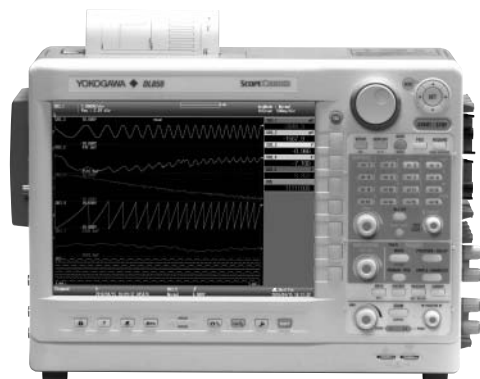


ScopeCorder DL850/DL850V

## Plug-In Modules — Specifications and Uses —



For DL850/DL850V main unit functions and specifications, see the "Bulletin DL850-00EN" catalog.

### Module Selection

Input	Model No.	Sample Rate	Resolution	Bandwidth	Number of Channels	Isolation	Maximum Input Voltage (DC+ACpeak)	DC Accuracy	Note
Analog Voltage	720210	100MS/s	12-Bit	20MHz	2	Isolated	1000V <sup>2</sup> 200V <sup>3</sup>	±0.5%	High speed · High voltage · Isolated Max. four (4) modules can be installed in a main unit.*6
	701250 <sup>5</sup>	10 MS/s	12-Bit	3 MHz	2	Isolated	600 V <sup>2</sup> 250 V <sup>3</sup>	±0.5%	high noise immunity
	701251	1 MS/s	16-Bit	300 kHz	2	Isolated	600 V <sup>2</sup> 140 V <sup>3</sup>	±0.25%	High sensitivity range (1 mV/div), low noise(±100 μVtyp.), and high noise immunity
	701255 <sup>5</sup>	10 MS/s	12-Bit	3 MHz	2	Non-Isolated	600 V <sup>4</sup> 250 V <sup>3</sup>	±0.5%	non-isolation version of model 701250
	701260	100 kS/s	16-Bit	40 kHz	2	Isolated	1000 V <sup>2</sup> 850 V <sup>3</sup>	±0.25%	with RMS, and high noise immunity
	720220	200kS/s	16-Bit	5kHz	16	Isolated(GND-terminal) non-isolated(CH-CH)	42V <sup>3</sup>	±0.3%	16CH voltage measurement(Scan-type)
Temperature	701261	100 kS/s (Voltage), 500 S/s (Temperature)	16-Bit (Voltage), 0.1°C (Temperature)	40 kHz (Voltage), 100 Hz (Temperature)	2	Isolated	42 V	±0.25% (Voltage)	thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel)
	701262	100 kS/s (Voltage), 500 S/s (Temperature)	16-Bit (Voltage), 0.1°C (Temperature)	40 kHz (Voltage), 100 Hz (Temperature)	2	Isolated	42 V	±0.25% (Voltage)	thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel), with AAF
	701265	500 S/s (Voltage), 500 S/s (Temperature)	16-Bit (Voltage), 0.1°C (Temperature)	100 Hz	2	Isolated	42 V	±0.08 (Voltage)	thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel), high sensitivity range (0.1 mV/div), and low noise (±4 μVtyp.)
Strain	701270	100 kS/s	16-Bit	20 kHz	2	Isolated	10 V	±0.5% (Strain)	Supports strain NDIS, 2, 5, 10 V built-in bridge power supply
	701271	100 kS/s	16-Bit	20 kHz	2	Isolated	10 V	±0.5% (Strain)	Supports strain DSUB, 2, 5, 10 V built-in bridge power supply, and shunt CAL
Analog Voltage, Acceleration	701275	100 kS/s	16-Bit	40 kHz	2	Isolated	42 V	±0.25% (Voltage) ±0.5% (Acceleration)	built-in anti-aliasing filter, Supports built-in amp type acceleration sensors (4 mA/22 V)
Frequency	701280	25 kS/s	16-Bit	resolution 50 ns	2	Isolated	420 V <sup>2</sup> 42 V <sup>3</sup>	±0.1% (Frequency)	Measurement frequency of 0.01 Hz to 200 kHz, Measured parameters (frequency, rpm, period, duty, power supply frequency, distance, speed)
Logic	720230	10MS/s	—	—	8-bit x 2 ports	non-isolated	depend on logic probe used.	—	(8-bit/port) x 2, compatible with four-type of logic probe(sold separately)
CAN	720240	100kS/s	—	—	(80signalsx2) port	Isolated	10V	—	CAN Data of max. 32-bit allowable It is available for DL850V only. Max two (2) modules can be installed in a main unit.*6

\*1: Probes are not included with any modules. \*2: In combination with 10:1 probe model 700929 \*3: Direct input \*4: In combination with 10:1 probe model 701940  
\*5: Some of the models 701250/701255 shipped on or before July, 2007 may require factory rework. \*6: Any other modules can be installed in the remaining slots.

For more information, go to

[tmi.yokogawa.com](http://tmi.yokogawa.com)

Test & Measurement Instruments

## Main Specifications (plug-in modules)

\*1: Under standard operating conditions (temperature of 23 °C ±5 °C, 20 to 80% RH, warm-up of 30 min. or more), after calibration. Recommended calibration period: 1 year. Note that the strain modules (701270/71) must be balanced.

\*2-11 See the figure on page 5 for notes on the maximum input voltage and maximum allowable common mode voltage.

\*12: See the figure on page 5 for the voltage-axis sensitivity setting.

### High-Speed 10 MS/s, 12-Bit Isolation Module (701250)

Input channels	2
Input type	Isolated unbalanced
Input coupling	AC, DC, and GND
Input connector	BNC connector (isolated type)
Input impedance	1 MΩ±1%, approx. 35 pF
Maximum sample rate	10 MS/s
Frequency range (-3dB) <sup>1</sup>	DC to 3 MHz
A/D conversion resolution	12-bit (150 LSB/div)
Voltage-axis sensitivity setting <sup>12</sup>	5 mV/div to 20 V/div (1-2-5 steps)
Maximum input voltage (1 kHz or less)	
In combination with 700929 (10:1) <sup>2</sup>	600 V (DC+ACpeak)
In combination with 701901+701954 (1:1) <sup>6</sup>	250 V (DC+ACpeak)
Direct input <sup>10</sup>	250 V (DC+ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	
In combination with 700929 (10:1) <sup>3</sup>	400 Vrms (CAT I), 300 Vrms (CAT II)
In combination with 701901+701954 (1:1) <sup>9</sup>	400 Vrms (CAT I), 300 Vrms (CAT II)
Direct input <sup>11</sup>	42 V (DC+ACpeak) (CAT I and CAT II, 30 Vrms)
Vertical (voltage) axis accuracy <sup>1</sup>	
DC accuracy	±(0.5% of 10 div)
Temperature coefficient	
Zero point	±(0.05% of 10 div)/°C (Typ.)
Gain	±(0.02% of 10 div)/°C (Typ.)
Bandwidth limit	OFF/500 Hz/5 kHz/50 kHz/500 kHz

### High-Speed 1 MS/s, 16-Bit Isolation Module (701251)

Input channels	2
Input type	Isolated unbalanced
Input coupling	AC, DC, and GND
Input connector	BNC connector (isolated type)
Input impedance	1 MΩ±1%, approx. 35 pF
Maximum sample rate	1 MS/s
Frequency range (-3dB) <sup>1</sup>	DC to 300 kHz (5 mV/div to 20 V/div) DC to 200 kHz (1 mV/div, 2 mV/div)
A/D conversion resolution	16-bit (2400 LSB/div)
Voltage-axis sensitivity setting <sup>12</sup>	1 mV/div to 20 V/div (1-2-5 steps)
Maximum input voltage (1 kHz or less)	
In combination with 700929 (10:1) <sup>2</sup>	600 V (DC+ACpeak)
In combination with 701901+701954 (1:1) <sup>6</sup>	140 V (DC+ACpeak)
Direct input <sup>10</sup>	140 V (DC+ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	
In combination with 700929 (10:1) <sup>3</sup>	400 Vrms (CAT I), 300 Vrms (CAT II)
In combination with 701901+701954 (1:1) <sup>9</sup>	400 Vrms (CAT I), 300 Vrms (CAT II)
Direct input <sup>11</sup>	42 V (DC+ACpeak)(CAT I and CAT II, 30 Vrms)
Vertical (voltage) axis accuracy <sup>1</sup>	
DC accuracy	5 mV/div to 20 V/div : ±(0.25% of 10 div) 2 mV/div : ±(0.3 % of 10 div) 1 mV/div : ±(0.5 % of 10 div)
Temperature coefficient	
Zero point	5 mV/div to 20 V/div : ±(0.02% of 10 div)/°C (Typ.) 2 mV/div : ±(0.05% of 10 div)/°C (Typ.) 1 mV/div : ±(0.10% of 10 div)/°C (Typ.)
Gain	1 mV/div to 20 V/div : ±(0.02% of 10 div)/°C (Typ.)
Bandwidth limit	OFF/400 Hz/4 kHz/40 kHz

### High-Voltage 100 kS/s, 16-Bit Isolation Module (with RMS) (701260)

Input channels	2
Input type	Isolated unbalanced
Input coupling	AC, DC, GND, AC-RMS, and DC-RMS
Input connector	BNC connector (isolated type)
Input impedance	1 MΩ±1%, approx. 35 pF
Maximum sample rate	100 kS/s
Frequency range (-3dB) <sup>1</sup>	
Waveform observation mode	DC to 40 kHz
RMS observation mode	DC, 40 Hz to 10 kHz
A/D conversion resolution	16-bit (2400 LSB/div)
Voltage-axis sensitivity setting <sup>12</sup>	20 mV/div to 200 V/div (1-2-5 steps)
Maximum input voltage (1 kHz or less)	
In combination with 700929 (10:1) <sup>2</sup>	1000 V (DC+ACpeak)
In combination with 701901+701954 (1:1) <sup>6</sup>	850 V (DC+ACpeak)
Direct input <sup>10</sup>	850 V (DC+ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	
In combination with 700929 (10:1) <sup>3</sup>	H side: 1000 Vrms (CAT II) <sup>4</sup> , L side: 400 Vrms (CAT II) <sup>5</sup>
In combination with 701901+701954 (1:1) <sup>9</sup>	H side: 700 Vrms (CAT II) <sup>7</sup> , L side: 400 Vrms (CAT II) <sup>8</sup>
Direct input	H/L sides: 30 Vrms (42 VDC+ACpeak) <sup>11</sup>
Vertical (voltage) axis accuracy <sup>1</sup>	
Waveform observation mode	DC accuracy ±(0.25% of 10 div)
RMS observation mode	DC accuracy ±(1.0% of 10 div)
AC accuracy (sinewave input)	
±(1.5% of 10 div) At frequency of 40 Hz to 1 kHz	
AC accuracy (crest factor 2 or less)	
±(2.0% of 10 div) At frequency of 40 Hz to 1 kHz	
AC accuracy (crest factor 3 or less)	
±(3.0% of 10 div) At frequency of 40 Hz to 1 kHz	
Temperature coefficient (Waveform observation mode)	
Zero point	±(0.02% of 10 div)/°C (Typ.)
Gain	±(0.02% of 10 div)/°C (Typ.)
Bandwidth limit	OFF/100 Hz/1 kHz/10 kHz
Response time (RMS observation mode)	
Rising (0 to 90% of 10 div)	100 ms (Typ.)
Falling (100 to 10% of 10 div)	250 ms (Typ.)

### Frequency Module (701280)

Measurement function	Frequency (Hz), RPMs, RPSs, period (sec), duty cycle (%), power supply frequency (Hz), pulse width (sec), pulse integration, and velocity
Input channels	2
Input type	Isolated unbalanced
Input coupling	AC and DC
Input connector	BNC connector (isolated type)
Input impedance	1 MΩ±1%, approx. 35 pF
	Pull-up function: 4.7 kΩ, approx. 5 V (pull-up can be turned ON only when the input is set to Pull-Up 5V)
Data update rate	25 kHz (40 μs)
Minimum measurement resolution	50 ns
Measured data resolution	16-bit (2400 LSB/div)
Input voltage range (±FS)	(1:1) ±1 V to ±50 V (1-2-5 steps)
Maximum input voltage	
In combination with 700929 (10:1) <sup>2</sup>	420 V (DC+ACpeak)
Direct input <sup>10</sup>	42 V (DC+ACpeak)
Maximum allowable common mode voltage	
In combination with 700929 (10:1) <sup>3</sup>	300 Vrms (CAT I and CAT II)
Direct input <sup>11</sup>	L side: 30 Vrms (CAT I and CAT II)
Bandwidth limit	OFF/100 Hz/1 kHz/10 kHz/100 kHz
Comparator section	
Preset function	Logic (5 V/3 V/12 V/24 V), electromagnetic pickup, zero crossing, pull-up (5 V), AC100 V, AC 200 V, and user-defined
Threshold range	±FS range, resolution 1% units
Hysteresis	±1%, ±2.5%, ±5 % of FS
Chatter elimination function	OFF or 1 ms to 1000 ms (1 ms resolution)
LED display (per CH)	
ACT (green)	Operating status (lights during pulse input)
OVER (red)	Overdrive status (lights when input exceeds range)
Measured parameters and measuring range	

Measured parameter	Measuring Range	Vertical axis sensitivity setting
Frequency (Hz)	0.01 Hz to 200 kHz	0.1 Hz/div to 50 kHz/div
RPMS	0.01 rpm to 100,000 rpm	0.1 rpm/div to 10 krpm/div
RPSs	0.001 rps to 2000 rps	0.01 rps/div to 200 rps/div
Period (sec)	5 $\mu$ s to 50 s	10 $\mu$ s/div to 5 s/div
Duty cycle (%)	0% to 100%	1%/div to 20%/div
Power supply frequency (Hz)	(50 Hz, 60 Hz, 400 Hz) $\pm$ 20 Hz	0.1 Hz/div to 2 Hz/div
Pulse width (sec)	2 $\mu$ s to 50 s	10 $\mu$ s/div to 5 s/div
Pulse integration	Up to 2 x 10 <sup>9</sup> pulses	10 x 10 <sup>-21</sup> value/div to 0.5 x 10 <sup>-21</sup> value/div
Velocity	Measuring range same as frequency (units can be converted to km/h, etc.)	

#### Measurement accuracy<sup>1</sup>

- When in frequency, RPM, RPS, or velocity measurement mode

##### Measurement accuracy

$\pm(0.05\%$  of 10 div + accuracy dependent on the input frequency)

##### Accuracy dependent on the input frequency

2 kHz or less 0.05% of the input frequency + 1 mHz  
 2 kHz to 10 kHz 0.1% of the input frequency  
 10 kHz to 20 kHz 0.3% of the input frequency  
 20 kHz or higher 0.5% of the input frequency

- When in period measurement mode

##### Measurement accuracy

$\pm(0.05\%$  of 10 div + accuracy dependent on the input frequency)

##### Accuracy dependent on the input period

500  $\mu$ s or greater 0.05% of the input period  
 100  $\mu$ s to 500  $\mu$ s 0.1% of the input period  
 50  $\mu$ s to 100  $\mu$ s 0.3% of the input period  
 50  $\mu$ s or less 0.5% of the input period + 0.1  $\mu$ s

- When in duty cycle measurement mode

##### Accuracy dependent on the input frequency

1 kHz or less  $\pm$ 0.1%  
 1 kHz to 10 kHz  $\pm$ 0.2%  
 10 kHz to 50 kHz  $\pm$ 1.0%  
 50 kHz to 100 kHz  $\pm$ 2.0%  
 100 kHz to 200 kHz  $\pm$ 4.0%

- When in pulse width measurement mode

##### Measurement accuracy

$\pm(0.05\%$  of 10 div + accuracy dependent on the input pulse width)

##### Accuracy dependent on the input pulse width

500  $\mu$ s or greater 0.05% of the input pulse width  
 100  $\mu$ s to 500  $\mu$ s 0.1% of the input pulse width  
 50  $\mu$ s to 100  $\mu$ s 0.3% of the input pulse width  
 50  $\mu$ s or less 0.5% of the input pulse width + 0.1  $\mu$ s

- When in power supply frequency mode

##### Measurement accuracy

When the center frequency is 50/60 Hz:  $\pm$ 0.03 Hz (0.01 Hz resolution)  
 When the center frequency is 400 Hz:  $\pm$ 0.3 Hz (0.01 Hz resolution)

#### Auxiliary measurement functions

Deceleration prediction	Computes the deceleration condition in realtime when the pulse input is cut off. Can be specified when measuring the frequency, RPMS, RPSs, period, and velocity.
Stop prediction	Sets the frequency to 0 after a certain time elapses after the pulse input is cut off. Stop interval setting: Set in the range of 1.5 to 10 times (10 settings) the period of the pulse measured last. Can be specified when measuring the frequency, RPMS, RPSs, period, and velocity.
Smoothing	Computes the moving average of the measured data using the specified time. Specified time: 0.1 to 1000 ms (0.1 ms resolution). Can be specified on all measurement parameters.
Pulse average	Performs frequency measurement per specified number of pulses. When fluctuation exists periodically in the pulse interval, the fluctuation can be eliminated. Specified number of pulses: 1 to 4096. Can be specified when measuring the frequency, RPMS, RPSs, power supply frequency, period, pulse integration, and velocity.
Offset function	Observe fluctuation with respect to the offset frequency. Offset range: Can be set up to 100 times the maximum range value.

#### High-Speed 10 MS/s, 12-Bit Non-Isolation Module (701255)

Input channels	2
Input type	Non-isolated, unbalanced
Input coupling	AC, DC, and GND
Input connector	BNC connector (metallic type)
Input impedance	1 M $\Omega$ $\pm$ 1%, approx. 35 pF
Maximum sample rate	10 MS/s
Frequency range (-3dB) <sup>11</sup>	DC to 3 MHz
A/D conversion resolution	12-bit (150 LSB/div)
Voltage-axis sensitivity setting <sup>12</sup>	5 mV/div to 20 V/div (1-2-5 steps)
Maximum input voltage (1 kHz or less)	In combination with 701940 (10:1) 600 V (DC+ACpeak) Direct input 250 V (DC+ACpeak)
Vertical (voltage) axis accuracy <sup>1</sup>	DC accuracy $\pm(0.5\%$ of 10 div)
Temperature coefficient	Zero point $\pm(0.05\%$ of 10 div)/ $^{\circ}$ C (Typ.) Gain $\pm(0.02\%$ of 10 div)/ $^{\circ}$ C (Typ.)
Bandwidth limit	OFF/500 Hz/5 kHz/50 kHz/500 kHz

#### Acceleration/Voltage Module (with AAF) (701275)

Input channels	2
Input type	Non-isolated, unbalanced
Input coupling	AC, DC, ACCL (acceleration), and GND
Input connector	BNC connector (metallic type)
Input impedance	1 M $\Omega$ $\pm$ 1%, approx. 35 pF
Maximum sample rate	100 kS/s
Frequency range (-3dB) <sup>11</sup>	(Acceleration) 0.4 Hz to 40 kHz (Voltage) DC to 40 kHz
A/D conversion resolution	16-bit (2400 LSB/div)
Voltage-axis sensitivity setting <sup>12</sup>	Acceleration ( $\pm$ 5 V = x1 range) x0.1 to x1 to x100 (1-2-5 steps) Voltage 5 mV/div to 10 V/div (1-2-5 steps)
Maximum input voltage (1 kHz or less) <sup>10</sup>	42 V (DC+ACpeak)
Maximum allowable common mode voltage (1 kHz or less) <sup>11</sup>	30 Vrms (CAT I and CAT II)
Vertical (voltage) axis accuracy <sup>1</sup>	Voltage (DC accuracy) $\pm(0.25\%$ of 10 div) Acceleration $\pm(0.5\%$ of range) at 1 kHz
Temperature coefficient (voltage) (excluding AUTO filter)	Zero point $\pm(0.02\%$ of 10 div)/ $^{\circ}$ C (Typ.) Gain $\pm(0.02\%$ of 10 div)/ $^{\circ}$ C (Typ.)
Bandwidth limit	OFF/Auto (AAF)/40 Hz/400 Hz/4 kHz
Anti-aliasing filter (AAF)	Cutoff frequency (fc) automatically linked with the sampling frequency (fs) fs $\geq$ 100 Hz : fc = fs x 40% fs $\leq$ 50 Hz : fc = 20 Hz
Cutoff characteristics	-65 dB at 2 x fc (Typ.)
Sensor supply current (voltage)	OFF/4 mA $\pm$ 10% (approx. 22 VDC)
Applicable acceleration sensor	Built-in amplifier type Kistler Instruments Corp.: Piezotron™, PCB Piezotronics Inc.: ICP™, Endevco Corp.: Isotron™, etc.

## Strain Module (NDIS) (701270) / Strain Module (DSUB, Shunt-Cal) (701271)

Input channels	2
Input type	DC bridge (auto balancing), balanced differential input, and isolated
Auto balance type	Electronic auto balance
Auto balance range	±10,000 μSTR (1 gauge method)
Bridge voltage	Select from 2 V, 5 V, and 10 V.
Gauge resistance	120 Ω to 1000 Ω (bridge voltage: 2 V) 350 Ω to 1000 Ω (bridge voltage: 2 V, 5 V, and 10 V)
Gauge factor	1.90 to 2.20 (set in 0.01 steps)
Maximum sample rate	100 kS/s
Frequency range (-3dB) <sup>11</sup>	DC to 20 kHz
A/D conversion resolution	16-bit (4800 LSB/div: Upper = +FS, Lower = -FS)
mV/V range support	mV/V range = 0.5 x (μSTR range/1000)
Measurement range/measurable range	

Measurement range (FS)	Measurable range (-FS to +FS)
500 μSTR	-500 μSTR to +500 μSTR
1000 μSTR	-1000 μSTR to +1000 μSTR
2000 μSTR	-2000 μSTR to +2000 μSTR
5000 μSTR	-5000 μSTR to +5000 μSTR
10,000 μSTR	-10,000 μSTR to +10,000 μSTR
20,000 μSTR	-20,000 μSTR to +20,000 μSTR

Maximum input voltage (1 kHz or less)	10 V (DC+ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	42 V (DC+ACpeak)(CAT I and CAT II, 30 Vrms)
DC accuracy <sup>1</sup>	±(0.5% of FS + 5 μSTR)
Temperature coefficient	
Zero point	±5 μSTR/°C (Typ.)
Gain	±(0.02% of FS)/°C (Typ.)
Bandwidth limit	OFF/10 Hz/100 Hz/1 kHz
• NDIS (701270)	
Function	mV/V support. Supports the strain gauge transducer unit system.
Input connector	NDIS connector (Recommended by JSNDI (The Japanese Society for Non-destructive Inspection))
Standard accessories	NDIS connector : 2 pieces
Recommended bridge head (sold separately)	701955 (NDIS 120 Ω, comes with a 5-m cable) 701956 (NDIS 350 Ω, comes with a 5-m cable)
• DSUB, Shunt-Cal (701271)	
Function	mV/V support.
Supports	the strain gauge transducer unit system. Shunt calibration support. Built-in shunt calibration relay (1 gauge method).
Input connector	9-pin D-Sub connector (female)
Standard accessories	Connector shell set for soldering : 2 sets
Recommended bridge head (sold separately)	701957 (D-Sub 120 Ω, comes with a 5-m cable) 701958 (D-Sub 350 Ω, comes with a 5-m cable)

## Universal (Voltage/Temp.) Module (701261) / with AAF (701262)

Function	Temperature (thermocouple) or voltage measurement (switchable)
Input channels	2
Input type	Isolated unbalanced
Input coupling	TC (thermocouple), DC, AC, and GND
Input connector	Binding post
Input impedance	Approx. 1 MΩ
Maximum sample rate	Voltage 100 kS/s
Data update rate	Temperature 500 Hz
Frequency range (-3dB) <sup>11</sup>	Voltage DC to 40 kHz Temperature DC to 100 Hz
Vertical resolution	Voltage 16-bit (2400 LSB/div) Temperature 0.1°C

Measurement range/accuracy <sup>1</sup>	
Voltage measurement	
Voltage-axis sensitivity setting <sup>12</sup>	5 mV/div to 20 V/div (1-2-5 steps)
Vertical (voltage) axis accuracy	±(0.25% of 10 div)
Temperature measurement	
(Does not include the reference junction temperature compensation accuracy.)	

Type	Measurement Range	Accuracy
K	-200°C to 1300°C	±(0.1% of reading + 1.5°C)
E	-200°C to 800°C	Except ±(0.2% of reading + 1.5°C)
J	-200°C to 1100°C	for -200°C to 0°C
T	-200°C to 400°C	
L	-200°C to 900°C	

Type	Measurement Range	Accuracy
U	-200°C to 400°C	
N	0°C to 1300°C	
R	0°C to 1700°C	±(0.1% of reading + 3°C)
S	0°C to 1700°C	Except, 0 to 200°C: ±8°C 200°C to 800°C: ±5°C
B	0°C to 1800°C	±(0.1% of reading + 2°C) Except, 400°C to 700°C: ±8°C Effective range is 400°C to 1800°C
W	0°C to 2300°C	±(0.1% of reading + 3°C)
Au7Fe3	0K to 300K	0K to 50K: ±4K 50K to 300K: ±2.5K

Maximum input voltage (1 kHz or less)	42 V (DC + ACpeak) (as a value that meets the safety standard) 150 V (DC + ACpeak) (maximum allowable voltage, as a value that does not damage the instrument when applied)
Maximum allowable common mode voltage (1 kHz or less)	42 V (DC+ACpeak) (CAT I and CAT II, 30 Vrms)
Temperature coefficient (Voltage)	
Zero point	±(0.01% of 10 div)/°C (Typ.)
Gain	±(0.02% of 10 div)/°C (Typ.)
Bandwidth limit	
Voltage	OFF/AUTO(AAF)/40 Hz/400 Hz/4 kHz
Temperature	OFF/2 Hz/8 Hz/30 Hz
Anti-aliasing filter (AAF)(701262 only)	
Cutoff frequency (fc)	automatically linked with the sampling frequency (fs) fs ≥ 100 Hz : fc = fs x 40% fs ≥ 50 Hz : fc = 20 Hz

## Temperature, High Precision Voltage Isolation Module (701265)

Function	Temperature (thermocouple) or voltage measurement (switchable)
Input channels	2
Input type	Isolated unbalanced
Input coupling	TC (thermocouple), DC, and GND
Input connector	Binding post
Input impedance	Approx. 1 MΩ
Data update rate	Temperature 500 Hz
Frequency range (-3dB) <sup>11</sup>	DC to 100 Hz
Vertical resolution	Voltage 16-bit (2400 LSB/div) Temperature 0.1°C
Measurement range/accuracy <sup>1</sup>	
Voltage measurement	
Voltage-axis sensitivity setting <sup>12</sup>	100 μV/div to 10 V/div (1-2-5 steps)
Vertical (voltage) axis accuracy	±(0.08% of 10 div + 2 μV)
Temperature measurement	
(Does not include the reference junction temperature compensation accuracy.)	

Type	Measurement Range	Accuracy
K	-200°C to 1300°C	±(0.1% of reading + 1.5°C)
E	-200°C to 800°C	Except ±(0.2% of reading + 1.5°C)
J	-200°C to 1100°C	for -200°C to 0°C
T	-200°C to 400°C	
L	-200°C to 900°C	
U	-200°C to 400°C	
N	0°C to 1300°C	
R	0°C to 1700°C	±(0.1% of reading + 3°C)
S	0°C to 1700°C	Except, 0 to 200°C: ±8°C 200°C to 800°C: ±5°C
B	0°C to 1800°C	±(0.1% of reading + 2°C) Except, 400°C to 700°C: ±8°C Effective range is 400°C to 1800°C
W	0°C to 2300°C	±(0.1% of reading + 3°C)
Au7Fe3	0K to 300K	0K to 50K: ±4K 50K to 300K: ±2.5K

Maximum input voltage (1 kHz or less)	42 V (DC + ACpeak)
Maximum allowable common mode voltage (1 kHz or less)	42 V (DC+ACpeak) (CAT I and CAT II, 30 Vrms)
Temperature coefficient (Voltage)	
Zero point	±((0.01% of 10 div)/°C + 0.05μV)/°C (Typ.)
Gain	±(0.02% of 10 div)/°C (Typ.)
Bandwidth limit	OFF/2 Hz/8 Hz/30 Hz

### High-Speed 100 MS/s, 12-Bit Isolation Module (720210)

Input channels	2
Input coupling	AC, DC and GND
Maximum sample rate	100MS/s
Input type	Isolated unbalanced
Frequency range(-3dB) <sup>1)</sup>	DC to 20MHz
Voltage-axis sensitivity setting	10 mV/div to 20V/div
Maximum input voltage (1kHz or less)	In combination with 700929 <sup>2)</sup> : 1000V(DC+ACpeak) CATII Direct input or cable not complying with the safety standard <sup>10)</sup> : 200V (DC + ACpeak)
Maximum allowable common mode voltage (1kHz or less)	In combination with the 700929 (10:1) <sup>3)</sup> : 1000Vrms (CAT II) Direct input or cable not complying with the safety standard <sup>11)</sup> : 42 V (DC+ACpeak) (CAT I and CAT II, 30 Vrms)
Vertical (voltage) axis accuracy <sup>1)</sup>	DC accuracy 10mV/div to 20V/div: ±(0.5% of 10 div)
Input connector	BNC connector (isolated type)
Input impedance	1 MΩ ± 1%, approx. 35 pF
Common mode rejection ratio	80 dB (50/60 Hz) or more (Typ.)
Withstand voltage	1500 Vrms for 1 minute (across each terminal and earth) (60 Hz)
Insulation resistance	500 VDC, 10 MΩ or more (across each input terminal and earth)
A/D conversion resolution	12-bit (150 LSB/div)
Temperature coefficient	Zero point: ±(0.1% of 10 div)/°C(Typ.) Gain: ±(0.05% of 10 div)/°C(Typ.)
Bandwidth limit	OFF/2MHz/1.28MHz/640kHz/320kHz/160kHz/80kHz/40kHz/20kHz/10kHz
Probe attenuation setting	Voltage Probe: 1:1, 10:1, 100:1, 1000:1 Current Probe: 10A:1V(for the 700937/701933), 100A:1V(for the 701930/701931)

Note: Max. four (4) modules can be installed in a main unit.

### 16-CH Voltage Input Module (720220)

Input channels	16
Input coupling	DC, GND (Selectable for each sub-CH)
Maximum sample rate	200kS/s(single CH) [10kS/s when using 16-CH]
Input type	Isolated unbalanced
Frequency range(-3dB) <sup>1)</sup>	DC to 5kHz
Voltage-axis sensitivity setting	200mV/div to 2V/div (1-2-5 steps)
Maximum input voltage(1kHz or less)	Direct input 42V (DC+ACpeak)
Maximum allowable common mode voltage(1kHz or less)	Direct input 42 V (DC+ACpeak) (CAT I and CAT II, 30 Vrms)
Vertical (voltage) axis accuracy	DC accuracy ±(0.3% of 10div)
Input connector	Spring-type terminal (removable per 8CH)
Input impedance	1MΩ ±1%
Common mode rejection ratio	80 dB (50/60 Hz) or more (Typ.)
A/D conversion resolution	16-bit (2400 LSB/div)
Temperature coefficient	Zero point: ±(0.02% of 10div)/°C (Typ.) Gain: ±(0.02% of 10div)/°C (Typ.)
Bandwidth limit	OFF/500Hz(Selectable for each sub-CH)

### Logic Input Module (720230)

Input ports	2
Input bits	8-bit/Port
Maximum sample rate	10MS/s
Input type	non-isolated
Compatible probes	Model:700986 (8-bit, non isolated input) Model:700987 (8-bit, isolated input) Model:702911 (8-bit, non-isolated input, support contact input) Model:702912 (8-bit, non-isolated input, support contact input)

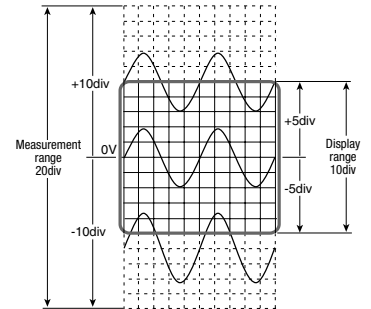
### CAN Bus Monitor Module (720240)

Input ports	2
Input type	Isolated (across port and main unit, across each port)
Input connector	D-Sub 9-pin (male)
Input channels	60-signal/port
Maximum sample rate	100kS/s (60-CH x 1kS/s per port)
Bit rate	10k, 20k, 33.3k, 50k, 62.5k, 66.7k, 83.3k, 100k, 125k, 250k, 500k, 800k, 1Mbps
Supported protocol	Physical layer: ISO-11898 (High Speed Communication) CAN in Automation: CAN2.0B (Standard & extended message format)
Terminator	Built-in, it is switchable On and Off per port.
Endian	Little or Big selectable
LED display	CAN Ch1: TERM on the panel CAN Ch2: TERM on the panel
Channel setting	Message ID (Standard or Extended) Extraction Position Bit Length (Max. 32-bit) Select the Endian (little or big) Convert physical value
Output function	Single shot Specified ID (Data) can be outputted manually.
Allowable voltage range	-3 to 10V
Maximum allowable common mode voltage (1kHz or less)	42 V (DC+ACpeak) (CAT I and CAT II, 30 Vrms)

Note: This module is available for DL850V only. Max two(2) modules can be installed in a main unit.

### Measurement Range and Display Range

The measurement range of the ScopeCorder is ±10 divisions (20 divisions of absolute width (span)) around 0 V. The display range of the screen is ±5 divisions (10 divisions of span). The following functions can be used to move the displayed waveform and display the waveform outside the display range by expanding/reducing the displayed waveform.

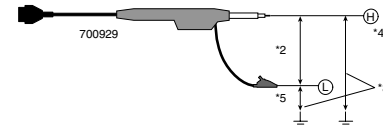


- Move the vertical position.
- Set the offset voltage.
- Zoom in or out of the vertical axis (expand/reduce).

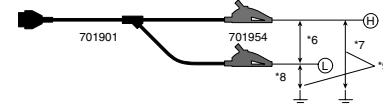
### Maximum Input Voltage and Maximum Allowable Common Mode Voltage

See Specifications of Plug-in Modules

<In combination with 700929>

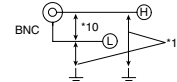


<In combination with 701901 + 701954>



<Direct input>

(with a cable which doesn't comply with the safety standard)



### WARNING

Do not apply input voltage exceeding the maximum input voltage, withstand voltage, or allowable surge voltage. To prevent the possibility of electric shock, be sure to furnish protective earth grounding of the main unit. To prevent the possibility of electric shock, be sure to fasten the module screws. Otherwise, the electrical and mechanical protection functions will not be activated.

## Main Specifications (probes and accessories)

### 100:1 isolation probe (701947)

Total length	1.5m
Input impedance/capacitance	100MΩ ± 1% <sup>11</sup> /7pF
Attenuation ratio	100: 1
Frequency range (-3dB)	DC to 200MHz
Voltage coefficient	0.001%/V(Typ.)
Maximum input voltage <sup>2</sup>	Space between shield and earth. ± 1000V(DC+ACpeak) CAT II ± 1000V(DC+ACpeak) CAT I Space between tip and shield, tip and earth. ± 1000V(DC+ACpeak) CAT II ± 3540V(DC+ACpeak) CAT I

### 10:1 Probe (for Isolated BNC Input) (700929)

Frequency range (-3 dB)	DC to 100 MHz
Attenuation ratio	10:1
Input impedance/capacitance	10 MΩ/approx. 18 pF
Maximum input voltage (probe alone)	1000 V (DC + AC peak) Space between clip and lead, lead and earth. When the input voltage is AC, the maximum allowable input decreases depending on the frequency.

### Current Probe (701933)

Frequency range (-3 dB)	DC to 50 MHz
Maximum continuous input range	30 Arms (AC and DC components) (The maximum allowable input decreases depending on the frequency.)
Maximum peak current	50 Apeak, non-continuous
Output voltage rate	0.1 V/A
Amplitude accuracy	To 30 Arms : ± 1% rdg ± 1 mV 30 Arms to 50 Apeak : ± 2% rdg (DC, and 45 to 66 Hz)

### Current Probe (701930)

Frequency range (-3 dB)	DC to 10 MHz
Maximum continuous input range	150 A (The maximum allowable input decreases depending on the frequency.)
Maximum peak current	300 Apeak, non-continuous
Output voltage rate	0.01 V/A
Amplitude accuracy	To 150 A : ± 1% rdg ± 1 mV 150 A to 300 A : ± 2% rdg (DC, and 45 to 66 Hz)

### Current Probe (701931)

Frequency range (-3 dB)	DC to 2 MHz
Maximum continuous input range	500 A (The maximum allowable input decreases depending on the frequency.)
Maximum peak current	700 Apeak, non-continuous
Output voltage rate	0.01 V/A
Amplitude accuracy	To 500 A : ± 1% rdg ± 5 mV 500 A to 700 A : ± 2% rdg (DC, and 45 to 66 Hz)

### Differential Probe (700924)

Frequency range (-3 dB)	DC to 100 MHz
Attenuation ratio	Switched ratios of 100:1 and 1000:1
Input impedance/capacitance	4 MΩ/approx. 10 pF
Differential allowable voltage	± 1400 V (DC + ACpeak) or 1000 Vrms at 1000:1 attenuation ± 350 V (DC + ACpeak) or 250 Vrms at 100:1 attenuation

### High Voltage Differential Probe (701926)

Frequency range (-3dB) <sup>13,14</sup>	DC to 50MHz
Attenuation	1000:1 or 100:1, switchable
Input resistance and capacitance (typ.)	50 MΩ + approx. 17 pF (parallel with respect to ground)
Allowable differential voltage (between + and - terminals) <sup>15</sup>	5000 V rms or less and 7000 Vpeak or less at 1000:1 attenuation 500 V rms or less and 700 Vpeak or less at 100:1 attenuation
Allowable common mode voltage <sup>15</sup>	5000 Vrms or less and 7000 Vpeak or less
Maximum input voltage (to ground) <sup>15</sup>	1000Vrms CAT III 5000 Vrms and 7000 Vpeak CAT I
Operating conditions	5 to 40°C 25 to 85%RH (no condensation)
Power requirements	· Internal battery: Four AA dry cells · External power supply: 6 VDC/200 mA or more or 9 VDC/150mA or more · From the probe power supply terminal of the DL Series, the 701934 using the probe power cable
External dimensions	202 mm × 83 mm × 38 mm (excluding connector and cable)
Weight	Approx. 500 g (excluding batteries)

### Passive Probe (701940)

Frequency range (-3 dB)	DC to 10 MHz at 10:1 attenuation DC to 6 MHz at 1:1 attenuation
Attenuation ratio	Switched ratios of 10:1 and 1:1
Input impedance/capacitance	10 MΩ/approx. 22 pF (10:1), 200 pF max. (1:1)
Maximum input voltage (probe alone)	600 V (DC + AC peak)

### Logic Probe (702911 : 1 m and 702912 : 3 m)

Number of inputs	8
Input type	Non-isolated (earth of all bits is common, SL1400 earth and earth of all bits are common)
Maximum input voltage	± 35 V
Response time	3 μs or less
Input impedance	10 kΩ or greater
Threshold level	Approx. 1.4 V
Input level	TTL level or contact input (switching type)

### High-Speed Logic Probe (700986)

Number of inputs	8
Input type	Non-isolated (earth of all bits is common, Main unit earth and earth of all bits are common)
Maximum input voltage (1 kHz or less)(across probe tip and earth)	42 V (DC+ACpeak)(CAT I and CAT II, 30 Vrms)
Response time	1 μs or less
Input impedance	Approx. 100 kΩ
Threshold level	Approx. 1.4 V

### Isolation Logic Probe (700987)

Number of inputs	8
Input type	Isolated (all bits are isolated)
Input connector	Safety terminal type (for banana plug) × 8
Input switching	Can switch between AC/DC input for each bit
Applicable input range	DC input H/L detection of 10 VDC to 250 VDC AC input H/L detection of AC type of 80 VAC to 250 VAC 50/60 Hz
Threshold level	DC input 6 VDC± 50% AC input 50 VAC± 50%
Response time	DC input within 1 ms AC input within 20 ms
Maximum input voltage (1 kHz or less)(across H and L of each bit)	250 Vrms (CAT I and CAT II)
Maximum allowable common mode voltage (1 kHz or less)	250 Vrms (CAT I and CAT II)
Maximum allowable voltage between bits	250 Vrms (CAT I and CAT II)
Input impedance	Approx. 100 kΩ

### Bridge Head (701955, 701956, 701957, 701958)

Bridge resistance	Model 701955, 701957 : 120Ω Model 701956, 701958 : 350Ω
Applicable gauge methods	Single-gauge Single-gauge three-wire Adjacent-side two-gauge Opposed-side two-gauge Opposed-side two-gauge three-wire Four-gauge
Operating conditions	Temperature: 5 to 40°C Humidity: 20 to 85% RH
External dimensions	Approx. 37(W) × 97(H) × 30(D) mm (701955, 701956) Approx. 50(W) × 101(H) × 29(D) mm (701957, 701958) Approx. 85 g (Bridge head only) (701955, 701956) Approx. 100 g (Bridge head only) (701957, 701958)
Weight	

### Power Supply (701934)

Compatible Probes	700937 Current probe, 701920 Differential probe, 701922 Differential probe 700924 Differential probe, 701921 Differential probe 701930 Current probe, 701931 Current probe 701932 Current probe, 701933 Current probe
No. of Power Receptacles	4
Output Voltage	± (12 ± 0.5) V
Rated Output Current	± 2.5 A (total value for each output)
Rated Supply Voltage	100 - 240VAC (actual power supply voltage may fluctuate within ± 10% of the rating)
Ripple Voltage	50mVp-p
Rated Power	190 VA Max (at the rated output current)
External Dimensions	80(W) × 119(H) × 200(D)mm
Weight	Approx. 1.2 kg

<sup>13</sup> When the supply voltage from the dry cells is 5 V or higher or when using an external power supply.

<sup>14</sup> At an ambient temperature 23±5°C.

<sup>15</sup> Derating is applied towards frequencies.

## Using the Strain Modules (701270, 701271)



Strain Module (NDIS)  
(Model: 701270)

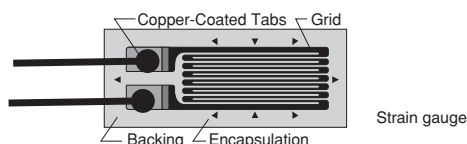


Strain Module (DSUB, Shunt-CAL)  
(Model: 701271)

Two types of modules are available depending on differences in the input connectors and support for shunt calibration. These support not only strain gauges, but also strain gauge type sensors.

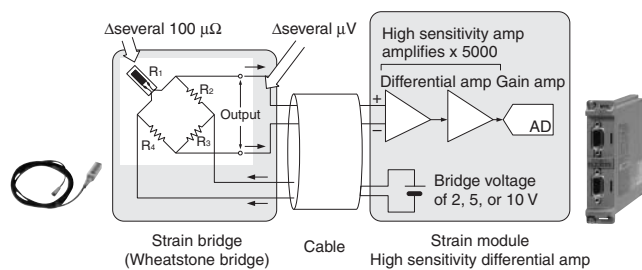
### Strain Gauge

A strain gauge is a sensor that detects mechanical stress (strain). It works on the principle that the resistance value of a metal foil changes as it expands and contracts. The strain gauge uses a specialized sensor that is affixed in the direction of expansion and contraction with an instant adhesive.



<Strain gauge>

The strain gauge's rate of change in resistance is very small. For instance, when using a 120-Ω strain gauge, the change in resistance corresponding to a strain of 1000 μ STR is 0.24 Ω. Relative to 1 μSTR, the change is a mere 0.00024 Ω. Converting such minute resistance changes to voltage requires a Wheatstone bridge.



< Strain gauge and measurement circuit >

Furthermore, because the bridge output is as small as a few micro volts, the input must be amplified inside the strain module using a differential and high gain amp. The DL850 provides amplification of 5000 times.

You can select a bridge voltage (DC) of 2, 5, or 10 V. The higher the input voltage the higher the output voltage. Therefore, low noise measurements are possible, but only a bridge resistance of 350 ohm is supported at 5/10 V .

### Measuring with a Strain Module

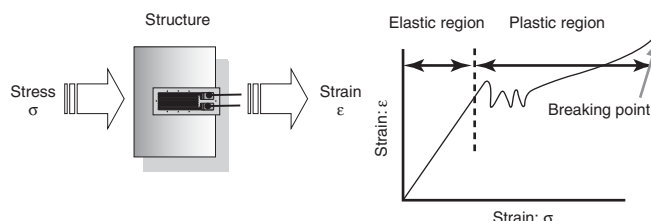
You can determine structural durability (elasticity) by measuring the strain.

$$\sigma = \epsilon E$$

$\sigma$  : stress

$\epsilon$  : strain

$E$  : elasticity (Young's modulus)

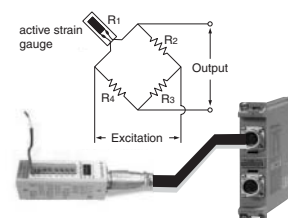


<Relationship between strain and stress>

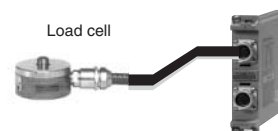
Stress ( $\sigma$ ) is calculated using the elasticity (Young's modulus) which depends on the material of the structure, and the durability of the structure is evaluated from the relationship thereof.

A strain gauge type sensor uses a built-in strain gauge to measure –based on the above principle–stresses that occur with changes in various physical quantities (load, pressure, displacement, vibration, torque, etc.). It then converts those to the original physical quantities and outputs them.

### Connecting to a Strain Module



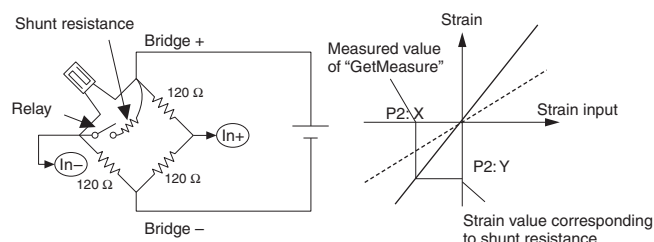
For strain measurements with a strain gauge, use the accessory bridge head.



Strain gauge type sensors are connected directly.

### Shunt Calibration

Shunt calibration (shunt CAL) means correcting the gain in strain measurements by inserting a known resistance (shunt resistance) in parallel with the strain gauge. Correction can be made without (before) introducing a load, and while not perfectly accurate, the correction can include up to the gauge wiring cables.



< Gain correction using shunt CAL (gain correction on the negative (-) side) >

The model 701271 Strain Module (DSUB, shunt CAL) supports shunt calibration. A bridge head that supports shunt CAL (model 701957 or 701958) is required to execute shunt CAL.

## Using the Acceleration Module (701275)



Model 701275 Acceleration/Voltage Module  
(with Anti-Aliasing Filter)

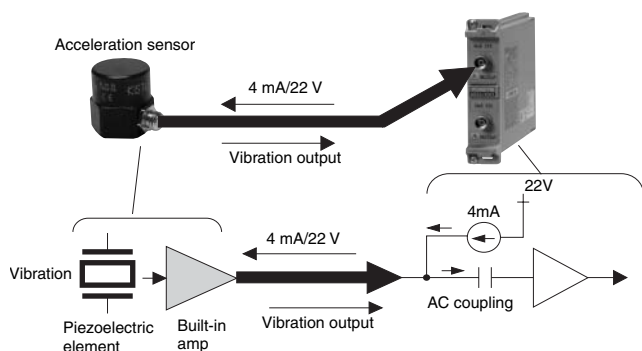
This module will accept direct input from a built-in amp type acceleration sensor to measure acceleration. You can also connect a charge output type acceleration sensor via a commercially available charge converter. Additionally, the module doubles as a voltage module to support common voltage measurements, and an effective anti-aliasing filter is built in for FFT analysis.

### ■ Built-In Amp Type Acceleration Sensors

Built-in amp type acceleration sensors use a voltage (piezoelectric) method, and have a built in piezoelectric element that emits a charge from the area of distortion when it encounters mechanical stress. When vibration occurs, a charge is generated on both ends of the element. Vibration is measured by measuring the voltage proportional to the generated charge.

DC power (4 mA/22 V) is supplied from the module to the sensor, and the vibration detected by the sensor is fed back to the module as AC output. The DC component is cut from the vibration output to isolate the AC component which is then amplified.

The model 701275 Acceleration/Voltage Module supports built-in amp type acceleration sensors. No charge amp is required, allowing sensors to be connected directly. It has low impedance, thus offering anti-noise characteristics.



< Connecting a built-in amp type acceleration sensor >

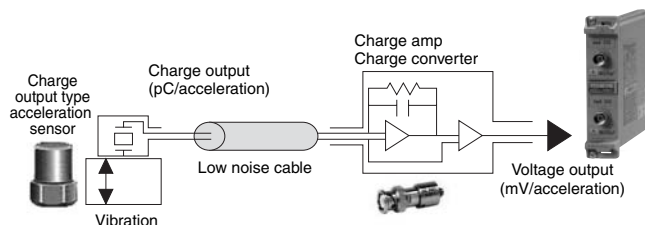
The 701275 Acceleration/Voltage Module can connect to any built-in amp type acceleration sensor that supports a constant drive current of 4 mA and drive voltage of 22 V. Please check the sensor's spec sheet to ensure you are using one that meets the constant drive current and voltage (range) requirement of 4 mA and 22 V. They are available from the following manufacturers.

Kistler: Piezotron<sup>TM1</sup> PCB: ICP<sup>TM1</sup> Endevco: isotron2<sup>TM1</sup>

1. These are registered trademarks.

### ■ Charge Output Type Acceleration Sensors

When you need to perform measurements by connecting a charge output type acceleration sensor, you can input to the 70125 Acceleration/Voltage module through a commercially available charge converter or charge amp.



< Connecting a charge output type acceleration sensor >

The electric charge proportional to acceleration (pC/acceleration) is conveyed to the charge amp via a low noise cable. The charge amp converts charge to voltage (mV/acceleration). Because impedance is high and charge is small, the signal is susceptible to noise and caution should be exercised. The drive current/voltage needed for connecting a built-in amp type acceleration sensor is not required with charge output type acceleration sensors.

When using the model 701275 Acceleration/Voltage Module to measure acceleration, enter output units (sensitivity, mV/unit) that are appropriate for the acceleration sensor being used. The output units are included on the sensor's spec sheet.

When connecting a built-in amp type acceleration sensor, turn ON the bias output (constant drive current).

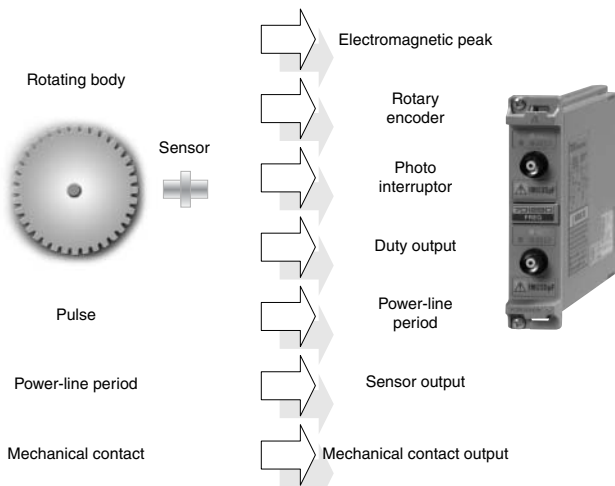
# Using the Frequency Module (701280)



Frequency Module (Model: 701280)

This module incorporates all the functions and performance required for measuring rotating bodies (pulses). It performs measurement of 9 different items, and reads in measured values directly.

With isolated input, its measurement range is 0.01 Hz to 200 kHz. Measured values are updated at high speed (40 μs/25 kHz) for real time confirmation.



< DUTs of the Frequency module >

Test Item	Measurement	Real-Time Calculation	Measurement Range <sup>1</sup>
Frequency (Hz)		Frequency (Hz) = 1/Tw (s)	0.01 Hz-200 KHz
Period (s)		Period (s) = Tw (s)	5 μs-50 s
Rpm		Rpm = freq. (Hz) × pulses per revolution (Nr) × 60	0.01 rpm-100,000 rpm
Rps		Rps = freq. (Hz) × pulses per revolution (Nr)	0.001 rps-2000 rps
Duty (%)		Duty (%) = Thigh (s) × Tw (s) or Tlow (s) × Tw (s)	0%-100%
Pulse width		Pulse width (sec) = Thigh (s) or Tlow (s)	2 μs-50 s
Power Supply Freq. (Hz)		Power supply freq. (Hz) = 1/Tw (s) at the 50/60 Hz setting, 0.01 Hz resolution	(50 Hz, 60 Hz, 400 Hz) ±20 Hz
Pulse Integration (Distance/Quantity of flow)		Distance = N (count) × distance per pulse ℓ * Distance ℓ and units are user-definable.	up to 2 × 10 <sup>9</sup> count
Velocity (km/h, mph)		Velocity (km/h) = distance per pulse ℓ (km) × Tw (s) × 3600 Velocity (m/s) = distance per pulse ℓ (m) × Tw (s) * Units are user-definable (angular velocity and other units)	F = (1/Tw) = 0.01 Hz-200 kHz

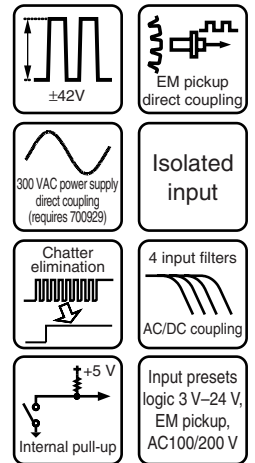
<sup>1</sup> Allowable input frequency range : 0.01 Hz-200 kHz

< Frequency module test items >

Unlike general FV converters, the model 701280 Frequency Module does not require scale conversion when acquiring measurement items such as the ones in figure 1 because it can read in values directly. It not only displays data as waveforms, but enables cursor and waveform parameter measurement of those waveforms.

## Input Signals

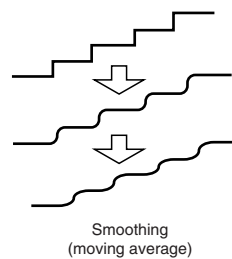
A variety of signal types can be input, such as encoder pulse input of up to ±42 V, powered electromagnetic pickup direct input (1:1), and AC power of up to 300 V (when using a 10:1 probe). The isolation function, amplifier, and filters are all equivalent to those in a normal voltage module, therefore it supports a broad range of voltage (6 ranges) and input formats. Precise chattering elimination from 1 ms to 1 s is supported. The unit comes configured with menu presets for logic input (3 V to 24 V), electromagnetic pickup, AC power, and other inputs.



## Real-Time Digital Filtering

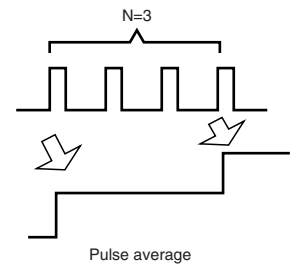
### Smoothing Filter (Moving Average)

Smooth stair-step shaped waveforms: Updating occurs every 40 μs, giving a high speed averaging effect. Filters are set at 0.1ms-1 sec (up to the 25000th order). Filters reduce jitter in observed waveforms, and increases resolution.



### Pulse Average

Useful for determining the average value per rotation, or determining the number of rotations when a gear is missing teeth. Output is averaged every specified number of pulses (between 1 and 4096 pulses).

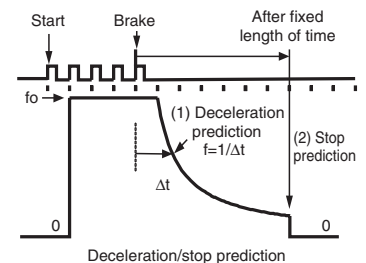


## Supports Braking Applications

By predicting the deceleration curve and stop point, the module automatically compensates for the lack of information on encoder pulses which occur during deceleration.

### Deceleration Prediction (1)

Automatically calculates and outputs a deceleration curve based on the interval of the last input pulse.



### Stop Prediction (2)

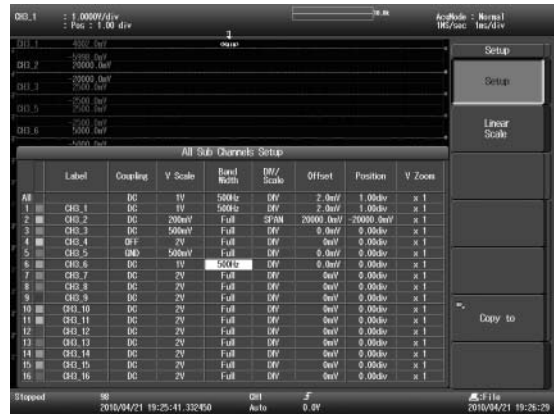
If no pulses are inputted for a period of time, a stop is inferred, and output is set to 0. Up to 10 steps can be specified.

You can detect actions from pulse output stop (break, etc.) to the actual stop, therefore it is effective for applications involving pulse measurement associated with deceleration and stopping.

## Using the 16 Channel Voltage Input Module (720220)



16-CH Voltage Input Module (Model: 720220)



< Channel setting screen >

This is a multichannel voltage module capable of measuring 16 channels of DC voltage on a single unit. Scan method measurements are possible by using a removable spring terminal block (removable in 8 channel sections) at the input. The input section uses Weidmueller B2L 3.5/16LH clamp connectors. The maximum sampling rates are 200 kS/s (1 CH) and 10 kS/s (16 CH simultaneous). The minimum voltage input range is 200 mV/div, and the maximum is 42 V (direct input, 1 kHz or less). You can build a 128 CH measuring system by installing up to 8 modules in a single DL850/DL850V.

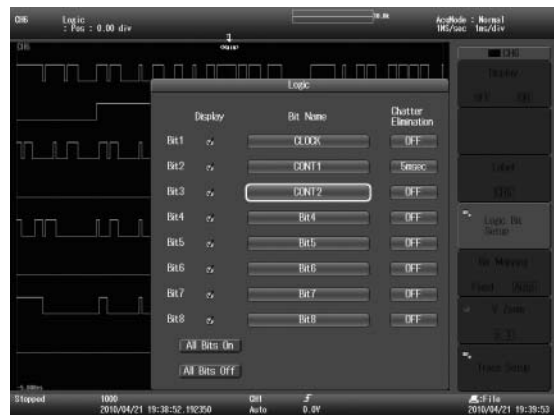
On each of the 16 channels (and subchannels) in the module, you can individually set the range and other input conditions, position, zoom, and other display conditions.

Input terminal blocks are isolated from ground. There is no isolation between channels within the input terminal block. The following electrical wire is recommended to be used. 0.20 mm<sup>2</sup> to 1.00 mm<sup>2</sup> (solid wire or thin stranded wire). AWG size: 24-18.

## Using the Logic Input Module (720230)



Logic Input Module (Model: 720230)



< Logic display setting screen >

Input logic signals can be displayed as waveforms at a sampling resolution of up to 10 MS/s. Each port can measure 8 bits, and 2 ports of input are available on each module. Thus, a single module can observe 16-bit logic signals. You can turn display of individual bits ON/OFF, and give each bit its own unique label.

The input format, maximum input voltage, threshold level, and other settings depend on the logic probe being used. Please refer to the specifications of your logic probe. The following logic probes can be used.

In all, you can input and display up to 128 bits of logic signals by installing up to 8 modules in a single DL850/DL850V. You can select from 4 different types of logic probe to best fit the input signal. For details on logic probes, see page 6 of this catalog. Also see the "Bulletin DL850-00E" catalog for logic probe adaptors and other accessories.)



Logic Probe  
(TTL level/Contact Input)  
1m: 702911/3m: 702912



High-Speed Logic Probe  
700986



Isolation Logic Probe  
700987

Model	702911/702912	700986	700987
Number of inputs	8	8	8
Isolated/ non-isolated	Non-isolated	Non-isolated	Isolated
Max. input voltage	±35V	30Vrms	250Vrms
Threshold level	Approx. 1.4 V	Approx. 1.4 V	6VDC or 50VAC
Response time	3 μs or less	1 μs or less	1ms or less(DC), 20ms or less(AC)

## Using the CAN Bus Monitoring Module (720240 and DL850V Only)



CAN Bus Monitor Module (Model: 720240)

The module interprets the CAN protocol, monitors communication data on the bus, and displays the time series trend waveforms. It is connected as an ISO-11898 CAN bus node, able to read data frames communicating on the bus.

By combining it with other input modules, it can simultaneously measure communication data on the CAN bus, voltage and temperature, sensor signals and other changes in analog data over time, as well as ECU (Electronic Control Unit) control block signals. These data can be displayed as waveforms or saved as files. All related data in the system can be interpreted, enabling evaluation of the overall CAN system.

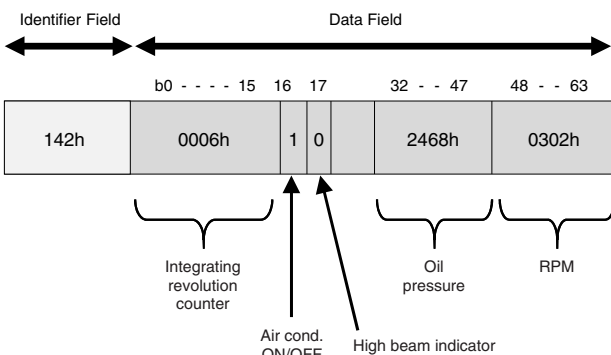
### ■ CAN Frames

This module can monitor data frames defined by the CAN protocol. It supports both standard and extended format.

#### ● Data Frame

A frame that outputs data on the CAN bus

### ■ CAN Data Monitoring Method



< Examples of CAN frames and physical data >

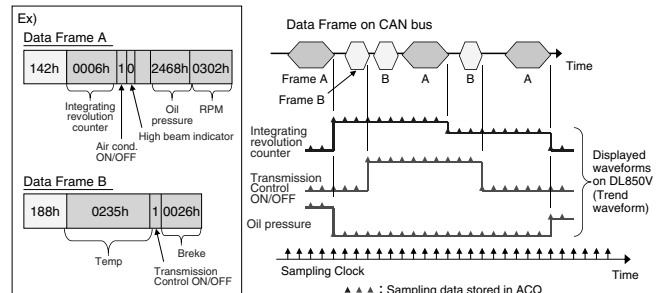
With CAN data frames, multiple data (physical data) are carried and received under a single ID.

The model 720240 CAN Bus Monitoring Module acquires (extracts) identifiers for data fields defined as channel settings (for example, "oil pressure" or "RPM"), then re-samples the data and converts it to time series data.

Data sections can be specified on up to 60 signals per port for a total of up to 120 channels per module. Both standard (11-bit) and extended (29-bit) message IDs can be specified, and arbitrary locations and bit lengths can be specified for extraction.

### ■ Sampled Data and Displayed Waveforms

Extracted data is stored in memory at up to 100 ks/s while simultaneously being displayed on screen as trends.



< Relationship between sampling data and displayed waveform(s) >

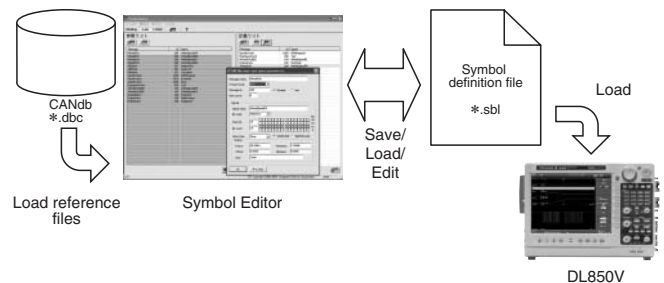
Sampled data (trend waveform data) can be saved to files.



< Example monitor screen >

### ■ Using the CANdb Database

You can use Vector Informatik's CANdb database file (.dbc format) to indicate the field being monitored (acquired). Using Yokogawa's free Windows PC software, "Symbol Editor," you can convert a CANdb (.dbc format) file to our proprietary symbol definition file (.sbl format) and import that file onto the DL850V.



< Using a CANdb database file >

### ■ Outputting Frame Data

Single specified (defined) data frames or remote frames can be output (manually, at desired timing).

Plug-in Module Model Numbers	
Model	Description
701250	High-speed 10 MS/s 12-Bit Isolation Module (2 ch)
701251	High-speed 1 MS/s 16-Bit Isolation Module (2 ch)
701255	High-speed 10 MS/s 12-Bit non-Isolation Module (2 ch)
701260	High-voltage 100 kS/s 16-Bit Isolation Module (with RMS, 2 ch)
701261	Universal Module (2 ch)
701262	Universal Module (with Anti-Aliasing Filter, 2 ch)
701265	Temperature/high-precision voltage Module (2 ch)
701270	Strain Module (NDIS, 2 ch)
701271	Strain Module (DSUB, Shunt-CAL, 2 ch)
701275	Acceleration/Voltage Module (with Anti-Aliasing Filter, 2 ch)
701280	Frequency Module (2 ch)
720210	High-speed 100 MS/s 12-Bit Isolation Module (2 ch)
720220	Voltage Input Module(16 ch)
720230	Logic Input Module (16 ch)
720240	CAN Bus Monitor Module (120ch, available DL850V only)

\* Probes are not included with any modules.

Note 1: These modules can be used with the DL750/DL750P/SL1000 and SL1400 as well with some exceptions.

Note 2: When using these module(s) with the SL1000, some indications for specifications are different. See the SL1000 instruction manual for details.

Note 3: Max. four(4) 720210 modules can be installed in a main unit.

Note 4: Max. two(2) 720240 modules can be installed in a DL850V main unit.

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\* Any company's names and product names mentioned in this document are trade names, trademarks or registered trademarks of their respective companies.

Probes, Cables, and Converters		
Product	Model No.	Description <sup>1</sup>
100:1 Isolation Probe	701947	1000V (DC+Acpeak) CAT II
10:1 Probe (for Isolated BNC Input)	700929	1000 Vrms-CAT II
1:1 Safety BNC Adapter Lead (in combination with followings)	701901	1000 Vrms-CAT II
Safety Mini-Clip (Hook type)	701959	1000 Vrms-CAT II, 1 set each of red and black
Large Alligator-Clip (Dolphin type)	701954	1000 Vrms-CAT II, 1 set each of red and black
Alligator Clip Adaptor Set (Rated Voltage 1000 V)	758929	1000 Vrms-CAT II, 1 set each of red and black
Alligator Clip Adaptor Set (Rated Voltage 300 V)	758922	300 Vrms-CAT II, 1 set each of red and black
Fork Terminal Adapter Set	758321	1000 Vrms-CAT II, 1 set each of red and black
Passive Probe <sup>2</sup>	701940	Non-isolated 600 Vpk (701255)(10:1)
1:1 BNC-Alligator Cable	366926	Non-isolated 42 V or less, 1m
1:1 Banana-Alligator Cable	366961	Non-isolated 42 V or less, 1.2m
Current Probe <sup>3</sup>	701933	30 Arms, DC to 50 MHz, supports probe power
Current Probe <sup>3</sup>	701930	150 Arms, DC to 10 MHz, supports probe power
Current Probe <sup>3</sup>	701931	500 Arms, DC to 2 MHz, supports probe power
Probe Power Supply <sup>4</sup>	701934	Large current output, external probe power supply (4 outputs)
Shunt Resistor	438920	250 $\Omega \pm 0.1\%$
Shunt Resistor	438921	100 $\Omega \pm 0.1\%$
Shunt Resistor	438922	10 $\Omega \pm 0.1\%$
Differential Probe	700924	1400 Vpk, 1000 Vrms-CAT II
Differential Probe	700925	500 Vpk, 350 Vrms (For 701255)
Differential Probe	701926	7000Vpk, 5000Vrms
Bridge Head (NDIS, 120 $\Omega$ /350 $\Omega$ )	701955/56	With 5 m cable
Bridge Head (DSUB, Shunt-CAL, 120 $\Omega$ /350 $\Omega$ )	701957/58	With 5 m cable
Safety BNC-banana Adapter	758924	500 Vrms-CAT II
Printer Roll Paper	B9988AE	For DL750, DL850, DL850V, 10 m x 10
Logic Probe <sup>5</sup>	702911	8-Bit, 1 m, non-Isolated, TTL level/Contact Input
Logic Probe <sup>5</sup>	702912	8-Bit, 3 m, non-Isolated, TTL level/Contact Input
High-speed Logic Probe <sup>5</sup>	700986	8-Bit, non-Isolated, response speed: 1 $\mu$ s
Isolated Logic Probe <sup>5</sup>	700987	8-Bit, each channel isolated
Measurement Lead Set	758917	Measurement leads (2 per set) Alligator-Clip is required separately.
Safety BNC-BNC Cable (1 m)	701902	1000 Vrms-CAT II (BNC-BNC)
Safety BNC-BNC Cable (2 m)	701903	1000 Vrms-CAT II (BNC-BNC)
External I/O Cable	720911	For external I/O connection
Plug-On Clip	701948	For 700929 and 701947
Long Test Clip	701906	For 700924 and 701926
Terminal	A1800JD	For 720220 module, One (1) piece
Soft Carrying Case	701963	For DL850/DL850V/DL750

<sup>1</sup> Actual allowable voltage is the lower of the voltages specified for the main unit and cable.

<sup>2</sup> 42 V is safe when using the 701940 with an isolated type BNC input.

<sup>3</sup> The number of current probes that can be powered from the main unit's power supply is limited.

<sup>4</sup> Any number of externally powered probes can be used.

<sup>5</sup> Includes one each of the B9879PX and B9879KX connection leads.

<sup>6</sup> Additionally, 758917 and either the 758922 or 758929 are required for measurement.

### Yokogawa's Approach to Preserving the Global Environment

- Yokogawa's electrical products are developed and produced in facilities that have received ISO14001 approval.
- In order to protect the global environment, Yokogawa's electrical products are designed in accordance with Yokogawa's Environmentally Friendly Product Design Guidelines and Product Design Assessment Criteria.

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