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Technical Data
Analog Input Cards and Cables
For HP 1000 A–Series Products with 25 kHz Power
Product Numbers
12060B, 12060BC, 12061A, and 12061AC
Features

- 8 differential inputs, expandable to 40 channels
- Up to 55 kHz throughput to memory
- Auto scanning or single–channel sampling
- 12–bit resolution including sign
- 4 programmable input ranges: ⊥1.28 V to ⊥10.24 V full–scale
- Input over–voltage protection
- External pacing/triggering
- Separate zero reference for error correction
- Easy connection via prewired cables and optional screw termination

Description

The HP 12060B and HP 12061A are plug–in cards for HP 1000 A–Series computers for low–cost, high–performance analog input capability in small distributed measurement and control applications. The A–Series product in which these cards are used must have a 25 kHz power supply. The HP 12060B High–Level Analog Input Card provides the capability of converting 8 differential analog voltage inputs to digital form. The HP 12061A Expansion Multiplexer Card provides an additional 32 channels of differential input for a total capability of 40 channels. All inputs are protected against accidental over voltage to 42 V peak.

HP 12060B Card

The HP 12060B is capable of acquiring up to 55,000 readings per second with 12–bit resolution. Auto scanning or single–channel sampling is possible to 55 kHz. Provisions for external pacing/triggering of sampling and scanning is provided. The HP 12060B includes four programmable full–scale ranges from ⊥1.28 V to ⊥10.24 V. Maximum resolution is 0.625 mV on the 1.28 V range to

5 mV on the 10.24 V range. A separate zero reference on the card allows the user to measure actual offset due to temperature drift, and correct reading on all 40 channels for higher accuracy.

HP 12061A Card

The HP 12061A provides 32 additional differential inputs for the HP 12060B card. It fastens directly onto the HP 12060B card, creating a two–board unit that occupies two I/O slots in an HP 1000 A–Series computer. Programming information is passed from the HP 12060B directly to the HP 12061A; analog signals on the additional 32 channels are in turn passed back to the HP 12060B for digitizing. The HP 12061A includes removable plug–in headers so the user can add current sense resistors for current loop measurements. These headers allow the board to be adapted to the specific application without soldering components directly on the board and are easily removable for repair.

HP 12060BC and 12061AC Cables

The HP 12060BC 8–channel Analog Input Cable and the HP 12061AC 32–channel Analog Input Cable provide for easy connection of your application to the HP 12060B and HP 12061A respectively. Both products provide a 3–meter cable prewired to the appropriate card–compatible edge–connector/hood assembly. Each channel is an individually shielded twisted pair for optional analog performance. The remote end of the cable is unterminated allowing direct wiring to the application. Alternately, the cable may be wired to the easy–to–use insulation displacement HP 12064A Termination Accessory providing electrician–compatible heavy–duty screw terminals and built–in wiring tray (see HP 12064A data sheet).

User Programming

User programming of both cards is easily accomplished using the parallel interface I/O driver (ID.50) in the RTE–A Operating System. A simple RTE EXEC call is all that is needed for full control of both cards. The format is as follows:

CALL EXEC (1, LU#, Data Buffer, # readings, control word)

The control word specifies:

- Gain (1, 2, 4, or 8)
- Start Channel: Scanning always begins at the specified Start Channel on the highest channel available (8 for the HP 12060B only and 40 with the HP 12061A). If more than one scan worth of readings has been requested, the next scan and all subsequent scans will also begin at the Start Channel.
- Auto Scan: The user specifies the starting channel(1–40) and the number of readings to be taken. The card will automatically begin at the starting channel, increment to the next and so forth, returning to the starting channel when reaching channel 8 (HP 12060B only) or channel 40 (HP 12061A), continuing until the specified number of readings have been taken.
- Single Channel: The user specifies the number of readings on a specific channel. The card then takes the readings requested.
- Internal Pacing: The card begins taking readings on commands and takes all readings at the maximum rate (18 ohms per reading), either scanning or on channel.
- External Pacing: The card begins taking readings when the external pace input goes high and stops when it goes low. This allows for pacing on channel by supplying a pace pulse less than a conversion time wide (nominally 15 ohms) for a specified number of readings. In auto scan mode, it allows pacing the start of scan by holding the input high for n readings per scan times one conversion time. Alternatively, readings in auto scan mode may be taken at any rate by applying a pulse train with a pulse width <15 ohms.

With a single call you can cause multiple scans and/or set up and wait for an external trigger.

Note: See related products information concerning MAC/1000 high–level call subroutines for A–Series M&C interfaces.

Calibration

The HP 12060B is calibrated at the factory and may require recalibration by the customer on arrival by using a voltage source and optional calibration software.

Gain Dependent *Table 1*

Specification	Gain			
	1	2	3	4

Full–scale Range			+10.24 V	+5.12 V	+2.56 V	+1.28 V
Resolution (12 bits)		5.0 mV	2.5 mV	1.25 mV	0.625 mV	
Accuracy (25ßC, RTI)		+5.0 mV	+2.5 mV	+1.25 mV	+0.625 mV	
Temperature Coefficient		+0.38 mV/ßC	+0.38 mV/ßC	+0.095 mV/ßC	+0.048 mV/ßC	
Inputs at:	12060B	+26.4 mV	+8.2 mV	+4.1 mV	+2.1 mV	
	12061A	+24.6 mV	+12.3 mV	+6.1 mV	+3.1 mV	

Overall Accuracy* [0ßC to 55ßC, referred to input (RTI), Worst Case]

* May be improved to 25ßC Accuracy Specification levels by correcting for the offset error due to temperature by measuring and subtracting the onboard zero reference voltage.

Functional Specifications

HP 12060B/12061A Analog Input System

Gain Dependent: See table 1.

Gain Independent:

Maximum input voltage:
⊥10.24 V to ground

Common mode rejection: >70 dB dc to 100 Hz with 1 k ohm source impedance and 1 kW source imbalance. Example: 20 Vp–p common mode voltage produces <6 mVp–p noise RTI.

Crosstalk: <80 dB dc to 100 Hz. Example: 20 V p–p adjacent channel input produces <2 mVp–p noise RTI.

Throughput to memory: 55,000 samples per second. Sample and hold aperture time: <20 nanoseconds

Input Overload Protection:

Steady state: Up to 25 V on any one input line to ground or to another input

Transient: 42 V for 500 ms without damage

Effective Input Impedance:

Power off: 1.2 k ohm (10%) to ground, 2.4 k ohm (10%) to any other channel

Power on: >5 M ohm

Source impedance and source imbalance: Up to 1 k ohm

Common mode return: Up to 10 k ohm

External Trigger: TTL–compatible handshake, not protected (operates at up to full 55 kHz rate, jumper selectable pull–up, pull–down, or TTL)

HP 12060B Physical Characteristics:

PC board: 28.9 cm (11.4 in) length, 17.2 cm (6.75 in) width, 1.9cm (0.75 in) height
Net weight: 0.4 kg (14 oz)

HP 12060B Power Requirements: 5.5 W at 5 V dc, 1.25 W at 25 kHz ac (normally provided by HP 12035A Power Module)

HP 12061A Physical Characteristics:

PC board: 28.9 cm (11.4 in) length, 17.2 cm (6.75 in) width, 2.8 cm (1.1 in) height
Net weight: 0.27 kg (9.3 oz)

HP 12061A Power Requirements: 0.05 W at 5 V dc, 2.0 W at 25 kHz ac

HP 12060BC And 12061AC Cables

Physical Characteristics

Cable length: 3 meters (9.84 feet) **Wire gauge**: 26 **Overall diameter**: <1.3 cm (0.5 in)

Electrical Characteristics

Configuration:
HP 12060BC ¬ 8 shielded twisted pairs plus one drain common to all shields
HP 12061AC ¬ 32 shielded twisted pairs plus one drain common to all shields

Voltage rating: 300 volts peak

Environmental characteristics: (both products)

Operating Temperature: 0ßC to 55ßC (32ßF to 131ßF)

Storage temperature: −40ßC to 75ßC (−40ßF to 167ßF)

Relative Humidity: 5% to 95% at 40ßC (104ßF) non−condensing

Altitude: Up to 4.6 km (15,000 ft) operating; up to 15.3 km (50,000 ft) non−operating

System Requirement: HP 1000 A−Series computers with 25 kHz power options. See the HP 1000 Ordering Information Guide.

Ordering Information

HP 12060B High−Level Input Card

The HP 12060B includes:

12060−60101 A−Series Analog Input Interface
12060−90003 User Information Manual
12060−90004 Operating and Service Manual

HP 12060B Options:

001 Adds Edge Connector Kit and extra edge connector
020 Calibration software on phase encoded minicartridges (P/N 12060–13301)
041 Calibration software of 8–inch flexible disk (P/N 12060–13401)
044 Calibration software on 3½–inch microfloppy disk (P/N 12060–13402)

The HP 12060BC includes:

12060–63001 3–meter unterminated cable with 8 individually shielded twisted pairs

HP 12061A Expansion Multiplexer Card

The HP 12061A includes:

12061–60001 A–Series Analog Input Expansion Interface
12061–60002 Test Hood

HP 12061A Option:

001 Adds Edge Connector Kit and extra edge connector

The HP 12061AC includes:

12061–63002 3–meter unterminated cable with 32 individually shielded twisted pairs

Diagnostics

Diagnostics software is supplied with the HP 24612A. This product includes diagnostic manuals, diagnostic software, and test hoods for the A–Series Measurement and Control interfaces including the HP 12060B, 12061A, 12062A, and 12063A. *Must* order one of the following media options: 020, 022, 041, 042, 044, or 051.

Related Products Information

MAC/1000 Software Library

This third–party software product provides a set of high–level call subroutines for the A–Series M&C family. These calls make upgrades to higher point count applications via Control 1000, straightforward. For more information contact:

Demand System, Inc.
6279 Variel Avenue, Suite D
Woodland Hills, CA 91637
Attn: Frank Zuhde
(213) 710–8851