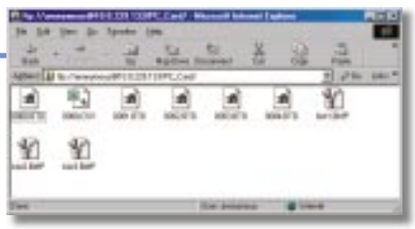
Advanced Networking and PC Connectivity

Web Server Functions

Connect the DL750 to your PC through the Ethernet connection. This allows for easy remote operation using Internet Explorer.

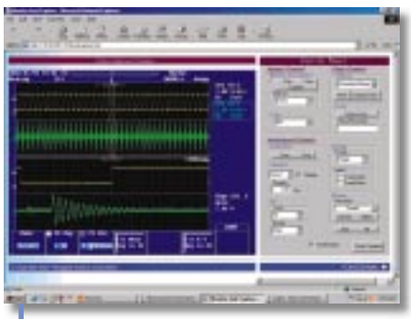
FTP

You can easily copy and paste files to and from a PC and the instrument's flash memory or other storage media.



Measurement Trend

Using Internet Explorer, you can periodically or manually download screen images to a PC for remote waveform monitoring. You can also download waveform data, start or stop a measurement, or setup a split display all from a PC.



Data Capture

This function downloads values of waveform parameters periodically, launches MS Excel and graphs the parameters on a spreadsheet values. This enables you to check the parameter trends at a glance.

Software for Waveform Measurement on a PC

Software for Remotely Controlling the DL Series

Wirepuller

The Wirepuller software program displays a screen image of the DL's front panel on your PC so that you can monitor waveform signals. In addition, you can use the PC's mouse and keyboard to control the DL. The DL can be controlled via an Ethernet, USB, or GP-IB.

This software program can be downloaded from the following URL (requires registration):
http://www.yokogawa.com/tm/Bu/DLsoft/wire/
Further details are available at the YOKOGAWA web site.

Software for Using Your PC to Check Waveform Data Captured in Long Memory

Waveform Viewer for DL Series

The Waveform Viewer software program lets you view waveform signals on your PC just as they appear on the DL screen. This includes zoom display, X-Y display and the history memory thumbnail displays. In addition, data can be converted to CSV format for use in programs like Excel.

A trial version of this software program can be downloaded from the following URL:
http://www.yokogawa.com/tm/Bu/700919/
Further details are available at the YOKOGAWA web site.

Main Unit Specifications

Basic Specifications

- Input
  - Type: Plug-in module (Each unit has a build-in A/D converter)
  - Slots: 8
  - Logic inputs: 16 (8 bits × 2)
- Horizontal
  - Maximum record length: 2.5 MW/CH, 50 MW total (standard)
    10 MW/CH, 250 MW total (with /M1 option)
    25 MW/CH, 500 MW total (with /M2 option)
    50 MW/CH, 1 GW total (with /M3 option)
  - Time axis accuracy1: ±0.005%
  - Sweep time: 500 ns to 5 sec/div (in steps of 1, 2, or 5), 10 sec/div, 20 sec/div, 30 sec/div
    3, 4, 6, 8, 10, 20, 30 sec/div
    1 to 10 min/div (1 min steps), 12 min/div, 15 min/div, 30 min/div
    1 to 10 h/div (1 h steps), 12 h/div
    1 day/div, 2 days/div, 3 days/div
- Acquisition modes
  - Normal: Maximum sampling rate: 10 MS/s
  - Envelope: Holds peak value at maximum sampling rate, regardless of time/div setting
  - Box average: Increases A/D resolution up to 4 bits (up to 16 bits)
  - Averaging: Number of averaging: 2 to 65,536 (2^n steps)
  - Roll: 100 msec/div or less
- Triggers
  - Modes: AUTO, AUTO LEVEL, NORMAL, SINGLE, SINGLE (N), LOG
  - Pretrigger: 0 to 100% (in 0.1% step)
  - Simple trigger source: CH1 to CH16, DSP1 to DSP6, LINE, EXT, LOGIC_A, LOGIC_B, TIME
  - Slope selection: CH1 to CH16, DSP1 to DSP6: Rise, fall, rise-fall
    EXT (external trigger input), LOGIC_A, LOGIC_B: Rise, fall
    Time: Date (year/month/date), hour (hours/minutes), time interval (1 minute to 24 hours)
  - Enhanced trigger source: CH1 to CH16, LOGIC_A, LOGIC_B
  - Enhanced trigger type: A → B (N), A delay B, B > Time, B < Time, B Time Out, Period, Window, OR, Edge On A, Wave Window
- Screen updating rate: Maximum 30 screens/sec for a single waveform

1. Typical operating conditions: Ambient temperature of 23°C ± 5°C, ambient humidity (RH) of 55 ± 10%

Display

- Display: 10.4-inch color TFT liquid crystal display
- Effective screen size: 211.2 mm × 158.4 mm
- Resolution: 800 × 600[1]
- Waveform display pixels: 650 × 512 (in normal waveform display mode)
  750 × 512 (in wide waveform display mode)
- Display modes
  - Split: Single, dual, triad, quad, octal
  - Zoom: Main, Main & Z1, Main & Z1 & Z2, Main & Z2, Z1 Only, Z2 Only, Z1 & Z2 (Z1 and Z2 are

abbreviations for zoom area 1 and zoom 2, respectively)
XY Single Mode (X is fixed, Y is set by user), Quad Mode (XY1, XY2, XY3, XY4)
Accumulation PERSIST Overlays in one color.

1. The LCD may contain some pixels that are always off or always on. In addition, brightness may vary due to the characteristics of the liquid crystal display. This is not an indication of any problem with the display.

Recorder

● Built-in printer
Printing method Thermal line-dot printing
Paper width 112 mm
Effective recording width 104 mm
Functions Screen printing, long printing
● Real-time hard drive recording (with /C8 option)
Data capacity 1 GW (for one time record)
Maximum sampling rate 100 kS/s (using 1 channel)

DualCapture

This function captures the same waveform data at two different sampling rates.
Main (low-speed) maximum sampling rate
Roll mode area at 100 kS/s
Sub (high-speed) maximum sampling rate
10 MS/s
Main maximum memory length
100 MW (with /M3 option)
Sub memory length 10 kW (fixed)
Sub maximum number of captured screens
100

Analysis Functions

● Channel-to-channel calculation function
Definable math waveforms 8
Calculable record length 800 kW (using MATH1 only)
100 kW (using MATH1 through MATH8)
Standard operators Addition, subtraction, multiplication, division, binary conversion, phase shifting, FFT
FFT type PS (Power Spectrum)
Number of points 1000, 2000, 10,000
Window functions Rectangular, Hanning, Flat-Top
User-defined math function (with /G2 option)
Operators ABS, SQR, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, BIN, P2, P3, F1, F2, FV, PWHH, PWHL, PWLH, PWLL, PWXX, FILT1, FILT2, HLBT, MEAN, MAG, LOGMAG, PHASE, REAL, IMAG
FFT types LS, PS, PSD, CS, TF, CH
Number of points 1000, 2000, 10,000
Window functions Rectangular, Hanning, Flat-Top

DSP Channel Function (with the /G3 option)

DSP channels 6
Maximum sampling rate[1] 100 kS/s (when exceeding 100 kS/s, the sampling rate is resampled at 100 kS/s)
Operators Calculation between channels (addition, subtraction, multiplication, division), differentiation (w/ LPF), integration, digital filtering (LPF/HPF/BPF, FIR type, IIR type, variable cutoff frequency)
Digital filtering cutoff setting range
IIR type: 0.2 to 30% of sampling frequency
FIR type: 2 to 30% of sampling frequency
Calculation delay 4 sampling + digital filtering calculation delay

1. When the DSP channel is ON, the maximum sampling rate of the analog channel is 5 MS/s.

Waveform Measurement Functions

● Cursors
Types Horizontal Two cursors
Vertical Two cursors
Marker Four markers
Degree Cursor measurement on the horizontal axis is displayed in a degree. (for TY display only)
H&V (for XY display only)
● Automatic measurement of waveform parameters
Maximum number of measured parameters
24
Measured parameters P-P, Max, Min, High, Low, Avg, Rms, Amp, StdDev, +Oshot, –Oshot, Rise, Fall, Freq, Period, +Duty, +Width, –Width, Pulse Burst1, Burst2, Avg Freq, Avg Period, Delay, Int1TY, Int2TY, Int1XY, Int2XY
● Cycle statistical process
Maximum number of cycles 24,000 (for one parameter)
Maximum total number of parameters
24,000 (total measured results)
Statistical values Maximum/minimum/average/standard deviations/number of samples
Maximum measurement range 10 MW
● Search function Edge, voice, auto scroll
● History search function Zone
● GO/NO-GO Judgment
Parameter: Make judgments using combinations of 16 waveform parameters.
Zone: Make judgments using combination of up to 6 waveform zones (AND, OR)
Actions: One or more of the followings: outputs screen image data, saves waveform data, sounds a buzzer, sends email

Screen Data Output (Printer)

Destinations Select built-in printer, external USB printer, or network printer (with /C10 option)
Formats Normal Outputs hard copy of screen shot
Long Zooms displayed waveform along time axis and outputs (The zoom factor differs depending on the time/div.)

Screen Data Output (Image Saving)

Destinations Installed drive (floppy drive, Zip® drive, or PC card), external SCSI drive, internal hard drive (with /C8 option), network drive (with /C10 option)
Formats PNG, JPEG, BMP, PostScript

External I/O

● LOGIC input specifications
Input points 8 bits × 2
Maximum sampling rate 10 MS/s
Compatible probes 8-bit non-isolated (700986), 8-bit isolated (700987)
● EXT TRIG IN/EXT TRIG OUT
Connector RCA pin jack
Input/output level TTL (0 to 5 V)
● EXT Clock IN
Connector RCA pin jack
Input level TTL (0 to 5 V)
Input frequency Up to 1 MHz (for module 701250/701251/701255), up to 100 kHz (for module 701260/701270/701271, DSP-CH), up to 500 Hz (for module 701265)
● Communication interfaces
GP-IB, USB peripheral equipment jacks (USB keyboards and USB printers), USB (complies with Rev. 1.1, for connection to PC), Ethernet (complies with 100BASE-TX and 10BASE-T; with /C10 option), serial (RS232), and SCSI
● GO/NO-GO I/O
Connector type Modular jack (RJ12)
I/O level TTL (0 to 5 V)
● Probe power terminal (with /P4 option)
Maximum number of probes powered 4
Compatible probes Current probes 700937 (15 Apeak) and 701930 (150 Arms)
Maximum number of current probes that can be used at one time
4 (for module 700937), 2 (for module 701930)

Voice Memo Function

● Voice memo
Record (roll mode)
Flexible: Multiple recording (min. 3 sec up to 100 sec, total 100 sec)
Fixed: Select from 5 sec × 20, 10 sec × 10, 20 sec × 5, 25 sec × 4, 50 sec 2, 100 sec × 1
Save Save together with waveform data (binary, same file)
Playback Voice data loaded on the main unit is outputted from microphone terminal and speaker output terminal (GO/NO-GO)
● Voice comment
Record 3 to 100 sec
Save When image saving is executed (separate file)
Playback Playback from microphone terminal and speaker output terminal (GO/NO-GO)

Acquisition Memory Backup

Batteries Four AA alkaline dry cells (AA/R6) (JIS and IEC type name: LR6) or four nickel metal-hydride rechargeable batteries
Backed up data Acquisition memory, waveform data, voice data
Backup duration (reference value)[2]
Approximately 10 hours (with /M3 option)

2. Actual backup duration will vary according to the usage conditions.

Media Drives

Internal media drives Floppy drive, Zip® drive, or PC card (choose one), and 20 GB hard drive (with /C8 option)

General Specifications

Rated supply voltage 100 to 120 VAC/200 to 240 VAC (automatically switched)
Rated supply frequency 50/60 Hz
Power consumed Approximately 200 VA-MAX
Maximum voltage 1500 VAC for one minute across power supply and ground
Insulating resistance 10 MΩ or greater at 500 VDC across power supply and ground
Exterior 355 × 250 × 180 mm (WHD), excluding knobs and protrusions
Weight Approx. 6.6 kg (main unit with full options, including M3, C8, C10, and P4)
Approx. 9 kg (main unit and eight 701250 modules)
Operating temperature range
5 to 40°C

For detailed specifications, go to the following URL: http://www.yokogawa.com/tm/Bu/DL750/

Plug-In Module Specifications

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

Input channels	2
Input couplings	AC, DC, GND
Maximum sampling rate	10 MS/s
A/D conversion resolution	12 bits (150 LSB/div)
Input type	Isolated unbalanced
Frequency range(–3 dB)[1]	DC, up to 3 MHz
Input range (10:1)	50 mV/div to 200 V/div (in steps of 1, 2, or 5),
(1:1)	5 mV/div to 20 V/div (in steps of 1, 2, or 5)
Effective measurement range	20 div (display range: 10 div)
DC offset	±5 div
Maximum input voltage (1 kHz or less)	
In combination with 700929 (10:1) [2]	600 V (DC + ACpeak)
Direct input (1:1) [6, 10]	250 V (DC + ACpeak)
Maximum allowable in-phase voltage	
In combination with 700929 (10:1) [3]	400 Vrms (CAT I), 300 Vrms (CAT II)
In combination with 7019in steps of 1, 2, or 5+701954 (1:1) [9]	400 Vrms (CAT I), 300 Vrms (CAT II)
Main unit only (1:1) [11]	42 V (DC + ACpeak) (CAT I and CAT II, 30 Vrms)
DC accuracy[1]	±(0.5% of 10 div)
Input impedance	1 MΩ ± 1%, approx. 35 pF
Connector type	Isolation type BNC connector
Input filter	OFF, 500 Hz, 5 kHz, 50 kHz, 500 kHz
Temperature coefficient	
Zero point	±(0.05% of 10 div)/°C (typical value)
Gain	±(0.02% of 10 div)/°C (typical value)

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

Input channels	2
Input couplings	AC, DC, GND
Maximum sampling rate	1 MS/s
A/D conversion resolution	16 bits (2400 LSB/div)
Input type	Isolated unbalanced
Frequency range (–3 dB)[1]	DC, up to 300 kHz (20 V/div to 5 mV/div)
Input range	
(10:1)	10 mV/div to 200 V/div (in steps of 1, 2, or 5)
(1:1)	1 mV/div to 20 V/div (in steps of 1, 2, or 5)
Maximum input voltage (1 kHz or less)	
In combination with 700929 (10:1) [2]	600 V (DC + ACpeak)
Direct input (1:1) [6, 10]	140 V (DC + ACpeak)
Maximum allowable in-phase voltage	
In combination with 700929 (10:1) [3]	400 Vrms (CAT I), 300 Vrms (CAT II)
In combination with 701901+701954 (1:1) [9]	400 Vrms (CAT I), 300 Vrms (CAT II)
Main unit only (1:1) [11]	42 V (DC + ACpeak) (CAT I and CAT II, 30 Vrms)
DC accuracy[1]	
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)
Input impedance	1 MΩ ± 1%, approx. 35 pF
Connector type	Isolated type BNC connector
Input filter	OFF, 400 Hz, 4 kHz, 40 kHz
Temperature coefficient	
Zero point	5 mV/div to 20 V/div: ±(0.02% of 10 div)/°C (typical value)
	2 mV/div: ±(0.05% of 10 div)/°C (typical value)
	1 mV/div: ±(0.10% of 10 div)/°C (typical value)
Gain	1 mV/div to 20 V/div: ±(0.02% of 10 div)/°C (typical value)

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

Input channels	2
Input couplings	AC, DC, GND
Maximum sampling rate	10 MS/s
A/D conversion resolution	12 bits (150 LSB/div)
Input type	Non-isolated unbalanced
Frequency range (–3 dB)[1]	DC, up to 3 MHz
Input range (10:1)	50 mV/div to 200 V/div (in steps of 1, 2, or 5)
(1:1)	5 mV/div to 20 V/div (in steps of 1, 2, or 5)
Effective measurement range	20 div (display range 10 div)
DC offset	±5 div
Maximum input voltage (1 kHz or less)	
In combination with 701940 (10:1)	600 V (DC + ACpeak)
Direct input (1:1)	250 V (DC + ACpeak)
DC accuracy[1]	±(0.5% of 10 div)
Input impedance	1 MΩ ± 1%, approx. 35 pF
Connector type	Metal type BNC connector
Input filter	OFF, 500 Hz, 5 kHz, 50 kHz, 500 kHz
Temperature coefficient	
Zero point	±(0.05% of 10 div)/°C (typical value)
Gain	±(0.02% of 10 div)/°C (typical value)
Adaptive passive probe (10:1)	701940

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

Input channels	2
Input couplings	AC, DC, GND, AC-RMS, DC-RMS
Maximum sampling rate	100 kS/s
A/D conversion resolution	16 bits (2400 LSB/div)
Input type	Isolated unbalanced
Frequency range (–3 dB)[1]	
Waveform measurement mode	DC, up to 40 kHz
RMS measurement mode	DC, 40 Hz to 10 kHz
Input range (10:1)	200 mV/div to 2000 V/div (in steps of 1, 2, or 5)
(1:1)	20 mV/div to 200 V/div (in steps of 1, 2, or 5)
Effective measurement range	20 div (display range 10 div)
DC offset	±5 div
Maximum input voltage (1 kHz or less)	
In combination with 700929 (10:1) [2]	1000 V (DC + ACpeak)
In combination with 701901+701954 (1:1) [6]	850 V (DC + ACpeak)
Maximum allowable in-phase voltage	
In combination with 700929 (10:1)	H side: 1000 Vrms (CAT II) [4], L side: 400 Vrms (CAT II) [5]
In combination with 701901+701954 (1:1)	H side: 700 Vrms (CAT II) [7], L side: 400 Vrms (CAT II) [8]
Direct input (when using a cable which doesn't comply with the safety standard)	H/L sides: 30 Vrms (42 V DC + ACpeak)[11]
DC accuracy (waveform measurement mode)[1]	±(0.25% of 10 div)
DC accuracy (RMS measurement mode)[1]	±(1.0% of 10 div)
AC accuracy (RMS measurement mode)[1]	
Sine wave input	±(1.5% of 10 div)
Crest factor of 2 or less	±(2.0% of 10 div)
Crest factor of 3 or less	±(3.0% of 10 div)
Input impedance	1 MΩ ± 1%, approx. 35 pF
Connector type	Isolated type BNC connector
Input filter	OFF, 100 Hz, 1 kHz, 10 kHz
Temperature coefficient (waveform measurement mode)	
Zero point	±(0.02% of 10 div)/°C (typical value)
Gain	±(0.02% of 10 div)/°C (typical value)
Response time (RMS mode)	
Rise (0 to 90% of 10 div)	100 ms (typical)
Fall (100 to 10% of 10 div)	250 ms (typical)
Crest factor (only at RMS measurement)	3 or less

* Please use 701901 (1:1 safety adaptor lead) or 700929 (10:1 safety probe), which complies with the safety standard, for high-voltage input.
* It is very dangerous to use cables that do not comply with the safety standard.

Temperature/High-Precision Voltage Module (701265)

Input channels	2
Input couplings	TC (thermocouple), DC, GND
Input type	Isolated unbalanced
Applicable sensors (input coupling: TC)	K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel
Data updating rate	500 Hz
Frequency range (-3 dB)[1]	DC, up to 100 Hz
Voltage accuracy[1] (at voltage mode)	±(0.08% of 10 div + 2 µV)
Temperature measurement accuracy [1, 12]	

Type	Measured range	Accuracy
K	–200°C to 1300°C	±(0.1% of reading + 1.5°C)
E	–200°C to 800°C	except –200 to 0°C:
J	–200°C to 1100°C	±(0.2% of reading + 1.5°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, S	0°C to 1700°C	±(0.1% of reading + 3°C) except 0 to 200°C: ±8°C, 200 to 800°C: ±5°C
B	0°C to 1800°C	±(0.1% of reading + 2°C), except 400 to 700°C: ±8°C, Effective range: 400 to 1800°C
W	0°C to 2300°C	±(0.1% of reading + 3°C)
Iron-doped gold/chromel	0 to 300 K	0 to 50 K: ±4 K, 50 to 300 K: ±2.5 K

Maximum input voltage (1 kHz or less)	42 V (DC + ACpeak) (CAT I and CAT II, 30 Vrms)
Input range (for 10 div display)	100 µV/div to 10 V/div (in steps of 1, 2, or 5)
Input connector	Binding post
Input impedance	Approx. 1 MΩ
Input filter	OFF, 2 Hz, 8 Hz, 30 Hz
Temperature coefficient (for voltage)	
Zero point	±((0.01% of 10 div)/°C + 0.05 µV)/°C (typical value)
Gain	±(0.02% of 10 div)/°C (typical value)

Strain Module (NDIS) (701270)

Input channels	2
Input types	DC bridge input (automatic balancing), balanced differential input, DC amplifier (floating)
Automatic balancing method	Electronic auto-balance
Automatic balancing range	±10,000 µSTR (1 gauge method)
Bridge voltages	Select from 2 V, 5 V, or 10 V
Gauge resistances	120 to 1000 Ω (bridge voltage of 2 V)
	350 to 1000 Ω (bridge voltage of 2/5/10 V)
Gauge rate	1.90 to 2.20 (variable in steps of 0.01)
A/D resolution	16 bits (4800 LSB/div: Upper=+FS, Lower=–FS)
Maximum sampling rate	100 kS/s
Frequency range (–3 dB)[1]	DC, up to 20 kHz
DC accuracy[1]	±(0.5% of FS + 5 µSTR)
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

mV/V range support	mV/V range = 0.5 × (µSTR range/1000)
Maximum allowable input voltage (1 kHz or less)	10 V (DC + ACpeak)
Maximum allowable in-phase voltage	42 V (DC + ACpeak) (CAT I and CAT II, 30 Vrms)
Temperature coefficient	
Zero point	±5 µSTR/°C (typical value)
Gain	±(0.02% of FS)/°C (typical value)
Internal filter	OFF, 1 kHz, 100 Hz, 10 Hz
Input connector	NDIS standard
Accessory (a set of connector shell for solder connection)	2 NDIS connectors (A1002JC)
Recommended bridge head (NDIS type) (sold separately)	701955 (bridge resistance of 120 Ω) (w/ 5 m cable)
	701956 (bridge resistance of 350 Ω) (w/ 5 m cable)

Plug-In Module Specifications

Strain Module (DSUB, Shunt-cal) (701271)

Input channels	2
Input types	DC bridge input (automatic balancing), balanced differential input, DC amplifier (floating)
Automatic balancing method	Electronic auto-balance
Automatic balancing range	±10,000 µSTR (1 gauge method)
Bridge voltages	Select from 2 V, 5 V, or 10 V
Gauge resistances	120 to 1000 Ω (bridge voltage of 2 V) 350 to 1000 Ω (bridge voltage of 2/5/10 V)
Gauge rate	1.90 to 2.20 (variable in steps of 0.01)
A/D resolution	16 bits (4800 LSB/div: Upper=+FS, Lower=–FS)
Maximum sampling rate	100 kS/s
Frequency range (–3 dB)[1]	DC, up to 20 kHz
DC accuracy[1]	±(0.5% of FS + 5 µSTR)

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

mV/V range support	mV/V range = 0.5 × (µSTR range/1000)
Maximum allowable input voltage (1 kHz or less)	10 V (DC + ACpeak)
Maximum allowable in-phase voltage	42 V (DC + ACpeak) (CAT I and CAT II, 30 Vrms)
Temperature coefficient	
Zero point	±5 µSTR/°C (typical value)
Gain	±(0.02% of FS)/°C (typical value)
Internal filter	OFF, 1 kHz, 100 Hz, 10 Hz
Input connector	DSUB
Accessory (a set of connector shell for solder connection)	2 DSUB connectors
Recommended bridge head (DSUB, Shunt-cal) (sold separately)	701957 (bridge resistance of 120 Ω) (w/ 5 m cable) 701958 (bridge resistance of 350 Ω) (w/ 5 m cable)

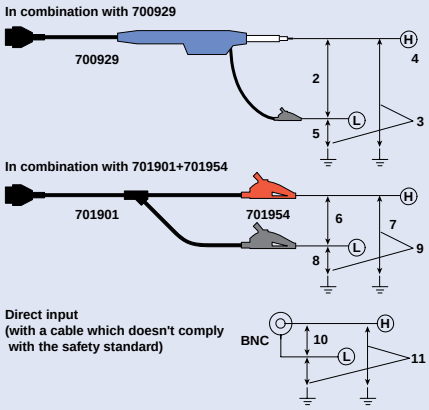
High-Speed Logic Probe (700986)

Number of inputs	8
Input types	Non-isolated (common ground for all bits; logic module and bits share common ground)
Maximum input voltage (1 kHz or less) (between probe tip and case ground)	42 V (DC +ACpeak) (CAT I and II, 30 Vrms)
Response time	1 µS or less
Input impedance	Approximately 100 kΩ
Threshold level	Approximately 1.4 V

Isolated Logic Probe (700987)

Number of inputs	8
Input types	Isolated (all individual bits are isolated)
Input connector	Safety connector (banana plug) × 8
Input switching capability	AC/DC input switching for each bit
Applicable input ranges	
DC input	H/L detection for 10 V DC to 250 V DC
AC input	H/L detection (50/60 Hz) for 80 V AC to 250 V AC
Threshold levels	
DC input	6 V DC ± 50%
AC input	50 V AC ± 50%
Response times	
DC input	1 ms or less
AC input	20 ms or less
Maximum input voltage (1 kHz or less)	(between H and L of each bit) 250 Vrms (CAT I and II)
Maximum allowable in-phase voltage	250 Vrms (CAT I and II)
Maximum allowable voltage between bits	250 Vrms (CAT I and II)
Input impedance	Approximately 100 kΩ

1. Under reference operating conditions (ambient temperature of 23°C ± 5°C, ambient humidity (RH) of 55% ± 10%; after calibration following 30- minute warmup period)
12. Does not include reference contact compensation accuracy.



⚠Warning
Do not exceed the maximum input voltage, withstand voltage, or surge current. In order to prevent electric shock, be sure to ground the main unit. In order to prevent electric shock, be sure to tighten the module's screws. Electrical protective functions and mechanical protective functions will not be effective.

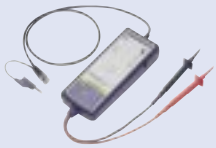
Accessories


Isolated probe (700929)


Passive probe for DL750 (701940)


Safety adaptor lead (701901)


Alligator clip (701954)
Dolphin type, red/black


Differential probe (700924)
ratio: 1/100, 1/1000 (variable)
Max. differential allowable voltage: ±1400 V

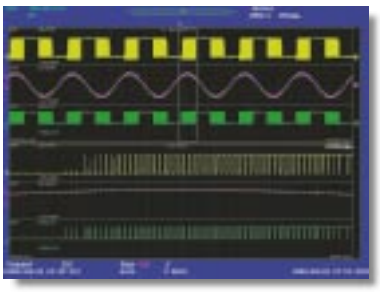

High-speed logic probe (700986)


Isolated logic probe (700987)


Bridge head (701955 & 701956)
NDIS-120 Ω/350 Ω, Enhanced Shield

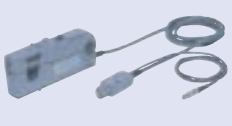

Conversion adaptor (366928)
For external trigger and external clock


Earphone Mic (w/ PUSH switch) (701951)
For the voice memo function



Measuring inverter I/O signals and control signals using the 10 MS/s high-speed 12-bit isolated module, current probe 700937 and isolated probe 700929
The model 700937 can be powered when the /P4 option is selected.


50 MHz bandwidth current probe (700937)
Input range: 15 Apeak


10 MHz bandwidth current probe (701930)
Input range: 150 Arms

701280 Frequency Module

■ **Frequency Measurement Section**

Input channels		2
Data update rate		25 kHz (40 µs)
Measurement range	(frequency)	0.01 Hz–200 kHz 0.1 Hz/div–50 kHz/div
Highest measurement resolution		50 ns (20 MHz)

■ **Input Section**

Compatible input signals		Encoder pulse input of up to ±42 V, Electromagnetic pickup input [6] AC power input up to 300 Vrms (700929 Isolation Probe required)
Input type		Isolated, unbalanced
Input coupling		AC,DC
Input voltage	(1:1)	±1 V–±50 V (6 ranges, 1-2-5 steps)
	(10:1)	±10 V–±500 V (6 ranges, 1-2-5 steps)
Max input voltage (1 kHz or less)		
When combined with 700929 (10:1) [2]		420 V (DC+ACpeak)
Direct input (1:1) [10]		42 V (DC+ACpeak)
Max allowable common mode voltage		
When combined with 700929 (10:1) [3]		300 Vrms (CAT II)
Direct input (1:1) [11]		42 V (DC+ACpeak) 30 Vrms (CAT II)
Input impedance:		1 MΩ±1%, approx. 35 pF
Connector type		Isolated BNC connector
Input filters		OFF/100 Hz/1 KHz/10 KHz/100 KHz
Input pullup function (ON/OFF)		Supports open collector, mechanical contact output, 4.7 KΩ(+5 V)
Input chatter suppression (ON/OFF)		Setting range 1 ms–1000 ms
Comparator section	Presets	Logic (5 V/3 V/12 V/24 V), electromagnetic pickup, zero-cross, pullup (5 V), AC100 V, AC200 V, user-defined
	Threshold range	±FS range, resolution in units of 1%
	Hysteresis	±1%, ±2.5%, or ±5% of FS
LED display (each CH)	ACT (green)	Operational status (illuminates during pulse input)
	OVER (red)	Overdrive status (illuminates during an input overrange)
Compatible probes/cables		(10:1 probe) 700929/701940 (1:1 cable) 366926

■ **Measurement Function Details**

Measurable items	Frequency (Hz), rpm, rps, Period (sec), Duty (%), Power supply freq. (Hz), Pulse width (sec), Pulse integration, Velocity
Effective measurement range	20 div (10 div display range)
Resolution of measured data	16 bit (2400 LSB/div)

Measurement items and ranges

Measured Item	Measurement Range	Range
Frequency (Hz)	0.01 Hz–200 kHz	0.1 Hz/div–50 kHz/div
rpm	0.01 rpm–100,000 rpm	0.1 rpm/div–10,000 rpm/div
rps	0.001 rps–2000 rps	0.01 rps/div–200 rps/div
Period (sec)	5 µs–50 s	10 µs/div–5 s/div
Duty (%)	0%–100%	1%/div–20%/div
Power supply freq (Hz)	(50 Hz, 60 Hz, 400 Hz)±20 Hz	0.1 Hz/div–2 Hz/div
Pulse width (sec)	2 µs–50 s	10 µs/div–5 s/div
Pulse integration	up to 2×10^{9} count	100×10^{-21}/div–500×10^{18}/div
Velocity	Same as freq. (can be converted to km/h and other units)	

Auxiliary Measurement Functions

■ Smoothing Filter (moving average)	Apply moving average to smooth stair step shaped waveforms. Moving average constant is specified from 0.2 ms to 1000 msec (moving average constant=specified time ÷40 µs) This reduces jitter and increases the resolution.
■ Pulse Average Function	Measure the specified number of pulses at once, and specify 1 to 4096 pulses for the average value output mode. This has the exact same effect as the smoothing filter, but averaging can be performed at the pulse interval. Even if encoder gaps are unequal, you can measure pulses together and average them.
■ Deceleration Prediction (Braking Applications)	A measuring function that automatically compensates for the lack of encoder pulse information during deceleration and hypothesizes a deceleration curve.
■ Stop Prediction (Braking Applications)	Predicts stop from a specified time after pulse stop (set up to 10 stages).
■ Offset Observation Function	Set an observational center, then zoom and display surrounding area (for fluctuation observation) Offset setting range = (1 div × 1000)

■ **Measurement Accuracy** [1] [5]

■ Frequency/Revolution/Velocity Measurements

Measurement accuracy		±(0.05% of 10 div + accuracy depending on the input frequency)
Accuracy depending on the input frequency	1 Hz–2 kHz:	0.05% of input waveform freq +1 mHz
	2 kHz–10 kHz:	0.1% of input waveform freq
	10 kHz–20 kHz	0.3% of input waveform freq
	20 kHk–200 kHz	0.5% of input waveform freq

■ Period Measurement

Measurement accuracy		±(0.05% of 10 div + accuracy depending on the input period)
Accuracy depending on the input period	500 µs–50 s	0.05% of input waveform interval
	100 µs–500 µs	0.1% of input waveform interval
	50 µs–100 µs	0.3% of input waveform interval
	5 µs–50 µs	0.5% of input waveform interval + 0.1 µs

■ Duty Measurement

Accuracy depending on the input frequency	0.1 Hz–1 kHz	±0.1% of 100%
	1 kHz–10 kHz	±0.2% of 100%
	10 kHz–50 kHz	±1.0% of 100%
	50 kHz–100 kHz	±2.0% of 100%
	100 kHz–200 kHz	±4.0% of 100%

■ Pulse Width Measurement

Measurement accuracy		±(0.05 % of 10 div + accuracy depending on the input pulse width)
Accuracy depending on the input pulse width	500 µs–100 s	0.05% of input waveform pulse width
	100 µs–500 µs	0.1% of input waveform pulse width
	50 µs–100 µs	0.3% of input waveform pulse width
	2 µs–50 µs	0.5% of input waveform pulse width + 0.1 µs

■ Power Supply Frequency Measurement

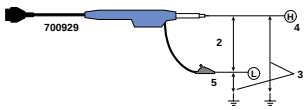
Measurement accuracy	Center freq. at 50, 60 Hz, accuracy of ±0.03 Hz, resolution of 0.01 Hz Center freq. at 400 Hz, accuracy of ±0.3 Hz, resolution of 0.01 Hz

1 Under standard operating conditions: (temperature 23˚C±5˚C, humidity 55%±10% RH, warmup of at least 30 minutes, and after calibration.)

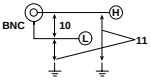
5 Given a minimum input of 0.2 Vpp. Measurement conditions:
- ■During freq./Period measurement: 1 Vpp/1µs square wave input (range=±10 V, bandwidth=FULL, hysteresis=±1%)
- ■During Duty/pulse width measurement: 1 Vpp/5 ns square wave input (range=±10 V, bandwidth=FULL, hysteresis=±1%)
- ■During power supply frequency measurement: 90 Vrms sinewave input (range=AC100 V, BW=100 kHz)

6 Electromagnetic pickup: given output within 0.2 Vpp–42 Vpp. Minimum sensitivity=0.2 V (at 1:1), connected with 1:1 cable. For types that requires a power supply or terminal resistance, apply it to the sensor side

In combination with 700929



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



701275 Acceleration/Voltage Module (with AAF)

Input channels		2
Input format		Switchable between acceleration and voltage input AAF (anti-aliasing filter) supports both acceleration and voltage
Input coupling		(AC coupling for acceleration) ACCL, (voltage) AC,DC,GND
Max sampling rate		100 kS/s
A/D conversion resolution		16-bit (2400 LSB/div)
Input type		Isolated, unbalanced
Frequency band (-3 dB)[1]		(acceleration) 0.4 Hz–40 kHz (voltage) DC–40 kHz
AC coupling (-3 dB point)	acceleration/voltage	0.4 Hz or less
Input range		
For acceleration (±5 V=X1 range)		X0.1–X1–X100 (1-2-5 steps)
For voltage (10:1)		50 mV/div–100 V/div (1-2-5 steps) [12]
For voltage (1:1)		5 mV/div–10 V/div (1-2-5 steps) [12]
Effective measuring range		20 div (10 div display range)
DC offset		±5 div
Max input voltage (1 kHz or less) [12]		42 V (DC+ACpeak)
Max allowable common mode voltage [11]		42 V (DC+ACpeak) 30 Vrms (CAT II)
Accuracy [1] For voltage (DC accuracy)		±(0.25% of 10 div)
For acceleration (AC accuracy)		±(0.5% of 10 div) (at 1 kHz)
Input impedance		1 MΩ±1%, approx. 35 pF
Connector type		Metal BNC connector
Input filters		OFF/Auto (AAF)/4 kHz/400 Hz/40 Hz
Anti-aliasing filter (AAF)		
Cutoff frequency [13]		fc (cutoff frequency)=fs (sampling frequency) × 40% fc automatically moves to the sampling frequency.
Cutoff characteristics		-65dB at 2Xfc (Typical)
Temperature coefficient (for voltage) [14]	Zero point	±(0.02% of 10 div)/ ˚C (Typical)
	Gain	±(0.02% of 10 div)/ ˚C (Typical)
Acceleration sensor bias		constant current drive =4 mA±10%, voltage < 22 V
Example of compatible acceleration sensor: [15]		Built-in amp type: Kistler Piezotron™, PCB ICP™, Endevco: Isotron2™
Sensor usage Notes:		Something that supports acceleration sensor and bias is 4 mA/22 V The sensor is highly sensitive to heat and shocks. If changes in temperature or shocks occur that are outside of the standard operating conditions, measurement may not be possible for several minutes.
Compatible probes/cables for voltage		(10:1 probe) 701940/700929 (1:1 cable) 366926

1 Under standard operating conditions: (temperature 23˚C±5˚C, humidity 55%±10%RH, warmup of at least 30 minutes, and after Calibration.)

12 The module's insulation is functional insulation. Even when using a probe, input above 42 V is not considered safe.

13 when fs= 50 Hz–100 kHz , (when fs <=50 Hz , fc is fixed to 20 Hz) 14 excludes AUTO Filter

15 Piezotron is a registered trademark of Kistler Instrument Corp.. ICP is a registered trademark of PCB Piezotronics Inc.. ISOTRON2 is a registered trademark of ENDEVCO Corp..

For detailed specifications and updated information. **http://www.yokogawa.com/tm/DL750/**

Universal (Voltage/Temperature) Modules (701261/701262)

Input channels		2
Input signals		Voltage or temperature (thermocouple)
AAF (anti-aliasing filter)		701261: none, 701262: included
Input couplings		TC (thermocouple), DC, AC, GND
Input typesI		Isolated unbalanced
Maximum sampling rate	Voltage	100 kS/s
Data updating rate	Temperature	500 Hz
A/D conversion resolution		Voltage: 16 bits (2400 LSB/div); temperature: 0.1°C
Frequency range (-3 dB)[1]	Voltage	DC to 40 kHz
	Temperature	DC to 100 Hz
Input range	Voltage (1:1)	5 mV/div to 20 V/div (10 div display, in steps of 1-2-5)
	Temperature	K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel
Effective measurement range (voltage)		20 div (display range 10 div)
DC offset (voltage)		±5 div
DC accuracy[1] (voltage)		±(0.25% of 10 div)

Temp. measured range/accuracy[1, 2]

Type	Measured Range	Accuracy
K	-200°C to 1300°C	±(0.1% of reading + 1.5°C)
E	-200°C to 800°C	However, for -200°C to 0°C,
J	-200°C to 1100°C	±0.2% of reading + 1.5°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, S	0°C to 1700°C	±(0.1% of reading + 3°C) However, 0°C for 200°C: ±8°C 200°C for 800°C: ±5°C
B	0°C to 1800°C	±(0.1% of reading + 2°C) However, 400°C to 700°C: ±8°C Effective range.: 400°C to 1800°C
W	0°C to 2300°C	±(0.1% of reading + 3°C)
Gold/chromel		0 K to 300 K 0 to 50 K: ±4 K 50 to 300 K: ±2.5 K

Max. input voltage (1 kHz or less)		42 V (DC+ACpeak): for satisfying safety standards[3] 150 V (DC+ACpeak): allowable maximum4
Max. allowable common mode volt. (1 kHz or less)		42 V (DC+ACpeak) (CAT I & CAT II, 30 Vrms)
Input connector		Binding post
Input impedance		Approximately 1 MΩ
Input filters	Voltage	OFF, AUTO (AAF), 4 kHz, 400 Hz, 40 Hz (-12 dB/oct except AUTO)
	Temperature	OFF, 30 Hz, 8 Hz, 2 Hz
AAF (anti-aliasing filter)[5]	701262 only	Cutoff frequency fc = fs (sampling frequency) × 40% fc automatically linked with the sampling frequency. Cutoff characteristics: -65 dB at 2 Xfc (typical value)
Temp. coefficient (for voltage)[6]	Zeropoint	±(0.01% of 10 div)/°C (typical value)
	Gain	±(0.02% of 10 div)/°C (typical value)
Compatible cable		366961 (banana-to-alligator 1:1)

1. Under reference operating conditions (ambient temp. of 23°C ±5°C, ambient humidity of 55% ±10%RH, after 30-minute warmup period and calibration).
2. Does not include reference junction/temperature compensation accuracy.
3. Since the input connecter is of a binding post type, it is possible to touch the metal part of the connector. Therefore, for safety reasons, the maximum value is 42 V (DC+ACpeak).
4. Maximum value at which the input circuit will not be damaged.
5. When fs= 50 Hz to 100 KHz. When fs≤50 Hz, fc=20 Hz (fixed).
6. Except when filters set to AUTO.

DL750/DL750P Model Numbers and Suffix Codes

Model	Suffix Code	Description
701210		"DL750 main unit (16 isolated channels + 16-bit logic)[1] 112 mm width A6 thermal printer built-in"
701230		"DL750P main unit (16 isolated channels + 16-bit logic)[1] 210 mm width A4 thermal printer built-in"
Power cable	-D	UL/ CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard(Complied with CCC)
Internal media drive[2]	-J1	Floppy drive
	-J2	Zip® drive (available for the DL750 only)[3]
	-J3	PC card drive
Default Help language	-HE	English online help
	-HJ	Japanese online help
	-HC	Chinese online help
	-HG	German online help
	-HF	French online help
	-HL	Italian online help
	-HK	Korean online help
Memory expansion	/M1	Memory expansion to 10 MW/CH[4]
	/M2	Memory expansion to 25 MW/CH[4]
	/M3	Memory expansion to 50 MW/CH[4]
Other specifications	/C8	Internal 30 GB hard drive (FAT32)
	/C10	Ethernet interface
	/G2	User-defined math function
	/G3	DSP channel function
	/P4	Probe power (4-output)
	/DC	DC12 V power (DC10-18 V) (DL750 only)[3]

1. Plug-in modules are not included.
2. Choose only one.
3. Zip drive and DC12V power supply cannot be specified together with the DL750P.
4. Cannot be specified together.

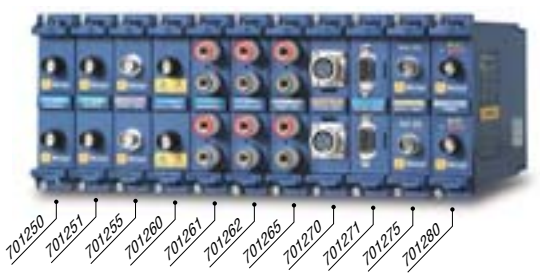
Standard Accessories

Product		Order Qty.
Power cable		1
User's manuals (one set)		1
Transparent front cover		1
Printer roll paper	DL750 (A6 10 m/roll)	3
	DL750P (A4 20 m/roll)	1
Cover panel (for blank module slots)		8
Rubber feet (four per set)		1
Soft case (for storing accessories)		1

Plug-in Module Model Numbers[5]

Model No.	Description	Firmware
701250	High-speed 10 MS/s 12-bit isolation module (2 CH)	1.07 or later
701251	High-speed 1 MS/s 16-bit isolation module (2 CH)	1.07 or later
701255	High-speed 10 MS/s 12-bit non-isolation module (2 CH)	2.02 or later
701260	High-voltage 100 kS/s 16-bit isolation module (2 CH, with RMS)	2.02 or later
701261	Universal Module (2 CH)	5.01 or later[7]
701262	Universal Module (with AAF 2 CH)	5.01 or later[7]
701265	Temperature/high-precision voltage module (2 CH)	1.07 or later
701270	Strain module (NDIS, 2 CH)	2.02 or later
701271	Strain module (DSUB, Shunt-CAL, 2 CH)	2.02 or later
701275	Acceleration/voltage module (with AAF, 2 CH)	3.01 or later
701280	Frequency module (2 CH)	3.01 or later

5. Probes are not included with any modules.
6. The latest firmware for the DL750 series is available on our Web site. http://www.yokogawa.com/tm/DL750/
7. Only supported by the initially-released DL750P (ver. 5.01 or later). DL750 support to be offered by 3rd quarter 2005 (ver. 6.01 or later)



DL750/DL750P Accessories

Product	Model No.	Description1
Isolated probe	700929	1000 Vrms-CATII for 701250, -51, and -60 (10:1)
"1:1 BNC safety adapter lead (in combination with the following)"	701901	1000 Vrms-CATII for 701250, -51, and -60
Safety mini clip (hook type)	701959	1000 Vrms-CATII, 1 set each of red and black
Large Alligator clip (dolphin type)	701954	1000 Vrms-CATII, 1 set each of red and black
Alligator adapter (rated volt.: 1000 V)	758929	1000 Vrms-CATII, 1 set each of red and black
Alligator adapter (rated volt.: 300 V)	758922	300 Vrms-CATII, 1 set each of red and black
Fork terminal adapter	758921	1000 Vrms-CATII, 1 set each of red and black
Passive probe for DL750/750P[2]	701940	Non-isolated 600 Vpk (701255) 42 V or less (other) (10:1)
1:1 BNC-alligator cable	366926	Non-isolated 42 V or less, for 701250, -51, -55, 1 m
1:1 Banana-alligator cable	366961	Non-isolated 42 V or less, for 701261, -62, -65, 1.2 m
Current probe[3]	701933	30 Arms, DC to 50 MHz, supports probe power
Current probe[3]	701930	150 Arms, DC to 10 MHz, supports probe power
Current probe[3]	701931	500 Arms, DC to 2 MHz, supports probe power
Probe power[4]	701934	Large current output, external probe power supply (4 outputs)
Differential probe	700924	1400V pk, 1000 Vrms-CAT II
Bridge head (NDIS, 120 Ω/350 Ω)	701955/56	With 5 m cable
"Bridge head (DSUB, Shunt-cal 120 Ω/350 Ω)"	701957/58	With 5 m cable
GO/NO-GO cable	366973	For GO/NO-GO I/O and start input
Safety BNC-banana adapter	758924	500 Vrms-CATII, for 701250, -51, -55, -60
Printer roll paper	B9988AE	DL750, A6 size (120 mm wide × 10m), include 10 rolls
Printer roll paper	701966	DL750P, A4 size (210 mm wide × 20m), include 6 rolls
High-speed logic probe[5]	700986	8-bit, non-isolated, response speed: 1µs
Isolated logic probe6	700987	8-bit, each channel isolated, response speed: 20 ms (for AC)
Isolated logic measurement leads	758917	"Isolated logic measurement leads (2 per set) Alligator clip required separately. "
Conversion adaptor	366928	BNC (jack)-RCA (plug) conversion
Safety BNC cable (1 meter)	701902	1000 Vrms-CATII (BNC-BNC)
Safety BNC cable (2 meters)	701903	1000 Vrms-CATII (BNC-BNC)
Soft carrying case	701963	For DL750, with 3 storage pockets
Soft carrying case	701967	For DL750P, with 3 storage pockets

1. Actual allowable voltage is the lower of the voltages specified for the main unit and the cable
2. 42 V is safe when using the 701940 with a Non isolated type BNC input.
3. The number of current probes that can be powered from the main unit probe power is limited. See the following for details. http://www.yokogawa.com/tm/probe/
4. There is no limit to the number of externally powered probes that can be used.
5. One of each connection lead (B9879PX and B9879KX) is included.
6. 758917, and either 758922 or 758929 is required for measurement.

Exterior Dimensions