

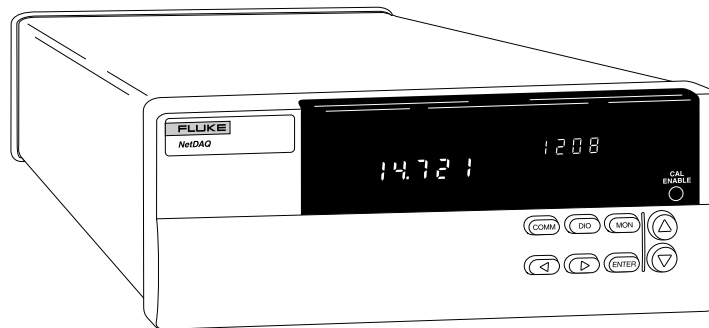
NetDAQ® Series Models 2640A and 2645A

2640A

- 100, 50, 6 readings/second
- 18 bit A/D resolves 0.3 μ 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 μ 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 Ω range, 37 readings/second on 3 M Ω 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 Ω range, 44 readings/second on 3 M Ω 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: ≥ 120 dB (50/60 Hz, $\pm 0.1\%$ max 1k Ω source imbalance)

DC: ≥ 120 dB

2645A:

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

DC: ≥ 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 ^{9, 10}		Accuracy ^{1,6} , 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 ¹ , 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 ^{1,3} (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 ^{9, 10}		Accuracy ^{1,7} , 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 ¹ , 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 ^{1,4} (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 ^{1,2,3} , 3 σ , ± (% input+counts)	
			Slow	Fast
300mV	1 μ 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 μ 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 ^{1,5} , 3 σ , ± °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 ^{1,8} , -20 to 60°C				
Range	Resolution		Accuracy, 3 σ , ± (% 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	

¹ 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.

² Sine wave inputs >2000 counts (slow), >200 counts (fast). Accuracies for crest factor ≤ 2.0 .

³ For two-wire measurements add 5 Ω to basic accuracy (does not include lead-wire resistances).

⁴ For two-wire measurements add 700-1000 Ω to basic accuracy (does not include lead-wire resistances). Ohms varies due to the resistance of the solid state switches.

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

Model 2645A

AC Voltage				
Range	Resolution	Frequency	Accuracy ^{1,2,3} , 3 σ , ± (% input+counts)	
			Slow	Fast
300mV	10 μ 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 μ V	Same frequencies, similar accuracies as above		
30V	1 mV	Same frequencies, similar accuracies as above		
RTD (Pt 100)		Accuracy ^{1,5} , 3 σ , ± °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 ^{1,8} , -20 to 60°C				
Range	Resolution		Accuracy, 3 σ , ± (% 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	

⁶ 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.

⁷ 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.

⁸ Accuracy for both slow and fast scan speeds.

⁹ Open thermocouple detection is performed on each thermocouple channel unless defeated by computer command.

¹⁰ 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)

Fluke measurement specification philosophy

The accuracy specifications for the 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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