Control/1000

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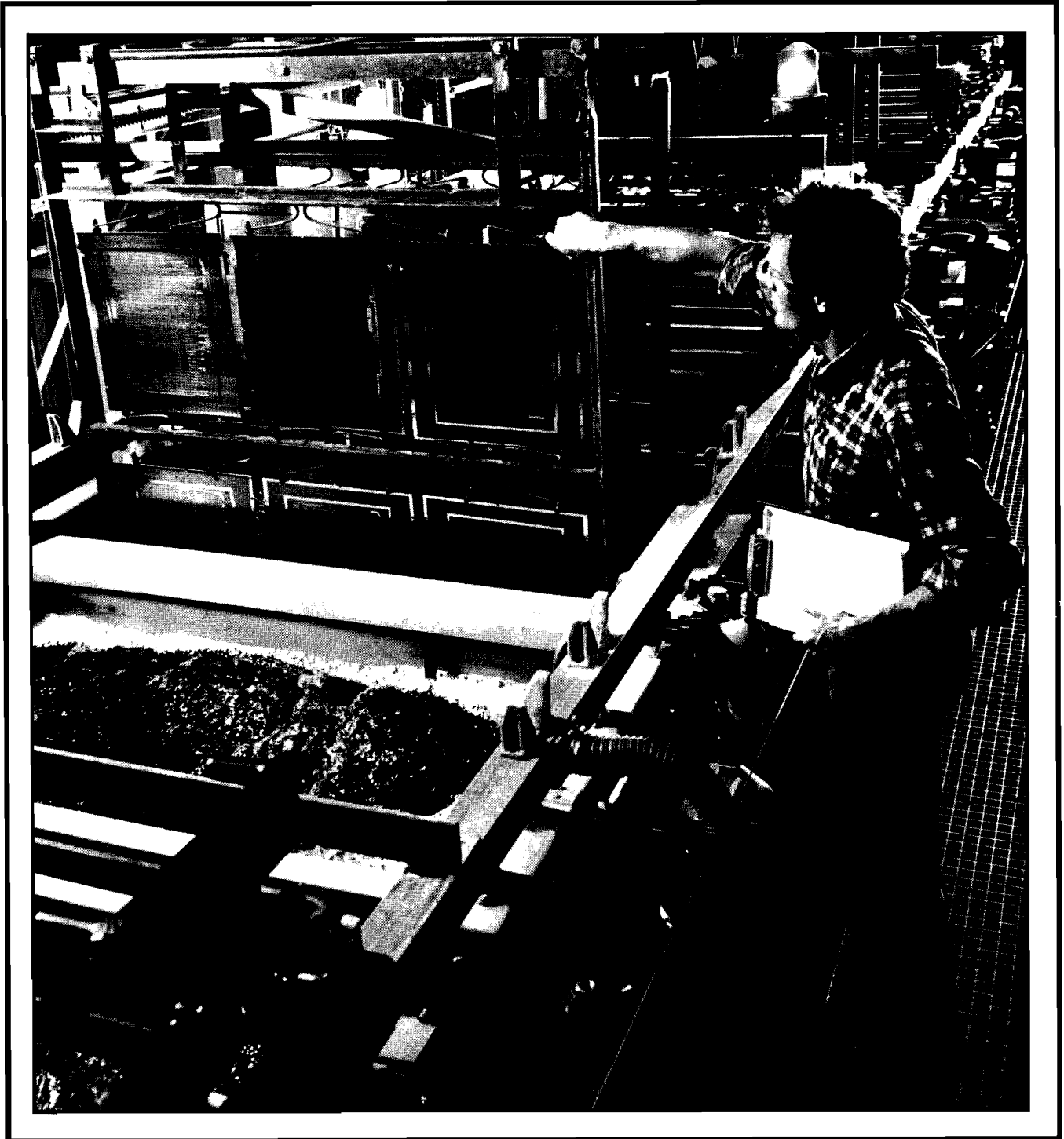**Technical Information Package**

Technical Information Package Contents

Control/1000 Description and Components Specifications

HEWLETT PACKARD

12035A POWER SUPPLY — 2104B CARD CAGE — 2106AK A600 BOARD COMPUTER — MEASUREMENT AND CONTROL INTERFACE — DS/1000-IV INTERFACE — TO OTHER HP 1000 SYSTEMS — MEASUREMENT AND CONTROL UNIT 1 — MEASUREMENT AND CONTROL UNIT 8* — MEASUREMENT AND CONTROL FUNCTION CARDS — RACK MOUNTING SCREW TERMINATION STRIPS — TO APPLICATION
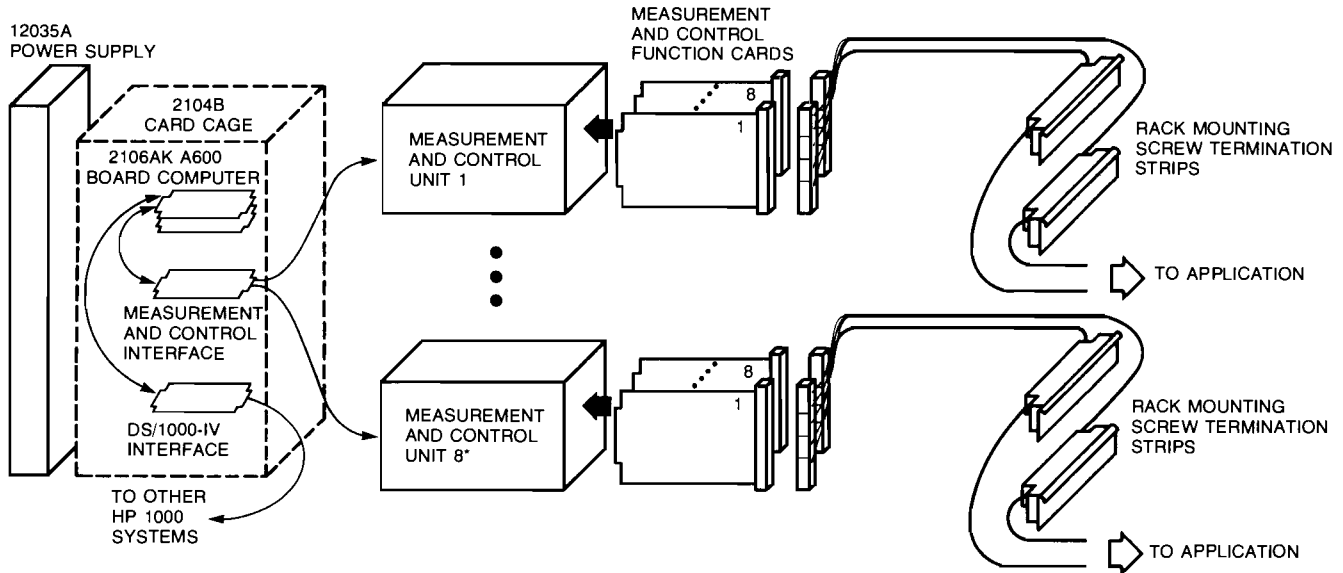
* Measurement and control units 3 through 8 must be housed in 2255H Measurement and Control Subsystems

Control/1000 Components

Control/1000 identifies a family of software and hardware products that are designed for flexible application to industrial automation jobs that involve medium to high point count measurement and control. Control/1000 software in the 91823A Control/1000 software package coordinates an extensive choice of powerful measurement and control components. The 91823A Control/1000 software is covered in a separate data sheet in this Control/1000 information package.

Control/1000 components are housed in the 2250H (rack cabinet) or 2250A (NEMA-12 cabinet) Measurement and Control System. All operations are coordinated by a 2106AK Option 012 A600 computer with 512k bytes of memory. The computer controls up to 8 measurement and control units*, each capable of supporting up to 8 measurement and control function cards (up to 1920 analog inputs or up to 2048 digital inputs and outputs) via a single measurement and control interface. Rack mounting screw-terminal connection assemblies make it easy to connect application inputs and outputs to the 2250 function cards.

In addition to its communication with the application via the measurement and control interface and measurement and control units and function cards, the computer communicates with other systems via a DS/1000-IV network interface card to transfer processed data to other HP 1000 Computer Systems. It is thus designed to fit into your own completely-unified manufacturer's productivity network.

* *The base 2250A/H includes one measurement and control unit and has space for another as well as space for enough rack-mounting screw-terminal assemblies to connect all application input and output points that can be supported by two measurement and control units (16 function cards). Additional measurement and control units and screw-terminal assemblies for the 2250H can be accommodated in 2255H Measurement and Control Subsystems.*

Control/1000 components and their specifications are summarized in Table 1 (next page) to help you evaluate Control/1000 as a solution to your application.

Table 1. HP Control/1000 Components Specifications Summary

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
SYSTEM AND PROCESSOR COMPONENTS AND CABINETS		

2250H	RACK-MOUNTING MEASUREMENT AND CONTROL SYSTEM, which includes:
	
	1. 2104B Measurement and Control Processor with card cage, power supply, and:
	  a. L-Series CPU and RRACK cards
	  b. 12009A HP-IB Interface card.
	  c. 12071A Measurement and Control Interface card.
	2. 2251B Measurement & Control Unit (MCU).
	3. Rack mount cabinet with space for two 2251B MCUs and 30 field wiring assemblies.
		PREREQUISITES FOR CONTROL/1000 USE: 2250H Option 020, a 2106AK+012 (A600) two-card Board Computer with 512kb memory, a 12007B or 12044A DS/1000-IV network interface and connection to an HP 1000 system, and one or more function cards in the included 2251B Measurement and Control Unit (MCU).
		
		2251B MCUs SUPPORTED: 2 in 2250H, up to 8 addressable by 12071A Measurement and Control Interface (MCI) Card. Third through eighth MCUs must be housed in 2255H Measurement and Control Subsystems.
		
		NUMBER OF FIELD WIRING ASSEMBLIES SUPPORTED: 30.

-001	Adds a second 2251B MCU.	
-010	Adds 12103A Battery Backup Card (supports only the 512kb memory controller, no memory array cards).	
-020	Control/1000 option (deletes L-Series CPU, RRACK, and 12009A HP-IB cards from 2104B; remaining 12071A Measurement and Control Interface uses one 2104B card cage slot).	
-326	Operation from 120V/47-66Hz ac power.	
-335	Operation from 230V/47-66Hz ac power.	
2255H	MEASUREMENT AND CONTROL SUBSYSTEM with one 2251B MCU.	APPLICATION: Adds capacity for two 2251B MCUs interfaced from processor unit in 2250H and 30 field wiring assemblies. Includes one MCU.
-001	Adds a second 2251B MCU.	
-326	Operation from 120V/47-66Hz ac power.	
-335	Operation from 230V/47-66Hz ac power.	
2250A	INDUSTRIAL MEASUREMENT AND CONTROL SYSTEM IN NEMA-12 CABINET, which includes: 1 and 2. Same as for 2250H, above. 3. NEMA-12 Industrial Cabinet with space for two 2251B MCUs and 64 field wiring assemblies	PREREQUISITES FOR CONTROL/1000 USE: 2250A Option 020; other prerequisites same as for 2250H, above. 2251B MCUs SUPPORTED, NUMBER OF FIELD WIRING ASSEMBLIES SUPPORTED, AVAILABLE +5V CURRENT, AND AVAILABLE CARD CAGE SLOTS: Same as for 2250H, above. However, no industrially-packaged measurement and control subsystem is available for accommodating more than two MCUs.
-001 through -335	Same as for 2250H above.	
2106AK	A600 BOARD COMPUTER, which includes: 1. 12102A 128kb Memory controller card. 2. 12101A A600 CPU card. 3. 12038A Memory frontplane connector.	PREREQUISITES FOR CONTROL/1000 USE: 2106AK Option 012 (512k bytes of memory) and 92077A/R/E RTE-A operating system. BASE COMPUTATIONAL PERFORMANCE: 1 million instructions per second, average.
-012	12102B 512kb Memory controller card instead of 12102A 128kb Memory controller card. NOTE: The A600/A600+ Computer Installation and Service Manual, HP Part Number 02156-90002, should also be ordered to provide documentation for the 2106AK.	SINGLE-PRECISION FLOATING POINT PERFORMANCE: 53,400 operations per second, average. MAXIMUM MEMORY: The 91823A Control/1000 software has been tested in 512k bytes of memory; although it may be usable in systems with more than 512k bytes of memory, such use is not currently supported by Hewlett-Packard.
12013A	BATTERY BACKUP CARD to sustain 512kb memory in memory controller in event of a power failure.	2104B CARD CAGE SLOTS REQUIRED: 1. HOLD-UP TIME: Up to 60 minutes; additional time can be achieved by connecting an external battery.
MEASUREMENT AND CONTROL UNIT		
2251B	MEASUREMENT AND CONTROL UNIT (MCU), which includes: 1. Rack-mounting card cage. 2. Backplane interface card.	APPLICATION: The 2251B MCU is used to house 255xxB/C function cards in the 2250A/H Measurement and Control System or 2255H Measurement and Control Subsystem. One 2251B is included in the 2250A/H Measurement and Control System or 2255H Measurement and Control Subsystem.
-326	Operation from 120V/47-66Hz ac power.	NUMBER OF FUNCTION CARDS SUPPORTED: 8.
-335	Operation from 230V/47-66Hz ac power.	REQUIREMENTS FOR ANALOG INPUT MULTIPLEXER SUPPORT: 25501B ADC function card must be in card cage slot 1.

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Table 1. HP Control/1000 Components Specifications Summary, continued

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
	ANALOG INPUT FUNCTION CARDS AND SIGNAL CONDITIONING COMPONENTS	
25501B	16-CHANNEL HIGH-SPEED ADC CARD, which includes: 1. 25501-60001 ADC Card 2. One 25551-60005 set of Screw-terminated cables, mounting assemblies, and labels	INPUT RANGE: +/-10V +/-5V +/-2.5V +/-1.25V INPUT SPAN: 20V 10V 5V 2.5V RESOLUTION: 1.25mV 625uV 312uV 1.562uV MAX. DIFF. + COMMON MODE VOLTAGE: +/-10V on all ranges. MAX RECOMMENDED SOURCE IMPEDANCE: 1k ohm, balanced or unbalanced.
-001	Replaces screw-terminated cables with unterminated cables.	MAX. RETURN IMPEDANCE: 10k ohms.
-002	Deletes cables, mtg assemblies, and labels.	COMPATIBLE MULTIPLEXERS: Up to seven 25502B, 25503B/C, and/or 25504B/C multiplexers can be used in any combination. The 25501B ADC must be installed in slot 1 of the 2251B MCU for use with multiplexers. PROGRAMMING INFORMATION: See Control/1000 software data sheet. OTHER SPECIFICATIONS: See 25501A data sheet in 2250 Technical Data book (5953-4288).
25502B	32-CHANNEL HIGH-LEVEL MULTIPLEXER CARD, which includes: 1. 25502-60001 Multiplexer card. 2. Two 25551-60005 sets of Screw-terminated cables, mounting assemblies, and labels.	INPUT RANGE, SPAN, RESOLUTION, MAX DIFF + COMMON MODE VOLTAGE, AND MAX SOURCE AND RETURN IMPEDANCES: Same as for 25501B, above. OTHER SPECIFICATIONS: See 25502A data sheet in 2250 Technical Data book (5953-4288).
-001	Replaces screw-terminated cables with unterminated cables.	
-002	Deletes cables, mtg assemblies, and labels.	
-B40	R-C Filter signal conditioning modules (four 25540Bs).	
-D40	4-20mA Current loop input signal conditioning modules with R-C filters (four 25540Ds).	
25503B	32-CHANNEL LOW-LEVEL MULTIPLEXER CARD, which includes: 1. 25503-60001 Multiplexer card. 2. Two 25551-60005 sets of screw terminated cables, mounting assemblies, and labels.	INPUT RANGES AND RESOLUTION WHEN USED WITH 22501B ADC: Full Scale Input Voltage Amplifier Range Span Resolution Gain +/-10V 20V 1.25mV 1 +/-5V 10V 625uV 2 +/-2.5V 5V 312uV 4 +/-1.25V 2.5V 156uV 8 +/-1V 1.25V 125uV 10
-001	Replaces screw-terminated cables with unterminated cables.	+/-500mV 1V 62.5uV 20 +/-250mV 500mV 31.2uV 40 +/-125mV 250mV 15.6uV 80
-002	Deletes cables, mtg assemblies, and labels.	+/-100mV 200mV 12.5uV 100 +/-50mV 100mV 6.25uV 200
-B40	R-C Filter signal conditioning modules (four 25540Bs)	+/-25mV 50mV 3.12uV 400 +/-12.5mV 25mV 1.56uV 800
-D40	4-20mA Current loop input signal conditioning modules with R-C filters (four 25540Ds)	MAX SOURCE AND RETURN IMPEDANCES: Same as for 25501B, above. OTHER SPECIFICATIONS: See 25503A data sheet in 2250 Technical Data book (5953-4288).
25503C	32-CHANNEL LOW-LEVEL MULTIPLEXER CARD WITH THERMOCOUPLE CONNECTION, which includes: 1. 25503-60001 Multiplexer card. 2. Two 25594-60003 Thermocouple reference connectors. 3. Two 25552-60003 sets of cables, mounting assemblies, and labels.	INPUT CAPACITY: 30 Thermocouples. OTHER SPECIFICATIONS: Same as for 25503B, above, except as modified by 25594A data sheet in the 2250 Technical Data book (5953-4288).
-B40	R-C Filter signal conditioning modules (four 25540Bs).	

Table 1. HP Control/1000 Components Specifications Summary, continued

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)

ANALOG INPUT FUNCTION CARDS AND SIGNAL CONDITIONING COMPONENTS, continued

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS
25504B -001 -002	16-CHANNEL LOW-LEVEL RELAY MULTIPLEXER CARD, which includes: 1. 25504-60001 Relay multiplexer card. 2. One 25551-60006 set of screw-terminated cable, mounting assembly, and labels. Replaces screw-terminated cables with unterminated cables. Deletes cables, mtg assemblies, and labels.	INPUT RANGES AND RESOLUTION WHEN USED WITH 22501B ADC: Full Scale Input Voltage Amplifier Range Span Resolution Gain +/-100V 200V 12.5mV 0.1 +/-50V 100V 6.25mV 0.2 +/-25V 50V 3.12mV 0.4 +/-12.5V 25V 1.56mV 0.8 +/-10V 20 1.25mV 1 +/-5V Specifications are the same as through for 25503B, above. +/-12.5mV OTHER SPECIFICATIONS: See 25504A data sheet in 2250 Technical Data book (5953-4288).
25504C	16-CHANNEL LOW-LEVEL RELAY MULTIPLEXER CARD WITH THERMOCOUPLE CONNECTION, which includes: 1. 25504-60001 Multiplexer card. 2. One 25594-60003 Thermocouple reference connector. 3. One 25552-60003 set of cables, mounting assemblies, and labels.	INPUT CAPACITY: 15 Thermocouples. OTHER SPECIFICATIONS: Same as for 25504B, above, except as modified by the 25594A data sheet in the 2250 Technical Data book (5953-4288).
25540x 25540B ANALOG INPUT SIGNAL CONDITIONING MODULE WITH R-C FILTER. 25540D ANALOG INPUT SIGNAL CONDITIONING MODULE WITH CURRENT LOOP TERMINATION AND R-C FILTER.	INPUT SIGNAL CONDITIONING MODULES.	APPLICATION: Provides space for signal conditioning of inputs to 25502B or 25503B/C 32-channel Multiplexers. CAPACITY: 8 differential inputs per 25540x module. NUMBER PER 25502B OR 25503B MULTIPLEXER: 4, maximum. CHARACTERISTIC: -5dB at 25Hz, decreasing 20dB per decade. CHARACTERISTIC: Termination is 250 ohms for conversion of 4 to 20mA current loop signal to voltage followed by filter with -5dB at 25Hz, decreasing 20dB per decade.

ANALOG OUTPUT FUNCTION CARD

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS
25510B -001 -002	4-CHANNEL ISOLATED VOLTAGE/CURRENT ANALOG OUTPUT CARD, which includes: 1. 25510-60001 Analog output card. 2. One 25551-60007 set of screw-terminated cable, mounting assembly, and labels. Replaces screw-terminated cable with unterminated cable. Deletes cable, mtg assembly, and labels.	APPLICATION: Provides analog outputs for proportional controllers, strip chart recorders or other devices that respond to analog input. NUMBER OF OUTPUTS: 4. OTHER SPECIFICATIONS: See 25510A data sheet in 2250 Technical Data book (5953-4288).

DIGITAL INPUT AND OUTPUT FUNCTION CARDS

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS
25511B -001 -002 -B35 through -V37	32-POINT DIGITAL INPUT CARD, which includes: 1. 25511-60001 Digital input card. 2. Two 25550-60005 sets of screw-terminated cables, mounting assemblies, and labels. Replaces screw-terminated cables with unterminated cables, the same order). Deletes cables, mtg assemblies, and labels. Digital input signal conditioning module options for 25511B. Each option provides a full complement of one type of signal conditioning module. For example, B35 provides eight 25535B SCMs.	NUMBER OF INPUT POINTS: 32. OTHER SPECIFICATIONS: See 25511A data sheet in 2250 Technical Data book (5953-4288). Non-isolated: B35 Isolated: P37 R37 V37 DC Input: 5V 24V n/a AC Input: n/a n/a 115V
25512B	4-CHANNEL COUNTER CARD, which includes: 1. 25512-60001 Counter card. 2. One 25550-60005 set of screw-terminated cable, mounting assembly, and labels.	NUMBER OF INPUT CHANNELS: 4. OTHER SPECIFICATIONS: See 25512A data sheet in 2250 Technical Data book (5953-4288).

Table 1. HP Control/1000 Components Specifications Summary, continued

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS. DATA RATES. ETC.)
	DIGITAL INPUT AND OUTPUT FUNCTION CARDS. continued	
25512B	4-CHANNEL COUNTER CARD, continued	
-001	Replaces screw-terminated cable with unterminated cable.	
-002	Deletes cable, mtg assembly, and labels.	
-B35 through -K36	Digital input signal conditioning module options for 25512A. Each option provides a full complement of one type of signal conditioning module. For example. B35 provides two 25535B SCMs.	Type: Source Sink Non-isolated: B35 K35 Isolated: B36 K36 DC Input: 5V 5V
25513B	32-POINT DIGITAL OUTPUT CARD, which includes: 1. 25513-60001 Digital output card. 2. Two 25550-60005 sets of screw-terminated cables, mounting assemblies. and labels.	NUMBER OF OUTPUT POINTS: 32. OTHER SPECIFICATIONS: See 25513A data sheet in 2250 Technical Data book (5953-4288).
-001	Replaces screw-terminated cables with unterminated cables.	
-002	Deletes cables, mtg assemblies, and labels.	
-A44 through -P45	Digital output signal conditioning module options for 25513B. Each option provides a full complement of one type of signal conditioning module. For example. A44 provides eight 25544A SCMs.	SCM Type: Non-isolated Isolated SCM Opt: A44 B44 N43 P45 DC Output: Open drain 5V 60V n/a AC Output: n/a n/a 42V 120V
25514B	16-POINT RELAY OUTPUT CARD, which includes: 1. 25514-60001 Relay output card. 2. One 25550-60005 set of screw-terminated cable, mounting assembly, and labels.	NUMBER OF OUTPUT POINTS: 16 Form C (SPDT) sealed relays. OTHER SPECIFICATIONS: See 25514A data sheet in 2250 Technical Data book (5953-4288).
-001	Replaces screw-terminated cable with unterminated cable.	
-002	Deletes cable, mtg assembly, and labels.	
-G39	Four 25539G Relay arc suppression modules.	PEAK WORKING VOLTAGE: +/-37V.
-H39	Four 25539H Relay arc suppression modules.	PEAK WORKING VOLTAGE: +/-160V.
25515B	4-CHANNEL PULSE GENERATOR CARD, which includes: 1. 25515-60001 Pulse generator card. 2. One 25550-60007 set of screw-terminated cable, mounting assembly, and labels.	NUMBER OF OUTPUT CHANNELS: 4. OTHER SPECIFICATIONS: See 25515A data sheet in 2250 Technical Data book (5953-4288).
-001	Replaces screw-terminated cable with an unterminated cable.	
-002	Deletes cable, mtg assembly, and labels.	
-B35 through -B46	Digital I/O signal conditioning module options for limit switch input and pulse output. Each option provides a full complement of one type of signal conditioning module. For example. B35 provides two 25535Bs.	Type: Input Output Non-isolated: B35 C35 L35 A44 B46 Isolated: P37 Q37 n/a n/a n/a DC Volts: 5V 12V 12V Open drain 5V Sink
25516B	16-POINT IN/16-POINT OUT DIGITAL MULTI-FUNCTION CARD, which includes: 1. 25516-60001 Digital multifunction card. 2. Two 25550-60005 sets of screw-terminated cables, mounting assemblies, and labels.	NUMBER OF INPUT POINTS: 16. OUTPUT: 16 output points with two ranks of storage to permit verification before outputting. OTHER SPECIFICATIONS: See 25516A data sheet in 2250 Technical Data book (5953-4288).
-001	Replaces screw-terminated cables with unterminated cables.	
-002	Deletes cables, mtg assemblies, and labels.	
-B35 through -V37	Digital input signal conditioning module options for 25516B. Each option provides a full complement of one type of signal conditioning module. For example, B35 provides four 25535B SCMs.	Non-isolated: B35 Isolated: P37 R37 V37 DC Input: 5V 24V n/a AC Input: n/a n/a 115V

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Table 1. HP Control/1000 Components Specifications Summary, continued

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)

NON-ISOLATED DIGITAL INPUT SIGNAL CONDITIONING MODULES (SCMs)

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
25516B -A44 through -N43	16-POINT IN/16-POINT OUT DIGITAL MULTI-FUNCTION CARD, continued Digital output signal conditioning module options for 25516A. Each option provides a full complement of one type of signal conditioning module. For example, A44 provides four 25544A SCMs.	SCM Type: Non-isolated Isolated SCM Opt. A44 B44 N43 P45 DC Output: Open drain 5V 60V n/a AC Output: n/a n/a 42V 120V
25531x	ONE-POINT, NON-ISOLATED EXTERNAL STROBE SIGNAL CONDITIONING MODULES.	APPLICATION: Provides non-isolated signal conditioning of external strobe inputs to 25511B, 25513B, 25514B, and 25516B digital I/O cards. CAPACITY: One external strobe input per 25531x module. NUMBER OF SCMs PER DIGITAL I/O CARD: Two per 25511B or 25513B card, one per 25514B or 25516B card. VOLTAGES BY SCM NUMBER: SCM Number: 25531B 25531C 25531D 25531E 25531K 25531L Input Type: Source Source Source Source Sink Sink Voltage: 5V dc 12V dc 24V dc 48V dc 5V dc 12V dc OTHER SPECIFICATIONS: See 25531/25535B/C/D/E/K/L data sheet in 2250 Technical Data book (5953-4288)
25535x	FOUR-POINT, NON-ISOLATED DIGITAL INPUT SIGNAL CONDITIONING MODULES.	APPLICATION: Provides non-isolated signal conditioning of digital inputs to 25511B, 25512B, and 25516B Digital I/O cards. Each SCM supports up to four points. CAPACITY: Four digital inputs per 25535x module. NUMBER OF SCMs PER DIGITAL I/O CARD: Eight per 25511B, one per 25512B, four per 25516B. VOLTAGES BY SCM NUMBER: Voltages of 25535B, C, D, E, K, and L are same as for 25531B, C, D, E, K, and L, above. OTHER SPECIFICATIONS: See 25531/25535B/C/D/E/K/L data sheet in 2250 Technical Data book (5953-4288).

ISOLATED DIGITAL INPUT SIGNAL CONDITIONING MODULES (SCMs)

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
25533x	ONE-POINT, ISOLATED EXTERNAL STROBE SIGNAL CONDITIONING MODULES.	APPLICATION: Provides isolated signal conditioning of external strobe inputs to 25511B, 25513B, 25514B, and 25516B digital I/O cards. Each SCM supports up to 16 points. CAPACITY: One external strobe input per 25533x module. NUMBER OF SCMs PER DIGITAL I/O CARD: Two per 25511B or 25513B card, one per 25514B or 25516B card. VOLTAGES FOR SCMs 25533B THROUGH 25533E: SCM Number: 25533B 25533C 25533D 25533E DC Input: 5V dc 12V dc 24V dc 48V dc AC Input: n/a n/a 16V rms n/a VOLTAGES FOR SCMs 25533F THROUGH 25533J: SCM Number: 25533F 25533G 25533H 25533J DC Input: 72V dc 120V dc n/a n/a AC Input: n/a 72V rms 115V rms 230V rms OTHER SPECIFICATIONS: See 25533B,C,D,E,F,G,H,J - 25537P,Q,R,S,T,U,V,W data sheet in 2250 Technical Data book (5953-4288).
25537x	FOUR-POINT, ISOLATED DIGITAL INPUT SIGNAL CONDITIONING MODULES.	APPLICATION: Provides isolated signal conditioning of digital inputs to 25511B, 25512B, and 25516B Digital I/O cards. Each SCM supports up to four points. CAPACITY: Four digital inputs per 25537x module. NUMBER OF SCMs PER DIGITAL I/O CARD: Eight for 25511B, one for 25512B, four for 25516B. VOLTAGES OF 25537P, Q, R, AND S: Same as for 25533B,C,D, and E, respectively, above. VOLTAGES OF 25537T, U, V, AND W: Same as for 25533F,G,H, and J, respectively, above. OTHER SPECIFICATIONS: See 25533B,C,D,E,F,G,H,J - 25537P,Q,R,S,T,U,V,W data sheet in 2250 Technical Data book (5953-4288).

Table 1. HP Control/1000 Components Specifications Summary, continued

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)

DIGITAL OUTPUT SIGNAL CONDITIONING MODULES (SCMs)

PRODUCT AND OPT NUMBERS	COMPONENT NAME AND DESCRIPTION	SPECIFICATIONS (CAPACITY, LOGIC LEVELS, DATA RATES, ETC.)
25539x	FOUR-POINT RELAY ARC SUPPRESSION SIGNAL CONDITIONING MODULES.	APPLICATION: Prevents damage to contacts of the 25514B 16-Point Relay Output card and reduces noise due to voltage spikes that accompany the switching of motors, solenoids, or other inductive loads. Long cables are inductive loads and require arc suppression. CAPACITY: Four sets of relay contacts. NUMBER OF 25539x SCMs PER 25516B RELAY OUTPUT CARD: Four. WORKING AND CLAMPING VOLTAGES BY SCM NUMBER: SCM Type: Bread-board With components SCM Number: 25539A 25539E 25539G 25539H 25539J Peak working V: Set by User +/-30V +/-37V +/-160V +/-320V Max. clamping V: Set by User 57V 68V 287V 574V OTHER SPECIFICATIONS: See 25539 data sheet in 2250 Technical Data book (5953-4288).
25543N	FOUR-POINT ISOLATED OUTPUT SIGNAL CONDITIONING MODULE.	APPLICATION: Provides isolated switching of high common mode voltages by digital outputs of 25513B, 25515B, or 25516B Digital I/O cards. CAPACITY: Four output points. NUMBER OF SCMs PER DIGITAL I/O CARD: Eight for 25513B, one for 25515B, four for 25516B. OTHER SPECIFICATIONS: See 25543N data sheet in 2250 Technical Data book (5953-4288).
25544x	FOUR-POINT NON-ISOLATED DC OUTPUT SIGNAL CONDITIONING MODULES.	APPLICATION: Provides switching of dc signals up to 60V by digital outputs of 25513B, 25515B, or 25516B Digital I/O cards. CAPACITY: Four output points. NUMBER OF SCMs PER DIGITAL I/O CARD: Eight for 25513B, one for 25515B, four for 25516B. VOLTAGES BY SCM NUMBER: SCM Number: 25544A 25544B 25544C SCM Voltage: Open drain 5V dc 12V dc OTHER SPECIFICATIONS: See 25544A,B,C data sheet in 2250 Technical Data book (5953-4288).
25545P	TWO-POINT ISOLATED SOLID-STATE RELAY AC OUTPUT SIGNAL CONDITIONING MODULE.	APPLICATION: Provides switching of 115V rms ac by digital outputs of 25513B, 25515B, or 25516B Digital I/O cards. CAPACITY: Two output points. NUMBER OF SCMs PER DIGITAL I/O CARD: Eight for 25513B, two for 25515B, four for 25516B. OTHER SPECIFICATIONS: See 25545P data sheet in 2250 Technical Data book (5953-4288).
25546B	FOUR-POINT NON-ISOLATED DC OUTPUT SIGNAL CONDITIONING MODULES.	APPLICATION: Provides switching of 5V dc signals with low transmission line ringing by digital outputs of 25513B, 25515B, or 25516B Digital I/O cards. CAPACITY: Four output points. NUMBER OF SCMs PER DIGITAL I/O CARD: Eight for 25513B, one for 25515B, four for 25516B.

Control/1000

Control/1000 is a software package which enables a user to construct measurement and process control programs in high level languages such as FORTRAN and Pascal. The 91823A product is combined with the HP 2250 Measurement and Control System, an HP 1000 A-Series board computer, memory cards, and interface cards, under management by an RTE-A operating system. This configuration provides true multitasking and multiprogramming capability, combined with the high speed of the A-Series computer — one million instructions per second. Control/1000 is designed for industrial control and measurement applications with a medium to high sensor/control point count.

Features

- **Up to 2048 sensor/actuator points per Measurement and Control Interface (MCI) card**
- **Full power and compatibility of the A600 CPU**
- **Fast, real-time response time**
- **Large user memory, up to 512k bytes**
- **Data communications via Distributed Systems Link (DS/1000-IV)**
- **Clean, efficient interface between user programs and measurement and control devices**
- **DMA per channel for fast I/O**

Summary of Control/1000 capabilities in an RTE-A Environment

- **Analog/digital I/O commands**
  - Easy to remember and use, applications-oriented
  - Programmable analog gains
  - Parallel measurement and control operations
  - User-selectable computer data formats
- **Synchronizing, timing, and pacing commands**
  - Programmable internal pacing of all function cards
  - Synchronization with external events
- **Callable from Macro/1000 Assembler and these high level languages**
  - FORTRAN
  - Pascal
- **Multi-tasking capabilities**
  - True multiprogramming with concurrent program execution
  - Time, event, program-to-program, and operator scheduling of program execution
  - Automatic background task scheduling

Typical applications

- Production Steam Turbine Testing
- Wastewater Treatment Plants
- Oil Viscosity Testing
- Printing Press Automation
- Petroleum Pilot Plant Monitoring
- Paper Chemical Treatment Plant Automation

System Architecture

The HP 2250 Measurement and Control System that previously used an HP 1000 L-Series microcomputer linked to a host computer via an HP Interface Bus (HP-IB) now utilizes an A600 microcomputer. In the place of the HP-IB is a Distributed Systems/1000-IV link that enables measurement and control applications to be an integral part of an overall computer network.

The A600 computer, imbedded within the HP 2250 chassis with a real-time operating system, works with the Control/1000 software to eliminate much of the hardware and software protocol required to communicate with the Measurement and Control function cards. I/O functions are accomplished with callable subroutines written in FORTRAN, Pascal, or Macro/1000 Assembler. These subroutines and the measurement and control programs have access to all the resources available to any program running under an RTE operating system. The role of the host computer has been reduced to bootup, downloading, printing and display of the results of Control/1000-based operations, and overall supervision.

The 91823A product is the Control/1000 software subsystem, consisting of high level language callable subroutines for I/O functions and timing, an RTE driver for the Measurement and Control Interface (MCI) Card, and DEMON, an interactive hardware verification software aid. Applications programs can access the driver through measurement and control subroutines or directly through Interface EXECutive calls.

The MCI Driver performs all the necessary communication and handshaking with the MCI Card. Incoming requests to the MCI Driver are queued up and serviced according to priority, with highest priority going to MCI interrupts.

Software Components and Functions

Measurement and Control Subroutines

A comprehensive set of measurement and control subroutines, combined with an internal system table structure, form the software for interface between user requests and the MCI Driver, as well as vital measurement calibrations not provided on the HP 2250 function cards. Control/1000 measurement and control subroutines, listed below, can be called from FORTRAN 77, Pascal, or Macro/1000 Assembler user programs.

Control/1000 Command Set

DIGITAL I/O FUNCTION CARDS						DIGITAL I/O COMMANDS
25511B Digital Input Card	25513B Digital Output Card	25514B Relay Output Card	25515B Pulse Output Card	25516B Digital I/O Multifunction Card	25512B 4-Ch Counter Card	
x				x		DI Read digital input point
x				x		FI Read digital input field
	x	x		x		DO Write digital output pt
	x	x		x		FO Write digtl outpt field
	x	x		x		RDO Read digitl outpt point
	x	x		x		RFO Read digitl outpt field
			x			POC Pulse channel config
			x			PRATE Pulse rate config
			x			PNUMBER Set pulse number
			x			PCONTROL Pulse channel control
			x			RREM Read number of remaining pulses
x				x	x	INTERRUPT* Point interrupt enable control
x				x	x	RINTERRUPT Read interrupt configuration
x				x		SENSE Sense transition control
x				x		SOVER Sense override control
				x		PRESET Preset counter on multifunction card
				x		RPRESET Read counter on multifunction card
				x		ROLL Counter rollover for multifunction card
					x	ECFN Extended counter channel configuration
					x	CFN Counter channel config
					x	RCFN Read counter card configuration
					x	CNUMBER Set counter card average
					x	RCNUMBER Read counter card average
					x	CCONTROL Counter card control
				x	x	COUNT Read single word count
					x	DCOUNT Read double word count
					x	RCOUNT Read single word count with re-start
					x	RDCOUNT Read double word count with re-start
x	x	x	x	x	x	REGIO Register I/O

* Command that cannot be chained

ANALOG I/O FUNCTION CARDS					ANALOG I/O COMMANDS
25501B ADC Card	25502B 32-Ch HL MPX Card	25503B/C 32-Ch LL MPX Card	25504B/C 16-Ch Relay MPX	25510B DAC Card	
x	x	x	x		CLB* Calibrate analog input
x					AON Autorange on
x					AOFF Autorange off
x	x	x	x		AIR Analog input, real format
x	x	x	x		AIC Analog input, raw format
x	x	x	x		GAIN Set analog input gain
x	x	x	x		RGAIN Read analog input gain
x	x	x	x		RANGE Set analog input range
				x	VO Analog voltage output
				x	CO Analog current output
x	x	x	x	x	REGIO Register I/O

* Command that cannot be chained

SYSTEM COMMANDS THAT APPLY TO ALL CARDS	
RESET*	System reset
SYN*	System normalization of function cards
FCID*	MCU/function card identification
CTL	Write card configuration register(s)
RCS	Read function card status register(s)

SYSTEM COMMANDS THAT DO NOT APPLY TO FUNCTION CARDS	
FCI*	Function card interrupt (master)
RFCI*	Read function card interrupt (master)
IHON*	Enable function card interrupt handling program
IHOFF*	Disable function card interrupt handling program
PACE	Set pacing timer
XCT*	Perform pending operations MCL equivalent
CHNCLEAR*	Clear measurement and control chain
CHNSTORE*	Store measurement and control chain
CHNXCT*	Execute measurement and control chain

* Command that cannot be chained

Interface EXECutive. An application program may make an EXEC request on the MCI Driver directly. Such a request would be similar in complexity to an MCL I/O program and the user must use proper physical function card register addresses to perform the proper request. Because the request is sent directly to the driver, it executes slightly faster than would an I/O subroutine call. However, in calling the driver directly, the user sacrifices a friendlier interface to the driver. Little checking is performed on the request by the driver. A good working knowledge of the physical function card registers is necessary for use of this mode.

DEMON. Measurement and control hardware can be verified interactively from a terminal using DEMON, a softkey, menu driven program that allows the user to identify all measurement and control cards in the system. With DEMON, measurements can be made from any arbitrary input point, and any output point value can be specified by the user. All of these operations require only a response to program prompts from the host terminal.

Configuration

In addition to the 91823A Software Package, the following components are necessary to complete the Control/1000 system:

Hardware Components

1. HP 2106AK A600 board computer
2. 512k bytes of memory (Option 012 to 2106AK)
3. One of the three following HP 2250 Measurement and Control System configurations, of which the first two include an integral HP 2104 processor unit, and measurement and control function cards as required for the application:
   a. HP 2250A NEMA-12 enclosed 2250 system, with Option 020
   b. HP 2250H Rack-mount 2250 system, with Option 020
   c. Stand-alone HP 2251B Measurement and Control Unit, and HP 2104B Processor Unit, with Option 020 in a customer-furnished enclosure.
4. Link to another HP 1000 Computer System via one of the following DS/1000-IV interfaces:
   a. HP 12007B DS/1000-IV HDLC Modem Interface to HP 1000 with 5m/16ft RS-232-C cable
   b. HP 12044A DS/1000-IV HDLC Direct Connect interface with two 5m/16ft direct connection cables and verifier hoods

NOTE: A limitation on the number of interface cards that can be plugged into the HP 2104 processor is the 24 amps available from the +5 volt power supply.

Software components:

1. HP 92077A/R/E Opt 600 RTE-A operating system
2. HP 91750A/R Opt 600 DS/1000-IV software

Specifications

For a summary of Control/1000 components, including Measurement and Control Function cards, see the Control/1000 Description and Components Specification sheet (first data sheet in this Technical Information package).

Ordering information

91823A Software

The 91823A Control/1000 product, which must be ordered with Use Option 600, consists of:
1. Control/1000 software on Media Option 020, 022, 041, 042, 044, 050, or 051, one of which must be ordered.
2. License to use Control/1000 on one system.
3. 91823K Manuals Package as listed below.

91823A Media Options

-020 Software on 264x compatible mini-cartridge
-022 Software on 7908/11/12 compatible cartridge tape
-041 Software on 1.2M byte flexible discs for 9895A
-042 Software on minifloppy discs for microsystem
-044 Software on microfloppy discs
-050 Software on 800 bpi, 9-track magnetic tape
-051 Software on 1600 bpi, 9-track magnetic tape

91823R Right-to-Copy Control/1000 Software for Use on an Additional Computer System

The 91823R Right-to-Copy product is available only to customers who have previously purchased a license to use the 91823A product. The 91823R product consists of:
1. The license to make one copy of software purchased with 91823A for use on an additional system.
2. 91823K Manuals Package as listed below.

91823K Control/1000 Manuals Package

The 91823K Manuals Package includes the following manuals:
1. Control/1000 Library Reference Manual (91823-90001)
2. Control/1000 MCI Driver Reference Manual (91823-90002)
3. Control/1000 Installation and Startup Manual (91823-90003)

Software support products available

91823FT	Customer Support Service (CSS) for 91823A (same Media Options for updates as for 91823A software).
91823FV	Extension of 91823FT for use on one additional system licensed under 91823R
91823FS	Software Subscription Service (SSS) for 91823A software (same Media Option for updates as for 91823A)
91823FW	Right to reproduce 91823FS software updates for one additional system.
91823Q	Manual Update Service for one set of manuals purchased with 91823A/R/K