Stand Alone
MODULAR FRONT END
Data Acquisition & Control

SYSTEM 10

For revisions to this catalog, see the latest 10KUPDATE Supplement
Since its founding in 1954, Daytronic Corporation has been in the business of solving unique, challenging measurement and control problems. A recognized leader in sensor-based signal conditioning, Daytronic is uniquely positioned to serve the needs of today’s fast-changing digital world using the proven capabilities of analog measurement technology. Combining advanced modular hardware design with sophisticated software tools, Daytronic instruments and systems have found their way into virtually every kind of industrial data-acquisition application, and into many scientific and academic research areas as well.

Daytronic offers a comprehensive hardware family—from transducers and single-channel benchtop or machine-dedicated conditioner/indicators to high-speed PC/PLC front ends and factory-wide distributed networks. Typical applications include production-line automatic testing, remote safety monitoring, prototype evaluation, real-time process control via closed-loop servo systems, and statistical analysis of both real-time and historical data.

Daytronic is located in Dayton, Ohio. In addition to its in-house staff of sales application engineers, it has an international network of independent sales representatives in over 20 countries. Several offices are designated as Authorized Service Facilities.
SYSTEM 10
Data Acquisition and Control System

Accepting raw measurement signals from virtually all conventional sensors, Daytronic’s modular “System 10” yields unbeatable ACCURACY, LINEARITY, and REPEATABILITY. Designed for specific input types, plug-in Signal Conditioning Cards feature precisely regulated, remotely sensed excitation, in addition to per-channel amplifiers, built-in linearization and calibration, selectable digital smoothing, and powerful low-pass filtering to eliminate aliasing and unwanted dynamic content. Our guarantee of the cleanest, most jitter-free data possible stands on over 40 years’ experience in the field of ANALOG SIGNAL CONDITIONING.

System 10 is a UNIVERSAL FRONT END with stand-alone intelligence. While serving as a low-noise data-collection unit for virtually any computer, it has standard firmware for providing multiple individually configurable DATA DISPLAYS, plus real-time DIGITAL SIGNAL PROCESSING and PROCESS CONTROL functions that include cross-channel calculations; per-channel limit checking and alarming; analog and digital control outputs with precisely determined response times; counter/timer functions; digital data recording and playback; true on-line SPC; report generation; and much more—all completely independent of the host computer.

A System 10 can operate as a datalogger, a process control workstation, a programmable safety monitor, an independent node within an extended data acquisition and control network, or a database for the archiving and retrieval of “historical” data. Special drivers allow real-time data exchange with a number of popular third-party software packages for data analysis and graphic display, including those that support the Microsoft Windows® DDE protocol.
We are proud to offer TOTAL CUSTOMER SERVICE, both before and after the sale. This includes:

- free applications assistance and on-site demos
- in-house system integration, with fully customized hardware/software packages
- on-site installation and startup assistance
- in-depth technical training, either on-site or at our fully equipped in-house training facility
- dependable in-house repair and upgrade services
- free telephone support
- hardware/software field support, including “preventive maintenance” calls

For full descriptions and specifications of all Daytronic Signal Conditioning Cards—including our new “AA” Series Conditioners with programmable analog filtering—see our separate Conditioner Cards Catalog.
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What is System 10?

An advanced high-speed DATA ACQUISITION AND CONTROL SYSTEM that can stand alone…
Introduction

...but doesn't have to!
What is System 10?

Most of all, System 10 is a Dependable, High-Performance Solution for Real-Time Measurement and Control

PC-based data acquisition systems are adequate for some situations, but in the most demanding applications—requiring the fastest, most accurate acquisition of mixed real-world data signals—System 10 is the solution of choice. Here are some reasons why...

Accuracy

- Features the proven reliability of TRUE ANALOG SIGNAL CONDITIONING, with accurate, remotely sensed excitation and with separate amplifier, 3-pole filter, and selectable digital smoothing for each input channel
- LOW-NOISE FRONT-END ENVIRONMENT ensures drift-free measurement and dependable control action
- Optional synchronous data collection yields VIRTUALLY ZERO TIME SKEW
- Accurate BUILT-IN CALIBRATION for a wide variety of real-world sensors

A/D, Signal Processing, & Process Control

- SYSTEM 10 SUPPLIES THE HOST COMPUTER WITH FINISHED ENGINEERING-UNIT DATA EITHER AUTOMATICALLY OR ON REQUEST
- MULTIPLE CONCURRENT PROCESSING WITH TRUE "REFLECTIVE" MEMORY offers simultaneous access of all collected and calculated data to all on-board coprocessors (including "video," "history," "satellite communications," etc.)
- REAL-TIME PROCESSING FUNCTIONS include automatic conversion to floating-point format; maintaining individual multi-channel data displays; archiving and playback of historical data; limit checking and alarming; linearization and calibration; cross-channel calculations; analog and digital control outputs (including high-frequency analog output and PID loop control) with precisely determined response times; counter/timer functions; on-line SPC; report generation; and much more—ALL COMPLETELY INDEPENDENT OF THE COMPUTER
**Speed**

- Typically 2500 to 3000 finished answers per second. Finished-answer processing (including data display and real-time process control) makes no demands at all on the host computer.

- For systems with over 50 measurement inputs or with complex internal calculations, throughput of finished-answer data is typically faster than the comparable PC-based system—and this includes continuous per-channel limit monitoring—with no display update delay.

**Universality**

- Accepts mixed inputs from virtually all transducers for an exceptionally wide range of measurements.

- Interfaces with virtually any computer under any operating system and programming language; positioned for compatibility with new computers as they become available.

- Special communications cards allow connection of a single system to multiple networks, using a mixture of interface types (RS-232, RS-422, IEEE-488, etc.).

- Open-architecture linkage makes real-time and historical data accessible via computer-independent third-party MMI software (AutoNet, LabVIEW, DDE-enabled Windows software packages, etc.).

**Expandability**

- Indefinitely expandable through addition of mainframe racks and/or networking of individual “on-site” units.

- Quickly and easily reconfigurable in the field, with no computer programming; off-the-shelf cards can be added or replaced without taking the mainframe apart.

**Connections**

- Direct transducer connections from the rear of the instrument, allowing quick disconnect while on-line.

- Remote data collection and control units can be located close to process sensors, greatly reducing costly and troublesome cable connections.
The Daytronic System 10 is just that—a system. Regardless of its size and complexity, each configuration is unique, because it’s designed to solve a unique “real-world” measurement and control problem.

Each system is totally modular, consisting of standard off-the-shelf components with fixed operating firmware that provides the standard functions described on the following pages. No “programming,” as such is necessary for the data acquisition system to perform its assigned functions. However, the user still faces an initial “customizing” task—the task of selecting the mainframe(s), plug-in cards, and other elements that—as a complete and integrated system—best satisfy his or her specific measurement and control requirements.

1 Identify your measurement and control problem

A number of important questions must first be answered. How many and what type of I/O points are required? What kind of calibration is desired for analog inputs? Are special linearization techniques required? Is local or remote data display needed, and if so, what kind? Are limit alarm actions required? Cross-channel calculations? Internal counter/timer or SPC functions? Analog outputs for loop control feedback? Logging, archiving, or reporting of data? What are the data communications requirements, if any? Are there specific software packages with which you want the data acquisition hardware to interface? To help you address these and other questions relevant to your application, fill out and send or FAX us the System 10 Application Worksheet in the rear of this catalog.

The Daytronic sales staff will provide all the applications assistance you might need, free of charge. If your application requires extensive customization of hardware and/or software, our expert INTEGRATED SYSTEMS DEPARTMENT (ISD) staff can furnish special programming, software interfacing, system housing and testing, and much more.

2 Configure your custom solution from standard components and preprogrammed functions

A given system can have any of a large number of different elements, each performing its own specific function within the total application solution. The purpose of this catalog is to help you understand the various System 10 “building blocks.” Only with an understanding of component functions can an intelligent selection of system components take place. Our factory sales staff and sales representative offices are on hand to give you any and all assistance you might need.

3 Add new functions as your requirements change and grow

Application-Specific Modifications

can be made at the factory to many standard Conditioner Cards;
contact the Daytronic Sales Staff for assistance
The various System 10 mainframes are described on pp. 19-41. In addition to all necessary power supplies, each mainframe provides the advanced multiprocessor architecture necessary for complete and independent management of all system analog/digital database operations.

There are two basic mainframe types:

**“A-SIZED” MAINFRAMES**

These mainframes (Fig. 1) contain a single rack for installation of system “A Cards” (only).

**“B-SIZED” MAINFRAMES**

These mainframes (Fig. 2) contain a rack for installation of system “B Cards,” as well as one or more “A-Card” racks.

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* The Models 10KN6 and 10KN7 may have up to four “A Card” racks.
A large assortment of optional plug-in circuit cards is available for each system mainframe. There are three basic types of cards:

**“A CARDS”**

These ANALOG cards occupy the mainframe’s A-CARD rack(s).*

- SIGNAL CONDITIONER (Analog Input) Cards
- CARDS FOR SPECIAL Analog-Based FUNCTIONS such as Analog Output, Analog Peak Capture or Track/Hold, FIFO Buffer Memory, PID Loop Control, etc.
- DIAGNOSTIC TEST CARDS

System 10 “Special-function” and diagnostic A Cards are described on pp. 50-58.

FOR FULL DESCRIPTIONS AND SPECIFICATIONS of all SIGNAL CONDITIONING CARDS that may be used in System 10, see the latest Daytronic Conditioner Cards Catalog.

**“B CARDS”**

Described on pp. 59-68, these larger-sized cards may only be used with “B-SIZED” mainframes. They are essentially DIGITAL cards, and accomplish more complex data-acquisition and communications tasks such as “history” recording and playback, network management, and auxiliary computer interfacing.

* Both “A” and “B” cards are accessible from the front of the mainframe. With the exception of the Model 10AO-16 Universal Logic I/O Card and the Model 10AFIFO Buffer Memory Card, all “A” cards may be used with every System 10 mainframe.

**“V CARDS”**

Described on pp. 72-73, these cards are concerned with optional CRT VIDEO-RELATED FUNCTIONS such as formatted hard-copy output and real-time bargraph display. They may be used only with “B-SIZED” mainframes and require special installation in the mainframe’s Video Backplane.
## General System Features

### Standard Command Set

- **Simple ASCII mnemonic commands** initiate standard user-selected SETUP and “RUN-TIME” functions; since no “programming” is involved in configuring the data acquisition system, it can be up and running in a very short time.*

- Commands may be entered
  - by the operator, via mainframe keyboard or keypad, or via connected ASCII terminal;
  - by a connected computer via main or auxiliary computer interface port; or
  - internally, via automatic “EXECUTE” function (see below)

- Every System 10 emulates a **standard full-duplex RS-232-C, IEEE-488, or RS-422 data terminal**—a device with which, regardless of the operating system or user programming language employed, virtually all computers are capable of communicating.

- All commands are transparent to a supervisory PC, if present, which only “sees” the finished engineering-unit data it has requested. The computer need intervene in the actual data acquisition process only when it deems appropriate.

- Every System 10 is **completely STAND-ALONE** to ensure maximum system uptime. When multiple System 10 units are networked, each node operates as an independent stand-alone system, even when the “host” computer is “down.”

* Each “mnemonic” is an easily remembered abbreviation or acronym for one or more English words (e.g., “FILTER,” “EXU” for EXECUTE, “CLC” for CALCULATE, “HIL” for HIGH LIMIT; “PRT” for PRINT; or “RSN” for RESET SERIAL NUMBER). There are “WRITE” mnemonic commands to enter configuration and calibration values. There are “READ” commands to retrieve these values, along with any measured or calculated data in the system’s continuously updated DATA RAM. And there are “IMPERATIVE” commands to instruct the system to do something (e.g., change a video page, transmit selected data using a certain format, “lock” or “unlock” a given data channel, activate shunt calibration, etc.).

FOR A SYNOPSIS OF SYSTEM 10 MNEMONIC COMMANDS, BOTH “SETUP” AND “RUN-TIME,” SEE APPENDIX A.

### Analog Inputs

- A large family of single- and multichannel SIGNAL CONDITIONER CARDS, described in the latest Conditioner Card Catalog. These include
  - Standard cards for Thermocouples, Thermistors, RTD’s, LVDT’s, Frequency Sources, Analog Voltage and Current Sources, and DC/AC Strain Gage Transducers
  - Specialized conditioners for TC Conditioner with Isolated Inputs; High-Voltage Isolation RTD Conditioner; Encoder Conditioner, Linear or Rotary; Simmonds Shaft Torque Sensor Conditioner; Modulated Carrier Flow Conditioner; AC RMS Conditioners, 2- and 4-channel; Low-Level Voltage Conditioner; Vibration Conditioner for Amplified Piezoelectric Accelerometer; and others

- Special commands for precise “$y = mx + b$” scaling of transducer inputs

- Optional run-time auto-zeroing (taring) of inputs

- **Custom linearization** of nonlinear sensor inputs (up to 8 internal look-up tables, up to 58 segments each; menu-driven software included)—NOW A STANDARD FEATURE (see p. 25)

- Optional auxiliary excitation—see the **Model 10AX-2 Auxiliary Excitation Card** (p. 58)

### Analog Outputs

- Independent, digitally-controlled ±5 V-DC outputs for commanding servo loops and for driving external recorders, plotters, indicators, etc.—see the **Model 10AAO-8 Voltage Output Card** (p. 52)

- Analog error signal for stable, high-speed closed-loop control—see the **Model 10APID Loop Control Card** (p. 56)

- Conversion of voltage outputs to ±10 V-DC or to standard 4-20 mA “process control” outputs—see the **Model 10AAO-4 Analog Buffer Card** (p. 52) and the **Model 10A79-4 Peak Capture Card** (p. 51)

- Isolated ±10-V buffering of standard system ±5-V signals for output to an oscilloscope, strip chart recorder, or other receiver—see the **Model 10CISO Isolated Analog Buffer Interface** (p. 52)

### Logic & Digital I/O

- Up to 1000 internal logic bits, assignable to individual terminal pins (input or output, latching or nonlatching)—see the **Models 10AIO-16 and 10BIO-16 Universal Logic I/O Cards** (pp. 56 and 68, respectively)

- Direct control of bits via internal system conditions (including the “limit logic” established for a given data channel), external inputs, special bit-setting commands, etc.

- Binary and binary coded decimal (BCD) I/O
System 10 reactions to predictable situations and events, you can greatly reduce communications and processing burdens. More importantly, proper and prompt reactions to emergency conditions can be assured, even though the supervisory computer may be unable, at the time, to give attention to the process.

In response to a specific process condition or event, a System 10 can, for example:

- Send a prespecified warning message to the supervisory computer and its operator
- Activate multiple logic outputs in a given pattern
- Increment a counter channel
- Change the video page on display
- "Dump" selected data to a printer
- Initiate digital "history" recording of a list of data channels
- Redefine limit setpoints "on the fly" for ramp-soak operations
- Rescale an analog output or switch it to a different source channel
- "Lock" or "unlock" specific measured or calculated data values

…to name just a few of the many useful functions that can be effectively automated

**“Conditional” execution of command strings based on the occurrence of prespecified Boolean combinations of system logic, limit, and/or time-interval conditions**

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### Dual Limit Monitoring

- Continuous, automatic per-channel HI-LO limit evaluation, with activation of specified logic outputs based on current "limit status"
- Each limit value can be either fixed or equal to the existing reading of any system channel (this makes possible the continuous display of upper and lower limit setpoints and direct comparison of two channels' data values)
- A “Limit Logic” command specifies the particular latching or nonlatching logic output to be activated whenever data for a given channel lies within any of three alarm zones: “GREATER THAN,” “BETWEEN,” and “LESS THAN”

### Calculation Channels

- Permit real-time computation of such process variables as Efficiency, Horsepower, Specific Fuel Consumption, Power Factor, Lift-Drag Ratio, Spring Modulus, etc.; also instantaneous conversion from one engineering unit to another

- Conventional mathematical functions, including \(+\), \(-\), \(\times\), \(\div\), SQUARE ROOT, ABSOLUTE VALUE, MAXIMUM (most positive value), and MINIMUM (least positive value)—see the complete “CLC” list on p. 88; updated each scan cycle for real-time readings; may be sequentially chained to achieve complex algebraic computations

- "Identity" function can be used to duplicate a given data channel any number of times

### Download & Timer Channels

- Volatile and nonvolatile data registers for computer-downloaded constants; these may represent identifying part or operator numbers, mathematical constants, constant setpoint reference values, etc.
- Allows remote control of limit values, gains, etc.; may also be used for block transfer of internal data sets
- Event-controlled counter channels, both incremental and decremental
- Automatically incremented or decremented timer channels

- Optional COUNTER/TIMER functions, including totalization and measurement of frequency and period; controllable by software command or logic input; provided by the Model 10ACT01 Counter/Timer Card and the Model 10ACC-4 Totalizer Card (p. 55)

### Automatic Command Execution

- Automatic execution of pre-entered command strings upon detection of specific system logic events—specifically, on detection of predefined LOGIC CONDITIONS or upon receipt of an external LOGIC INPUT.* This extremely useful feature lets you set up process-interactive control strategies. By specifying preplanned, intelligent

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* A-sized mainframes now provide 24 independent TIMERS, each of which may be used to trigger a selected system logic bit at a prespecified “time-of-day” (according to the system time-of-day clock). The triggered bit can then be used to execute one or more desired functions via an EXECUTE (EXU) command. The TIMER (TMR) command loads a given TIMER with a specific time value; the TIMER BIT (TBT) command links a given TIMER to a given logic bit.

** This function is available to “B-sized” mainframes only.
High-Speed Data Communications

- A variety of single- and multi-channel data-transfer modes to an external RS-232-C computer, terminal, modem, printer, recorder, etc., including “random channel,” “dump,” “data-stream,” “snapshot” (for a time-coherent data set), and “hard copy”; standard baud rates from 110 through 153.6K*.
- Optional conversion of RS-232 output to IEEE-488 or RS-422—see the Model 10CIF488A IEEE Interface Adaptor, Model 10CLB488 IEEE-488 to RS-422 Converter, and Model 10E422 RS-232 to RS-422 Converter (p. 47), and also the Models 10BACI-422 and 10BACI-488 Auxiliary Computer Interface Cards (pp. 60-61).
- Extending the maximum distance for high-speed serial communications (153.6K baud) up to about 3000 ft. via the Model 10ESRE Serial Range Extender (p. 48).
- Auxiliary interfaces for simultaneous high-speed communication with more than one external device—see the Models 10BACI, 10BACI-422, and 10BACI-488 Auxiliary Interface Cards (pp. 60-61).
- Optional conversion of “10BACI” data output to either IEEE or DEC floating-point format.
- Selectable intertransmission delay.
- Automatic timeout alert.
- Automatic transmission of specific ASCII messages or interrupt characters.

* When computer input buffering is limited, or when true hardware handshake is desired, the Daytronic Model PC-HSICA High-Speed Serial Interface Card is available (see p. 85).

Networking of Multiple System 10 Mainframes

- When equipped with an optional Model 10BD4 Satellite Interface Card (p. 62), any “B-sized” mainframe can become a central “host” unit for an RS-485 Satellite Network of up to 31 independent System 10 data acquisition and control units. Intercommunicating transparently with the host—and, in some cases, even among themselves—such “satellite” nodes can provide complete remote-site data acquisition, data display, process control, or entry of “global” system commands.
- The Model 10K488 Data Concentrator (p. 40) can link up to 19 individual “B-sized” System 10 mainframes to a supervisory computer’s IEEE-488 bus. All mainframes can “listen” simultaneously to a request for data, and then “talk” (issue data) simultaneously to individual buffer cards in the 10K488 for subsequent high-speed access by the computer.

Formatting & Storage of Data Outputs

- Optional “Channel Number Echo” and per-channel “Limit Zone” indication.
- Parallel-column formatting of displays and printouts, with optional “HEADER” and “TAILER” character strings; enables “live” data to be updated in place, without scrolling, on a CRT screen.
- More advanced printer outputs with format “templates” for presentation of channel data are possible for “B-sized” mainframes equipped with an optional Model 10VF0132 Formatted Output Card (p. 72).

Digital History Recording & Playback with Optional On-Line SPC

- Four independently controllable RAM recorders provided by the Model 10BDR64 History Card (p. 65).
- Automatic recording of selected data channels at preset time intervals or triggered by Boolean combinations of system logic, limit, and/or time-interval conditions.
- Formattable printout of all or a part of recorded data, including a selected number of recordings made both before and after the occurrence of a halt-triggering condition.
- Video playback of “historical” data; “time search” function for fast review of recorded data; “replay” of all recorded data using variable time scale (allows “slow motion” replay).
- Optional on-line SPC provided by the high-density Model 10BSPC384 (p. 67); performs statistical analysis of “historical” data over selected sampling periods; includes playback of lowest and highest values, continuous average value, X-BAR, and RANGE.
- Optional battery backup of “history” memory—see the high-density Model 10BHDM384 (p. 67).
Analog Peak Capture & Track/Hold

- For instantaneous real-time capture and hold of peak or transient analog-signal values, see the Model 10A79-4 Analog Peak Capture Card (p. 51). This versatile card can also be used for “track and hold” operation,* or to report the difference between the maximum and minimum values experienced by an analog input signal over a period of time.

Video Capabilities

- LCD/VFD video capabilities for “A-SIZED” MAINFRAMES are described on p. 70. These capabilities include optional X vs Y and STRIP-CHART GRAPHICS for LCD displays (see the “G” Option, p. 25)
- All “B-SIZED” MAINFRAMES support MULTIPLE INDIVIDUALLY CONFIGURABLE VGA DATA DISPLAYS, local or remote. CRT video capabilities for “B-sized” mainframes are described on pp. 70-71. These capabilities include
  - Quick and easy formatting of video pages in the field
  - Standard CRT display features such as logic-bit indication, limit-controlled visual effects, “history” playback fields, operator-entered “messages,” etc.
  - Video inputs and outputs (see also the COLOR MONITORS described on pp. 44-46)
  - High-speed HORIZONTAL BARGRAPHICS, when the Model 10VGM500 Video Graphics Memory Option (p. 72) is installed

PID Loop Control

- The Model 10APID Loop Control Card (p. 56) provides stable, high-speed closed-loop control, with selective error-signal damping; individually settable P, I, and D inputs for quick and accurate loop tuning; and automatic clamping of control inputs to preset values

Keyboard “Prompt” Functions

- “Function-key” setup of mainframe plug-in keyboards and front-panel keypads; automatic entry of standard mnemonics when certain keys are pressed

Diagnostic Tools

- With its own independent temperature-stabilized reference source, the “A-sized” Model 10AHM Health Monitor Card (p. 55) lets the system read and display all pertinent power and reference voltages; the companion Model 10BDHM (p. 64) is a “B-sized” card which, when connected to the 10AHM via a special cable, can be used to monitor all B-rack voltage supplies, plus critical software handshake lines and other dynamic signals
- The Model 10AEX-20 “A Card” Extender Board (p. 54) permits direct access to a given A Card’s on-board hardware, while maintaining all “live” card connections
- The Model 10AST Analog Slot Test Card (p. 58) brings out all “A Slot” signals for direct oscilloscope or voltmeter observation

Free Configuration & Startup Software

- Every System 10 comes with a copy of the Windows-based System 10 Configuration Software described on pp. 76-77. This convenient utility will save any System 10 user a great deal of time and effort when it comes to setting up (“configuring”) the system. And it provides complete backup security if an existing configuration ever needs to be reloaded.
- Every System 10 also comes with a copy of Daytronic’s StartPAC V software. This software may be used for
  - establishment and verification of data communications
  - multichannel data display and printout
  - printout, backup, and duplication of System 10 setup data (including video page formats)
- StartPAC V contains the following individual programs, each of which is described under “Daytronic SuperPAC V Software” (pp. 81-84): USERTIPS, COMMLINK, TERMINAL, DAS1, SYSPRINT, CLONE1, CLONE2, VCLONE1, VCLONE2.

* For real-time TRACK/HOLD of strain gage or voltage inputs, see the Models 10A74-4C, 10VAC, and 10A1 in the Conditioner Card Catalog.
A major manufacturer of automobile parts uses System 10 to perform 100% audit of parts, with automatic rejection of nonconforming parts right off the line. The long-term cost-effectiveness of such systems allows many companies to install multiple test stations throughout their plants.

Consisting of eight “satellite” System 10 mainframes linked to a central “host” mainframe, this system monitors and controls a group of large turbo air compressors that are used to simulate flight conditions for jet engine testing (pressures must be developed to simulate air speeds of over 200 MPH). Over 400 transducer signals are received, including force, flow, torque, temperature, and displacement. The System 10 network interacts with a computer and PLC to generate all control signals necessary to maintain safe and effective compressor operation.

A system for high-speed multisindle torque monitoring reduces production costs and improves productivity for a major transmission manufacturer.

The block diagram represents a large System 10 “satellite” network for monitoring the performance of standard and custom-designed pumps. All test data is acquired with minimal time skew. Local System 10 nodes are responsible for controlling the precise test sequence at each stand. The system provides both local and central display of all measured and calculated parameters.
Introduction

System 10 ... 

... in the air

Jet engine performance is carefully monitored by this airborne System 10.

... in the lab

A well-known racing team gathers and displays data during wind-tunnel experiments, in an effort to optimize aerodynamic response and other important race-car characteristics.

... on the road

A manufacturer of automobile brakes uses an on-board DC-powered mainframe to make sure that brake systems comply with Federal Motor Vehicle Safety Standards.

... and even on the track

The above-mentioned racing team gives System 10 its toughest test by mounting a Model 10KU in the race car itself, to provide continuous monitoring of critical structural and performance variables while the car is racing.
Every “System 10” mainframe contains all necessary power supplies, plus all hardware and software necessary for complete, fast, and independent management of ANALOG/DIGITAL DATABASE OPERATIONS. As the following pages show, mainframe models vary with respect to:

- size
- analog and logic capacities
- the number of “A-,” “B-,” and “V-Card” slots available to the user
- local and remote video capabilities, both standard and optional
- keyboard/keypad capabilities, both standard and optional

All mainframe functions are carried out at exceptionally high speed. A 16-bit successive-approximation A/D converter yields a nominal internal “finished data” throughput from 2500 to 3000 channels per second. No significant speed reduction is imposed by the system’s internal data acquisition and control workload.\(^1\)

Of course, the actual transfer of data to a host computer may be considerably slower, the overall throughput being determined by the computer’s own speed capabilities. You can, in fact, impose a fixed delay time between successive channel transmissions, to avoid overrunning the PC’s input buffer when full handshake protocols are not observed.\(^2\)

For all System 10 mainframes, maximum data precision is one part in ±32768 (16 bits). Any numeric character can be replaced by a decimal point. A maximum of seven characters is allowed, in addition to a minus sign, if applicable.

Each mainframe’s front-panel SYSTEM STATUS INDICATORS let you continuously monitor the validity of various system communication links, including the main RS-232 Computer Interface and the plug-in keyboard, if present. The E2P light tells you when the mainframe’s CONFIGURATION WRITE PROTECT FUNCTION has been enabled.\(^3\)

---

\(^1\) A special command lets you disable the reading of system logic bits, to increase the internal scan rate even further.

\(^2\) See also the computer-installed Model PC-HSICA High-Speed Serial Interface Card, p. 85.

\(^3\) With “B-sized” mainframes, the “EEPROM Switch” can be turned ON and OFF by software command.
**Internal Scan Rate**

Typically 2500 to 3000 channels per second, depending on the mainframe’s CENTRAL PROCESSOR model and the number and “types” of channels being scanned; this rate includes all internal numeric processes (linearization, “y = mx + b” scaling, limit decisions, cross-channel computations, etc.)

**A/D Resolution**

16-bit (0.0015% of full scale); for all Conditioner Cards, measurement resolution is determined by the user during system calibration

**Filtering**

Multipole low-pass active analog filter per channel (see *Conditioner Cards Catalog* for details); digital smoothing function per channel with individually selectable quieting factor

**Custom Linearization**

. . . of up to eight analog input channels now standard for all mainframes (see p. 25)

**Overall Accuracy**

0.02% of full scale typical, following calibration (see *Conditioner Cards Catalog* for specific cards)

**Real-Time Clock and Date**

. . . included; battery backup ensures correct time and date

Please Note: System 10 is “Year 2000 Compliant,” since a Julian calendar is used to express the date in MM/DD/YY format. The system only requires that “YY” be manually reset at the beginning of each year.

**Power-Off Protection**

All setup data (calibration, limit values, video page formats, etc.) is now stored in nonvolatile “Zero-Powered” (battery-backed) RAM for all mainframes (see p. 25); configuration “Write Protection” may be enabled and disabled via physical or “software” switch

**Power Requirements**

90 - 130 or 180 - 260 V-AC (47 - 63 Hz) standard for all mainframes. Maximum amperage varies with mainframe “family”: 0.5 amp for “10KU’s” (50 W typical); 2 amps for “10K1,” “10K2,” and “10K4T” families (100 W typical); and 3 amps for all “B-sized” mainframes (100 W typical); for optional 12-28 V-DC external power, see *Vehicle Operation (“V”) Option*, p. 25

**Mounting**

All mainframes are RACK- or PANEL-MOUNTABLE; Rackmount Kits are available for all models less than 19” wide (see the *Models RMK-10KU and RMK-10K4T*, p. 42); contact the factory for precise panel cutout dimensions required by any given model

**Operating Temperature Range**

+41° F to +122° F (+5° C to +50° C)

**Relative Humidity**

95% maximum (noncondensing)

For all **Standard Mainframe Options**, see pp. 24-27

For **Standard Mainframe Accessories**, see pp. 42-48

**Communications**

RS-232-C Serial ASCII standard at baud rates from 110 through 153.6K; IEEE-488 and RS-422 interfacing optional (see p. 47 and the “Auxiliary Computer Interface” Cards, pp. 60-61)
### Overview of Mainframes

#### A-Card, B-Card, Analog, & Logic Capacities

#### “A-Sized” Mainframes

<table>
<thead>
<tr>
<th>Mainframe Model</th>
<th>Available A-CARD Slots</th>
<th>Available B-Card Slots</th>
<th>Max. No. of Analog CHANNELS 1</th>
<th>Max. No. of Analog I/O 2</th>
<th>Max. No. of Logic BITS</th>
<th>Max. No. of Logic I/O 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10KU, 10KU-KD</td>
<td>4</td>
<td>—</td>
<td>160</td>
<td>32</td>
<td>1000</td>
<td>64</td>
</tr>
<tr>
<td>10K1C, 10K2C, 10K2D</td>
<td>20</td>
<td>—</td>
<td>160</td>
<td>160</td>
<td>1000</td>
<td>320</td>
</tr>
<tr>
<td>10K4T, 10K4T-KD, 10K4T-D, 10K4T-DA</td>
<td>10</td>
<td>—</td>
<td>160</td>
<td>80</td>
<td>1000</td>
<td>160</td>
</tr>
</tbody>
</table>

1. Up to 1000 channels can be handled when the “S” (Satellite) Option is present (see p. 25).
2. Assumes all A SLOTS dedicated to analog I/O only (with eight channels per slot).
3. Assumes all A SLOTS dedicated to logic I/O only; requires one optional Model 10AIO-16 Universal Logic I/O Card for every group of 16 bits to serve as logic I/O.

#### “B-Sized” Mainframes

<table>
<thead>
<tr>
<th>Mainframe Model</th>
<th>Available A-CARD Slots</th>
<th>Available B-Card Slots</th>
<th>Max. No. of Analog CHANNELS 1</th>
<th>Max. No. of Analog I/O 3</th>
<th>Max. No. of Logic BITS</th>
<th>Max. No. of Logic I/O 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10KN3</td>
<td>0</td>
<td>8</td>
<td>1000</td>
<td>0</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN6</td>
<td>24</td>
<td>8</td>
<td>1000</td>
<td>192</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN6-2</td>
<td>48</td>
<td>8</td>
<td>1000</td>
<td>384</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN6-3</td>
<td>72</td>
<td>8</td>
<td>1000</td>
<td>576</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN6-4</td>
<td>96</td>
<td>8</td>
<td>1000</td>
<td>768</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN7</td>
<td>24</td>
<td>8</td>
<td>1000</td>
<td>192</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN7-2</td>
<td>48</td>
<td>8</td>
<td>1000</td>
<td>384</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN7-3</td>
<td>72</td>
<td>8</td>
<td>1000</td>
<td>576</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN7-4</td>
<td>96</td>
<td>8</td>
<td>1000</td>
<td>768</td>
<td>1000</td>
<td>128</td>
</tr>
<tr>
<td>10KN8A</td>
<td>8</td>
<td>2</td>
<td>1000</td>
<td>64</td>
<td>1000</td>
<td>32</td>
</tr>
</tbody>
</table>

1. Assumes all A SLOTS dedicated to analog I/O only (with eight channels per slot).
2. Assumes all B SLOTS dedicated to logic I/O only; requires one optional Model 10BIO-16 Universal Logic I/O Card for every group of 16 bits to serve as logic I/O.
3. Expandable to 19 with “E” Option (see p. 25).
4. Expandable to 304 with “E” Option (see p. 25).
### Overview of Mainframes

#### Data Display Capabilities

<table>
<thead>
<tr>
<th>Mainframe Model</th>
<th>See Figure No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“A-Sized” Mainframes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10KU</td>
<td>3</td>
<td>OPTIONAL remote 7-line, 12-channel LCD display, up to 25 ft. (Model 10LCD12A, p. 43); OPTIONAL front-panel or keyboard 2-line LCD “billboard” display (Model 10DISU, p. 44, or Model 10P80D or 10P25D, p. 42)</td>
</tr>
<tr>
<td>10KU-KD</td>
<td>3</td>
<td>Front-panel 2-line LCD “billboard” display</td>
</tr>
<tr>
<td>10K1C</td>
<td>7</td>
<td>OPTIONAL remote 7-line, 12-channel LCD display, up to 25 ft. (Model 10LCD12A, p. 43); OPTIONAL front-panel 7-line, 12-channel LCD display (Model 10LCD12-2, p. 44); OPTIONAL keyboard 2-line LCD “billboard” display (Model 10P80D or 10P25D, p. 42)</td>
</tr>
<tr>
<td>10K2C</td>
<td>7</td>
<td>Front-panel 7-line, 12-channel liquid crystal (LCD) display (175 x 50 mm) ¹</td>
</tr>
<tr>
<td>10K2D</td>
<td>7</td>
<td>Front-panel 8-line, 12-channel vacuum fluorescent (VFD) display (140 x 35 mm) ²</td>
</tr>
<tr>
<td>10K4T</td>
<td>11</td>
<td>OPTIONAL remote 7-line, 12-channel LCD display, up to 25 ft. (Model 10LCD12A, p. 43); OPTIONAL front-panel or keyboard 2-line LCD “billboard” display (Model 10DIS4T, p. 44, or Model 10P80D or 10P25D, p. 42)</td>
</tr>
<tr>
<td>10K4T-KD</td>
<td>11</td>
<td>Front-panel 2-line LCD “billboard” display</td>
</tr>
<tr>
<td>10K4T-D</td>
<td>11</td>
<td>Front-panel 7-line, 12-channel liquid crystal (LCD) display (175 x 50 mm) ¹</td>
</tr>
<tr>
<td>10K4T-DA</td>
<td>11</td>
<td>Front-panel 8-line, 12-channel vacuum fluorescent (VFD) display (140 x 35 mm) ³, ³</td>
</tr>
</tbody>
</table>

¹ The front bezel itself may be used as a remote LCD display (up to 25 ft.).

² TIME and DATE are always displayed in addition to 12 selected data channels, along with “live” per-channel LIMIT-STATUS INDICATION. The “G” Option cannot be used with this mainframe.

³ The front bezel of the Model 10K4T-DA may itself be used as a remote VFD display (up to 25 ft.), if an optional remote power supply (available from Daytronic) is provided.

<table>
<thead>
<tr>
<th>Mainframe Model</th>
<th>See Figure Nos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“B-Sized” Mainframes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10KN3</td>
<td>17, 18</td>
<td>VGA input and output; external monitor required for data display; 2 available V-Card slots</td>
</tr>
<tr>
<td>10KN6 (-2,-3,-4)</td>
<td>17, 18</td>
<td>VGA input and output; external monitor required for data display; 2 available V-Card slots</td>
</tr>
<tr>
<td>10KN7 (-2,-3,-4)</td>
<td>17, 19</td>
<td>Internal CRT (B/W, 5” x 9”); RS-170 and “RGB” (CGA) output; 2 available V-Card slots</td>
</tr>
<tr>
<td>10KN8A</td>
<td>21, 22</td>
<td>Internal CRT (COLOR, 12” multi-sync (CGA/EGA/VGA)); VGA input and output; 2 available V-Card slots</td>
</tr>
</tbody>
</table>

¹ See p. 26 for the SVGA video capabilities offered by the optional Model SI-EC Embedded Computer.
### Keyboard/Keypad Provisions

#### “A-Sized” Mainframes

<table>
<thead>
<tr>
<th>Mainframe Model</th>
<th>See Figure No.</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>10KU</td>
<td>5</td>
<td>OPTIONAL extended or operator’s keyboard with 2-line LCD “billboard” display (Model 10P80D or 10P25D, p. 42); OPTIONAL remote LCD display with extended keyboard (Model 10LCD12A with 10P80A, p. 43); OPTIONAL front-panel LCD display with keypad (Model 10DISU, p. 44)</td>
</tr>
<tr>
<td>10KU-KD</td>
<td>6</td>
<td>Integral front-panel keypad; OPTIONAL extended or operator’s keyboard, with or without 2-line LCD “billboard” display (Model 10P80A, 10P80D, 10P25A, or 10P25D, p. 42)</td>
</tr>
<tr>
<td>10K1C</td>
<td>9</td>
<td>OPTIONAL extended or operator’s keyboard with 2-line LCD “billboard” display (Model 10P80D or 10P25D, p. 42); OPTIONAL remote LCD display with extended keyboard (Model 10LCD12A with 10P80A, p. 43); OPTIONAL front-panel LCD display with extended keyboard (Model 10LCD12-2 with 10P80A, p. 44)</td>
</tr>
<tr>
<td>10K2C, 10K2D</td>
<td>10</td>
<td>Extended keyboard (Model 10P80A, p. 42); OPTIONAL operator’s keyboard (Model 10P25A, p. 42)</td>
</tr>
<tr>
<td>10K4T</td>
<td>13</td>
<td>OPTIONAL extended or operator’s keyboard with 2-line LCD “billboard” display (Model 10P80D or 10P25D, p. 42); OPTIONAL remote LCD display with extended keyboard (Model 10LCD12A with 10P80A, p. 43); OPTIONAL front-panel LCD display with keypad (Model 10DIS4T, p. 44)</td>
</tr>
<tr>
<td>10K4T-KD</td>
<td>14</td>
<td>Integral front-panel keypad; OPTIONAL extended or operator’s keyboard, with or without 2-line LCD “billboard” display (Model 10P80A, 10P80D, 10P25A, or 10P25D, p. 42)</td>
</tr>
<tr>
<td>10K4T-D, 10K4T-DA</td>
<td>15</td>
<td>Extended keyboard (Model 10P80A, p. 42); OPTIONAL operator’s keyboard (Model 10P25A, p. 42)</td>
</tr>
</tbody>
</table>

1. See p. 39 for a description of keypad functions.
2. The Model 10P80D or 10P25D keyboard may NOT be used with these mainframes.

#### “B-Sized” Mainframes

<table>
<thead>
<tr>
<th>Mainframe Model</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL MODELS 4</td>
<td>Extended keyboard (Model 10P80A, p. 42); OPTIONAL operator’s keyboard (Model 10P25A, p. 42)</td>
</tr>
</tbody>
</table>

1. A standard keyboard is also supplied with the optional Model SI-EC Embedded Computer, with optional rackmount keyboard (any “10KN6” mainframe—see p. 26).
## Overview of Mainframes

### “A-Sized” Mainframes

<table>
<thead>
<tr>
<th>Mainframe Model</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>10KU, 10KU-KD</td>
<td>Satellite (“S”); Vehicle (“V12,” “V28”)</td>
</tr>
<tr>
<td>10K1C</td>
<td>LCD Graphics (“G”); Satellite (“S”)</td>
</tr>
<tr>
<td>10K2C</td>
<td>LCD Graphics (“G”); Satellite (“S”)</td>
</tr>
<tr>
<td>10K2D</td>
<td>—</td>
</tr>
<tr>
<td>10K4T-DA</td>
<td>—</td>
</tr>
</tbody>
</table>

1. The former “L” (Custom Linearization) Option and “R” (Zero-Powered RAM) Option are now standard features for all System 10 mainframes (see next page).

2. The “G” Option requires that the 10K1C be equipped with an external Model 10LCD12A or front-panel Model 10LCD12-2 (see pp. 43-44); it cannot be used when the “S” (Satellite) Option is present.

3. The “G” Option cannot be used when the “S” (Satellite) Option is present.

4. Mainframes with integral “VFD” display cannot use the “S” (Satellite) Option.

5. The “G” Option requires that the 10K4T be equipped with an external Model 10LCD12A (see p. 43); it cannot be used when the “S” (Satellite) Option is present.

### “B-Sized” Mainframes

<table>
<thead>
<tr>
<th>Mainframe Model</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>10KN3</td>
<td>Extended B-Rack (“E”)</td>
</tr>
<tr>
<td>10KN6 (-2,-3,-4)</td>
<td>Extended B-Rack (“E”); Model SI-EC Embedded Computer (see pp. 26-27)</td>
</tr>
<tr>
<td>10KN7 (-2,-3,-4)</td>
<td>—</td>
</tr>
<tr>
<td>10KN8A</td>
<td>—</td>
</tr>
</tbody>
</table>

1. The former “L” (Custom Linearization) Option and “R” (Zero-Powered RAM) Option are now standard features for all System 10 mainframes (see next page).

2. The Model SI-EC Embedded Computer cannot be installed in any “10KN6” version mainframe with the “E” Option.
**New Standard Mainframe Features**

**Custom Linearization**

Any System 10 mainframe can now furnish high-speed linearization of up to eight different system data channels (these would normally represent nonlinear sensor inputs). Using a total of 58 segments anchored at any of 256 breakpoints to profile the input curve at any selected position on the curve, custom linearization can normally achieve linearity with errors of less than 0.05% of full scale. It is particularly recommended for flowmeter-based and irregularly nonlinear thermocouple-based measurements.

Up to eight customized linearization (“look-up”) tables can be loaded into the mainframe’s EEPROM memory either at the factory, in accordance with the purchaser’s specifications, or in the field, via the Daytronic LinPAC V software supplied free of charge with every mainframe. The same table can be shared by more than one signal of a given type (e.g., TC, RTD, etc.).

LinPAC V allows the creation/editing, loading, backup, and restoration of up to eight customized linearization tables. It also lets the user create a curve-generating linearization function “on-line” on a per-segment basis, to be subsequently loaded from the software to a connected System mainframe. Any currently loaded function can be downloaded from the mainframe to the computer’s hard disk for storage or editing. LinPAC V also includes the following standard “SofPAC” programs described on p. 81: USERTIPS, COMM-LINK, TERMINAL, DAS1.

**Zero-Powered RAM**

Every System 10 mainframe is now equipped with a nonvolatile battery-backed RAM with self-contained power supply. The RAM allows faster transfer of data to and from system memory than did the former EEPROM-based method—plus a considerably higher “write life.” It also ensures power-off protection for downloaded data values not previously stored in EEPROM.

---

**Standard Mainframe Options**

### "E" Option: Extended B-Card Rack

**Applies to Models 10KN3 and 10KN6 (-2, -3, -4).** This option provides the user with a total of 19 slots for optional “B Cards.”

### "G" Option: LCD Graphics

**Applies to Models 10K2C and 10K4T-D; Model 10K1C or 10K4T with optional remote 10LCD12A display; and Model 10K1C with optional front-panel 10LCD12-2 display.**

With this option, these mainframe models offer LCD X versus Y or STRIP-CHART plotting of data-channel values, in addition to “normal” data-display pages. Graph resolution is 2% vertical, 0.5% horizontal, with scales and legends independently set by the user. Includes “Pen Off-Screen” indicator arrow.

For each strip-chart display, you can specify one, two, or three data channels to be plotted versus time. You can also indicate the precise time interval at which the mainframe’s strip-chart RECORDER is to make successive recordings of all channels in its current “list,” thus setting the total “time length” of every strip-chart display from 2 seconds to 66.6 hours. Simple commands allow instant clearing, freezing, and restarting of strip-chart displays, which may be either scrolling or nonscrolling.

LCD displays cannot be printed out. Note too that the “G” Option may not be used with the “S” (Satellite) Option.

### "S" Option: Satellite Operation

**Applies to ALL “A-SIZED” MAINFRAME MODELS.** Entailing a special Central Processor, this option is required for every “A-Sized” mainframe that is to be included in a Model 10BD4-based SATELLITE NETWORK (p. 62).

The “S” Option provides the mainframe with a 1000-channel capacity, along with the limited bidirectionality required for “global” interchanges with the network.

### "V" Option ("V12" or "V28"): Vehicle (DC) Operation

**Applies to all “10KU” and “10K4T” Mainframes with the exception of the Model 10K4T-DA.** A “V” version mainframe can be used with any external 12-28 V-DC power supply (maximum 50 W). This includes 12 V-DC for cars, 24 V-DC for trucks, and 28 V-DC for aircraft (NOTE: units with this option may NOT be operated at 110 or 220 V-AC; “V12” or “V28” must be specified at the time of order).

This capability, along with small size and outstanding physical and electrical stability, makes these mainframes ideal for any number of “on-board” performance-testing applications involving the measurement and real-time computation of highly dynamic variables like wheel torque, fuel flow, under-hood temperatures, corrected horsepower, etc.—with or without an accompanying portable computer or printer of the user’s choice.

---

* This option does not apply to “10KN6” versions with the Model SI-EC Embedded Computer installed (see pp. 26-27).
This compact, feature-rich computer slides easily into any Daytronic Model 10KN6 Mainframe. It can also be installed in an older Model 10K6A Mainframe that has been upgraded via the Model 10VRK6 VGA Retrofit Kit (p. 42).  

The “BASIC” MODEL IS-EC features

- either a 486 or Pentium CPU (specified at the time of order)
- 32-Mb RAM standard, up to 64 Mb total
- 3.2-Gb IDE hard drive
- One 3.5” 1.44-Mb internal floppy drive
- Two serial ports
- One parallel port
- One 37-pin external floppy/tape adaptor port
- Two available 1/2-length 16-bit ISA card slots
- MS serial mouse
- Built-in IDE and floppy controller

- Battery-backed RTC and CMOS RAM
- 16 levels of hardware interrupts
- On-board speaker/buzzer
- The latest Windows 95 version preinstalled
- SVGA video adaptor (1 Mb on-board RAM)
- Standard 104 QWERTY, ESD-resistant keyboard supplied; includes adaptor cable with 5-pin DIN termination
- All-aluminum chassis with 4-slot passive backplane (approximate weight 6.5 lbs.)

Two free half-length 16-bit ISA expansion slots are offered, for installation of additional cards—including Daytronic’s Model PC-HSICA High-Speed Serial Interface Card (p. 85).

1 Since it occupies otherwise unused CRT space in the mainframe’s “B Rack,” an embedded computer cannot be installed in a Model 10K7A or 10KN7, or in any “10K6” version with the “E” (Expanded B-Card Rack) Option.

2 Optional rackmount keyboard is also available.
The IS-EC supports other options, including

• Up to 64 Mb of memory
• Larger-capacity hard drive
• A number of individual **I/O - COMMUNICATIONS HARDWARE OPTIONS**, including
  — Dual RS-422 / RS-485 Serial I/O Card
  — 28,800-bps Modem with 14,400-bps Fax
  — Ethernet 10-Mbit, 16-bit Card (NE2000 support)
  — 16-bit Arcnet Network Adaptor Card (Model SI-6900-70)
  — 16-bit IEEE-488 Interface Card with 1-Mb/second data transfer (Model SI-HW-488)

This photo shows the rear of the slide-in IS-EC computer. All computer interconnections are available from the rear of the 10KN6 mainframe.

For full details on all **Embedded Computer Options** and on customized **Pentium-Based Mini Tower Computers for use with System 10** contact our Integrated Systems Department at 1-800-668-4745
Mainframe Layouts & Dimensions

The “10KU” Family

Fig. 3 “10KU” Mainframe Front Elements

Fig. 4 “10KU” Mainframe Rear Elements

See p. 39 for a description of Front-Panel Keypad Functions

See p. 41 for details on our new Model 10KU-EL Entry-Level Data Acquisition Package
Fig. 5 Model 10KU Dimensions

Dimensions in inches (cm)

Fig. 6 Model 10KU-KD Dimensions

* The Model 10P80D and 10P25D Keyboards may also be used with the Model 10KU-KD mainframe.

OPTIONAL Model 10P80A Extended Keyboard

OPTIONAL Model 10P25D Operator’s Keyboard

OPTIONAL Model 10P80D Extended Keyboard

OPTIONAL Model 10LCD12A (includes Model 10P80A Extended Keyboard)

OPTIONAL Model 10DISU Display Option

OPTIONAL Model 10KU-KD Dimensions

5.32 (13.51) 4.00 (10.16) 4.90 (12.45) 13.10 (33.27) 0.625 (1.59)

Allow 3 in. (7.6 cm) for cable bend in rear
Mainframe Layouts & Dimensions

The "10K1 / 10K2" Family

Fig. 7 "10K1 / 10K2" Mainframe Front Elements

Fig. 8 "10K1 / 10K2" Mainframe Rear Elements

See p. 70 for LCD/VFD Displays for "A-Sized" Mainframes
**Fig. 9 Model 10K1C Dimensions**

DIMENSIONS IN INCHES (CM)

- **17.46 (44.35)**
- **19.00 (48.26)**
- **3.50 (8.89)**
- **1.30 (3.30)**
- **0.50 (1.27)**

OPTIONAL Model 10LCD12-2 Display Option

Allow 3 in. (7.6 cm) for cable bend in rear

OPTIONAL Model 10P80D Extended Keyboard

OPTIONAL Model 10P25D Operator's Keyboard

OPTIONAL Model 10LCD12A (includes Model 10P80A Extended Keyboard)

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**Fig. 10 Model 10K2C / 10K2D Dimensions**

DIMENSIONS IN INCHES (CM)

- **17.46 (44.35)**
- **19.00 (48.26)**
- **3.50 (8.89)**
- **1.30 (3.30)**
- **0.50 (1.27)**

Allow 3 in. (7.6 cm) for cable bend in rear

Model 10P80A Extended Keyboard (SUPPLIED)

OPTIONAL Model 10P25A Operator's Keyboard

Dimensions in inches (cm)
Mainframe Layouts & Dimensions

The “10K4T” Family

Fig. 11 “10K4T” Mainframe Front Elements

See p. 39 for a description of Front-Panel Keypad Functions

Fig. 12 “10K4T” Mainframe Rear Elements

"A SLOT" No. 10
Actuating Lever
System Status Indicators

“A SLOT” No. 1
Optional "A Cards"

LCD / VFD Connector
(for 10K4T versions with display)

Front-Panel Large-Scale LCD / VFD Display
(Model 10K4T-O / 10K4T-DA only)

Front-Panel Two-Line LCD Display
(Model 10K4T-KD only)

Front-Panel Keypad
(Model 10K4T-KD only)

Screws for Removal of Front Panel

See p. 39 for a description of Front-Panel Keypad Functions

Power ON/OFF Switch
Fuse
AC Power Connector
Voltage Selector Switch
Plug-In Keyboard Connector
EEPROM Write Protect Switch
Interface Protocol Switches
Computer Interface Connector
"A Card" I/O Connectors
(for connection of transducers and control I/O)

Panel-Mount Slide
Fig. 13 Model 10K4T Dimensions

Fig. 14 Model 10K4T-KD Dimensions

Fig. 15 Model 10K4T-D / 10K4T-DA Dimensions

* The Model 10P80D and 10P25D Keyboards may also be used with the Model 10K4T-KD mainframe.
The Model 10KN3

For Model 10KN3 front and rear elements, see Figs. 17 and 18. The only difference between the 10KN3 and the 10KN6 mainframes is that the 10KN3 has no “A-CARD” RACK, and thus no A-CARD-based analog I/O capabilities.

Fig. 16 Model 10KN3 Dimensions

Dimensions in inches (cm)

The "10KN6 / 10KN7" Family

* Model 10KN7 mainframes only. On mainframes with the "E" (Extended B Rack) Option, the CRT space will be occupied by additional B Slots.

** The Video Signal Card and any other optional video cards are located to the left of the Video Text Card (connected to the Video Backplane). For mainframes with the "E" (Extended B Rack) Option, the Video Text Card will occupy B Slot No. 4.

*** Not present on the 10KN3 mainframe. A "10KN6" or "10KN7" mainframe may have up to four A Decks in all.

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Fig. 17
Front Elements, Models 10KN3, 10KN6, and 10KN7 Mainframes (front bezel(s) removed)

Fig. 18 Rear Elements, Models 10KN3, 10KN6, and 10KN7 Mainframes (NOTE: 10KN7 Video Connector Panel is shown separately in Fig. 19)

* Many "B Cards" come with their own rear connector assemblies (not shown here).

** Not present on the 10KN3 mainframe, which has no "A Card Deck."
Fig. 19 Model 10KN7 Video Connector Panel

RS-232 Formatted Output Connector
(requires optional Model 10VFO132 Formatted Output Card for operation)

"RGB" Output
(to external CGA color monitor)

RS-170 Output
(to external monochrome monitor)

Fig. 20 Models 10KN6 / 10KN7 Dimensions*

* Heights of “multi-A-rack” mainframes are as follows:
  - Model 10KN6-2 or 10KN7-2 (with 2 A-card racks): 14.00” (35.56 cm)
  - Model 10KN6-3 or 10KN7-3 (with 3 A-card racks): 17.50” (44.45 cm)
  - Model 10KN6-4 or 10KN7-4 (with 4 A-card racks): 21.00” (53.34 cm)
The Model 10KN8A

Fig. 21
Front Elements,
Model 10KN8A
Mainframe (front
bezel removed)

* For the Model 10KN8A, B Slot Nos. 1 and 2 are used for optional “V Cards” only: an optional Model 10VGM500 will always go in B Slot No. 1, while an optional Model 10VFO132 will go in B Slot No. 2.

Fig. 22
Rear Elements,
Model 10KN8A Mainframe

* Many “B Cards” come with their own rear connector assemblies (not shown here).
Fig. 21 Model 10KN8A Dimensions

Dimensions in inches (cm)
“KD” Mainframes (Front-Panel Keypad and LCD)

Through simple keypad entries, the operator of a Model 10KU-KD or 10K4T-KD mainframe* can invoke instant “live” readout of a selected system channel or bit on the unit’s convenient two-line LCD display—and can also set bits to desired states. Channel display includes a user-specified engineering-unit legend of up to four characters.

The integral keypad greatly simplifies system setup by letting the operator review in sequence all basic “configuration parameters” for any selected channel or bit, for the system itself, or for the mainframe’s Computer Interface Port. The specific parameters displayed for a given data channel will depend on the channel’s “type” designation. A channel or bit sequence may in turn be “stepped” through an entire range of channels or bits.

Parameters involving only numerical values (decimal or hexadecimal) may be immediately reset via the keypad, as prompted by a cursor in the display.

In addition, there’s a connector in the rear of the 10KU-KD or 10K4T-KD mainframe for plugging in an optional Model 10P80A or other Extended or Operator’s Keyboard (not supplied with the mainframe itself). This allows rapid manual entry of any standard command recognized by the system. The front-panel LCD will display any and all keyboard command entries, and all system responses to keyboard-entered interrogations.

A special “FUNCTION” key lets the operator communicate any of up to five prespecified command MNEMONICS to the system, thus allowing entry of selected commands from the keypad alone.

* Or a Model 10KU with the Model 10DISU Display Option, or a Model 10K4T with the Model 10DIS4T Display Option.
Up to 19,000 analog input channels can now be accommodated in a single system, using the **Model 10K488 Data Concentrator**.\(^1\)

The 10K488 provides a data communications interface between a digital computer connected to an IEEE-488 bus and up to nineteen System 10 “B-Sized” mainframes with RS-422 I/O capability. Multiple 10K488 systems can be “cascaded” to handle even greater numbers of channels (up to fourteen 10K488’s on a single IEEE-488 interface!).

The 10K488 consists of a rackmountable “A-sized” mainframe with 21 card slots.\(^2\) The **Model 10A488 IEEE-488 Interface Card** in Slot No. 21 provides the necessary IEEE-488 bus interchange protocol handling and the control of data transfer to and from up to 19 individual **Model 10A422 Communication Buffer Cards** occupying the 10K488’s Slots 1 through 19. Although the distance between the computer and the 10K488 is limited by IEEE-488 standards to about two meters, each RS-422 “node” device can be as far as one kilometer (0.62 mile) from the Data Concentrator.

While it may serve as a communications interface for any RS-422 device, the Model 10K488 was specifically designed to let multiple System 10 mainframe units “listen” simultaneously to a supervisory computer's request for data, and then “talk” (issue data) simultaneously to individual buffer cards for subsequent high-speed access by the computer. In addition, the 10K488 provides a hardwire logic control line to each mainframe to trigger *synchronous data collection*, if desired. The control line can be exercised by direct computer command.

In Fig. 22, an independent “B-sized” mainframe (like the single one shown) is to be connected via RS-422 cabling to each 10A422 card in the 10K488. Each mainframe is equipped with a **Model 10BACI-422 Auxiliary Computer Interface Card** for direct connection to the respective 10A422 card.\(^3\)

In addition to providing RS-422 serial linkage, each Model 10A422 Communication Buffer Card has an internal logic-controlled RAM for storage of up to 2048 bytes of data being transferred from the card’s RS-422 port to the Model 10A488 IEEE-488 Interface Card and of up to 2048 bytes of data being transferred from the Model 10A488 to the RS-422 port. All data is stored in a strictly “first-in-first-out” (FIFO) manner.

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1. This assumes that synchronous data collection is not required. With synchronous sampling at intervals of 0.2 second, up to 9600 channels can be handled; at intervals of 0.1 second, up to 4800 channels.

2. 10K488 dimensions are identical to those of the Model 10K1C Mainframe (Fig. 9, p. 31).

3. See p. 60 for a description of the Model 10BACI-422 and of its use in synchronous data collection.
In terms of IEEE-488 conventions, the Model 10K488 can be either a TALKER or a LISTENER. It employs a standard “extended address” mode of operation.* The commands used to initiate actual data interchanges between the computer and the 10K488 will depend on the computer’s specific I/O handler. The 10K488 responds to standard “clear” commands within the IEEE-488 language structure. Additional commands exist for synchronizing data collection to a “master” timing clock.

* The “primary” address is the 10K488’s address as a TALKER/LISTENER peripheral on the general IEEE-488 bus. This address can be any integer from 0 through 30, and is set by means of switches on the Model 10A488 IEEE-488 Interface Card. The “secondary” (or “extended”) address is latched and decoded to select one of the nineteen card slots in which Model 10A422 Communication Buffer Cards can be located—or all of these slots simultaneously. When the 10K488 is the “primary addressed” LISTENER, and the “secondary” address is either 1-19 (to select a particular 10A422) or zero (to select all 10A422’s), then data can be transferred from the computer to one or all of the RS-422 devices connected to the 10K488. When the 10K488 is the “primary addressed” TALKER, then the “secondary” address must be that of one of the 10A422 cards (i.e., a number from 1 through 19), to provide transfer of data to the computer from the single RS-422 device connected to the addressed 10A422.

Model 10KU-EL Entry-Level Data Acquisition System

The low-cost Model 10KU-EL is intended for high-speed front-end data acquisition and logging applications where a relatively small number of transducer inputs are involved, and where optimum portability is desired.

Each 10KU-EL package includes

- the Model 10KU mainframe
- your choice of one standard “10A” ANALOG SIGNAL CONDITIONER CARD from the latest Conditioner Card Catalog
  — Additional cards can be ordered to fill the two remaining slots
- one Model 10AIO-16 Universal Logic I/O Card (see p. 56)
- one standard RS-232 Interface Cable
- Daytronic Windows-based System 10 Configuration Software (described on pp. 76-77)
- your choice of one of the following Software Interface Packages:
  — Model 10SD-DDE Windows-Based DDE I/O Server (see p. 78)
  — Model 10SD-LABV National Instruments LabVIEW® Driver (see p. 79)
Rackmount Kits for “A-Sized” Mainframes

The Model RMK-10KU Rackmount Kit lets you install any “10KU” mainframe in a standard 19” instrument rack, while the Model RMK-10K4T Rackmount Kit lets you install any “10K4T” mainframe. Height of the RMK-10KU or RMK-10K4T panel is 5.22 inches (13.26 cm).

Expander Rack for “B-Sized” Mainframes

Up to three Model 10KN0 A-Card Expander Racks may be added to any Model 10KN6 or 10KN7 mainframe. Each rack integrates with the existing mainframe to provide plug-in slots for up to 24 additional System 10 “A Cards.” Note that the mainframe must be returned to the factory for installation of one or more 10KN0’s.

VGA Retrofit Kits for Older “B-Sized” Mainframes

The Model 10VRK6 VGA Retrofit Kit lets you upgrade an existing Model 10K3A or 10K6A Mainframe to full VGA video capabilities. The Model 10VRK6E is to be used for a 10K3A or 10K6A mainframe that has the “E” (Extended B-Card Rack) Option. Each field-installable kit consists of the Model 10BVS98 VGA Video Signal Card and appropriate video backplane. Note that upgrade to VGA capability may require a special jumper wire on the Video Text Card as well (contact the factory for complete instructions). It will also require new cables (supplied by the user or ordered separately from Daytronic).

Extended Keyboards

These sturdy plug-in keyboards are used for manual entry of standard mainframe setup and “run-time” commands. They are also required in the composition and editing of CRT video pages for “B-Sized” mainframes. They can be programmed for up to five “special functions”—i.e., for communicating up to five prespecified system “mnemonics” to the mainframe, via the Prompt key followed by a number key from 0 through 4.

Each keyboard comes with an attached cord of approximately four feet at full extension. The free terminal of the cord locks securely into the mainframe’s KEYBOARD CONNECTOR, which is located either on the front or the rear of the mainframe. Each keyboard has fold-up 1” tilt legs in the rear. For dimensions, see the next page.

The Model 10P80A Extended Keyboard is supplied with the following mainframes: Models 10K2C, 10K2D, 10K4T-D, 10K4T-D-A, 10K3A, 10KN6 (-2, -3, -4), 10KN7 (-2, -3, -4), and 10KN8A. It may be purchased separately as an option for the Models 10KU-KD and 10K4T-KD, which have their own front-panel keypad and two-line LCD display.

The optional Model 10P80D Extended Keyboard is recommended for use with those “A-Sized” mainframes that do not have their own internal LCD display (the Models 10KU, 10K1C, and 10K4T), as an alternative to the Model 10LCD12A Display Option (see below). It is identical to the 10P80A, except that it incorporates all of the LCD display and keypad features of the “KD” mainframe models (10KU-KD or 10K4T-KD). It thus not only furnishes a “BILLBOARD” for observation of command entries, system interrogation responses, and standard system prompting messages, but is also capable of stepping the operator through channel, logic, and port configuration sequences, for rapid review and alteration of system setup values. These features are described on p. 39.

The Model 10P25A Operator’s Keyboard is intended primarily for use with a “B-sized” mainframe (10KN5, 10KN6 (-2, -3, -4), 10KN7 (-2, -3, -4), or 10KN8A)—or with an “A-sized” “KD” mainframe (10KU-KD or 10K4T-KD)—as an alternative to the Model 10P80A Extended Keyboard.

1 The 10P80D Keyboard cannot be used with a “B-sized” mainframe.
2 Model 10P25A only.
Dimensions for the 10LCD12A are identical to those of the front bezel of the Model 10K4T-D mainframe (see Fig. 15, p. 33). The unit obtains primary power from the connected mainframe. Note that two 10LCD12A units can be connected in series.

**Remote LCD Display Option for “A-Sized” Mainframes**

The **Model 10LCD12A Display Option** can provide a Model 10KU, 10K1C, or 10K4T with a formatable 12-channel LCD display at a distance of up to 25 feet from the mainframe. With standard system “BILLBOARD,” a 10LCD12A-generated display is identical to that provided by the Models 10K2C and 10K4T-D—except that the 10LCD12A supports the “G” (XY/STRIP-CHART GRAPHICS) option only for the Models 10K1C and 10K4T. The 10LCD12A includes the Model 10P80A Extended Keyboard, which is required for the setup of LCD video pages.

Thus, up to 40 LCD “pages” can be stored, each dedicated to up to twelve user-specified data channels, including TIME and DATE. A four-character unit legend for each channel’s “live” reading can be entered. A simple command calls individual pages to display.

Dimensions for the 10LCD12A are identical to those of the front bezel of the Model 10K4T-D mainframe (see Fig. 15, p. 33). The unit obtains primary power from the connected mainframe. Note that two 10LCD12A units can be connected in series.

**Model 10LCD12A with Model 10KU Mainframe**

* The 10P25D Keyboard cannot be used with a “B-sized” mainframe.
Front-Panel LCD
Display Options for
"A-Sized" Mainframes

Several System 10 products are available that provide local, front-panel LCD displays for "A-sized" mainframes that do not normally have such displays.

The Model 10LCD12-2 Display Option replaces the front bezel of an existing Model 10K1C Mainframe to give it the 7-line, 12-channel LCD display of a Model 10K2C (see Fig. 9, p. 31). The 10LCD12-2 includes the Model 10P80A Extended Keyboard, which is required for the setup of LCD video pages.

The Model 10DISU Display Option replaces the front bezel of an existing Model 10KU Mainframe to give it both the 2-line LCD "BILLBOARD" display and the front-panel operator's keypad of a Model 10KU-KD (see Fig. 5, p. 29). The "BILLBOARD" is for display of command entries, system interrogation responses (including individual channels and bits), and standard system prompting messages. The keypad provides all the functions described on p. 39.

TFT Rackmount Color Monitors

The Models SI-RMTFT-12 and SI-RMTFT-14 Color Monitors incorporate a 12.1" and 14.5" active matrix TFT LCD display, respectively. Each of these convenient rackmount monitors has a tinted Lexan shield for added display protection, and does not require special proprietary LCD peripheral cards or drivers. Connecting directly to standard VGA outputs, the TFT LCD display automatically switches to the corresponding VGA mode. Minimal overall height and depth (H 10.5" and D 2" for the SI-RMTFT-12; H 14" and D 3" for the SI-RMTFT-14) allow these displays to fit into space-restricted rack openings.

Other features include

- 800 x 600 maximum resolution for the SI-RMTFT-12;
- 1024 x 768 maximum resolution for the SI-RMTFT-14
- 262, 144 colors
- Signal and power cables provided

Specifications:

Dimensions:

SI-RMTFT-12: 10.5" (H) x 19.0" (W) x 2.0" (D)
SI-RMTFT-14: 14" (H) x 19.0" (W) x 3.0" (D)

Display: Active Matrix color TFT LCD

Display Area:

SI-RMTFT-12: 12.1" diagonal
SI-RMTFT-14: 14.5" diagonal

Colors: 262, 144 colors

Resolution:

SI-RMTFT-12: 800 x 600 maximum
SI-RMTFT-14: 1024 x 768 maximum

On-Screen Controls:

SI-RMTFT-12: Brightness, Contrast, Horizontal and Vertical Position, Frequency, Focus, and Display Mode
SI-RMTFT-14: Brightness, Contrast, Horizontal and Vertical Position, Frequency, Phase, Expansion, Clock, Color Temp, and Display Mode

Horizontal Frequency:

SI-RMTFT-12: 24 - 38 kHz
SI-RMTFT-14: 24 - 61 kHz

Vertical Frequency: 50 - 90 Hz
Input Signal: RGB analog video, H and V TTL sync
Input Cable: 15-pin mini D-Sub VGA
AC Input: 90 - 260 V-AC (50/60 Hz)
Power Consumption:

SI-RMTFT-12: 25 W maximum
SI-RMTFT-14: 38 W maximum

Operating Temperature Range: 0° C - 50° C
Relative Humidity: 10 - 90%, maximum
Weight:

SI-RMTFT-12: 15 lb.
SI-RMTFT-14: 20 lb.
Multifrequency Rackmount Color Monitors

Model SI-RMM-15

Conforming to standard VGA video signals, the Model SI-RMM-15 Color Monitor accommodates multiple display resolutions and scan frequencies, along with infinite color display. Features include

- High resolution with 0.28-mm dot pitch
- Unlimited display colors
- On-screen digital controls (including rotation, pin cushion, and trapezoid)
- Standard VGA 15-pin input connector
- Automatic degaussing on powerup
- Video and power cables

This 15” PC-compatible color monitor is secured in a rugged 14 GA steel frame that can be quickly installed in any standard 19” rack. It has a tinted Lexan shield which effectively seals the monitor and protects the screen from damage, dust, and moisture. The rear of the monitor is fully enclosed in a ventilated aluminum housing behind the front panel. The monitor comes in a standard light gray, medium texture.

Specifications:

- **Dimensions:** See Fig. 25
- **CRT:** 15” (13.9” viewable), non-glare tube
- **Dot Pitch:** 0.28 mm
- **Resolution:** 640 x 480 (NI); 800 x 600 (NI); 1024 x 768 (NI); 1280 x 1024 (NI)
- **On-Screen Digital Display Controls:** Contrast, Brightness, Position (H and V), Size (H and V), Pincushion, Rotation, Trapezoid, RGB Gain, Manual Degauss
- **Bandwidth:** 100 MHz
- **Horizontal Scan Frequency:** 30 - 60 kHz
- **Vertical Scan Frequency:** 50 - 120 Hz
- **Compatibility:** VGA, SVGA, 8514A, VESA, Apple with additional adaptor
- **Plug & Play:** DDC1 and DDC2B
- **Display Colors:** Unlimited
- **Signal Cable:** 15-pin mini D-Sub (6 ft. length)
- **AC Input:** 90 - 260 V-AC (50/60 Hz), autoswitching
- **Power Consumption:** 94 W, maximum
- **Power Management:** Complies with EPA, VESA, DPMS, and IC0
- **Operating Temperature Range:** 0° C - 50° C
- **Humidity:** 10 - 90%, noncondensing
- **Weight:** 40 lb.
The sturdy 17" **Model SI-RMM-17 Color Monitor** is a plug-and-play multifrequency rackmount monitor with built-in power management and digital on-screen controls. Conforming to standard VGA video signals, it supports multiple display resolutions, scan frequencies, and unlimited colors. Features include:

- High resolution with 0.26-mm dot pitch
- 110-MHz bandwidth
- Unlimited display colors
- On-screen digital controls (see Specifications)
- Standard VGA 15-pin input connector
- Plug-and-play with power management
- Automatic 90 - 264 V-AC input switching
- Video and power cables

The SI-RMM-17 has a Lexan shield in front of the monitor display, to provide added protection by sealing the display from dust and moisture. All monitor controls (including power switch) are accessible through a door on the front panel.

**Specifications:**

### Model SI-RMM-17

- **Dimensions:** 17.5" (H) x 19.0" (W) x 17.5" (D)
- **CRT:** 17" (FST 15.9" viewable), non-glare
- **Dot Pitch:** 0.26 mm
- **Resolution:** 640 x 480 (NI); 800 x 600 (NI); 1024 x 768 (NI); 1280 x 1024 (NI)
- **Horizontal Scan Frequency:** 24 - 66 kHz
- **Vertical Scan Frequency:** 50 - 120 Hz
- **Bandwidth:** 110 MHz
- **Display Colors:** Unlimited
- **AC Input:** 90 - 264 V-AC (50/60 Hz), autoswitching
- **Power Consumption:** 120 W, maximum
- **Operating Temperature Range:** 0°C - 50°C
- **Humidity:** 10% - 90%, noncondensing
- **Weight:** 50 lb.

**Supported Video Standards:** IBM VGA (640 x 480 at 60 Hz); VESA (640 x 480 at 60/72 Hz, 800 x 600 at 56/60/72 Hz, 1024 x 768 at 60/70 Hz); DEC (1024 x 864 at 60 Hz, 1280 x 1024 at 66/72 Hz); SUN (1152 x 900 at 67/76 Hz); SG/IBM RISC (1280 x 1024 at 60 Hz); HP 700 (1280 x 1024 at 72 Hz); IBM RISC (1280 x 1024 at 77 Hz)

**Input Signals:** Video: RGB analog (white level = 0.714 V above ref. black, into 75 Ω, differential); Std. Sync: H and V separate (TTL levels); Sync with BNC Opt.: Composite on green video (0.286 V below ref. black) or Composite separate (into 75 Ω differential)

**Model SI-RMM-20**

Designed for harsh industrial conditions, this monitor features a 20-inch (diagonal) high-contrast screen with SP phosphor and AGRAS coating. It provides both automatic and manual degaussing to eliminate color impurities and other display distortions created by environmental magnetic fields. Differential inputs with high noise immunity allow reliable operation with long cable runs. Automatic beam-current limiting maximizes brightness while optimizing phosphor life. By virtue of its fiberglass PCB's and rugged steel frame, the SI-RMM-20 can withstand extreme shock and vibration (see Specifications). Optional TOUCHSCREEN OVERLAY is available.

**Specifications:**

### Model SI-RMM-20

- **Dimensions (in/cm):** 17.5/44.4 (H) x 19.0/48.3 (W) x 18.2/46.2 (D)
- **CRT:** 20" diagonal; 14.0" (W) x 10.5" (H) display area
- **Dot Pitch:** 0.28 mm
- **Supported Video Standards:** IBM VGA (640 x 480 at 60 Hz); VESA (640 x 480 at 60/72 Hz, 800 x 600 at 56/60/72 Hz, 1024 x 768 at 60/72 Hz); DEC (1024 x 864 at 60 Hz, 1280 x 1024 at 66/72 Hz); SUN (1152 x 900 at 67/76 Hz); SG/IBM RISC (1280 x 1024 at 60 Hz); HP 700 (1280 x 1024 at 72 Hz); IBM RISC (1280 x 1024 at 77 Hz)
- **Front-Panel Controls:** Power, Degauss, Brightness, Contrast, H Size, H Position, V Size, V Position
- **Amplifier Bandwidth:** 150 MHz
- **Horizontal Deflection Frequency:** Variable: 30 - 82 kHz
- **Vertical Deflection Frequency:** Variable: 40 - 80 Hz
- **Input Signals:** Video: RGB analog (white level = 0.714 V above ref. black, into 75 Ω, differential); Std. Sync: H and V separate (TTL levels); Sync with BNC Opt.: Composite on green video (0.286 V below ref. black) or Composite separate (into 75 Ω differential)

**Input Connections:** Standard: HD15 (RGB, HS, VS); Optional: Additional 4 BNC (RGB, CS)

**AC Input:** 90 - 264 V-AC (45 - 70 Hz)

**Power Consumption:** 130 W, maximum

**Operating Temperature Range:** 0°C - 50°C (32° - 122° F)

**Humidity:** 10% to 90%, noncondensing

**Operating ESD:** 8.0 kV-DC

**Operating Vibration:** 0.01 in. peak-to-peak (5-54 Hz sine); 1.5 g peak (54-500 Hz sine)

**Operating Shock:** 20 g (1/2 sine, 11 msec)

**Weight:** 651 lb. (30 kg)
IEEE Interface Adaptor

The **Model 10CIF488A IEEE Interface Adaptor** enables any System 10 mainframe to be established as a “Talker/Listener” peripheral on a standard IEEE-488 bus, with a switch-selectable bus address from 0 through 30.

As shown in Fig. 26, the 10CIF488A consists of two separate units: the **Model 10E422 RS-232-C to RS-422 Converter** and the **Model 10CLB488 IEEE-488 to RS-422 Converter**. The interconnecting cable is normally supplied by the user (Daytronic cable No. 52259 may be used for distances of up to 10 feet).

Replacing the former Model 10CIF488, the 10CIF488A makes possible IEEE-488 communications across significantly greater distances, at a higher data rate and with greatly enhanced noise immunity.

For optional “AUXILIARY” RS-232, RS-422, and IEEE-488 INTERFACING for “B-sized” mainframes, see the **Models 10BACIA, 10BACI-422, and 10BACI-488 Auxiliary Computer Interface Cards**, pp. 60-61.

For optional System 10 SATELLITE NETWORK COMMUNICATIONS—including the **Model 10CCONB Operator Console**—see pp. 62-64.

IEEE Interface Adaptor

**Model 10CLB488** (HWD in inches/cm: 1.14/2.90; 9.05/22.99; 3.25/8.26)

**IEEE-488 to RS-422 Converter**

A basic component of the Model 10CIF488A IEEE Interface Adaptor (above), the externally mounted **Model 10CLB488 IEEE-488 to RS-422 Converter** is used as shown in Fig. 26 to directly connect a System 10 mainframe’s Model 10E422-converted interface to an IEEE-488 bus. A six-foot power cord comes with every 10CLB488, with a switch-selectable transformer that may be plugged into any standard source of 110 or 220 V-AC.

**RS-232-C to RS-422 Converter**

The external **Model 10E422 RS-232-C to RS-422 Converter** lets you convert to “RS-422” standards a System 10 mainframe’s main RS-232-C Computer Interface or the “Auxiliary” RS-232-C Interface supplied by an optional “10BACI” Card (see pp. 60-61). A single 10E422 would be used to link a mainframe either to a device with RS-422 I/O (as in Fig. 27) or to a Model 10CLB488 IEEE-488 to RS-422 Converter (as in Fig. 26). Baud rate and other protocols for the resulting RS-422 interface are identical to those to which the mainframe’s RS-232-C interface has been set.

A six-foot power cord is supplied with every 10E422, with a switch-selectable transformer that may be plugged into any standard source of 110 or 220 V-AC (60 Hz), if external power is required (see the notes to Figs. 27 and 28).
Here, in order to boost the 153.6K-baud link between a System 10 mainframe and an external RS-232-C computer, printer, or PLC, one of the two 10E422 units is attached to the mainframe’s Computer Interface Port or optional “Auxiliary” (10BACIA-supplied) Computer Interface Port. The other 10E422 attaches to the RS-232-C port of the external device.

As noted above, a 10E422 connected to a “B-sized” mainframe requires its own AC power supply, unless it connects to a 10BACIA. The 10E422 that attaches to the external RS-232-C device also requires its own AC power supply, unless it is connected to a Model PC-HSICA High-Speed Serial Interface Card (p. 85). Two six-foot power cords are therefore supplied with every 10ESRE, each with a switch-selectable transformer that may be plugged into any standard source of 110 or 220 V-AC (60 Hz).

Serial Range Extender

Under optimal circumstances, the maximum cable length for valid RS-232-C interchanges at 153.6K baud is approximately 50 feet. However, by means of the Model 10ESRE Serial Range Extender, you can extend the distance for high-speed serial communications to approximately one kilometer (3000 feet), using a BELDEN 9730 DATALENE 100 Ω cable (for precise configuration and shielding, contact the factory).

The Model 10ESRE itself consists of

- two Model 10E422 RS-232-C to RS-422 Converters (see above);
- a 10-foot, 9-wire, 100-ohm shielded RS-422 cable (Daytronic Cable No. 52259), intended primarily for testing purposes; and
- two plug-in AC power adapters

Fig. 28 shows a typical 10ESRE arrangement.
System 10 “A Cards”

Analog Signal Conditioner Cards

System 10 offers a large family of premium SIGNAL CONDITIONER CARDS to accommodate virtually every type of transducer input. Inserted in the mainframe’s “A Card” rack, each conditioner card has an I/O connector accessible at the rear of the unit, for simple, direct connection of transducer cable(s) and quick on-line disconnection, when required.

Because many of the “A Cards” originally designed for System 10 may now be used in the Daytronic SPS6000 and SPS8000 Signal Processing Systems as well, we have dedicated a separate catalog to these cards. For full descriptions and specifications of all SIGNAL CONDITIONING CARDS—both the original “10A” Series and our new enhanced “AA” Series—see our latest Conditioner Cards Catalog.

All System 10 “A-card” data channels are automatically and continuously monitored for conformance to preset HIGH and LOW LIMITS.

For all conditioner cards, measurement resolution is determined by the user, during calibration. Maximum resolution is one part in 20000. Following initial calibration of a given transducer-based data channel, the overall stability of the system will normally allow measurements by that channel to an accuracy of within 0.02% of full scale, except when limited by engineering-unit resolution considerations.

Multipole low-pass active ANALOG FILTERING is applied individually to each data channel. With programmable per-channel analog filtering, our new “AA” Conditioner Cards are able to handle an even wider range of transducer-based signals. By adjusting individual corner frequencies to correspond to changes in the sampling rate, error-causing aliasing can be virtually eliminated.

In addition, a selectable per-channel Daytronic Smoothing Algorithm (DSA) may be applied on command by the System 10 Central Processor. The effect of this adjustable proprietary smoothing function is to remove small unwanted dynamic signal components, while allowing large-scale fluctuations to pass unaffected.

Most Daytronic signal conditioner cards provide an “AUXILIARY OUTPUT” for every analog input channel. These outputs are made available on wire-wrap pins, and may be directly hard-wired via the System 10 mainframe’s Analog Motherboard to a Model 10AAO-4 Analog Buffer Card (p. 52), a Model 10APID Loop Control Card (p. 56), or any other card that receives and processes “internally sourced” analog signals.*

The operating measurement range and resolution that will apply to any given analog-input data channel are automatically selected by the system Central Processor when that channel’s “type” code is entered during system configuration. Appendix A of the Conditioner Card Catalog gives a complete list of “type” codes for analog data channels originating from Daytronic signal conditioner cards, both “10A” and “AA.” For “type” codes belonging to System 10 data channels that do not originate from conditioner cards, see Appendix B in the rear of this catalog (System 10).

* Outputs with high bandpass frequency are available on certain specially modified cards for capturing signal peaks of short duration or for sending high-frequency analog signals to external A/D devices (contact the factory Sales Staff for assistance).

In short, our experience of over forty years in the field of electronic measurement lets us guarantee noise-free, drift-free, solidly accurate signal conditioning—even under the toughest real-world conditions.
Aside from the Analog Signal Conditioner Cards, there are a number of “special function” A Cards. These are summarized in the following table, along with several related accessories. Most of these cards are for use in the Daytronic System 10 only.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Main Function(s)</th>
<th>For description, see page</th>
</tr>
</thead>
<tbody>
<tr>
<td>10A79-4</td>
<td>(1) Real-time analog PEAK CAPTURE (up to 4 inputs)</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>(2) Real-time analog “MAX MINUS MIN” measurement (up to 4 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Real-time analog TRACK AND HOLD operation (up to 4 inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) Real-time UNSCALED ANALOG SIGNAL BUFFERING (up to 4 inputs)</td>
<td></td>
</tr>
<tr>
<td>10AAO-4</td>
<td>Real-time SCALED ANALOG SIGNAL BUFFERING (up to 4 inputs)</td>
<td>52</td>
</tr>
<tr>
<td>10AAO-8</td>
<td>Up to 8 real-time digitally-controlled ANALOG OUTPUTS</td>
<td>52</td>
</tr>
<tr>
<td>10CISO-8</td>
<td>±10-V ISOLATED ANALOG SIGNAL BUFFERING (up to 8 inputs)</td>
<td>52</td>
</tr>
<tr>
<td>10CAI-8</td>
<td>Up to 8 real-time 4-20 mA and/or ±10-V ANALOG OUTPUTS</td>
<td>52</td>
</tr>
<tr>
<td>10ACC-4</td>
<td>User-controlled TOTALIZER (COUNTER) functions (up to 4 inputs)</td>
<td>53</td>
</tr>
<tr>
<td>10ACT01</td>
<td>(1) FREQUENCY measurement (EVENTS PER UNIT TIME—1 input)</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>(2) PERIOD measurement (AVERAGE TIME PERIOD for a given number of events—1 input)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) User-controlled TOTALIZER (COUNTER) function (1 input)</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>(4) User-controlled TIMER function (1 input)</td>
<td>54</td>
</tr>
<tr>
<td>10AEX-2</td>
<td>Front-panel A-SLOT ACCESS for diagnostic purposes</td>
<td>54</td>
</tr>
<tr>
<td>10AFIFO</td>
<td>Nonvolatile FIFO BUFFER STORAGE for any “A-sized” mainframe</td>
<td>54</td>
</tr>
<tr>
<td>10AHM</td>
<td>System HEALTH MONITORING</td>
<td>55</td>
</tr>
<tr>
<td>10AIO-16</td>
<td>LOGIC-LEVEL CONTROL INPUTS AND OUTPUTS for any “A-sized” mainframe</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>(up to 16 independently programmable I/O)</td>
<td></td>
</tr>
<tr>
<td>10APID</td>
<td>High-speed PID CLOSED-LOOP CONTROL</td>
<td>56</td>
</tr>
<tr>
<td>10AST</td>
<td>Diagnostic “A-SLOT” TESTING</td>
<td>58</td>
</tr>
<tr>
<td>10AX-2</td>
<td>AUXILIARY EXCITATION for external transducers (1 or 2 outputs)</td>
<td>58</td>
</tr>
</tbody>
</table>

---

**Fig. 29 Using the Model 10A79-4 to Test Torque Wrenches for Proper Slip-Point**
Model 10A79-4 Analog Peak Capture Card

This extremely useful card can be remotely controlled to provide:

- Real-time capture of analog-signal peak values, both positive and negative. The card will detect and store in analog (capacitor) memory the most positive and most negative values experienced by a given analog input signal since the input channel in question was last reset by an appropriate logic “TRACK” command. Each peak value will remain in memory—though subject to analog decay*—until reapplication of the respective “TRACK” command, or until occurrence of a subsequent more positive or more negative signal excursion (thus permitting the capture of successively higher maxima or successively lower minima).

You can easily arrange for any and all positive or negative peaks reported by a 10A79-4’s Channel No. y to be indefinitely (digitally) held, by entering a CALCULATE (CLC) command of the form CLC x = MAX CHN y or CLC x = MIN CHN y.

- Real-time “MAX minus MIN” measurement (i.e., the real-time difference between the most positive and most negative values detected for a given analog input signal since the input channel was last reset). This feature, which requires that the input be set to “MAX-MIN” mode, is particularly useful when you need to know the precise range of an excursive phenomenon like the runout, wobble, or looseness of a rotating part. If you wish to display a given “MAX-MIN” value for any length of time, without decay, you can apply a LOCK (LOK) command to the channel in question.

- “TRACK and HOLD” operation for up to four analog signals. Upon release of an input channel’s “TRACK” condition, the channel will, when set to this mode of operation, instantly freeze its present value in analog memory until reapplication of the “TRACK” command. If you wish to display a given “held” value for any length of time, without decay, you can apply a LOCK (LOK) command to the channel in question.

- Buffering of up to four analog signals for continuous, real-time, unscaled output to various external devices (for scaled buffering, see the Model 10AIO-4, p. 52).

Each of the 10A79-4’s four analog inputs can be hard-wired to any selected “A-Card” Conditioner within the system that has “Auxiliary Output” provisions.** Derived from each of the four inputs are:

a. two internal SYSTEM DATA CHANNELS: (1) “+PEAK” and (2) either “MAX-MIN” or “–PEAK,” depending on the input’s mode setting. These channels can be displayed on the system CRT or LCD display, if present, and can be interrogated like any other standard data channels via the CHANNEL (CHN) command.

b. two ANALOG OUTPUTS: (1) “+PEAK” and (2) “–PEAK.” These can be sent in turn to a strip-chart recorder or similar device, or can serve as fast “real-time” inputs to a PID servo controller.

The 10A79-4’s PEAK-CAPTURE, “MAX — MIN,” and/or “TRACK and HOLD” process is completely controlled by logic-level inputs received at the 10A79-4’s rear I/O Connector from a Model 10A1O-16 or 10B1O-16 Universal Logic I/O Card, or from an external logic source. There are two such logic inputs for each analog input channel: “TRACK / NOT + PEAK” and “TRACK / NOT MAX-MIN.”

Standard processing functions may be applied to any of the internal data channels generated by the 10A79-4, including calculations, dual limit monitoring, etc.

Additional 10A79-4 Specifications:

** Inputs: Four standard “System 10” ±5 V-DC analog data signals from user-specified Conditioner Cards or other data-signal sources within the system, via direct hard-wire connection on the mainframe’s Analog Motherboard. Each 10A79-4 channel may be assigned the same “TYPE” code as the “source” conditioner channel supplying the analog input from which the 10A79-4 channel is derived—or it may be assigned a special “Conversion Channel” code of “E8.” Use of “E8” typing greatly simplifies calibration of the 10A79-4 channel, which is now automatically loaded with the calibration values currently in effect for the “source” channel.

** Amplifier (per channel): Input Impedance (Differential): Greater than 1 megohm

(cont’d)
**Model 10AAO-8 Analog Output Card**

This card provides up to eight independent, digitally-controlled analog output signals that can be used for commanding servo control loops, and for driving external recorders, plotters, indicators, etc.

The eight voltage outputs are individually controlled and updated once each scan cycle by the system Central Processor, in accordance with user or computer instructions.

The data source for each 10AAO-8 output may be specified as a linear function of any system data channel No. y by applying an ANALOG OUTPUT (ANO) command of

\[ \text{ANO } x = m(CHN } y \text{) + } b \]

where “m” and “b” are floating-point constants entered by the user to convert the engineering units of Channel No. y to millivolts. The allowable range is ±5000 mV. Alternatively, the data source for an analog output may be specified as a fixed millivolt value.

**Additional 10AAO-8 Specifications:**

- **Voltage Signal Output:**
  - **Configuration:** Single-ended, return to System Common
  - **Range:** ±5 volts, with 20% overrange
  - **Resolution:** Settable to one millivolt
  - **Allowable Loading:** 5 mA, maximum
  - **Accuracy:** ±0.05%, ±1 millivolt
  - **Response Time:** Output updated once each scan cycle, and processed through 3-pole, 4-Hz active filter (settling time 300 milliseconds)**; scan cycles per second = 2500/(N + 15), where N is total number of channels

**Model 10CISO-8 Isolated Analog Buffer Interface**

The Model 10CISO-8 is an external unit for ±10-V isolated buffering of up to eight individual analog signals (with 20% overrange at 1 mA and minimum load resistance of 2.5 kΩ). It may be used to amplify the standard ±5-V analog outputs of a Model 10AAO-4 or Model 10AAO-8, or of a Conditioner Card that issues such output. A six-foot power cord comes with every 10CISO-8, with a switch-selectable transformer that may be plugged into any standard source of 110 or 220 AC.

Common-mode range for the 10CISO-8 is ±50 V, with a rejection ratio of -46 dB at DC and 60 Hz.

**Model 10CAI-8 Eight-Channel Buffer Interface**

Using this externally mounted buffer unit with the Model 10AAO-4 or Model 10AAO-8, you can directly connect system analog outputs to a test or process that employs ISA standard 4- to 20-mA control signals, or you can amplify analog outputs to the ±10-V-DC range.

Receiving up to eight standard ±5-V inputs from the 10AAO-4 or 10AAO-8, the 10CAI-8 produces up to eight corresponding output signals, each of which is individually programmable for full-scale representation as

- ±4 to 20 mA (corresponding to a 10AAO-4 or 10AAO-8 output of 0 to +5 V-DC);
- ±4 to 12 to 20 mA (“zero-center,” corresponding to a -5 to +5 V-DC output); or
- ±10 V-DC (corresponding to ±5 V-DC output).

All 10CAI-8 outputs are “single-ended,” and return to Signal Common.

A six-foot power cord comes with every 10CAI-8, with a switch-selectable transformer that may be plugged into any standard source of 110 or 220 V-AC.

---

**Model 10AAO-4 Analog Buffer Card**

For purposes of “real-time” monitoring, the Model 10AAO-4 provides continuous buffering, filtering, and fixed gain of 1, 2, or 4 for up to four individual System 10 analog signals. Each signal may originate from any one of the system’s Conditioner Cards that provides “Auxiliary Output” to wire-wrap pins.* The actual gain setting for each output will depend on the “TYPE” designation of the corresponding “source” conditioner channel.

Each of the 10AAO-4’s four outputs is nominal ±5 V-DC (±6 V maximum), with a minimum load resistance of 2 kΩ. Each output is factory-set for a “single-ended” configuration (i.e., output referenced to Signal Common (Ground)). If desired, however, all four outputs may be reconfigured as “floating,” by connecting an external supply of ±9 V-DC, furnished by the user.

Each 10AAO-4 channel contains a 3-pole modified Butterworth filter with a bandwidth of 47 Hz. In addition, individual ZERO and SPAN controls are accessible at the front of the card, for further calibration or scaling of a given channel with reference to its “source” input.

---

* Cards without “Auxiliary Output” currently include the Models 10A9-8C, 10A10-4, 10A15-8, 10A35, 10A62-8C, 10A64-8C, 10A65-8, and 10A69-4 (see the latest Conditioner Card Catalog). None of these cards may be directly connected to the Model 10AAO-4 without special modification.

** Higher filter values (1 kHz, 2 kHz, or higher) are available on specially modified versions of the 10AAO-8.
Model 10ACC-4 Four-Channel Totalizer Card

This card provides the totalizer (counter) function of the Model 10ACT01 Counter/Timer Card (see below) for up to four individual TTL-level inputs (+5 V-DC, maximum; contact closures are negative true to ground). It is particularly useful in assembly-line applications that require the accurate counting of large numbers of parts.

Unlike the 10ACT01, the Model 10ACC-4 has input provisions for a user-supplied auxiliary external power supply from 9 to 15 V-DC, which would let you keep the count “alive” during system power shut-down.

Also, you may select a debounce time from 0.06 through 30 milliseconds for all four inputs, via DIP-switch settings on the 10ACC-4 board.

The 10ACC-4 responds to all commands applicable to the Model 10ACT01’s “COUNTER” mode, except the SENSITIVITY (SEN), EXTERNAL INPUT DISABLE (EID), and EXTERNAL INPUT ENABLE (EIE) commands. Like the 10ACT01, it also provides for the application and release of “COUNT HOLD” and “COUNT RESET” by appropriate negative-true logic inputs at the I/O Connector.

Model 10ACT01 Counter/Timer Card

Featuring a 1,000,000-MHz crystal frequency reference, this card may be made to function in any of the four modes of operation described below, by entering an appropriate TYPE (TYP) command.

In all but the “TIMER” mode, the “events” being counted by the 10ACT01 are waveform pulses, AC or unipolar, delivered to the card’s rear I/O CONNECTOR by an external pulse transformer transducer with two-wire isolated windings (turbine flowmeter, tachometer pickup, etc.), by a transistor or logic-circuit driver, or by a similar signal source. Specifications for the 10ACT01’s pulse-signal input are identical to those given for the Model 10A40 Frequency Input Conditioner Card in the latest Conditioner Card Catalog. The analog-input voltage range may be set, independent of the mode of operation, via the SENSITIVITY (SEN) command.

Capacitive coupling of 0.1 or 10 microfarads is provided for low-frequency inputs, to eliminate false triggering by signal noise.

### Model 10ACT01 Ranges for Period Mode

<table>
<thead>
<tr>
<th>Full-Scale Reading (millisecond)</th>
<th>No. of Cycles Averaged</th>
<th>Minimum Input Frequency</th>
<th>Resolution</th>
<th>Range No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3276.7</td>
<td>1</td>
<td>0.032 Hz</td>
<td>1 millisecond</td>
<td>1</td>
</tr>
<tr>
<td>3276.7</td>
<td>10</td>
<td>0.032 Hz</td>
<td>1 millisecond</td>
<td>2</td>
</tr>
<tr>
<td>3276.7</td>
<td>100</td>
<td>0.032 Hz</td>
<td>1 millisecond</td>
<td>3</td>
</tr>
<tr>
<td>2730.5</td>
<td>120</td>
<td>0.037 Hz</td>
<td>1 millisecond</td>
<td>4</td>
</tr>
<tr>
<td>546.1</td>
<td>60</td>
<td>0.183 Hz</td>
<td>1 millisecond</td>
<td>5</td>
</tr>
<tr>
<td>327.67</td>
<td>1</td>
<td>0.32 Hz</td>
<td>100 microsecond</td>
<td>6</td>
</tr>
<tr>
<td>327.67</td>
<td>10</td>
<td>0.32 Hz</td>
<td>100 microsecond</td>
<td>7</td>
</tr>
<tr>
<td>327.67</td>
<td>100</td>
<td>0.32 Hz</td>
<td>100 microsecond</td>
<td>8</td>
</tr>
<tr>
<td>273.05</td>
<td>120</td>
<td>0.37 Hz</td>
<td>100 microsecond</td>
<td>9</td>
</tr>
<tr>
<td>54.61</td>
<td>60</td>
<td>1.83 Hz</td>
<td>100 microsecond</td>
<td>10</td>
</tr>
<tr>
<td>32.767</td>
<td>1</td>
<td>3.2 Hz</td>
<td>10 microsecond</td>
<td>11</td>
</tr>
<tr>
<td>32.767</td>
<td>10</td>
<td>3.2 Hz</td>
<td>10 microsecond</td>
<td>12</td>
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<tr>
<td>32.767</td>
<td>100</td>
<td>3.2 Hz</td>
<td>10 microsecond</td>
<td>13</td>
</tr>
<tr>
<td>27.305</td>
<td>120</td>
<td>3.7 Hz</td>
<td>10 microsecond</td>
<td>14</td>
</tr>
<tr>
<td>5.461</td>
<td>60</td>
<td>18.3 Hz</td>
<td>10 microsecond</td>
<td>15</td>
</tr>
<tr>
<td>3.2767</td>
<td>10</td>
<td>320 Hz</td>
<td>100 microsecond</td>
<td>21</td>
</tr>
<tr>
<td>3.2767</td>
<td>100</td>
<td>320 Hz</td>
<td>100 microsecond</td>
<td>22</td>
</tr>
<tr>
<td>2.7305</td>
<td>120</td>
<td>370 Hz</td>
<td>100 microsecond</td>
<td>23</td>
</tr>
<tr>
<td>0.5461</td>
<td>60</td>
<td>1832 Hz</td>
<td>100 microsecond</td>
<td>24</td>
</tr>
<tr>
<td>0.32767</td>
<td>100</td>
<td>3200 Hz</td>
<td>10 microsecond</td>
<td>25</td>
</tr>
</tbody>
</table>

1. **FREQUENCY MEASUREMENT**

In this mode, the Model 10ACT01 counts events per unit time (EPUT), and may thus be used for frequency or rpm measurement. The full-scale range (with corresponding resolution) and the specific time base during which “events” (pulses) are to be counted are selectable via the RANGE (RNG) command from the following values. Multiple 10ACT01’s operating in this mode may be “slaved” for time-base synchronization.

<table>
<thead>
<tr>
<th>Full-Scale Range</th>
<th>Resolution</th>
<th>Time Base</th>
<th>Range No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2 kHz</td>
<td>0.1 Hz</td>
<td>10 sec</td>
<td>1</td>
</tr>
<tr>
<td>32 kHz</td>
<td>1 Hz</td>
<td>1 sec</td>
<td>2</td>
</tr>
<tr>
<td>32 kHz</td>
<td>1 Hz</td>
<td>10 sec</td>
<td>4</td>
</tr>
<tr>
<td>320 kHz</td>
<td>10 Hz</td>
<td>0.1 sec</td>
<td>3</td>
</tr>
<tr>
<td>320 kHz</td>
<td>10 Hz</td>
<td>1 sec</td>
<td>5</td>
</tr>
<tr>
<td>320 kHz</td>
<td>10 Hz</td>
<td>10 sec</td>
<td>7</td>
</tr>
<tr>
<td>3.2 MHz</td>
<td>100 Hz</td>
<td>0.1 sec</td>
<td>6</td>
</tr>
<tr>
<td>3.2 MHz</td>
<td>100 Hz</td>
<td>1 sec</td>
<td>8</td>
</tr>
</tbody>
</table>

2. **PERIOD MEASUREMENT**

In this mode, the Model 10ACT01 calculates the average time period required for the occurrence of 1, 10, 60, 100, or 120 pulse “events” (cycles). Such measurements are particularly useful when dealing with relatively low flow or speed signals, where a conventional frequency-to-voltage conversion is impractical. The full-scale reading (along with corresponding resolution and minimum frequency input) is also selectable, again via the RANGE (RNG) command, as shown in the above table.

3. **TOTALIZER (COUNTER)**

In this mode, the Model 10ACT01 counts all perceived “events” (pulses) by an increment of 1, 10, or 100 (with a respective full-scale count reading of 32767, 327670, or 3276700), selectable via the RANGE (RNG) command (“Range Nos.” 1, 2, or 3, respectively).

(cont’d)
Special commands allow the operator or computer to increment the counter at any time by “1,” to disconnect or reconnect the external output, to freeze the existing displayed count, to instantly update the displayed count, to reset the counter to zero, and to clear the counter (to resume normal counting from zero). You can also use specific logic inputs to the 10ACT01’s rear I/O Connector to enable or disable the external input or to initiate a “hold,” “release,” “resetting,” or “clearing” of the counter.

4. TIMER

In this mode, the Model 10ACT01 provides precision timing by counting pulses generated by its own internal clock. Resolution is selectable via the RANGE (RNG) command from 10 microseconds to 10 minutes, with corresponding full-scale readings from 0.32767 second to 327670 minutes, as follows:

<table>
<thead>
<tr>
<th>Full-Scale Reading</th>
<th>Resolution</th>
<th>Range No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.32767 sec</td>
<td>10 microsec</td>
<td>1</td>
</tr>
<tr>
<td>3.2767 sec</td>
<td>100 microsec</td>
<td>2</td>
</tr>
<tr>
<td>32.767 sec</td>
<td>1 millisecond</td>
<td>3</td>
</tr>
<tr>
<td>327.67 sec</td>
<td>10 milliseconds</td>
<td>4</td>
</tr>
<tr>
<td>3276.7 sec</td>
<td>100 milliseconds</td>
<td>5</td>
</tr>
<tr>
<td>32767 sec</td>
<td>1 second</td>
<td>6</td>
</tr>
<tr>
<td>327670 sec</td>
<td>10 seconds</td>
<td>7</td>
</tr>
<tr>
<td>3276700 sec</td>
<td>100 seconds</td>
<td>8</td>
</tr>
<tr>
<td>32767 min</td>
<td>1 minute</td>
<td>9</td>
</tr>
<tr>
<td>327670 min</td>
<td>10 minutes</td>
<td>10</td>
</tr>
</tbody>
</table>

A special command lets you disconnect the 10ACT01’s external input (including any and all logic commands received at the I/O Connector) in order to establish strictly internal control of the timing process (via mnemonic commands). You can then re-enable the external input whenever you wish the card to respond as well to external logic-signal commands—as, for example, when you’re timing the duration of a switched process state. The external-input disable/enable function is also available via logic command at the 10ACT01’s rear I/O Connector.

**Model 10AEX-20**

A Card Extender Board

By bringing the appropriate slot connections out the front of the mainframe, the Model 10AEX-20 lets you operate any System 10 “A Card” outside its designated “A Slot.” It thus permits direct access to all of the card’s “on-board” hardware, while at the same time maintaining any and all of the card’s rear connections (to transducer, contact closures, other system cards, etc.). The Extender Board may thus be used for purposes of signal tracing, waveform observation, adjustment of internal controls, or various other diagnostic or service functions.

**Additional 10ACT01 Specifications:**

**Excitation:** Nominal ±5 V-DC (±20 mA maximum); may also be wired for ±10 V-DC excitation to “Zero-Velocity” Sensor

**Amplifier:**

- **Normal-Mode Range:** ±200 V operating and without instrument damage
- **Common-Mode Range:** ±50 V, operating; ±90 V, without instrument damage
- **Common-Mode Rejection Ratio:** at 60 Hz: -120 dB; at 1 kHz: -60 dB
- **Input Impedance:** Differential: 400 KΩ; Common-Mode: 100 KΩ
- **Time-Base Accuracy:** 0.01% of full scale

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**Model 10AFIFO**

Buffer Memory Card

The Model 10AFIFO First-In-First-Out Buffer Memory Card features

- battery-backed FIFO RAM (up to 10,000 hours)
- 175K bytes storage standard (typically 30,000 finished data-channel readings); 750K bytes (up to 120,000 readings) optional
- “destructive” and “nondestructive” I/O modes
- checksum verification of data integrity
- “true erasure” of data (for high-security requirements)

The Model 10AFIFO is for use in System 10 “A-sized” mainframes only (i.e., any “10KU,” “10K1,” “10K2,” or “10K4T” version). Its purpose is to provide nonvolatile buffer storage of serial-ASCII outputs issued from the mainframe’s Computer Interface Port. These outputs are normally data transmissions produced in response to standard system mnemonic commands like DUMP (DMP), STREAM (STR), HARD COPY (HCY), etc. However, they may also include the Central Processor’s responses to standard system interrogations.

With battery-backed RAM, the FIFO buffer card is ideal for applications where it’s impractical to connect a computer, printer, recorder, or other receiver directly to the mainframe while data is being acquired—as, for example, in “on-the-road” vehicle performance testing, using a DC-powered mainframe (see p. 25).

Via its 20-pin FIFO Computer Port, the 10AFIFO connects both to the mainframe’s Computer Interface Port and to an external RS-232-C receiving device (dual cable supplied). Protocol for the latter interface is user-selectable (up to 153,6K baud).
The 10AFIFO receives instructions through its FIFO Computer Port (only), passing on to the mainframe’s Central Processor all computer-entered commands not relating to itself. FIFO setup parameters are written to EEPROM, as enabled by the “software” setting of a special system logic bit.

In addition to the mnemonics for I/O-mode setup and the initiating of FIFO transmissions (see below), specific commands exist for reaccessing the FIFO memory (should the 10AFIFO card be removed from the mainframe); for “true erasure” of memory contents, using a physical overwrite technique; and for allowing System 10 interrogation responses to temporarily bypass the FIFO memory.*

The 10AFIFO memory can be made to receive and store transmissions from the mainframe’s Computer Interface Port continuously, rewriting over the oldest contents of the 10AFIFO’s main memory when the buffer is full (this is the “destructive data input” or “cyclic” mode). Or it can be made to receive and store system outputs continuously until the memory is full, after which it will receive and store an output only when the required memory space becomes available (this is the “nondestructive data input” or “fill” mode).

When the 10AFIFO is in “open output” mode, it will continuously transmit the oldest contents of its main memory via its output buffer. When in “gated output” mode, however, it will transmit only when and as instructed by one of the two following commands:

1. The **DESTRUCTIVE DATA OUTPUT (DDO)** command causes the 10AFIFO to output the oldest contents of its main memory and to place these contents in its output buffer, from which they may be retransmitted via the **NDO** command any number of times (until the DDO command is next re-entered). When a DDO command is entered, the existing contents of the output buffer are destroyed.

2. The **NONDESTRUCTIVE DATA OUTPUT (NDO)** command causes the 10AFIFO to output the current contents of its output buffer (only), without destroying these contents.**

In either output mode, the 10AFIFO can be instructed by the receiving device to halt or resume transmission.

---

**Model 10AHM Health Monitor Card**

Installed in any unoccupied System 10 “A Slot,” this card lets the system read and display all pertinent power and reference voltages. It has its own independent temperature-stabilized reference source to verify the accuracy of all measurements.

The 10AHM’s eight diagnostic “subchannels” are listed below. Each subchannel can be dedicated to an otherwise unused system data channel. It can then be scaled and filtered like any analog data channel, and can be continuously and automatically monitored for conformance to specific limit values.

The companion **Model 10BDHM** is a “B-sized” card which, when connected to the 10AHM via a special cable, can be used to monitor B-Deck voltage supplies, plus critical software handshake lines and other dynamic signals. If the 10BDHM is used along with the 10AHM, there will be 21 subchannels in all. See p. 64 for a list of 10BDHM subchannels (Nos. 9 through 21).

**Model 10AHM Subchannels:**

**No. 1:** Measures various voltages referenced to Signal Common with a clip lead. May be used to troubleshoot cards in conjunction with the **Model 10AST Analog Slot Test Card** (p. 58).

**No. 2:** An on-board +2.5000-V reference, temperature-stabilized in its own oven. Used to track the gain drift, if any, of the A/D and its amplifier.

**No. 3:** Measures the amplitude of the system AC Reference, which controls the excitation levels for LVDT and AC strain gage cards. Its frequency (3276.8 Hz) also provides sync for a variety of cards.

**No. 4:** Measures the system DC Reference. Since System 10 is ratiometric, this should always read 5.000 ± 0.001 V. Deviations indicate trouble with the mainframe’s **Model 10BIP232 RS-232 Interface Card**.

*(cont’d)*
Nos. 5 and 6: Measure the ±9-volt supplies, which are factory-set to ±8.90 V. Normal loading effects should not result in more than 0.3-V drop.

No. 7: Measures the local (A-Deck) SIGNAL COMMON. Large deviations from 0 indicate excessive current, and thus possible faulty modules on the A Deck. Faulty input wiring can occasionally cause this also.

No. 8: Measures the local (A-Deck) POWER COMMON. As with Signal Common, large deviations from 0 indicate excessive current, and thus possible faulty modules on the A Deck. Faulty input wiring can occasionally cause this also.

Model 10APIO-16 Universal Logic I/O Card

This is an “A Card”-sized version of the Model 10BPIO-16 Universal Logic I/O Card, which is fully described on p. 68. Functions and specifications of the 10AIO-16 are identical to those of the 10BIO-16, except that

- the 10AIO-16 may be used only in “A-Sized” mainframes (i.e., any “10K1,” “10K2,” or “10K4T” version);
- it is initialized by means of the A SLOT (ASL) command; and
- the maximum current of the Logic Reference Supply is 50 mA, total. For this reason, a full-capacity relay board used with the 10AIO-16 may require its own external power supply.

Model 10APID Loop Control Card

The Model 10APID is a low-cost and flexible means of achieving stable, high-speed closed-loop control in engine dynanometry, fluid pumping, hydraulic servo operations, and any number of other industrial applications. It is compatible with all System 10 mainframe models.

Operating on standard SET-POINT (“COMMAND”) and FEEDBACK (“RESPONSE”) inputs that may be analog, digital, or mixed, the 10APID generates a fast, selectively damped ERROR SIGNAL (see Fig. 36 for 10APID “Significant I/O Connections”). The COMMAND input is user-adjustable, while the RESPONSE input represents the measured process variable to be “controlled”—temperature, pressure, position, etc. The ±7 V-DC ERROR SIGNAL output can be used to drive a motor, pump, solenoid valve, relay, temperature regulator, or other servo equipment, in order to continuously control the measured variable, thereby keeping the process at a steady state, even under widely varying conditions.

The fastest loop response characteristics are obtained when COMMAND and RESPONSE inputs to the 10APID are both “real-time” analog signals. This permits continuous error-sensing feedback independent of the mainframe’s internal scan speed—resulting in a speed that is simply not possible with most sample-based multiplexing systems. In this case, the 10APID may receive its COMMAND and RESPONSE signals either via hardwire connection to the mainframe’s analog motherboard (when the signal source is internal to the mainframe system) or via the card’s rear 20-pin I/O connector (when the source is external).

The COMMAND and RESPONSE inputs may also be established digitally, as standard system data channels. This permits them to be directly loaded by the operator or supervisory computer, or to represent continuous arithmetic functions of other system channels that report either constant or variable data. In this case, the COMMAND and RESPONSE inputs may be easily set and/or modified through the ANALOG OUTPUT (ANO) or CALCULATE (CLC) command. Although the overall control-loop response time is now limited by the scan rate of the system Central Processor, this will not be a problem in most applications, since the scan rate is typically over 2500 channels per second.*

Regardless of their respective sources, the COMMAND and RESPONSE inputs are continuously available as standard ±5 V-DC analog outputs both from wirewrap pins on the mainframe motherboard and from the 10APID’s rear I/O connector (see again Fig. 36). They may thus be read by other signal-processing and/or display elements either internal or external to the mainframe system.

Derived from the arithmetic difference between the COMMAND and RESPONSE inputs, the ±7 V-DC ERROR SIGNAL is continuously available as an

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* Note that the COMMAND and RESPONSE inputs may also be mixed with regard to “type,” if required (i.e., one analog, the other digital).

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Special Function “A Cards” & Accessories

Fig. 32 Typical Closed-Loop Applications
analog output from the rear I/O connector only, for connection to the process actuator. You can easily and precisely adjust the 10APID’s PROPORTIONAL, INTEGRAL, and DERIVATIVE coefficients to tailor the characteristics of the ERROR SIGNAL output to your specific control application. In general, you will want to make the error signal react as fast to a change in the COMMAND and/or RESPONSE input as the actuator to which it is issued allows or requires.

This procedure (“tuning the loop”) is again accomplished by means of the ANALOG OUTPUT (ANO) command. The millivolt value to which the 10APID’s INTEGRAL (“I”) input is set determines the “rise time” of the error signal, thereby controlling the basic response time of the loop. A nonzero PROPORTIONAL (“P”) gain term may then be applied to stabilize the error signal (if it has a large “I” rate). Finally, a nonzero DERIVATIVE (“D”) input may be applied to “soften” the error signal, so that the user’s servo equipment does not receive a step impulse, and also to slow down the RESPONSE as it approaches the COMMAND value, thus reducing or eliminating overshoot or undershoot.

Optimum weighting of the P, I, and D factors will depend on the nature of the process to be controlled. If, for example, the process is naturally slow to respond to control action, a overdamped error signal with a relatively long settling time might be satisfactory (see Fig. 33). If a minimum settling time is required, but overshoot or undershoot about the set-point value is also acceptable, an underdamped error signal might work best (Fig. 34). Or finally, if the application requires a minimum settling time with no overshoot, you might have to adjust the I and D settings to produce a critically damped error signal (Fig. 35).

The 10APID’s COMMAND, RESPONSE, INTEGRAL (I), and DERIVATIVE (D) inputs may each be clamped to individual high and low limit values, in order to protect the user’s servomechanism—and to safeguard the process itself—in the event that the input in question violates its normal operating range. Clamp limits are preset by the operator, using on-board potentiometer controls, and may be displayed by the system as standard data channels.

In addition to these limit settings, a System 10 mainframe with LCD or CRT video capability can display “live” values of the 10APID’s COMMAND, RESPONSE, PROPORTIONAL (P), INTEGRAL (I), and DERIVATIVE (D) inputs, as well as the ERROR SIGNAL output. The display in Fig. 37 shows a...
Model 10AX-2
Auxiliary Excitation Card

This card supplies two channels of regulated, sensed ±12 V-DC, ±2% power (up to 20 mA) for excitation of external transducers. Though most often used to power high-output DC-to-DC LVDT’s, it may also be used with other transducers within this voltage and current range.

Model 10AST
Analog Slot Test Card

The 10AST is a special diagnostic and service tool. Plugging directly into the Slot Connector of any mainframe “A Slot,” its front section protrudes from the slot. Through an array of labelled terminal posts, it thus allows voltmeter or oscilloscope observation of power and reference voltages, logic and calibration signals, data-bus lines, and all other signals pertinent to the slot in question. The 10AST also lets the system read and display the slot’s Signal Common, Power Common, DC Reference, Input Signals, and ±9 V-DC Power Supply levels, as it would any standard System 10 data channels.

Additional 10APID Specifications:

**Inputs and Outputs:**
- See Fig. 36; the card must be set by means of internal programming jumpers for the appropriate sources of the COMMAND and RESPONSE inputs (analog from rear I/O connector, analog from slot connector, or digital via 10APID “subchannel”)

**Subchannel Assignments:**
- See the table on the previous page; note that except for Subchannel Nos. 1, 7, and 8, all subchannels are “shared” between an analog input function (i.e., a particular “CLAMP” LIMIT) and an analog output function (COMMAND, RESPONSE, INTEGRAL, PROPORTIONAL, or DERIVATIVE—as defined by a corresponding ANO command)

**COMMAND and RESPONSE Input**
- **Range:** ±5 V-DC (internal source); ±7 V-DC (external source)
- **Impedance:** Greater than 10 KΩ
- **ERROR SIGNAL Output:** ±7 V-DC, ±5 mA
- **Accuracy of ERROR SIGNAL:** 0.2% of COMMAND input
# System 10 “B Cards”

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Main Function</th>
<th>For description, see page</th>
</tr>
</thead>
<tbody>
<tr>
<td>10BACIA</td>
<td>“AUXILIARY” RS-232 COMMUNICATIONS with TIME-COHERENT DATA FRAMES</td>
<td>60</td>
</tr>
<tr>
<td>10BACI-422</td>
<td>“AUXILIARY” RS-422 COMMUNICATIONS with TIMED SYNCHRONOUS DATA COLLECTION</td>
<td>60</td>
</tr>
<tr>
<td>10BACI-488</td>
<td>“AUXILIARY” IEEE-488 COMMUNICATIONS</td>
<td>61</td>
</tr>
<tr>
<td>“FP” Option</td>
<td>FLOATING-POINT format for “10BACI” outputs</td>
<td>61</td>
</tr>
<tr>
<td>10BD1</td>
<td>SATELLITE “NODE” INTERFACING</td>
<td>62</td>
</tr>
<tr>
<td>10BD4</td>
<td>SATELLITE “HOST” INTERFACING</td>
<td>62</td>
</tr>
<tr>
<td>10CCONB</td>
<td>SATELLITE DISPLAY AND COMMAND-ENTRY CONSOLE</td>
<td>64</td>
</tr>
<tr>
<td>10BDHM</td>
<td>“B-Deck” HEALTH MONITORING</td>
<td>64</td>
</tr>
<tr>
<td>10BDR64</td>
<td>Digital “HISTORY” RECORDING AND PLAYBACK</td>
<td>65</td>
</tr>
<tr>
<td>10BHDM384</td>
<td>High-density “HISTORY” MEMORY</td>
<td>67</td>
</tr>
<tr>
<td>10BSPC384</td>
<td>SPC ANALYSIS of “historical” data</td>
<td>67</td>
</tr>
<tr>
<td>10BIO-16</td>
<td>LOGIC-LEVEL CONTROL INPUTS AND OUTPUTS for any “B-sized” mainframe (up to 16 independently programmable I/O)</td>
<td>68</td>
</tr>
</tbody>
</table>
As seen by a connected external RS-232-C device, an “auxiliary” interface port behaves identically to the mainframe’s standard Computer Interface Port. That is, a standard mnemonic command issued to a 10BACIA by the connected device will invoke a response identical in form to that produced by the Computer Interface Port to the same command. For example, a DUMP (DMP) command issued to a 10BACIA will cause it to “dump” data; a SEND (SND) command will cause it to “send” the specified message; a COLUMNS (CLM) command will establish columnar format for subsequent “stream” and “hardcopy” outputs from that 10BACIA, and so on.

With the “FP” (Floating Point) Option described on p. 61, the 10BACIA can be instructed to output data for all scanned channels or for a specified range of channels in either IEEE or DEC floating point format.

By replacing the standard RS-232 backplane of a Model 10BACIA with the mainframe-mounted Model 10422BP RS-422 Backplane, you can convert the 10BACIA to a Model 10BACI-422 (see below).2

While the activity of a given “auxiliary” interface port can be directly controlled by the external RS-232-C device to which it is connected, it can also be controlled by commands entered through the mainframe’s plug-in keyboard or Computer Interface Port. Such control can be effected by one of three “run-time” commands: ATTACH (ATT), VIA (VIA), or COMMUNICATIONS (COM). The ATT and VIA commands serve to route operator- or computer-entered commands directly to or from the 10BACIA, respectively. They are often employed to specify “protocol” characteristics. The number of 10BACIA cards a mainframe may contain is limited only by the number of available “B Slots.”

The Model 10BACIA responds to the System 10 FRAME CHANNELS (FCH) command. This command allows a time-coherent “frame” of data for a specified range of channels to be transferred to the 10BACIA’s output buffer as soon as this data set has been fully scanned and posted. During loading of the buffer, the 10BACIA will delay responding to a request for output until the loading has been completed (about 5 milliseconds). If the 10BACIA is in the process of transmitting data at the end of the scan cycle, loading is suspended. The currently loaded “buffer frame” of data can be subsequently transmitted from the 10BACIA via any of the standard channel-outputting commands (DMP, STR, HCY, SNP, DSD, DSF, etc.).3

The Model 10BACIA is a system COPROCESSOR. In addition to an auxiliary RS-232-C interface, it also provides an on-board DATA RAM. Externally acquired numeric and logic data can thus be downloaded from the connected RS-232-C device to the 10BACIA itself. With each internal scan cycle, this data will be locally updated (at the 10BACIA) and will be read from there by the system Central Processor. Such local handling of downloaded data by the 10BACIA helps preserve the mainframe’s high scan speed when a large number of inputs is involved.

Front-edge LED status indicators similar to those on the mainframe’s Model 10BIP232 Interface Card let you monitor line and command activity at each auxiliary interface port. In addition, a 10BACIA’s COM indicator will light when that card has been designated to be the mainframe’s “Default Communications Port.”

The 10BACIA replaces the former Model 10BACI, which cannot be used with the FRAMES CHANNELS (FCH) command.2

The 10422BP may also be used with an older Model 10BACI, but in this case the synchronization features of the 10BACIA and 10BACI-422 will not be available.3

The FCH command does not require the presence of the Model 10BCP200 Central Processor. It may be applied to any system 10BACIA card, or to any Model 10BACI-422 or 10BACI-488. It can be sent directly to the 10BACIA via the 10BACIA’s RS-232-C port, the mainframe’s keyboard or standard Computer Interface, or an EXECUTE (EXU) or COMMAND (CMD) function.
When an external synchronizing pulse signal is available through the RS-422 interface—as it is when the 10BACI-422 is communicating with a Model 10BACI-422 Data Concentrator—then you will need to enter a CLOCK (CLK) command and a MASTER TIMING CLOCK (MTC) command in order to “slave” the mainframe’s scan cycle to this “master” pulse signal. The external sync pulses must be at a rate of 1 second ± 0.05%.

The Model 10BACI-488 is equivalent to a Model 10BACIA with a 24-pin parallel port for standard TALKER/LISTENER communications with an IEEE-488 bus (in place of the 10BACIA’s standard RS-232-C interface). Special front-panel LAD (“Listener Active Device”) and TAD (“Talker Active Device”) lights continuously indicate the System 10’s current bus role. There are on-board DIP switches for assigning a specific bus address to the System 10. Note also that the rear connector supplied with the 10BACI-488 covers two mainframe “B Slots.”

While the 10BACI-488 conforms to the hardware protocol of IEEE-488, it employs a proprietary software protocol. Also, the data transfer rate is limited by the rate at which data can be received from the System 10 database (typically 2500 to 3000 channels per second). As a result, the 10BACI-488 transfer rate will normally be about 15,000 to 17,000 bytes per second.

Two additional commands have been developed for use with the 10BACI-488: ADDRESS (ADD), which lets you read the current bus address setting, and END OR IDENTIFY (EOI), which lets you invoke the “END OR IDENTIFY” function at the end of each output line and/or at the end of each complete output transmission.

Like the 10BACIA, the 10BACI-488 will respond to the FRAME CHANNELS (FCH) command, and may employ the “FP” (Floating Point) Option.

“FP” (Floating Point) Option

This option applies to all versions of the “10BACI” (10BACI, 10BACIA, 10BACI-422, and 10BACI-488). It allows the “10BACI” card to issue data for all scanned channels or for a specified range of channels in either IEEE or DEC floating-point format.

You will use the FLOATING POINT FORMAT (FPF) command to tell the “10BACI” what format you want. A run-time FLOATING POINT DUMP (FDM) command then instructs the “10BACI” to output data once only for all scanned channels or for a specified range of channels, in the specified floating-point format.

1 The CLK and MTC commands are effective only when the mainframe contains a Model 10BCP200 Central Processor Card (as do all currently manufactured “B-sized” mainframes). The purpose of the CLK command is to synchronize the scanning of data channels to the mainframe’s time-of-day clock. The purpose of the MTC command is to synchronize the mainframe’s time-of-day clock to the externally sourced timing pulse, to within ±2 milliseconds. The synchronized millisecond clock is then used to trigger successive scans at 0.1-second intervals, as directed by the CLK command. MTC should be applied to one and only one Model 10BACI-422 in the system, since it in effect tells the 10BCP200 which 10BACI-422 to “listen to” for each successive sync pulse.

2 When large blocks of data are being routinely placed on the bus—as would happen, for instance, in response to a DUMP (DMP) command—it would optimize speed to have EOI occur only at the end of every complete transmission, and not at the end of every output line.

3 The difference between the two floating point formats lies in the interpretation of the 8 bits representing the exponent for each transmitted channel data value.
“B Cards” & Accessories

Model 10BD4
Satellite Interface Card

Model 10BD1
Satellite Slave Card

When equipped with a Model 10BD4, any System 10 “B-sized” mainframe can become a central “host” unit for a network consisting of one or more Daytronic “satellite” units.

Any “B-sized” mainframe may function as a satellite. An “A-sized” mainframe may function as a full satellite only if it is equipped with the “S” (Satellite) Option (see p. 25).* A Model 10CCONB Operator Console (described on p. 64) can also serve as a satellite unit. All in all, such satellites can provide complete remote-site data acquisition, data display, process control, and/or entry of “global” system commands.

While responding instantly and “transparently” to interrogation by the “B-sized” host mainframe, each satellite mainframe remains independently responsible for all data collection, control, and/or display functions relating to those data channels and logic bits for which it serves as a unique “local” origin. These functions may include cross-channel calculations, analog peak capture, logic and analog control I/O, automatic command “executes,” maintenance of “live” LCD or CRT display, and digital “history” recording.

“Host” 10KN8A
System with Remote
10K1CS, 10KUS, and
10K4T-KDS Satellites

As stated above, every “A-sized” satellite must be an “S” version.* An S-version unit has limited bidirectionality. It is provided with a capacity of 1000 data channels and with an external RS-485 converter connector mounted on its Computer Interface Port. It permits direct keyboard entry of mnemonic commands, both “local” and “global.” However, such a satellite cannot receive “local” commands through its Computer Interface Port, which is necessarily dedicated to the network (see Fig. 38).

Fig. 38 shows a generalized satellite network with the “host” mainframe in a “network-terminating” position (“non-terminating” placement of the host is also possible). Host-satellite and satellite-satellite interchanges are achieved via RS-485 interface of fixed protocol (153.6K baud, 8 data bits, 2 stop bits, odd parity). The 10BD4 normally allows up to 31 satellites on a twisted-pair ring of up to 1 km (3279 ft.) in total length.

Every “B-sized” satellite requires a Model 10BD1 Satellite Slave Card in order to issue data to the network and to receive data from the network for “local” display, printout, etc. Such a satellite can receive commands “locally” through its plug-in keyboard, through its Computer Interface Port (which in this case is not dedicated to the network), or through an optional Auxiliary Computer Interface supplied by a version of the “10BACI” card (see above).

Every Operator Console satellite is furnished with an externally mounted RS-485 converter connector, and can only receive “global” data from the network.

In setting up the network, you will first assign a unique identifying “Satellite Number” to each satellite. You may then dedicate to the host mainframe and to each satellite mainframe in the network a selected range of “global” data channels and a selected range of “global” logic bits. “Global” here means that such a data channel or logic bit may be simultaneously read and/or displayed, if desired, by any member of the satellite network.

Each network mainframe—including the “HOST”—will now serve as the unique “data origin” for its specified channels and bits. The dedication of “global” channels and bits to network mainframes is done via the SATELLITE (SAT)

* If an existing “non-S” A-Sized mainframe is supplied with a Model 10D485 RS-485 Satellite Inter-Face Adapter, that mainframe is capable of receiving “global” data from the System 10 satellite network. It will not be possible, however, for the mainframe to transmit its own “local” data to the network.
and SATELLITE SYSTEM BITS (SSB) commands, respectively.

After the network has been fully set up, the Model 10BD4 will automatically interrogate each satellite in turn, according to the predesignated “Satellite Number” sequence, having first interrogated the host unit. The 10BD4 operates on a scan cycle which is independent of that of the host’s Central Processor.

When interrogated, each network mainframe (host or satellite) will transmit a “data packet” to the 10BD4. That is, it will send to the 10BD4, in sequence, the numeric data values and logic states currently in its DATA RAM for all “global” data channels and logic bits that have been specifically dedicated to that mainframe. A simple “checksum” procedure allows detection of faulty data transfer to the 10BD4.

With each of its own scan cycles, the host mainframe’s Central Processor interrogates the Model 10BD4 for all current data in the 10BD4’s DATA RAM, as collected from all satellite mainframes in the network. The host then updates its own DATA RAM accordingly, publishing all network-collected data to any and all of its “COPROCESSOR” cards (i.e., to every History Card, Auxiliary Computer Interface Card, etc., contained in the host mainframe).

At the same time that it is transmitted to the Satellite Interface Card, a given “data packet” is transmitted to every “B-Sized” mainframe satellite in the network. This same data is further available to every “A-Sized” mainframe satellite that has been configured to receive it.

After receiving a data packet, a satellite will accordingly update the corresponding data channels and logic bits in its own DATA RAM, and also any “local” LCD or CRT display of these channels and bits for which it is responsible.

The network also allows any satellite to issue standard “System 10” commands to any other satellite or to the host. Every interrogation by the 10BD4 for “local” satellite data will be accompanied by an interrogation for a “message packet” —i.e., for any mnemonic commands that may be currently awaiting delivery from the satellite in question to some other network “node.”

On receipt by the 10BD4, all such “global” commands are immediately sent to the host’s Central Processor. From there each command is routed directly to the individual network unit to which it is “implicitly” addressed by virtue of the “global” data channel(s) or logic bit(s) referred to by the command itself, or to which it has been “explicitly” addressed by means of an OPEN (OPN) or NODE (NOD) command. Because of this “global command” capability, the total system can accommodate more than one observation station throughout the network.

In contrast to a “global” command, which may be entered through the keyboard, Computer Interface Port, or optional Auxiliary Computer Interface Port of any network node in order to be sent to any other node, a “local” command can only be “heard” and acted upon by the node whose keyboard, Computer Interface Port, or optional Auxiliary Computer Interface Port has been used to enter that command.

(cont’d)
When interrogated by the 10BD4, each Operator Console satellite will only transmit its current message packet (such a unit does not transmit data; it only receives it for purposes of “local” display, printout, recording, etc.—see below). It can both issue and receive “global” commands via the OPEN (OPN) command, just like a mainframe satellite. Like an “A-Sized” mainframe satellite, it can receive “local” commands through its keyboard (only).

LED status indicators on the 10BD4’s front edge alert the operator to “timeout error” (when a satellite is not answering an interrogation by the 10BD4), or “checksum error” (indicating faulty data transmission to the 10BD4). Other indicators on both the 10BD4 and the 10BD1 let you know when the respective data-transmission and data-reception lines are active. Special commands permit interrogation and resetting of the 10BD4’s “Satellite Error Log” and “Cycle Counter.”

**Model 10CCONB Operator Console**

The Model 10CCONB is only for use within Daytronic “SATELLITE” NETWORKS. Within a Model 10BD4-based network this unit can

* provide remote color CRT display of data acquired by one or more mainframe “nodes” within the network—or of an external color VGA video input received by the “console” itself—on standard CRT “Video Pages” that are locally formattable and either locally or remotely selectable
* allow a local operator to issue “global” commands to any other member of the network

The “console” monitor offers the same video functions as a Model 10KN8A mainframe (see pp. 37-38 and 70-71). These functions include

* composition, storage, and selection of up to 100 “video page formats,” through a plug-in Model 10P80A Extended Keyboard (supplied with the 10CCONB)
* standard VGA video I/O
* optional formattable printer output via the Model 10VF0132 Formatted Output Card (p. 72)
* optional video bargraph display and video memory extension via the Model 10VGM500 Video Graphics Memory Card (p. 72)

An Operator Console differs from a “B-sized” mainframe satellite, however, in several important ways:

* It has no “local data” capability; it cannot acquire, process, and transmit “real-world” analog and logic data.
* It responds only to mnemonic commands relating to System 10 “video” functions, both standard and optional.
* When set to “internal” video mode, it will display data received from the satellite network through its “Console Interface Port” (this port includes an external “video” RS-485 converter connector and is preconfigured to recognize the interface protocols required for network data and command interchanges).

Dimensions of the Model 10CCONB are identical to those of the Model 10KN8A Mainframe (see Fig. 21, p. 38). For optional 220 V-AC power (50 Hz only), specify Model 10CCONB-F.

**Model 10BDHM B-Deck Health Monitor Card**

The Model 10BDHM is a “B-sized” companion card to the Model 10AHM Health Monitor Card, described on pp. 55-56. When connected to the 10AHM via a special cable, it can be used to monitor B-Deck voltage supplies, plus critical software handshake lines and other dynamic signals.

The following 13 diagnostic “subchannels” are furnished by the 10BDHM*:

**No. 9:** Measures the microprocessor’s +5-V rail.

**Nos. 10 and 11:** Measure the B-Deck ±12-V supplies. These power the A/D, RS-232 I/O, internal monitor, etc.

**No. 12:** Measures the “ISO-5 V” supply for Model 10BIO-16 Universal Logic I/O Cards.

**No. 13:** Measures the active-low EEPROM Enable signal on the B Deck.

**Nos. 14, 15, and 16:** Measure the state of the “handshake” lines among the B-Deck cards. These active-low lines toggle briefly when messages move from board to board. A persisting logic low (> 0.7 V) indicates internal communications problems or one or more external devices that are not ready to receive data from the System 10.

**Nos. 17, 18, and 19:** These channels are “stretched” versions of Nos. 14, 15, and 16 and are used to verify that messages are being properly sent.

**Nos. 20 and 21:** These channels are B-Deck counterparts of the 10AHM-sourced Subchannels Nos. 7 and 8 (SIGNAL COMMON and POWER COMMON, respectively—see p. 56).

* Like the 10AHM-sourced subchannels listed on pp. 55-56, they can be scaled and filtered like any analog data channel, and can be continuously and automatically monitored for conformance to specific limit values.
Model 10BDR64
History Card

The purpose of this unique microprocessor-based card is to make, store, and selectively output digital recordings of numerical and logic data acquired by a System 10 “B-sized” mainframe. The History Card is extremely useful when you need sequential recording of one or more data sets at a rate too fast for a computer or other data-receiving device, or the accumulation of data which is collected at a rate too slow to warrant tying up valuable computer time for its communication.

Through simple mnemonic commands, you can instruct each of the History Card’s four independent RAM recorders to automatically record a pre-defined list of randomly selected data channels and logic bits. Recording can be made to occur at preset time intervals—from 10 milliseconds to 24 hours—or can be triggered by a specific combination of system logic, limit, and/or time-interval conditions. Similar conditions can also be specified for halting and restarting each recorder.

With the \textit{CLK = ON} command in effect, recording of data by the History Card can be synchronized with the data sampling rate.

The outputting of recorded data to an external computer, printer, or display—via either the mainframe’s Computer Interface Port or an “Auxiliary” Computer Interface Port supplied by a “10BACI” card—can occur in either of two ways:

1. You can “empty” all or part of the data recordings made by one of the four recorders since it was last interrogated, or
2. You can initiate a “history dump,” which is a transmission of a selected range of recordings made, if desired, both before and after the occurrence of a halt-triggering condition.

“Emptying” of a recorder can be done while recording is in process, and lets you learn what has happened since the last such interrogation.2 “History dumping,” on the other hand, is generally done after recording has stopped. It creates, in effect, an expandable “history window,” letting you review the “data history” associated with, say, a critical limit violation or process shutdown. Specified regions of a recorder’s history memory can, however, be “dumped” at any time. Such “dumping” is not affected by any previous “emptying” of the recorder.

Through the \textbf{OUTPUT IMAGE (IMA)} command, you can select the variables you want to appear in a recorder’s output (such as time, date, serial number, etc.), and the order in which these variables are to be transmitted.

The History Card’s versatile playback function makes available for direct interrogation, monitoring, or video display all of the readings recorded for a given system data channel that are currently in history memory. Thus, you can play back as a live data channel the data last recorded for any given system channel or the data recorded for that channel at a specified time in the past. You can easily arrange for simultaneous video display, on the same CRT page, of a set of “playback channels” and of the corresponding “live” data values (as in the display shown in Fig. 39).3

When the History Card is accompanied by a \textbf{Model 10BSPC384 High Density History SPC Option Card} (described on p. 67), special “statistical” playback functions allow the system to perform independent, “on-line” Statistical Process Control (SPC). When used in “front-end” applications, the mainframe can even be disconnected from the host computer during the production process, while it continues to collect, display, store, classify, and analyze all measurement data.

Through a special “time search” function, it is possible to quickly review the values recorded by a given 10BDR64 recorder for one or a set of data channels over a specific period of time. You can also “replay” all data for a given recorder’s “non-statistical” playback channels, from the “oldest” to

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1 For the \textbf{CLOCK (CLK)} command, see the Model 10BACI-422, p. 61.
2 Recorder contents are not literally “emptied” in this process. In fact, you can easily reaccess all “frames” of recorded data that have been previously “emptied.”
3 Playback of system “BIT GROUPS” is also possible, using specially set up BINARY “CONVERSION” CHANNELS. Note too that you can have up to 300 special “VIDEO PLAYBACK” channels for display of historical data. While they cannot be monitored like “live” data channels for conformance to preset limit values, these “VIDEO PLAYBACK” display channels have no effect whatsoever on the system scan speed.
“B Cards” & Accessories

the “newest,” using a variable time scale. This permits “slow motion” playback of all data recorded during a fast event, or a fast review of all data recorded for a test or process of long duration.

The History Card’s normal capacity is 32000 scaled data readings. The portion of this total “history memory” that will be allocated to each of the card’s four RAM recorders is dependent on the size of that recorder’s specified “list” of variables to be included in each “frame” of recorded data, multiplied by the specified “depth” of the recorder (the total number of “frames” to be recorded).

When you require history memory beyond 32K readings, you may install the Model 10BHDM384 High Density History Memory Card (see below).* You can easily arrange for the history memory to be either VOLATILE or NON-VOLATILE. When volatile mode is in effect, all data recordings will be automatically and “truly” erased every time the History Card is powered up. When nonvolatile mode is in effect, only the battery-backed history memory residing on an optional 10BHDM384 Memory Card** is available for storage of history recordings.**

Front-edge LED status indicators tell you when the History Card is in setup mode, when the current total history memory is insufficient for the present recorder configuration, when each of the card’s recorders first begins recording, or when recording stops because a halt-triggering condition has occurred or the recorder’s memory has been cleared.

Every History Card comes with free History StartPAC V software for rapid setup of history recording functions and the offloading of recorded data to disk file. The following special programs are included in History StartPAC V:

** SETUP2H **
Provides a simple menu-driven procedure for setting up and controlling the History Card. Also permits the recording of data by the 10BDR64 in a form that is compatible with all LOGGER2 readout programs (see p. 84).

This program is a great time-saver. Explaining History Card setup considerations in simple language, it guides the user through selection of all necessary setup parameters for each of the History Card’s four RAM recorders—including Channel “List,” Recording Interval, “Start” and “Halt” Triggers, “Halt Depth,” etc. A list of allowable entry values for each parameter is presented, and each entry is tested before it is accepted.

SETUP2H also monitors the allocation of total “history memory” among the 10BDR64’s four recorders. Thus, as each setup value is selected, current “Memory Used” and “Memory Available” are displayed. The user may then alter one or more setup values for the recorder in question, to adjust the distribution of memory.

** LOGGER2H **
Can be used to offload all data recorded by the History Card to a computer disk file, once recording has been completed. The disk file may then be processed by any of the standard LOGGER2 readout programs and by LOTUSLNK (see p. 84). All in all, LOGGER2H offers extreme flexibility in the storage and analysis of “historical” data.

** SETUP3H **
Similar to SETUP2H, except that the resulting data format is compatible with LOGGER3 readout programs (see p. 84), having been optimized for those processes best analyzed by true X-Y plotting. Unlike SETUP2H, SETUP3H provides for the recording of data sets upon detection of various specified logic conditions, rather than at strictly uniform time intervals.

** LOGGER3H **
Similar to LOGGER2H, except that it is used when the History Card has been set up via SETUP3H. The resulting disk file may be processed by any of the standard LOGGER3 readout programs (see p. 84).

** HSTYDUMP **
Initiates a “history dump” of specified measurement data. Produces a data file of “dumped” history memory contents. This data is then subject to selective CRT display, printout, X-Y plotting, and/or conversion for LOTUS or other spreadsheet processing.

History StartPAC V also includes the following standard “SoPAC” programs described on pp. 81-84: USERTIPS, COMMLINK, TERMINAL, DAS1, VIEWLOG, PRINTLOG, PLOTLOG, PLOTLOG3, and LOTUSLNK.

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* The Model 10BSPC384 also provides for an additional battery-backed history memory of up to 384K scaled readings.

** “True erasure” of history-memory contents is also possible in NONVOLATILE MODE, by means of the NONVOLATILE HISTORY (NVH) command.
The function of the 10BSPC384 is to provide a total volatile "history" memory of 416K readings, or a total nonvolatile memory of 384K readings. \(^1\) \(^2\)

When you use the 10BSPC384 simply to extend the RAM memory of your system’s History Card, the History Card’s original 32K scaled readings—plus the 384K additional readings stored on the 10BSPC384 Card—will remain volatile, and will thus be lost upon loss of system primary power.

When, however, you use 10BSPC384 to furnish battery backup for the entire system history memory, then the History Card’s original 32K memory is no longer available to the system. In this case, you must apply a NONVOLATILE HISTORY (NVH) command, whereupon all current history memory will be completely cleared, and all subsequent data recordings will be stored in nonvolatile memory on the 10BSPC384 Card only.

Installation of the Model 10BSPC384 requires a special “history backplane” within the mainframe.

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1 The Model 10BSPC384 also provides for an additional battery-backed history memory of up to 384K scaled readings. Note that a complete set of data records will typically take more than one “reading,” depending on the number of channels and bit groups in the set and also the inclusion of system DATE in the output.

2 The 10BSPC384 replaces the Models 10BHM128, 10BHM256, and 10BHM384 with a single high-density memory card.

3 The 10BSPC384 replaces the Model 10BSPC, which provided storage for only 128K recorded data readings.
This card allows a System 10 “B-sized” mainframe to perform automatic safety monitoring and other programmed logic control functions in connection with controlled tests and processes. It provides sixteen optically isolated LOGIC I/O PORTS, each of which can be designated as either input or output, in any desired mix.* For “A-sized” mainframes, you will use the Model 10AIO-16 Universal Logic I/O Card (see p. 56).

Once initialized via the B SLOT (BSL) command, an installed Model 10BIO-16 establishes a one-to-one correspondence between its own sixteen logic I/O ports and the sixteen members of any selected system “bit group.”** The card’s I/O ports will then reflect at all times the existing logic states of the corresponding system bits. The state of any given bit will be determined in turn by one (only) of several different “logic sources,” which include:

* system “limit logic”
* a logic input received by the Model 10BIO-16 (or 10AIO-16) at the corresponding port
* an externally applied bit-setting command (BIT, BIN, BCD, or HEX)
* a “special bit” assignment via a command of TMO, CSB, PSB, etc.
* assignment to a system “COPROCESSOR” card

Thus, for example, the 10BIO-16 lets a host computer directly read or set individual logic inputs or outputs, respectively—in accordance, say, with calculations performed by the computer itself. At the same time, certain 10BIO-16 outputs can be made to reflect—instantly and automatically, without further attention from the computer—any specified violations of preset limit values occurring in any specified data channel or group of channels.

By means of special “CONVERSION CHANNELS,” the Model 10BIO-16 permits the system to handle BINARY and BCD inputs and outputs. Thus, a BINARY input can be read as a decimal or hexadecimal value, while a BCD input can be read as a decimal value only. A BINARY output can be issued by the 10BIO-16 to represent a fixed decimal or hexadecimal value or to represent the current decimal reading of a specified data channel; a BCD output can be issued to represent either a fixed decimal value or the current reading of a specified channel.

The Model 10BIO-16 accepts logic inputs directly from dry contacts (switches, relays, etc.). Inputs and outputs are compatible with TTL and other solid-state logic systems (see Specifications), as well as the Daytronic Models 9398 and 9399 Solid State Relays.

In addition, the 10BIO-16 is electrically compatible with many popular plug-in “logic modules” for power control switching. In fact, it is fully plug-compatible with the standard ribbon cable used for the sixteen-channel power boards on which these various I/O modules can be mounted.

Equipped with one or more Model 10BIO-16 cards, a System 10 mainframe can read pressure switches, mechanical limit switches, AC or DC power terminals, relays, photocell detectors, operator push buttons, and similar logic-input sources. It can also actuate solenoid valves, illuminate panel displays, sound alarms, start and stop motors or pumps, initiate and control safety shut-down sequences, and perform many other automation tasks that require “intelligent” switching, even of substantial amounts of power.

The intelligence required for these functions can be very simple or very complex—and, depending on application requirements, it can reside in the System Central Processor alone, or in the programming of the (optional) host computer.

** Additional 10BIO-16 Specifications:**

* Number of I/O Channels: Sixteen (any combination of inputs and outputs)

** Logic I/O Interface:**

* General: Optically isolated logic; isolated + 5 V Reference Power Supply provided; maximum current is 200 mA, total; external reference supply may be used; allowable VCC range is + 5 to + 24 V

* As Input: CMOS-device input with internal 100-kilohm pull-up to VCC (“Logic 1”); may be driven by TTL, LSTTL, CMOS (+ 5 V), or through dry contacts to Isolated Common

* As Output: Open-collector current sink with internal 100-kilohm pull-up to VCC; maximum sink current is 50 mA per output

** Channel Activity Indicator: LED logic-state indicator for each I/O PORT visible through mainframe front panel
System 10 Video
Functions & Cards

A hallmark of the Daytronic System 10 is its integral data display capability, which has been consistently designed with the operator interface in mind.

System 10 video is “built-in” all the way. NO COMPUTER PROGRAMS ARE NECESSARY for the operator to compose unique, vivid, dynamic, and highly effective displays for:

- readout of both “live” and “historical” analog/logic data
- visual annunciation of process status and alarms—including graphic indication of bit states and process trends
- prompting appropriate operator actions by means of timely display messages
Mainframe Video Capabilities

Video Capabilities for “A-Sized” Mainframes

- **Models 10K2C and 10K4T-D** support local and optional remote 7-line alphanumeric LIQUID CRYSTAL (LCD) data display.

- **Models 10K2D and 10K4T-DA** support local 8-line VACUUM FLUORESCENT (VFD) data display.

- Up to 40 LCD/VFD “pages” can be stored for each display type. Each page can be dedicated to up to twelve user-specified data channels, including TIME and DATE.* A four-character unit legend for each channel’s “live” reading can be entered. A simple PAGE (PAG) command calls individual pages to display.

- Optional X vs Y and STRIP-CHART GRAPHICS for LCD displays (only)—see the “G” Option, p. 25

Creating your own large-scale display formats could not be easier…

1. Enter “Text Editor” mode

2. Type in FIXED TEXT and variable DATA FIELDS

   Creating your own large-scale display formats could not be easier…

   There are 13 character sizes to choose from, ranging from “1x1” to “4x4.” Each display allows up to 23 lines of single-height characters and up to 80 single-width characters per line. You can specify a desired foreground/background color or intensity combination for every line or portion of a line of FIXED TEXT, along with status-dependent color combinations to be exhibited by individual DATA FIELDS.

3. Return to “Live Data” mode

   DATA FIELD colors and visual effects continuously reflect process status.

* “Live” display of TIME and DATE is automatically included in the VFD display (only), along with per-channel LIMIT-STATUS INDICATION. An ARROW following the data reading points UP for a “HI LIMIT” violation, DOWN for a “LO LIMIT” violation, and LEFT for an “OK” (no violation) value.

** The mainframe **Models 10KN7 and 10KN8A** have integral MONOCHROME and COLOR CRT display, respectively. The **Models 10KN3 and 10KN6** require an external video monitor (supplied by the user). For RACKMOUNT COLOR MONITORS available from Daytronic, see pp. 44-46.

Video Capabilities for “B-Sized” Mainframes

- All “B-sized” mainframes support MULTIPLE INDIVIDUALLY CONFIGURABLE DATA DISPLAYS, local and/or remote, with adjustable update rates from 1 to 60 Hz.**
• These large-scale, VGA-resolution CRT displays may be instantly composed, edited, and saved by the operator, in the field, via simple "word-processor" keyboard entries—*even while the measured test or process is running*. Up to 100 unique non-scrolling CRT page formats may be created and stored for any given "B-sized" mainframe.*

• By means of standard System 10 commands, a connected host computer can quickly recompose displayed page formats, line by line, during the measurement and control process. Formats can also be transmitted to the computer, line by line, for storage on disk.

• Standard System 10 CRT displays feature—logic-bit indication via user-specified "bit designator" word pairs (HIGH/LOW, ON/OFF, OPEN/CLOSED, GO/STOP, PASS/FAIL, etc.)—an ideal feature for security-system annunciation

— Operator-entered Messages to be displayed and/or printed when required by the state of the measured process

— Special fields for video playback of "historical" data recorded by a Model 10BDR64 History Card (p. 65)

• Video inputs and outputs:

All "B-sized" mainframes except the Model 10K7 are fully compatible with 640 x 480 VGA format, with a horizontal refresh rate of 31.5 KHz.**

— VGA output can be transmitted directly to any monitor capable of receiving it

— CGA/EGA/VGA input can be received directly from any external VGA analog card (digital video signals from CGA/EGA cards will not be accepted).

You can toggle between the display of "internal" System 10 video page formats and externally-sourced video screens by a simple keystroke or on application of a simple mnemonic command.

— The Model 10K7 mainframe can transmit a standard two-wire RS-170 Composite Video Signal to an external monochrome monitor, and a standard 9-wire "RGB" output to an external CGA/EGA color monitor

• With installation of the optional Model 10VM500 Video Graphics Memory Option (described on p. 72), any CRT display can incorporate up to 80 high-speed horizontal bargraphs, individually dedicated to selected data channels. Bar types include solid bar, upward pointer, and downward pointer—each with or without graduated scale.

* Usable video memory is normally 157 “blocks” of 64 bytes each. A typical page format takes 5 to 7 memory blocks, with a nominal maximum of 32. The Model 10VM500 Video Graphics Memory Card (p. 72) will increase the total memory capacity to 661 blocks.

** Special Retrofit Kits are available for users who wish to upgrade existing Model "10K3(A)" and "10K6(A)" mainframes to VGA (see p. 42).
Every System 10 “B-sized” mainframe has two internal Slot Connectors for the installation of optional “V CARDS.” Located on the mainframe’s Video Backplane, these connections are immediately to the left of the Video Signal Card (Model 10BVS90, 10BVS95, or 10BVS98), as viewed from the front of the unit.

For Model 10KN3, 10KN6(T), and 10KN7 Mainframes, the front Video Guard Panel must be removed to access the Video Signal Card and any optional “V-Cards” (in the 10KN7, this panel is attached to the CRT housing, which must also be removed). For a Model 10KN8A mainframe and for “E” version of a 10KN3 or 10KN6(T) mainframe, all “V SLOTS” are accessible from the front of the mainframe, and each corresponds to a numbered “B SLOT.”

Model 10VFO132 Formatted Output Card

This card provides a special RS-232-C printer interface port for instant hard-copy reproduction of the video page format currently on display or of any video page currently in EEPROM storage (including the system’s standard “page directory”). It can also transmit to a printer, in sequence, all existing video page formats within a specified “page-number” range.

* If an optional Model 10VFO132 Formatted Output Card is present, it must be installed in the “V Slot” to the immediate left of the Video Signal Card. If an optional Model 10VGM500 Video Graphics Memory Card is present, it must be installed in the second “V Slot” to the left of the Video Signal Card (the Model 10VGM500 requires the Model 10BVS95 or 10BVS98 Video Signal Card). CONTACT THE FACTORY FOR FULL “V-CARD” INSTALLATION INSTRUCTIONS.

** “1” indicates that channel data is currently LESS THAN both preset limit values; “2,” that it is BETWEEN these limits; and “3,” that it is GREATER THAN both limits.

A transmitted page format will include all appropriate “live” data values, bit states, messages, and “video playbacks” (see the Model 10BDR64 History Card, p. 65). When dedicated by means of a special command to an Epson or Epson-compatible printer, the 10VFO132 lets you print video pages containing horizontal bargraphs generated by an optional Model 10VGM500 Video Graphics Memory Card (below).

In addition, the Model 10VFO132 permits the printing of “live” data from a single system channel, all system channels, or a selected range of channels—along with specified “HEADER” and “TAILER” texts. These “headers” and “tailers” are separate, precomposed video pages.

Data-link protocols for the 10VFO132’s printer port are as follows: baud rate selectable in standard steps from 50 to 19.2K baud; 7 or 8 data bits; 1 or 2 stop bits; parity even, odd, or none. You can specify an intercharacter delay of 0, 0.1, 0.24, 0.58, 1.4, 3.4, 8.2, or 20 milliseconds. Via the EOL or EOP command, respectively, you can also enter up to eight standard printer control characters to be automatically transmitted at the end of each line or page of output. Unused lines at the bottom of transmitted page formats can be suppressed, if desired.

The TEMPLATE (TMP) command lets you create a unique format “template” for the presentation of transmitted channel data. This template is a combination of variable data fields and one or more portions of user-entered fixed text, in any desired order. Any data field may contain Channel Number and/or “Limit-Zone” Indicator Number.** The inclusion of terminating spaces in the “template” statement allows columnar formatting of printed data.

Model 10VGM500 Video Graphics Memory (“Bargraph”) Card

With installation of the optional Model 10VGM500, your System 10’s CRT displays can incorporate multiple high-speed horizontal bargraphs, individually dedicated to selected data channels. With continuous real-time video updating, the bargraph enhancement makes possible any number of dynamic data displays, easily formatted by the operator via simple keyboard entries. There can be up to 80 bargraphs per video page.
Bargraph displays are a simple, vivid way to portray monitored tests or processes. They let the operator grasp the state of an entire process at a glance. They can be made to include virtually instantaneous alarm annunciation, along with messages that prompt the operator to take specific control actions. All in all, they can do much to enhance user interaction with any mainframe system that incorporates a CRT display, color or monochrome.

**Real-time histograms** for use in SPC and trend analysis can be easily created by means of the 10VGM500. In the display shown in Fig. 42, for example, each bar represents a data-register channel that automatically counts the total number of “Below Limit,” “OK,” or “Above Limit” parts.

There are six basic bargraph types: solid bar with scale, solid bar without scale, upward pointer with scale, upward pointer without scale, downward pointer with scale, downward pointer without scale.

Each 10VGM500-generated bargraph is configured through simple keyboard entries, during composition of the video page in which it is to appear. Thus, for each bargraph you will specify its size, its position on the page, and the individual data channel it is to represent. Prompted by a menu on the system display, you will then enter the bargraph’s type (bar, upward pointer, downward pointer—with or without scale) and range (“data zero” and “data top”). If a bargraph with scale is selected, you may further indicate the desired spacing of the graduation marks for that scale.

Like that of any standard video data, bit-state, or message field, the background/foreground color or intensity combination of each bargraph will be continuously controlled by “STATUS”-defining commands entered by the user (STATUS (STS), “GREATER THAN” STATUS (VGT), “BETWEEN” STATUS (VBT), etc.). By this means, the bargraph can be made to exhibit special event-triggered visual effects, including instant color changes, blinking, and “flashing.”

When the mainframe contains an optional **Model 10VFO132 Formatted Output Card** (see above), hard-copy printout of any bargraph display is possible on any Epson or Epson-compatible printer.

The 10VGM500 increases a “B-sized” mainframe’s total video memory capacity to 661 “blocks,” which is usually more than enough to completely fill each of the 100 available video pages. (“Standard” video memory is 157 “blocks” of 64 bytes (or characters). A typical page format will take 5 to 7 memory blocks, with a nominal maximum of 32.)

**Fig. 42** Part Classification via 10VGM500-Generated Histogram

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1. To specify the size of a given bargraph, you will first enter the desired height of the display line to contain the bargraph and the desired width of each character in that line. The length of the bargraph field entered within the line must be greater than nine character spaces.

2. Other serial ASCII printers may be used for bargraph printouts, but are not recommended. An Epson or Epson-compatible printer will yield exact hard-copy reproduction of any of the 10VGM500’s six basic bargraph types, except that printed bars will be proportionally shorter than displayed bars because of a necessary reduction of pixel-per-character width. A line will be printed either below or above each bar or pointer to indicate the total length of the bargraph field. Graduation marks will appear on this line when the bargraph is a type “with scale.”

3. An existing System 10 that does not contain the Model 10BVS95 or 10BVS98 will require exchange and/or upgrade of its Video Card Set (and possibly also its Central Processor Card) at an additional charge, to ensure compatibility with the enhancement offered by the Model 10VGM500. Contact the factory for details.
With new communications drivers
developed by Daytronic, users of many third-party data acquisition and
control software packages have fast and flexible access to analog and digital data acquired by any
System 10 instrument or network. And more drivers are being developed all the time.

All in all, the seamless integration of System 10 with the latest and best Graphical User Interface
(GUI) software represents a TOTAL SOLUTION to conventional data acquisition and control prob-
lems within the discrete manufacturing, product testing, and continuous process industries—
and to many scientific research applications as well.

Connect the best hardware to the best
software, for a combination of unmatched
performance and potentiality...
The **Model 10S-WCNF System 10 Configurator** is a simple Windows® User Interface with menu and/or button access to all functions and screens.

In “ON-LINE” mode, the software lets you change setup parameters applying to a “live” System 10 connected via RS-232 serial communications link—parameters such as scan rate; video refresh rate; channel filter and calibration constants; “CALCULATE” expressions; limit values and trigger bits; “EXECUTE” and “CONDITIONAL” statements; and many more. The on-line System 10’s Configuration Write Protect function will be automatically disabled while new configuration data is being downloaded.* If desired, the entire configuration of the connected System 10 can be uploaded for disk storage or printout.

In “OFF-LINE” mode, you can create and save any number of new System 10 configurations for later use. Or you can edit any existing configuration file, which can then be printed out or “sent” at any time to a connected System 10 mainframe.

* For mainframes without software control of the “EEPROM Switch,” the Configurator will prompt the operator to turn off the write protection function.
A sequence of easy-to-use screens with input error checking and context-sensitive Help steps the operator through the entire setup process—all the way from selecting and “locating” the plug-in cards that go into your mainframe to calibrating individual analog input channels based on an appropriate user-selected calibration method.

The Configurator’s “TERMINAL” screen lets the user send any standard mnemonic command to a connected System 10. Data received from the System 10 in response to this command will be scrolled into the Configurator’s “Receive Edit Box” (which will always display the last 50 lines received from the system). Received data may be edited as desired and saved to disk file.
DDE Communications

For real-time data exchange with Windows® Application Programs

Model 10SD-DDE Windows DDE Server

This software allows direct communication between System 10 and any software program that supports the Microsoft Windows DDE (Dynamic Data Exchange) protocol. This includes:

- spreadsheet programs like Microsoft Excel®, Lotus 1-2-3 for Windows®
- SCADA supervisory control software like InTouch™ (Wonderware®), WinWorX™ (Genesis Control Series), The FIX DMACS™ (Intellution)
- test, measurement, and control packages like LabVIEW® (National Instruments), LabTech™, Snap Master™, Trend Link™
- and many more…

Collecting measured and/or calculated data from a single System 10 instrument, the DDE server passes the information to one or more Windows-based “client” application programs that support DDE.

Data is transmitted in discrete data channels and logic bits via the System 10 mainframe’s standard RS-232 computer interface at any standard baud rate from 300 through 19.2K.

Depending on the application program used as the DDE “client,” live System 10-acquired channel and/or logic data might be:

- displayed in a spreadsheet cell
- graphed or otherwise incorporated into the user’s “live” process control graphics
- periodically logged to disk
- analyzed in order that a given action might be performed in response to a perceived channel limit violation or other predefined condition

“The hot” and “cold” DDE links are supported for both formats. A “cold link” exchange occurs on a one-time basis, in response to a “request” from the client program. A “hot link” exchange occurs on a continuous, report-by-exception basis, where the client program is continuously “advised” of any data updates.

In addition to servicing the client program’s requests for channel and bit data, the software also allows the client to set a System 10 channel or bit to a new value—an action which can in turn be made to trigger an automatic command “EXECUTE” function within the data acquisition system. In fact, any valid command string can be issued to System 10 via the DDE link.

Minimum Hardware/Software Requirements:

- Windows 3.0 (running in Standard Mode) or Windows 3.1 or higher (running in Standard or Enhanced Mode)
- A hard drive with at least 500K available for installation of the DDE Server and associated files, 3.5” floppy drive for installation of the software
- At least 2M of RAM
- Any IBM-compatible keyboard (mouse supported but not required)
Model 10SD-LABV
Labview Driver

This new communications driver gives users of National Instruments' LabVIEW® software fast and flexible access to analog and digital data acquired by any System 10 instrument or network, while maintaining the intuitive “look and feel” of current LabVIEW functions and features.*

High interface rates result from the use of special System 10 binary mode commands. These commands compact individual data transmissions and thus reduce the workload of the communications exchange.

The LabVIEW driver is a natural extension of System 10’s proven data acquisition and control capabilities. System 10 can now interact directly with any LabVIEW graphical displays, front panel user interfaces, and integrated data analysis and management systems.

Using LabVIEW’s versatile graphics-based “G” programming language, the System 10/ LabVIEW interface can run on any platform that supports LabVIEW—including Windows, Windows NT, and Power Macintosh.**

The driver software provides the LabVIEW user with a comprehensive “Interface Library” of preprogrammed “Sub VI” ("Sub Virtual Instrument") modules. By incorporating these modules into your own application design, you can achieve real-time System 10/LabVIEW data exchanges that are fast, reliable, and easy to implement.

There are standardized Sub VI’s for:
- setting up and closing down serial or GPIB communications functions
- reading requested data from System 10 for a single channel and/or logic bit, or for an entire array of channels and/or logic bits (channel “reads” can include limit status and scaling information, if desired)
- writing a boolean value to a specified System 10 logic bit (perhaps for purposes of triggering the automatic execution of a sequence of control commands)
- writing a single-precision value to a specified System 10 data channel
- sending to System 10 any valid “read” or “write” command for immediate execution

The Interface Library also includes a number of useful sample applications—including examples of data gathering and display, datalogging, terminal interfacing, and channel configuration and calibration.

The 10SD-LABV driver currently supports only serial communication. To enable all error-handling functions, an appropriate LabVIEW Interface Adaptor (or equivalent cabling supplied by the user) is required: Model 10ELBV9 (for a 9-pin COMM port) or Model 10ELBV25 (for a 25-pin COMM port).

Model ANS-5000-45
AutoNet System 10 Driver

Model ANS-5300-45
AutoNet System 10 Driver with Configurator

With either of these special I/O drivers, AutoNet™ Data Acquisition Software is now fully compatible with System 10.

AutoNet is very fast. Its preemptive multitasking operating system delivers a real-time database speed of over 50,000 measurements per second. Data can be recorded to disk at rates that exceed 20,000 measurements per second, while 3D animated graphic screens can be updated 25 times a second. And all of these operations take place at the same time.

AutoNet’s client/server architecture offers TCP/IP communications over Ethernet to Windows, Netware, and UNIX. Applications database and...
can specify all significant System 10 setup values, including

- **individual analog data-channel parameters**: AutoNet “point-tags”; channel “types”; slot “locations”; calibration values (scaling and offset); digital smoothing constants; limit setpoints and trigger bits, etc.

- **“CALCULATE” expressions and other “pseudochannel” parameters**

- **individual logic-bit parameters**: AutoNet “point-tags”; logic “sources” (with latch status); I/O assignments; associated “EXECUTES” and “CONDITIONALS”; etc.

Once a specific configuration has been created and saved to the PC’s hard disk, it can be downloaded to a connected System 10 mainframe for immediate implementation and for transfer to the mainframe’s nonvolatile EEPROM storage.

Any configuration created by the ANS 5300-45 driver can be printed out for hard-copy storage or can be kept on the hard disk for later use.

A special “Dialog” menu lets the operator send standard mnemonic commands to a connected System 10 and to receive data from the system in response. The last 50 commands are stored in disk file.
Daytronic “SofPAC” Software

The following “SofPAC” software packages are associated with specific products and are provided free of charge with those products:

<table>
<thead>
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<th>SofPAC Name</th>
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Model 10S-SP5 SuperPAC V Software

Daytronic’s SuperPAC V software provides many extremely useful functions when it comes to setting up a System 10 and taking full advantage of its data-acquisition capabilities. General SuperPAC V functions include:

• establishment and verification of data communications
• “live” data display and printout
• “historical” data recording and playback
• rapid System 10 setup, calibration, and interrogation
• backup storage and duplication of System 10 configurations and video pages
• rapid setup of an optional Model 10BDR64 History Card and the offloading of recorded data in “history” memory
• interactive linkage with Lotus 1-2-3® software
• control and interrogation of remote System 10 mainframes via modem communications

The individual programs contained in SuperPAC V are listed below. They are totally menu-driven, with clean, simple setup instructions and ample tutorial guides. A non-programmer can have his PC “talking” fluently with a System 10 mainframe the very same day it arrives.

• USERTIPS
  A menu-guided tutorial program to familiarize the user with SuperPAC V features, functions, terminology, conventions, and procedures.

• COMMMLINK
  Initiates, tests, and verifies proper two-way communication between the computer and the System 10 mainframe. In the event of communications failure, runs a series of diagnostic tests of cabling, “handshake” protocols, etc., guiding the user to appropriate corrective action by means of simple menu-type instructions.

• TERMINAL
  Operates the computer as a “dumb terminal” connected to the System 10 mainframe. Lets you send standard mnemonic commands to System 10 without having to write program statements, by simply typing them on the computer keyboard. By this means, you can completely set up the data acquisition system, interrogate it for setup and data values, and initiate standard run-time operations. Command entries and System 10 responses (if any) will appear on the computer’s CRT screen. TERMINAL is extremely useful for setup and operational control of “A-sized” mainframes that have no standard video capabilities (Models 10KU, 10K1C, 10K4T, etc.).

• DAS1
  Provides “live” CRT display of up to 1000 System 10 data channels. Up to 100 user-selectable, nonscrolling CRT video pages are available for multichannel display of data. Each page is preformatted, and allows “live” in-place readout of a selected group of ten sequential channels (1 to 10, 11 to 20, 21 to 30, etc.)—along with TIME (hour:minute:second) and DATE (month-day-year). See Fig. 43. If a printer is installed, a hard-copy printout of the page being displayed can be obtained at the touch of a key.

• DAS2
  An enhanced version of DAS1. Provides “live” CRT display of up to 1000 data channels, and offers formatting and automatic printout of display pages, along with automatic alarm indication.

(cont’d)
informational HEADERS (format file name; company name; test description, location, and number; operator ID; and "remarks"), plus descriptions ("names") and engineering-unit legends for all channels. The program will also list all available format files in an on-screen menu, allowing rapid selection without reference to notes. You can then edit the selected format simply by moving the CRT cursor to the proper space on a simulated page and typing in the desired changes.

Printout pages are automatically numbered; paper perforations are automatically skipped. All data is identified by TIME (hour:minute:second) and DATE (month-day-year). All printing formats can be saved on disk for future use or editing.

• **TIMEPLOT**

  Provides "live" time-plotting of data on the computer's CRT screen.

  TIMEPLOT permits properly scaled plotting, versus time, of up to three selected data channels, each with individual color. Each channel's "Y axis" can be individually scaled, if desired. You can choose from sixteen different time axes (from 12 seconds to 128 hours, full scale), and save the plot format on disk for future use.

  The plot can be continuously refreshed at the end of the time axis, or it can be halted. Plotting can be started or stopped manually, by operator keystroke, or automatically, upon detection of a logic-bit "trigger." The program also produces hard-copy output of the CRT display, if desired, at the touch of a key (see Fig. 46).

**DAS2** lets you compose up to 20 nonscrolling CRT pages, each of which may be called to display by keystroke. Each page contains a specified fixed-text HEADER and any 10 selected data channels, plus TIME (hour:minute:second) and DATE (month-day-year). Each displayed channel can be identified by a "name" (up to 32 characters) and engineering-unit legend (up to 8 characters). See Fig. 44. These designations are readily entered or modified, using a "Text Editor" mode. You can also select among seven colors for background text, live data, and highlighting. All page formats can be saved on disk for future use or editing.

As with DAS1, hard-copy printout of the page on display can be obtained by a keystroke. In addition, automatic printout of all channels or of specified pages can be initiated on detection of a specified logic "trigger" event (i.e., a limit violation or other "Logic 1" bit state) and/or at a pre-specified time interval (from one minute to eight hours).

A "System Status" message (NORMAL, ALERT, or ALARM) can also be tied to selected System 10 logic bits, and will be displayed on the CRT in appropriate warning colors and/or blinking mode.

**Fig. 45** Typical Data Printout Generated by LOGGER1

**LOGGER1**

With optional printer, this program turns your System 10 / PC combination into an automatic datalogging system.

Columnar printout of "live" data from any seven channels is performed automatically at selectable time intervals, either "fast" (2 to 60 seconds) or "slow" (5 to 3600 seconds). See Fig. 45. The "fast" interval may be invoked automatically upon detection of one or more pre-specified limit violations or "Logic 1" bit states.

You can format LOGGER1 printouts, using simple menu-driven editing procedures to enter

**Fig. 46** Typical Data Printout Generated by TIMEPLOT
* **XYSCAT**

Plots a “live” scatter diagram on the computer CRT screen. Provides “live” plotting, in color, of up to three selected data channels versus any selected fourth channel (see Fig. 47). X- and Y-axis scales are individually selectable. The plot format can be saved on disk for future use or editing.

Data points can be plotted on operator keystroke, or automatically, at preselected time intervals or on detection of a logic-bit “trigger.” You can clear and restart the plot, freeze and resume plotting, or produce a hard-copy printout at the touch of a key.

* **SETUP1**

Allows quick, easy configuration of all system data channels. Via spreadsheet display, you can enter or modify configuration parameters for individual channels, including “type,” “location,” digital smoothing constant, limit values, limit logic, and visual effects for channel data display. Simply step the cursor to the proper variable and type in the desired value. The program also lets you define **CALCULATE (CLC)** functions for your system.

SETUP1 checks all user inputs for appropriateness before putting them into effect. “HELP” is available at every step. At the touch of a key, you can call to the screen an explanation of any specific channel variable and a full listing of the values it can take. Repeated reference to the instruction manual is no longer necessary.

* **CALIBR8**

Provides quick, easy calibration of all system data channels. Once the number of the channel to be calibrated has been entered, the program explains the various methods available for calibrating this particular “TYPE” of channel. These methods may include absolute calibration from known calibration data (“mV/V full scale,” “cycles per gallon,” “K factor,” etc.), “two-point (deadweight)” calibration, “simulated” calibration via shunt resistor, etc.

Having selected the desired method, you can proceed to calibrate the channel. CALIBR8 will prompt you with explicit, step-by-step instructions for all necessary procedures, including selection of engineering units and display resolution. All scaling calculations are performed by the program.

* **ASK1**

Interrogates the system for setup values pertaining to any data channel. The program searches the mainframe’s EEPROM setup memory and lists all pertinent configuration/calibration entries for a given data channel, plus any and all **EXECUTE (EXU), CONDITIONAL (CDL), or COMMAND (CMD)** statements which involve that channel. The user can step through the channel sequence, displaying a full screen of information for each channel.

ASK1 can also furnish a short-form listing of all active channels (with hard-copy printout, if desired), or of only those channels that share a specific “key” parameter (“type,” “location,” logic-bit association, etc.). For example, given the number of a particular channel, the program can tell you its slot “location”—or, given a particular “location,” it can tell you what channel resides there.

ASK1 is particularly useful when you’re “reconfiguring” your system and need to ensure that no new or modified setup values conflict with existing ones.

* **ASK2**

Interrogates the system for setup values pertaining to any logic bit. This program is similar to ASK1, except that it relates to system logic bits rather than to data channels. Thus, it will search for any and all setup entries that can affect the state of a particular bit—or it will inform you of everything the state of a given bit can affect. In light of the complex AND- and OR-coupling of bits which is possible with System 10, this program represents a powerful tool in the analysis of system logic behavior.

* **SYSPRINT**

Prints the current System 10 setup. Through SYSPRINT, you can obtain a hard-copy record of current system configuration values, which can be a useful system design and analysis tool. Configuration settings may be stored to disk file for permanent storage and to permit scrolling display.

* **FINDEXU**

Finds all of the system’s current **EXECUTE (EXU)** commands (see p. 14). The program searches the mainframe’s setup memory and lists all currently effective **EXECUTE (EXU)** commands—any of which you can then cancel, if you wish. (Forgotten EXECUTES can be mischievous!)

* **CLONE1, CLONE2**

These programs provide backup storage of System 10 setup data, and also duplication of any stored System 10 “configuration.”

CLONE1 offloads to a disk file all of the configuration and calibration data contained in the Central Processor memory of a previously set-up System 10 mainframe—and also in any and all “Coprocessor” memories, if present, in that mainframe (Model 10BD664, 10BACIA, 10BD4, etc; video setup data is handled by the VCLONE programs, below).

CLONE2 reloads into the same or a different System 10 mainframe the configuration/calibration data contained in a CLONE1-created file.

These are valuable “security” programs, since they allow any System 10 to be “backed up” for later reconfiguration, in the event that the configuration memory is accidentally or deliberately erased. They also permit duplication (“cloning”) of an original System 10 configuration in identical copies. Since many man-hours can be invested in calibration operations, this program pair can easily pay for itself in a single use by fully restoring lost calibration data.
Daytronic “SofPAC” Software

- **VCLONE1, VCLONE2**
  These programs provide backup storage of System 10 video page formats, and the easy transfer of video pages from one System 10 to another.
  Similar to the CLONE1 and CLONE2 programs, above, VCLONE1 and VCLONE2 will respectively load off and download to and from a computer disk file all configuration and video-page data contained in the system VIDEO MEMORY (including any optional “V” Cards).

- **LOGGER2, VIEWLOG, PRINTLOG, PLOTLOG**
  These programs provide comprehensive data recording and playback functions.
  LOGGER2 automatically scans any specified list of data channels on a predefined time schedule, producing a disk-based “historical” record of measurement data. The program takes into account the speed and memory capabilities of the computer on which it is being run, and guides the user to easy selection of the list of data channels to be scanned, the number of scan cycles to be recorded, and the time interval between successive scan cycles. Once entered, scanning formats (channel list, interval, duration, etc.) can be saved on disk for future use or editing. Data files are also stored by “name,” for rapid retrieval.

Once stored via LOGGER2—or via LOGGER2H, a special version for use with the History Card, as explained on p. 66—each data file may be processed by any of the three following programs.*

- **VIEWLOG** permits rapid CRT review of data-file contents from LOGGER2, LOGGER2H, LOGGER3, or LOGGER3H. You can use it not only for examining specific data within a file, but also for rapidly searching a large file for specific areas of interest—to be subsequently plotted (via PLOTLOG) or printed (via PRINTLOG). Selecting any five individual data channels for display, you can specify that all recorded data sets be displayed, or only every “nth” set (time of storage accompanies each data reading). Or you can view only those data sets taken between two specified times. Also, you can scroll backwards and forwards through displayed pages, or jump immediately to the next page in sequence. Finally, you can recycle the program as often as desired, with different selections each time.

- **PRINTLOG** gives columnar printout of selected data from a disk file produced by LOGGER2, LOGGER2H, LOGGER3, or LOGGER3H, using formats similar to those of LOGGER1. Once defined, these formats can be saved on disk for future use or editing. As with VIEWLOG, you can select data channels (in this case, any seven), data starting and stopping times, and either all data sets or every “nth” set for inclusion in the printout.

- **PLOTLOG** retrieves up to three channels for linear plotting on the computer CRT (for X vs. Y plotting, see PLOTLOG3, below). Each channel will be plotted in a different color against a common selected time base. Independent Y-axis scaling may be specified for each channel. In setting the desired time axis, you can command that the specified channels be plotted over the time represented by the entire file, or that the plot start at a given time and be scaled to a given number of hours, minutes, seconds, or milliseconds, full scale. This “axis control” feature permits an overall picture of a data set’s full recorded “history” within the file, followed, with the next recycling of the program, by a “zoom in” to any area of particular interest. By pressing a key, you can initiate hard-copy printout of the entire plot (see Fig. 46; a PLOTLOG printout is virtually identical in form to that produced by the TIMEPLOT program).

- **LOGGER3, PLOTLOG3**
  These programs yield true X versus Y plotting of data on the computer CRT screen.
  LOGGER3 is similar in function to LOGGER2, above, but is optimized to gather data specifically intended for X vs. Y plotting. It allows data sets to be taken upon operator keystroke, upon incremental changes in a specified data channel, and/or under automatic logic-bit control—either on a “one-shot” basis or at specified repetition rates.
  PLOTLOG3 will plot on the computer CRT any three channels versus any selected fourth channel, from a data file produced by LOGGER3 or LOGGER3H (a special version for use with the History Card, as explained on p. 66). X-axis and Y-axis scaling are individually selectable in all cases. By key entries, you can clear the screen, recycle (with new selections), or initiate hard-copy printout of the completed plot.

- **SETUP2H, LOGGER2H, SETUP3H, LOGGER3H**
  These programs are described under the Model 10BDR64 History Card (p. 66).

- **HSTYDUMP**
  This program is described under the Model 10BDR64 History Card (p. 66).

- **LOTUSLNK**
  Provides interactive linkage with LOTUS 1-2-3®. This program converts any data file stored under the LOGGER2, LOGGER2H, LOGGER3, or LOGGER3H program into a file format that permits importation and analysis by LOTUS 1-2-3 software.

- **CALL1**
  Establishes full modem linkage between a local computer and a single “remote” System 10 mainframe. CALL1 will set all necessary protocols for the telephone modem link, and will conduct all necessary tests to insure that the System 10 is ready to receive commands or interrogations from the computer. At this point other SuperPAC V programs can be invoked to log or display modem-transmitted data, to download instructions to the System 10 mainframe, or even to reconfigure the remote data-acquisition system (using the “cloning” programs).

All the user need do is to enter the proper telephone number (including long distance codes, if applicable), await confirmation from the System 10, and then run the desired programs.

- **CALLMANY**
  Automatically “calls up” and interrogates up to 100 remote System 10 mainframes. Following a user-defined time schedule and telephone-number list, CALLMANY will automatically call and interrogate up to 100 remote System 10 units. On an individual mainframe basis, the program will log data for specified channels to disk file. Once entered, specific calling lists and logging schedules can be saved on disk under individual file names for easy future recall.

- **FONFILE**
  Allows the user to build a disk file of telephone numbers for modem communications via the CALL1 and CALLMANY programs.

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* A special program named CONVERT5 is included for translation of “logger” files created by older SuperPAC versions to the SuperPAC V format.
Model PC-HSICA
High-Speed Serial Interface Card

This half-height card makes available to the computer a “DB-25” RS-232-C port for asynchronous serial communication at 600, 1200, 2400, 4800, 9600, 19.2K, and 153.6K baud. Baud rate and other interface protocols may be completely specified via the DOS “MODE COM” or BASIC “OPEN COM” command, or through the Windows® TERMINAL program.

With enhanced EMI filtering and transient suppression, the PC-HSICA is recommended for serial interchanges not only because of speed, but also because it furnishes a true hardware handshake, thus reducing the possible noise effects that can result from the use of a long interface cable. It features receive and transmit FIFO’s with 32-byte depth plus “Receive FIFO Full” and “Carriage Return Detect” interrupt capabilities. In addition, the PC-HSICA can be configured as a standard 16C650 UART with all its functional capability (requires optional driver).
Appendix A
System 10 Mnemonic Commands

ADD (ADDRESS) AUXILIARY COMPUTER INTERFACE OPERATION
Reads the IEEE-488 bus address setting of the Model 10BACI-488 to which the
command is directed.

ANO (ANALOG OUTPUT) ANALOG CHANNEL SETUP
Sets or reads the “data source” for a given analog output channel (or each such
channel in a given range of channels) as a fixed millivolt value or a linear func-
tion of a specified data channel.

ASL (A SLOT) LOGIC I/O SETUP
Sets or reads the bit group assigned to the Model 10AIO-16 occupying a given
A slot.

ASN (ASSIGN SATELLITE NUMBER) SATELLITE NETWORK SETUP
Sets or reads the satellite number of the network “node” to which the command is
directed, and determines the network role of that node (“host” or “satellite”).

ATC (ASSOCIATED TEXT COLOR) CRT VIDEO SETUP
Sets or reads the foreground/background color or intensity combination for the
display of all “associated” fixed text when in “text editor” mode.

ATT (ATTACH) GENERAL SYSTEM OPERATION
“Attaches” a given B slot to the mainframe command source (keyboard or Com-
puter Interface Port) from which the command originates. Cancelled by
DETACH (DET) command. “Read” form of the command returns the B slot
currently “attached” to the mainframe command source from which the com-
mand originates.

BAU (BAUD RATE) COMPUTER INTERFACE SETUP
Sets or reads protocols for the Computer Interface Port: baud rate (300 through
153.6K), number of data bits (7 or 8), number of stop bits (1 or 2), and parity
(even, odd, or none).

BCD (BINARY CODED DECIMAL) DIGITAL I/O SETUP
Sets a given bit group (or each bit group in a given range of bit groups) to encode
in BCD form either a specified decimal value or the current value of a specified
data channel. “Read” form of the command returns the decimal value currently
represented by the BCD configuration of a specified bit group (or each bit group in
a given range of bit groups), or the data channel assigned to that bit group.

BCP (B CENTRAL PROCESSOR) AUXILIARY COMPUTER INTERFACE SETUP
Informs all system Auxiliary Computer Interface Cards of the mainframe’s Central
Processor version. “Read” form of the command returns the current “BCP” set-
ing.

BDP (BIT DESIGNATOR PAIR) CRT VIDEO SETUP
Defines or reads a pair of words (with corresponding foreground/background color
or intensity combinations) to be used to display system logic bits.

BEE (ZERO OFFSET; “b”) ANALOG CHANNEL SETUP
Sets or reads the zero offset (“b” term) to be applied to the data reading of a given
channel or of each channel in a given range of channels. May also be used to
reset the precision of a CALCULATE pseudochannel.

BIN (BINARY) DIGITAL I/O SETUP
Sets a given bit group (or each bit group in a given range of bit groups) to encode
in BINARY form either a specified decimal value or the current value of a specified
data channel. “Read” form of the command returns the decimal value currently
represented by the BINARY configuration of a specified bit group (or each bit group
in a given range of bit groups), or the data channel assigned to that bit group.

BIT (SET BIT) SYSTEM LOGIC BITS
Sets or reads the logic state of a given bit or of each bit in a given range of bits.
May also be used to return bit control to the logic “source” specified by the last-
entered LOGIC SOURCE (SRC) command, and to turn on and off the main-
frame’s EEPROM Write Protect Switch.

BLS (BLANK LINE SUPPRESS) FORMATTED OUTPUT SETUP
Suppresses printout of all unused lines at the bottom of any CRT video page trans-
mitted from the Model 10VFO132 Printer Interface Port in response to a
PRINT PAGE (PRI) command.

BSD (BIT STATE DISPLAY) CRT VIDEO SETUP
Sets or reads the pair of words (with corresponding foreground/background color
or intensity combinations) to be used to display a given logic bit or each bit in
a given range of bits.

BSL (B SLOT) LOGIC I/O SETUP
Sets or reads the bit group assigned to the Model 10BIO-16 occupying a given
B slot.

BTS (BITS) SYSTEM LOGIC BITS
Cancels NO BITS (NOB) command, to resume normal reading of system logic
bits with each scan cycle. May be used to re-enable system EXECUTE (EXU)
functions.

BVS (B VIDEO SIGNAL) CRT VIDEO SETUP
Sets the system for operation with the Model 10BVS90 Video Signal Card.
“Read” form of the command returns the current “BVS” setting.

BYP (BYPASS) FIFO BUFFER OPERATION
Initiates or cancels the “FIFO bypass” for all outputs from the Computer Interface
Port. Principally used to obtain quick responses to “read” commands received at
the Model 10AFIFO’s Computer Port which do not relate to the 10AFIFO itself
(each such answer is transferred directly to the 10AFIFO’s output buffer). “Read”
form of the command returns the current “FIFO bypass” status.

CAT (CATALOG) FORMATTED OUTPUT TRANSMISSION
Transmits the VIDEO PAGE DIRECTORY from the Model 10VFO132 Printer
Interface Port.

CCH (CONVERSION CHANNEL) DIGITAL I/O SETUP
Sets a specified data channel as “data source” for a given “conversion” channel.
“Read” form of the command returns the source channel currently assigned to
a given conversion channel.

CDL (CONDITIONAL) AUTOMATIC COMMAND EXECUTION
Defines or reads the logical combination of system conditions that will set a given
“conditional bit” to Logic 1, expressed as a Boolean string of up to 16 mnemonic
terms and up to 15 operators. Applies to “B-sized” mainframes only.

CHN (CHANNEL) DATA TRANSMISSION;
SYSTEM PSEUDOCHANNELS; DIGITAL I/O SETUP
“Read” form of the command transmits current data once only for a given chan-
el or for each channel in a given range of channels. For every channel, outputs
x, w, z [OPT] from the Computer Interface Port, where x = optional channel
number “echo,” w = channel data value, z = optional limit-zone indicator num-
er, and [OPT] = output terminator. “Write” form of the command is normally
used to load a given pseudochannel (or each pseudochannel in a given range
of channels) with either a fixed data value or the current data reading of a specified
channel (includes resetting of scanned “MAX/MIN” CALCULATE pseudochannels).
“Write” form is also used to set up a BINARY or BCD input channel, and to dedi-
cate it to the reading of the BINARY or BCD configuration of a given bit group.
### System 10 Mnemonic Commands

**CHS (CURRENT HALT STATUS)**
Reads current “halt status” of a given Model 10BDR64 “history” recorder or of each recorder in a given range of recorders. For each recorder, returns the number of frames recorded so far since occurrence of the predefined “halt” condition and the total “halt depth” of the recorder.

**CLC (CALCULATE)**
Sets or reads the definition of a CALCULATE pseudochannel (x) as a function of one or more other channels (y, z); “m” and “b” are scaling and offset constants entered by the user:
- \( CLC \ x = m(CHNy) + b \)
- \( CLC \ x = (CHNy)/m + b \)
- \( CLC \ x = m(CHNy + CHNz) + b \)
- \( CLC \ x = m(CHNy - CHNz) + b \)
- \( CLC \ x = m(CHNy)/(CHNz) + b \)
- \( CLC \ x = m(CHNy)(CHNz) + b \)
- \( CLC \ x = (CHNy)/m + b \)
- \( CLC \ x = m(CHNy) + b \)

**CLK (CLOCK)**
Synchronizes scanning of data channels to the system time-of-day clock by pausing at the end of each scan until the clock regiserts its next tenth of a second. “Read” form of the command returns the current “CLK” setting.

**CLM (COLUMNS)**
Sets or reads the number of columns for all STREAM (STR) and HARD COPY (HCY) transmissions from the Computer Interface Port.

**CLQ (CLEAR QUEUE)**
Clears a “queue” of CRT video pages yet to be transmitted from the Computer Interface Port.

**CMD (COMMAND)**
Sets or reads the command(s) to be automatically executed when a given “conditional bit” goes “high” or “low.” “Read” form of the command can return the CMD command string for each conditional bit in a given range of conditional bits. Applies to “B-sized” mainframes only.

**CMT (COMMAND TERMINATOR)**
Sets or reads the single ASCII character to be recognized as the “command terminator” for all commands received via the Computer Interface Port or (if a Model 10VFO132 is present) by the FIFO Computer Port.

**COC (COUNTER CLEAR)**
Releases COUNTER RESET (COR) command, resuming normal updating (from zero) of a given Model 10ACT01 or 10ACC-4 “COUNTER” channel.

**COH (COUNTER HOLD)**
Inhibits updating of the scanned data reading of a given Model 10ACT01 or 10ACC-4 “COUNTER” channel.

**COLD BOOTV**
Displays menu page with further instructions for selective “rebooting” of the video card set.

**COM (COMMUNICATIONS)**
Designates a given “10BACI”-supplied Auxiliary Computer Interface to be the system’s DEFAULT COMMUNICATIONS PORT (DCP); reads the current DCP assignment. Also used to return the main Computer Interface Port to the function of DCP.

**CON (CONFIGURE)**
Sets a given channel to the configuration encoded by a specified ASCII string. “Read” form of the command returns the current ASCII-encoded configuration of a given channel or of each channel in a given range of channels.

**COR (COUNTER RESET)**
Sets and holds at zero the scanned data reading of a given Model 10ACT01 or 10ACC-4 “COUNTER” channel (unless the COUNTER HOLD (COH) command is in effect for that channel).

**COU (COUNTER UPDATE)**
Releases COUNTER HOLD (COH) command, updating the scanned data reading of a given Model 10ACT01 or 10ACC-4 “COUNTER” channel.

**CPC (CHARACTERS PER CHANNEL)**
Sets or reads the number of data-field spaces for all STREAM (STR) and HARD COPY (HCY) transmissions from the Computer Interface Port.

**CSB (COMPUTER STATUS BIT)**
Sets or reads the system COMPUTER STATUS BIT, which will be at “Logic 1” only when the COMPUTER COMMAND QUEUE is empty.

**CSF (CHECKSUM FIFO)**
Stores the checksum value of the 10AFIFO’s existing EEPROM contents and the checksum value of its existing RAM contents. “Read” form of the command is used to determine whether various FIFO checksum tests have passed or failed.

**DDI (DESTRUCTIVE DATA INPUT)**
Places the Model 10AFIFO in “cyclic” input mode, so that the FIFO main memory will continuously receive and store consecutive data records from the Computer Interface Port, rewriting over the oldest memory contents when it is full. Requires “FIFO bypass” to be off.

**DDO (DESTRUCTIVE DATA OUTPUT)**
Closes the Model 10AFIFO to output through the FIFO Computer Port the oldest data record in the FIFO main memory, one time only. A copy of this data record is retained in the 10AFIFO’s output buffer, the previous contents of which are destroyed (for retransmission of output-buffer contents, see the NONDESTRUCTIVE DATA OUTPUT (NDO) command). Only effective when the 10AFIFO is in “GATED” OUTPUT MODE (see the TRANSMISSION DISABLE (XDS) command) and the “FIFO bypass” is off.

**DEC (DECREMENT)**
Decreases by one count the current data value of a given “download” pseudochannel or of each “download” pseudochannel in a given range of channels.

**DEL (DELETE)**
Deletes a specified video page format from EEPROM storage; requires special confirmation, and can only be entered through the keyboard.

**DET (DETACH)**
Cancels ATTACH (ATT) command, detaching the B card presently “attached” to the mainframe command source (keyboard or Computer Interface Port) from which the command originates.

**DFC (DATA FIELD COLOR)**
Sets or reads the foreground/background color or intensity combination for the display of all data fields when in “text editor” mode.
DHT (DEFAULT HEADER/TAILER) FORMATTED OUTPUT SETUP
Sets or reads the default “header” and “tailer” pages for Model 10VFO132
PRINT CHANNEL DATA (PRT) transmissions.

DIR (DIRECTORY) CRT VIDEO SETUP
Calls the VIDEO PAGE DIRECTORY to display.

DIS (DISPLAY) GENERAL SYSTEM SETUP
Sets the mainframe for proper functioning of its 2-line or 7-line LCD display and
for proper keyboard communications. Applies to all “A-sized” mainframes with
local or remote LCD display.

DIT (DISPLAY TEST) GENERAL SYSTEM SETUP
Writes an ASCII character string to the VFD display, then turns ON all display pix-
els, then turns all pixels OFF. Applies to Model 10K2D and 10K4T-DA
Mainframes only.

DLB (DOWNLOAD BITS) SATELLITE NETWORK SETUP
When applied to the network host, causes the Model 10BD4 Satellite Interface
Card to download a given “global” bit group (or a continuous range of “global”
bit groups) to each “A-sized” satellite in the network that has been set to “hear”
these bits, with each 10BD4 scan cycle. “Read” form of the command returns the
global bit group(s) to be downloaded with each scan cycle.

DLC (DOWNLOAD CHANNELS) SATELLITE NETWORK SETUP
When applied to the network host, causes the Model 10BD4 Satellite Interface
Card to download a given “global” data channel (or a continuous range of “global”
data channels) to each “A-sized” satellite in the network that has been set to “hear”
these channels, with each 10BD4 scan cycle. “Read” form of the command returns the
global data channel(s) to be downloaded with each scan cycle.

DMP (DUMP) DATA TRANSMISSION
Transmits current data once only for all scanned channels (including Chns. 998
(TIME) and 999 (DATE)) or for a continuous range of channels. For every chan-
nel, outputs x, w, z [OPT] from the Computer Interface Port, where x = option-
al channel number “echo,” w = channel data value, z = optional limit-zone
indicator number, and [OPT] = output terminator.

DLY (DELAY) DATA TRANSMISSION SETUP
Sets or reads the time delay (in milliseconds) between successive channel data
transmissions from the Computer Interface Port in response to a DUMP (DMP),
STREAM (STR), HARD COPY (HCY), SNAPSHOT (SNP), or LIMIT
ZONE (LZN) command.

DSM (DUMP SYSTEM MESSAGE DATA) DATA TRANSMISSION
Transmits in BINARY (ASCII-CODED) format any pending System 10 “mes-
sage”—including responses to valid mnemonic commands—terminated by the
current “OPT” (Output Terminator). If no message is pending, a null string will be
issued.

DTE (DATE) GENERAL SYSTEM SETUP
Sets or reads the system internal date.

ECO (ECHO) DATA TRANSMISSION FORMATTING
Enables channel-number “echo” for all transmissions from the Computer Inter-
face Port in response to a CHANNEL (CHN), DUMP (DMP), or SNAPSHOT
(SNP) command; automatically in effect for all STREAM (STR) and HARD
COPY (HCY) transmissions. Cancelled by NO CHANNEL (NCH) command.

EID (EXTERNAL INPUT DISABLE) COUNTER/TIMER OPERATION
Disconnects from the Model 10ACT01 that uses a specified data channel all
external signals and logic commands received at its rear I/O connector. Cancelled by
EXTERNAL INPUT ENABLE (EIE) command.

EIE (EXTERNAL INPUT ENABLE) COUNTER/TIMER OPERATION
Cancels EXTERNAL INPUT DISABLE (EID) command, reconnecting all
external signals and logic commands received by the Model 10ACT01 that uses
a specified data channel.

EMM (SCALING FACTOR: “m”) ANALOG CHANNEL SETUP
Sets or reads the scaling factor (“m” coefficient) to be applied to the data reading
of a given channel or of each channel in a given range of channels. May be used to
reset the precision of an analog input channel.

EMP (EMPTY) HISTORY CARD OPERATION
Outputs from the Computer Interface Port either all “frames” or a selected number of
“frames” of a given Model 10BDR64 “history” recorder, in sequence, that
have been recorded since the EMP command was last applied to that recorder.

EOI (END OR IDENTIFY) AUXILIARY COMPUTER INTERFACE SETUP
Causes an invocation of the END OR IDENTIFY (EOI) function after the last byte of
the “output terminator” (OPT) and/or “end-of-transmission terminator”
(EOT) for all transmissions from the Model 10BACI-488 to which the com-
mand is directed. “Read” form of the command returns the current EOI settings for
this 10BACI-488.

EOL (END OF LINE) FORMATTED OUTPUT SETUP
Sets or reads the printer control character(s) to be transmitted at the end of each
line of output issued from the Model 10VFO132 Printer Interface Port in
response to a PRINT PAGE (PRI) or PRINT CHANNEL DATA (PRT)
command.

EOP (END OF PAGE) FORMATTED OUTPUT SETUP
Sets or reads the printer control character(s) to be transmitted at the end of each
page of output issued from the Model 10VFO132 Printer Interface Port in
response to a PRINT PAGE (PRI) or PRINT CHANNEL DATA (PRT)
command.

EOT (END OF TRANSMISSION) DATA TRANSMISSION FORMATTING
Sets or reads the string of up to four ASCII characters to be used as the “end-of-
transmission terminator” for all outputs from the Computer Interface Port or (if a
Model 10AFIFO is present) from the FIFO Computer Port—if this string is to be
different from the current “output terminator” (see the OPT command).

ESC (ESCAPE) DATA TRANSMISSION
Halts any transmission from the Computer Interface Port; clears any partial com-
mand that may have been previously entered. May be entered by pressing the key-
board’s Esc key, or by transmitting the [ESC] character to the system via the
Computer Interface Port.
**System 10 Mnemonic Commands**

**Mnemonic Commands**

**FRZ (FREEZE)**

Sets an unchanging (“frozen”) search frame for every “non-statistical” playback pseudochannel assigned to a given Model 10BDR64 “history” recorder (or to each recorder in a given range of recorders), on the basis of a specified search-depth offset; also specifies an increment for further keyboard-controlled alteration of the search depth (see also the ZOOM (ZUM) command). “Read” form of the command returns the current search-depth offset and depth increment for a recorder or range of recorders.

**FRQ (FREQUENCY CALIBRATION)**

Sets an appropriate scaling factor for a given Frequency Input Channel (or for each such channel in a given range of channels) based on the nominal full-scale rating of the frequency source (or the highest frequency expected to be measured) and the corresponding value of the measured phenomenon, expressed in the desired engineering units and precision. “Read” form of the command returns current “FRQ” calibration constants for the frequency input channel(s).

**FRC (FORCE)**

Sets the scaling factor (“m” coefficient) for a given analog input channel—or for each such channel in a given range of channels—so that the existing channel input yields a specified reading. Also sets desired precision (decimal-point location) for the channel(s). “Read” form of the command returns an internal scaling number for a given analog input channel or each such channel in a given range of channels.

**FIL (FILTER)**

Sets or reads the digital smoothing constant (0 through 15) for a given analog input channel or for each analog input channel in a given range of channels.

**FCH (FRAME CHANNELS)**

When directed to a Model 10BACIA, 10BACI-422, or 10BACI-488, sets or reads the continuous range of data channels to be loaded into that card’s output buffer at the end of every complete scan cycle, thus allowing a time-coherent “frame” of data.

**FDM (FLOATING POINT DUMP)**

Instructs a “10BACI” card equipped with the “FP” option to output data for either all scanned channels or a continuous range of channels once only and in the floating-point format specified by the last-entered FLOWING POINT FORMAT (FPF) command.

**FCL (FIFO CLEAR)**

Clears the Model 10AFIFO memory, using a physical overwrite technique to destroy all stored contents, which cannot be reaccessed via the REACCESS FIFO MEMORY (RFM) command.

**EXM (EXECUTE MODE)**

**AUTOMATIC COMMAND EXECUTION**

Enables or disables “EXECUTE” powerup delay (when the delay is enabled, triggering of system EXECUTE (EXU) sequences will not occur during the first 15 seconds after powerup). “Read” form of the command returns the current “execute mode” (disabled or enabled). Applies to “B-sized” mainframes only.

**EXU (EXECUTE)**

**AUTOMATIC COMMAND EXECUTION**

Sets or reads the command(s) to be automatically executed when a given system logic bit goes “high” or “low.” “Read” form of the command can return the EXU command string for each bit in a given range of bits.

**FHY (FIRMWARE HISTORY)**

**LCD GRAPHICS OPERATION**

Clears the “history memory” of a given Model 10BDR64 “history” recorder or of each recorder in a given range of recorders. For “true erasure” of history memory, see the NONVOLATILE HISTORY (NVH) command.

**FRX (GRAPH RANGE X)**

**LCD GRAPHICS SETUP**

Sets or reads the full-scale display range for the “x” channel of a given “XY” or “STRIP-CHAR” LCD video page or of each such page in a given range of pages.

**FRY (GRAPH RANGE Y)**

**LCD GRAPHICS SETUP**

Sets or reads the full-scale display range for the “y” channel of a given “XY” or “STRIP-CHAR” LCD video page or of each such page in a given range of pages.

**FRZ (GRAPH RANGE Z)**

**LCD GRAPHICS SETUP**

Sets or reads the full-scale display range for the “z” channel of a given “STRIP-CHART” LCD video page or of each such page in a given range of pages.

**GBL (GLOBAL)**

**SATELLITE NETWORK OPERATION**

When issued to a satellite network node, disables or re-enables the transmission from that node of any and all “implicitly addressed” commands entered at that node via keyboard, Computer Interface Port, or Auxiliary Computer Interface Port. When GBL=OFF, every command entered at that node is treated strictly as a “local” command. Also reads the current “GBL” status of the interrogated node.

**GCL (GRAPH CLEAR)**

**LCD GRAPHICS OPERATION**

Clears the plot of the “XY” LCD video page on display and restarts plotting from current x,y values.

**GDR (GRAPH RANGE X)**

**LCD GRAPHICS SETUP**

Sets or reads the format (IEEE or DEC) for the floating-point output of a “10BACI” card equipped with the “FP” option to output data for either all scanned channels or a continuous range of channels once only and in the floating-point format specified by the last-entered FLOATING POINT FORMAT (FPF) command.

**GFR (GRAPH RANGE Y)**

**LCD GRAPHICS SETUP**

Sets or reads the format (IEEE or DEC) for the floating-point output of a “10BACI” card equipped with the “FP” option (see also the FLOATING POINT FORMAT (FPF) command).

**GZL (GRAPH ZERO LEFT)**

**LCD GRAPHICS OPERATION**

Initiates “zero left” mode for all “STRIP-CHART” LCD video pages. Each displayed time scale—as defined by the INTERVAL (INT) command—will scroll continuously to the left with each new recording, the numbers on the scale indicating elapsed time since recording began. Subsequent manual scrolling of the displayed page via keyboard “arrow” keys is possible in “GZL” mode (only). In this mode, the LCD strip-chart recorder will stop when it reaches its maximum depth, and can only be restarted by application of a REORDER CLEAR (REC) command or by recycling power.

**GZR (GRAPH ZERO RIGHT)**

**LCD GRAPHICS OPERATION**

Initiates “zero right” mode for all “STRIP-CHART” LCD video pages. Each displayed time scale—as defined by the INTERVAL (INT) command—will scroll continuously to the right with each new recording, the numbers on the scale indicating elapsed time since recording began. Subsequent manual scrolling of the displayed page via keyboard “arrow” keys is possible in “GZR” mode (only). In this mode, the LCD strip-chart recorder will not stop when its maximum depth is reached, but will continue to record, overwriting the oldest recording in memory with each new recording.

**HCL (HISTORY CLEAR)**

**HISTORY CARD OPERATION**

Clears the “history memory” of a given Model 10BDR64 “history” recorder or of each recorder in a given range of recorders. For “true erasure” of history memory, see the NONVOLATILE HISTORY (NVH) command.

**HCY (HARD COPY)**

**DATA TRANSMISSION**

Transmits current data once only for a given channel, for each channel in a given range of channels, or for all scanned channels (including Chns. 998 (TIME) and 999 (DATE)). For every channel, outputs x, w, z [OPT] from the Computer Interface Port, where x = channel number “echo,” w = channel data value, z = optional limit-zone indicator number, and [OPT] = output terminator. “HCY” output also includes user-specified HEADER and/or TAILER (see HEADER (HDR) and TAILER (TLR) commands).

**HDP (HALT DEPTH)**

**HISTORY CARD SETUP**

Sets or reads the “halt depth” for a given Model 10BDR64 “history” recorder or for each recorder in a given range of recorders (a recorder’s halt depth is the number of frames that will be recorded following occurrence of a halt-triggering condition).

**HDR (HEADER)**

**DATA TRANSMISSION FORMATTING**

Sets or reads an ASCII string of up to 80 characters to be transmitted at the beginning of each data set transmitted from the Computer Interface Port in response to a STREAM (STR) or HARD COPY (HCY) command.
HDO (HISTORY DUMP)  HISTORY CARD OPERATION
Transmits from the Computer Interface Port a given “frame” (or each frame in a
given range of frames) from a specified Model 10BDR64 “history” recorder.
Output format is determined by the OUTPUT IMAGE (IMA) command.

HEX (HEXADECIMAL)  SYSTEM LOGIC BITS
Sets a given bit group (or each bit group in a given range of bit groups) to repre-
sent a specified four-character HEXADECIMAL word. “Read” form of the com-
mand returns the HEXADECIMAL word currently represented by the existing
configuration of a specified bit group (or each bit group in a given range of bit
groups).

HIL (HIGH LIMIT)  ANALOG CHANNEL SETUP
Sets or reads the HIGH limit value for a given channel or for each channel in a
given range of channels; it can be a fixed value or equal to the “live” reading of a
specified channel.

HLT (HALT)  HISTORY CARD SETUP
Sets or reads the logical combination of conditions that will cause a given Model
10BDR64 “history” recorder to halt the recording of data, expressed as a Boolean
string of up to 16 mnemonic terms and up to 15 operators.

LCD (INTERCHARACTER DELAY)  FORMATTED OUTPUT SETUP
Sets or reads the time delay between successive character transmissions from the
Model 10VFO132 Printer Interface Port.

IMA (OUTPUT IMAGE)  HISTORY CARD SETUP
Sets or reads the variables (frame number, serial number, time, date, etc.) to
appear in each line of output for a given Model 10BDR64 “history” recorder,
and the order in which they are to be transmitted.

INC (INCREMENT)  COUNTER/TIMER FUNCTIONS
Increases by one count the current data value of a given “download” pseudo-
channel or of each “download” pseudochannel in a given range of channels. May also
be used to increment a single “COUNTER” channel (only) of a Model
10ACT01 or 10ACC-4.

INT (INTERVAL)  ANALOG CHANNEL SETUP
Sets or reads the recording interval for the mainframe’s “STRIP-CHART” recorder
and the time scale to be displayed on every “STRIP-CHART” LCD video page. The
interval can be set to the current scan rate, with 200 recordings per page.

ITR (COMPUTER INTERRUPT)  COMPUTER INTERFACE SETUP
“Write” form of the command sets the string of up to 32 ASCII characters to be
transmitted from the Computer Interface Port (only) upon receipt of the “read”
form of the command.

KEY  KEYBOARD SETUP
Sets or reads the three-letter command mnemonic to be issued by the keyboard
when a given numeral key from 0 through 4 is pressed, after the Prompt key is
pressed.

LBT (“BETWEEN” LOGIC)  ANALOG CHANNEL SETUP
Sets or reads the logic bit to be at “Logic 1” when data for a given channel (or for
any channel in a given range of channels) is in that channel’s SAFETY (NO VIO-
LATION) limit zone.

LCT (LOCATE)  ANALOG CHANNEL SETUP
Sets or reads the “location” assignment for a given system ANALOG I/O channel
(or for each such channel in a given range of channels). May also be used to
“locate” a VOLATILE DOWNLOAD pseudochannel to a “10BAC” card, or a
GLOBAL DATA CHANNEL to a Model 10BD1 Satellite Slave Card.

LEG (LEGEND)  LCD/VFD VIDEO SETUP
Sets or reads the 4-character unit legend to appear with every display of a given
channel (or of every channel in a given range of channels) on the mainframe’s
LCD/VFD display.

LGO (LOGO)  LCD/VFD AND CRT VIDEO SETUP
Sets or reads the string of characters to be displayed in the mainframe’s LCD/VFD
or CRT display “billboard” line whenever the “billboard” is not called upon to dis-
play other material.

LGT (“GREATER THAN” LOGIC)  ANALOG CHANNEL SETUP
Sets or reads the logic bit to be at “Logic 1 ” when data for a given channel (or for
any channel in a given range of channels) is in that channel’s “GREATER THAN”
limit zone.

LIM (LIMITS)  DATA TRANSMISSION FORMATTING
Includes the limit-zone indicator number for every channel in all CHANNEL
(CHN), DUMP (DMP), HARD COPY (HCY), STREAM (STR), and
SNAPSHOT (SNP) transmissions from the Computer Interface Port. Cancelled by
NO LIMITS (NOL) command.

LIN (LINEARIZE)  ANALOG CHANNEL SETUP
Sets or reads the prestored linearization table to be applied to a given analog input
channel. May also be used to set up a LINEARIZATION pseudochannel.

LLT (“LESS THAN” LOGIC)  ANALOG CHANNEL SETUP
Sets or reads the logic bit to be at “Logic 1” when data for a given channel (or for
any channel in a given range of channels) is in that channel’s “LESS THAN” limit
zone.

LNE (LINE)  CRT VIDEO OPERATION
“Write” form of the command changes the current format (height/width, color/
intensity, fixed text, data fields, etc.) of a specified line of the CRT video page on
display. “Read” form of the command transmits from the Computer Interface
Port the format of a specified line of the CRT video page on display (unless the line
contains one or more bargraph fields).

LOK (LOCK)  GENERAL SYSTEM OPERATION
Inhibits automatic updating of the system DATA RAM, instantly “locking” all
scanned channels, one given channel, or each channel in a given range of chan-
nels. Cancelled by UNLOCK (UNL) command.

LOL (LOW LIMIT)  ANALOG CHANNEL SETUP
Sets or reads the LOW limit value for a given channel or for each channel in a
given range of channels; it can be a fixed value or equal to the “live” reading of a
specified channel.

LST (LIST)  HISTORY CARD AND LCD GRAPHICS SETUP
Sets or reads the “list” of variables for a given Model 10BDR64 “history” recorder.
The “list” expression can include channels and channel ranges, bit
groups and bit-group ranges, and (optional) data. Also clears the specified
recorder and all higher-numbered recorders. For “A-sized” mainframes with LCD
“G Option,” sets or reads the “list” of channels and/or channel ranges for the
“STRIP-CHART” recorder.

LZN (“LIMIT ZONE”)  DATA TRANSMISSION
When entered through the Computer Interface Port, transmits from that port a
number indicating the limit zone in which the data for a given channel (or for
each channel in a given range of channels) currently lies. When entered through
the keyboard, displays the limit status (only).

MEM (MEMORY)  HISTORY CARD OPERATION
Returns a hexadecimal number representing the total number of scaled data read-
ings the history “system” is capable of storing; the answer also indicates whether
the history memory is currently volatile or nonvolatile.
### System 10 Mnemonic Commands

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<th>Description</th>
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<tr>
<td><strong>MES</strong> (MESSAGE)</td>
<td><strong>CRT VIDEO OPERATION</strong>&lt;br&gt;Sets or reads the alphanumeric text string to appear in the displayed field of a given system &quot;message.&quot; Also specifies the visual effects for that display.</td>
</tr>
<tr>
<td><strong>MOD</strong> (MODE)</td>
<td><strong>FIFO BUFFER OPERATION</strong>&lt;br&gt;Reads current &quot;input&quot; and &quot;output&quot; modes for the <strong>Model 10AFIFO</strong> (see the DDI, NDI, XEN, and XDS commands).</td>
</tr>
<tr>
<td><strong>MTC</strong> (MASTER TIMING CLOCK)</td>
<td><strong>GENERAL SYSTEM SETUP</strong>&lt;br&gt;Starts or stops synchronization of the system time-of-day clock to the externally sourced timing pulse received from the single <strong>Model 10BACI-422</strong> to which the command is directed. Requires <strong>CLK=ON</strong> command to be in effect, and power to be cycled. &quot;Read&quot; form of the command returns current &quot;MTC&quot; status.</td>
</tr>
<tr>
<td><strong>MVV</strong> (MILLIVOLT/VOLT CALIBRATION)</td>
<td><strong>ANALOG CHANNEL SETUP</strong>&lt;br&gt;Sets or reads an appropriate scaling factor for a given <strong>Strain Gage Input Channel</strong> (or for each such channel in a given range of channels) based on the transducer sensitivity rating in mV/V, full scale, and the nominal full-scale rating of the transducer expressed in the desired engineering units and precision. &quot;Read&quot; form of the command returns current &quot;MVV&quot; calibration constants for the strain gage input channel(s).</td>
</tr>
<tr>
<td><strong>NCH</strong> (NO CHANNEL)</td>
<td><strong>DATA TRANSMISSION FORMATTING</strong>&lt;br&gt;Cancels <strong>ECHO (ECO)</strong> command, removing channel-number &quot;echo&quot; for all transmissions from the Computer Interface Port in response to a <strong>CHANNEL (CHN)</strong>, <strong>DUMP (DMP)</strong>, or <strong>SNAPSHOT (SNP)</strong> command.</td>
</tr>
<tr>
<td><strong>NDI</strong> (NONDESTRUCTIVE DATA INPUT)</td>
<td><strong>FIFO BUFFER SETUP</strong>&lt;br&gt;Places the <strong>Model 10AFIFO</strong> in &quot;FILL&quot; <strong>INPUT MODE</strong>, so that the <strong>FIFO</strong> main memory will receive and store consecutive data records from the Computer Interface Port until the memory is full, after which it will receive and store a data record only when the required memory space becomes available. Requires &quot;FIFO bypass&quot; to be off.</td>
</tr>
<tr>
<td><strong>NDO</strong> (NONDESTRUCTIVE DATA OUTPUT)</td>
<td><strong>FIFO BUFFER OPERATION</strong>&lt;br&gt;Causes the <strong>Model 10AFIFO</strong> to output through the <strong>FIFO Computer Port</strong> the data record currently in the <strong>10AFIFO</strong>’s output buffer, one time only (this data record is retained in the output buffer, and may be retransmitted by subsequent applications of the <strong>NDO</strong> command). Only effective when the <strong>10AFIFO</strong> is in &quot;GATED&quot; <strong>OUTPUT MODE</strong> (see the <strong>TRANSMISSION DISABLE (XDS)</strong> command) or when the &quot;FIFO bypass&quot; is on.</td>
</tr>
<tr>
<td><strong>NOB</strong> (NO BITS)</td>
<td><strong>SYSTEM LOGIC BITS</strong>&lt;br&gt;Disables the reading of system logic bits with each scan cycle; cancelled by <strong>BITS (BTS)</strong> command. May be used to disable system <strong>EXECUTE (EXU)</strong> functions.</td>
</tr>
<tr>
<td><strong>NOD</strong> (NODE)</td>
<td><strong>SATELLITE NETWORK OPERATION</strong>&lt;br&gt;Routes a single standard mnemonic command of up to 80 ASCII characters to a given network node (host or satellite), one time only. Requires <strong>OPEN=LOC</strong> command to be in effect at the node where the <strong>NOD</strong> command is entered.</td>
</tr>
<tr>
<td><strong>NOL</strong> (NO LIMITS)</td>
<td><strong>DATA TRANSMISSION FORMATTING</strong>&lt;br&gt;Cancels <strong>LIMITS (LIM)</strong> command, removing channel limit-zone indication from all transmissions from the Computer Interface Port in response to a <strong>CHANNEL (CHN)</strong>, <strong>DUMP (DMP)</strong>, <strong>HARD COPY (HCP)</strong>, <strong>STREAM (STR)</strong>, or <strong>SNAPSHOT (SNP)</strong> command.</td>
</tr>
<tr>
<td><strong>NVH</strong> (NONVOLATILE HISTORY)</td>
<td><strong>HISTORY CARD SETUP</strong>&lt;br&gt;Activates the system's optional nonvolatile &quot;history&quot; memory, physically erasing all current memory and making inaccessible for storage of subsequent recordings the original 32K readings of the <strong>Model 10BDR64</strong> card.</td>
</tr>
<tr>
<td><strong>OPN</strong> (OPEN)</td>
<td><strong>SATELLITE NETWORK OPERATION</strong>&lt;br&gt;&quot;Opens&quot; an &quot;explicit&quot; command route between the network node to which the command is applied and one (only) other specified network node (host or satellite). May also be used to return to &quot;local&quot; operation the node command source through which the <strong>OPN</strong> command is entered, thus cancelling the &quot;explicit&quot; routing of commands from that node to another node. &quot;Read&quot; form of the command returns the number of the node currently &quot;open&quot; to the local command source, or &quot;LOC,&quot; if no node is &quot;open&quot; to the source node.</td>
</tr>
<tr>
<td><strong>OPT</strong> (OUTPUT TERMINATOR)</td>
<td><strong>DATA TRANSMISSION FORMATTING</strong>&lt;br&gt;Sets or reads the string of one or two ASCII characters to be used as the end-of-line terminator for all outputs from the Computer Interface Port or (if a <strong>Model 10AFIFO</strong> is present) from the FIFO Computer Port. Also sets the end-of-transmission terminator (see the <strong>EOT</strong> command).</td>
</tr>
<tr>
<td><strong>PAG</strong> (PAGE)</td>
<td><strong>LCD/VFD AND CRT VIDEO OPERATION</strong>&lt;br&gt;Calls any existing LCD/VFD or CRT video page to display. May also be used to read the number of the video page currently being displayed, and to read the number of &quot;blocks&quot; of video memory currently used by an existing CRT video page.</td>
</tr>
<tr>
<td><strong>PBR</strong> (PRINTER BAUD RATE)</td>
<td><strong>FORMATTED OUTPUT SETUP</strong>&lt;br&gt;Sets or reads protocols for the <strong>Model 10VFO132</strong> Printer Interface Port: baud rate (50 through 19.2K), number of data bits (7 or 8), number of stop bits (1 or 2), and parity (even, odd, or none).</td>
</tr>
<tr>
<td><strong>PEN</strong></td>
<td><strong>LCD GRAPHICS OPERATION</strong>&lt;br&gt;&quot;Raises&quot; or &quot;lowers&quot; the &quot;pen&quot; of an &quot;XY&quot; LCD video page (i.e., discontinues or resumes plotting of data points from current values), or one specified &quot;pen&quot; (X, Y, or Z) of a &quot;STRIP-CHART&quot; LCD video page. Also reads the current pen status for an &quot;XY&quot; LCD video page, or for a given pen of a &quot;STRIP-CHART&quot; LCD video page.</td>
</tr>
<tr>
<td><strong>PGL</strong> (PAGE LIST)</td>
<td><strong>LCD/VFD VIDEO SETUP</strong>&lt;br&gt;For a given &quot;DATA&quot; LCD/VFD video page (or for each such page in a given range of pages), sets or reads the &quot;list&quot; of up to 12 data channels to be displayed. For one or a range of &quot;XY&quot; LCD video pages, sets or reads the two channels on which the displayed plot is to be based. For one or a range of &quot;STRIP-CHART&quot; LCD video pages, sets or reads one, two, or three channels to be plotted versus time.</td>
</tr>
<tr>
<td><strong>PBT</strong> (PAGE TYPE)</td>
<td><strong>LCD GRAPHICS SETUP</strong>&lt;br&gt;For a given &quot;DATA&quot; LCD/VFD video page (or for each such page in a given range of pages), sets or reads the &quot;page type&quot; (&quot;DATA,&quot; &quot;XY,&quot; or &quot;STRIP-CHART&quot;) for a given LCD video page or for each LCD video page in a given range of pages.</td>
</tr>
<tr>
<td><strong>PLA</strong> (PLAYBACK)</td>
<td><strong>HISTORY CARD SETUP</strong>&lt;br&gt;Sets up a &quot;NORMAL&quot; or &quot;VIDEO PLAYBACK&quot; pseudochannel to represent the data value for a specified channel that was recorded by a given <strong>Model 10BDR64</strong> &quot;history&quot; recorder a specified number of &quot;frames&quot; in the past. May also be used to set up a video playback pseudochannel to represent the serial number, integral time of recording, fractional time of recording, or date of recording of a given &quot;frame.&quot; When an optional <strong>Model 10BSPC384</strong> card is present, may be used to set up a &quot;VIDEO STATISTICAL PLAYBACK&quot; pseudochannel to represent the lowest value, highest value, continuous average value, &quot;X-BAR,&quot; or &quot;RANGE&quot; experienced by a specified channel over a specified number of &quot;frames.&quot; &quot;Read&quot; form of the command returns the current playback parameters for a given channel.</td>
</tr>
<tr>
<td><strong>PRI</strong> (PRINT PAGE)</td>
<td><strong>FORMATTED OUTPUT TRANSMISSION</strong>&lt;br&gt;Transmits a specified video page, each video page in a specified range of pages, or the video page currently on display—along with all appropriate &quot;live&quot; data—from the <strong>Model 10VFO132</strong> Printer Interface Port. May also be used to transmit CARRIAGE RETURN from the Printer Interface Port (for vertical formatting of printouts).</td>
</tr>
</tbody>
</table>
Mnemonic Commands

PRT (PRINT CHANNEL DATA) FORMATTED OUTPUT TRANSMISSION
Transmits from the Model 10VFO132 Printer Interface Port the data for a given channel, a given range of channels, or all scanned channels, along with specified HEADER and TAILER pages (which may be the DEFAULT header and tailer, if desired—see DEFAULT HEADER/TAILER (DHT) command), with blank-line suppression. Per-channel output may include channel number and limit-zone indicator number—see also TEMPLATE (TMP) and CHANNELS PER LINE (CPL) commands.

PSB (PERIPHERAL STATUS BIT) AUTOMATIC COMMAND EXECUTION
Sets or reads the system PERIPHERAL STATUS BIT, which will be at “Logic 1” only when the PERIPHERAL COMMAND QUEUE is empty.

PTY (PRINTER TYPE) FORMATTED OUTPUT SETUP
Sets or reads the “printer type” for Model 10VFO132 transmitters.

RCL (RECALL) CRT VIDEO OPERATION
“Recalls” to display (from temporary buffer storage) the last CRT video page to have been composed or edited.

REC (RECODER CLEAR) LCD GRAPHICS OPERATION
Clears the mainframe’s LCD “STRIPT-CHART” recorder; the next recording will have a “depth” of “1.” In “ZERO LEFT” mode, resets the time scale to “zero” (see the GRAPH ZERO LEFT (GZL) command).

REF (REFRESH) CRT VIDEO SETUP
Sets or reads the refresh rate for the CRT display.

REH (RECODER HALT) LCD GRAPHICS OPERATION
Halt becomes the LCD “STRIPT-CHART” recorder until application of a RECODER START (RES) command or recycling of power; freezes the displayed plot and time scale (if scrolling) for all LCD “STRIPT-CHART” video pages.

RES (RECODER START) LCD GRAPHICS OPERATION
Restarts an LCD “STRIPT-CHART” recorder that has been halted by a RECODER HALT (REH) command, from the point where it was halted.

RFL (REACCESS FIFO MEMORY) FIFO BUFFER OPERATION
Restores access to all data records currently contained in the Model 10AFFF0.

RHM (REACCESS HISTORY MEMORY) HISTORY CARD OPERATION
Restores access to all recorded “frames” currently contained in a given Model 10BDR64 “history” recorder—or in each recorder of a given range of recorders—regardless of any and all EMPTY (EMP) commands previously applied to the recorder(s). May also be used to restore access only to the last “n” frames recorded by a given “history” recorder or range of recorders prior to the last EMPTY (EMP) command.

RLS (RELEASE) SYSTEM LOGIC BITS
Releases the LATCH of a given logic bit or of each bit in a given range of bits.

RMD (RECORD MODE) HISTORY CARD OPERATION
Causes the Model 10BDR64 History Card to exit setup mode, making each of the four recorders ready to record data and inhibiting further entry or modification of setup values (see SETUP MODE (SMD) command).

RNG (RANGE) COUNTER/TIMER AND ENCODER CONDITIONER SETUP
Sets or reads a specific combination of range and resolution for a Model 10ACT01 or 10ACC-4 channel or range of channels. May also be used to set or read a count predivision integer for a Model 10A35 channel or range of channels, or to reset (“zero-index”) a 10A35 channel or range of channels.

RPL (REPLAY) HISTORY CARD OPERATION
Initiates or terminates either a single “history replay” or repeated “history replays” for all “nonstatistical” playback pseudochannels set up for a given Model 10BDR64 “history” recorder or for each recorder in a given range of recorders.

RSM (RESUME) ANALOG CHANNEL SETUP
Resumes normal measurement by unlatching any and all latched calibration conditions that may exist for a given channel or for any channel (see the SHUNT CALIBRATE (SHP/SHN) commands).

RSN (RESET SERIAL NUMBER) HISTORY CARD OPERATION
Resets to zero or to a specified number the serial number of the “frame” to be next recorded by a given Model 10BDR64 “history” recorder or by each recorder in a given range of recorders.

RSP (REACCESS STATISTICAL PLAYBACK) HISTORY CARD OPERATION
When an optional Model 10BSPC384 card is present, resets all “X-BAR” and “RANGE” playback pseudochannels for a given Model 10BDR64 “history” recorder or each recorder in a given range of recorders.

RST (RESET) ANALOG CHANNEL SETUP
Resets a given analog input channel (or each such channel in a given range of channels) to a direct millivolt reading; changes the channel “type” code to “55,” the scaling factor (“m”) to “5000,” and the zero offset (“b”) to “0.” May also be used to “reset” to “D0” one or a range of “CONVERSION” channels, ANALOG OUTPUT channels, or PSEUDOCHANNELS of any kind.

SAT (SATELLITE) SATELLITE NETWORK SETUP
When applied to the network host, designates a given satellite to be the sole “data origin” for a specified “global” data channel or a specified range of “global” data channels. May also be used to tell the host that a given satellite is an OPERATOR CONSOLE, or to cancel the existing dedication of one or more global data channels to a given satellite. “Read” form returns the global data channel(s) currently assigned to a given satellite.

SAV (SAVE) CRT VIDEO SETUP
Places in nonvolatile storage the currently displayed CRT video page, giving it a specified “page number.” Can only be entered via the keyboard.

SCN (SCAN) GENERAL SYSTEM OPERATION
If the mainframe EEPROM Switch is OFF, specifies the first and last channels of the system’s “temporary” scan range (on powerup, the scan range will default to that defined by the last-entered TERMINATOR (TER) command). If the EEPROM Switch is ON, specifies a default (powerup) scan range, regardless of the TER command currently in effect.

SEL (SATELLITE ERROR LOG) SATELLITE NETWORK OPERATION
Reads the ERROR LOG for a given satellite or for each satellite in a given range of satellites.

SEN (SENSITIVITY) COUNTER/TIMER SETUP
Sets or reads the input-amplifier sensitivity of a given Model 10ACT01 channel.

SHN (SHUNT CALIBRATE—NEGATIVE) ANALOG CHANNEL SETUP
Closes and latches the Shunt Calibration Switch for a given Strain Gage Input Channel (or for each such channel in a given range of channels) for a negative up-scale reading; switch is released by the RESUME (RSM) command.

SHO (SHOW) AUTOMATIC COMMAND EXECUTION
Causes the display of the CONDITIONAL DIRECTORY for system Conditional Bits 1 through 5 or 6 through 10. Applies to “B-sized” mainframes only.
Mnemonic Commands

GENERAL SYSTEM SETUP

TAR (TARE)
Zeros a given channel (or each channel in a given range of channels) and stores the offset value in volatile RAM memory (see also the ZERO (ZRO) command).

TBT (TIMER BIT)
GENERAL SYSTEM SETUP
For an “A-sized” mainframe (only), assigns a specified logic bit to a given timer or to each timer in a given range of timers, so that the bit is set to “Logic 1” for a period of one complete scan cycle when the timer registers the time value to which it has been set by an appropriate TIMER (TMR) command. “Read” form of the command returns the current logic-bit assignment for a given timer or for each timer in a given range of timers.

TER (TERMINATOR)
GENERAL SYSTEM SETUP
Sets or reads the system “TERMINATOR” channel (i.e., the final channel of the default scan range). Can be overridden by a SCAN (SCN) command.

TME (TIME)
GENERAL SYSTEM SETUP
Sets or reads the system internal clock-time.

TMO (TIMEOUT)
COMPUTER INTERFACE SETUP
Sets or reads the system TIMEOUT BIT, which will be set to “Logic 1” if no recognizable character has been received at the Computer Interface Port for a specified period of time (up to 60 seconds), and will be reset to “Logic 0” upon subsequent receipt of a recognizable character at that port.

TMP (TEMPLATE)
FORMATTED OUTPUT SETUP
Sets or reads format “template” for channel data transmitted from the Model 10Y0132 Printer Interface Port in response to a PRINT CHANNEL DATA (PRT) command (the template expression is a combination of fixed text and variable data fields).

TMR (TIMER)
GENERAL SYSTEM SETUP
For an “A-sized” mainframe (only), sets or reads the time value (any legal time-of-day reading) for a given timer or for each timer in a given range of timers. May be used to disable one or more timers. See TIMER BIT (TMB) command.

TYP (TYPE)
CHANNEL SETUP
Sets or reads the “type” code for a given channel or for each channel in a given range of channels.

UNL (UNLOCK)
GENERAL SYSTEM OPERATION
Cancels the LOCK (LK) command, resuming automatic updating of all scanned channels, one given channel, or each channel in a given range of channels.

VBT (“BETWEEN” STATUS)
CRT VIDEO SETUP
Sets or reads the visual effects to be exhibited by the data field assigned to a given channel or to each channel in a given range of channels—and by any fixed text “associated” with that field—when the data for that channel lies in the “BETWEEN” LIMIT ZONE. Also used to set visual effects for display of system TIME and DATE.

VDL (VIDEO DOWNLOAD)
CRT VIDEO OPERATION
Begin or terminates downloading to the system video memory, via the Computer Interface Port, of the contents of a given “section” of the CRT video page being transmitted to the mainframe. Allows storage of the downloaded page in non-volatile EEPROM. See also the VIDEO UPLOAD (VUL) and VIDEO ERROR LOG (VEL) commands.

SHP (SHUNT CALIBRATE—POSITIVE)
ANALOG CHANNEL SETUP
Closes and latches the Shunt Calibration Switch for a given Strain Gage Input Channel (or for each such channel in a given range of channels) for a positive up-scale reading; switch is released by the RESUME (RSM) command.

SMD (SETUP MODE)
HISTORY CARD SETUP
Places the Model 10BDR64 History Card in setup mode, stopping any recording in process, and allowing entry of recorder parameters and/or conditions (see RECORD MODE (RMD) command).

SND (SEND)
COMPUTER INTERFACE OPERATION
Transmits a specified ASCII string of up to 32 characters from the Computer Interface Port.

SNP (SNAPSHOT)
DATA TRANSMISSION
Transmits a time-coherent “snapshot” of each channel in a given range of channels, or of all scanned channels (including Chns. 998 (TIME) and 999 (DATE)). For every channel, outputs x, w, z [OPT] from the Computer Interface Port, where x = optional channel number “echo,” w = channel data value, z = optional limit-zone indicator number, and [OPT] = output terminator.

SOP (SIGN-ON PAGE)
CRT VIDEO SETUP
Sets or reads the CRT video page to be displayed upon system powerup (does not apply to LCD/VFD displays).

SRC (LOGIC SOURCE)
LOGIC BIT AND I/O SETUP
Sets or reads the “logic source”—and, where applicable, the desired “latch” mode—for a given logic bit or for each bit in a given range of bits.

SSB (SATELLITE SYSTEM BITS)
SATELLITE NETWORK SETUP
When applied to the network host, designates a given satellite to be the sole “data origin” for a specified “global” bit group or a specified range of “global” bit groups. May also be used to cancel the existing dedication of one or more global bit groups to a given satellite. “Read” form returns the current logic-bit assignment for a given channel or to each channel in a given range of channels—and by any fixed text “associated” with that field. May be used to return control of visual effects for display of a given channel or range of channels to the last-entered VBC, VGT, VBT, and VLT commands applying to the channel(s).

STH (START FROM HALT)
HISTORY CARD OPERATION
Restarts a given Model 10BDR64 “history” recorder—or each recorder in a given range of recorders—that has been halted.

STO (STORE)
HISTORY CARD SETUP
Sets or reads a Boolean expression of up to 15 mnemonic terms and up to 14 operators defining the logical combination of conditions that will cause a given Model 10BDR64 “history” recorder—or each recorder in a given range of recorders—to record and store a “frame” of data for all channels and bit groups in its predefined “list.”

STR (STREAM)
DATA TRANSMISSION
Continuously repeats transmission of current data for a given channel, for each channel in a given range of channels, or for all scanned channels (including Chns. 998 (TIME) and 999 (DATE)), until terminated by the ESCAPE (ESC) command or pressing the keyboard ESC key. For every channel, outputs x, w, z [OPT] from the Computer Interface Port, where x = channel number “echo,” w = channel data value, z = optional limit-zone indicator number, and [OPT] = output terminator. “STR” output also includes user-specified HEADER and/or TAILER (see HEADER (HDR) and TAILER (TLR) commands).

STS (STATUS)
CRT VIDEO OPERATION
Sets or reads the visual effects to be exhibited by the DATA FIELD or VIDEO PLAYBACK FIELD assigned to a given channel or to each channel in a given range of channels, and by any FIXED TEXT “associated” with that field. May be used to return control of visual effects for display of a given channel or range of channels to the last-entered VBC, VGT, VBT, and VLT commands applying to the channel(s).
VDU (VIDEO DISPLAY UNIT)  CRT VIDEO SETUP
Sets or reads video format and frame rate for all system CRT’s, internal and external.

VEL (VIDEO ERROR LOG)  CRT VIDEO OPERATION
Requests the last error to have occurred during transfer of a CRT video page initiated by either the VIDEO UPLOAD (VUL) or VIDEO DOWNLOAD (VDL) command.

VGT ("GREATER THAN" STATUS)  CRT VIDEO SETUP
Sets or reads the visual effects to be exhibited by the data field assigned to a given channel or to each channel in a given range of channels—and by any fixed text “associated” with that field—when the data for that channel lies in the “GREATER THAN” LIMIT ZONE.

VIA  GENERAL SYSTEM OPERATION
Routes a single specified mnemonic command to the card occupying a given B slot (it need not be preceded by the ATTACH (ATT) command).

VID (VIDEO MODE)  CRT VIDEO SETUP
Sets or reads the video display mode (INTERNAL or EXTERNAL).

VLT ("LESS THAN" STATUS)  CRT VIDEO SETUP
Sets or reads the visual effects to be exhibited by the data field assigned to a given channel or to each channel in a given range of channels—and by any fixed text “associated” with that field—when the data for that channel lies in the “LESS THAN” LIMIT ZONE.

VSS (VIDEO SCAN SYMBOL)  GENERAL SYSTEM SETUP
Adds ampersand (&) flag to the CRT display of any and all data channels outside the current scan range, or cancels ampersand flagging of out-of-scan channels. “Read” form of the command returns current “video scan symbol” status. Applies to “B-sized” mainframes only.

VUL (VIDEO UPLOAD)  CRT VIDEO OPERATION
Transmits from the Computer Interface Port a specified CRT video page in EEPROM storage or the video page currently on display. See also the VIDEO DOWNLOAD (VDL) and VIDEO ERROR LOG (VEL) commands.

XBG (EXECUTE BASE GROUP)  AUTOMATIC COMMAND EXECUTION
Specifies a given system bit group as the first or second of any two bit groups to be used for EXECUTE (EXU) functions. “Read” form of the command returns the number of the first or second EXU bit group.

XDS (TRANSMISSION DISABLE)  FIFO BUFFER OPERATION
Places the Model 10AFIFO in “GATED” OUTPUT MODE, so that the 10AFIFO will subsequently transmit the oldest contents of its main memory or the contents of its output buffer only when so instructed by a DESTRUCTIVE DATA OUTPUT (DDO) or NONDESTRUCTIVE DATA OUTPUT (NDO) command, respectively. Requires “FIFO bypass” to be off.

XEN (TRANSMISSION ENABLE)  FIFO BUFFER OPERATION
Places the Model 10AFIFO in “OPEN” OUTPUT MODE, so that the 10AFIFO will continuously output the oldest contents of its main memory via the output buffer; in this mode, the DESTRUCTIVE DATA OUTPUT (DDO) and NONDESTRUCTIVE DATA OUTPUT (NDO) commands have no effect. Requires “FIFO bypass” to be off.

ZRO (ZERO)  ANALOG CHANNEL SETUP
Sets the zero offset ("b" term) for a given analog input channel—or for each such channel in a given range of channels—so that the existing channel input yields either zero or a specified nonzero reading. “Read” form of the command returns an internal scaling number for a given analog input channel or each such channel in a given range of channels.

ZUM (ZOOM)  HISTORY CARD OPERATION
Increases by a specified number of “frames” the search depth of every “nonstatistical” playback pseudochannel assigned to a given Model 10BDR64 “history” recorder or to every recorder in a given range of recorders. Also specifies an increment for further keyboard-controlled alteration of the search depth. “Read” form of the command returns the current search-depth offset and depth increment.
# Appendix B

## Type Codes for Non-Conditioner Data Channels

For a complete list of “type” codes for System 10 analog data channels originating from Daytronic SIGNAL CONDITIONER CARDS, see Appendix A of the latest Conditioner Card Catalog.

### Binary Conversion Channels

<table>
<thead>
<tr>
<th>Channel Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary (BIN) Output</td>
<td>B1</td>
</tr>
<tr>
<td>Binary (BIN) Input</td>
<td>B4</td>
</tr>
<tr>
<td>Binary Coded Decimal (BCD) Output</td>
<td>B2</td>
</tr>
<tr>
<td>Binary Coded Decimal (BCD) Input</td>
<td>B3</td>
</tr>
</tbody>
</table>

### Counter/Timer Channels

(Models 10ACT01, 10ACC-4)

<table>
<thead>
<tr>
<th>Channel Type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>C0</td>
</tr>
<tr>
<td>Period (1/f)</td>
<td>C1</td>
</tr>
<tr>
<td>Totalizer (Event Counter)</td>
<td>C2</td>
</tr>
<tr>
<td>Timer</td>
<td>C3</td>
</tr>
</tbody>
</table>

### Download & Timer Pseudochannels

<table>
<thead>
<tr>
<th>Pseudochannel</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile Download Pseudochannel</td>
<td>D0</td>
</tr>
<tr>
<td>Nonvolatile (EEPROM-resident) Download</td>
<td></td>
</tr>
<tr>
<td>Pseudochannel</td>
<td>D1</td>
</tr>
<tr>
<td>Incremental One-Second Counter Pseudochannel</td>
<td>D2</td>
</tr>
<tr>
<td>Decremental One-Second Counter Pseudochannel</td>
<td>D3</td>
</tr>
<tr>
<td>Global Download Pseudochannel (&quot;A-sized&quot; Satellite Mainframe)</td>
<td>D4</td>
</tr>
<tr>
<td>Video Playback Pseudochannel (&quot;History Playback&quot;)</td>
<td>D9</td>
</tr>
<tr>
<td>&quot;10BACI&quot; Volatile Download Pseudochannel</td>
<td>DA</td>
</tr>
</tbody>
</table>

### Analog Output Channels

(Model 10AAO-8)

\[
\text{ANO } x = m \left( \text{CHN } y \right) + b \quad \text{E0}
\]

\[
\text{ANO } x = e \quad \text{E1}
\]

### Calibration & Linearization Pseudochannels

<table>
<thead>
<tr>
<th>Pseudochannel</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration Conversion Pseudochannel</td>
<td>E8</td>
</tr>
<tr>
<td>&quot;LIN x&quot; Linearization Pseudochannel</td>
<td>EA</td>
</tr>
<tr>
<td>&quot;LIN y&quot; Linearization Pseudochannel</td>
<td>EB</td>
</tr>
</tbody>
</table>

### Calculation Pseudochannels

\[
\text{CLC } x = m \left( \text{CHN } y + \text{CHN } z \right) + b \quad \text{F0}
\]

\[
\text{CLC } x = m \left( \text{CHN } y - \text{CHN } z \right) + b \quad \text{F1}
\]

\[
\text{CLC } x = m \left( \text{CHN } y \right) \left( \text{CHN } z \right) + b \quad \text{F2}
\]

\[
\text{CLC } x = m \left( \text{CHN } y \right) / \left( \text{CHN } z \right) + b \quad \text{F3}
\]

\[
\text{CLC } x = \left( \text{CHN } y \right) / \left( \text{CHN } z \right)m + b \quad \text{F4}
\]

\[
\text{CLC } x = m \left( \text{CHN } y \right) / \left( \text{CHN } z \right)m + b \quad \text{F5}
\]

\[
\text{CLC } x = m \left( \text{CHN } y \right) + b \quad \text{F6}
\]

\[
\text{CLC } x = m / \left( \text{CHN } y \right) + b \quad \text{F7}
\]

\[
\text{CLC } x = m \left( \text{SQR } \text{CHN } y \right) + b \quad \text{F8}
\]

\[
\text{CLC } x = m \left( \text{ABS } \text{CHN } y \right) + b \quad \text{F9}
\]

\[
\text{CLC } x = m \left( \text{MAX } \text{CHN } y \right) + b \quad \text{FA}
\]

\[
\text{CLC } x = m \left( \text{MIN } \text{CHN } y \right) + b \quad \text{FB}
\]

\[
\text{CLC } x = \left( \text{CHN } y \right) / m + b \quad \text{FC}
\]
Transducers

For fast, reliable measurement of electromechanical phenomena...

Transducers for Linear Displacement

These high-stability LVDT’s yield full ratiometric measurement of linear motion, size, strain, position, distortion, expansion, and similar mechanical phenomena, from a range of ±0.010 inch (±0.25 mm) to ±3.000 inch (±76.20 mm). Magnetically shielded in hardened stainless-steel housings, they offer extreme resistance to the effects of vibration, rotation, and electrical interference, as well as to adverse environmental factors like humidity, ambient temperature variation, and corrosive atmospheric conditions. Larger units have a threaded shank and locking nut for secure positioning in a simple mounting fixture.

Noncontact Proximity Sensors

Used with the Model 4033 Two-Channel Eddy Current Instrument, these high-speed DC-excited sensors measure the precise distance between the tip of the sensor probe and a “target” surface of ferrous metal. Both shielded and unshielded models are available, precalibrated for either English or Metric units.

- Special versions for high-temperature operation—up to 400°F (205°C)
- Linear ranges from 0.005” (or 0.100 mm) minimum to 0.200” (or 5.00 mm) maximum
- Excellent repeatability
- Large gage factors (up to 400 mV/0.001”)
- High repetition rates (up to 4000/sec)

With an adjustable sensing window from 4 to 30 inches, the Model D4900 Ultrasonic Proximity Sensor provides a proportional linear output of either 0–5 V-DC or 4–20 mA. Response speed for this rugged industrialized sensor is approximately 50 milliseconds.

Strain Gage Load Cells

A variety of industrial stainless-steel load cells are available for precise measurement of weight, torque, tension, and other mechanical forces. Using 4-arm 350-Ω bonded foil or 500-Ω bonded semiconductor bridges, these transducers offer high accuracy and linearity, with exceptional structural resistance to off-axis loading, side-loading, and other extraneous forces, and with overload protection from 150% to 200% of full scale.

- General-Purpose Low-Profile Load Cells—For tension and compression loads from ±25 to ±5000 lbs; temperature compensated.
- All-Steel Load Cells for High-Stress Weighing Applications—Constructed of high-alloy tool steel, electroless nickel-plated; long-life heat-treated; maximum shock and overload resistance; temperature and pressure compensated. “S” BEAM cells for tension loads from 250 to 20000 lbs; SQUARE BEAM cells for compression loads from 1 to 100 lbs; RECTANGULAR SHEAR BEAM cells for compression loads from 500 to 20000 lbs.
- Miniature and “Pancake-Thin” General-Purpose Load Cells—For tension and compression loads from ±50 g to ±50000 lbs; temperature compensated.
- Tank-Weighing Load Cells—For compression loads from ±50 to ±2500 lbs; standardized outputs for summing in multielement applications; high-alloy tool steel, electroless nickel-plated.

Strain Gage Pressure Transducers

These transducers measure gage, absolute, and differential pressure in flow determination, tank inventory, pump monitoring, engine testing, and many other applications. Welded stainless-steel construction provides exceptional durability in harsh industrial environments.

- Wet/Dry Differential Pressure Transducers—Lightweight high-frequency sensors for liquid and gas differential pressures from 0.5 to 1000 psid, with dry port as reference.
- Wet/Wet Differential Pressure Transducers—For bidirectional differential measurements from 0.5 to 10000 psid,
where both pressure sources can involve wet or corrosive fluids. All units feature mechanical stops to prevent overload damage.

- **Gage/Absolute Pressure Transducers**—Rugged transducers for pressures from 1 to 15000 psig/a; drift-free “true gage” design; outstanding stability and repeatability for high-volume requirements; high-accuracy models available (within 0.1% of full scale).

**Thermistor Temperature Probes**

These are rugged, fast-response stainless-steel probes for accurate detection of temperature changes in gaseous, liquid, or solid media. When used with suitable signal-conditioning instrumentation, they offer excellent linearity and interchangeability. The operating range is -30° C to +100° C (-22° F to +212° F). The series includes both immersible and non-immersible general-purpose models, attachable surface models, air temperature models, and immersible tubular models, with or without fitting.

### Amplified Piezoelectric Accelerometer

This small-sized nonmagnetic accelerometer is designed for use in vibration testing for engine and turbine monitoring, mining engineering, and many other applications. It features a high natural frequency and a wide frequency range. Low output, combined with the ability to drive high load capacitance, permits long runs of low-cost cable without degradation of data.

### Magnetic Speed Sensor

This sturdy magnetic pickup measures the speed of mechanical rotary motion in the determination of flow, rpm, and other frequency-related parameters. It is a passive device for maximum-sensitivity applications with relatively low speed and/or large air gaps.

---

**3000 Instrument Series**

Compact, single-channel **Signal Conditioners** with

- High-level ANALOG OUTPUTS
- Selectable low-pass active filtering
- Built-in regulated excitation with remote sensing

Options include

- Local LED digital indication
- Dual limit monitoring with isolated logic outputs
- Analog peak capture
- 4-20 mA output
- Dual galvanic isolated output
- Internal electromechanical or solid-state relays

**3500 Instrument Series**

Microprocessor-based single-channel instruments for industrial data acquisition and control. Features include

- High-speed user-formattable **RS-232/RS-485 computer/network data communications**
- Vivid LCD digital indication
- Continuous dual limit monitoring with front-panel annunciation and isolated logic outputs
- User-programmable internal linearization
- Digital track and hold function
- Real-time TARE function via front panel or external logic
- Real-time analog peak capture with digital hold (most models)
- Scalable “live” analog output for recording, monitoring, and control
- Complete setup and configuration via front-panel keypad or external computer

Other Daytronic Products 99
Other Daytronic Products

4000 Instrument Series

Enormously versatile single- and multichannel instruments for local real-time data collection, data processing, data display, and process control. Each individual instrument is a complete DATA ACQUISITION AND CONTROL SYSTEM in a panel-mountable box. Standard features include

- Simultaneous digital and bargraph data display
- Continuous 7-zone limit monitoring, plus programmable logic I/O for annunciation, control, and automatic command execution
- Automatic event counting
- Real-time cross-channel calculations
- Formattable RS-232 data transmissions
- User-programmable internal linearization
- Scalable “live” analog output

4000 Series options include

- RS-485 network communications
- Real-time SPC
- DDE data exchange with Windows® programs

SPS6000 Signal Processing System

A modular multichannel system combining analog accuracy and response with digital ease and flexibility. Using proven Daytronic conditioner cards, SPS6000 serves as a high-speed front-end for PC-based data acquisition systems, distributed control systems, and industrial PLC’s. In addition to the highest-quality signal conditioning, it provides user-configured analog signal operations like sum/difference, ±peak capture, auto zero, continuous comparator functions, and sample/hold. Proven analog technology lets the system recognize even the quickest of transient events, while analog limit decisions provide instantaneous outputs on critical violations.

- Up to 32 inputs per mainframe; up to 32 software-scaleable ±10-V analog outputs for connection to industry standard data acquisition cards or appropriate PLC inputs
- Shielded low-noise front-end environment
- Up to 10 kHz per-channel bandwidth, with typical accuracy of 0.02% of full scale
- Optional “AA Cards” provide programmable low-pass analog filtering
The best of both worlds: real-time analog signal conditioning combined with high-speed concurrent digital signal processing (DSP). Interfacing with a 486-based or Pentium PC, SPS8000 provides real-time measurement and control of a large number of data channels and logic bits, with no associated computer overhead. It’s ideal for dynamic structural testing, product development testing, vibration analysis, and other applications requiring accurate data that is collected, processed, and graphically displayed at high speeds.

- User-selected ANALOG FUNCTION MODULES for real-time capture and evaluation of specific instantaneous signal characteristics prior to A/D conversion
- Event- and time-coordinated measurements
- Software-programmable signal pathing and system configuration
- Logic I/O for direct control of processing functions and for external annunciation and process control
- Optional front-panel data display and calibration
- On-board diagnostics with relay contact to report system health status

SPS8000 Signal Processing System

- Up to 1000 data channels per 4-level rack (including on-board calculations); up to 1000 user-programmable logic bits, plus 7 internal “global” bits for system-wide limit checks
- Up to 80,000 finished answers per second for a 4-level rack; control responses are issued within the same scan sequence that acquires and evaluates the data
- Synchronous data collection between individual card decks (no time skew)
- Multiple independent scan rates from 1 to 200 ms per channel let you maximize the available scan bandwidth, getting the fastest sampling speed where it’s most needed
- “Internal sync” mode permits full stand-alone operation

(cont’d)
- **Real-time DSP functions** include IEEE floating-point conversion; per-channel scaling, linearization, smoothing, taring, and 5-zone limit checking; real-time math calculations; Boolean processing of logic bits; scaling and clamping of “live” analog outputs.

- Communications between SPS8000 and the host PC use a high-speed deterministic 10BASE2 network physically compatible with Thin-Wire Ethernet; a special bus conversion board called the **Daytronic Gateway Interface (DGI) Card** uses true DUAL-PORT RAM to transfer SPS8000-acquired data directly into the host’s memory space with no DMA interruptions.

- “Listen-only” DGI Cards allow multiple computers to be supported from one SPS8000 unit.

- Seamless integration with 3rd-party application software for data acquisition, graphical display, and process control—includingAutoNet™, InTouch™ (Wonderware®), KineticaRT™, Windows® DDE, and custom Windows 3.1 or Windows 95 programs written in C, C++, or Visual Basic.

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**Use the attached reply card to order**

free technical literature on these and other

Daytronic products, or visit our web site at

www.daytronic.com
Daytronic Corporation System 10 Application Worksheet

Name: ________________________________ Date: ________________
Title or Department: ____________________
Company: ______________________________
Address: ______________________________
City, State, Zip: _________________________
Telephone: ____________________________  FAX: ________________________

Type of application: ______________________

Do you currently use data acquisition / signal conditioning equipment? YES NO
If "YES," what is the average no. of inputs? 1-9 10-49 50-99 100-499 500-999 >1000
When is the equipment needed? less than 1 month 1-3 months 3-12 months over 1 year

1. SENSOR INPUTS—List required sensor types (load cell, LVDT, etc.) and applicable information for each:

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>No. of inputs of this type</th>
<th>Approx. measurement range</th>
<th>Required excitation (if any)</th>
<th>Desired frequency response</th>
<th>Desired accuracy / resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>______________________</td>
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</tbody>
</table>

[use the rear of this sheet if you need more space]

2. REQUIRED OUTPUT(S) (check all that apply):
   Analog output:
   Voltage: desired range: ____________________ desired bandwidth: ____________________ scalable? YES NO
   Current: 4-20 mA Other:
   Intended for PID loop control? YES NO
   Isolated digital/logic control output Relay control output
   Serial data output to computer, printer, or other device (BE SURE TO ANSWER QUESTION 3)
   Is formatted printer output required? YES NO

3. REQUIRED DATA COMMUNICATIONS INTERFACE(S) (check all that apply):
   None RS-232-C IEEE-488 RS-422 RS-485 (Network) Other:

4. REQUIRED FINISHED-ANSWER THROUGHPUT (if known): ________________/second

5. DESIRED DATA DISPLAY MODE(S) (check all that apply):
   None Local LCD/VFD Remote LCD Local CRT Remote CRT
   Multiple Remote CRT Monitors Bargraphs XY Plots Timeplots
   High-Speed Control Graphics Other:

6. DESIRED CALIBRATION METHOD(S) (check all that apply):
   Two-point ("deadweight") Linearization curve Shunt calibration Absolute
   Precision frequency reference Other:

7. IS PER-CHANNEL LIMIT MONITORING REQUIRED? YES NO
   If "YES," are variable limit setpoints required? YES NO
   Is visual alarm indication required? YES NO Other required alarm action(s):

8. OTHER REQUIRED FUNCTIONS / FEATURES (check all that apply):
   Logging / archiving of data Statistical Process Control (SPC) Peak capture
   Track and hold Automatic tare offset Cross-channel calculations
   Programmable digital/logic I/O, including Binary or BCD (are Boolean functions required? YES NO)
   Counter/timer functions (is ramp-soak setpoint control required? YES NO)
   Downloading of setpoints or other constants
   Networking of multiple Data Acquisition and Control stations
   TOUCHSCREEN interaction Local FIFO buffer storage Internal system diagnostics

9. POWER REQUIREMENTS: Nominal 110 V-AC Nominal 220 V-AC DC (specify level: _______________)

10. OTHER REQUIREMENTS: Please list on the rear of this sheet.

Return this form to:
Daytronic Corporation • 2211 Arbor Blvd. • Dayton, OH 45439-1521 • Tel: (937) 293-2566 • FAX: (937) 293-2586