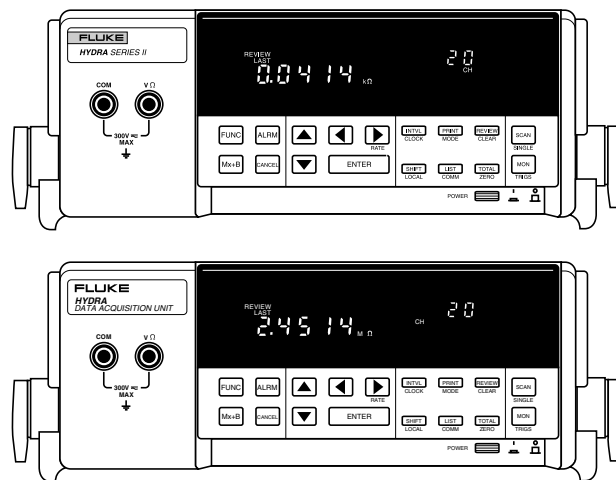


## Data Acquisition Detailed Specifications 2680A Series - NetDAQ® - Hydra Series

### Hydra Series Models 2620A, 2620A/05, 2625A, 2635A

This document provides detailed specifications for the Fluke 2680A Series, Hydra Series and NetDAQ data acquisition products. This is a supplement to the Fluke Data Acquisition Tools brochure (1267610). If you wish to obtain a copy of this product brochure you may call: in the U.S.A., (800) 44-FLUKE; Canada, (905) 890-7600; Europe, +31 (0) 40 2 678 200; other countries, (425) 356-5116, or contact your local representative.



### Hydra Series

#### Channel capacity

Analog inputs: 21

Digital I/O and alarm outputs:  
12 total

Totalizer: 1

#### Power

90 to 264 Vac, 50 or 60 Hz (<10W), or 9 to 16 Vdc (<4W) (If both sources are applied simultaneously, the greater of ac or dc is used.) At 120 VAC the equivalent DC voltage ~14.5V.

#### Temperature, humidity (non-condensing)

Operating: 0°C to 28°C, ≤ 90% RH; 28°C to 40°C, ≤ 75% RH; 40°C to 60°C, ≤ 50% RH

Storage: -40°C to 75°C, 5% to 95% RH

#### Altitude

Operating: 2000 m

Storage: 12000 m

#### Voltage ratings

300 Vdc or Vac rms (channels 0,1,11); 150 Vdc or Vac rms (all other inputs) IEC Overvoltage Category II

#### Common mode voltage

300V dc or ac rms maximum from any analog input (channel) to earth provided that channel to channel maximum voltage ratings are observed

#### Standards

IEC1010, ANSI/ISA-S82.01-1994, CSA-C22.2 No. 1010.1-92, and EN61010-1:1993. Complies with EN 50081-1, EN 50082-1, Vfg. 243/1991 and FCC-15B at the Class B level, when shielded cables are used.

#### Size

9.3 cm H x 21.6 cm W x 31.2 cm D

#### Weight

3.0 kg

#### Memory life

10 years minimum for real time clock, setup configuration and measurement data (from date of manufacture)

#### Interfaces

##### RS-232

connector: Nine pin male (DB-9P)  
signals: TX, RX, DTR, GND, CTS,\* DSR,\* RTS\*

modem control: Full duplex  
baud rate: 300, 600, 1200, 2400, 4800, 9600, 19.2k\*, 38.4k\*

data format: 8 data bits, no parity, one stop bit; or 7 data bits, one parity bit, one stop bit

parity: Odd, even, none  
echo: On/Off  
flow control: XON/XOFF, CTS\*

\* 2635A only

**IEEE-488** (Optional, 2620A only)  
Disables RS-232 interface while in use.

## 2635A memory card

**Type:** SRAM type only; PCMCIA compliant

**Capacity:** The chart below shows Memory Card storage capacity in scans for one data file. One scan comprises date and time, readings from all defined analog input channels, the status of the four alarm outputs and eight digital I/O, and the totalizer count.

### Number of scans per card

Memory Card size	Channels in scan		
	4	10	20
256 kb	8900	4800	2710
512 kb	18250	9840	5560
1 Mb	36860	19860	11210
2 Mb	74110	39910	22550
4 Mb	149039	80251	45359

## 2625A data memory

- Stores 2,047 scans
- Stored with each scan: time stamp, all defined analog input channels, the status of four alarm outputs and eight digital I/O, and the totalizer count
- Memory life: 5 years minimum; at 25°C

RTD (Pt 100)			Accuracy <sup>1,3</sup> ± °C (4-Wire)	
Temp. (°C)	Resolution		Slow	Fast
	Slow	Fast		
-200°C	0.02	0.1	0.05	0.47
0°C	0.02	0.1	0.09	0.55
100°C	0.02	0.1	0.10	0.58
300°C	0.02	0.1	0.14	0.65
600°C	0.02	0.1	0.20	0.76

Frequency			Accuracy (Slow/Fast) ± (%+counts)
Range	Resolution		
	Slow	Fast	
15-900 Hz	0.01 Hz	0.1 Hz	0.05 + 2
9 kHz	0.1 Hz	1.0 Hz	0.05 + 1
90 kHz	1 Hz	10 Hz	0.05 + 1
900 kHz	10 Hz	100 Hz	0.05 + 1
1 MHz	100 Hz	1 kHz	0.05 + 1
Sensitivity			
Frequency	Level		
15 Hz-100 kHz	100 mV rms sine wave		
100 kHz-300 kHz	150 mV rms sine wave		
300 kHz-1 MHz	2V rms sine wave		
Above 1 MHz	not specified		

## Measurement accuracy

DC Voltage			Accuracy <sup>1</sup> , 3σ, ± (%+V)		
Range	Resolution		Slow		Fast
	Slow	Fast	90 days	1 year	1 year
90 mV*	1 μV	10 μV	.019% + 6 μV	.024% + 6 μV	.044% + 20 μV
300 mV	10 μV	100 μV	.018% + 20 μV	.023% + 20 μV	.040% + 0.2 mV
3V	100 μV	1 mV	.019% + 0.2 mV	.024% + 0.2 mV	.041% + 2 mV
30V	1 mV	10 mV	.019% + 2 mV	.024% + 2 mV	.041% + 20 mV
300/150V	10 mV	100 mV	.019% + 20 mV	.024% + 20 mV	.041% + 0.2V
Resistance			Accuracy (4-wire) <sup>1,3</sup> ± (%+Ω)		
300Ω	10 mΩ	100 mΩ	0.013% + 20 mΩ	0.014% + 20 mΩ	0.014% + 200 mΩ
3 kΩ	100 mΩ	1Ω	0.015% + 0.2Ω	0.016% + 0.2Ω	0.016% + 2Ω
30 kΩ	1Ω	10Ω	0.013% + 2Ω	0.014% + 2Ω	0.014% + 20Ω
300 kΩ	10Ω	100Ω	0.020% + 20Ω	0.021% + 20Ω	0.021% + 0.2 kΩ
3 MΩ	100Ω	1 kΩ	0.059% + 0.2 kΩ	0.063% + 0.2 kΩ	0.063% + 2 kΩ
10 MΩ	1 kΩ	10 kΩ	0.168% + 2 kΩ	0.169% + 2 kΩ	0.709% + 20 kΩ
AC Voltage (True rms, ac coupled) Frequency			Accuracy <sup>1,2</sup> ± (%+counts)		
300 mV	10 μV	100 μV	20 Hz-50 Hz	1.43% + 15	1.43% + 4
3V	100 μV	1 mV	50 Hz-150 Hz	0.3% + 15	0.3% + 4
30V	1 mV	10 mV	150 Hz-10 kHz	0.16% + 15	0.16% + 4
300/150V	10 mV	100 mV	10 kHz-20 kHz	0.37% + 15	0.37% + 4
			20 kHz-50 kHz	1.9% + 20	1.9% + 4
			50 kHz-100 kHz	5.0% + 50	5.0% + 10

Thermocouples <sup>5</sup>		Accuracy <sup>1,4</sup> , 3σ, ± (°C)				
2635A ITS90		18 to 28°C			0 to 60°C	
Type	Temp. (°C)	90 days slow	1 year slow	1 year fast	1 year slow	1 year fast
J	-100°C to -30°C	0.42	0.43	0.91	0.55	1.08
	-30°C to 150°C	0.37	0.39	0.80	0.57	1.02
	150°C to 760°C	0.44	0.48	0.94	0.88	1.38
K	-100°C to -25°C	0.52	0.53	1.13	0.65	1.31
	-25°C to 120°C	0.43	0.44	0.93	0.62	1.16
	120°C to 1000°C	0.61	0.68	1.38	1.28	2.03
	1000°C to 1372°C	0.89	0.98	1.87	1.85	2.79
N	-100°C to -25°C	0.62	0.63	1.44	0.75	1.61
	-25°C to 120°C	0.53	0.55	1.22	0.67	1.39
	120°C to 410°C	0.47	0.49	1.08	0.69	1.28
	410°C to 1300°C	0.70	0.78	1.52	1.45	2.23
E	-100°C to -25°C	0.44	0.46	0.91	0.57	1.09
	-25°C to 350°C	0.38	0.39	0.77	0.61	0.98
	350°C to 650°C	0.39	0.43	0.82	0.80	1.23
	650°C to 1000°C	0.50	0.56	1.05	1.11	1.63
T	-150°C to 0°C	0.68	0.69	1.50	0.82	1.71
	0°C to 120°C	0.45	0.46	0.95	0.59	1.13
	120°C to 400°C	0.36	0.39	0.78	0.61	1.02
R	250°C to 400°C	0.83	0.85	2.47	1.02	2.66
	400°C to 1000°C	0.79	0.81	2.30	1.15	2.53
	1000°C to 1767°C	0.96	1.05	2.59	1.85	3.42
S	250°C to 1000°C	0.88	0.89	2.60	1.26	2.80
	1000°C to 1400°C	0.83	0.89	2.34	1.47	2.94
	1400°C to 1767°C	1.07	1.17	2.96	2.03	3.84
B	600°C to 1200°C	1.11	1.12	3.53	1.27	3.69
	1200°C to 1550°C	0.74	0.77	2.25	1.18	2.57
	1550°C to 1820°C	0.82	0.89	2.35	1.43	2.90
C	0°C to 150°C	0.72	0.73	1.90	0.86	2.08
	150°C to 650°C	0.62	0.64	1.62	0.99	1.94
	650°C to 1000°C	0.70	0.76	1.81	1.29	2.38
	1000°C to 1800°C	1.12	1.25	2.86	2.38	4.04
	1800°C to 2316°C	1.86	2.08	4.61	4.06	6.66

\*2635A only

Note: The terms "slow" and "fast" in these tables refer to the minimum and maximum measurement speed (Rdgs/s) as listed in the specifications for a specific model.

**Measurement accuracy** cont.

Thermocouples <sup>5</sup>		Accuracy <sup>1,4</sup> , 3σ, (± °C)				
		18 to 28°C			0 to 60°C	
B	600 to 1200	1.11	1.12	3.53	1.27	3.69
	1200 to 1550	0.74	0.77	2.25	1.18	2.57
	1550 to 1820	0.82	0.89	2.35	1.43	2.90
C	0 to 150	0.72	0.73	1.90	0.86	2.08
	150 to 650	0.62	0.64	1.62	0.99	1.94
	650 to 1000	0.70	0.76	1.81	1.29	2.38
	1000 to 1800	1.12	1.25	2.86	2.38	4.04
	1800 to 2316	1.86	2.08	4.61	4.06	6.66

<sup>1</sup> Total instrument accuracy for 1 year following calibration (unless otherwise stated). Ambient operating temperature 18°-28°C (unless otherwise stated). Includes A/D errors, linearization conformity, initial calibration error, isothermality errors, and reference junction conformity. (Sensor inaccuracies not included.) Relative humidity up to 90% non-condensing (except up to 70% for the 300 kΩ, 3 MΩ, and 10 MΩ ranges).  
<sup>2</sup> Sine wave inputs >2000 counts (slow), >200 counts (fast). Accuracies for crest factor ≤2.0.  
<sup>3</sup> DIN/IEC 751 only, 4-wire configurations.  
<sup>4</sup> Resolution is 0.1°C or 0.1°F over the useful range of base metal thermocouples (J, K, T, E, N) and 0.2° resolution for types R, S, B, and C, with slow scan. Fast scan resolution = 1°C or F.  
<sup>5</sup> Open thermocouple detection is performed on each thermocouple channel unless defeated by computer command. IPTS 68 specifications are published in the user manual.

**Front panel input**

DCV, ACV, (300V maximum) resistance, frequency. Use any of the Fluke TL Series of test leads. (One set of TL70 test leads included with Hydra)

**Common mode rejection**

**AC:** ≥120 dB (50/60 Hz, ±0.1% max 1 kΩ source imbalance)  
**DC:** ≥120 dB

**Normal mode rejection**

53 dB (60 Hz, ±0.1%)  
 47 dB (50 Hz, ±0.1%)

**Scan speed**

**Slow:** 4 readings/second nominal  
**Fast:** 18 readings/second nominal (1.5 readings/second for ACV and Ω inputs nominal)

**Analog to digital converter**

Dual Slope type, linear to 17 bits

**Totalizing inputs**

DC coupled, non-isolated, max + 30V, min -4V

**Max count:** 65,535

**Minimum signal:** 2V peak

**Threshold:** 1.4V

**Rate:** 0-5 kHz (debounce off)

**Hysteresis:** 500 mV

**Input debouncing:** None or 1.66 ms

**Digital inputs**

**Threshold:** 1.4V

**Hysteresis:** 500 mV

**Maximum input:** +30V, min -4V; non-isolated

**Digital/Alarm outputs**

The open collector output lines are non-isolated, TTL compatible with the following logic levels:

**Logical "zero" output:**

0.8V max | out = -1.0 mA (1 LSTTL load equivalent)  
 1.8V max, | out = -20 mA  
 3.25V max, | out = -50 mA

**Logical "one" output:**

Output voltage depends on external load  
 3.8V min, | out = 0.05 mA (1 LSTTL load equivalent)

**Trigger input**

**Minimum pulse:** 5 μs

**Maximum latency:** 100 ms

**Repeatability:** 1 ms

**Input "High":** 2.0V min, 7.0V max

**Input "Low":** -0.6V min, 0.8V max

Non-isolated, contact closure and TTL compatible

**Clock**

Accurate to within 1 minute/month for 0°C to 50°C range

**Calibration**

Calibration is performed closed-case via software, eliminating troublesome mechanical adjustments. This improves operational reliability by avoiding the drift caused by vibration, temperature, and humidity on conventional calibration controls.

**Alarms associations**

Configured from	Alarm outputs				Digital I/O							
	0	1	2	3	0	1	2	3	4	5	6	7
<b>Front panel</b>	ch0	ch1	ch2	ch3 (Fixed)	digital inputs				ch4	ch5	ch6	ch7
									ch8	ch9	ch10	ch11
									ch12	ch13	ch14	ch15
									ch16/20	ch17	ch18	ch19
<b>Computer</b>	ch0	ch1	ch2	ch3 (Fixed)	Each Digital I/O may be randomly assigned as a digital input, status output, or alarm output (associated with any input channel or channels), except ch 0-3							

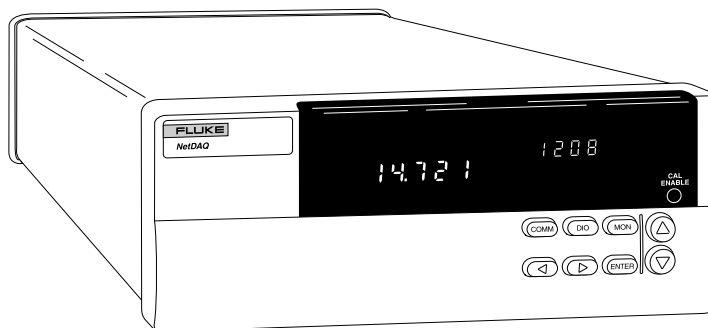
## NetDAQ® Series Models 2640A and 2645A

### 2640A

- 100, 50, 6 readings/second
- 18 bit A/D resolves 0.3  $\mu$ V and .02°C
- 300V maximum measurement input
- Built-in signal conditioning
- Real time on-board clock
- -20 to 60°C (-4 to 140°F) operating temperature

### 2645A

- 1000, 200, 48 readings/second
- 16 bit A/D resolves 3  $\mu$ V and 0.2°C
- 50V maximum measurement input
- Built-in signal conditioning
- Real time on-board clock
- -20 to 60°C (-4 to 140°F) operating temperature



## NetDAQ Series

### Channel capacity

**Analog inputs:** 20

**Computed channels:** 10

**Digital I/O and alarm outputs:** 8 total

**Totalizer:** 1

### Math functions

In addition to its 20 analog input channels, each NetDAQ unit supports 10 computed channels.

Calculations include: addition, subtraction, multiplication, division, log, natural log, exponent, square root, absolute value, integer function, and average.

### Measurement speed (2640A)

**Slow:** 6 readings/second nominal

**Medium:** 41 (50 Hz), 48 (60 Hz) readings/second nominal

**Fast:** 143 readings/second nominal (5 readings/second for VAC nominal, 140 readings/second on 300 $\Omega$  range, 37 readings/second on 3 M $\Omega$  range)

### Measurement speed (2645A)

**Slow:** 45 (50 Hz), 54 (60 Hz) readings/second nominal

**Medium:** 200 readings/second nominal

**Fast:** 1000 readings/second nominal (5 readings/second for VAC nominal, 370 readings/second on 300 $\Omega$  range, 44 readings/second on 3 M $\Omega$  range)

### Analog to digital converter

**2640A:** Multi-slope type, linear to 18 bits

**2645A:** Multi-slope type, linear to 16 bits

### Common mode rejection

**2640A:**

AC:  $\geq 120$  dB (50/60 Hz,  $\pm 0.1\%$  max 1k $\Omega$  source imbalance)

DC:  $\geq 120$  dB

**2645A:**

AC:  $\geq 100$  dB (50/60 Hz,  $\pm 0.1\%$  max 1k $\Omega$  source imbalance)

DC:  $\geq 100$  dB

### Normal mode rejection

50 dB @ 50/60 Hz,  $\pm 0.1\%$

### Common mode voltage maximum

**2640A:** 300 VDC or VAC rms (channels 1,11); 150 VDC or VAC rms (all other channels)

**2645A:** 50 VDC or 30 VAC rms (all channels)

## Measurement accuracy

### Model 2640A

Thermocouples <sup>9, 10</sup>		Accuracy <sup>1,6</sup> , 3σ, ± °C				
		18 to 28°C			-10 to 60°C	
		90 Day	1 Year		1 Year	
Type	Temp (°C)	Slow	Slow	Fast	Slow	Fast
J	-100°C to 80°C	0.45	0.5	0.8	0.6	0.8
	80°C to 230°C	0.35	0.5	0.7	0.6	0.8
	230°C to 760°C	0.4	0.5	0.7	0.8	0.9
K	-100°C to -25°C	0.55	0.6	0.9	0.7	1.0
	-25°C to 120°C	0.4	0.5	0.8	0.6	0.9
	120°C to 800°C	0.5	0.65	0.9	1.0	1.2
	800°C to 1372°C	0.7	1.0	1.3	1.6	1.9
N	-100°C to -25°C	0.65	0.75	1.2	0.8	1.3
	-25°C to 120°C	0.55	0.6	1.0	0.7	1.1
	120°C to 1000°C	0.45	0.6	0.9	1.0	1.2
	1000°C to 1300°C	0.55	0.75	1.0	1.2	1.5
E	-100°C to -25°C	0.45	0.5	0.8	0.6	0.8
	-25°C to 20°C	0.35	0.4	0.6	0.5	0.7
	20°C to 600°C	0.3	0.4	0.6	0.5	0.8
	600°C to 1000°C	0.4	0.5	0.7	0.9	1.0
T	-100°C to 0°C	0.6	0.65	1.0	0.7	1.1
	0°C to 150°C	0.4	0.5	0.8	0.6	0.9
	150°C to 400°C	0.3	0.4	0.6	0.6	0.8
R	250°C to 600°C	0.9	1.0	2.1	1.2	2.2
	600°C to 1500°C	0.8	0.9	1.8	1.3	2.0
	1500°C to 1767°C	0.85	0.85	1.9	1.7	2.5
S	250°C to 1000°C	0.95	1.1	2.3	1.3	2.4
	1000°C to 1400°C	0.8	1.0	1.9	1.4	2.3
	1400°C to 1767°C	1.0	1.3	2.2	1.8	2.8
B	600°C to 900°C	1.2	1.4	3.1	1.5	3.2
	900°C to 1200°C	0.9	1.0	2.2	1.2	2.4
	1200°C to 1820°C	0.75	1.0	1.9	1.3	2.2
C	0°C to 150°C	0.8	0.9	1.6	1.0	1.7
	150°C to 650°C	0.65	0.75	1.4	1.0	1.5
	650°C to 1000°C	0.65	0.85	1.4	1.2	1.8
	1000°C to 1800°C	1.0	1.3	2.1	2.1	2.8
	1800°C to 2316°C	1.6	2.1	3.2	3.4	4.6

### Model 2640A

DC Voltage		Accuracy <sup>1</sup> , 3σ, ± (%input + V) 18 to 28°C		
Range	Resolution	90 Day	1 Year	
	Slow	Slow	Slow	Fast
90 mV	.3 μV	0.01%+7 μV	0.013%+8 μV	0.013%+18 μV
300 mV	1 μV	0.01%+15 μV	0.013%+17 μV	0.013%+35 μV
3V	10 μV	0.01%+.1 mV	0.013%+.15 mV	0.013%+.2 mV
30V	100 μV	0.01%+1.5 mV	0.013%+1.7 mV	0.026%+3.5 mV
150/300V	1 mV	0.01%+15 mV	0.013%+17 mV	0.052%+35 mV
Resistance		Accuracy <sup>1,3</sup> (4-wire), 3σ, ± (% input+Ω )		
300Ω	1 mΩ	0.015%+20 mΩ	0.02%+30 mΩ	0.02%+120 mΩ
3 kΩ	10 mΩ	0.02%+.3Ω	0.02%+.5Ω	0.02%+1.2Ω
30 kΩ	100 mΩ	0.03%+3Ω	0.03%+5Ω	0.04%+15Ω
300 kΩ	1Ω	0.1%+40Ω	0.1%+60Ω	0.2%+150Ω
3 MΩ	10Ω	0.25%+800Ω	0.25%+1 kΩ	0.5%+1.5 kΩ

### Model 2645A

Thermocouples <sup>9, 10</sup>		Accuracy <sup>1,6</sup> , 3σ, ± °C				
		18 to 28°C			-10 to 60°C	
		90 Day	1 Year		1 Year	
Type	Temp (°C)	Slow	Slow	Fast	Slow	Fast
J	-100°C to 80°C	0.8	0.9	1.6	0.9	1.7
	80°C to 230°C	0.7	0.8	1.4	0.9	1.5
	230°C to 760°C	0.7	0.8	1.3	1.0	1.5
K	-100°C to -25°C	1.0	1.1	2.0	1.2	2.1
	-25°C to 120°C	0.8	0.9	1.7	1.0	1.8
	120°C to 1000°C	0.9	1.1	1.8	1.5	2.2
	1000°C to 1372°C	1.2	1.5	2.3	2.0	2.9
N	-100°C to -25°C	1.4	1.5	2.8	1.5	2.9
	-25°C to 120°C	1.1	1.3	2.3	1.3	2.4
	120°C to 1000°C	1.0	1.1	2.0	1.2	2.1
	1000°C to 1300°C	1.0	1.2	1.9	1.6	2.4
E	-100°C to -25°C	0.8	0.9	1.5	1.0	1.6
	-25°C to 20°C	0.7	0.7	1.2	0.8	1.3
	20°C to 600°C	0.6	0.7	1.1	0.8	1.2
	600°C to 1000°C	0.6	0.8	1.2	1.1	1.5
T	-100°C to 0°C	1.1	1.2	2.2	1.3	2.3
	0°C to 150°C	0.9	1.0	1.7	1.0	1.8
	150°C to 400°C	0.7	0.8	1.4	0.8	1.5
R	250°C to 600°C	2.4	2.7	5.6	2.8	5.7
	600°C to 1500°C	2.0	2.3	4.6	2.4	4.8
	1500°C to 1767°C	2.0	2.3	4.5	2.8	5.1
S	250°C to 1000°C	2.6	2.8	5.9	2.9	6.0
	1000°C to 1400°C	2.0	2.3	4.6	2.6	5.0
	1400°C to 1767°C	2.3	2.7	5.3	3.3	5.9
B	600°C to 1200°C	3.6	3.9	8.5	4.0	8.6
	1200°C to 1550°C	2.1	2.4	5.0	2.6	5.2
	1550°C to 1820°C	2.0	2.3	4.7	2.7	5.0
C	0°C to 150°C	1.9	2.0	4.0	2.1	4.2
	150°C to 650°C	1.6	1.7	3.5	1.8	3.6
	650°C to 1000°C	1.4	1.7	3.2	2.0	3.5
	1000°C to 1800°C	2.0	2.5	4.5	3.2	5.3
	1800°C to 2316°C	3.1	3.8	6.8	5.1	8.1

### Model 2645A

DC Voltage		Accuracy <sup>1</sup> , 3σ, ± (%input + V) 18 to 28°C		
Range	Resolution	90 Day	1 Year	
	Slow	Slow	Slow	Fast
90 mV	3 μV	0.01%+20 μV	0.013%+23 μV	0.013%+50 μV
300 mV	10 μV	0.01%+40 μV	0.013%+49 μV	0.013%+93 μV
3V	100 μV	0.01%+.3 mV	0.013%+.38 mV	0.013%+.64 mV
30V	1 mV	0.01%+4 mV	0.013%+4.9 mV	0.026%+9.5 mV
150/300V	10 mV	0.01%+30 mV	0.013%+40 mV	0.052%+64 mV
Resistance		Accuracy <sup>1,4</sup> (4-wire), 3σ, ± (% input+Ω )		
300Ω	10 mΩ	0.02%+60 mΩ	0.02%+.1Ω	.02%+.2Ω
3 kΩ	100 mΩ	0.02%+6Ω	0.02%+1Ω	.02%+3Ω
30 kΩ	1Ω	0.02%+6Ω	0.02%+10Ω	.02%+300Ω
300 kΩ	10Ω	0.5%+80Ω	0.5%+150Ω	1.0%+3 kΩ
3 MΩ	100Ω	1.3%+1 kΩ	1.3%+2 kΩ	2.0%+200 kΩ

## Measurement accuracy cont.

### Model 2640A

AC Voltage				
Range	Resolution	Frequency	Accuracy <sup>1,2</sup> , 3 $\sigma$ , ± (% input+counts)	
			Slow	Fast
300mV	1 $\mu$ V	20 Hz-50 Hz 50 Hz-20 kHz 20 kHz-50 kHz 50 kHz-100 kHz	3.0%+25 0.4%+25 2.0%+30 5.0%+50	6.0%+50 1.0%+50 3.0%+50 5.0%+100
3V	100 $\mu$ V	Same frequencies, similar accuracies as above		
30V	1 mV	Same frequencies, similar accuracies as above		
150/300V	10mV	Same frequencies, similar accuracies as above		
RTD (Pt 100)		Accuracy <sup>1,5</sup> , 3 $\sigma$ , ± °C (4-wire)		
Temperature °C	Resolution °C	90 Day, 18 to 28°C	1 Year, 18 to 28°C	
	Slow	Slow	Slow	
-200°C	0.003	0.06	0.09	
0°C	0.003	0.09	0.13	
100°C	0.003	0.10	0.16	
300°C	0.003	0.14	0.21	
600°C	0.003	0.19	0.30	
Frequency Measurement Accuracy <sup>1,8</sup> , -20 to 60°C				
Range	Resolution		Accuracy, 3 $\sigma$ , ± (% input +Hz)	
	Slow	Fast	Slow	Fast
15 Hz-900 Hz	0.01 Hz	0.1 Hz	0.05%+0.02 Hz	0.05%+0.2 Hz
900 Hz-9 kHz	0.1 Hz	1 Hz	0.05%+0.1 Hz	0.05%+1 Hz
9 kHz-90 kHz	1 Hz	10 Hz	0.05%+1 Hz	0.05%+10 Hz
90 kHz-900 kHz	10 Hz	100 Hz	0.05%+10 Hz	0.05%+100 Hz
1 MHz	100 Hz	1 kHz	0.05%+100 Hz	0.05%+1 kHz
Frequency Measurement Sensitivity (sine wave)				
Frequency	Minimum Signal		Maximum Signal	
15 Hz - 200 Hz	100 mV rms		150/300V rms	
200 Hz - 70 kHz	100 mV rms		30V rms	
70kHz - 100 kHz	100 mV rms		20V rms	
100 kHz - 200 kHz	150 mV rms		10V rms	
200 kHz - 300 kHz	150 mV rms		7V rms	
300 kHz - 1 MHz	linearly increasing from 150 mV rms at 300 kHz to 2V rms at 1 MHz		linearly decreasing from 7V rms at 300 kHz to 2V rms at 1 MHz	

<sup>1</sup> Total instrument accuracy for the indicated time period and ambient temperature range. Includes A/D errors, linearization conformity, initial calibration error, isothermality errors, reference junction conformity and power line voltage effects within the range from 107VAC to 264VAC.

<sup>2</sup> Sine wave inputs >2000 counts (slow), >200 counts (fast). Accuracies for crest factor  $\leq 2.0$ .

<sup>3</sup> For two-wire measurements add 5 $\Omega$  to basic accuracy (does not include lead-wire resistances).

<sup>4</sup> For two-wire measurements add 700-1000 $\Omega$  to basic accuracy (does not include lead-wire resistances). Ohms varies due to the resistance of the solid state switches.

<sup>5</sup> DIN/IEC 751 only, assumes no lead-wire resistance errors.

### Model 2645A

AC Voltage				
Range	Resolution	Frequency	Accuracy <sup>1,2</sup> , 3 $\sigma$ , ± (% input+counts)	
			Slow	Fast
300mV	10 $\mu$ V	20 Hz-50 Hz 50 Hz-20 kHz 20 kHz-50 kHz 50 kHz-100 kHz	3.0%+25 0.4%+25 2.0%+30 5.0%+50	6.0%+50 1.0%+50 3.0%+50 5.0%+100
3V	100 $\mu$ V	Same frequencies, similar accuracies as above		
30V	1 mV	Same frequencies, similar accuracies as above		
RTD (Pt 100)		Accuracy <sup>1,5</sup> , 3 $\sigma$ , ± °C (4-wire)		
Temperature °C	Resolution °C	90 Day, 18 to 28°C	1 Year, 18 to 28°C	
	Slow	Slow	Slow	
-200°C	0.03	0.16	0.25	
0°C	0.03	0.20	0.31	
100°C	0.03	0.23	0.34	
300°C	0.03	0.30	0.41	
600°C	0.03	0.53	0.63	
Frequency Measurement Accuracy <sup>1,8</sup> , -20 to 60°C				
Range	Resolution		Accuracy, 3 $\sigma$ , ± (% input +Hz)	
	Slow	Fast	Slow	Fast
15 Hz-900 Hz	0.01 Hz	0.1 Hz	0.05%+0.02 Hz	0.05%+0.2 Hz
900 Hz-9 kHz	0.1 Hz	1 Hz	0.05%+0.1 Hz	0.05%+1 Hz
9 kHz-90 kHz	1 Hz	10 Hz	0.05%+1 Hz	0.05%+10 Hz
90 kHz-900 kHz	10 Hz	100 Hz	0.05%+10 Hz	0.05%+100 Hz
1 MHz	100 Hz	1 kHz	0.05%+100 Hz	0.05%+1 kHz
Frequency Measurement Sensitivity (sine wave)				
Frequency	Minimum Signal		Maximum Signal	
15 Hz - 200 Hz	100 mV rms		30V rms	
200 Hz - 70 kHz	100 mV rms		30V rms	
70kHz - 100 kHz	100 mV rms		20V rms	
100 kHz - 200 kHz	150 mV rms		10V rms	
200 kHz - 300 kHz	150 mV rms		7V rms	
300 kHz - 1 MHz	linearly increasing from 150 mV rms at 300 kHz to 2V rms at 1 MHz		linearly decreasing from 7V rms at 300 kHz to 2V rms at 1 MHz	

<sup>6</sup> Resolution is 0.02°C or 0.04°F over the useful range of base metal thermocouples (J, K, T, E, N) and 0.1°C or 0.2°F resolution for types R, S, B, and C with slow scan.

<sup>7</sup> Resolution is 0.2°C or 0.4°F over the useful range of base metal thermocouples (J, K, T, E, N) and 1.0°C or 2.0°F resolution for types R, S, B, and C with slow scan.

<sup>8</sup> Accuracy for both slow and fast scan speeds.

<sup>9</sup> Open thermocouple detection is performed on each thermocouple channel unless defeated by computer command.

<sup>10</sup> When NetDAQ is mounted on its side, using the Y2642 adapter or other means, thermocouples at the ends of the input connector module may have an additional  $\pm 0.25^\circ\text{C}$  error.

**Totalizing inputs**

DC coupled, non-isolated, max +30V, min -4V

**Max count:** 4,294,967,295

**Minimum signal:** 2V peak

**Threshold:** 1.4V

**Rate:** 0-5 kHz (debounce off)

**Hysteresis:** 500 mV

**Input debouncing:** None or 1.66 ms

**Digital inputs**

**Threshold:** 1.4V

**Hysteresis:** 500 mV

**Maximum input:** +30V, min -4V; non-isolated

**Digital/master alarm outputs**

The open collector output lines are non-isolated, TTL compatible with the following logic levels:

**Logical "zero" output:**

- 0.8V max |out = -1.0 mA (1 LSTTL load equivalent)
- 1.8V max |out = -20 mA
- 3.25V max |out = -50 mA

**Logical "one" output:**

- Output voltage depends on external load
- 3.8V min |out = 0.05 mA (1 LSTTL load equivalent)

**Alarm associations**

Each Digital I/O may be randomly assigned as a digital input, status output, or alarm output (associated with any input channel or channels)

**Trigger input**

**Minimum pulse:** 5 μs

**Minimum latency:** 2 ms

**Repeatability:** 1 ms

**Input "High":** 2.0V min, 7.0V max

**Input "Low":** -0.6V min, 0.8V max non-isolated, contact closure and TTL compatible

**Clock**

Accurate to within 1 minute/month for 0°C to 50°C range

**Power**

107 to 264 VAC, 50 or 60 Hz (<15W), or 9 to 16 VDC (<6W) (if both sources are applied simultaneously, the greater of AC or DC is used.), at 120 VAC the equivalent DC voltage ~ 14.5V

**Temperature, humidity (non-condensing)**

**Operating:** -20°C to 28°C, ≤90% RH; 28°C to 40°C, ≤75% RH; 40°C to 60°C, ≤50% RH

**Storage:** -40°C to 70°C, 5% to 95% RH

**Altitude**

**Operating:** 2000m

**Storage:** 12,200m

**Electromagnetic interference (EMI)**

FCC-15B Class B Equipment, Vfg. 243, European Norms EN50081-1 and EN50082-1, CE. When shielded cables are used.

**Safety**

Complies with applicable sections of the IEC 1010-1, ANSI/ISA-S82.01-1994, CSA-C22.2 No. 1010.1-92. Overvoltage Category II

**Weight**

3.7 kg

**Size**

9.3 cm H, 21.6 cm W, 36.2 cm D

**Battery life**

10 years minimum for real time clock (from date of manufacture)

**Interfaces**

**Ethernet:** Conforms to IEEE 802.3 Ethernet standard, compatible with 10Base2 and 10BaseT standards, uses TCP/IP protocol

**RS-232C:** For calibration only. The optional NetDAQ Service Manual provides step-by-step calibration instructions.

**Data buffer memory**

- Stored with each scan: time stamp, all defined analog input channels, the status of the eight digital I/O, and the totalizer count.
- The number of stored scans varies with the number of channels configured. The following table shows the scan size and time it takes to fill the data buffer memory.

# of channels configured	# of scans stored	Time to fill the 2640A's buffer (100 rps)	Time to fill the 2645A's buffer (1,000 rps)
1	6,400	48 sec (118 rps)	14 sec (427 rps)
2	5,688	77 sec (131 rps)	17 sec (628 rps)
5	4,266	133 sec (142 rps)	23 sec (886 rps)
10	3,011	183 sec (145 rps)	29 sec (1019 rps)
20	1,896	227 sec (147 rps)	33 sec (1102 rps)

## 2680A Series

### Models 2680A and 2686A

#### 2680A (Chassis)

- 20 to 120 channels
- Universal inputs
- 10 BaseT / 100 BaseT operation

#### 2686A (Chassis)

Same as 2680A, plus:

- PC ATA flash memory card to 2 GB
- Stand-alone operation or networked

#### 2680A-PAI

##### Precision Analog Input Module

- High Isolation
- Precision thermocouple measurements

#### 2680A-FAI

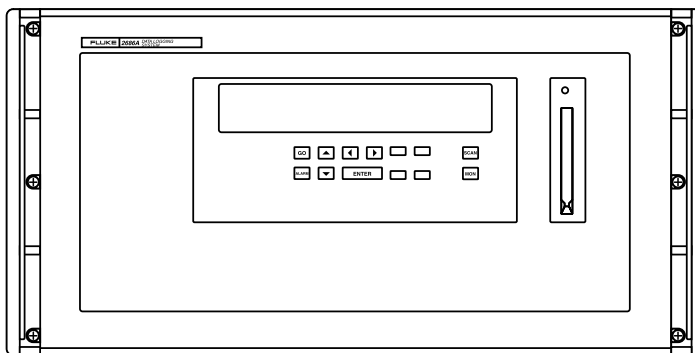
##### Fast Analog Input Module

- High data throughput
- Fast scanning rates

#### 2680A-DIO

##### Digital I/O and Relay Module

- 20 addressable DIO
- 8 relay contacts
- Up/down totalizer



## 2680A Series

### Channel capacity (2680A or 2686A)

20 to 120 channels per chassis  
(6 analog input modules of 20 channels each)

One master alarm (open collector) per chassis

**Communications:** 10BaseT/100BaseT, TCP/IP via RJ45 connector, Cat 5

### Math functions

In addition to its analog and digital input channels, each system supports 60 computed channels. Calculations include: time & rate, addition, subtraction, multiplication, division, log, natural log, exponent, square root, absolute value, integer function and average.

### Measurement speed (2680A-PAI)

**Slow:** 6 readings/second nominal  
**Medium:** 41 (50 Hz), 48 (60 Hz) readings/second nominal

**Fast:** 143 readings/second nominal (5 readings/second for VAC nominal, 140 readings/second on 300Ω range, 37 readings/second on 3 MΩ range)

### Measurement speed (2680A-FAI)

**Slow:** 45 (50 Hz), 54 (60 Hz) readings/second nominal

**Medium:** 200 readings/second nominal

**Fast:** 1000 readings/second nominal (5 readings/second for VAC nominal, 370 readings/second on 300Ω range, 44 readings/second on 3 MΩ range)

### Analog to digital converter

**2680A-PAI:** Multi-slope type, linear to 18 bits

**2680A-FAI:** Multi-slope type, linear to 16 bits

### Common mode rejection

**2680A-PAI:**  
AC: ≥120 dB (50/60 Hz, ±0.1% max 1kΩ source imbalance)  
DC: ≥120 dB

**2680A-FAI:**  
AC: ≥100 dB (50/60 Hz, ±0.1% max 1kΩ source imbalance)  
DC: ≥100 dB

### Normal mode rejection

50 dB @ 50/60 Hz, ±0.1%

### Common mode voltage maximum

**2680A-PAI:** 300 VDC or VAC rms (channels 1,11); 150 VDC or VAC rms (all other channels)

**2680A-FAI:** 50 VDC or 30 VAC rms (all channels)



## Measurement accuracy

Model 2680A-PAI

Thermocouples <sup>9</sup>		Accuracy <sup>1,6</sup> , 3σ, ± °C				
		18 to 28°C			-10 to 60°C	
		ITS90	90 Day	1 Year		1 Year
Type	Temp (°C)		Slow	Slow	Fast	Slow
J	-100°C to 80°C	0.45	0.5	0.8	0.6	0.8
	80°C to 230°C	0.35	0.5	0.7	0.6	0.8
	230°C to 760°C	0.4	0.5	0.7	0.8	0.9
K	-100°C to -25°C	0.55	0.6	0.9	0.7	1.0
	-25°C to 120°C	0.4	0.5	0.8	0.6	0.9
	120°C to 800°C	0.5	0.65	0.9	1.0	1.2
	800°C to 1372°C	0.7	1.0	1.3	1.6	1.9
N	-100°C to -25°C	0.65	0.75	1.2	0.8	1.3
	-25°C to 120°C	0.55	0.6	1.0	0.7	1.1
	120°C to 1000°C	0.45	0.6	0.9	1.0	1.2
	1000°C to 1300°C	0.55	0.75	1.0	1.2	1.5
E	-100°C to -25°C	0.45	0.5	0.8	0.6	0.8
	-25°C to 20°C	0.35	0.4	0.6	0.5	0.7
	20°C to 600°C	0.3	0.4	0.6	0.5	0.8
	600°C to 1000°C	0.4	0.5	0.7	0.9	1.0
T	-100°C to 0°C	0.6	0.65	1.0	0.7	1.1
	0°C to 150°C	0.4	0.5	0.8	0.6	0.9
	150°C to 400°C	0.3	0.4	0.6	0.6	0.8
R	250°C to 600°C	0.9	1.0	2.1	1.2	2.2
	600°C to 1500°C	0.8	0.9	1.8	1.3	2.0
	1500°C to 1767°C	0.85	0.85	1.9	1.7	2.5
S	250°C to 1000°C	0.95	1.1	2.3	1.3	2.4
	1000°C to 1400°C	0.8	1.0	1.9	1.4	2.3
	1400°C to 1767°C	1.0	1.3	2.2	1.8	2.8
B	600°C to 900°C	1.2	1.4	3.1	1.5	3.2
	900°C to 1200°C	0.9	1.0	2.2	1.2	2.4
	1200°C to 1820°C	0.75	1.0	1.9	1.3	2.2
C	0°C to 150°C	0.8	0.9	1.6	1.0	1.7
	150°C to 650°C	0.65	0.75	1.4	1.0	1.5
	650°C to 1000°C	0.65	0.85	1.4	1.2	1.8
	1000°C to 1800°C	1.0	1.3	2.1	2.1	2.8
	1800°C to 2316°C	1.6	2.1	3.2	3.4	4.6
L	-100°C to 100°C	0.9	1.0	2.0	1.3	2.0
	100°C to 800°C	0.5	0.9	1.4	1.2	1.7
	800°C to 900°C	0.5	0.7	1.1	1.3	1.5
U	-100°C to 0°C	1.5	1.5	2.6	1.6	3.0
	0°C to 600°C	0.6	0.8	1.6	1.1	1.9

Model 2680A-FAI

Thermocouples <sup>9</sup>		Accuracy <sup>1,6</sup> , 3σ, ± °C				
		18 to 28°C			-10 to 60°C	
		ITS90	90 Day	1 Year		1 Year
Type	Temp (°C)		Slow	Slow	Fast	Slow
J	-100°C to 80°C	0.8	0.9	1.6	0.9	1.7
	80°C to 230°C	0.7	0.8	1.4	0.9	1.5
	230°C to 760°C	0.7	0.8	1.3	1.0	1.5
K	-100°C to -25°C	1.0	1.1	2.0	1.2	2.1
	-25°C to 120°C	0.8	0.9	1.7	1.0	1.8
	120°C to 1000°C	0.9	1.1	1.8	1.5	2.2
	1000°C to 1372°C	1.2	1.5	2.3	2.0	2.9
N	-100°C to -25°C	1.4	1.5	2.8	1.5	2.9
	-25°C to 120°C	1.1	1.3	2.3	1.3	2.4
	120°C to 1000°C	1.0	1.1	2.0	1.2	2.1
	1000°C to 1300°C	1.0	1.2	1.9	1.6	2.4
E	-100°C to -25°C	0.8	0.9	1.5	1.0	1.6
	-25°C to 20°C	0.7	0.7	1.2	0.8	1.3
	20°C to 600°C	0.6	0.7	1.1	0.8	1.2
	600°C to 1000°C	0.6	0.8	1.2	1.1	1.5
T	-100°C to 0°C	1.1	1.2	2.2	1.3	2.3
	0°C to 150°C	0.9	1.0	1.7	1.0	1.8
	150°C to 400°C	0.7	0.8	1.4	0.8	1.5
R	250°C to 600°C	2.4	2.7	5.6	2.8	5.7
	600°C to 1500°C	2.0	2.3	4.6	2.4	4.8
	1500°C to 1767°C	2.0	2.3	4.5	2.8	5.1
S	250°C to 1000°C	2.6	2.8	5.9	2.9	6.0
	1000°C to 1400°C	2.0	2.3	4.6	2.6	5.0
	1400°C to 1767°C	2.3	2.7	5.3	3.3	5.9
B	600°C to 1200°C	3.6	3.9	8.5	4.0	8.6
	1200°C to 1550°C	2.1	2.4	5.0	2.6	5.2
	1550°C to 1820°C	2.0	2.3	4.7	2.7	5.0
C	0°C to 150°C	1.9	2.0	4.0	2.1	4.2
	150°C to 650°C	1.6	1.7	3.5	1.8	3.6
	650°C to 1000°C	1.4	1.7	3.2	2.0	3.5
	1000°C to 1800°C	2.0	2.5	4.5	3.2	5.3
	1800°C to 2316°C	3.1	3.8	6.8	5.1	8.1
L	-100°C to 100°C	1.2	1.3	2.9	1.6	3.1
	100°C to 800°C	0.9	1.0	2.1	1.2	2.3
	800°C to 900°C	0.7	0.8	1.3	1.0	1.5
U	-100°C to 0°C	2.0	2.1	4.3	2.2	4.6
	0°C to 600°C	1.3	1.4	2.5	1.6	2.6

Model 2680A-PAI

DC Voltage		Accuracy <sup>1</sup> , 3σ, ± (%input + V) 18 to 28°C		
Range	Resolution	90 Day	1 Year	
			Slow	Fast
90 mV	.3 μV	0.01%+7 μV	0.013%+8 μV	0.013%+18 μV
300 mV	1 μV	0.01%+15 μV	0.013%+17 μV	0.013%+35 μV
3V	10 μV	0.01%+.1 mV	0.013%+.15 mV	0.013%+.2 mV
30V	100 μV	0.01%+1.5 mV	0.013%+1.7 mV	0.026%+3.5 mV
150/300V	1 mV	0.01%+15 mV	0.013%+17 mV	0.052%+35 mV
Resistance		Accuracy <sup>1,3</sup> (4-wire), 3σ, ± (% input+Ω )		
300Ω	1 mΩ	0.015%+20 mΩ	0.02%+30 mΩ	0.02%+120 mΩ
3 kΩ	10 mΩ	0.02%+.3Ω	0.02%+.5Ω	0.02%+1.2Ω
30 kΩ	100 mΩ	0.03%+.3Ω	0.03%+.5Ω	0.04%+15Ω
300 kΩ	1Ω	0.1%+40Ω	0.1%+60Ω	0.2%+150Ω
3 MΩ	10Ω	0.25%+800Ω	0.25%+1 kΩ	0.5%+1.5 kΩ

Model 2680A-FAI

DC Voltage		Accuracy <sup>1</sup> , 3σ, ± (%input + V) 18 to 28°C		
Range	Resolution	90 Day	1 Year	
			Slow	Fast
90 mV	3 μV	0.01%+20 μV	0.013%+23 μV	0.013%+50 μV
300 mV	10 μV	0.01%+40 μV	0.013%+49 μV	0.013%+93 μV
3V	100 μV	0.01%+.3 mV	0.013%+.38 mV	0.013%+.64 mV
30V	1 mV	0.01%+4 mV	0.013%+4.9 mV	0.026%+9.5 mV
150/300V	10 mV	0.01%+30 mV	0.013%+40 mV	0.052%+64 mV
Resistance		Accuracy <sup>1,3</sup> (4-wire), 3σ, ± (% input+Ω )		
300Ω	10 mΩ	0.02%+60 mΩ	0.02%+.1Ω	.02%+.2Ω
3 kΩ	100 mΩ	0.02%+6Ω	0.02%+1Ω	.02%+3Ω
30 kΩ	1Ω	0.02%+6Ω	0.02%+10Ω	.02%+300Ω
300 kΩ	10Ω	0.5%+80Ω	0.5%+150Ω	1.0%+3 kΩ
3 MΩ	100Ω	1.3%+1 kΩ	1.3%+2 kΩ	2.0%+200 kΩ

## Measurement accuracy cont.

### Model 2680A-PAI

AC Voltage				
Range	Resolution	Frequency	Accuracy <sup>1,2</sup> , 3 $\sigma$ , ± (% input+counts)	
			Slow	Fast
300mV	1 $\mu$ V	20 Hz-50 Hz 50 Hz-20 kHz 20 kHz-50 kHz 50 kHz-100 kHz	3.0%+25 0.4%+25 2.0%+30 5.0%+50	6.0%+50 1.0%+50 3.0%+50 5.0%+100
3V	100 $\mu$ V	Same frequencies, similar accuracies as above		
30V	1 mV	Same frequencies, similar accuracies as above		
150/300V	10mV	Same frequencies, similar accuracies as above		
RTD (Pt 100)		Accuracy <sup>1,5</sup> , 3 $\sigma$ , ± °C (4-wire)		
Temperature °C	Resolution °C	90 Day, 18 to 28°C	1 Year, 18 to 28°C	
	Slow	Slow	Slow	
-200	0.003	0.06	0.09	
0	0.003	0.09	0.13	
100	0.003	0.10	0.16	
300	0.003	0.14	0.21	
600	0.003	0.19	0.30	
Thermistor <sup>10</sup> 2 k to 100 k $\Omega$				
-40 °C to 150 °C	0.003	0.3	0.4	
Frequency Measurement Accuracy <sup>1,8</sup> , -20 to 60°C				
Range	Resolution		Accuracy, 3 $\sigma$ , ± (% input +Hz)	
	Slow	Fast	Slow	Fast
15 Hz-900 Hz	0.01 Hz	0.1 Hz	0.05%+0.02 Hz	0.05%+0.2 Hz
900 Hz-9 kHz	0.1 Hz	1 Hz	0.05%+0.1 Hz	0.05%+1 Hz
9 kHz-90 kHz	1 Hz	10 Hz	0.05%+1 Hz	0.05%+10 Hz
90 kHz-900 kHz	10 Hz	100 Hz	0.05%+10 Hz	0.05%+100 Hz
1 MHz	100 Hz	1 kHz	0.05%+100 Hz	0.05%+1 kHz
Frequency Measurement Sensitivity (sine wave)				
Frequency	Minimum Signal		Maximum Signal	
15 Hz - 200 Hz	100 mV rms		150/300V rms	
200 Hz - 70 kHz	100 mV rms		30V rms	
70 kHz - 100 kHz	100 mV rms		20V rms	
100 kHz - 200 kHz	150 mV rms		10V rms	
200 kHz - 300 kHz	150 mV rms		7V rms	
300 kHz - 1 MHz	linearly increasing from 150 mV rms at 300 kHz to 2V rms at 1 MHz		linearly decreasing from 7V rms at 300 kHz to 2V rms at 1 MHz	

<sup>1</sup> Total instrument accuracy for the indicated time period and ambient temperature range. Includes A/D errors, linearization conformity, initial calibration error, isothermality errors, reference junction conformity and power line voltage effects within the range from 100VAC to 264VAC.

<sup>2</sup> Sine wave inputs >2000 counts (slow), >200 counts (fast). Accuracies for crest factor  $\leq 2.0$ .

<sup>3</sup> For two-wire measurements add 5 $\Omega$  to basic accuracy (does not include lead-wire resistances).

<sup>4</sup> For two-wire measurements add 700-1000 $\Omega$  to basic accuracy (does not include lead-wire resistances). Ohms varies due to the resistance of the solid state switches.

<sup>5</sup> DIN/IEC 751 only, assumes no lead-wire resistance errors.

### Model 2680A-FAI

AC Voltage				
Range	Resolution	Frequency	Accuracy <sup>1,2</sup> , 3 $\sigma$ , ± (% input+counts)	
			Slow	Fast
300mV	10 $\mu$ V	20 Hz-50 Hz 50 Hz-20 kHz 20 kHz-50 kHz 50 kHz-100 kHz	3.0%+25 0.4%+25 2.0%+30 5.0%+50	6.0%+50 1.0%+50 3.0%+50 5.0%+100
3V	100 $\mu$ V	Same frequencies, similar accuracies as above		
30V	1 mV	Same frequencies, similar accuracies as above		
RTD (Pt 100)		Accuracy <sup>1,5</sup> , 3 $\sigma$ , ± °C (4-wire)		
Temperature °C	Resolution °C	90 Day, 18 to 28°C	1 Year, 18 to 28°C	
	Slow	Slow	Slow	
-200	0.03	0.16	0.25	
0	0.03	0.20	0.31	
100	0.03	0.23	0.34	
300	0.03	0.30	0.41	
600	0.03	0.53	0.63	
Thermistor 10 k to 100 k $\Omega$				
-40 °C to 150 °C	0.03	0.4	0.5	
Frequency Measurement Accuracy <sup>1,8</sup> , -20 to 60°C				
Range	Resolution		Accuracy, 3 $\sigma$ , ± (% input +Hz)	
	Slow	Fast	Slow	Fast
15 Hz-900 Hz	0.01 Hz	0.1 Hz	0.05%+0.02 Hz	0.05%+0.2 Hz
900 Hz-9 kHz	0.1 Hz	1 Hz	0.05%+0.1 Hz	0.05%+1 Hz
9 kHz-90 kHz	1 Hz	10 Hz	0.05%+1 Hz	0.05%+10 Hz
90 kHz-900 kHz	10 Hz	100 Hz	0.05%+10 Hz	0.05%+100 Hz
1 MHz	100 Hz	1 kHz	0.05%+100 Hz	0.05%+1 kHz
Frequency Measurement Sensitivity (sine wave)				
Frequency	Minimum Signal		Maximum Signal	
15 Hz - 200 Hz	100 mV rms		30V rms	
200 Hz - 70 kHz	100 mV rms		30V rms	
70 kHz - 100 kHz	100 mV rms		20V rms	
100 kHz - 200 kHz	150 mV rms		10V rms	
200 kHz - 300 kHz	150 mV rms		7V rms	
300 kHz - 1 MHz	linearly increasing from 150 mV rms at 300 kHz to 2V rms at 1 MHz		linearly decreasing from 7V rms at 300 kHz to 2V rms at 1 MHz	

<sup>6</sup> Resolution is 0.02°C or 0.04°F over the useful range of base metal thermocouples (J, K, T, E, N, L, U) and 0.1°C or 0.2°F resolution for types R, S, B, and C with slow scan.

<sup>7</sup> Resolution is 0.2°C or 0.4°F over the useful range of base metal thermocouples (J, K, T, E, N, L, U) and 1.0°C or 2.0°F resolution for types R, S, B, and C with slow scan.

<sup>8</sup> Accuracy for both slow and fast scan speeds.

<sup>9</sup> Open thermocouple detection is performed on each thermocouple channel unless defeated by computer command.

<sup>10</sup> Using Stein hart - Hart thermistor polynomial:  $T = A+B (\ln R) + C (\ln R)^3$   
 $T =$  temp in °K  
 $A, B$  and  $C =$  fitting constants  
 $R =$  resistance of thermistor in  $\Omega$ .

## 2680A-DIO

### Totalizing input

Pre-settable starting count up/down counter

DC coupled, non-isolated, max +30V, min -4V

Max count: 4,294,967,295

Minimum signal: 2V peak

Threshold: 1.4V

Rate: 0-5 kHz (debounce off)

Hysteresis: 500 mV

Input debouncing: None or 1.66 ms

Digital inputs/outputs: 20

Threshold: 1.4V

Hysteresis: 500 mV

Maximum input: +30V, min -4V; non-isolated

Logical "zero" output:

0.8V max |out = -1.0 mA

(1 LSTTL load equivalent)

1.8V max |out = -20 mA

3.25V max |out = -50 mA

Logical "one" output:

Output voltage depends on external load

3.8V min |out = 0.05 mA

(1 LSTTL load equivalent)

### Relays

Quantity: 8

Type: Form C; DPST

Current: 1 amp, non-inductive

Operation time: 75 ms

### Alarm associations

Each Digital I/O may be randomly assigned as a digital input, status output, or alarm output (associated with any input channel or channels)

## General Specifications

### Trigger input

Minimum pulse: 5 μs

Minimum latency: 100 ms

Input "High": 2.0V min, 7.0V max

Input "Low": -0.6V min, 0.8V max

non-isolated, contact closure and TTL compatible

### Clock

Accurate to within 1 minute/month for 0°C to 50°C range

### Power

100 to 240 VAC, 50 or 60 Hz

100 VA max, or 9 to 45 VDC

(50W DC) (if both sources are applied simultaneously, the greater of AC or DC is used.),

at 120 VAC the equivalent DC voltage ~ 14.5V

### Temperature, humidity (non-condensing)

Operating: -20°C to 28°C, ≤90% RH; 28°C to 40°C, ≤75% RH;

40°C to 60°C, ≤50% RH

Storage: -40°C to 70°C, 5% to 95% RH

### Altitude

Operating: 2000m

Storage: 12,200m

### Standards

All inputs: IEC Overvoltage rating Category II

Product conforms to the following safety and emission standards:

EN50082-2

EN55022-1

EN55011 class A

EN610000-4-2,3,4,6,8

EN61326

EN61010-1, CAT II

CSA C22.2 No. 1010.1

### Operating temperature

-20°C to 60°C (-4°F to +140°F)

### Storage temperature

-40°C to 70°C (-40°F to +158°F)

### Size

18.6" x 17" x 9.3"

(473 mm x 423 mm x 237 mm)

### Weight

2680A/2686A chassis only:

18.86 lbs. (8.47 kg)

2680A-FAI: 1.74 lbs. (0.79 kg)

2680A-PAI: 2.66 lbs. (1.21 kg)

2680A-DIO: 1.75 lbs. (0.80 kg)

### Interfaces

Ethernet: Conforms to IEEE

802.3 Ethernet standard,

compatible with 100BaseT and

10BaseT standards, uses TCP/IP protocol

RS-232C: For calibration only

## 2686A memory card storage capacity

### 2686A – Active channels and number of scans to card capacity

Memory Card / Active Channels	20 ch	40 ch	60 ch	80 ch	100 ch	120 ch
16 MB	100,548	66,765	50,074	40,059	33,382	28,613
128 MB	800,000	528,000	400,000	320,000	264,000	224,000
256 MB	1.6 M	1.056M	800,000	640,000	528,000	448,000
512 MB	3.2 M	2.112 M	1.6 M	1.28 M	1.056 M	896,000
1 GB	6.2 M	4.224 M	3.2 M	2.56 M	2.112 M	1.792 M

Estimating space: 80 bytes / scan + 4 bytes / channel scanned (allow 4.5% overhead for card formatting)

## Fluke measurement specification philosophy

The accuracy specifications for the 2680A, Hydra and NetDAQ instruments are calculated conservatively so that they include 3 standard deviations from the nominal value: this is referred to as 3-Sigma. Greater than 99.7% of the instruments produced will perform within the error limits. Rigorous screening and testing procedures catch and correct the 3 out of 1000 instruments which would have fallen outside their published specifications. Many other products use a 'root-sum-square' scheme, or only specify the error band within 1 standard deviation (1-Sigma) of nominal. This method produces a specification that appears to be more accurate, but the resulting "typical" specifications correctly characterize only ~66% of the instruments produced. This method is kind of like knowing how accurate "most of the instruments" will be. Our 3-Sigma specifications tell you how accurate ALL of the instruments will be.

**Fluke.** *Keeping your world up and running.*

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