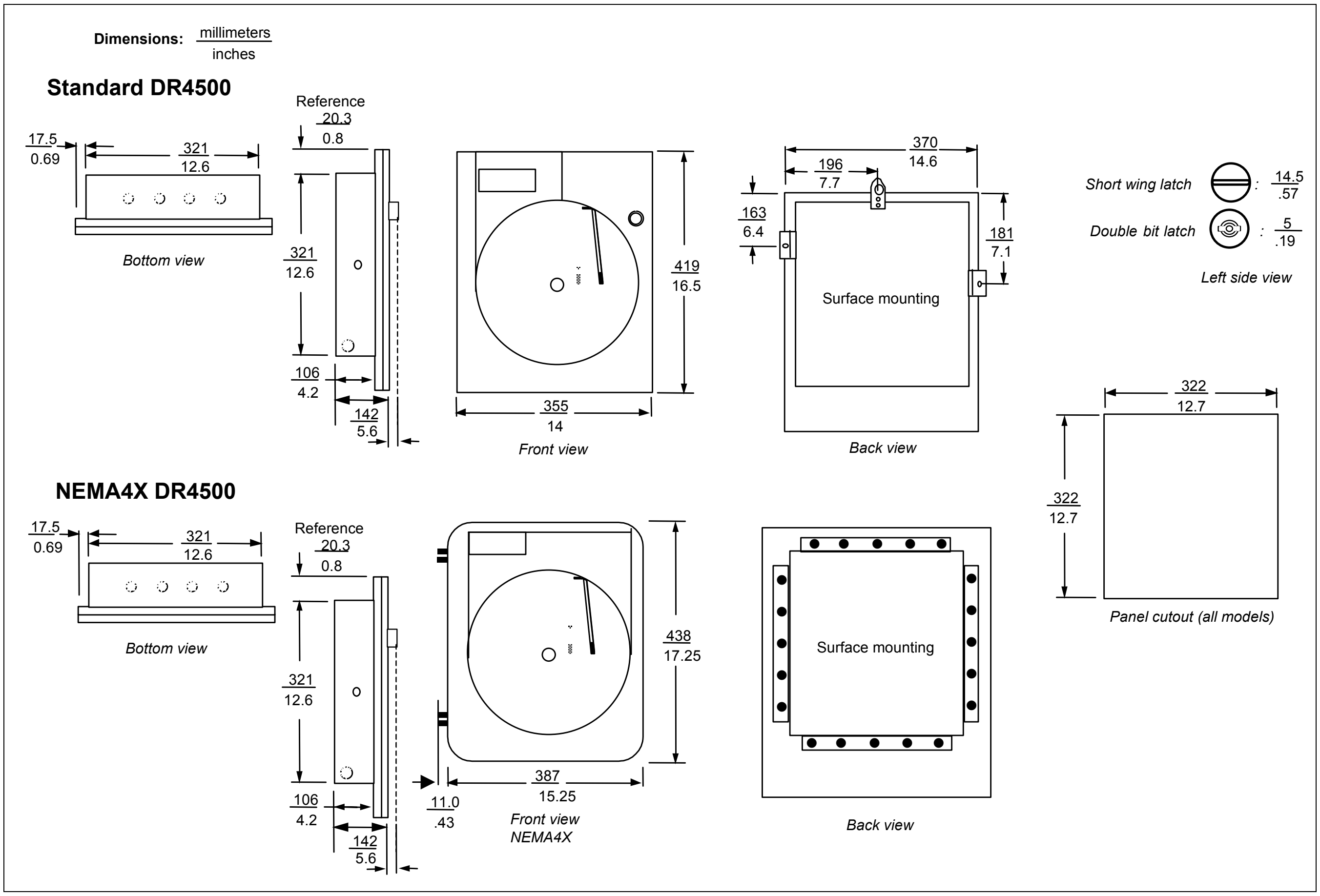
Environmental and Operating Conditions

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

General Reference Data

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

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