GRAPHTEC

WR8500 SERIES

Thermal Arraycorders

Easy Operation and High-level Performance

The WR8500 series thermal arraycorders are economical, no-frills waveform recorders which feature a large-format LCD screen for waveform monitoring, and a performance level usually found in our more expensive recorders such as the WR9000. Chart speeds up to 200 mm/s are selectable from the front panel, and the sampling rate is a high-speed 4 µs. For users who need increased functionality, we offer a wide range of options such as logic amp input, floppy and MO disk drives, RS-232C and GPIB interfaces, additional memory, DC drive, and a Z-fold chart paper box.

WR8500 16-channel model

User-friendly functions—make the WR8500 so much easier to use

- External sampling function captures data synchronized to an external signal into memory
- Wide range of trigger and remote control functions, as well as an event marker function to record phenomena as they occur
- Selection of noise filters: OFF, 1.5 Hz (line), 10, 30, 50, 100, 500 Hz, 5 kHz
- Up to 8 hours memory backup

Easy operation—just like an analog recorder

Independent setup parameter keys for each channel means that you can change parameters for any channel even during recording. Up to four sets of setup parameters can be saved in memory. A separate bank of chart speed setting keys enables you to change the chart speed at any time, and four directional cursor keys are provided for easy menu selection.

Direct key operation for an analog look and feel

Three recording modes for diverse measurement scenarios

The WR8500 comes standard with three recording modes to suit your applications: Recorder, Memory Recorder, and Logging. In Recorder mode, the WR8500 displays and records analog signals as realtime waveforms, and it can also capture data into memory simultaneously. Voltage ranges are from 50 mV to 500 V, and logic input is available as an option. In Memory Recorder mode, data captured into memory can be displayed and recorded as waveforms. The WR8500 comes with a standard memory capacity of 64 kwords/channel, and an additional 256 kwords/channel memory is available as an option. In Logging mode, measured data is displayed and recorded as digital values. Data can be captured directly onto a floppy or MO disk*[1].

Wide-format recording and display

Graphtec's 8 dot/mm thermal array technology enables the information shown on the LCD panel to be accurately reproduced on chart paper. In addition to waveform recording up to 200 mm wide and printing of digital values, you can also print out a list of setup parameters, as well as a hard copy of the display screen. 11 formats are available for the 8-channel model in Y-T mode*[2], and a 150 x 150 mm format in the X-Y mode. A selection of 9 grid patterns is also offered.

Separate bank of chart speed setting keys

File Conversion Software

Graphtec's OPS011 file conversion software (Windows version) converts data stored on the WR8500's floppy or MO disks into TXT or CSV formats so that it can be used with spreadsheet applications such as Microsoft's Excel or Lotus 1-2-3.

*1 Floppy disk and MO drives are available as options.
*2 13 formats for the 16-ch model

Functions to Make the Most of Your Measurement Data

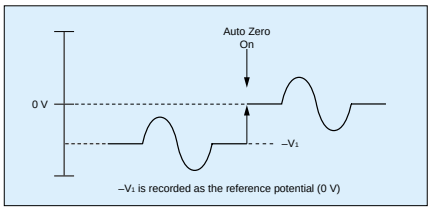
Cursor Functions

For data captured in memory, you can use a cursor to read measured data at a specific position on the waveform. The jog/shuttle dial moves the cursor with speed and ease.

- **Scrolling function**
  The jog/shuttle dial is used to scroll the display of data captured in memory
- **Cursor Readout function**
  Displays the electric potential, time and frequency (difference) at the cursor position in waveform display
- **Statistical Calculation functions**
  Perform statistical calculations on the data in the range specified by the waveform cursors
- **Storage of data in the cursor-specified range**
  Saves data in the range specified by the waveform cursors to a floppy or MO[*1] disk
- **Cursor Zoom function**
  Provides an enlarged display of data in the range specified by the waveform cursors
- **Print function**
  Prints out data in the range specified by waveform cursors

Auto Zero

The Auto Zero function is used to compulsorily move the reference potential of the signal input to the WR8500's zero-point position which is regarded as the 0 V position for recording. The voltage at the time the Auto Zero function is enabled becomes the reference potential.



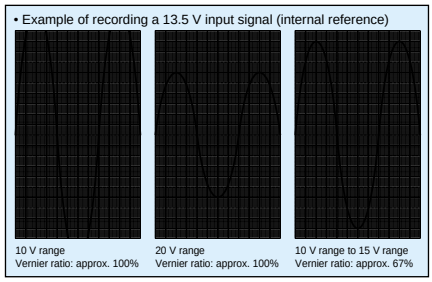
Range/Span Setting Functions

For voltage measurement, three functions for setting the range and span are provided:

- **Auto Range**
  Automatically sets the optimum measurement range for measuring voltage
- **Span mode**
  Specifying the upper and lower limit values for a measurement range that has already been specified determines the zero position
- **Position mode**
  Specifying the zero position for a measurement range that has already been specified determines the upper and lower limit values.

Vernier

The VERNI function enables fine adjustment of the measurement range.



Scaling

This function enables you to convert voltage signals to another industrial unit, and to specify upper and lower limits of scaling and a user-defined unit for the results of conversion. The user-defined unit (mm, kg, etc.) can be specified using up to 6 characters.

Overwrite

When this function is enabled, new waveforms will be displayed over the waveform already being displayed so that you can make comparisons.

Remote Interface

A remote interface (CMOS level) which enables start/stop control of the recorder using external signals is built in.

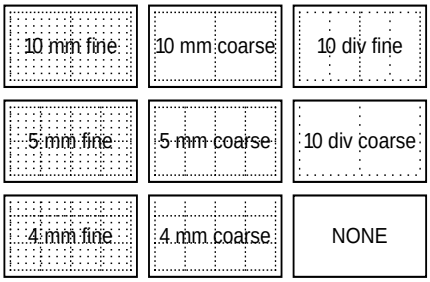
Calculation Functions

The WR8500 can perform the following 7 cursor-specified statistical calculations:

- **Standard Deviation (S.D.)**
- **Maximum and Minimum Values (Max/Min)**
- **Absolute Peak-to-Peak Values (p-p)**
- **Averaging (Average)**
- **Root-Mean-Square (R.M.S.)**
- **Rise Time and Fall Time**
- **X-Y Area and Y-T Area**

Grid Patterns

In recorder mode and memory recorder mode, a choice of 9 grid patterns is provided to enable easier reading of the waveform.



*1 Floppy disk and MO drives are available as options.

Options

Logic amp	B-375	16 channels/unit	
Floppy disk drive	B-371	3.5", 1.44 MB	Cannot be installed concurrently
Magneto-optic disk drive	B-364	3.5", 640 MB	
RS-232C interface	B-372		Cannot be installed concurrently
GP-IB interface	B-363	Conforms to IEEE-488-1978	
Additional memory	B-373	256 kwords/ch, for 8-ch model	
	B-374	256 kwords/ch, for 16-ch model	
DC drive	B-376	10 to 16 VDC, for 8-ch model	
	B-377	10 to 16 VDC, for 16-ch model	
Long-length Z-fold paper box	B-367	For use with PZ231A 100-m length Z-fold paper	
WR8500 Interface Command Manual	WR8500-UM-351	RS-232C and GP-IB Control Commands	

Standard Accessories

Chart paper	1 roll
Chart paper flanges	1 set
Power cable	1
Remote connector	1
User's manual	1

Specifications

Basic Specifications

Measurement modes	Recorder, Memory Recorder, and Logging
Number of channels	8, 16
Memory capacity	64 kwords/channel (optionally expandable to 256 kwords/channel)
Display panel	8.9" LCD
Recording method	Thermal recording by a thermal array print head of 8-dot/mm pitch
Chart paper	Roll paper (part no. PR231A), 210 mm × 40 m, trace color: black
Recorded width	205 mm (1,640 dots) maximum
Isolation voltage	1 min at 1,500 VAC between the AC power supply and frame
Isolation resistance	20 MΩ or more at 500 VDC between the AC power supply and frame, and between the input terminals and frame
Backup functions	Settings: EEPROM; clock[*1]: secondary lithium battery (when fully charged, lasts about three months if the RAM Backup function is Off); RAM Backup[*1]: secondary lithium battery, when fully charged lasts four hours minimum (with the memory option) or eight hours minimum (with standard memory only)
Interface	Option, RS-232C or GP-IB
Operating range	0 to 40°C, 30 to 80% RH (5 to 35°C for printing)
Power rating	100 V series: 100 to 120 V 100 V/200 V series: 100 to 120 V/200 to 240 V CE mark: 100 to 120/200 to 240 V DC drive available as an option
Power consumption	8-ch model: 360 VA max., 16-ch model: 400 VA max. (with the 100-120 VAC system)
External dimensions	8-ch model: approx. 360 (W) × 296 (D) × 120 (H) mm, 16-ch model: approx. 360 (W) × 296 (D) × 200 (H) mm, excluding rubber feet and protuberances
Weight	8-ch model: approx. 6.5 kg (approx. 8.0 kg with the DC drive option); 16-ch model: approx. 10 kg (approx. 10.5 kg with the DC drive option)

MEMORY functions

Sampling speeds	4 µs to 5 s (in steps of 1, 2, 4, 5, and 8), External [4 µs to 100 ms (in steps of 1, 2, 4, 5, and 8) in Recorder mode]
Memory banks	1, 2, 4, 8, 16, 32, or 64 blocks
Memory coupling (Expand)	8 ch × 1, 4 ch × 2, 2 ch × 4, or 1 ch × 8
Specifiable output zone	10 to 100% (10% steps)
Waveform scaling	Time axis: ×8 to ×1/8 plus Fixed (A4 size); between cursors; voltage axis (data specified by cursors)
Cursor functions	Cursor readout, scrolling, zoom

TRIGGER functions

Trigger modes	Off, Manual, External, and Internal (Only, Combination, All OR, All AND, Logic OR[*2] Logic AND[*2], Window In, Window Out)
Channel combinations	Combination of any 2 channels (AND, OR)
Trigger slope	Rising or Falling
Trigger level	0 to 100% (1% steps) or directly set as a voltage level within the specified RANGE (±F.S.)
Trigger functions[*3]	Start, Stop, Start & Stop, Trig Memory, Trig & Trig, Trig Zoom (Recorder mode only)
Trigger delay	–100 to +100% (10% steps) during memory recording
Trigger action	Single or Repeat

RECORDER mode

Waveform display	Display format: Y-T, X-Y Display direction: Horizontal scrolling (specify for Y-T) Channels displayed: Y-T=Same as Recording formats X-Y=1 X-axis channel, 7 Y-axis channels[*4]
Recording formats	200 mm × 1, 100 mm × 1, 80 mm × 2, 50 mm × 4, 25 mm × 8, 160 mm × 1, 100 mm × 2, 50 mm × 2, 40 mm × 4, 20 mm × 8, (12.5 mm × 16, 10 mm × 16), User Figures in ( ) apply to the 16-ch model only
Chart speeds	1, 1.25, 2, 2.5, 5, 10, 12.5, 20, 25, 50, 100*, 200* mm/s, mm/min, mm/h; External (0.03125 mm/pulse, 640 pps max) * 100 and 200 can only be combined with "mm/s"

MEMORY RECORDER mode

Waveform display	Display format: Y-T or X-Y display Display direction: Horizontal scroll (Y-T) Channels displayed: Y-T=Same as Recording formats X-Y=1 X-axis channel, max. 7 Y-axis channels
Measured data display	Measured data of 8 (16) channels can be displayed at the left of the screen as digital values Figures in ( ) apply to the 16-ch model only
Display method	Roll mode display with Overwrite[*5] function (overwrites specified data in memory)

LOGGING mode

Measured data display	Measured data of any channel can be displayed as digital values using a screen split into 1, 2, 4, 8, or (16) parts Figures in ( ) apply to the 16-ch model only
Display speed	00:00:01 to 24:00:00 (1 s steps)
Measurement interval	1 ms[*8] to 800 ms (in steps of 1, 2, 4, 5, or 8), 00:00:01 to 24:00:00 (1 s steps)
Recording formats	Day/month/year (at start of measurement), hh:mm:ss, Channel-specific measured data (16 max.[*9]), minimum, maximum, and mean values are recorded as digital values (after recording has been completed)
Recording interval	Synchronized with the display interval (7 mm/line)
Memory recording	Data being measured can be directly written to an external memory device (optional floppy or MO disk)[*6]
Data transfer	Output of ASCII data via the RS-232C interface[*7]

*1 The secondary lithium battery is shared.
*2 Requires installation of the logic amp option.
*3 In Recorder or Logging mode only (fixed to Memory in Memory Recorder mode).
*4 In X-Y display mode, the frequency response varies with the number of measurement channels (1 ch: 800 Hz, 2 ch: 400 Hz, 4 ch: 200 Hz, 8 ch: 100 Hz)
*5 Valid only when the output factor is Fixed
*6 Both drives are options; must be specified at time of ordering
*7 Option. The GP-IB interface cannot be used to send ASCII data in Logging mode
*8 1 ms speed applies only when saving data to an FD or MO disk; it cannot be displayed or recorded
*9 For a 16-ch model, data is displayed in two rows

V (Voltage input) type amp

Input configuration	Floating ground with unbalanced-load input
Input resistance	Approx. 1 MΩ±1%
Measurement range	Voltage: 50, 100, 200, 500 mV/FS 1, 2, 5, 10, 20, 50, 100, 200, 500 V/FS
Accuracy (Voltage)	±0.25% of FS
Temperature coefficient	Zero point: 0.02% of FS/°C, Gain: 0.01% of FS/°C
Input coupling	DC, GND, CAL (1/2 FS), OFF
Maximum permissible input voltage[*1]	500 VDC* (DC + ACp-p) between + and – terminals * 30 VDC at the 50 mV to 2 V ranges 250 VACrms between terminal and frame
Insulation resistance	20 MΩ or more at 500 VDC
Isolation voltage (between the input terminal and frame)	1 minute at 500 VAC; CE Mark compliant models: 1 minute at 2300 VAC
Permissible signal source resistance	1 kΩ maximum
Input bias current	10nA (typical)
CMRR	100 dB (50/60 Hz, signal source resistance up to 500 Ω)
A/D conversion	Sampling speed: 4 µs max, Resolution: 12 bits (10 bits[*2])
Frequency response	DC coupling: DC to 50 kHz (+1/–3 dB typical)
Filter	Line: 1.5 Hz ((–3 dB) at –6 dB/oct), Lowpass: 10, 30, 50, 100, 500, 5k Hz ((–3 dB) at –6 dB/oct)
GAIN vernier	Variable setting of the measurement range from 120 to 40% (digital specification)
Auto Range function	Automatically selects the measurement range best suited to the input
AUTO ZERO function	Automatically sets the zero point to the reference potential of the voltage input
Input terminals	Safety sockets (2 terminals: +, –)

LO (Logic input) type amp, 16 channels/unit

Number of channels	16 (4 per terminal × 4)
Input voltage range	0 to +25 V max (Single-ended ground)
Sampling speed	Synchronized with the recorder
Threshold levels	TTL (+1.4 V) CMOS (+2.5 V) Contact point (+5 V)
Trigger settings	AND or OR trigger for 16 channels (when the condition of an armed trigger is met)
Trigger filter	Sampling speed × 2^n (n = 0 to 6)
Display/recording	Can be switched on/off for each group of four channels
Zone positioning	Each four-channel group (A, B, C, D) can be assigned to a zone for display and recording
Standard accessories	Four RIC-10 probe sets

*1 The maximum input voltage that can be measured (including peak values) is within the RANGE voltage ± full scale.
*2 Resolution of measured data during internal processing by the amp.

To ensure correct and safe use of your recorder:
• Read your User's Manual before using the recorder, and operate it correctly in accordance with the procedures described.
• To prevent malfunctions or electrical shock due to current leakage, ensure that the recorder has a good protective ground, and that the supply voltage conforms to the recorder's power rating.

Specifications are subject to change without notice.

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