Introduction

The PCL-818 series is a family of high-performance, multifunction cards that offer the five most desired measurement and control functions: 12-bit A/D conversion, D/A conversion, digital input, digital output and counter/timer.

Automatic Channel/Gain Scanning

All PCL-818 series cards feature an automatic channel/gain scanning circuit. This circuit, instead of your software, controls multiplexer switching during sampling. On-board SRAM stores different gain values for each channel. This combination lets you perform multichannel high-speed sampling (up to 100 KHz) with different gains for each channel and DMA data transfer.

Unique Technology

The PCL-818 series cards share a custom-designed 160-pin ASIC (Application Specific Integrated Circuit) chip. This chip has a gate count of over 7,000 and utilizes 1.0 mm CMOS technology. This custom integration gives higher performance and reliability with lower power consumption on a smaller board.

Wide Selection with Migration Path

The PCL-818 series lets you choose the card that exactly matches your application and price range. The PCL-818L is the perfect choice if you are on a tight budget. It offers the best price/performance in the market. If you need more power, you can easily upgrade to any other card in the series. The PCL-818 series is connector compatible. All your programs will work with your new card, protecting your investment.

Common Features

- 16 digital inputs and 16 digital outputs
- One 12-bit analog output channel
- Programmable pacer/counter

Common Specifications

Analog Input

- Channels: 16 single-ended or 8 differential
- Resolution: 12 bits
- Input Range Selection: software controlled
- Auto Channel/Gain Scanning
- Triggering: software, pacer or external
- Data Transfer: program control, interrupt (IRQ 2 – 7) or DMA (Ch. 1 or 3)
- Input Impedance: 10 MΩ
- Input Overvoltage: ±30 VDC max.

Analog Output (D/A Converter)

- Channels: one 12-bit (double-buffered)
- Output Range:
  - 0 – +5 V or 0 – +10 V with internal reference
  - 0 – +10 V or 0 – -10 V with external reference

Digital Input/Output

- Channels: 16 inputs, 16 outputs (all TTL compatible)
- Input Voltage:
  - low: 0 – +0.8 V
  - high (min. +2.0 V)
- Input Load:
  - low: +0.5 V @ 0.4 mA max.
  - high: +2.7 V @ 0.05 mA max.
- Output Voltage:
  - low: 0 – +0.4 V
  - high: min. +2.4 V
- Driving Capacity:
  - low: (sink) 8 mA @ 0.5 V max.
  - high: (source) -0.4 mA @ 2.4 V min.

A/D Pacer and Counter (8254)

- A/D Pacer: 32-bit with 10 MHz or 1 MHz time base
- Max. and Min. Rates: 2.5 MHz to 0.00023 Hz
- Counter: one 16-bit counter with 100 KHz time base

General

- Operating Temperature: 0° – 50° C (32° – 122° F)
- Storage Temperature: -20° – 65° C (-4° – 149° F)
- Operating Humidity: 5% – 95% RH non-condensing (refer to IEC 68-2-3)
## PCL-818HD 100 KS/s A/D at All Input Ranges

The PCL-818HD has guaranteed 100 KHz sampling and transfer speeds at all gains (x 1, 2, 4 or 8, programmable) and input ranges. It features an onboard 1 K sample FIFO (First In First Out) buffer for faster data transfer and more predictable performance under Windows.

### Specifications

#### Analog Input
- **Conversion Time:** 8 µsec.
- **Input Range (V):**
  - Bipolar: ±10, ±5, ±2.5, ±1.25, ±0.625
  - Unipolar: 0 ~ 10, 0 ~ 5, 0 ~ 2.5, 0 ~ 1.25
- **Maximum Data Throughput:** 100 KHz for all input ranges
- **Accuracy:**
  - Gain = 0.5, 1: 0.01% of FSR ±1 LSB
  - Gain = 2, 4: 0.02% of FSR ±1 LSB
  - Gain = 8: 0.04% of FSR ±1 LSB

#### General
- **On-board Memory:** 1K samples FIFO for A/D. Can generate an interrupt when full or half full
- **Power Consumption:** +5 V @ 500 mA max., +12 V @ 200 mA max
- **I/O Ports:** 32 bytes with FIFO active or 16 bytes with FIFO disabled
- **A/D, D/A Connector:** DB-37
- **Dimensions:** 185 mm (L) x 100 mm (H) (7.3" x 3.9")

## PCL-818HG Direct Thermocouple Measurement

The PCL-818HG offers the same functions as the PCL-818HD, but it features a special high-gain programmable instrument amplifier for reading very low level input signals (x 0.5, 1, 5, 10, 50, 100, 500 or 1000).

The PCL-818HG package includes a special wiring board (PCLD-8115) with a DB-37 connector and CJC. This combination lets you measure low-level thermocouple signals without an external signal-conditioning board.

### Specifications

#### Analog Input
- **Conversion Time:** 8 µsec.
- **Input Range (V):**
  - Bipolar: ±10, ±5, ±1, ±0.5, ±0.1, ±0.05, ±0.01, ±0.005
  - Unipolar: 0 ~ 10, 0 ~ 1, 0 ~ 0.1, 0 ~ 0.1
- **Maximum Data Throughput:** (depends on input amplifier settling time and slew rate)
- **Gain Speed Channels**
  - 0.5, 1: 100 KHz Single (input signal ≤ 3 V p-p)
  - 0.5, 1, 5, 10: 35 KHz Multiple
  - 50, 100: 7 KHz Multiple
  - 500, 1000: 1 KHz Multiple
- **Accuracy:**
  - Gain = 0.5, 1: 0.01% of FSR ±1 LSB
  - Gain = 5, 10: 0.02% of FSR ±1 LSB
  - Gain = 50, 100: 0.04% of FSR ±1 LSB
  - Gain = 500, 1000: 0.08% of FSR ±1 LSB

#### General
- See PCL-818HD
High-performance Multifunction Cards

Ordering Information

- **PCL-818L**: Low-cost high-performance half-size multifunction card, user’s manual and driver CD-ROM. (cable not included)
- **PCL-818LS**: PCL-818L with PCLD-8115 and DB-37 cable assembly (PCL-10137)
- **PCL-818HG**: High-performance high-gain half-size multifunction card, PCLD-8115, DB-37 cable assembly (PCL-10137), user’s manual and driver CD-ROM.
- **PCL-818HD**: High-performance half-size multifunction card with DB-37 connector, user’s manual and driver CD-ROM. (cable not included)
- **PCL-818H**: High-performance half-size multifunction card with 20-pin flat cable connectors, user’s manual and driver CD-ROM. (cable not included)
- **PCL-10120-1**: 20-pin flat cable, 1 m
- **PCL-10120-2**: 20-pin flat cable, 2 m
- **PCL-10137-1/2/3**: DB-37 cable assembly, 1, 2 and 3 m
- **PCLD-8115**: Industrial wiring terminal board with CJC circuit

**Block Diagram (PCL-818HG)**

**PCL-818 Series Quick-reference Table**

<table>
<thead>
<tr>
<th>Model</th>
<th>AO speed</th>
<th>Unipolar Input (V)</th>
<th>Bipolar Input (V)</th>
<th>Onboard memory</th>
<th>DAU chan.</th>
<th>Connector</th>
<th>Size</th>
<th>On-board DC/DC</th>
<th>Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCL-818L/LS</td>
<td>40 KHz</td>
<td>-</td>
<td>$\pm 10, \pm 5, \pm 2.5, \pm 1.25, \pm 0.625$</td>
<td>-</td>
<td>1</td>
<td>DB-37</td>
<td>155 x 100 mm</td>
<td>-</td>
<td>&lt;1.4 W</td>
</tr>
<tr>
<td>PCL-818HD</td>
<td>100 KHz</td>
<td>$0 - 10, 0 - 5, 0 - 2.5, 0 - 1.25$</td>
<td>$\pm 10, \pm 5, \pm 2.5, \pm 1.25, \pm 0.625$</td>
<td>1 K samples FIFO</td>
<td>1</td>
<td>DB-37</td>
<td>155 x 100 mm</td>
<td>Yes</td>
<td>&lt;2.9 W</td>
</tr>
<tr>
<td>PCL-818HG</td>
<td>100 KHz</td>
<td>$0 - 10, 0 - 1, 0 - 0.1$</td>
<td>$\pm 10, \pm 5, \pm 0.5, \pm 0.1$</td>
<td>1 K samples FIFO</td>
<td>1</td>
<td>DB-37</td>
<td>155 x 100 mm</td>
<td>Yes</td>
<td>&lt;2.8 W</td>
</tr>
<tr>
<td>PCL-818H</td>
<td>100 KHz</td>
<td>$0 - 10, 0 - 5, 0 - 2.5, 0 - 1.25$</td>
<td>$\pm 10, \pm 5, \pm 2.5, \pm 1.25, \pm 0.625$</td>
<td>-</td>
<td>1</td>
<td>20-pin flat cable</td>
<td>185 x 100 mm</td>
<td>Yes</td>
<td>&lt;2.8 W</td>
</tr>
</tbody>
</table>
PCL-818L/LS 40 KHz Multifunction Card

The PCL-818L is the entry-level model in the PCL-818 series. We designed it with the cost-sensitive customer in mind. It offers the same functions as the rest of the series, except that it has a 40 kHz sampling rate and only accepts bipolar inputs. It is fully software and connector compatible with the PCL-818HD and PCL-818HG. This lets you upgrade your applications to these higher performance cards without hardware or software changes.

The PCL-818LS Bundle

The PCL-818LS bundle consists of the PCL-818L card, the PCLD-8115 wiring terminal board and a DB-37 cable assembly. The PCLD-8115 accommodates on-board passive signal conditioning components (resistors and capacitors), allowing you to easily implement a low-pass filter, a voltage attenuator or a 4 ~ 20 mA voltage converter.

Specifications

Analog Input

- **Conversion Time:** 25 µsec.
- **Input Range (V):** bipolar: ±10, ±5, ±2.5, ±1.25, ±0.625
- **Maximum Data Throughput:** 40 KHz for all input ranges
- **Accuracy:**
  - Gain = 0.5, 1 0.01% of FSR ±1 LSB
  - Gain = 2, 4 0.02% of FSR ±1 LSB
  - Gain = 80.04% of FSR ±1 LSB

General

- **Power Consumption:** +5 V @ 210 mA typical, 500 mA max.
- **I/O Ports:** 16 consecutive bytes
- **A/D, D/A Connector:** DB-37
- **Dimensions:** 155 mm (L) x 100 mm (H) (6.1" x 3.9")

PCL-818H General-purpose Multifunction Card with 20-pin Connectors

The PCL-818H is a 100 KHz Multifunction card with standard PCL-818 series features. It attaches directly to signal-conditioning boards with 20-pin flat cable connectors. The PCL-818H is a half-size card that uses the Advantech ASIC chip.

Specifications

Analog Input

- **Conversion Time:** 8 µsec.
- **Input Range (V):**
  - Bipolar: ±10, ±5, ±2.5, ±1.25, ±0.625
  - Unipolar: 0 ~ 10, 0 ~ 5, 0 ~ 2.5, 0 ~ 1.25
- **Maximum Data Throughput:** 100 KHz
- **Accuracy:**
  - Gain = 0.5, 1 0.01% of FSR ±1 LSB
  - Gain = 2, 4 0.02% of FSR ±1 LSB
  - Gain = 80.04% of FSR ±1 LSB

General

- **Power Consumption:** +5 V @ 180 mA typical, 500 mA max.
- **I/O Ports:** 16 consecutive bytes
- **A/D, D/A Connector:** 20-pin flat cable
- **Dimensions:** 185 mm (L) x 100 mm (H) (7.3’’ x 3.9’’)

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