HP 3852A

# Data Acquisition / Control Unit

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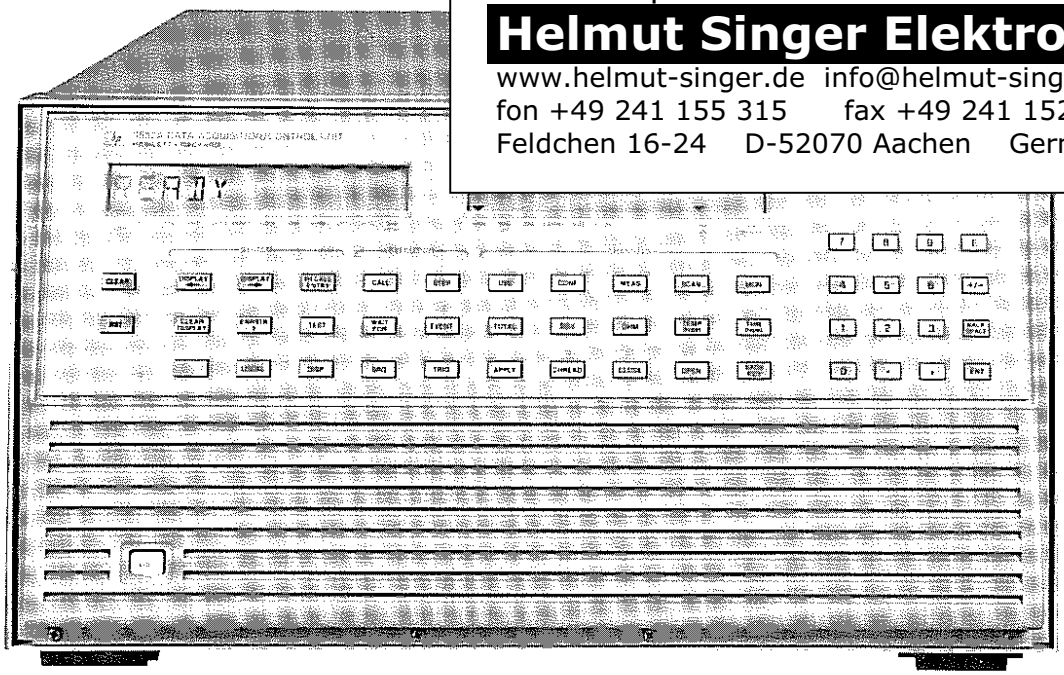
# DATA ACQUISITION SYSTEMS

## Instruments for Measurement and Control

**HP Model 3852A**





HP Model 3852A

DESIGNED FOR HP-IB SYSTEMS

### Configure the Capabilities You Need

You can easily configure an HP 3852S Data Acquisition and Control System to meet your needs for measuring physical parameters through transducers, and for providing control outputs. The HP 3852A Data Acquisition/Control Unit (mainframe) has eight slots for plug-in function modules. If more slots are needed, up to seven extenders can be added, each with ten additional slots. You can choose any combination of capabilities that include precision and high-speed plug-in voltmeters and a variety of analog and digital input/output functions.

A system clock and programmable pacer are built-in to drive your system. The clock — non-volatile for four years; 1 msec resolution—allows data to be time-stamped and events to be timed. The pacer—0.25 μsec resolution—provides powerful capabilities to initiate and pace measurements, scans, or events.

### Include High-Speed and Accurate Analog Measurements in One System

Choose from two digital voltmeters to meet your measurement needs. For applications that require sensitive, accurate measurements in the presence of noise (for example, thermocouples), use the 5½-Digit Integrating Voltmeter and Relay Multiplexers. If you need speed, the 13-Bit High-Speed Voltmeter and High-Speed FET Multiplexers are the answer, providing single-channel bursts, channel-to-channel, random channel, full auto-ranging, and direct DMA transfers to a hard disc at an honest 100,000 readings/sec. The system voltmeters can be used in the mainframe or any extender, and multiple voltmeters are allowed per card-cage.

### Add Versatility and Expandability to Your System

With the HP 3852S Data Acquisition and Control System, you'll have available a complete set of input and output plug-in modules for interfacing to measurements and for controlling and sequencing your tests. Modules are available to handle physical measurements of temperature, flow, pressure, level, and strain.

### Take Advantage of Extensive Front-End Intelligence

The HP 3852A mainframe has considerable built-in intelligence to increase the speed of collecting measurement and control data. Control decisions can be handled faster using subroutines running within the mainframe. This intelligence can be used to *return only significant data* to the computer, increasing its efficiency.

- Up to 5,500 readings can be stored in the standard HP 3852A mainframe. Expand this memory (used for storage of user routines as well as readings) to 256 kbytes, 1 Mbytes, 2 Mbytes, or 4 Mbytes with an Extended Memory board. Extended memory fits inside the mainframe controller module without using an I/O slot.

The power of this front-end intelligence in combination with an HP Series 300 Computer and the optional data acquisition software adapts easily to testing your complex product or characterizing your process. Of course, the mainframe can be also used with HP 1000 computers, HP Vectra PC, other IEEE-488 controllers and instruments, and a variety of computer peripherals.

### Reduce Your Test Development Investment

Optional data acquisition software for an HP Series 300/200 computer or HP Vectra PC gets your application running quickly and easily by providing off-the-shelf solutions for:

Data base management — store large amounts of data in files that are easy to identify and access later.

Graphics presentations — display or plot color graphs, display a real-time strip chart, plot data with linear, log, semilog, or automatic axis scaling.

Data analysis — This software provides high-level subroutines as tools to be used in a test system program running with HP BASIC. Ease-of-use is exemplified by:

- automatic creation of a data base for storing data using only one subroutine,
- fast access to a single data item or a block of data items using only one subroutine,
- manipulation and formatting of gathered data any way you wish.

Program development time is leveraged using this software, while allowing a powerful, highly customized system to be developed. Furthermore, the software can be used with any HP-IB instrument.

## Data Acquisition and Control Unit — HP 3852A

**Mainframe Supports:**

- Eight Function Module Slots
- Data Acquisition Operating System
- System Timer
- Measurement Pacer
- Full Alphanumeric Keyboard, Command and Result Displays

**Benefits**

- **Make real-time decisions and reduce data without burdening your computer:**
  - — Multitasking operating system prioritizes and timeslices tasks
  - — Powerful HP 3852A command statements simplify complex measurements.
  - — Execution speed of command sequences are enhanced by executing subroutines stored in the HP 3852A memory.
  - — Built-in, easy-to-use transducer conversions are supported for thermocouples, thermistors, RTDs, and strain gages.
  - — Post-processing and data reduction before transferring results to a computer are achievable by first storing data to the HP 3852A internal memory.
  - — Limit checking of analog measurements is performed in real time or after the measurements have been stored in mainframe memory.
- **Optimize measurement timing and throughput to meet your needs:**
  - — Real-time interrupts allow higher priority tasks and external inputs to be serviced at any time
  - — Asynchronous communication with a computer is achieved through input and output buffering.
  - — Control can be timed using built-in clock and alarm capabilities (can cause an interrupt).
  - — A built-in pacer simplifies measurement timing and triggering.
  - — Multiple voltmeters can be used. The high-speed voltmeter can control scanning, timing, and triggering of its own high-speed FET multiplexer subsystem via ribbon cable. Several of these subsystems can run simultaneously.

**Commands:**

Powerful data acquisition commands are easy to remember and use. For example, "MEAS TEMPK <channel_list>" performs K-type thermocouple measurements, cold-junction compensation, linearization, and channel scanning—ALL AUTOMATICALLY. In addition, <channel_list> may be a short list of channels—or possibly the name of an array containing a much longer list.

**Down-Loaded Subroutines:**

FOR . . . NEXT, IF . . . THEN . . . ELSE, WHILE . . . ENDWHILE Enhanced BASIC language constructs are available.

User subroutines with variables can be called for execution by a computer, other subroutines, or conditional interrupts.

**Transducer Conversions:**

Transducer conversions have been optimized to support high system accuracy and speed for these transducers:

- * Thermocouples
- * Thermistors
- * Platinum RTDs
- * Strain Gages

**Special Conversions:**

A special function permits user-defined tables of X,Y pairs to be used for linear interpolation (at a small price in memory usage, this function will typically execute much faster than high-order polynomial calculations).

**Limit Testing:**

Perform limit testing in real-time (data is tested as it is measured) or as a post-process (data previously stored in arrays is tested). Limit test failures can cause an interrupt if enabled.

**Interrupts:**

Time alarms, events that have just occurred, or limit tests of measurements can cause an HP-IB Service Request or a call to a stored subroutine.

**Math Operations:**

+, −, *, /, <, >, ATN, BINAND, BINCMP, BINEOR, BINIOR, BIT, COS, EXP, LOG, SIN, SQR

**Scaling:**

Offset and scale factors (mx + b) can be performed on an entire array using just one command.

**Statistics:**

An easy-to-use function finds MIN, MAX, MEAN, and SIGMA (standard deviation) of the values stored in arrays.

## Data Acquisition Operating System

**Multi-tasking**

Several subroutines called "run tasks" can be assigned equal priority and the operating system will timeslice them such that it appears they are running simultaneously. "Queued tasks" can be defined to run after certain conditions are met. Priority assignment allows complete control over front panel, HP-IB, interrupt, and run task execution.

**Real-time Interrupts**

Interrupts from the front panel, HP-IB, plug-in accessories, or higher priority tasks are serviced immediately after the current command is done executing.

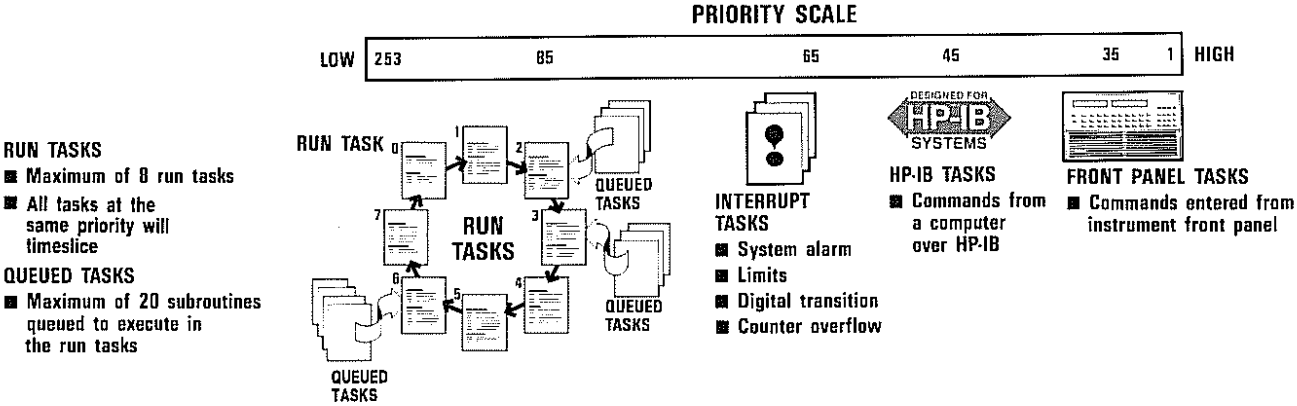
## Extender Chassis — HP 3853A

Extender Supports:

- Ten Function Module Slots

**Benefit**

- **Expand your system with no loss of functional capability:**
  - — Up to seven extenders may be used with each HP 3852A mainframe.
  - — Any slot can be used for any function module and multiple voltmeters can be used with parallel triggering.
  - — All mainframe functions, including interrupts and triggering, are available through the extender control cable.



**HP Model 3852A**



### 5½ to 3½ Digit Integrating Voltmeter - HP 44701A

Directly Measures:
- DC Voltage
- Resistance
- AC Voltage

**Benefits**
- **Accurately measure small signal changes in noisy environments:**
  — Integrating A/D rejects normal mode noise at multiples of the power line frequency.
  — Guarded input maximizes common-mode rejection.
- **Choose the resolution, accuracy, and noise rejection needed, while maximizing measurement speed:**
  — Integration selection (number of power line cycles) is key to optimizing these performance parameters.
  — This voltmeter provides the fastest DC reading rates available with power line-related noise rejection.
- **Optimize resistance measurements to the accuracy you need:**
  — Use two-wire ohms for measurements where lead resistance is not critical.
  — Use four-wire ohms where inaccuracies due to measurement leads cannot be tolerated (*most accurate measurement technique for RTDs*).
  — Use offset-compensated ohms to correctly measure resistance in the presence of series voltages (often caused by thermocouple effects).

**DC Voltage**

**Accuracy:**

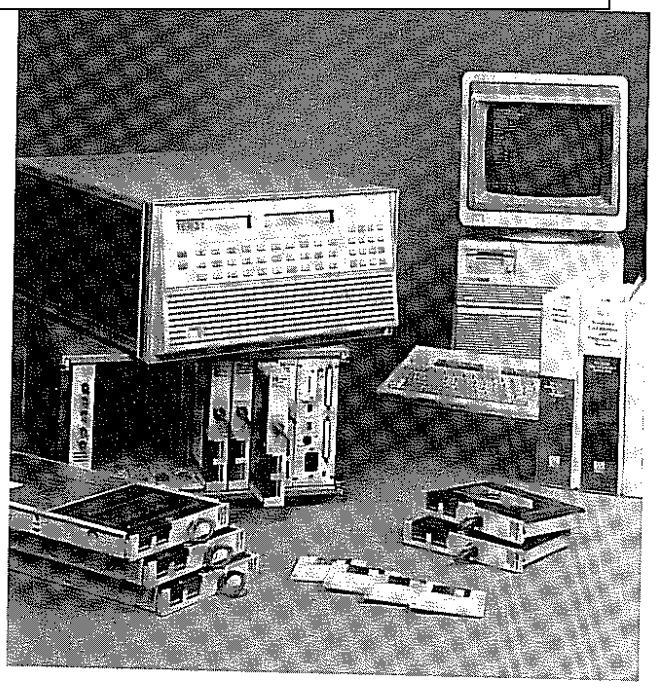
± (% of reading + volts), rear terminal input, one-hour warm-up, specified over time since last calibration, and operating temperature.

**90 Days, 18 to 28°C, Auto-zero On**
**Integration Time in Number of Power Line Cycles** (NPLC)

| Range: | 1 | 0.1 | 0.005 | 0.0005 |
|---|---|---|---|---|
| 30 mV | 0.02% + 6 µV | 0.02% + 8 µV | 0.02% + 20 µV | 0.02% + 60 µV |
| 300 mV | 0.008% + 6 µV | 0.008% + 10 µV | 0.008% + 40 µV | 0.008% + 400 µV |
| 3 V | 0.008% + 8 µV | 0.008% + 40 µV | 0.008% + 400 µV | 0.008% + 4 mV |
| 30 V | 0.008% + 300 µV | 0.008% + 700 µV | 0.008% + 4 mV | 0.008% + 40 mV |
| 300 V | 0.008% + 700 µV | 0.008% + 4 mV | 0.008% + 40 mV | 0.008% + 400 mV |

**Reading Rate/Noise Rejection:**
**Integration Time in Number of Power Line Cycles** (NPLC)

| Integration Time 60 Hz (50 Hz) | 1 16.7 (20.0) msec | 0.1 1.67 (2.0) msec | 0.005 100 (100) µsec | 0.0005 10 (10) µsec |
|---|---|---|---|---|
| Number of Converted Digits | 6½ | 5½ | 4½ | 3½ |
| Reading Rate (readings/sec) with auto-zero, auto-range off 60 Hz (50 Hz) | 57 (48) | 415 (360) | 1350 (1350) | 1600 (1600) |
| Min Noise Rejection (dB) Normal Mode Rejection at 50 or 60 Hz ± 0.09% | 60 | 0 | 0 | 0 |
| DC Common Mode Rejection with 1 kΩ in low lead | 120 | 120 | 120 | 120 |
| Effective Common Mode Rejection, at 50 or 60 Hz ± 0.09% with 1 kΩ in low lead | 150 | 90 | 90 | 90 |



### 13-Bit High-Speed Voltmeter — HP 44702A/B

Directly Measures:
- DC Voltage
- DC Resistance

**Benefits**
- **Collect data quickly:**
  — A measurement rate of 100,000 readings/sec with auto-ranging is achieved by directly controlling up to six (eight in an extender) High-Speed FET Multiplexers through a dedicated ribbon cable.
  — Multiple High-Speed Voltmeters can be triggered simultaneously.
- **Maximize your measurement throughput:**
  — On-board buffer is included for over 8,000 readings (HP 44702A) or over 64,000 readings (HP 44702B) that can be transferred to mainframe internal memory or to hard disc via GPIO and a DMA controller while taking measurements.
  — Dedicated triggering is achieved with on-board pacers.
  — Balanced input, equal impedance between high-to-chassis and low-to-chassis, gives good common mode noise rejection.

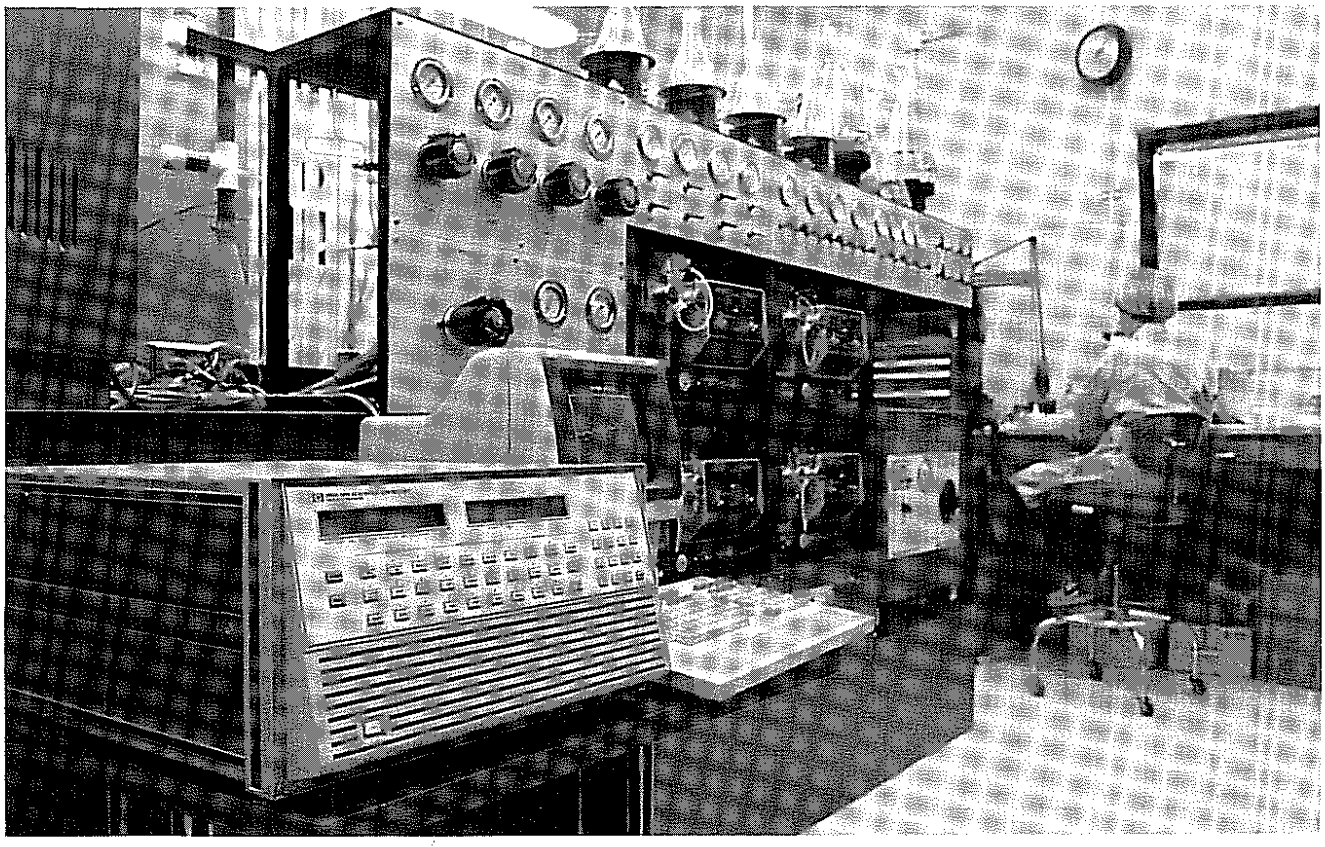
**DC Voltage**

**Accuracy:**

± (% of reading + volts), rear terminal input, one-hour warm-up, specified over time since last calibration, and operating temperature, with auto-zeroing performed within one minute of measurement.

**90 Days, 18 to 28°C**

| Range: | Accuracy |
|---|---|
| 40 mV | 0.05% + 68 µV |
| 320 mV | 0.05% + 234 µV |
| 2.56 V | 0.05% + 1.88 mV |
| 10.24 V | 0.05% + 7.5 mV |



**Reading Rates:**
100,000 readings/sec with auto-ranging. Proper auto-ranging is ensured as long as a single-channel signal changes no more than 600 volts/sec during auto-ranging.

**Noise Rejection:**
Min effective common mode rejection specified in dB for DC to 60 Hz with 1 kΩ in low lead; maximum signal (high to low) + common mode voltage (low to chassis) for proper operation is ±10.24 volts.

| Range: | ECMR |
|---|---|
| 40 mV | 90 |
| 320 mV | 80 |
| 2.56 V | 70 |
| 10.24 V | 70 |

## Relay Multiplexers — HP 44705A/44705H/44706A/44708A/44708H/44717A/44718A

Directly Multiplexes:

- Voltage
- Resistance
- Thermocouples
- Strain Gages

**Benefits**

- **Reduce the effects of real-world measurement errors in a multichannel system:**
  - — Relay multiplexers minimize errors due to thermal DC offsets, crosstalk, and injected (bias) currents.
  - — The relay multiplexers have high, low, and guard terminals to maximize common mode noise rejection.
  - — A single-ended multiplexer (HP 44706A) lowers your cost per channel.
  - — With shunt and series jumpers in each channel of the HP 44705A/H and 44708A/H multiplexers, you can easily install a one-pole low-pass filter for additional noise rejection, a voltage divider to extend relay lifetime, or a shunt resistor to measure current.
  - — Differential or common mode voltages up to 350 V peak or 250 Vdc can be handled by the HP 44705H and 44708H modules.
  - — Scanning is break-before-make to prevent inadvertent connections of circuits being measured.
  - — Each lead to the back-plane and common terminals has a 100Ω resistor in series to prolong the lifetime of the relay contacts. Due to placement, these resistors contribute no error when measuring 2-wire ohms resistance using the HP 44701A Integrating Voltmeter. The resistor can be shorted, but this can seriously shorten relay contact life if relatively high voltages or currents are switched.
  - — Tree switch relays automatically isolate each bank of relays from the back-plane to reduce crosstalk and improve settling time.
- **Optimize thermocouple measurement accuracy:**
  - — Thermocouple types can be mixed on the HP 44708A/H multiplexer to optimize accuracy over the temperature ranges needed.
  - — Thermocouple compensation is handled automatically with no extra wiring.
- **Measure strain accurately:**
  - — Strain sensitivity can be optimized using finger-moveable jumpers to select between ¼-, ½-, and full-bridge configurations. The HP 44717A and 44718A multiplexers each support 10 bridges for 120Ω and 350Ω strain gages.
  - — No manual adjustments are required to balance the bridge.
  - — Strain accuracy is independent of long-term bridge excitation voltage changes because the excitation voltage is automatically measured and included in the strain calculations.
  - — The excitation voltage is always applied, never switched, reducing errors due to dynamic heating and cooling of the gages.
  - — Connection to an available Wagner ground reduces errors due to gage leakage current.

### FET Multiplexers — HP 44709A/44710A/44711A/44712A/44713A/44719A/44720A

Directly Multiplexes:
- Voltage
- Thermocouples
- Resistance
- Strain Gages

**Benefits**
- **Maximize your measurement throughput:**
  - — A throughput rate of 100,000 readings/sec is realized using High-Speed FET Multiplexers (HP 44711A/44712A/44713A) directly controlled through a dedicated ribbon cable by the 13-Bit High-Speed Voltmeter.
  - — Up to six (eight in an extender) High-Speed FET Multiplexers can be controlled through this ribbon cable.
  - — The 24-channel multiplexers switch high and low only. Each floating input is balanced (that is, equal impedance between high-to-chassis and low-to-chassis) to provide good common mode noise rejection.
  - — For lower costs per channel, single-ended multiplexing of 48 channels (HP 44712A) is also available (has no common mode noise rejection, however).
- **Increase system reliability:**
  - — FETs have no mechanical limitations (no wear out due to switching).
  - — Similar to their relay counterparts, the HP 44709A/44710A/44719A/44720A FET multiplexers have high, low, and guard connections for better common mode rejection than the high-speed FET multiplexers.

### Digital to Analog Converters — HP 44727A/44727B/44727C

Directly Outputs:
- DC Voltage
- DC Current

**Benefit**
- **Simplify your test system by providing test or control of devices with one data acquisition control system:**
  - — Four channels are provided on each module.
  - — Each channel can be configured using finger-movable jumpers to output either unipolar or bipolar voltage, or unipolar current. Reconfiguration may require recalibration of the changed channel. Recalibration consists of adjustments to zero offset and gain potentiometers, and can be performed with the HP 44701A Integrating Voltmeter or equivalent. Three configurations (4-Channel Voltage—HP 44727A; 4-Channel Current—HP 44727B; 2-Channel Voltage, 2-Channel Current—HP 44727C) are available to make reconfiguration unnecessary in most cases.
  - — Channels are isolated and can be connected in parallel for current or in series for voltage to expand the usable ranges.
  - — Each channel configured for voltage has remote sense capabilities to ensure accurate voltages at the device.

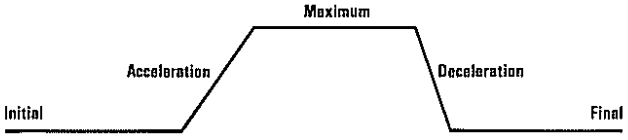
**DC Voltage**
**Ranges:** 0 to +10.235 V or −10.235 to +10.235 V
**Resolution:** 2.5 mV (12 bits plus a sign bit for bipolar range)
**DC Current**
**Ranges:** 0 to +20.16 mA or +4 to +20.16 mA
**Resolution:** 2.5 μA (13 bits)

### 3-Channel Stepper Motor Controller - HP 44714A

Directly Provides:
- Stepper Motor Control Signals
- Limit Inputs
- Built-in Quadrature Counters
- Pulse Output

**Benefit**
- **Completely control three stepper motors with one module:**
  - —Output a continuous stream or a fixed number of pulses.
  - —Program separate acceleration and deceleration rates for trapezoidal motion profiles.
  - —Halt output pulses when limits are reached or from the emergency stop input.
  - —Built-in quadrature counter on each channel gives position feedback.
- **Use the module as a pulse generator.**
  - —Output a set number of pulses or a continuous stream.
  - —Set, accelerate, and decelerate both pulse width and pulse rate.

**Trapezoidal Motion Profile**



Trapezoidal Motion Profile

### 5-Channel Counter/Totalizer — HP 44715A

Directly Provides:
- Count Measurements
- Period Measurements
- Frequency Measurements
- Interrupts

**Benefit**
- **Reduce your costs by taking advantage of frequency counting versatility:**
  - — The counter/totalizer accurately measures logic or RMS inputs with frequencies up to 200 kHz.
  - — By multiplexing between five isolated channels and five non-isolated channels, a total of ten connected channels is possible (only five can operate simultaneously).
  - — Each DC logic channel independently counts on either positive or negative signal transitions. Non-isolated, low-level RMS inputs are measured using a zero-crossing detector.
  - — Any channel that is totalizing can be programmed to set an interrupt for a counter roll-over to zero.
  - — For isolated DC inputs, nominal voltages are separately selected for each channel by finger-movable jumpers. For non-isolated inputs, either TTL or low-level RMS inputs are also separately selected for each channel by finger-movable jumpers.
  - — Debounce times (common to all channels) can be programmed to prevent false counts.
  - — With shunt and series jumpers in each channel, you can easily install a one-pole low-pass filter for rejection of unwanted signals.

### Digital Inputs with Totalize and Interrupt - HP 44721A/44722A

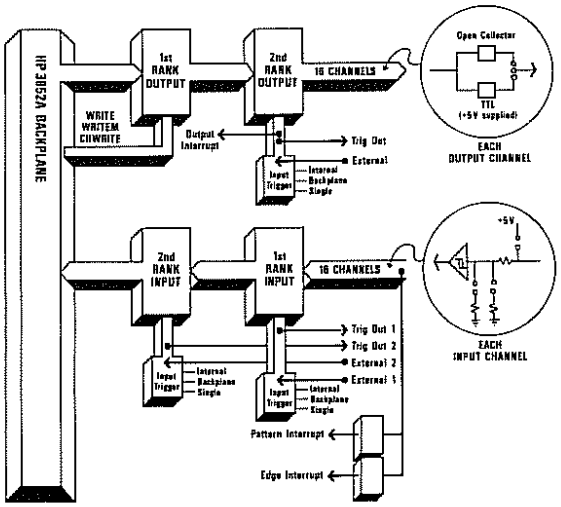
Directly Provides:
- Logic Readings
- Totalize Count Measurements
- Interrupts

**Benefit**
- **Conveniently read a variety of digital values in your system:**
  - — Isolated inputs detect the presence of DC (HP 44721A 16-channel digital input) or AC (HP 44722A 8-channel digital input) inputs based on nominal voltages selected by finger-movable jumpers.
  - — Each channel can independently totalize positive or negative (whichever is selected) logic transitions.
  - — Voltage selection and function can be set independently on each channel.
  - — Any channel can be programmed to set an interrupt for an edge occurrence (positive or negative) or a counter roll-over to zero.
  - — Debounce circuitry that is common to all channels prevents erroneous readings on inputs that are still changing after a logic level transition.
  - — For detecting whether switches are opened or closed, the HP 44721A has a non-isolated five volt supply at the terminal module with 9.4 kΩ ±10% pull-up resistors on each input.

## 32-Channel High-Speed Digital Sense/Control -HP 44723A

Directly Provides:
- High-speed Digital Input and Output
- Triggered Input and Output
- Interrupts
- Output Handshaking

**Benefit**
- —Input 16 channels or output 16 channels over 150,000 times per second.
- —Capture and load 16-bit patterns with external triggers.
- —Interrupt on any input channel on any transition or on a user-specified 16-bit pattern.




High-Speed Digital Sense/Control

## 16-Channel Digital Output — HP 44724A

Directly Provides:
- Open Drain Digital Outputs

**Benefit**
- Conveniently control DC devices or logic levels:
  - — Open drain outputs are used to control DC devices with up to 55 V, or drive TTL logic levels. An external power supply and external pull-up resistors are required.

**Characteristics**

**Max Input Voltage:**
Between High and Low Terminal of Each Channel — 55 V DC
Between Channels or Between Any Terminal and Chassis — 354 V peak or 250 V DC
**Max Sink Current:** 500 mA DC per channel (1 A fuse protection)
**Max Reverse Polarity Current:** 500 mA DC per channel
**TTL Compatibility:** 200 mA per channel with Vout ≤0.4 volts

## Switching — HP 44725A/44728A/44729A

Directly Switches:
- Voltage
- Current
- Power

**Benefit**
- **Reliability switch the voltage, current, or power you need:**
  - — Both the HP 44725A and 44728A use single-pole double-throw (SPDT) Form-C relays that return to their normally closed positions at power down. The HP 44725A 16-channel general purpose relays are for switching low-level power or moderate voltages and currents in an experiment while minimizing errors due to cross talk and thermal DC offsets. More DC or AC power can be switched with the HP 444728A 8-channel relay actuator.
  - — The HP 44729A 8-channel AC power controller distributes AC power. It switches "on" at the zero voltage crossing and "off" at the zero current crossing for long device life and low transient generation. Each channel has a relay and solid state switch in parallel to provide an exceptional combination of switch life and low on-resistance.

**Characteristics**

| | Module | | |
|---|---|---|---|
| | HP 44725A | HP 44728A | HP 44729A |
| Max Input Voltage (Vmax) Per Channel | 30 V DC or RMS, 42 V peak | 300 V DC, 250 V RMS | — 250 V RMS, 354 V peak |
| Max Input Current Per Channel | 1.5 A DC, 1.5 A RMS | 2 A DC, 3 A RMS (5 A fuse protection) | 2.5 A RMS (3 A RMS if module is limited to 16 A RMS total; 4 A fuse protection per channel) |
| Max Sum of the Squared RMS Currents In Each Channel (per module; for any load type) | 24 $A^2$ | 26 $A^2$ | — |
| Max On Resistance | 175 mΩ | 200 mΩ | 125 mΩ @ 3 A RMS; 200 mΩ @ 100 mA RMS |
| Switch Life (on/off cycles) Full Load | $10^5$ (≤2 switches per second) | $10^5$ | $5*10^6$ |
| Min Load | $10^5$ (≤2 switches per second) | — | — |
| Max Wire Size | 16 AWG | 14 AWG | 12 AWG (power in terminals); 14 AWG (power distribution terminals) |

### New HP 3852A Accessories in 1988

- **Arbitrary Waveform Digital-to-Analog Converter—HP 44726A**
  - —Two channels
  - —Waveforms stored in on-board memory
  - —Repetitive or single-shot output
- **Track/Hold Multiplexer with Signal Conditioning—HP 44730A**
  - —Four channels
  - —Three selectable gains
  - —Triggerable for simultaneous sampling
- **Dynamic Strain Gage Multiplexers - HP 44732A** (120 ohm) **HP 44733A** (350 ohm)
  - —Four channels
  - —Select ¼, ½, or full bridge configurations
  - —Electronic nulling

# DATA ACQUISITION SYSTEMS

## Instruments for Measurement and Control (cont'd)



### HP Model 3852A

### Ordering Information

To order, specify an HP 3852S System with the appropriate software, controller, mainframe, extenders, function modules, racks, and extra terminal modules. The HP 3852S itself has no cost—each component of the system is priced individually.

#### Data Acquisition Manager

**HP 44458A** Data Acquisition and Control Software for Series 300/200 Computers on 3½" Flexible Discs (BASIC 4.0 and 5.0)
**HP 44458B** Data Acquisition and Control Software for Series 200 Computers on 5¼" flexible Discs (BASIC 4.0 and 5.0)
**HP 44458R** License to Reproduce HP 44458A or 44458B. Includes one set of software manuals.
**HP 44459A** Data Acquisition and Control software for HP Vectra Computers on 3½" flexible discs (BASIC 5.0)
**HP 44459B** Data Acquisition and Control software for HP Vectra Computers on 5¼" flexible discs (BASIC 5.0)
**HP 44459R** License to reproduce HP 44459A/44459B. Includes one set of software manuals.

#### Mainframe

**HP 3852A** Data Acquisition and Control Unit
**HP 44703A** Mainframe Extended Memory Card—256 kbytes*
**HP 44703B** Mainframe Extended Memory Card—1 Mbyte*
*Only one extended memory option may be added per mainframe.

Extended memory cards for 2 Mbytes and 4 Mbytes can be ordered from Infotek Systems, 1400 N. Baxter Street, Anaheim, CA 92806-1201, as AM220B and AM244B, respectively. These products have been *functionally tested, but are not warranted or supported by HP* (no RFI or environmental tests were conducted). Warranty for two years and support of individual cards are provided by Infotek.

#### Extender Chassis

**HP 3853A** Extender Chassis with ten additional slots for function modules. A 1-meter extender control cable, and two 1-meter (3 wires each) analog signal extender cables are included. All other mainframe functions, including interrupts and triggering, are available to the HP 3852A through the extender control cable. Multiple voltmeters can be used. A total of seven extenders may be added to a mainframe. Extender control cables are always needed. Analog signal extender cables are needed if analog voltages must be switched to the mainframe or another extender.

#### Voltmeters

**HP 44701A** 5½ to 3½-Digit Integrating Voltmeter
**HP 44702A** 13-Bit High-Speed Voltmeter (100,000 readings/sec; buffer for over 8,000 readings)
**HP 44702B** 13-Bit High-Speed Voltmeter (100,000 readings/sec; buffer for over 64,000 readings)
**HP 44703C** High Speed Extended Memory Card for expanding HP 44702A Buffer to over 64,000 readings

#### Relay Multiplexers

**HP 44705A** 20-Channel Relay Multiplexer
**HP 44705H** 20-Channel High-Voltage Relay Multiplexer
**HP 44706A** 60-Channel Single-Ended Relay Multiplexer
**HP 44708A** 20-Channel Relay Multiplexer with Thermocouple Compensation
**HP 44708H** 20-Channel High-Voltage Relay Multiplexer with Thermocouple Compensation
**HP 44717A** 10-Bridge 120 Ohm Static Strain Gage Relay Multiplexer
**HP 44718A** 10-Bridge 350 Ohm Static Strain Gage Relay Multiplexer

#### FET Multiplexers

**HP 44709A** 20-Channel FET Multiplexer
**HP 44710A** 20-Channel FET Multiplexer with Thermocouple Compensation
**HP 44719A** 10-Bridge 120 Ohm Static Strain Gage FET Multiplexer
**HP 44720A** 10-Bridge 350 Ohm Static Strain Gage FET Multiplexer
**HP 44711A** 24-Channel High-Speed FET Multiplexer
**HP 44712A** 48-Channel High-Speed Single-Ended FET Multiplexer
**HP 44713A** 24-Channel High-Speed FET Multiplexer with Thermocouple Compensation

#### Analog Outputs

**HP 44727A** 4-Channel Voltage DAC
**HP 44727B** 4-Channel Current DAC
**HP 44727C** 2-Channel Voltage; 2-Channel Current DAC

#### Stepper Motor Controller

**HP 44714A** 3-Channel Stepper Motor Controller/Pulse Output

#### Counter

**HP 44715A** 5-Channel Counter/Totalizer (200 kHz)

#### Digital Inputs/Outputs—Switching

**HP 44721A** 16-Channel Digital Input with Totalize and Interrupt
**HP 44722A** 8-Channel AC Digital Input with Totalize and Interrupt
**HP 44723A** 32-Channel High-Speed Digital Sense/Control
**HP 44724A** 16-Channel Digital Output
**HP 44725A** 16-Channel General Purpose Switch
**HP 44728A** 8-Channel Relay Actuator
**HP 44729A** 8-Channel Power Controller

#### Breadboard

**HP 44736A** Breadboard

#### High-Speed Accessories

**HP 98620B** 2-Channel DMA Controller for HP Series 300/200 Computers
**HP 98622A** GPIO Interface for HP Series 300/200 Computers
**HP 98625B** High-Speed HP-IB Disc Interface for HP Series 300/200 controllers
**HP 44744A** 2-Meter GPIO Cable with Mating for HP 44702A/B and HP 98622A
**HP 44744B** 4-Meter GPIO Cable with Mating for HP 44702A/B and HP 98622A
**HP 44745A** 4-Meter GPIO Cable with Mating for HP 44702A/B and HP 12006A (GPIO interface for HP 1000 Computers)

#### Service and Support Products and Courses

**HP 44743F** Service Kit consists of specially designed hardware and software for operationally verifying and calibrating the HP 3852A family of products. Menu-driven software (supplied on both 3½ and 5¼" media) provides semi-automatic testing of the HP 3852A mainframe, HP 44701A voltmeter, HP 44702A/B voltmeter, and all plug-in accessories (when used with the accessory fixtures listed below). Contains necessary hardware for functional verification of the HP 3852A mainframe, HP 44701A voltmeter, and HP 44702A/B voltmeter. Fixtures for individual accessories should be ordered separately below. (Accessory testing requires a DMM such as the HP 3478A, 44701A, or equivalent).
**HP 50011B** HP-IB Course for HP Series 300/200 Computers
**HP 50015A** Data Acquisition and Control Fundamentals Course
**HP 50016E** HP-IB Course for HP 1000 Computers
**HP P/N 03852-88701** ROM Update Kit