Catalog 498-61

1987 GOULD
TEST AND MEASUREMENT INSTRUMENTS AND SYSTEMS

Oscilloscopes

Waveform Recorders

Data Acquisition Systems

Custom Systems

Medical Recording Systems

Supplies

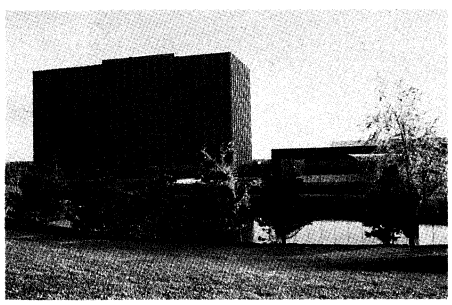
GOULD
Electronics

Gould Inc.,

is a Fortune 500 company that develops, manufactures and markets information systems, materials and components, defense systems and instrumentation and industrial automation systems.

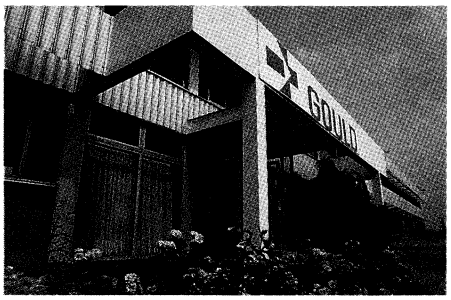
Composed of four business sections located in 51 facilities worldwide, it serves the electronic, defense, industrial and medical markets.

- **Information Systems** designs and manufactures high-performance, 32-bit super mini-computers, mini super-computers, and digital imaging and graphic systems.
- **Materials and Components** produces advanced materials for electronics, custom and semi-custom integrated circuits, and circuit protection devices for electrical and electronics applications.
- **Defense Systems** develops advanced undersea weapons systems, sonar, military communications, and specialized active and passive military electronic components.
- **Instrumentation and Automation Systems** designs and manufactures industrial automation systems, and test and measurement instruments and systems.



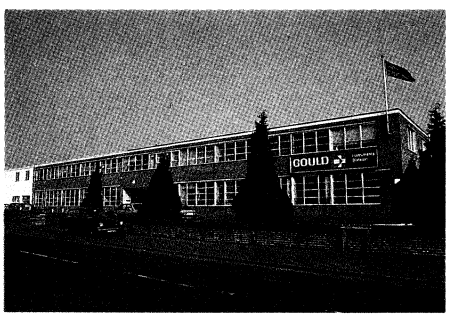
Gould Test and Measurement Group is one of the world's largest general purpose test and measurement suppliers. It includes four producing divisions and the Test and Measurement Sales and Service Division, together employing more than 1000 persons.

- **Array Recorders Division,** the world's most innovative designer of array recording devices, produces both array and direct writing recording systems at its location in Ballainvilliers, France.



- **Recording Systems Division,** located in Cleveland, Ohio, has been the leading recorder manufacturer since, as Brush Instruments, it introduced the first portable electrocardiograph in 1937. Today, it is a leading supplier of a broad line of recorders, signal conditioners, waveform recorders and PC-based data acquisition systems.

- **Design and Test Systems Division,** originally Biomation, developed the first analog waveform recorder and one of the first digital logic analyzers. It produces a broad line of logic analyzers — from the K450 with Auto Setup® to the economical K50 — at its Cupertino, California, location.
- **Instrument Systems Division,** founded in 1922 as Advance Electronics, introduced one of the world's first digital storage oscilloscopes in 1974. Today, it produces a broad range of DSOs that provide outstanding price performance value, at its Hainault, England, location.



- **Test and Measurement Sales and Service Division,** headquartered in Cupertino, CA, sells and services all products in this Catalog directly through 30 U.S. and European Sales and Service Offices. Gould Test and Measurement instruments and systems are also sold by more than 50 representatives and distributors throughout the world.

Contents

One Call Does It All

The Gould Telemarketing Center is open from 8 a.m. to 8 p.m. EST with multilingual telemarketing representatives available to help you contact your local Sales Office and the specific individual responsible for your area of interest.

Domestic

U.S., Canada, Mexico: 1-800-GOULD-10 (1-800-468-5310)

International

United Kingdom	0-800-89-1095	Korea	800-900-8295
France	19-05-90-1345	The Netherlands	06-022-0321
Denmark	043-402-561	Sweden	020-795-6061
Germany	0130-9860	Switzerland	046-05-3939

Model Numbers are listed in alphanumeric sequence.

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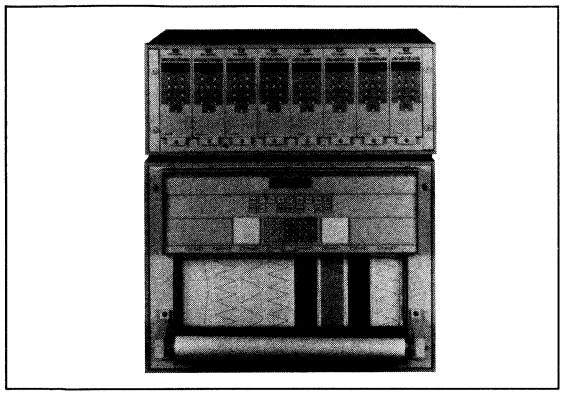
New Products

All new products shown on these pages are more fully described elsewhere in this catalog. For more comprehensive data, please consult the page number alongside each product description.

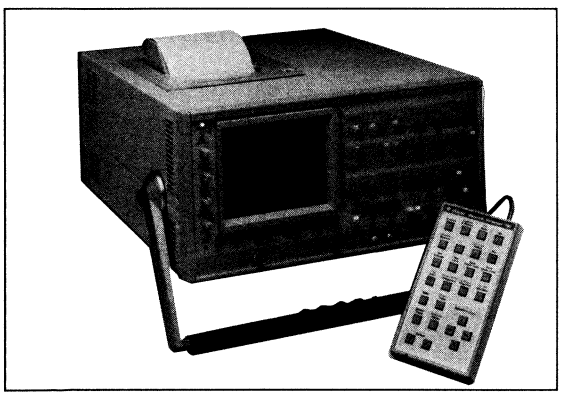
3000 Series Oscillographs



- **Fully programmable via RS-232C and IEEE-488**
- **True real time recording**
- **Permanent pressure ink or thermal writing**
- **Inter-channel annotation and event marks**
- **Programmable amplitude triggering**

Gould's new 3000 Series Oscillograph carries the Brush tradition of quality and innovation with the first fully programmable recorder. Select from 2, 4, 6 and 8-channel rack or portable configurations. Combined with the new 5600 Programmable Signal Conditioners, you get an integrated system that can be controlled from a remote location. *For more information, see page 60.*

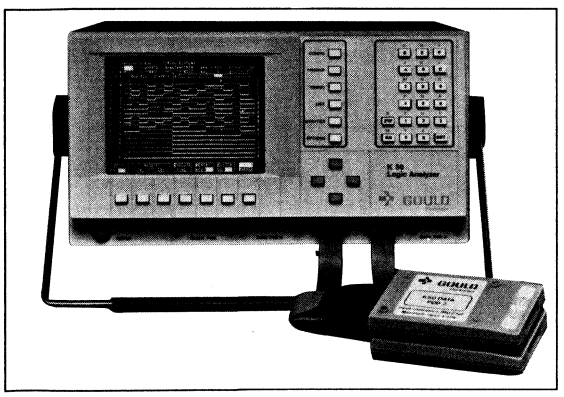
4070 Digital Storage Oscilloscopes



- **Dual 400 ms/s 8-bit digitizers**
- **100 MHz transient bandwidth**
- **2 ns/div time resolution**
- **Waveform processing**
- **Auto Setup®**

Gould breaks the sound and speed barriers with its easy-to-use 4070 Series Digital Storage Oscilloscope. A super-fast, super-accurate instrument, this fully programmable 4070 comes with 400 ms/s, 8-bit converters per channel. It is the first portable DSO able to capture signals with frequencies up to 100 MHz (3.5 ns rise time). *For more information, see page 36.*

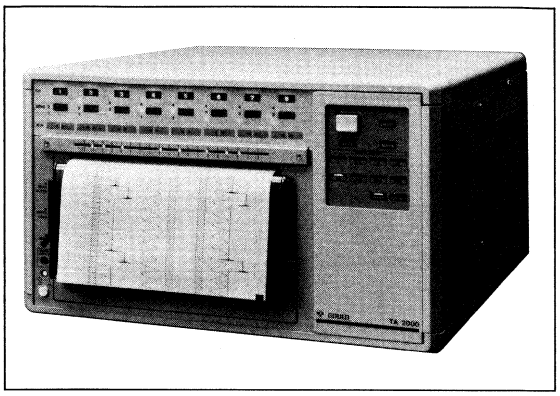
K50 Logic Analyzer



- **32 state or timing channels**
- **10 ns resolution on up to 8 channels**
- **Glitch triggering with 5 ns glitch capture**
- **Popular disassemblers for 8-bit and 16-bit microprocessors**

The Gould K50 Logic Analyzer is a low cost, general purpose instrument with the ability to resolve timing problems on eight channels at 10 ns (100 MHz) and disassemble most of today's popular 8-bit and 16-bit microprocessors. In addition, the K50 captures data both synchronously and asynchronously without reprobing. Four levels of trigger sequence steps can be programmed with one of four trigger words. *For more information, see page 22.*

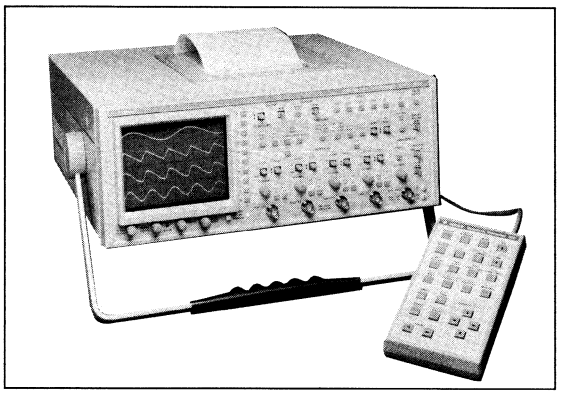
TA 2000 Thermal Array Recorder



- 1 to 8 analog channels
- Frequency response up to 2.5 kHz
- Peak capture of events 150 µs or longer
- Overlapping traces
- 200 mm/s maximum chart speed

With Gould's new eight-channel TA 2000 Thermal Array Oscillograph, you'll get high recording performance and increased flexibility with less effort. Its front panel features instantly recognizable keys, organized in a familiar design. Our TA 2000 lets you overlap traces, and provides a 200-mm chart width; 8-dots/mm resolution; 200-mm/s maximum chart speed; frequency response up to 2.5 kHz, and peak capture of events 150 µs or longer. *For more information, see page 69.*

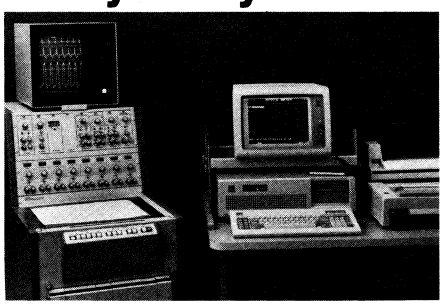
1604 Digital Storage Oscilloscope



- Dual 20 Ms/s 8-bit digitizers
- 10 k word memory per channel
- 4-channel operation
- Fully programmable
- Internal digital plotter
- Auto Setup®

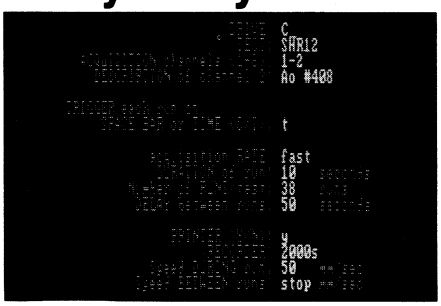
This economical digital storage oscilloscope provides many automatic measurement and data processing functions normally associated with only high-end products. When measuring signals in either low-frequency electronics or transducer-based mechanical and physiological testing, Gould's 1604 DSO provides extensive signal capture with extensive data analysis and archiving capabilities. With its 10 k word memory per channel, you can examine detail with expansion factors up to x200 and resolution down to 50 ns/div. *For more information, see page 41.*

Hemodynamic Analysis System



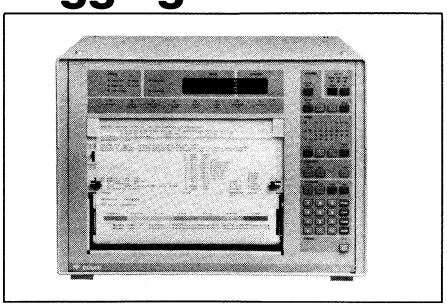
The new Gould/Trinity PC/AT-based Hemodynamic Analysis System (HAS) integrates Gould's EP-Cath Lab recording system with application-specific software to provide a total information package. This on-line system acquires data in real time, computes common hemodynamic parameters and stores these calculations and the original waveforms in a common database. It also provides for convenient entry of patient demographics and generates complete, user-configurable final reports. *For more information, see page 136.*

Blood Pressure Analysis System



This 8-channel system automatically acquires, computes and logs systolic, diastolic, mean pressure and heart rate values. Its menu-driven software reduces setup time, and provides easy calibration of pressure channels. All data is stored with time and data information and can be converted — utilizing a unique DIF file conversion utility — for use by popular spreadsheets like Lotus 1-2-3 and statistical packages like RS-1. *For more information, see page 137.*

SC 2130 Data Logging Recorder



Use the Gould SC 2130 30-channel data logger to measure and record temperatures from seven T/C types and PT-100 RTD's, voltages from ±20 mV to ±20 V and currents from ±20 mA to ±200 mA. Significant features include paper speeds from 10 to 600 mm/hr., 15 high and 15 low alarms, and 3 recording modes. All functions can be remotely controlled via IEEE-488 or RS-232C interfaces. *For more information, see page 75.*

Logic Analyzers

Gould's Leading Edge Group of Logic Analyzers

Successful completion of any technical project depends upon having the right tools. Gould has a broad line of logic analyzers with performance tailored to your special application. Whether it is high speed computer design, microprocessor hardware and software integration, general logic hardware debug, or remote field service, look to Gould for logic analysis solutions.

K500 Analyzer

Leading edge high speed logic designs require the 2 ns resolution (500 MHz sampling rate) performance of the K500 Logic Analyzer. Frequency bandwidth well beyond the 500 MHz sampling rate guarantees your signal gets into the analyzer undistorted. Search and compare functions then locate the failure. An analog measurement mode (100 MHz bandwidth), triggered from the logic analysis portion of the K500, aids in correlating analog signal problems (i.e. power supply failures) to digital faults.

K450 Analyzer

Up to 48 channels at 100 MHz, or 24 channels at 200 MHz sampling rate makes the K450 an ideal choice for designing hardware and integrating hardware/software. Sixteen levels of **Trace Control™** aid in locating critical problems that fall beyond the typical logic analyzer performance capabilities.

Additionally, the versatile waveform display capabilities makes signal analysis fast and simple. To aid in quick setup, an **Auto Setup™** function has been added to the K450, to configure, capture, and display data with the touch of a key. Other features such as the Autosave function, indispensable for locating intermittent faults, and extensive post-analysis compare features, complete the uncompromising analysis performance available to you in the K450.

K115 Analyzer

The numerous types of microprocessors available today place a demand on you to select a flexible yet powerful logic analyzer. Gould's K115 Logic Analyzer solves the selection problems by offering two logic analyzers in one. The K115 can be configured with up to 64 channels at 20 MHz and an addition 8/4 channels at 100/200 MHz or 32 channels at 20 MHz and 16/8 channels at 100/200 MHz. You can track hardware events at 100/200 MHz, software events at 20 MHz, and critical hardware/software interactions. Powerful triggering with eight levels of **Trace Control™** then focuses the K115's measurement features on specific system activities.

K100-D/T12 Analyzer

Remote diagnosis of logic failures is easy with the Gould K100-D Logic Analyzer and T12 Communication option.

Sixteen channels of data can be captured at 100 MHz sampling rates and transferred error free over standard telephone lines. The T12 Communicator performs extensive error checking to guarantee data transmission and receiving integrity. Communication can be established between two K100/T12 analyzers with one analyzer being a base installation and the other being a field installation.

- **Manufacturer of Biomation logic analyzers**
- **A history of technical leadership for 20 years**
- **Extensive selection of logic analyzer configurations to meet your application needs**

K50 Analyzer

The Gould K50 Logic Analyzer is a low cost, lightweight (23 lb.), high performance, portable instrument. Used in engineering, education, service, and manufacturing, the K50 offers features usually found only in logic analyzers costing much more. The K50 is a true general purpose Logic Analyzer. It provides the ability to resolve timing problems on eight channels at 10 ns (100 MHz) and disassemble most of today's popular 8-bit and 16-bit microprocessors. In addition, the K50 can capture data both synchronously and asynchronously without re-probing. To pinpoint and capture data, four levels of trigger sequence steps can be programmed with one or four trigger words. Word one can be ANDed with the glitch word when glitch mode is selected. Each word can be used in any of the trigger sequencer terms. Once data has been captured, the K50's crisp timing and state displays include a trigger marker plus two reference cursors with direct readout of their absolute and relative positions and the data value of the selected cursor.

Easy to Use

The top of the line K450 offers a revolutionary approach to human interfacing with logic analyzers — **Auto Setup™.** An industry first, **Auto Setup** configures, captures, and displays a timing display with only one keystroke.

To further assist you the K450 and K115, both have a special **Help** key function to instantly display the necessary operating information. This lets you quickly learn the full performance of the unit.

Modular and Upgradable

The K450 and K115 allow you to purchase a lower cost logic analyzer with a channel configuration to fit today's task, then upgrade at a later date to meet your future needs.

Microprocessor Analysis Packages

Analysis of program execution displayed in HEX or BINARY format is extremely time consuming for even the simplest program. Microprocessor Analysis Package disassembler software translates the data captured from a K450, K115 or K50 Logic Analyzer into easily understood assembly language mnemonics. Instruction fetches, memory reads and writes, and interrupts are clearly displayed to help understand a microprocessor's operation. Illegal and non-executed instructions are also prominently marked to eliminate interpretation errors. Gould supports a wide variety of disassemblers that range from the Motorola 68000/10/20 to the Intel 80186/188/286. Also supported are 8-bit microprocessors like the Z80, 6800 and 8080. If you need a disassembler that isn't available, Gould offers a User Definable Microprocessor Analysis Package.

Outstanding Probe Characteristics

Today's high speed microprocessors, such as the 68020, are sensitive to the loading of their circuitry. Gould's K450 and K115 use state of the art probes. When these are connected to a disassembler package the signal loading is 1 megohm shunted by 8 pF (less than 1 TTL load). This allows you to test a circuit without affecting its characteristics.

Gould Logic Analyzers at a Glance

Logic Analyzer Features	Gould Model Numbers				
	K500	**K450**	**K115**	**K100-D**	**K50**
Applications	Ultra high-speed Logic Designers timing analysis	High-speed simulaneous hardware/software analysis	Microprocessor hardware/software debug	General-purpose timing analysis	Multi-purpose low-cost
Timing Mode (internal clock)					
Maximum no. of channels at MHz	8 at 500 MHz	16, 32, 48 at 100 MHz; 8, 16, 24 at 200 MHz; 8 at 100 ps (opt.)	32, 64 at 20 MHz (LS); 8, 16 at 100 MHz (HS); 4, 8 at 200 MHz (HS) see *Note*	16 at 100 MHz	32 at 25 MHz; 16 at 50 MHz; 8 at 100 MHz
Memory depth in channels	2K at all channels	2K at 48 channels; 4K at 24 channels	1K at all channels	1K at all channels	1K at all channels; 2K at 16 channels; 4K at 8 channels
State Mode (external clock)					
Maximum no. of channels at MHz	8 at 130 MHz	16, 32, 48 at 50 MHz	32, 64 at 20 MHz (LS); 8, 16 at 70 MHz (HS)	16 at 70 MHz	32 at 25 MHz; 16 at 50 MHz
Memory depth in channels	2K at all channels	2K at 48 channels; 4K at 24 channels	1K at all channels	1K at all channels	1K at all channels; 2K at 16 channels
Maximum no. of clocks	2	12	10	4	3
Glitch Capture	Yes	Yes	Yes	Yes	Yes w/glitch trigg.
Minimum pulse width	2 ns	5 ns	5 ns	5 ns	5 ns
Trace Control No. of Levels	2 levels	16 levels	8 levels	2 levels	4 levels
Pattern Generation	Yes / PG4064	Yes / PG4064	Yes / PG4064	Yes / PG4064	Yes / PG4064
Interfaces					
RS-232C	No	Standard	Standard	No	Standard
IEEE-488	No	Standard	Standard	Yes	Standard
Print timing and state analysis	No	Standard	Standard	Yes*	Standard
Video out	No	Standard	Standard	Standard	Standard
Auxiliary Storage					
Media	No	2, 5¼ in. disks	1, 5¼ in. disk	No	Yes
Capacity	No	624K bytes	312K bytes		battery backed
Auto save	No	Yes	Yes		internal memory
MAPs (microprocessor analysis package)	No	12	19	No	Call Factory
Other	1 analog channel	Auto Setup Telediagnosis S/W PCLA	Performance Analysis S/W PCLA	Telediagnosis	
Refer to Page	20	16	18	21	22

*Video print of screen

Note: K115 has three card slots. Maximum 2 cards of one kind.

Logic Analyzers to Solve Your Problems

Gould Logic Analyzers Solve Problems

Gould provides a wide range of logic analyzers, each with features tailored for a specific class of problems. When considering a logic analyzer, consider your environment and the task at hand. High speed hardware timing, microprocessor hardware/software integration, software debugging or production and service test, there is a Gould logic analyzer tailored to fit your needs.

Hardware Timing

If your job is examining hardware related problems in detail, you either need a few channels at high speed with an easy-to-use trigger scheme to rapidly pinpoint timing conflict, or you need a lot of channels and complex triggering to examine timing conflicts on wide computer buses or ASIC interfaces to external circuitry.

If you are in the first group, consider the Gould K500 with 8 channels at 500 MHz. Its analog input channel allows you to look at specific signals in detail. Also consider the K450, which is available in a 16-channel, 100-MHz configuration (configurable to 8 channels at 200 MHz). If your requirements change, this unit may be expanded to 48 channels at any time.

If you need to examine a large number of signals at one time, the K450 is for you. With 48 channels at 100 MHz (configurable to 24 at 200 MHz), the K450 is at the top of the performance curve. Sixteen levels of Trace Control, with 20-ns level-to-level decision speeds, allow you to catch even the most complex timing events. Glitch capture allows you to look at 5-ns events, or switch to the 200-MHz mode and see the signal in detail. If you need even more time resolution, consider the HR/1000-ATC option. For repetitive signals, the HR/1000 can resolve timing differences to greater than 100 ps across 8 channels.

Software Debugging, Software/Hardware Integration

Software development engineers need logic analyzers to provide the transparent view of program execution, which cannot be obtained with in-circuit emulators or operating system debuggers. Because a logic analyzer snapshots data nonintrusively in real time, you never have to be concerned about the interactions between the instrument and the debugging process. The Gould K115 is your instrument. Microprocessor disassemblers, Trace Control structured to unscramble complex program flow, and histogram software performance analysis speed you through your task.

If your problems arise where "the software meets the hardware," Gould provides two alternatives. The K115 can be expanded with 8 or 16 independent 100-MHz timing channels (configurable to 1/2 at 200 MHz). Cross trigger capability allows program flow to initiate high-speed data capture, providing a magnifying glass to pinpoint timing related events.

The K450 provides similar capability with a different approach. Since all of the channels in the unit are identical and function in either a timing or state mode, you never have to double probe the system under test to examine a problem in detail.

Now consider your work environment. In some cases, it is necessary to bring the logic analyzer to the task, sharing it between users and projects. A stand-alone unit on a cart is the right choice. However, if your software development and debugging is being performed with an IBM-PC, Gould also has a solution. Either the K115 or K450 may be remotely controlled with a standard software package, PCLA, over an IEEE-488 link. In this way, software development and analysis can be performed from one system.

General Use

All Gould logic analyzers provide general purpose features. The issue is the amount of measurement power required. In some cases, there is no alternative to high channel count and speed. In others, general purpose may mean good capabilities across a wide range of applications, in the lab, on the production floor or in the field.

The K50 answers the second class of problems. This highly portable instrument is specifically tailored for mixed applications. Microprocessors or hardware timing, design, or service, the K50 produces results. The human interface is structured to get the job done with a minimum of keystrokes. Even the casual user will quickly become a digital troubleshooting expert.

Remote Diagnostics

The Gould K100-D was the first logic analyzer to address the problem of debugging systems remotely over a telephone line with the T-12 package. With the K450, this capability has been greatly expanded. There is no reason today to send an engineer to babysit an intermittent computer system. First, the logic analyzer can be set to capture and store faults on its floppy disk. You can examine the results later, in person or remotely over a telephone line from a second analyzer or an IBM PC. The logic analyzer can also be set to call you to report a problem.

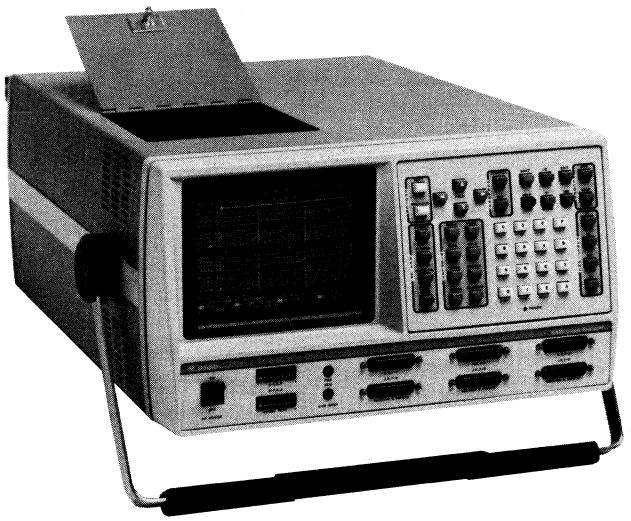
Manufacturing and Service Test

Logic analyzers have long been considered the tool of last resort in a production or service environment. By their nature, logic analyzers present measurements in detail and at a level of complexity which may be difficult for a technician, not familiar with total operation of a system, to interpret. Gould solution to this problem is Mr. Goodchips. This applications software package integrates the K450 Logic Analyzer with an IBM PC to create a component-level test system. You do not have to change your test strategy or write custom test programs. Just clip the system onto a component and enter the part number. The system automatically captures the input and output signals, then compares them to a simulated model. The test is fast, the results are crisp: *Good* or *Bad* component. If you need more detail about the timing information on each device pin, it is there to examine.

Logic Analyzer
Gould K450

The exceptional logic analyzer for hardware and software engineers

- **Perform state and timing on the same channels**
- **48/24 channels at 100/200 MHz**
- **Decisions within 20 ns on all 16 levels of Trace Control™**
- **Popular microprocessor disassemblers including Motorola 68000/10/20 and Intel 80186/188/286**
- **PCLA software interface w/telecommunications**



The K450 belongs to the new generation of logic analyzers. Its feature set is optimized to solve not only routine problems, but also those complex and elusive failures which occur intermittently. Its powerful features, combined with easy setups, make this Logic Analyzer an indispensable tool for hardware and hardware/software engineers who are working with custom digital boards, bit-slice systems, ECL state machines, gate arrays and custom chips, multi-logic designs, and high-speed microprocessors.

Trace Control™ for complete control.
Trace Control™ is an effective data qualifying feature developed by Gould to precisely control capturing of information by logic analyzers. Trace Control™ runs on easily learned command

Specifications

Help Screens

Help Messages: On-screen messages explain individual fields in setup screens by pressing the HELP key.

Self Test: During power-up, self tests check internal circuitry, including ROM, RAM, power supply, and keyboard.

Data Channels

Configurations: K450-116: 16 channels;
K450-132: 32 channels;
K450-148: 48 channels.

Maximum Sample Rate: 200 MHz (internal clock);
50 MHz (external clock).

Memory: The K450's acquisition (M), display (A), and reference (B) memories are each 2K samples deep. At 200 MHz, each memory is 4K samples deep.

Format: Binary, Hex, Octal, EBCDIC, ASCII, or mixed.

Thresholds: Selectable for TTL (+1.40 V), ECL (−1.30 V), or one of two variable thresholds over a +9.99 V to −9.99 V range in 0.01-V steps (20 mV precision) for clock channels and groups of 8 data channels.

Polarity: Either + or − on a per-channel basis.

Setup Time: 8 ns typical, 5 ns minimum, 12 ns maximum.

Hold Time: 0 ns.

Clocks

Sample Clock: The SAMPLE clock samples data at the probe tips and moves it into the sample registers. This can be an internal or external clock.

Internal Clock: The edge-sensitive internal SAMPLE clock period is selectable from 20 ns to 100 ms in a sequence of 10, 20, 30 . . . 100, 200, 300 . . . etc. Also available is a 10-ns or 5-ns clock in the SAMPLE STORE section.

External Clock: DC to 50 MHz (20 ns). You can combine up to six signals using AND/OR combinations to generate the edge-sensitive SAMPLE clock.

Clock Frequency Measurement: The K450 automatically measures the external clock's frequency from 100 Hz to 50 MHz with 0.1% accuracy.

Input Modes:

Standard: Clocks all K450 sections with one master clock.

Advanced Modes: Sample store, Demultiplex, Latch, Glitch.

Sample Store: All three K450 sections (16 channels per section) can store sampled data at different rates.

Demultiplex: The K450 demultiplexes data collected via one set of probes from a multiplex bus. There is no need to double-probe signals.

Latch: Data held by LATCH clock is sampled by SAMPLE clock, then moved into memory by MASTER clock.

Glitch: A short HIGH or LOW pulse that occurs between SAMPLE clocks is stored as a state change at the next clock. Glitches can have a duration as short as 5 ns with 25% or 250 mV-overdrive, whichever is greater.

Trace Control: The K450 can be programmed in 16 indepen-

TM: Trace Control and Auto Setup are trademarks of Gould Design & Test Systems Division

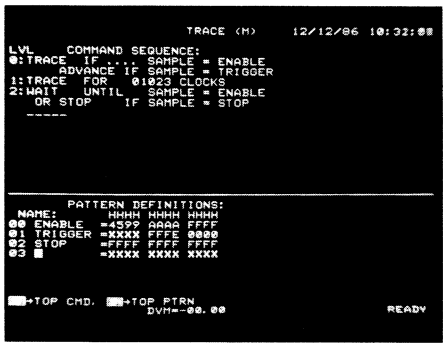
language, letting the K450 Logic Analyzer users specify exactly which samples to save or ignore. Unlike other logic analyzers that perform housekeeping between levels and miss crucial data as a result, the K450 executes each level within 20 ns, so no event is missed.

Auto Setup™
Our research has shown that ease of use is the primary concern of logic analyzer users. Gould is committed to addressing this concern. We were the first to offer the **Help** key with built-in manual. Now the Gould K450 offers another industry first to logic analyzer users called **Auto Setup™.** Auto Setup configures, captures and displays a timing diagram with the touch of a key.

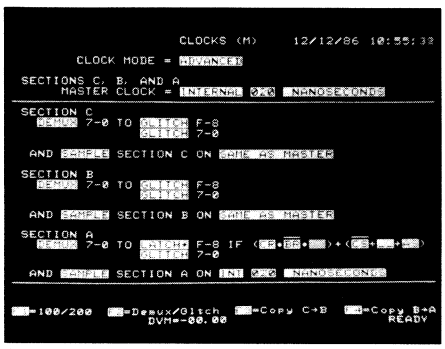
Built-in disk drive.
The K450 Logic Analyzer comes with a built-in disk drive as standard equipment. Save data setups to eliminate the reprogramming of repetitive tasks.

TeleDiagnosis
TeleDiagnosis is a diagnostic tool designed to debug digital systems over phone lines and service large mainframe computers, PBX switches, unmanned communication systems at secluded locations, and industrial control networks. It can assist in repairing smaller but sophisticated digital systems at a customer site whenever a quick response is desired or skilled personnel are not readily available. It can also be integrated with current repair tools to debug subassemblies at field depots. TeleDiagnosis is an ideal option to curtail system down time and travelling expenses. This option allows the Specialists to spend more time in their factory solving problems, instead of travelling around for days to resolve glitches that may take only a couple of hours.

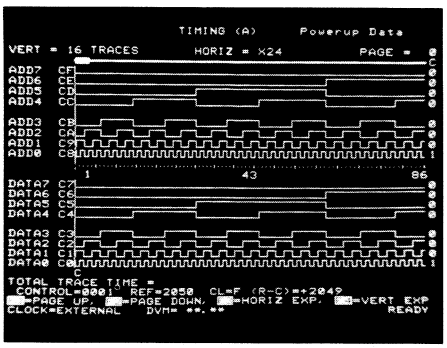
PCLA Option for the IBM PC® integration.
PCLA is software that allows you to run the K450 remotely from your desk or over the telephone via your IBM PC.



16 Level Trace Control can follow a simple or complex chain of events



Glitches are captured on all 48 channels at 100 MHz without reducing memory depth



Versatile timing display labels each channel, repositions, prints, or saves your waveforms

dent but interactive levels to follow the activities of the system under test. Trace Control runs at rates as high as 50 MHz and employs TRACE, WAIT, ADVANCE, GO TO and STOP commands and three conditions: FOR, UNTIL and IF.

Patterns: User definable labels for up to 50 patterns.

Delay: Up to 65,535 clocks or events per level.

Total Trace Time: Measures the time between any two events from 00.00 µs to 1,638.35 s (27.3 min) at a 0.5-µs resolution.

Interfaces

RS-232C: For communications between the K450 and other devices, you can set baud rate (up to 9600 bps), stop bits, parity, protocol, etc.

IEEE-488 (1978 STD): A complete Talker/Listener interface.

Get: The Group Execute Trigger signal works with the IEEE-488 interface.

Composite Video (RS-170): Video output (1 VP-P into 75 Ω).

Trace Output: This port outputs a TTL HIGH when the K450 is armed and trace is enabled.

Clock Output: An ECL active-LOW signal corresponds to the K450's internal clock.

Probe Characteristics

Input Resistance: 1MΩ, ±2%.

Input Capacitance: ≤6 pF normally; ≤15 pF with flying leads.

Probe Test: The K450 provides two sockets, either of which can test a probe's two clocks and eight data channels. Also use these sockets to explore the K450's operation.

Battery Back-Up CMOS Memory: Holds last setup in memory at power down.

Time of Day Clock: The K450 displays a 24-hour time of day clock that is battery backed.

Digital Voltmeter (DVM): Range: ±20 VDC max. Resolution: 20 mV. Accuracy: ±0.5%. Impedance: 20 kΩ.

Physical Characteristics

Dimensions: 8.6 in. (218 mm) H x 17.5 in. (445 mm) W x 24.7 in. (627 mm) D with bail.

Weight: 45 lbs. (20 kg).

Input Voltages: 50 or 60 Hz; 90 to 135 VAC or 180 to 270 VAC.

Accessories Supplied: Probes, probe connectors with flying leads, DVM cable, grabbers, power cord, training kit, operating manual and pouch.

Ordering Information

Product No.	Description
K450-116	16-channel logic analyzer with disk storage system.
K450-132	32-channel logic analyzer with disk storage system.
K450-148	48-channel logic analyzer with disk storage system.

See page 29 for availability of accessories.

Logic Analyzer
Gould K115

The logic analyzer for microprocessors

- **Perform state and timing on the same channels**
- **64 channels at 20 MHz**
- **8/16 channels at 200/100 MHz with 5 ns glitch capture**
- **Popular microprocessor disassemblers including Motorola 68000/10/20 and Intel 80186/188/286**
- **PCLA software interface**

For design, debug and test in microprocessor applications, take command of your digital problems with a K115 Logic Analyzer that gives you more capability dollar for dollar. It provides 32 or 64 channels at 20 MHz for state and timing in 8, 16, and 32-bit applications, and a direct link to either 8/16 channels at 100 MHz or 4/8 channels at 200 MHz.

You can switch from state to timing by simply pushing one button. No hardware reconfiguration to slow your process. A quick software selection through Trace Control™ links you to high speed modules for precise timing measurements.

Trace Control™ for complete control.
Trace Control™ is a powerful data qualifying feature developed by Gould to precisely control capturing of information by logic analyzers. Trace Control™ runs on easily learned command language, letting the K115 Logic Analyzer users specify exactly which samples to save or ignore.

Specifications

Help Screens: On-screen messages explain individual fields in setup screens by pressing the HELP key.

Self Test: During power-up, self tests check internal circuitry, including ROM, RAM, power supply, and keyboard.

Data Channels

Maximum Number: K115-132: 32 main;
K115-140: 32 main, 8 high speed;
K115-148: 32 main, 16 high speed;
K115-164: 64 main;
K115-172: 64 main, 8 high speed.

Memory: 1024 bits per channel of both acquisition and reference/compare memory.

Format

Timing Display: 4, 8 or 16 channels, in any order, in groups of 4.

Data Display: Binary, Hex, Octal, EBDIC, ASCII, or mixed.

Thresholds: Selectable for TTL (+1.40 V), ECL (−1.30 V), or one of two variable thresholds over a +9.9 V to −9.9 V range in 0.1-V steps (50 mV accuracy) for clock channels and groups of 8 data channels.

Polarity: Selectable either + or − on a per-channel basis.

Input Modules

Main Channels

Inputs: 32 or 64 main inputs at 20 MHz. Recorded data controlled by Trace Control.

Clocks Internal: Selectable from 50 ns to 50 ms clock rate.

External: 8 external inputs are available to form a combinational (and/or) master clock signal (maximum 20 MHz/ minimum 25-ns pulse width).

External Multiphased: The same capability as external mode with the addition of individual sample clock combinations for each section (up to four maximum).

Setup Time: 25 ns maximum, 10 ns typical.

Hold Time: 0 ns

Input Modes Sample: Inputs sampled only at active clock edge.

Demultiplex: Signal inputs to Section A are clocked into section A memory using the sample clock, then into section B memory using the demux clock on each clock cycle. Sections C and D operate in the same manner so that 32-channel demultiplexing may take place.

High Speed Channels

Inputs: 8 or 16 channels at 100 MHz or 4 or 8 channels at 200 MHz. Triggered by selected trigger word after link from Trace Control.

Clocks Internal: Selectable 5 ns to 50 ms in a 1-2-5 sequence.

External: Two external inputs are available as an ORed clock signal up to 70 MHz minimum, 90 MHz typical (minimum 10-ns pulse width).

Setup Time: 4 ns maximum.

Hold Time: 0 ns

TM: Trace Control is a trademark of Gould Design & Test Systems Division

HELP!
Gould's Biomation wrote the book on logic analyzers, and now the book is in the K115. When you press the HELP key, step-by-step operating instructions for the viewed screen appear across the bottom of the screen.

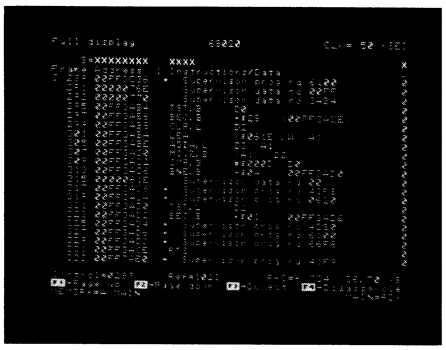
Microprocessor Analysis Package (MAP) Library.
A comprehensive MAP Library simplifies setup and problem definition for disassembly of major microprocessors. For custom microprocessors there is a user-definable disassembler (UDD) available.

Built-in disk drive.
The K115 redefines logic analyzer value with a built-in disk drive as standard equipment. Automatic testing capabilities are also built in. Save data setups to eliminate the reprogramming of repetitive tasks.

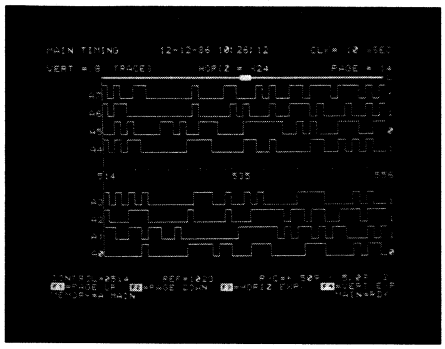
Auto Comparison.
Make your logic analysis and testing efforts more productive with the only analyzer you don't have to babysit. Activate the Auto Comparison feature and compare with B memory for errors. Hold the error in memory or automatically transfer it to disk with time and date. Then look for the next occurrence.

On-screen B memory edit.
Speed through comparison setups. The B memory can be edited on-screen to define the comparison to high, low, or don't care on any bit, on any channel.

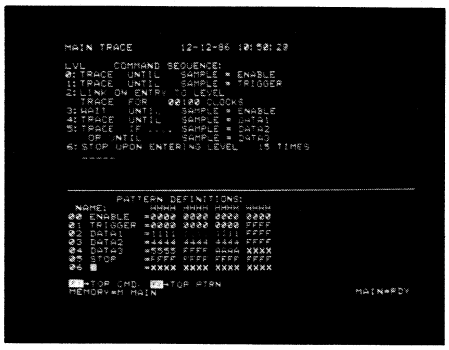
PCLA option for the IBM PC® integration.
PCLA allows you to run the K115 remotely from your IBM PC. Your PC can also be programmed in C or BASIC to write interactive or stand alone test routines without writing device specific commands in assembly for bus and logic analyzer support.



Disassemble data for popular μP.



Customize the timing waveform display to suit your varying needs.



8 Level Trace Control can follow a simple or complex chain of events.

Input Modes Sample: Inputs sampled only at active clock edge.

Glitch: A short positive or negative pulse that occurs between sample clocks is stored as a state change at the next clock. Glitches can have a duration as short as 5 ns with 25% or 250-mV overdrive, whichever is greater. (Not applicable on 5-ns clock).

Trace Controls (Triggering)

The K115 can be programmed in eight independent but interactive levels to follow the activities of the system under test. Trace Control runs at rates as high as 20 MHz, and employs TRACE, WAIT, ADVANCE, GO TO and STOP commands and three conditions: FOR, UNTIL, and IF.

Patterns: User definable for 50 patterns.

Delay: Up to 65,535 clocks or events per level.

Probe Inputs

Input Resistance: 1 MΩ, ±2%

Input Capacitance: ≤6 pF normally, ≤15 pF with flying leads.

Maximum Input: ±50 VP

Interfaces

RS-232C: For communications between the K115 and other devices, you can set baud rate (up to 9600 bps), stop bits, parity, protocol, etc.

IEEE-488 (1978 STD): A complete Talker/Listener interface.

Composite Video (RS-170): Video output (1 VP-P into 75Ω).

Link Output: This port outputs a TTL HIGH when the link from Trace Control to high speed trigger occurs.

Clock Output: An ECL active-LOW signal corresponds to the K115's internal clock.

Time of Day Clock and Date

The K115 displays a 24-hour time of day clock and the date. They are battery backed up.

Physical Characteristics

Dimensions: 8.6 (218 mm) H x 17.5 in. (445 mm) W x 24.7 in. (627 mm) D with bail.

Weight: 43 lbs. (19.5 kg).

Input Voltages: 50 or 60 Hz; 90 to 135 VAC or 180 to 270 VAC.

Input Power: 275 W, typical.

Accessories Supplied: Probes, probe connectors with flying leads, grabbers, power cord, operating manual, and pouch.

Ordering Information

Product No.	Main Channels	High Speed Channels	Mass Storage
K115-132	32	—	Single Disk Storage
K115-140	32	8	Single Disk Storage
K115-148	32	16	Single Disk Storage
K115-164	64	—	Single Disk Storage
K115-172	64	8	Single Disk Storage

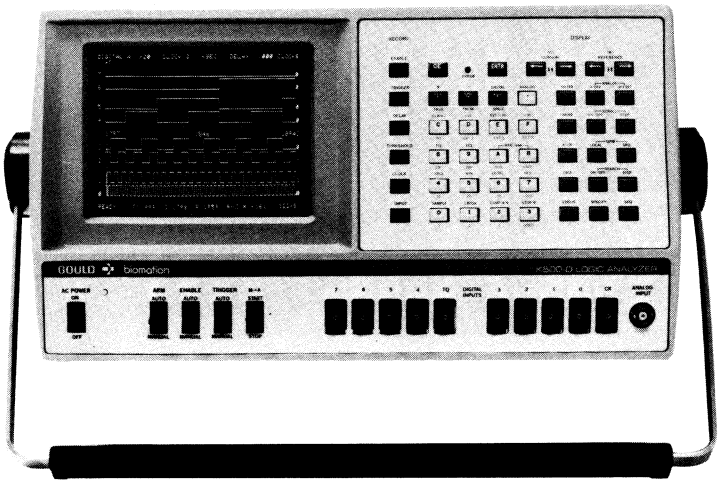
See page 28 for availability of accessories.

Logic Analyzer

Gould K500

Ultra high speed sampling and glitch detection

- **500 MHz sample rate**
- **8 data channels**
- **2 ns resolution**
- **2K deep memory**
- **External clock plus trigger qualifier**
- **Analog channel at 500 MHz sample rate**



The K500 Logic Analyzer is a significant tool for design and development of high speed digital circuits. A set of features has been integrated into a single system and optimized to solve the problems encountered when working with ultra high-speed circuits.

The K500 is not only capable of sampling data at rates up to 500 MHz but of detecting glitches as short as 2 ns regardless of clock rate. Ten digital and one analog inputs are provided. The digital inputs include 8 data channels, one trigger and one qualifier. Each data channel may be independently used in the sample or glitch mode, while any of four different threshold levels may be selected for any of the 10 digital inputs. The analog input has a resolution of 4 bits at a sample rate of 500 MHz and may be used simultaneously with four digital inputs. In addition to being able to trigger on a defined word or an external pulse input, the K500 may also be triggered from an external analog event.

Specifications

Inputs

Digital Inputs

10, including 8 data, ext. clock, and 1 trigger qualifier.

Impedance: 250kΩ, 3.0 pF at active probe tip.

Threshold: Each input may be assigned one of four references: TTL (1.4 V), ECL (−1.3 V), VAR A, VAR B (selectable between −6.35 V and +6.30 V, in 50-mV increments).

Modes: Selected for each channel as sample or latch.

Minimum Detectable Pulse: 2 ns with threshold overdrive of 25% of total voltage swing or 250 mV, whichever is greater.

Analog Inputs

Single input via front panel BNC

Impedance: 10 MΩ, 13 pF at tip of 10:1 probe; 1 MΩ, 40 pF at instrument.

Range: 2 V (0.5 V/DIV), 4 V (1.0 V/DIV), and 8 V (2.0 V/DIV).

Offset: +5 V to −5 V in 1 V increments.

Bandwidth: 100 MHz (500 MHz sample rate).

Max. Input: ±20 V continuous, ±50 V transient (at probe tip).

Resolution: 4 bits (1 part in 16).

Coupling: DC only.

Clock

Internal: Selectable from 2 ns to 50 ms in a 1-2-5 sequence.

Skew: <1 ns, channel to channel.

External: DC −130 MHz single edge. DC −65 MHz both edges.

Setup Time: <2.5 ns.

Hold Time: 0.

Trigger

Three events control data and recording: Arm, Enable, and Trigger.

Arm: Selectable Manual, Auto, or via panel BNC input (ECL or TTL).

Delay: Trigger delay by clock or trigger occurrences up to 65,500.

Filter: When on, three trigger occurrences are required to trigger.

Output: BNC output, TTL active low when trigger is detected.

Memory: High speed, reference and display memory are each 8 bits wide and 2K words deep.

Output: RS-170; IEEE-488.

Physical Characteristics

Dimensions: 8.5 in. (216 mm) H x 15.5 in. (394 mm) W x 21.75 in. (552 mm) D.

Weight: 45 lbs. (20.5 kg).

Power: 100, 120 VAC ±10%; 220, 240 VAC ±10% 400 watts

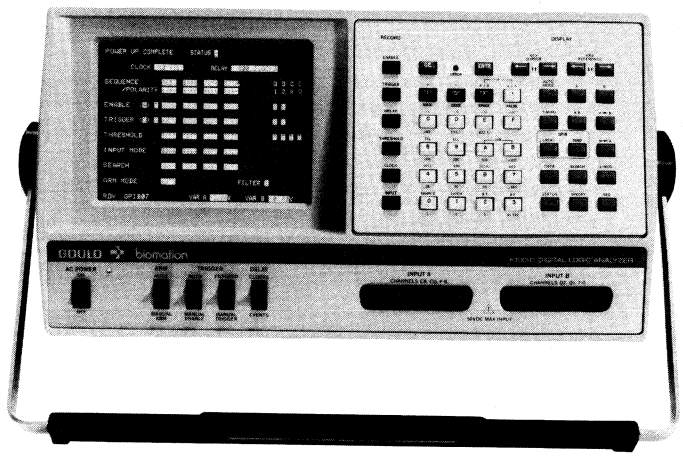
Ordering Information

Product No.	Description
K500-D	Includes digital probes, analog probe, power cord, signal wires, grabbers and users manual.

Logic Analyzer
Gould K100-D

The most popular logic analyzer in the world

- **16 Timing channels to 100 MHz**
- **32 state channels (Option)**
- **1 k samples per channel**
- **10-ns trigger recognition**
- **Data and glitch modes**
- **Menu driven**



The Gould K100-D Logic Analyzer is the most popular logic analyzer ever introduced. With over 8000 units installed, it sets the standard to which all logic analyzers are compared. The K100-D has proven itself to be an invaluable tool in hardware development, microprocessor hardware/software debugging, production testing and service. The wide range of options makes it a complete problem solver. Timing, state, GPIB, RS-232; wherever the problem exists, the K100-D can identify it.

The GPIB interface (standard) allows the K100-D to be fully programmed by an external controller.

The T-12 communicator option allows the K100-D units to operate in a master/slave configuration over a telephone line connection. This capability allows your top technical expert to diagnose problems in a remote location without having to travel.

Specifications

Standard Channels: 16 data channels with 1 k words of memory/channel

Clock

Internal: 10 ns to 50 ms in 1-2-5 sequence.

External: Selectable positive or negative edge, DC-70 MHz.

Qualities: External clock, trigger (2 channels).

Threshold: TTL, ECL, 2 valuable (−6.4 V to +6.4 V) set at each input.

With D/32 External Option

Channels: 16 address, 16 data with 512 bits of memory/channel.

Clock

External: DC-12 MHz.

Qualifiers: 3 external lines.

Threshold: TTL.

Modes

Sample: Unit stores the detected logic level present at each active clock transition simultaneously on all inputs. Minimum pulse always detected and stored is one clock period plus 4 ns.

Latch: Whenever an even number of threshold transitions occur between two successive clock intervals, an input latch stores the state opposite that stored at the previous clock interval on the next clock. The glitch may be stored in one or two memory cells.

Minimum Detectable Pulse: 4 ns typical, 5 ns with threshold overdrive of 25% of total voltage swing, or 250 mV, whichever is greater.

Trigger

Function: Arm, Enable, Trigger, Delay, Filter.

Event: Single level with 2 external qualifiers. May be defined in binary or hexidecimal as true, false, don't care.

Memory: Three segments each 1 k words deep

M: High Speed data capture
A: Display
B: Reference compare, with conditions A = B or A ≠ B over entire memory or segments

Probes

Standard: 6-foot length, flying leads accommodate test points to 18-inch separation; 1 MΩ, 5 pF.

With D/3 Option:

Qualifier: 0.2 mA

Clock: .8 mA (TTL)

Interface: IEEE-488 standard.

Physical Characteristics

Temperature Range: 0 - 50° C, operating.

Dimensions: 8.6 in. (218 mm) H x 17.5 in. (446 mm) W x 18.9 in. (480 mm) D.

Weight: 43 lbs. (19.5 kg) including probes.

Power: 100, 120, 220, or 240 V ±10%, 400W.

UL Listing: Complies with Underwriters Laboratories Safety Standards UL1244, listing #342Z.

Ordering Information

Product No.	Description
K100-000	16-channel logic analyzer with probes, flying leads.
K100-200	Same as above with T12A communicator, phone.
K100-950	Same as K100-000 with 50 Hz to 400 Hz power supply.
K100-952	K100-000 with Portability package.

See page 27 for availability of accessories.

Logic Analyzer
Gould K50

NEW

The general purpose Logic Analyzer

- **32 state or timing channels**
- **10 ns resolution on up to 8 channels**
- **Glitch triggering with 5 ns glitch capture**
- **Variable thresholds**
- **Popular disassemblers for 8-bit and 16-bit microprocessors**
- **Channel labeling**

The Gould K50 Logic Analyzer is a low cost, light weight (23 lb), high performance, portable instrument. Used in engineering, education, service, and manufacturing, the K50 offers features usually found only in logic analyzers costing much more. The K50 is a true general purpose Logic Analyzer. It provides the ability to resolve timing problems on eight channels at 10-ns (100 MHz) and disassemble most of today's popular 8-bit and 16-bit microprocessors. In addition, the K50 can capture data both synchronously and asynchronously without reprobing.

To pinpoint and capture data, four levels of trigger sequence steps can be programmed with one of four trigger words. Word 1 can be ANDed with the glitch word when glitch mode is selected. Each word can be used in any of the trigger sequencer terms. Once data has been captured, the K50's crisp timing and state displays include a trigger marker plus two reference cursors with direct readout of their absolute and relative positions and the data value of the selected cursor.

Specifications

Data Channels, 32-Channels State/Timing

Probes: Four probes, 8 channels each.

Formats
(async.): 32 Channels up to 25 MHz; 16 Channels up to 50 MHz; 8 Channels up to 100 MHz; 4 Channels are used if in glitch capture mode.

Formats
(sync.): 32 Channels DC to 25 MHz; 16 Channels DC to 50 MHz.

Memory

Configurable as:

No. of Data Channels	No. of Glitch Channels	Data Memory Depth	Max. Freq. (MHz)
32	0	1k	25
or 28	4	1k	25
16	0	2k	50
or 12	4	2k	50
8	0	4k	100
or 4	4	4k	100

Reference Memory: Equal in size and configuration to data memory. Can be loaded from data memory or via RS-232/IEEE-488 interfaces.

Non-volatile Memory: Non-volatile storage of current Data and Reference memories, 2 further acquisitions and 16 setups. Data retention by Lithium cell; typical life, 10 years.

Clocks

Internal: 10 Hz to 100 MHz in a 1-2-4 sequence.

External: DC to 50 MHz.

Setup: 10 ns.

Hold Time: 0 ns.

Inputs: 3 clocks which are independently qualified and ORed together.

Triggering

Trigger Sequence Words: 4 words of up to the maximum number of bits of the selected channel configuration. Word 1 is ANDed with the glitch word when the glitch mode is selected. Each word can be used in any of the trigger sequencer terms.

Trigger Sequence Terms: The actual trigger and restart terms searched for in a sequencer step each consist of up to 4 trigger sequencer words ORed together.

Trigger Sequencer Steps: Each of up to 4 sequencer steps consists of a search for the trigger and restart terms specified in that step. Each step has an event count of 1 to 256 occurrences of the trigger term. In 50 MHz and 100 MHz configurations, only 1 sequencer step is available.

Filter Trigger: OFF or 2 to 32 clocks.

Restart Trigger: OFF or 1 to 16 clocks.

Trigger Position: Selectable position on the screen or by using the delay up to 60 k clocks before the display memory.

Trigger Output: TTL signal at rear BNC.

Restart Output: TTL signal at rear BNC.

Hardware and Software Engineers

From triggering on a glitch to resolve a signal race condition to conducting "what if" tests to untangle a software bug, the K50 provides the measurement capability to get the task done. High impedance probes minimize the possibility of the K50 changing the measurement you are making by loading the circuit. Variable threshold probe pods allow you to look at mixed logic families simultaneously.

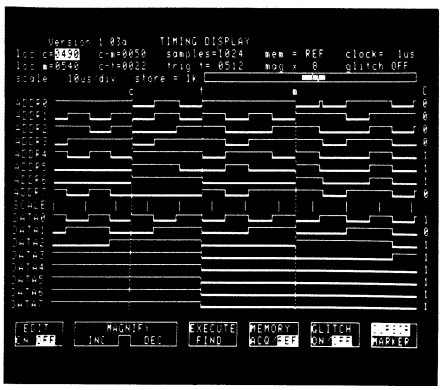
Service and Manufacturing Technicians

You can quickly set up the K50 using the 16 non-volatile setup memories, sample data and compare the results with one of the reference memories. Then, by using the channel and memory length compare options, you can quickly analyze the data for good and bad signals.

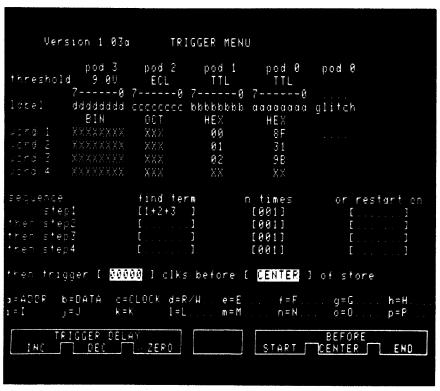
Educational Institutions

You can provide training on STATE, TIMING, and DISASSEMBLY of microprocessor code with an industrial quality instrument, that gives your students the edge they will need to acquire a job upon graduation.

Disassemble data for popular µPs.



Customize the timing waveform display to suit your varying needs.



4 levels of triggering can follow a simple or complex chain of events.

Glitch

Minimum PW (pulse width): Captures glitches as small as 5 ns in duration (glitch triggering is not available in 50 MHz and 100 MHz configurations).

Probe Inputs

Impedance: 1 MΩ, 5 pF shunt.

Threshold: TTL (+1.4 V) or Variable.

Variable Threshold Range: −9.0 V to +9.0 V in 100-mV steps.

Maximum Input Voltage: ±50 V continuous.

Hysteris: 100 mV typical.

Minimum Input Overdrive: 250 mV or 25% of input amplitude, whichever is greater.

Data Skew: Typically better than 2 ns between input channels of the same pod; typically better than 4 ns between all channels.

Disassemblers

Instrument may contain three disassemblers simultaneously.

Interfaces (standard)

Full IEEE-488, Centronics and RS-232-C port. Composite video output (75 Ω, 1 VP-P).

Other: BNC TTL level trigger.

Physical Characteristics

Dimensions: 7.5 in. (190 mm) H x 13.8 in. (350 mm) W x 17 in. (430 mm) D.

Weight: 23.1 lb. (10.5 kg).

Operating Temperature: 5°C to 40°C.

Power Requirements: 95-135 VAC or 180-265 VAC, 47-440 Hz; 100 VA max.

Display: 7 in., non-glare, green CRT; 25 lines x 64 characters.

Ordering Information

Model Number	Description
K50-032	32-channel state or timing logic analyzer. Includes 4 probes, 1 clock probe, user's manual and power cord.

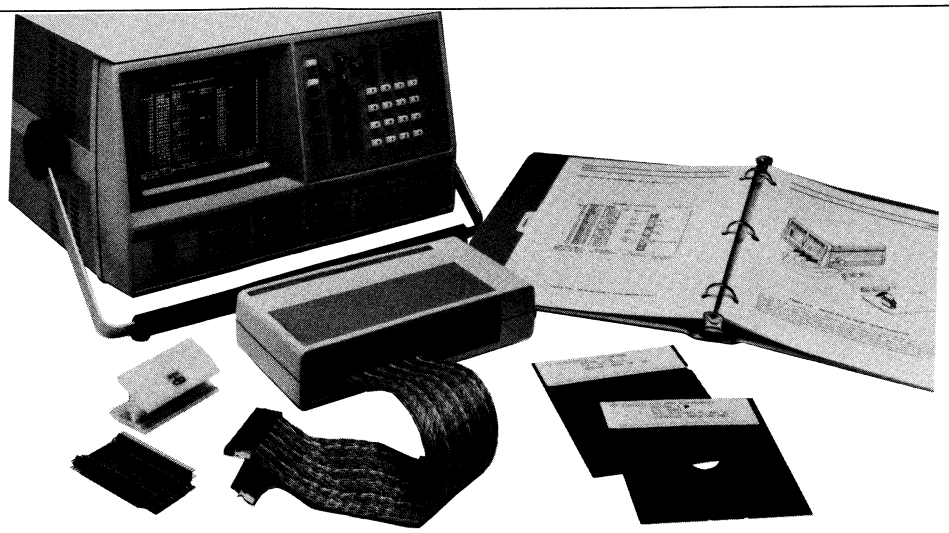
Accessories

Model Number	Description
A60011	Z-80 MAP disassembler
A60012	8085 MAP disassembler
A60015	6502/65C02 MAP disassembler
A60017	6809/E MAP disassembler
A60021	8086/88 MAP disassembler
A60022	68000 MAP disassembler

Call factory for availability of additional microprocessors analysis packages not listed here.

Microprocessor Analysis Packages

- **Non-invasive program execution monitoring**
- **Support for all popular 8-, 16-, and 32-bit μPs**
- **Display in manufacturers' mnemonics**
- **Easy connection to prototype with chip clip or probe**
- **Disassembly software provided on diskette (K450/K115) or in ROM pack (K50)**



Microprocessor Analysis Packages (MAPs) provide complete interfacing and disassembly for most of the popular microprocessors in use today. In addition, a User-Definable Disassembler and Interface Adapter will support any additional standard or custom processors.

Analysis of program execution displayed in Hex or Binary format is extremely time consuming for even the simplest of programs. The Gould Microprocessor Analysis Package (MAP) quickly converts executed object code into assembly language instructions and data.

Multi-byte instructions are grouped together on one line. Each line lists address, hex object code, and source mnemonics of the executed code. Memory reads and writes are also displayed, including any special type of memory space addressed (user, supervisor, etc.). Interrupts and other exception processing are flagged so they can be quickly located and analyzed. Illegal and nonexecuted queue instructions also prominently marked to eliminate errors.

Specifications

Microprocessor	K450		K115		K50
Intel	**-132**	**-148**	**-132**	**-164**	
8031/51	X	X	X	X	X
8048/51	X	X	X	X	
8080/A	X	X	X	X	
8085/A	X	X	X	X	X
8086/8		X		X	X
80186/8		X		X	
80286		X		X	
Motorola					
6800/02			X	X	
6809	X	X	X	X	X
68008		X		X	
68000/10		X		X	X
68020		X		X	
Zilog					
Z80/A/B	X	X	X	X	X
Other					
6502					X
Universal (UDD)	X	X	X	X	X

General Features

All MAP packages provide the following basic capabilities:

- Capture of address, data and control signals related to program execution.
- Trigger on combinations of bus cycle types; Input, Output, Memory read/write, Instruction fetch, Interrupts. MAP packages configure Trace Control so that trace parameters can be defined in terms of the microprocessor's software architecture.
- Display in prime vendor execution mnemonics.
- Cycle by cycle or summary by instruction displays.
- Data capture speed is typically governed by the basic logic analyzer specification. Certain MAP packages contain external interface hardware to demultiplex bus signals and generate clock signals. This hardware is designed to support the fastest processor of its type. For details contact your local sales office.

Special Considerations

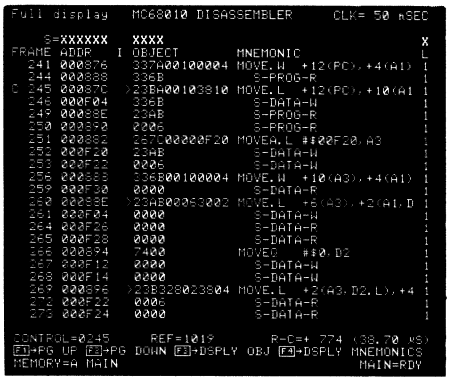
Microprocessor MAP support views the chip activity at the component pins. Certain microprocessors (eg: 68020, 8051) contain internal cache and program memory. These features must be disabled to obtain a complete picture of the components activity.

Each MAP is delivered with complete interface hardware (a convenient chip clip for snap-on simplicity and a processor probe board for high integrity termination). Each connection type is supported by a custom molded interface pod and cable.

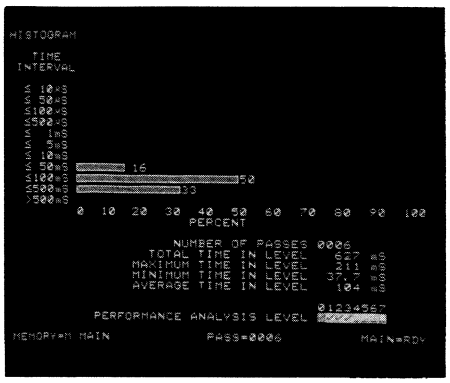
A MAP transforms your logic analyzer into a complete microprocessor system debug station. Along with data formatting (for disassembly displays), a complete parametric setup is made including Automatic Status decoding. This decoding can be used in trace selections (READ, I/O, FETCH, etc.) without determining the individual status bits. Additionally, all monitored bus and control signals are labeled on the timing display for convenient analysis.

Logic analyzers with MAP support assist you in debugging and tuning your software. Disassembly allows you to pinpoint problems and determine how the software got to a code segment and what happened during its execution. Unlike an in-circuit emulator which may change program execution, the logic analyzer monitors circuit activity transparently.

The development of functional software is only half of the task. Optimizing it to meet performance and system requirements can be as time consuming as the development itself. The Gould K115 in a stand-alone configuration, or either the K115 or K450 used in conjunction with a PC for remote control, provide histogram overview displays. These graphical representations of program flow let you evaluate the time spent in program segments. This view of program execution allows you to quickly determine where to focus your code optimization efforts.



Disassemblers automatically display address, object data, mnemonics and operands.



Histogram displays show time in code segments to aid in optimization.

Non-microprocessor buses, including Q-Bus and IEEE-488 and RS-232-C are also supported.

User-Definable Disassembler and Interface

Using a standard RS-232-C terminal and the K115/K450 (with disk) as its own host computer, Gould's model User-Definable Disassembler (UDD) can be used to create your own symbolic translator. A flexible command structure allows you to design simple look-up tables of complex disassemblers for virtually any microprocessor. Unsupported or custom processors can receive the same productivity enhancements gained through standard disassemblers. The UDD is supplied with software diskette and user's manual.

The User-Definable Interface (UDI) can be easily configured into a custom interface adapter. Once configured, this adapter permits one-step connection to target systems. Circuit board area, IC pads, and power buses permit user-added circuitry. Each unit includes pod casing, motherboard with mounted connections for 6 probes (K115/K450 type), internal PC board for cross-connections or circuitry, (clips and cables available as MAP accessory parts), and a user's manual.

Protocol Analyzers

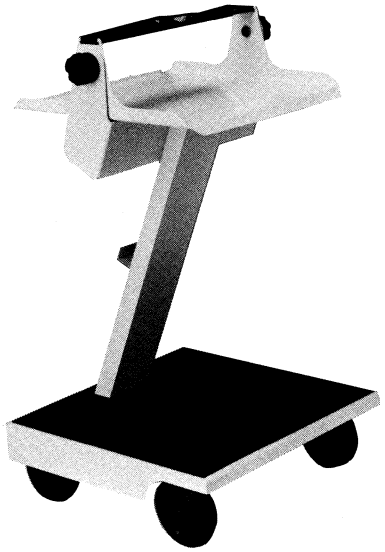
Gould's K450/K115 Logic Analyzers have the option which allows either RS-232-C and IEEE-488 protocols to be examined at the transaction level. Each option includes mating connectors.

Logic Analyzer Accessories

Instrument Cart

Fits all logic analyzers and oscilloscopes.

- **Ergonomic viewing angle, with positive detent locking shelf**
- **Easy to maneuver with free rolling 5-inch casters**
- **Stays put with front locking brakes**
- **Handy auxiliary AC power outlet for other equipment**



Gould's mobile Instrument Cart is specifically designed for the K-XXX series Logic Analyzer family. The cart is constructed of sheet steel that is finished with a Gould Gray paint. The base has a black rubber mat on the surface, and a 1.5 in. black nylon protective bumper strip. The 5 in. caster system, having swivel front casters and rigid rear casters, makes the cart especially easy to maneuver. The ergonomic design of the instrument shelf allows viewing at any angle, but a positive locking detent is provided at the ideally determined angle of 23 degrees.

The cart assembles in minutes by following the assembly instructions.

Specifications

Overall Size: 33.5 in. (850.9 mm) H x 21.5 in. (546.1 mm) W x 22 in. (558.8 mm) D.

Shelf Size: 17.5 in. (444.5 mm) W x 19 in. (482.6 mm) D.

Base Size: 21.5 in. (546.1 mm) W x 22 in. (558.8 mm) D.

Shipping Weight: approximately 65 lbs. (29 kg).

Color: Gould Gray.

Auxiliary AC Outlet: 20 A.

Shelf Load Capacity: 70 lbs. (31 kg).

Order Number: A50009.

Logic Analyzer Accessories
for Gould K100-D

A full range of accessories is offered to further enhance your digital design productivity.

Description	Model Number
K100-D/10 Probe Pods Provide 16-channel operation. Each pod is supplied with a 9-in. signal cable, hook-type grabbers, and accepts 10 inputs	A11014
K100-D/32 Input Adapter Provides K100-D with 32-channel, 12 MHz data domain capability with 512 bits per channel	A11003
K100-D/40 Input Adapter Provides convenient one-step connection between a microprocessor and K100-D/32	A11004
6-Ft. Probe Set Includes two 6-ft. probes, flying leads, and grabbers	A11016
9-Ft. Probe Set Includes two 9-ft. probes, flying leads, and grabbers	A11019
10 TC-02 High Performance Probe Pod Includes two K100-D "Probe to BNC" adapters.	A11011
10-XR High Performance Probe Set 10 MΩ, x 10 compensated probes, 6-ft. lengths, packaged nine to a set with removable tips	A11010
Probe Tip Adapters (20 plus polarizer)	A11018

Description	Model Number
K100-D/RS-232 Serial Data Analyzer For monitoring RS-232C interface. Includes "piggy-back" connector	A11005
K100-D/488 GPIB Analyzer Provides transparent connector to IEEE-488 bus. Monitors all data and control lines	A11006
Portability Package Includes hardware to cover front panel. Pouch to fit on top of K100-D (field installable). PORTABILITY PACKAGE NOT AVAILABLE WITH T-12A	A50003
T-12A Communicator Allows the K100-D to communicate via telephone. For U.S.A. use only. A flip-phone and pouch are included. The K100-D must have IEEE interface. PORTABILITY PACKAGE NOT AVAILABLE WITH T-12. (field installable)	A11007
K100 User's Manual	A11013
T-12A User's Manual	A11020
Camera Adapter Designed for use with Tektronix C-5B or C-5C option 01 cameras	A50008

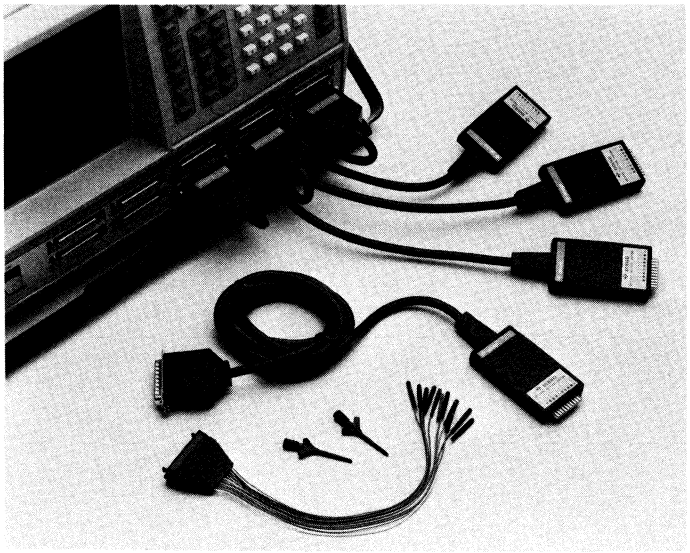
Logic Analyzer Accessories

For Gould K115

Microprocessor Analysis Package

Microprocessor Analysis Packages translate the data captured from a K115 Logic Analyzer into easily understood assembly language mnemonics. Instruction fetches, memory reads and writes, and interrupts are clearly displayed to help understand a microprocessor's operation. Illegal and non-executed instructions are also prominently marked to eliminate interpretation errors.

Model No.	Description
	Intel
A11513	MAP for 8080/8080A
A11524	MAP for 8031/51
A11532	MAP for 8048/49
A11512	MAP for 8085/8085A
A11511	MAP for 8086/88
A11535	MAP for 80186/80188
A11537	MAP for 80286
	Motorola
A11515	MAP for 6800/02
A11516	MAP for 6809
A11533	MAP for 68008
A11510	MAP for 68000/10
A11531	MAP for 68020
	Zilog
A11514	MAP for Z80, Z80A, Z80B
A11508	**User-Definable Disassembler.**
A19511	**K115 PCLA.** IBM PC, XT and AT software for controlling your K115. Interfaces to the logic analyzer through RS-232 port. (Supports National IEEE-488 only, see A19512).
A19512	**GPIB Interface.** National IEEE-488 interface hardware for IBM PC supported by PCLA/TECS software (A19511).
A19502	**S10 Probe.** 8 data and 2 clock inputs each with an active probe on a 6′ cable providing up to 12′ of probe separation. Includes 10 sets of flying leads and grabbers.
A11501	**32 Channels.** For K115-132 and K115-140. Includes 4 probes, 4 probe connectors with flying leads, 4 sets of 9 grabbers each and installation instructions. (Field installable).
A11502	**First 8 Channels at 100 MHz or 4 at 200 MHz.** For K115-132 and K115-164. Includes 1 probe, 1 probe connector with 11 flying leads, a set of 11 grabbers and installation instructions. (Field installable).
A11503	**Second 8 Channels at 100 MHz or 4 at 200 MHz.** For conversion to K115-148. Includes 1 probe, 1 probe connector with 9 flying leads, a set of 9 grabbers and installation instructions. (Field installable).



Model No.	Description
A11521	**Upper Probe Kit.** Includes 1 probe, 1 probe connector with 9 flying leads, 9 grabbers and a set of labels.
A11522	**Lower Probe Kit.** Includes 1 probe, 1 probe connector with 11 flying leads, 11 grabbers and a set of labels.
A11523	**Flying Lead Kit.** Includes 3 lower section probe connector with 11 flying leads each, and 3 upper section probe connector with 9 flying leads each. Also includes 66 grabbers.
A19509	**User-Definable Interface.**
A11505	**Serial Data Analyzer.** For monitoring RS-232C interface. Includes "piggy-back" connector.
A11506	**GPIB Analyzer.** Provides transparent connector to IEEE-488 bus. Monitors all data and control lines.
A11551	**K115 User's Manual.**
A11552	**K115 Disk Storage System Operating Diskette.**
A50007	**Pouch.** For probes, etc.
A11553	**K115 Training Kit.** Self-teaching guide. Includes "Know Your K115 Quickly" workbook and data generator board. One kit already included with K115.
A11554	**K115 Service Kit.** Includes 2 extender cards, maintenance manual and diagnostics diskette.
A50001	**Rack Mount Kit.** Includes drawer slides.
A50009	**Instrument Cart.**
A50006	**Transit Case.** Reusable polyethylene shipping container. Measures 16.5 in. (419 mm) H x 21 in. (533 mm) W x 31 in. (787 mm) D.
A19510	**Graphics Printer Kit.** Prints state and timing displays. Kit includes cable and printer compatible with Epson FX series graphic printers.

Logic Analyzer Accessories

For Gould K450

Microprocessor Analysis Package

Microprocessor Analysis Packages translate the data captured from a K450 Logic Analyzer into easily understood assembly language mnemonics. Instruction fetches, memory reads and writes, and interrupts are clearly displayed to help understand a microprocessor's operation. Illegal and non-executed instructions are also prominently marked to eliminate interpretation errors.

Model No.	Description
	Intel
A14510	MAP for 8080/8080A
A14509	MAP for 8085/8085A
A14508	MAP for 8086/88
A14512	MAP for 80186/80188
A14513	MAP for 80286
A14545	MAP for 8031/51
	Motorola
A14515	MAP for 68008
A14507	MAP for 68000/10
A14514	MAP for 68020
	Zilog
A14511	MAP for Z80, Z80A, Z80B
A14516	**User-Definable Disassembler.** Create your own disassembler.
A19509	**User-Definable Interface.** Create your own probe connection box.
A14525	**Q-Bus Disassembler.** Includes 1/2 high Q-Bus card, probe interface card and software.
A14526	**HR1000/ATC.** Up to 100 ps resolution of a repetitive signal ≥20 ns pulse width on 8 channels. Includes S8 probe, necessary cable and users manual. The K450 must have version 2.0 or higher firmware. For firmware less than 2.0, order 2.0 version at no charge, product number A14519.
A19508	**Spare S8 Probe.** For HR1000/ATC.
A19502	**S10 Probe.** 8 data and 2 clock inputs each with an active probe on a 6-ft. cable providing up to 12 ft. of probe separation. Includes 10 sets of flying leads and grabbers.
A14520	**Telediagnostics.** Remote communication over phone lines via RS-232C. Includes diskette and user's manual. The K450 must have version 2.0 or higher firmware and disk storage system. For firmware less than 2.0, order 2.0 version at no charge, product number A14519.
A14546	**PLCA with Telediagnostics.** Software that allows you to run the K450 remotely from your desk or over the telephone via your IBM PC.
A19503	**Modem.** Hayes compatible, includes user's manual.

Model No.	Description
A14500	**16 Channel Upgrade.** 16 channels at 100 MHz or 8 at 200 MHz for K450-016, K450-216, K450-032, or K450-232. Includes 2 probes, 2 probe connectors with flying leads, 2 sets of 11 grabbers, and intallation instructions. (Field installable).
A14501	**Disk Storage System.** For K450-016, K450-032, and K450-048. Includes DOS diskette and user's manual. (Field installable).
A14505	**Probe Kit.** Includes 2 probes, 1 probe connector with 11 flying leads for lower (0-7) inputs, 1 probe connector with 11 flying leads for upper (8-F) inputs, 2 sets of 11 grabbers each, and a set of labels.
A11505	**Serial Data Analyzer.** For monitoring RS-232C interface. Includes "piggy-back" connector.
A11506	**GPIB Analyzer.** Provides transparent connector to IEEE-488 bus. Monitors all data and control lines.
A50007	**Pouch.** For probes, etc.
A50001	**Rack Mount Kit.** Includes drawer slides.
A50009	**Instrument Cart.**

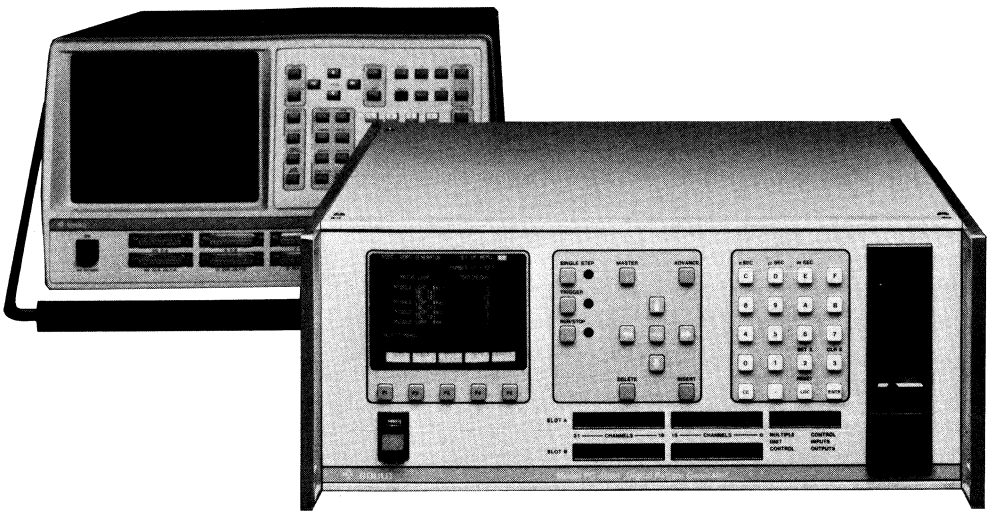
A50006	**Transit Case.** Reusable polyethylene shipping container. Measures 16.5 in. (419 mm) H x 21 in. (533 mm) W x 31 in. (787 mm) D.
A19510	**Graphics Printer Kit.** Prints state and timing displays. Kit includes cable and printer compatible with Epson FX series graphic printers.
A14506	**Upgrade Kit.** Factory upgrade for K205-x32 to K450-x32. For K205-x48, add one A14500.
A14502	**K450 User's Manual.**
A14503	**K450 Disk Storage System User's Manual.**
A14504	**K450 Disk Storage System Operating Diskette.**
A14527	**K450 Training Kit.** Self-teaching guide. Includes "Know Your K450 Quickly" workbook and data generator board. One kit already included with each K450.
A14518	**K450 Service Kit.** Includes 2 extender cards, maintenance manual and diagnostic diskette.

Digital Word Generator

Gould PG-4064

A perfect complement to the family of Logic Analyzers

- **Flexible low cost digital stimulus**
- **Up to 64 channels**
- **Simple operation**
- **GPIB control**



Key Tool

A pattern generator and logic analyzer are the key design tools of the digital design engineer. Both tools must be flexible enough to test a large variety of design applications. Applications of the PG-4064 include:

- Serial Data Communications
- Digital Circuit Design
- Analog to digital converter and digital to analog converter design verification
- Integrated Circuit Design Testing
- Device Characterization

Specifications

Channel Width Versus Memory Depth

10 MHz	20 MHz	40 MHz
32 x 4 k	16 x 8 k	8 x 16 k
16 x 8 k	8 x 16 k	4 x 32 k
8 x 16 k	4 x 32 k	2 x 64 k
4 x 32 k	2 x 64 k	1 x 128 k
2 x 64 k	1 x 128 k	
1 x 128 k		

Timing Simulator each slot):

32 channels x 4 k: 100-ns resolution.

16 channels x 4 k: 50-ns resolution.

Timing Relationships (all values are typical):

Channel to channel skew (same slot)	< 2 ns
Channel to channel skew (two slots)	= 2 ns
Gated output clock to data channels	= 8 ns
Gated output clock to program sync	= 5 ns
Gated output clock to major loop sync	= 10 ns
External clock to gated output clock	= 30 ns
External force tri-state to data channels	= 12 ns
External trigger to data channel (plus one clock period max.)	= 20 ns

Serial Data Communications

The serial mode is optimized for this application. Up to 128K bits may be generated on a single channel. This capability lets the PG-4064 replace a serial data source with a known good source. This is very useful in determining which sub-system of a large data communication system is operating incorrectly. The PG-4064 easily replaces many serial devices in a system, so you can replace a questionable module with a known-good system component.

Not Just for Digital . . . A Place in the Analog World

The PG-4064 can be used to replace missing components, such as analog-to-digital converters, or high speed memories used to drive digital-to-analog converters. The PG-4064 and a suitable logic analyzer or digital oscilloscope can help you determine the operating characteristics (response time, etc.) of these analog devices.

The Basic IC Tester

Precisely verifying the operating characteristics can be crucial to creating the cutting edge design. The PG-4064 with delay pods can help you verify set up and hold times, as well as timing delay paths. Two delay pods with 8 data channel inputs and one clock input are included with the PG-4064. They are used to adjust the data transition points relative to the clock edge over a 25 ns range with 150 ps resolution.

A logic analyzer and pattern generator with precision delay pods are the basic components of a custom IC tester. They are an ideal low-cost solution as compared to the much more expensive ASIC test systems.

Faster Design Verification

During the systems design, the PG-4064 may be used to replace signal sources that are not yet functional. This can speed up the system integration portion of your project, so you are working instead of waiting.

The PG-4064 can imitate complex clocking of microprocessors or other digital system components, using up to three levels of looping.

Using the table sequencer to specify the order and number of repetitions to generated signals or words, you can imitate the operation of a multitude of system components before the components are ready to use. Additionally, several word tables may be defined so that you can output a particular word for hundreds of milliseconds, then jump to another table with a much faster time base to finely control short precision pulses.

Mass Storage, CAE and More . . .

Many logic and fault simulators now run on personal computers. Output patterns produced by these CAE tools are easily transported to the PG-4064. The PG-4064 has a compatible disk drive for this purpose.

The disk drive is of additional benefit when used in conjunction with a GPIB controller. The controller requests a particular file from the PG-4064 to be run. The controller is then available to control other instruments in the test system.

Clocks

Internal oscillator is 40 MHz with stability of ±0.1%.

Internal period generator: 40 MHz max.

Range	Resolution
25 ns - 51.175 µs	25 ns
51.25 µs - 511.75 µs	250 ns
512.5 µs - 5.1175 ms	2.5 µs
5.125 ms - 51.175 ms	25 µs
51.25 ms - 511.75 ms	250 ms

External clock input: 40 MHz max with 12.5 ns minimum pulse width, rising edge active.

TTL Outputs and Inputs

Drivers: 256 mA sink current; 60 mA source current with no termination.

Syncs: Programmable and major loop, falling edge active.

Trigger In: Falling edge active /12.5 min. pulse width.

Force Tri-State: Low level active.

Remote Interfaces

GPIB: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0.

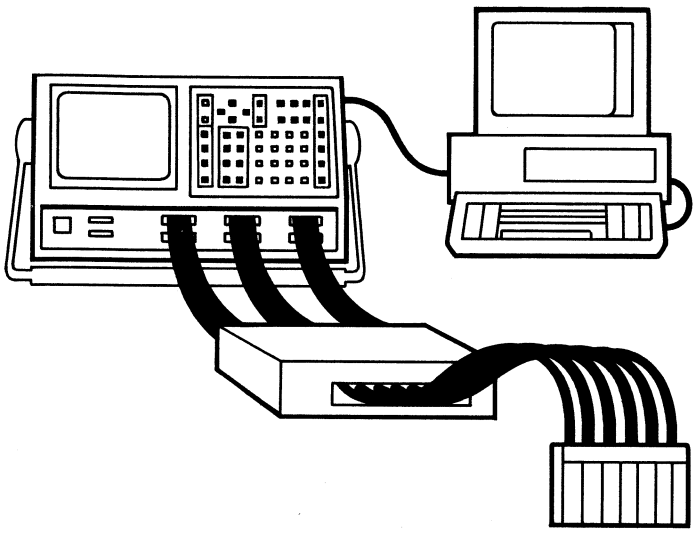
RS-232C: 110 - 19.2 k baud/switch selectable.

Mr. Goodchips In-Circuit IC Tester

Gould K450 / Chip Prober / IBM PC / Simulator

NEW

- **Low-cost in-circuit testing of integrated circuits**
- **Simple operation**
- **Fast results**
- **Comprehensive testing**



Mr. Goodchips is optimized for service-depot-level printed circuit repair applications. Mr. Goodchips requires no customer programming, which means it is busy finding bad integrated circuits in minutes after it is delivered. An easy-to-understand diagram appears on the screen indicating which pins of an integrated circuit pass or fail the test. Typically, replacing the failing integrated circuit is sufficient to make the board work again.

The System does not require you to change your test strategy. It replaces the oscilloscope and other testing instruments now being used and isolates bad components immediately.

The operator need only connect the clip to the circuit and type in the last 3 digits of the manufacturer's part number; Mr. Goodchips does the rest.

Low Cost

Until now, in-circuit testers represented a major investment in hardware, software and floor space. The testers were optimized for high-volume manufacturing environments with price tags reflecting that capability. Frequently, a team of programmers wrote extensive programs to verify many parameters with these expensive testers. Lastly, the tester required special power considerations and lots of floor space.

Because of this scenario, it was not cost-effective to use in-circuit testers in the service depot environment. Mr. Goodchips changes all that. Service environments do not require all the test capability of a full-blown in-circuit tester, since the failed board actually worked at one time. This fact eliminates the need to test for solder splats, whiskering, or opens and shorts on board traces. The most probable cause of failure in the field is bad integrated circuits; Mr. Goodchips finds them quickly.

Finding bad integrated circuits

Mr. Goodchips records with the K450 Logic Analyzer the inputs and outputs of the integrated circuit under test. The System compares the recording to a logical (Boolean) simulation of the integrated circuit. The System then indicates, in an easy-to-understand diagram, which inputs have been tested and which outputs compare favorably to the simulated outputs.

The System then retries the test, this time triggering the K450 Logic Analyzer on the transition of those inputs that were found to be untested. These tests are repeated until all required input states are observed and all outputs compared to the simulation.

Simple operation

Mr. Goodchips assumes two things:

- The service depot has a "golden chassis" (working target system) available.
- The golden chassis will run test diagnostics that exercise each integrated circuit on the board. Typically, these diagnostics isolate failures to the board level while exercising each integrated circuit on the board.

If these two assumptions are true, then testing can commence. The operator simply places a dip clip on the suspect integrated circuit, types in the last 3 digits of its manufacturer's part number, and in just a few seconds, a display will appear of the integrated circuit pinout with a pass/fail/unknown indication next to each pin. A fail clearly indicates that the integrated circuit is bad and should be replaced.

Fast results

Recordings are transferred via GPIB to the IBM XT/AT (or compatible), then compared to the simulation in less than 1 minute. When additional recordings are required, the actual test time will be some multiple of 5 seconds.

The simulation and compare process for the component under test takes place at a rate of 50,000 gates per second. No other simulator works this fast.

Comprehensive testing

Mr. Goodchips supports the most-used integrated circuits: over 250 TTL integrated circuits; over 150 ECL integrated circuits; over 125 CMOS integrated circuits, and over 25 memory devices. Memory devices require downloading of memory content for testing.

More information

In addition to the chip pinout result, the timing diagram appears, indicating where the recorded traces miscompare with the simulated traces.

When the active chip prober is used, the pinout diagram now indicates the high and low voltage levels. This type of information isolates faulty integrated circuits that are grounding bus lines, making several integrated circuits look like bad chips.

Specifications

System

K450 Logic Analyzer with 48 channels by 2 k at 100 MHz.

Chip prober with dip clip cable and dip clips.

Mr. Goodchips software. (Aldec Software guarantees operation and maintenance of the simulator.)

IBM XT or AT-compatible with at least 540 k of RAM and a hard disk drive (Customer-supplied).

GPIB interface board for the IBM XT or AT-compatible.

Chip Probers

The static prober uses the K450 probes (5 each) to sense the signals from the integrated circuit under test. It routes the signals from dip clips to the appropriate probe.

The active prober contains its own signal-sensing circuits with dual threshold. Threshold setting resolution is 5 mV. If an inordinate amount of time is spent between states (below one threshold voltage but above the other), that indicates a bus contention situation. Additionally, transitions are detected and used as the sample clock. This allows the logic analyzer to test with fewer recordings, since 2048 transitions or state changes are captured per recording. That adds up to even faster testing.

Data Capture

Samples are taken every 10 ns with the static chip prober and on all transitions with active prober. In either case, asynchronous interrupts are monitored and taken into consideration when the real vs. simulation comparison is made.

Oscilloscopes

Digital Storage Oscilloscopes Selection Chart

Our full line of DSOs can meet your specific application requirement. Programmable models can be interfaced to computers via either RS-232C or GPIB (IEEE-488) for mass storage, automatic customized signal processing and automatic test applications.

Model No.	Bandwidth MHz	No. of Channels	Memory Size Per Channel K Words	Vertical Resolution Bits	Sample Rate MHz	Pre-Trigger	RS-232C	GPIB	Special Features	Page No.
1421	20	2	1	8	2	25, 75, 100%	No	No	Storage of Repetitive Signals to 20 MHz	46
1425	20	2	1	8	2	25, 75, 100%	Yes	No	Cursor Measurements, Waveform Processing	46
1604	20	4	10	8	20	0 - 100% Variable	Yes	Yes	Fully Programmable, Built-in Color Plotter, Waveform Processing	41
4030	20	2	1	8	20	25, 75, 100%	No	No	Dual Converters, NATO Approved	44
4035	20	2	1	8	20	25, 75, 100%	No	Yes	Cursor Measurements, Waveform Processing	44
4050	35	2	1	8	100	25, 75, 100%	No	Yes	Waveform Processing, Non-Volatile Back-up Memories	39
4072	100	2	1	8	400	0 - 100% Variable	Yes	Yes	Fully Programmable, Built-in Color Plotter, Waveform Processing	36
4074	100	4	1	8	400	0 - 100% Variable	Yes	Yes	Fully Programmable, Built-in Color Plotter, Waveform Processing	36

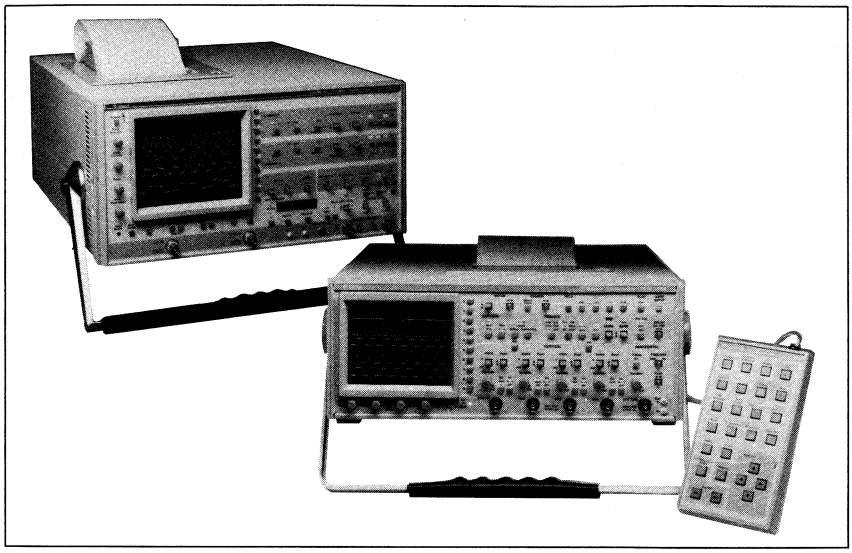
Digital Storage Oscilloscope

Gould's full line of Digital Storage Oscilloscopes (DSO) offers you the advantages of digital storage without giving up the ruggedness, versatility, and convenience of a general-purpose, real time scope.

Gould brings you a complete selection of applications-oriented scopes that function as real time scopes, digital storage scopes, transient recorders and electronic chart recorders.

If your needs go beyond that offered by most oscilloscopes available today, a Gould DSO is for you. No other scopes — real time, storage tube or digital — offer comparable advanced systems capabilities for so little. Using the optional keypad processors, you can do filtering, signal averaging, waveform comparison, TV line capture, frequency computations, and interchannel mathematical operations.

- **DSOs with 400 MS/s 8-bit converters**
- **Bandwidths up to 150 MHz**
- **Automatic cursor measurements**
- **Extensive waveform processing software**
- **Built-in color plotters**



Gould's Test and Measurement equipment provides:

☐ **Unmatched application flexibility.** Choose from the widest range of portable, dual-trace DSOs tailored to meet the needs of technicians, engineers and scientists in industries and professions with measurement needs in the DC to 100 MHz applications range.

☐ **Unequalled system functionality.** Capture, store, measure, compare and process data. These comprehensive measurement systems also allow observation of events in real time, the study of transient phenomena, and the convenient documentation of test results on a wide variety of analog and digital systems.

☐ **Unbeatable values.** Gould DSOs solve your problems for less money. Utilize features unavailable even on the most expensive scopes.

These DSOs are ideal for a multitude of exacting applications, such as:

Mechanical: Stress, vibration, and shock testing and analysis.

Electrical: Contact bounce, voltage breakdown, life/destructive testing, and transient analysis.

Electronic: Testing and development of microprocessor-based systems and communications products, power supplies, consumer electronics, part characterizations, etc.

Medical: Nerve studies, cardiac response, lung function, retina research, and speech pattern analysis.

Scientific: Tensile/compression, acceleration and displacement temperature and ultrasonic testing.

Gould Waveform Processors: To convert the Gould Digital Storage Oscilloscope into an even more powerful analysis system, see page 48 for more details.

Oscilloscope Accessories: See page 54 for details.

Real Time Oscilloscopes

Gould's portable real time oscilloscopes incorporate microprocessor technology to provide increased performance and ease of use. For example, key information such as measured values and control settings are displayed along with actual waveforms.

Four models are available with maximum bandwidths from 20 MHz to 150 MHz. All models, including the low-cost OS300, are highly reliable and are NATO approved.

Real Time Oscilloscopes Selection Chart

These instruments cover a wide range of bandwidths to ensure that there is one matched to your application.

Model No.	Bandwidth MHz	Max. Y Sens. mV/Div.	No. of Channels	Max. Sweep nS/Div.	Sweep Delay	Y Delay Line	TV Sync	Accel. Potential kV	Special Features	Page No.
OS300	20	2	2	50	No	Yes	Yes	2	Low Cost, NATO Approved Version	50
3060	60	1	3	5	Yes	Yes	Yes	12	Cursors, On-Screen Read-Out of Control Setting	51
3100	100	1	4	2	Yes	Yes	Yes	18	As Above Plus Built-In DVM and Frequency Counter	51
3150	150	2	4	2	Yes	Yes	Yes	20	As Above Plus Delay Events Counter	51

High Speed Digital Storage Oscilloscope

Gould 4072 and 4074

NEW

- **400 M samples/s 8-bit converters on every channel**
- **2 or 4 channel versions**
- **100 MHz transient bandwidth**
- **Low jitter and 2 ns/div time resolution**
- **Waveform processing**
- **Fully programmable**

Gould 4074

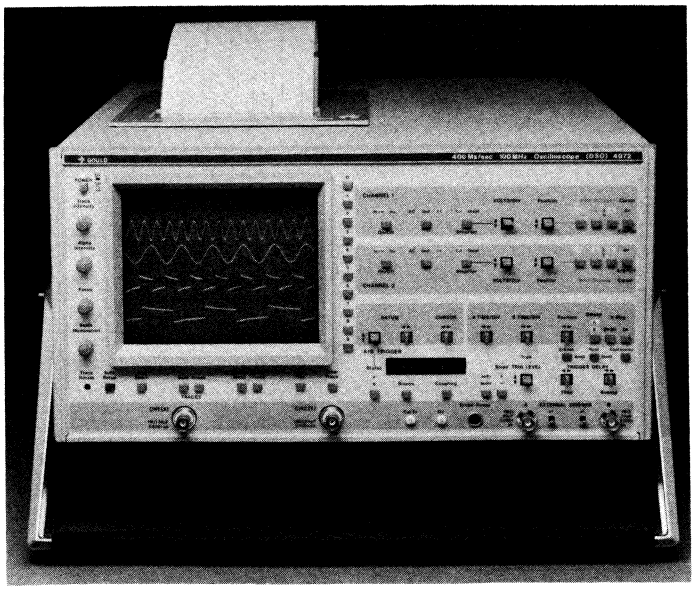
The Gould 4070 Series provides application flexibility to meet a wide range of needs, including high speed and processing capabilities for design and test applications. These scopes also provide full programmability for laboratory automation or ATE, the portability needed for field service, and the ruggedness and easy operation required for manufacturing applications.

Best performance around

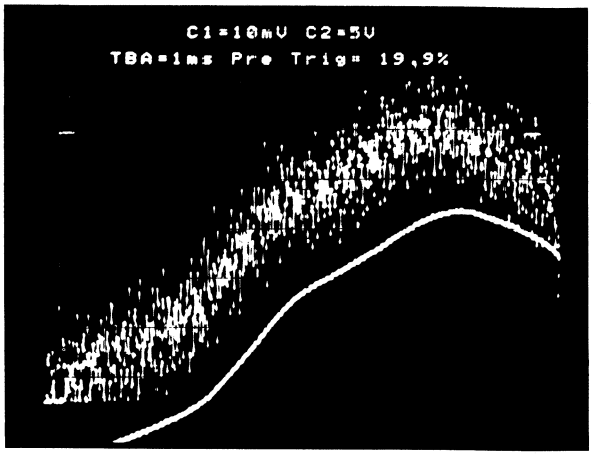
Gould's 4070 Digital Storage Oscilloscope Series delivers the best performance available. It features exclusive 400 M samples/s digitizers on every channel, enabling true 100 MHz bandwidth and accuracy for both transient and continuous signals in real time. To ensure the best results from fast signals there are sine and linear interpolators; less than 200 ps jitter to give high accuracy equivalent time sampling to 2-ns/div resolution, 5-ns glitch capture, and much more.

Exceptional triggering capability

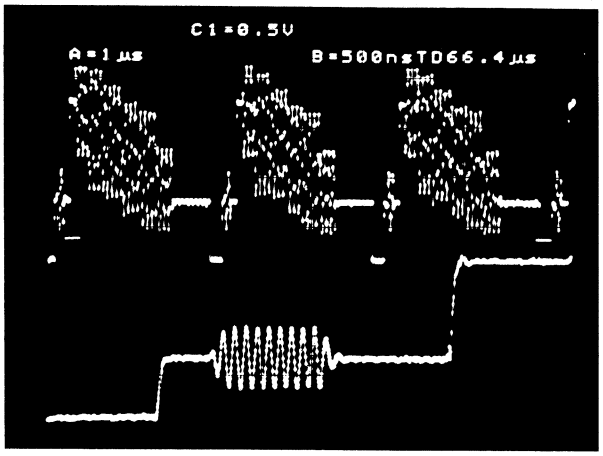
To complement the signal capture performance, the 4070 offers one of the most sophisticated triggering systems available on any oscilloscope today. Two time bases with separate trigger inputs are available, which can run synchronously or asynchronously and offer full delay facilities, such as delay by time, delay by events and gating. When delay by events is selected, the Gould 4070 will either trigger after the Nth event, so that individual pulses can be stored from logic trains, or it will trigger every Nth event for the display of individual lines of TV signals.



Gould 4072



Gould's unique filtering of transients after storage.
The Waveform Processor was used to apply a filtering algorithm to the stored signal resulting in the clearer trace making analysis easier.



Advantage of dual-timebase used with trigger delay system.
Use the optional Waveform Processor to trigger the 4070 on any preselected TV or video line. The fine detail of the color burst on the lower trace was achieved using the dual-timebase facility in combination with the flexible trigger delay system.

Specifications

(Unless otherwise stated, the specifications of the 4072 and 4074 are identical.)

Vertical Input

Input: 4072: 2 Channels
4074: 4 Channels

Bandwidth: DC: 0 – 100 MHz (– 3 dB).
AC: 4 Hz – 100 MHz (– 3 dB).

Sensitivity: 2 mV/div to 5 V/div.

Input Impedance: 1 MΩ/20 pF.

Input Protection: 400 VDC or pk AC.

Vertical Position Range: ± 8 div.

Display

CRT: 10 x 12 cm rectangular. Internal illuminated graticule.

Display Modes:

4072: CH1, CH2, CH1 invert, CH2 invert, CH1 + CH2, CH1 vs CH2, Reference Traces 1 through 8.

4074: CH1, CH2, CH3, CH4, CH1 invert, CH2 invert, CH3 invert, CH4 invert, CH1 vs CH2, CH1 vs CH3, CH1 vs CH4, Reference Traces 1 through 8.

Interpolation: Selectable either sine, linear or no interpolation.

Trigger Reference: There is an on-screen indicator which shows the location of the trigger level and the trigger point.

Readout: Readout characters indicate the current setting of the instrument: vertical sensitivity, timebase and cursor measurements.

Acquisition System

Maximum Sample Rate: 400 M samples/s.

Vertical Resolution: 8 bits (0.4%).

Record Length: 1K word per input channel.

Acquisition Modes

Refresh Mode: For stored data and display updated by trigger event.

Roll Mode: Stored data and display updated continually prior to being frozen by trigger.

Pre-trigger Roll Mode: Stored data is updated continually as per roll mode in pre-trigger part of the display. Then entire display is frozen as in refresh mode upon receipt of trigger.

Glitch Capture: Capture of either positive, negative or alternate positive and negative glitches. Typically a 5-ns pulse can be captured with 80% confidence. There is a 100% confidence of capture to 95% of amplitude for a 30-ns pulse.

Averaging: From 2 to 256 sweeps.

Non-Volatile Memory

Waveforms: Up to 8 waveforms can be stored and recalled.

Set-Ups: Total of 4 set-ups can be stored.

Specifications continued on next page.

Specifications — *(Continued from page 37)*

Horizontal Deflection

Horizontal Display Modes: A, A intensified by B, A alt B, B only, X-Y, Refresh, Roll, Pre-Trigger Roll.

Horizontal Display Accuracy: ±3%.

A and B Delayed Sweep Range: 20 ns/div to 20 s/div. Sweep speeds faster than 250 ns/div use equivalent time sampling (ETS).

Horizontal Expansion: Expansion from x2 to x20 times to a maximum of 2 ns/div.

Trigger Delay: A or B sweep start can be delayed from either Trigger A or Trigger B, respectively. Delay can be either negative (pre-trigger), or positive (post-trigger).

Trigger Range:

Pre-Trigger: 0 to 100% with 0.1% resolution.

Post-Trigger:

Timebase Range	Max. Delay
20 s to 0.1 ms/div	99.9 s
50 µs to 50 ns/div	0.99 s
20 ns/div	0.4 s

Delay by Events: This will allow the B sweep to be delayed from A sweep by up to 999,999 events with maximum trigger frequency of 100 MHz.

Trigger:

There are two trigger systems A and B. Each system has similar specifications.

Trigger A:

Source: 4072: CH1, CH2, EXT A, LINE.
4074: CH1, CH3, EXT A, LINE.

Couplings: AC, DC, ACHP, ACLP, DCLP.
TV Line, TV Field 1.
DCLP, ACLP — (<15 kHz).
ACHP — (>15 kHz).

Trigger B:

Source: As Trigger A except use EXT B.

Couplings: As Trigger A. TV Line taken from A Source.

Slope: Selectable +ve, −ve.

Trigger Level: Variable. Level indicated on screen with marker.

External Input Impedance: 1 MΩ/20 pF.

External Input Protection: 200 VDC or pk AC.

Trigger Combinations: A and B Timebase can be triggered independently or in any combination of the following:
'A' Trigger only
'A' Triggered then after Nth event.
'A' Triggered then after Nth event plus 'B' trigger delay.
'B' Trigger only.
'A' Triggered then after N x 'B' trigger events.

Cursor Measurements

Voltage and time differences between the measurement and datum cursors are automatically displayed.

IEEE-488 Interface

Read and Write Functions: All front panel controls are fully programmable.

Data can be read from and written to all of the memories.

All on-screen alpha-numerics can be read remotely.

The computer can display messages on the display in 16 lines of 32 characters each.

RS-423 (RS-232C) Interface

Specification: All of the functions available via the IEEE-488 Interface are available via the RS-423 Interface.

Baud Rate: 50, 110, 300, 600, 1200, 2400, 4800, 9600 selectable via menu.

Digital Plotter Interface

The instrument can directly address HPGL format plotters via either the IEEE-488 or RS-423 Interface. This plots out either menus or traces. The trace plots will include cursor information, range settings, date and time.

Color: Different colors selected for traces and the grid when multicolor plotters are used.

Internal Plotter

Direct digital plots to the internal multicolor plotter can be selected by the menu to be in the same format as above.

Analog Plotter Output

Analog Dual

4072: Simultaneous output of X with Y1 and Y2 outputs.

4074: As 4072 followed by output of X with Y3 and Y4 outputs.

Analog Single

4072: Individual plot of single Y channel plus X output (allowing 2 channels to be plotted sequentially from the socket).

4074: As 4072, but all 4 channels plotted sequentially.

Auto Plot

Initiates a plot at end of acquisition, then re-arms instrument at end of plot.

Power Requirements

Voltage: 90 V - 260 VAC. No switching required between voltage ranges.

Frequency: 45 - 440 Hz.

Power: 200 W max.

Ordering Information

Model Number	Description
4072	2-Channel Digital Oscilloscope
4074	4-Channel Digital Oscilloscope
4072/170	2-Channel Digital Oscilloscope plus Type 170 Waveform Processor
4074/170	4-Channel Digital Oscilloscope plus Type 170 Waveform Processor
Type 170	Waveform Processor — upgrade kit to add 170 Waveform Processor to 4072 or 4074

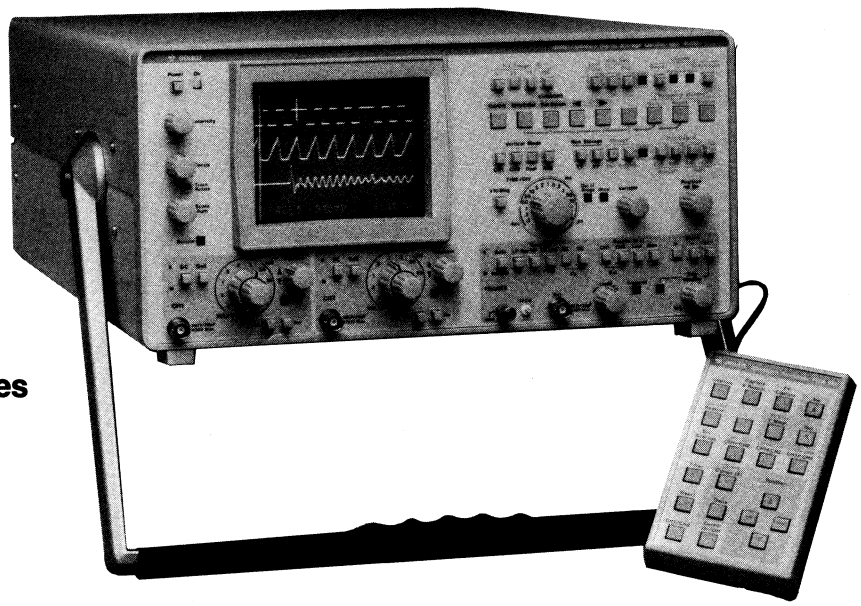
Waveform Processor

See type 170 on page 48.

Digital Storage Oscilloscope

Gould 4050

- **100 MHz – 8-bit converters on each channel**
- **35 MHz real time operation**
- **5 Non-volatile back-up memories**
- **Cursor measurements**
- **Waveform processing**
- **Computer and plotter interfaces**



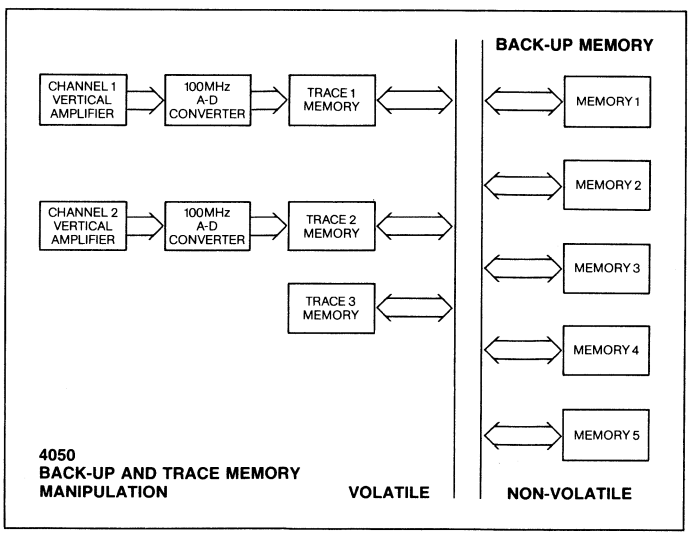
The 4050 enables high-speed signal capture and analysis capability for those fast transients and repetitive waveforms typically met in electronics applications.

Versatile triggering includes a trigger window feature which enables a *window* of voltages centered about the main trigger level to be set. Whenever a signal leaves this window, the Gould 4050 will trigger. This is ideally suited to the condition where the signal of interest cannot be uniquely triggered on a positive or negative slope. For video signals, there is an active TV sync separator and either TV line or TV field triggering can be selected.

The 4050 has several innovative features that make it even easier to analyze waveforms. An on-screen cursor and datum can easily and accurately measure voltage and time differences at any point of the waveform. To make comparisons easier, 5 non-volatile back-up memories are available for trace storage. When needed for comparison, it is very easy to recall the waveforms from any back-up memory to traces 1, 2 or 3 (see block diagram). The Waveform Processor for the 4050 enables waveforms to be averaged, mathematically manipulated, or rescaled and re-positioned on the screen. It will even apply a filtering algorithm to remove the effects of noise on stored transients as well as providing an extended range of measurement functions.

The 4050 will also interface directly to external computers. It will send waveform data to a computer for mass storage, or user-defined processing; or read data direct from the computer to set up comparison tests on the 4050 display. Also, the 4050 can communicate control setting information with the computer and show user-defined messages on its display for semiautomatic test routines.

Captured waveforms can be directly copied to an analog recorder or a digital plotter. With a digital plotter, multicolor plots can be selected to include the graticule and complete scaling information.



Back-up and trace memory manipulation.

Specifications

Display

CRT: 8 x 10 cm rectangular. Internal illuminated graticule.

Vertical Deflection

Two identical input channels CH1 and CH2.

Bandwidth: DC −35 MHz (−3 dB) DC coupled. 2 Hz −35 MHz (−3 dB) AC coupled to 15 MHz (−3 dB) at x5 gain.

Sensitivity: 5 mV/div to 5 V/div, x5 switched gain (1 mV/div).

Input Protection: 400 VDC or pk AC.

Horizontal Deflection

Non-Storage Sweep Rates: 200 ns/div to 0.5 s/div.

Expansion: x10 expansion gives up to 20 ns/div.

Trigger

Variable level control with Auto or Normal trigger.

Source: CH1, CH2, EXT. LINE, MANUAL.

Coupling: AC, DC, HF rej., LF rej., TV Line, TV field, TV active sync separator.

Slope: +, −, window (+ and −).

Level Range: +5 div internal. ±500 mV external.

Trigger Window Range: 0.5 to 8 div internal. 50 mV to 800 mV external.

Display Modes

Single Trace: CH1 or CH2.

Dual-Trace: Non-storage operation. Chopped or Alternate Modes, automatically selected by the timebase switch. In Storage Mode the dual-trace capture is simultaneous at all speeds.

Add: CH1 and CH2 added to give the algebraic sum of the two input channels. (Non-Storage Mode only).

Invert: CH2 may be inverted. When used in conjunction with Add Mode, it gives the algebraic difference of the two channels.

X-Y: CH1 gives X deflection and CH2 gives Y deflection. (Non-Storage Mode only.)

Digital Facilities

Memory Size: 1024 x 8 bits/channel.

Vertical Resolution: 1 in 256.

Expansion: x10.

Storage Modes

Roll: Stored data updated continually.

Refreshed: Stored data and display updated by triggered sweep.

Continuous Capture: Updates display each time a trigger occurs.

Single Capture: Freezes trace at end of triggered sweep.

Lock Display: Freezes display immediately.

Lock CH1: Holds CH1 memory immediately.

Lock CH2: Holds CH2 memory immediately.

Pre-Trigger Storage: Switchable for 0%, 25%, 75% and 100% of full memory. Available in Roll Mode only.

Measurement Facilities (Storage Mode only)

Measurements of voltage and time available between datum and cursor which may be assigned to either trace or the Third (or reference) trace.

Datum may be automatically shifted to trigger point.

Plot Outputs

Analog Dual: Simultaneous output of X with Y1 and Y2 outputs.

Analog Single: Individual plot of single Y channel plus X output allowing 2 channels to be plotted sequentially.

Digital Plotter Interface (Designed for HPGL format)

Scales: Automatically printed on plot.

Graticule: Plotted when selected from front panel.

Color: Different colors selected for CH1, CH2 and GRID when available on plotter.

Auto Plot: Initiates a plot at end of acquisition, then re-arms instrument at end of plot.

IEEE-488 Interface

Specification: SH1, AH1, T5, L4, SR1, RL1 or RL2, PPO, DC1, DTO.

Read and Write Functions: Data to and from CH1, CH2, Trace 3 (reference) and the five backup memories.
Data format and string length.
Roll/Refresh Modes.
CH1, CH2 and Dual, plus Trace 3 display.
Plot and plot rate.
Lock Display.
Pre-trigger.
Acquisition timebase range.
Arm and Release.

Read Only:
Non-Storage mode.
Store Status (Armed, Stored or Released).
CH1 and CH2 Hold Data.
Current attenuator settings.
Attenuator and timebase ranges used to store each trace.

Write Only:
Plot.
Arm.
Release.
Text.

Input/Output Facilities

Via 15-way D Type connector on side panel. Allows two instruments to operate in master/slave configuration.

External Arm: Input CMOS compatible, 5 V.

External Clock Input: Acquisition clock TTL levels 20 MHz max. frequency.

Internal Clock Output: Acquisition clock TTL levels 20 MHz max. usable frequency.

Power Requirements: 110 V, 120 V, 220 V, 240 V ±10%. 45-65 Hz, 250 W.

Ordering Information

Model Number	Description
4050/150	100 M samples/s Digital Storage Oscilloscope with Waveform Processor

Waveform Processor

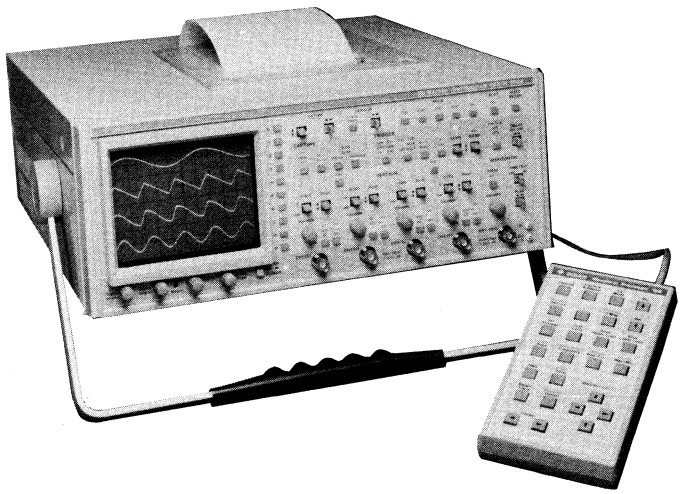
See type 150 on page 48.

Digital Storage Oscilloscope

Gould 1604

NEW

- **Advanced analysis capability**
- **10 k word memories on every channel**
- **Full 4 channel operation**
- **Exceptional trigger flexibility**
- **Fully programmable**
- **Integral color plotter**



Others display data — The 1604 displays information

This Digital Storage Oscilloscope improves efficiency by providing answers, not just data. For looking at signals in either low frequency electronics or from a transducer, the 1604 gives you a powerful combination of signal capture coupled with extensive data analysis and archiving capabilities.

Massive memories for more resolution

With massive 10 k word memories on each of its 4 channels, it allows examination of detail with expansion factors up to x200 and resolution down to 0.05 µs. A glitch detector ensures that the 1604 can capture high speed pulses even at the slowest time base speeds.

Acquire only the data needed

Run the data acquisition system continuously and tell it when to freeze. The 1604 can use a trigger to acquire all the data that occurs before it (pre-trigger) or to show data that occurs up to 1000 s after it. It can even simultaneously show data that occurs both before and after the trigger and count triggers to show the data that occurs up to 16383 trigger events later. There is no need to waste chart paper or spend time scanning data that is not required.

The 1604 can also store up to 50 traces in the backup memories of the waveform processor with the date and time of occurrence, or plot them out automatically to a strip chart recorder, before re-arming itself for the next trigger. It can, therefore, make available full details of signal activity without the need to have an operator present.

And it's easy to use

Press the blue button and the 1604 will automatically evaluate the incoming signal and position the fully programmable controls to give the optimum setting for that particular input, while also displaying the set up characteristics on the front panel.

It makes measurements automatically

Cursors can be positioned anywhere on the display to show the difference in voltage and time between them. When fitted with the Type 160 Waveform Processor, they can also show rise times, fall times, peak-to-peak measurements, overshoot, pulse widths, frequencies, area under curve and RMS values.

It provides more information with its waveform processor

The hand-held keypad also allows the ability to average up to 1024 traces, so that signals buried deep in noise can be analyzed in detail. Also, for transient events a built-in algorithm enables signals to be filtered in a number of selectable steps even after storage.

Individual lines of TV transmission can also be selected and stored in the large memories.

And the 1604 is fully programmable for use with personal computers

Optional IEEE-488 or dual RS-232C Interfaces enable the 1604 to communicate its data and fully programmable control functions with virtually all computers used in scientific areas. The 1604 can therefore be used for customized data analysis, mass storage or for integration as an acquisition component in an automatic test system.

The 1604 makes it easy to keep records of the data

When fitted with the waveform processor, the 1604 can store up to 50 traces (even when the power is switched off, the information is still retained). This optional plug-in waveform memory can be easily removed from the 1604 and sent from a remote site to base and the waveforms recalled to another 1604 — ideal in remote monitoring applications. For visual records a multi-color plotter is built into the instrument and enables each trace to be plotted in different colors, along with full information as to time and date captured and the range settings at the time of acquisition of each trace — a grid is also printed in another color so that any printing or paper registration problems are eliminated.

Alternatively the 1604 contains the intelligence to drive any HPGL plotter automatically, and can output information in the same form as above. The 1604 can even output information direct to analog strip chart or XY recorders, along with full control of the pen so that plotting or fly back corruption are eliminated.

Specifications

Vertical Deflection

Four identical input channels, CH1, CH2, CH3, CH4 (invert provided for all channels).

Bandwidth: DC: 0-20 MHz.
AC: 2 Hz-20 MHz.

Sensitivity: 2 mV/div to 10 V/div.

Input Impedance: 1 MΩ/30 pF.

Input Protection: 400 VDC or pk AC.

Vertical Position Range: ±8 div.

Display

CRT: 8 x 10 cm rectangular with internally illuminated graticule.

Non-Storage Display Modes

Single Trace: CH1 or CH2, or CH3 or CH4.

Multi-Trace: Any combination of the four available channels in Normal, Chopped or Alternate Modes, are automatically selected by the Timebase.

Add: CH1 + CH2 and/or CH3 + CH4.

Invert: Any channel may be inverted. When used in conjunction with ADD Mode, it gives the algebraic difference of the two channels.

X-Y: CH1 gives X, CH2, CH3 and CH4 give Y deflections.

Alphanumeric display of input voltage range and timebase range.

Storage Display Modes

Roll: Stored data and display updated continually.

Refreshed: Stored data and display updated by triggered sweep.

X-Y Display: As Non-Storage. 8 bit x 8 bit (256 x 256).

Interpolation: Linear.

Display Resolution: 8 bits x 1 k per channel (256 x 1024).

Display Hold: Freezes total store.

Channel Hold: Freezes individual selected channel.

Datum Cursors: Independent vertical and horizontal cursor lines.

Measurement Cursor: Assigned to trace.

Cursor Measurement Display: ΔV and ΔT displayed on screen.

Trigger Indication: Trigger level indication on-screen. On-trace trigger point bright-up indication.

Storage Facilities

Acquisition System

Acquisition Memory: 10 k words per channel.

Maximum Sample Rate: 20 M samples/s.

Vertical Resolution: 8 bits (1 in 256).

Peak Detection (Glitch Capture): Capture of positive and/or negative glitches to 50-ns pulse width.

Waveforms: Two reference traces can be stored and displayed in addition to input channel displays.

Set-Ups: A total of 4 set-ups can be stored in non-volatile memory.

Horizontal Deflection

Non-Storage

Sweep Rate: 0.2 µs/div to 10 ms/div.

Expansion: x5 gives fastest range sweep speed of 40 ns/div.

Storage

Sweep Rate: 50 µs/div - 200 s/div.

Horizontal Expansion: x1, x2, x5, x10, x20, x50, x100, x200.

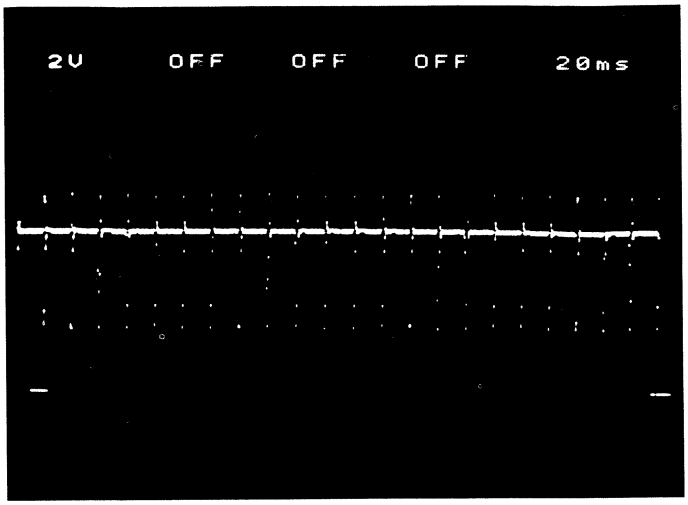
Trigger

Variable level control with Auto/Normal facility.

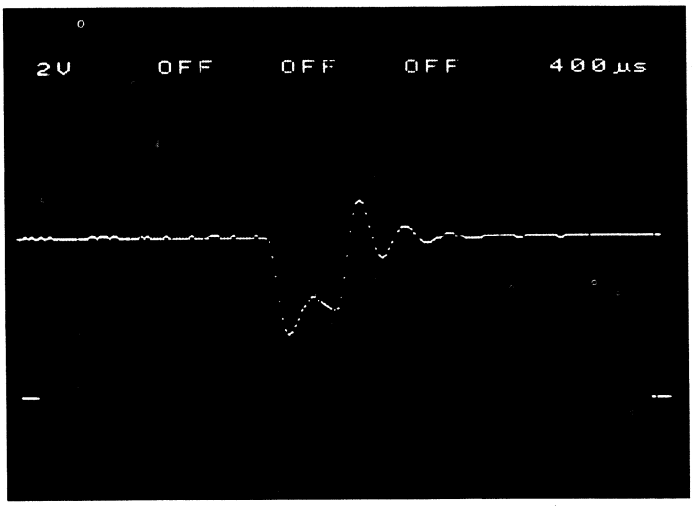
Source: Internal CH1, CH2, CH3, CH4, Ext, Line.

Slope: +ve or −ve.

Band Trigger: 0 to ±4 div.



Transient signal frozen in 10 k word memory.



Same signal expanded by x200 and still giving 5 data points per mm of display width.

Coupling: DC, DCLP, AC, ACLP, TV Frame, TV Line.

Post-Trigger Delay

Time: 0 to 1000 s.

Events: 1-16383 trigger events.

Trigger: Divide by N (N = 2 to 16383).

Pre-Trigger: 0-100% in 0.1% steps.

Internal Screen Plotter

Direct digital screen copy of waveforms with annotation of range scales, labels and graticule selected by menu.

Plot Size: 89 mm wide by 102 mm long (approx.).

No. of Pens: 4 color automatically selected.

Analog Output

Analog output of the stored displays for plotters and recorders.

Y Output: Parallel output of up to 4 channels. Serial output CH1 through CH4.

X Output: X ramp output.

Digital Plotter Output

(Available with an Interface Option): The instrument can directly output to HPGL format plotters via the IEEE or RS423 Interface Ports.

Plot Mode: Manual or Automatic after acquisition.

Colors: Color pens automatically selected when available.

Labels: Range scaling, measurements, labels and graticule information selected by menu.

Auto Plot: Initiates a plot at the end of acquisition and re-arms the instruments at the end of the plot cycle.

Power Requirements

Voltage: 100 V, 120 V, 220 V and 240 V.

Frequency: 45-400 Hz.

Power: 70 VA approx.

Option 103 – IEEE-488 Interface

Read and Write Functions

All front panel controls with the exception of:

- Variable Timebase Non-Storage
- Variable Input Attenuation
- Power On/Off
- Trace Intensity
- Scale Illumination
- Trace Rotation
- Alpha-Numeric Intensity.

All menu selections are programmable. Memory data is programmable. On-screen alpha-numerics can be read. Alpha-numeric 16 line x 32 characters are programmable for display messages.

Option 102 – RS423 (RS-2326) Serial Interface

Two Ports are provided:

1. Input/Output for control as IEEE specification.
2. Output only, e.g., for plotter or printer.

Baud Rate: Selectable via menu. 300 to 9600.

Ordering Information

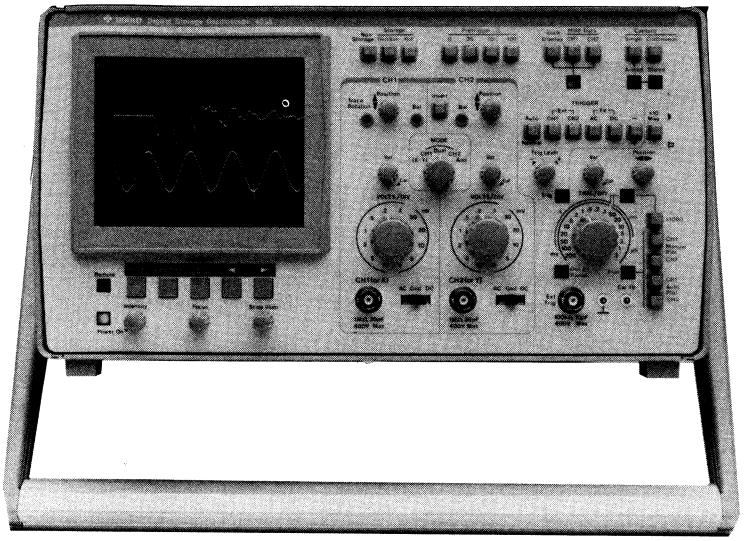
Model Number	Description
1604	4 Channel Digital Storage Oscilloscope
102	RS423 (RS232) Serial Interface
103	IEEE-488 Interface
160	Type 160 Waveform Processor
105	Type 105 Waveform storage module

Waveform Processor

See type 160 on page 48.

Digital Storage Oscilloscopes
Gould 4030 and 4035

- **20 MHz – 8-bit converters on each channel**
- **20 MHz real time operation**
- **Cursor measurements**
- **Waveform processing**
- **Computer and plotter interfaces**
- **NATO approved Ref. No. 6625-99-798-0565**



Two 20 MHz analog-to-digital converters enable permanent and crisp retention of fast analog waveforms. Each channel has its own converter and 1K word memory to provide the same accuracy and retention of detail when using one or both input channels. The waveform on either channel can be 'held' while the other is updated, so that changes in the signal can be

Specifications

Display

CRT: 8 x 10 cm rectangular with internal illuminated graticule.

Vertical Deflection

Two identical input channels CH1 and CH2.

Bandwidth: DC-20 MHz (−3 dB) DC coupled. (2 Hz-20 MHz) AC coupled.

Sensitivity: 2 mV/div to 10 V/div.

Input Impedance: 1 MΩ/25 pF.

Input Protection: 400 VDC, or pk AC.

Horizontal Deflection

Non-Storage:

Sweep Rates: 0.5 µs/div to 0.2 s/div.

Expansion: x10 push button gives up to 50 ns/div.

Storage:

Sweep Rates: 5 µs/div to 50 s/div incorporating x1000 multiplier.

Expansion: x10 gives up to 500 ns/div.

Trigger

Variable level control with Auto or Normal trigger.

Source: Internal CH1 or CH2, or External.

Slope: +/−.

Coupling: DC, AC or TV.

Note: Active TV sync separator. Line/frame selected by timebase.

Line Trigger Source: Rear panel output.

Display Modes

Single Trace: CH1 or CH2.

Dual-Trace: Non-Storage operation. Chopped or Alternate Modes, automatically selected by the timebase switch.

Storage Mode: The dual-trace capture is simultaneous.

Add: CH1 and CH2 added to give the algebraic sum of the two input channels (Non-Storage Mode only).

Invert: CH2 may be inverted. When used in conjunction with Add Mode, it gives the algebraic difference of the two channels.

X-Y: CH1 gives X deflection and CH2 gives Y deflection. (Non-Storage Mode only.)

Digital Facilities

Memory Size: 1024 x 8 bits/channel.

Vertical Resolution: 1 in 256.

Horizontal Resolution: 1 in 1024.

Expansion: x10, approx. 10 samples/div.

Maximum Data Conversion Rate: 20 MHz/channel, (single and dual channel mode).

Storage Modes

Roll: Stored data updated continually.

Refreshed: Stored data and display updated by triggered sweep.

Continuous Capture: Updates display each time a trigger occurs.

Single Capture: Freezes trace at end of triggered sweep.

Lock Display: Freezes display immediately.

Lock CH1: Holds CH1 memory immediately.

Lock CH2: Holds CH2 memory immediately.

detected by comparison with the waveform "frozen" on the screen.

The 4035 automatically makes measurements for time or voltage. The user positions the cursor on the trace and the 4035 calculates the difference in the stored digital values, implements the correct scaling, and displays the values on the screen. An IEEE-488 (GPIB) Interface can transfer data to or from a computer. It can also read or write to certain control settings.

The 4035 will also interface to the Waveform Processor Type 135. It will store a selected line of TV signal or store the average of up to 16 signals. It can magnify stored traces from 0.06 to 3.98 times or will arithmetically manipulate them. It can also filter noisy signals after storage to make measurements even easier. The 135 can shift the traces after storage to separate or overlay them for ease of measurement or for accurate comparisons.

These two instruments will also copy stored traces into an analog recorder automatically. The 4035 will also copy trace directly to a digital plotter in different colors. It automatically produces scales and also grids when required. These instruments can capture many waveforms during unattended operation. The plot control causes the displayed waveforms to be automatically copied onto a standard chart recorder and will then stop the chart and raise the pen until it is required to reproduce a subsequent waveform. The system is automatically armed after each copy so that it is available to store further waveforms initiated by subsequent trigger events.

Pre-Trigger Storage: Switchable for 0%, 25%, 75% and 100% of full memory. Available in Roll Mode only.

Automatic Measurements (4035 only)
(Storage Mode only)
Measurements of voltage and time available between datum and cursor which may be assigned to either trace.

Analog Plot Output
Analog output of the stored display suitable for X-Y or T-Y Chart Recorders.

Y Output (4030): Channel 1 or Channel 2.

Y Output (4035): Channel 1 and Channel 2.

X Output: X ramp.

Digital Plotter Interface (Designed for HPGL format) (4035 only)

Scales: Automatically printed on plot.

Graticule: Plotted when selected from front panel.

Colors: Different colors selected for CH1, CH2 and GRID when available on plotter.

Auto Plot
Initiates a plot at end of acquisition, then re-arms instrument at end of plot.

IEEE-488 (GPIB) Interface (4035 only)

Read and Write Functions
Stored Signal Data.
Data format (BIN, DEC, HEX, OCT).
Max. string lengths for Data.
Roll and Refreshed storage modes.
CH1, CH2 or DUAL display modes.
Plot Rate.
Lock Display.
Pre-Trigger.
Timebase Range.

Read Only
Non-Storage mode.
Store Status (Armed, Stored or Released).
CH1 and CH2 Hold Data.
Current attenuator settings.
Attenuator and timebase ranges used to store each trace.

Write Only
Plot.
Arm.
Release.
Text.

Power Requirements
100 V, 120 V, 220 V and 240 V ±10%. 45 to 400 Hz, 100 VA approx.

Ordering Information

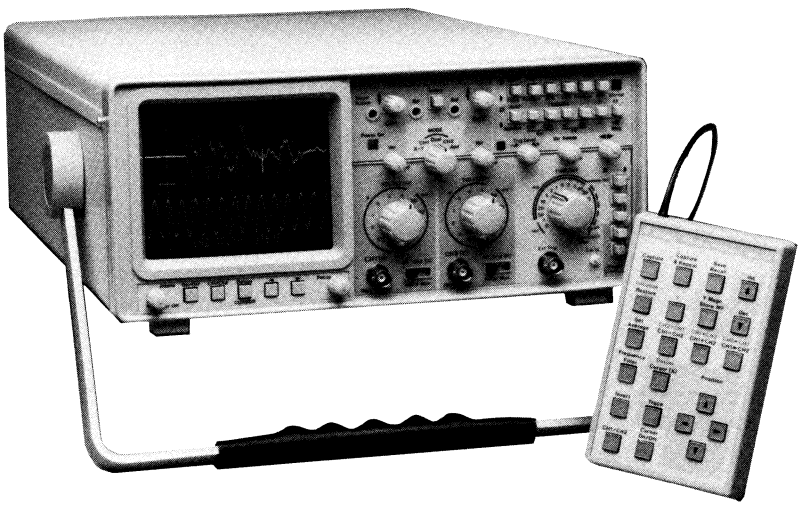
Model Nunber	Description
4030	Digital Storage Oscilloscope with two 20 MHz Converters
4035	4030 with Cursors/Readout and IEEE Interface
Type 135	Waveform Processor for 4035
4035/135	4035 Oscilloscope with the Waveform Processor

Waveform Processor

See type 135 on page 48.

Digital Storage Oscilloscopes
Gould 1421 and 1425

- **Low cost**
- **Real time and storage bandwidths up to 20 MHz on both channels**
- **Automatic measurements**
- **Waveform processing**
- **Computer and plotter interfaces**
- **Output for analog recorders**



The 1421 and 1425 provide two instruments in one for both electronics and transducer applications. Both will operate as comprehensive dual-channel conventional 20 MHz oscilloscopes or, at the touch of a button, as storage oscilloscopes capable of freezing transients and low repetition rate signals by sampling them at up to 2 MHz and "storing" them in a digital memory.

Specifications

Features common to 1421 and 1425

Display

CRT: 8 x 10 cm rectangular with internal graticule.

Vertical Deflection

Two identical input channels CH1 and CH2.

Bandwidth (−3 dB): DC to 20 MHz (2 Hz to 20 MHz on AC).

Sensitivity: 2 mV/div to 10 V/div.

Input Impedance: 1 MΩ/28 pF.

Input Protected: To 400 VDC or pk AC.

Horizontal Deflection

Normal Mode Sweep Rate: 0.5 µs/div to 0.2 s/div.

Store Modes Sweep Rate: 0.5 µs/div to 50 ms/div. To 50 s/div using x1000 multiplier.

Expansion: x10 pushbutton gives fastest speed of 50 ns/div. Accuracy ±3%. (50 ns ±5%)

Trigger

Variable level control with Auto or Normal trigger.

Source: Internal CH1 or CH2, or External.

Slope: +/−.

Coupling: DC, AC or TV.

Note: TV is active sync separator with line/frame selected by timebase.

Display Modes

Single Trace: CH1 or CH2.

Dual-Trace: In Normal, Chopped or Alternate Modes automatically selected by the timebase.

In storage mode the dual-trace capture is simultaneous at all speeds.

Add: CH1 and CH2 added to give the algebraic sum of the two channel inputs. (Normal mode only.)

Invert: CH2 may be inverted. When used in conjunction with Add mode it gives the algebraic difference of the two channels.

X-Y: CH1 input gives X deflection and CH2 input gives Y deflection. (Normal mode only.)

Roll: Stored data and display updated continually.

Refreshed: Stored data and display updated by triggered sweep.

Single Shot: Freezes store at end of triggered sweep.

Display Hold: Freezes store immediately.

Pre-Trigger Storage: Available in Roll mode only, switchable for 0%, 25%, 75% and 100% of full store pre-trigger.

Digital Facilities

Two channels of digital storage.

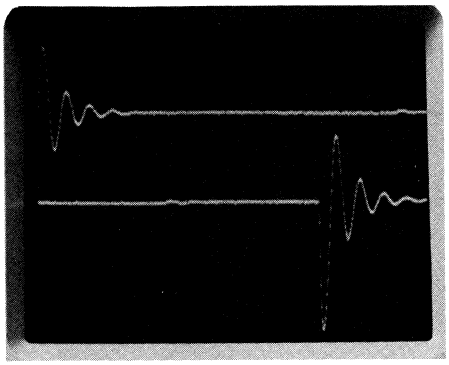
Store Size: 1024 x 8 bits in CH1 and CH2.

Vertical Resolution: 1 in 256, approx.

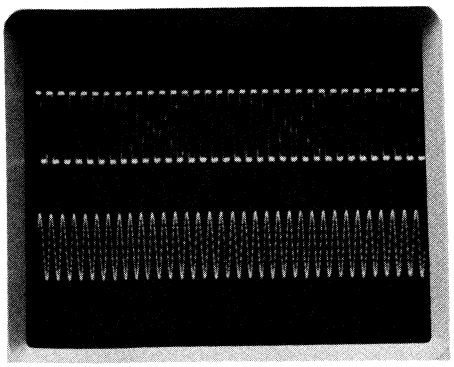
Expansion: x10 post storage trace magnification.

Equivalent Time Sampling: This mode enables continuous waveforms up to 20 MHz to be stored with full horizontal resolution.

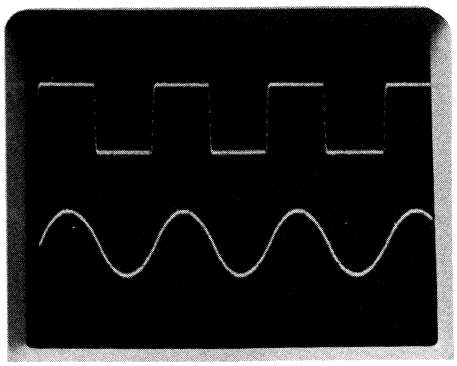
Channel 2 Hold: Freezes CH2 store immediately.



Top trace: No pre-trigger, bottom trace: 75% pre-trigger.



Stored signal before expansion.



Stored signal after expansion.

They can simultaneously display information that occurs both before and after the trigger point and archive it onto an analog recorder automatically. The 1425 can also make automatic measurements on the waveforms and display them in alphanumeric form on its screen.

The optional Waveform Processor for the 1425 enables waveforms to be averaged, mathematically manipulated, or re-scaled and re-positioned on the screen. It will even apply a filtering algorithm to remove the effects of noise on stored transients.

The 1425 will also interface directly to external computers. It will send waveform data to the computer for mass storage, or user-defined processing; or read data direct from the computer to set up comparison tests on the 1425 display. In addition, the 1425 can communicate control setting information with the computer and show user-defined messages on its display for semi-automatic test routines.

The 1425 will also copy traces directly to a digital plotter in different colors. It automatically produces scales and grids when required.

Plot Output
Analog output of the stored display.

Y Output: Channel 1 or channel 2.

X Output: X ramp.

Extra Features on the 1425

Automatic Cursor Measurements (Storage Mode only)
Measurements of voltage and time available between datum and cursor which may be assigned to either trace or the Third (or reference) trace.

Digital Plotter Interface
Output of data and range via RS423 interface to a digital plotter.

Scales: Automatically printed on plot.

Graticule: Plotted when selected from front panel.

Color: Different colors selected for CH1, CH2 and GRID when available on plotter.

RS423 Interface

Read and Write Functions
Baud rate: 300, 1200 or 9600.
Stored Data input/output.
Data Format: Binary, Decimal, Hexadecimal.
Octal and string length.
Timebase range: up to 50 µs/div.
Hold display and Hold CH2.

Write Only
Arm.
Release.
Analog plot.
Digital plot.
Local.
Text.

Read Only
CH1 and CH2 and Dual.
Current attenuator settings.
Attenuator and timebase ranges used to store each trace.

Power Requirements
100 V, 120 V, 220 V and 240 V ±10%. 45 to 400 Hz, 70 VA approx.

Additional Option — Non-Volatile Memory – Type 126
Provides non-volatile memory for 5 reference stores available with the waveform processor type 125. Retains data for up to 10 years.

Ordering Information

Model Number	Description
1421	1421 with 2 Channel Storage Analog Output
1425	1421 with Cursors/Readout and RS423 Interface
Type 125	Waveform Processor for 1425
1425/125	1425 with Waveform Processor
1425/125/126	1425/125 with non-volatile Reference Memory Option

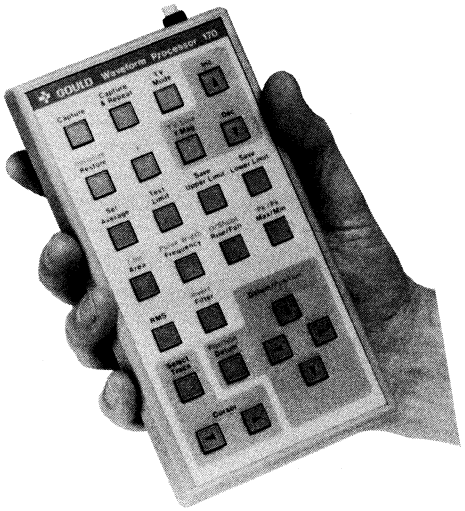
Waveform Processor

See type 125 on page 48.

Waveform Processors

Gould 125, 135, 150, 160, and 170

- **Converts your Gould Digital Storage Oscilloscopes into high-power analysis systems**
- **Can store up to 50 traces in non-volatile memory**
- **Provides a real time clock for annotation of waveform records**



The Waveform Processors add a range of functions to Gould Digital Storage Oscilloscopes that convert them into even more powerful analysis-systems. They reduce the time and effort that users expend in getting the required information from data as well as reducing the risk of errors.

Signal Capture Functions:

Signal Averaging. Steps selected from 1 to 1024 (dependent upon model).

Capture and Repeat. Arms the scope for a capture and automatically applies the post-storage functions of shift magnification, filtering or integration, that have been selected since the last initialization of the keypad.

TV Setup TV Line. Configure the instrument to acquire a selected TV line. (Switch between PAL, SECAM and NTSC systems.)

Limits Testing*. The scope will either hold or display a TEST FAILED message if the acquired signal goes outside a pre-defined test band.

Post-Storage Functions:

Filter. Six selectable stages of low pass filtering per time base range.

Vertical Trace Magnification/Attenuation. Multiplies trace from 0.06 to 4.00 times.

Invert. Invert the trace about the center line.

Position. Moves trace and datum in X and Y directions after storage.

Integration*. Calculates the indefinite integral and displays the resultant waveform.

Area*. Calculates the area under a curve with limits defined by the cursor and datum.

Rise/Fall Time*. Calculates rise and fall time of a signal.

Overshoot*. Calculates overshoot of a signal as a percentage.

Duty Cycle*. Calculates the duty cycle (ratio of mark-to-pulse period) as a percentage. Also calculates the average frequency and period of signal.

Pulse Width*. Calculates time between 50% points (or voltage datum if required).

Max/Min*. Displays maximum and minimum voltage excursion of a displayed waveform.

Peak-Peak*. Calculates peak-peak voltage of the waveform, bracketed between the cursor and datum.

RMS*. Calculates the root-mean-square (RMS) voltage of a waveform bracketed between the cursor and datum.

Reference Memory*. Additional reference memories are available with the Waveform Processor Module.

*Types 150, 160 and 170 only.

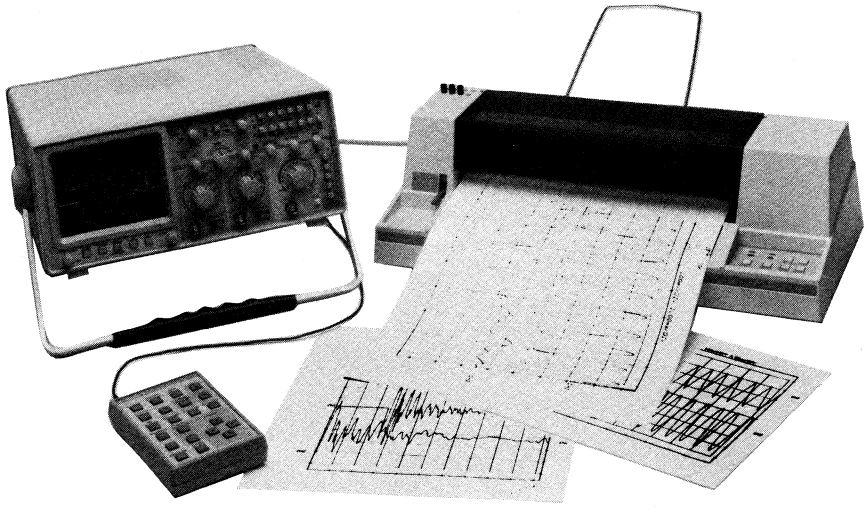
Waveform Processor Type	135	125	150	160	170
Oscilloscope Compatability	4035	1425	4050	1604	4072 4074
Signal Averaging (Number)	16	256	256	1024	256
Limits Testing			✓	✓	✓
TV Line Trigger	✓		✓	✓	✓
Trace Arithmetic (+, −, x)	✓	✓	✓	†	
Copy (CH1 <−>CH2)	✓	✓	✓		
Trace Magnification/Attenuation	✓	✓	✓	✓	✓
Post-Storage Filter	✓	✓	✓	✓	✓
Invert	✓	✓	✓	✓	✓
Post-Storage Trace Shift	✓	✓	✓	✓	✓
Reference Store Manipulation		✓	†	†	†
Integration			✓	✓	✓
Rise/Fall Time & Overshoot			✓	✓	✓
Frequency		✓	✓	✓	✓
Duty Cycle & Period			✓	✓	✓
Pulse Width			✓	✓	✓
Root Mean Square (RMS) Voltage			✓	✓	✓
Max, Min, Peak-to-Peak Voltage			✓	✓	✓

†This facility is available in the standard instrument.

Graphic Systems

Gould GGS 40, 41, 60 and 70

- **Permanent copies signal waveforms up to 100 MHz**
- **Traces and graticule plotted in different colors**
- **Automatic labelling of attenuator and timebase settings**



It is no longer necessary to search through long lengths of paper to find the signal of interest. This is not only inconvenient, but also consumes unnecessary quantities of expensive chart paper.

Gould DSOs can trigger when the input signal exceeds a pre-set limit or goes outside of a pre-set passband (1604, 4072 and 4074) while still retaining data that occurs immediately prior to the trigger point. They will freeze the data on the display for verification prior to selection of an automatic plot routine which produces clear, permanent A4 or A3 (ANSI A or B) paper copies (at lower costs than camera film alternatives) on the Type 6120 multi-color plotter (see page 79). Each trace is produced in a different color. The graticule is also reproduced in a different color to overcome potential errors due to alignment of pre-printed grids.

The oscilloscopes transmit data directly to the plotters, using the RS423 (RS232) in HPGL format without the need for a controller.

The multi-color plot provides a point-for-point reproduction of the traces in the memory. The digitized waveform in the oscilloscope memory is enlarged and copied, including the scaling for Y and T parameters, which results in more accurate measurements and comparisons of waveforms without any risk of forgetting the original "set-up" conditions.

Selection Guide

System consists of DSO, 6120 Plotter, interconnection leads, manuals and starter pack of consumables.

System Ref.	DSO Type	Page Ref. for DSO
GGS 40	1425	46
GGS 41*	1425 + 125	46
GGS 70/XXX	4070 series XXX is ordering reference from page 38 eg. GGS 70/4072/170	36
GGS 60/XXX	1604	41

*Includes Waveform Processor Type 125.

Babysit Mode

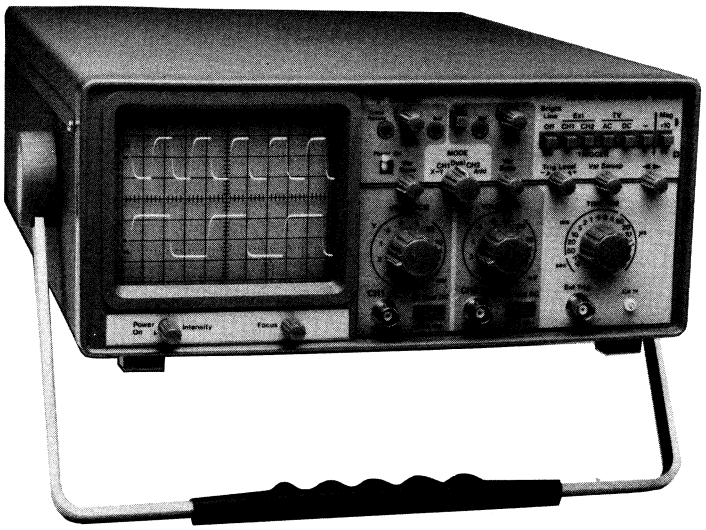
The 1604, 4072 and 4074 DSOs also include a small built-in color plotter using 4½ in. wide roll paper. This allows them to be set up and left unattended to acquire all triggered events in sequence with time and date printed on the chart for each occurrence.

When the oscilloscope triggers, the signal is captured in the memory. Immediately, when a capture is complete, the waveform is transmitted automatically to the plotter. This avoids the need to continuously run chart paper for sporadic events, since the recorder/plotter is only operational when data is being transmitted. This facility is particularly useful when it is required to monitor random transients on power supplies, causing system interference where intermittent faults occur in measurement or control equipment.

20 MHz Oscilloscope

Gould OS300

- **Low cost**
- **Dual channel**
- **Available in long persistence display**
- **X-Y or Y-t display**
- **Rugged construction**
- **NATO approved version Ref. No. 6625-99-966-7053**



Gould is one of the world's leading manufacturers of oscilloscopes. Our considerable experience and extensive research and development facilities have been combined to produce a high-performance, low-cost oscilloscope design.

The OS300 operates at its full bandwidth of 20 MHz, even on its most sensitive input range of 2 mV/div. With its 50 ns/div time base and bright display, you can analyze a wide range of signals. A fully variable amplifier sensitivity allows you to calibrate the display to your input signal and CH2 can be inverted and added to CH1 to make differential measurements.

For measurements on TV signals the "active" sync. separator triggers automatically off the line/frame, depending on time base speed. It allows details of the sync. timing and color information to be studied. The active trigger circuit retains sync. over a wide range of picture content and signal level without further adjustment.

Specifications

Display

CRT: 8 x 10 cm rectangular.

Vertical Deflection

Two identical input channels CH1 and CH2.

Bandwidth (−3 dB): DC to 20 MHz (2 Hz to 20 MHz on AC).

Sensitivity: 2 mV/div to 10 V/div.

Input Impedance: 1 MΩ/28 pF.

Input Protection: 400 VDC or pk AC.

Display Modes

Single Trace: CH1 or CH2.

Dual Trace: Chopped or Alternate modes automatically selected by the T.B.

Add: CH1 and CH2 added to give the algebraic sum of the two channels.

Invert CH2: CH2 may be inverted. When used in conjunction with Add mode, it gives the algebraic difference of the two channels.

X-Y: CH1 input gives X deflection and CH2 input gives Y deflection.

Horizontal Deflection

Timebase: 0.5 µs/div to 0.2 s/div.

X Expansion: x10 to 50 ns/div.

Source: Internal CH1 or CH2, or External.

Slope: +ve or −ve.

Coupling: DC, AC or TV active sync separator.

Power Requirements

100 V, 120 V, 220 V and 240 V ±10%, 45 to 440 Hz, approximately 50 VA.

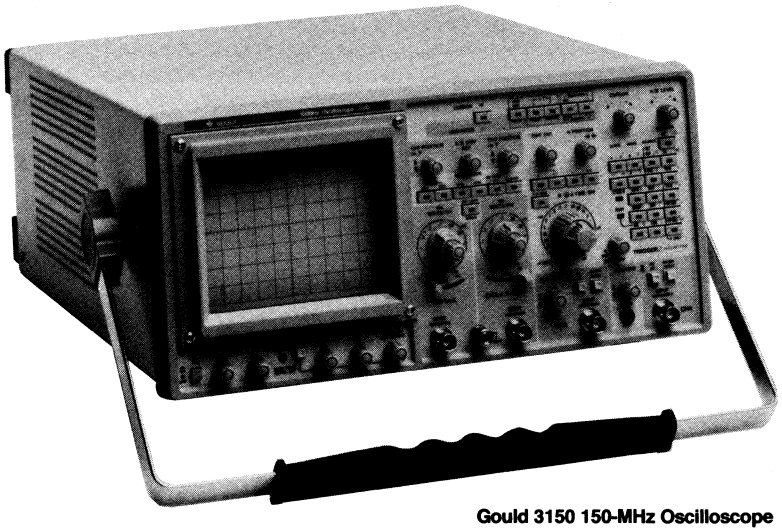
Ordering Information

Model Number	Description
OS300	20 MHz Dual Trace Oscilloscope
OS300S4	20 MHz Dual Trace Oscilloscope, rack mounted version
OS300/LP	OS300 with P7 Phosphor tube
OS300S1	NATO Type Approved OS300
OS300S1/LP	OS300S1 with P7 Phosphor tube

60 MHz, 100 MHz and 150 MHz Oscilloscopes

Gould 3060, 3100 and 3150

- **3 Models up to 150 MHz**
- **Cursor measurements for voltage, time and frequency**
- **Easy to use**
- **Excellent value**

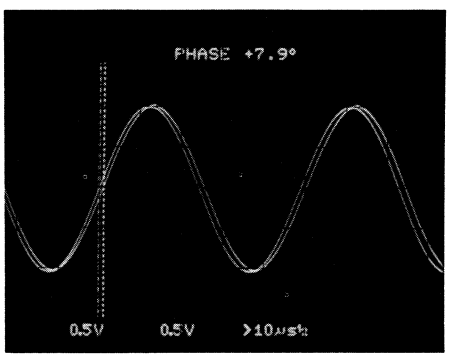


Gould 3150 150-MHz Oscilloscope

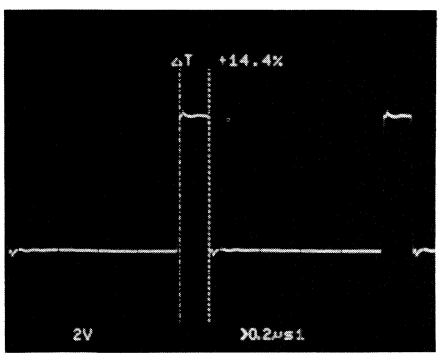
Three new sophisticated real time oscilloscopes from Gould bring micro-processor technology to waveform observation and measurement. The result? Unprecedented capability and ease of use, with key information, such as measured values and control settings, displayed on the screen with actual waveforms being observed. Compared with traditional instruments, the Series 3000 brings new levels of confidence and freedom from errors in making rapid and accurate measurements. In addition to the advanced measurement functions, the Series 3000 also offers high-input sensitivity, fast sweep rates, extensive trigger facilities and multichannel capabilities which all add up to today's most capable real time oscilloscope.

With the dual time base, simultaneous observation of main and delayed traces is possible with up to four channels, enabling up to eight traces to be displayed. Variable holdoff ensures stable triggering, even on complex waveforms. Independent position controls are provided for all four channels (three on the 3060). On the 3100 and 3150 there is selectable input coupling and switchable sensitivity of 0.1 and 0.5 V/div on CH3 and CH4. All channels have equal bandwidth and an accuracy of 2% with a channel-to-channel time skew of less than 1 ns between all channels.

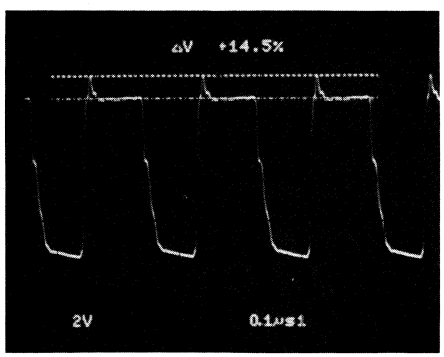
With the 3100 and 3150 the ground level can be displayed for both CH1 and CH2 simultaneously with the waveforms. Thus any DC offset can easily be seen. Also, any desired point may be used as an O dB reference, and measurements can be read out on the screen using the cursor; for example, the gain of a circuit can be measured directly in dB. With one cycle set to a predetermined number of horizontal divisions, the cursors can be used to measure the phase shift between two waveforms directly in degrees without the need to perform any calculations. The digital delay can be displayed in terms of trigger events on either the A or B sweep. This is particularly useful when viewing complex logic waveforms, or, for example, to allow the selection of an individual TV line from a frame with this and the frame displayed on the screen together.



Phase Shift (3100 and 3150)
With one cycle set to a predetermined number of horizontal divisions, the cursors can be used to measure the phase shift between two waveforms directly in degrees without the need to perform any calculations.



Duty Cycle (3100 and 3150)
The time difference between the cursors can be read directly as a percentage of the period. Therefore, the duty cycle of a pulse train can be displayed on the scope screen when one cycle is set to a predetermined number of horizontal divisions.



Overshoot (3100 and 3150)
A predetermined number of vertical divisions can be set to represent 100% making it possible to read the difference between the cursors and to measure the overshoot of a rising edge as a percentage.

Specifications

Gould 3060 60 MHz Bandwidth Oscilloscope

CRT Read-Out

Cursor Measurements: Voltage Difference (ΔV), Time Difference (ΔT), Frequency ($1/\Delta T$).

Control Settings: Vertical Def: V/div, MAG, UNCAL, INVERT (CH2), ADD, Probe Attenuator (x10). Horizontal Def: s/div, MAG, UNCAL, Delay Time.

CRT: Internal, illuminated graticule with 8x10 cm divisions and 2 mm sub-divisions.

Accelerating Potential: 12 kV. Beam Finder.

Vertical Deflection

Sensitivity

CH1 and CH2: 5 mV/div to 5 V/div. Sens. to 1 mV/div with x5 magnification.

CH3: Approx. 0.1 V/div, 1 V/div.

Input Couping: CH1 and CH2: AC, GND, DC; CH3: AC, DC.

Display Modes

CH1, CH2, ALT, CHOP, ADD (CH1 and CH2), TRIPLE, X-Y.

X-Y Operation

CH1: X Deflection. CH2: Y Deflection.

Sensitivity: 5 mV/div (1 mV/div with x5 switched gain).

Bandwidth: DC −2 MHz (−3 dB) with less than 3° phase shift at 50 kHz.

Horizontal Deflection

Main Time Base (A): 50 ns/div to 0.5 s/div.

Delayed Time Base (B): 50 ns/div to 50 ms/div.

Expansion (Time Base A or B): x10.

Display Modes: A, ALT (A intensified by B and B), B.

Sweep Delay: 1 μs to 5 s. Trace separation control.

Trigger

Modes

A: Auto, normal, TV-V, TV-H, single-sweep.

B: Auto, normal.

Source

A: CH1, CH2, CH3, Line, Vertical (composite CH1/CH2).

B: Gated with A.

Coupling: Internal DC, (CH3 AC, DC, DC ÷10).

Slope: Pos/Neg.

A: Trigger variable hold-off control.

Power Requirements

100/120/220/240 V ±10%, 48 to 440 Hz, approx. 50 VA.

Gould 3100
100 MHz Bandwidth Oscilloscope

CRT Read-Out

Cursor Measurements: Ground Reference Voltage (V), Voltage Difference (ΔV), Voltage Difference Ratio (ΔV%), Time Difference (ΔT), Time Difference Ratio (ΔT%), Frequency ($1/\Delta T$), Phase Difference (PHASE).

Frequency Counter: Frequency Range 0.12 kHz to approx. 99.9 MHz, 3 Digits, Minimum Resolution 0.04 kHz.

DVM: AC Voltage, DC Voltage.

Ground Reference: Automatic tracking and display of GND levels for CH1 and CH2 simultaneously with waveforms.

Control Settings:
Vertical Def: V/div (CH1 and CH2), Probe Attenuator (x10), UNCAL, MAG, ADD, INVERT, BWL, Input Coupling. Horizontal Def: Time/div (Time base A and B), UNCAL, MAG, Delay Time. Also A and B Trigger Source, X-Y Operation.

Comment Line: 30 characters defined and positioned by user.

CRT: Internal illuminated graticule.

Accelerating Potential: 20 kV Beam Finder.

Vertical Deflection

Sensitivity

CH1 and CH2: 5 mV/div to 5 V/div. Sens. to 1 mV/div, with x5 magnification.

CH3 and CH4: 0.1 V/div, 0.5 V/div.

Input Coupling: CH1 and CH2: AC, GND, DC.
CH3 and CH4: AC, DC.

Display Modes

CH1, CH2 (normal or invert), ALT, CHOP, ADD (CH1 and CH2), QUAD (ALT, CHOP), X-Y.

X-Y Operation

CH1: X Deflection. CH2: Y Deflection.

Sensitivity: 5 mV/div to 5 V/div; (1 mV/div with x5 magnification).

Bandwidth: DC −2 MHz (−3 dB) with less than 3° phase shift from DC to 1 MHz.

Horizontal Deflection

Main Time Base (A): 20 ns/div to 0.5 s/div in 23 ranges in 1-2-5 sequence. Accuracy ±2%.

Variable Sweep Control: 1:<2.5 (UNCAL) between ranges.

Delayed Time Base (B): 20 ns/div to 50 ms/div in 20 ranges in 1-2-5 sequence. Accuracy ±2%.

Expansion (Time Base A or B): x10 Accuracy ±4% 2 ns/div to 10 ns/div.

Display Modes: A, INTEN (A intensified by B), ALT (A intensified by B and B), B.

Sweep Delay: 1 μs to 5 s. Trace separation control.

Trigger

Modes

A: Auto, normal, single-sweep.

B: Auto, normal.

Source

A: CH1, CH2, CH3, CH4, Line, CH1 and CH2 alternate (composite).

B: (In normal mode) CH1, CH2, CH3, CH4.

Coupling

A: DC, AC, Hf Reject, Lf Reject, TV-V, TV-H.

B: DC, AC, TV-H.

Slope: Pos/Neg.

A: Trigger variable hold-off control.

Power Requirements

100/120/220/240 V ±10%, 48 to 440 Hz, approx. 65 VA.

Gould 3150
150 MHz Bandwidth Oscilloscope

CRT Read-Out

Cursor Measurements: Ground Reference Voltage (V), Voltage Difference (△V), Voltage Difference Ratio (△ V%), Time Difference (△T), Time Difference Ratio (△T%), Frequency ($1/_{\triangle T}$), Phase Difference (PHASE).

Frequency Counter: Frequency Range 10 Hz to 150 MHz, 5 Digits, Minimum Resolution 0.1 Hz.

Event Counter: Up to 99,999 events in delay time or delayed sweep time (max. frequency 20 MHz).

DVM: AC voltage (RMS value), DC voltage.

Ground Reference: Automatic tracking and display of GND levels for CH1 and CH2 simultaneously with waveforms.

Control Settings: Vertical Def: V/div (CH1 and CH2), Probe Attenuator (x10), UNCAL, MAG, ADD, INVERT, BWL, Input Coupling.
Horizontal Def: Time/div (Time Base A and B), UNCAL, MAG, Delay Time. Also A and B Trigger Source, X-Y Operation.

Comment Line: 2 lines, 30 characters max. defined and positioned by user.

CRT: Internal illuminated graticule with 8x10 cm divisions and 2 mm sub-divisions.

Accelerating Potential: 20 kV; Beam Finder.

Vertical Deflection

Sensitivity

CH1 and CH2: 2 mV/div to 5 V/div.

CH3 and CH4: 0.1 V/div, 0.5 V/div.

Input Coupling: CH1 and CH2: AC, GND, DC. CH3 and CH4: AC, DC.

Display Modes

CH1, CH2 (normal or invert), ALT, CHOP, ADD (CH1 and CH2), QUAD (ALT, CHOP), X-Y.

X-Y Operation

CH1: X Deflection. CH2: Y Deflection.

Sensitivity: 2 mV/div to 5 V/div.

Bandwidth: DC −2 MHz (−3 dB) with 3° phase shift or less from DC −1 MHz.

Horizontal Deflection

Main Time Base (A): 20 ns/div to 0.5 s/div.

Delayed Time Base (B): 20 ns/div to 50 ms/div.

Expansion (Time Base A or B): x10.

Display Modes: A, INTEN (A intensified by B), ALT (A intensified by B and B), B.

Sweep Delay: 1 µs to 5 s. Trace separation control.

Trigger

Modes

A: Auto, normal, single-sweep.

B: Auto, normal.

Source

A: CH1, CH2, CH3, CH4, Line, CH1 and CH2 alternate (composite).

B: (In normal mode) CH1, CH2, CH3, CH4.

Coupling

A: DC, AC, Hf Reject, Lf Reject, TV-V, TV-H, p-p Auto (in Auto mode).

B: DC, AC, TV-H.

Slope: Pos/Neg.

A: Trigger variable hold-off control.

Power Requirements

90 V to 250 V continuous, 48 to 440 Hz, approx. 75 VA.

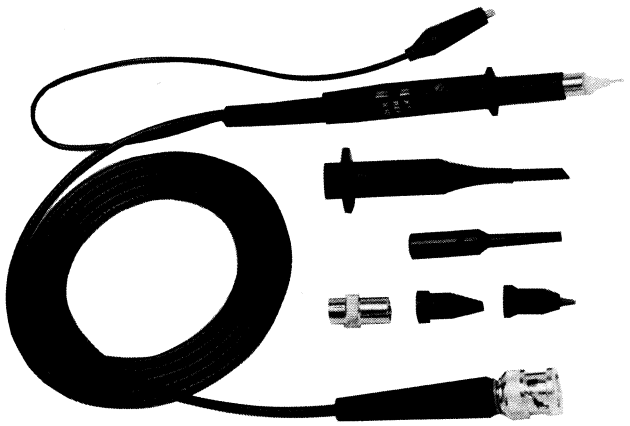
Ordering Information

Model Number	Description
3060	60 MHz Oscilloscope with On-Screen Measurements
3100	100 MHz Oscilloscope with On-Screen Measurements
3150	150 MHz Oscilloscope with On-Screen Measurements

Note: Standard accessories supplied with each instrument include one pair of probes and a dust cover.

Accessories and Consummables

Probes, Leads and Terminations
Viewing Hoods and Camera
Rack Mount Kits
Panel Covers and Carrying Cases
Instrument Cart



A comprehensive range of accessories are available to ensure that you get the best from your Gould oscilloscope.

Passive Probes

Gould Part No.	PB12		PB13	PB20		PB19	PB36	PB17	PB27
Switched	'x10' position	'x1' position	N/A	'x10' position	'x1' position	N/A	N/A	N/A	N/A
Attenuation Ratio	10:1	1:1	10:1	10:1	1:1	10:1	10:1	100:1	1000:1
Bandwidth	DC – 100 MHz	DC – 10 MHz	DC – 100 MHz	DC – 250 MHz	DC – 10 MHz	DC – 250 MHz	DC – 300 MHz	DC – 250 MHz	DC – 7 MHz typical
Rise Time	3.5 ns	35 ns	3.5 ns	1.4 ns	35 ns	1.4 ns	1.2 ns	1.4 ns	50 ns
Input Capacitance	Nominal 16 pF	55 pF + scope input capacitance	Nominal 15 pF	Nominal 18 pF	40 pF + scope input capacitance	Nominal 16 pF	Nominal 16 pF	Nominal 6.5 pF	Nominal 3 pF
Compensating Range	10 – 60 pF	—	10 – 60 pF	10 – 60 pF	—	10 – 60 pF	10 – 60 pF	15 – 50 pF	15 – 50 pF
Input Resistance	10 MΩ when used with scopes which have 1 MΩ input. (Probe resistance 9 MΩ ±1%.)	1 MΩ (scope input)	10 MΩ when used with scopes which have 1 MΩ input. (Probe resistance 9 MΩ ±1%.)	10 MΩ when used with scopes which have 1 MΩ input. (Probe resistance 9 MΩ ±1%.)	1 MΩ (scope input)	10 MΩ when used with scopes which have 1 MΩ input. (Probe resistance 9 MΩ ±1%.)	10 MΩ when used with scopes which have 1 MΩ input. (Probe resistance 9 MΩ ±1%.)	100 MΩ when used with scopes which have 1 MΩ input. (Probe resistance 99 MΩ ±1%.)	500 MΩ approx.
Max. Input Voltage	600 VDC including peak AC, derating with frequency							1200 V including peak AC, derating with frequency	15 kV including peak AC, derating above 55 kHz
Working Temp. Range	−25 to 70°C								
Cable Length	1.5 meters		1.5 meters	1.2 meters		1.2 meters	1.5 meters	1.5 meters	1.5 meters
Notes	'REF' POSITION: Probe tip is grounded via 9 MΩ resistor, oscilloscope input grounded						Automatically indicates x10 selection with 4070 Series		Switched for impedances of 1 MΩ or 100 MΩ

Protective Carrying Cases

These are very strong and enclose the instrument with three thicknesses of padded material covering the front panel.

Model No.	Description
4101044	For OS300
4101100	For 4030, 4035
4101118	For 1421, 1425
4101136	For 4050
4101172	For 4072, 4074
4101176	For 1604

Front Panel Covers

A hard plastic cover which clips over the oscilloscopes control panel and display to protect it during transportation.

Model No.	Description
455354	For 3060
455355	For 3100, 3150
4101070	For OS300
4101099	For 4030, 4035
4101119	For 1421, 1425
4101177	For 1604

Type TR7 Cart

A purpose designed instrument cart. Incorporating a unique mechanism for adjusting the viewing angle without reducing the intrinsic stability of the cart or the safety of an instrument.

Specifications

Size of Instrument Tray: 45 cm (wide) x 50 cm (17½ x 19½ in.).

Height of Tray: 74 cm (29 in.).

Rear Wheels: Rubber tired, 20-cm diameter.

Front Wheels: Rubber tired castors with brake. 10-cm diameter.

Bottom Tray: Removable with non-slip rubber mat.

Top Tray: Fully adjustable angle (−5° to −65°) by unique "lead-screw" mechanism. Fitted with non-slip rubber mat.

Safety: 2-in. wide nylon safety belt. 2 adjustable rear stop handles.

Finish: Epoxy powder stove enamel.

Color: Grey.

Type TR7 Cart

Rack Mount Adaptor Kits

Flanges to enable the Gould Oscilloscopes to be fitted into a 19-in. rack.

Model No.	Description
4019019	For OS300
4091426	For 1421, 1425
4091631	For 1604
4094031	For 4030, 4035
4094058	For 4050

Rack Mount Support Shelf

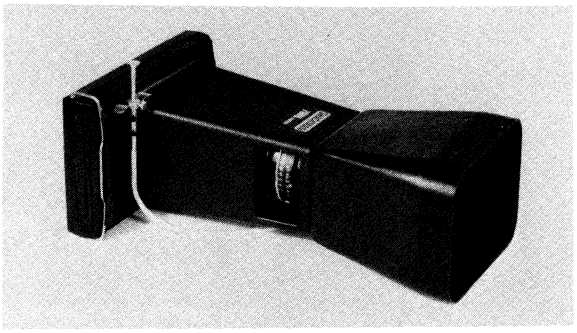
The one unit high support has slides and filler panels included. The Slide Kit provides ready access to the internal shelf areas and is designed for racks with 24-in. or 18-in. depth vertical support rails. Brackets and mounting screws are included.

Model No.	Description
	For 24 in. depth. 5 units total height.
4091632	Rack Mount with slides for 1604
4094032	Rack Mount with slides for 4030, 4035
4094059	Rack Mount with slides for 4050
4094732	Rack Mount with slides for 4072, 4074
	For 18 in. depth. 4 units total height.
4019020	Rack Mount with slides for OS300
4091437	Rack Mount with slides for 1421, 1425

Viewing Hoods

Fit to the bezel surround reducing glare in high ambient light.

Model No.	Description
4101073	For OS300, 1421, 1425
4101101	For 4030, 4035, 4050
455352	For 3060, 3100, 3150



Type 7000 Camera

Oscilloscope Camera

Model 7000:
Fast and simple to operate. Can be fitted with a spacer/adaptor or hood and can be used with all Gould Oscilloscopes.

(C). Adapter with spacer.
For positive fixing to oscilloscope, hinged action allows the operator to have unobstructed view of the screen.

(D). Hood for Hand Held Operation.

Oscilloscope Type	Adaptor Type (C)	Hood Type (D)
OS300, 1421, 1425, 1604	N/A	504
4050, 4030, 4035	A66	504
3060, 3100, 3150	AS51	504

Leads and Terminations

Type: PL43 lead
BNC-BNC 50-Ω lead with full cable strain reliefs. 1 m length.

Type: PL44 lead
BNC-Crocodile Clips. 50-Ω lead with cable strain relief. 1 m length.

Model No.	Description
4101133	RS-423 (1425/6120) cable 2 m length
4101188	RS-423 (4070/6120) cable 2 m length
4108105	IEEE-IEEE cable 2 m length

Type: TP24 50-Ω termination
A 50-Ω through-termination for connecting a high impedance input in a transmission system.

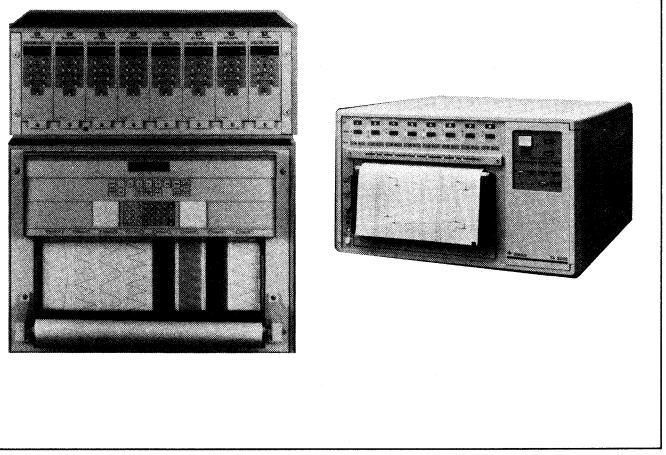
Internal Plotter Consummables

For use on 1604, 4072 and 4074 DSOs.

Model No.	Description
4101175	Pack of 4 replacement pens. One of each color
4101165	Pack of 8 rolls of paper

Gould Graphic Recorders

- **Broad range of recording technologies**
  - **— Direct writing ink and thermal**
  - **— Thermal and electrostatic array**
  - **— Piezoelectric ink jet**
- **Input frequency ranges from DC to 5 kHz**
- **Channel widths up to 250 mm**
- **Discrete and overlapping traces**
- **Wide range of options**
- **Fully compatible with Gould 4600 and 5600 signal conditioners**
- **Leader in high performance recording technology since 1937**



For 50 years Gould's Recording System Division and Brush Instruments before it have established a tradition of quality and innovation. This tradition continues today as we continue to design and develop a full spectrum of premier analog and digital recording instruments and systems for the Industrial, Military/Aerospace and Medical markets.

Direct Writing Recorders
(Pressurized Ink and Thermal)

The fully programmable 3000 Series direct writing oscillograph is the industry standard. It is designed with a unique pressurized ink system for clear uniform traces, high gain servo system for high response speed, and Metrisite position transducers for infinite resolution. Together these technologies provide a true rectilinear trace with 99.65% linearity and less than 1% overshoot on square waves and transients.

Thermal and Electrostatic Array Recorders

The TA 2000 and ES 1000 linear array recorders use digital technology to provide high performance and unique features. A stationary imaging head with an array of closely spaced writing elements (styli) generate permanent chart records of multiple analog signals. In the thermal TA 2000 the styli are heating elements and the recording medium is heat-sensitive paper. In the electrostatic ES 1000 the styli are electrodes that place charges on a dielectric-coated paper medium that attract toner. Unique features include high frequency response (independent of the number of channels), high peak capture capability, overlapping traces, simultaneous generation of grids, timing marks, and traces and comprehensive annotation.

Strip Chart Recorders and Data Logger

The SC 270 and SC 280 strip chart recorders can measure DC voltages from 1 mV to 500 VFS, current from 1 uA to 500 mA, and temperature through a range of thermocouple amplifiers. A standard feature of the SC 270 and an option on the SC 280 is a pen offset compensation function that fully synchronizes all channels eliminating the time gap between channels.

The SC 2130 is a 30 channel logging recorder used to measure voltage, current, and temperature. Analog traces are recorded, in one of 7 colors, using a unique piezoelectric ink jet recording technique that writes through the paper from the rear to create an instantly readable trace.

The level of the ink supply in the ink tank is lower down than the print nozzle orifice of the nozzle plate. Capillary force compels the ink to rise from the tanks to the end of the nozzle duct.

When one of the piezoelectric tubes in the print head is energized by an electric pulse, then the inner diameter of the tube is momentarily reduced. The pressure produced projects a drop of ink from the print nozzle orifice onto the back of the recorder chart.

Analog X-Y Recorder

Gould 50000 and 60000 Analog X-Y Recorders are used to record the relationship between two variables. The 50000 Series can function either as an analog XY/XYY or an intelligent digital XY plotter, and the 60000 functions as a XY/t recorder.

Our broad range of graphic recording technologies and our 50 years of applications experience combine to provide you with systems to meet your growing application requirements. When you need quality graphic recording systems, think Gould Recording Systems Division.

Technologies that Make Gould the Leader

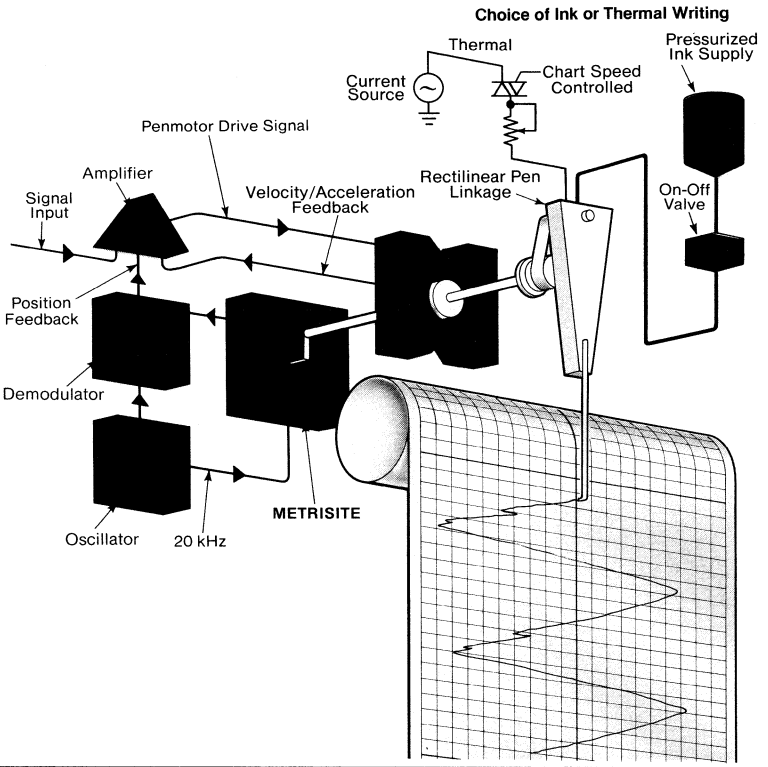
Graphic recorders are divided into two basic writing technologies: direct and indirect. Direct writing technology is subdivided into pressurized ink, direct thermal and edge thermal; indirect into thermal array and electrostatic array. Each technology provides unique performance characteristics to meet your application requirements. The following information outlines the unique benefits of various writing technologies and provides specifications for representative Gould products.

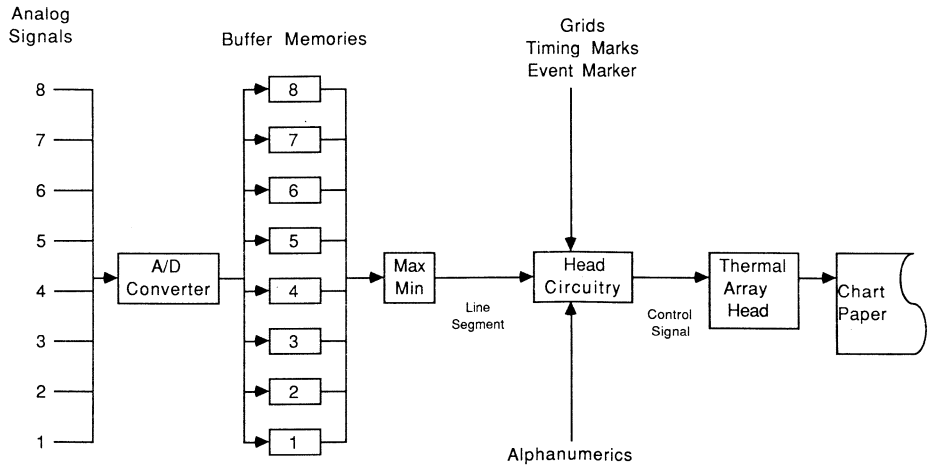
Pressurized Ink and Thermal Writing

- **True "real-time" trace representation**
- **Pressurized ink provides uniform traces independent of chart speed or pen excursion**
- **Closed loop control of thermal pen heat insures high quality trace at all chart speeds**
- **Discrete channels**
- **High quality permanent records**

3000 Series Recorders

- **2, 4, 6 and 8 channel configurations**
- **40, 50, 80, 100 mm channel widths**
- **60 Hz at 40 mm frequency response**
- **Pressurized ink and thermal units**
- **Improved pressure ink system**
- **Four ink colors (red, black, green and blue)**
- **Remote control via RS-232 or IEEE-488**
- **Fully programmable**
- **Interchannel annotation and event marks**
- **Modular design**





TA 2000 Writing System Block Diagram

Linear Thermal Array Writing

- **No moving parts for increased performance and reliability**
- **High frequency response**
- **Transient capture capability**
- **Overlapping traces**
- **Full page annotation**
- **High resolution trace**
- **Self-generating grids**

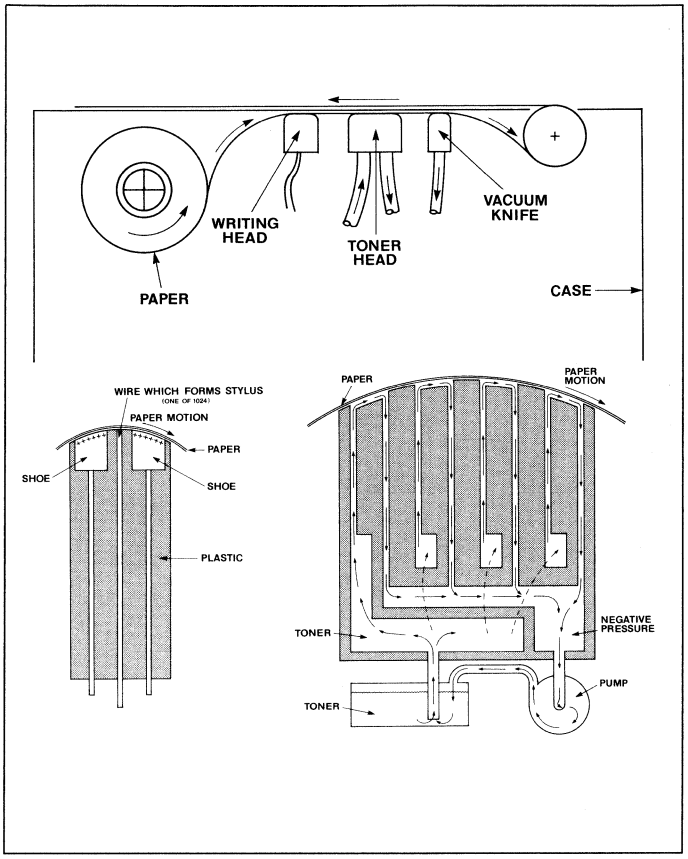
TA 2000 Thermal Array Recorder

- **1 to 8 traces**
- **2.5 kHz frequency response**
- **Peak capture of events 150 µs or longer**
- **200 dots/in amplitude resolution**
- **200 mm maximum channel width**
- **Comprehensive annotation**
  - **— Full page (48 lines x 80 columns)**
  - **— Parameter ID (8 character)**
- **5 grid patterns**

Oscillographs/Graphic Recorders

Linear Electrostatic Array Writing

- No moving parts for increased performance and reliability
- High frequency response
- Transient capture capability
- Overlapping traces
- Full page annotation
- High resolution trace
- Self-generating grids



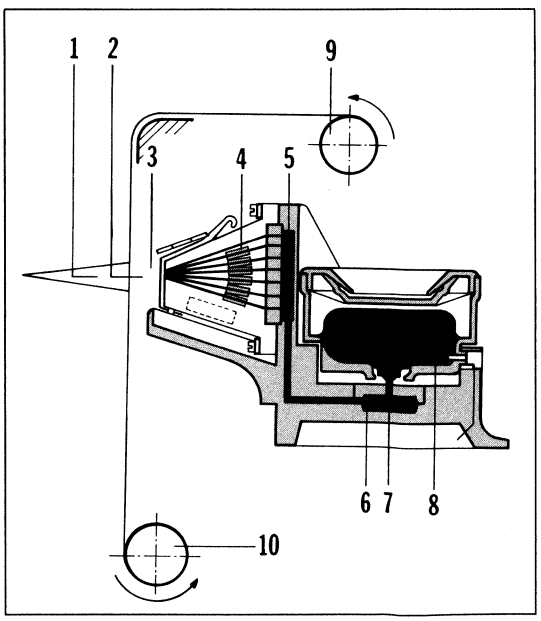
ES 1000 Electrostatic Array Recorder

- 1 to 32 channels*
- 5 kHz frequency response
- Peak capture of events 40 μs or longer
- 100 dots/in amplitude resolution
- 256 mm maximum chart width
- Comprehensive annotation
  - — Full page (24 lines x 50 characters)
  - — Up to 10, 50 character messages
  - — Parameter ID (2, 15 character lines)
- Grid patterns
  - — 4 standard
  - — 9 optional**

*With SP 400 modules **With IT 190 module

Basic components of the recording mechanism

1 Viewing direction
2 Recording point
3 Ink jet plate
4 Piezoelectric tubes
5 Distributor
6 Filter
7 Steel tubes
8 Ink tank
9 Paper roll
10 Take-up reel



Piezoelectric ink-jet writing

- Real-time trace representation
- Multiple colors
- Simultaneous printing of analog traces, alphanumerics and grids

SC 2130 Logging Recorder

- 30 channels
- 7 colors
- 100 ms/channel scan time
- 3 recording modes
- 270 mm maximum chart width
- 15 high and 15 low alarms
- Direct signal connection

Writing Technologies

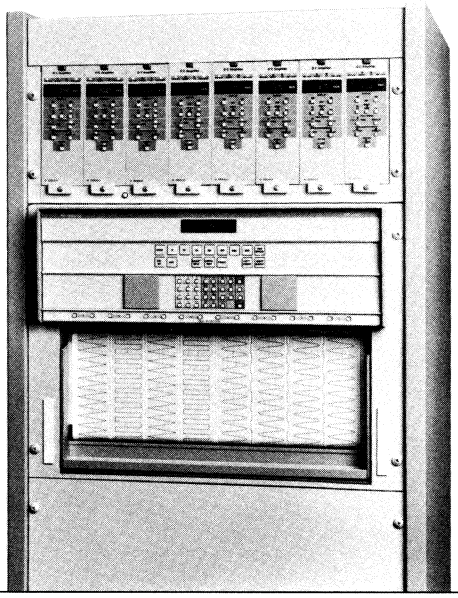
Major Considerations	Direct Writing				Indirect Writing		
	Pressurized Ink & Thermal	Edge Writer (Thermal)	Felt Tip Pen, Strip Chart	Piezoelectric Ink Jet	Electrostatic Array	Thermal Array	Thermal Array
Product	3000 Series Recorders	8000 Series Recorders	SC 270/280 Strip Chart Recorders	SC 2130 Logging Recorder	ES 1000 Recorder	TA 2000 Recorder	TA 550 Recorder
Freq. Response @ Full Excursion	Flat to 60 Hz, @ 40 mm	Down 2 mm, peak, at 50 Hz	Flat at 1 Hz	100 ms/ch Scan Time	Down 2% at 10 kHz	Less than 2% down at 2.5 kHz	Flat to 50 Hz
Chart Speeds	5,10,25,100,250, 500 mm/s, with divide by 60, 100, 1000, variable, external	1,5,10,25,50, 100, 200 mm/s, mm/min., mm/h	SC 270 - 1 cm/h to 100 cm/h SC 280 - 1 cm/h to 100 cm/h	10 to 60 mm/h	5,10,25,50, 100,250 mm/s	1, 2.5,5,10,25, 50,100,200 mm/s and mm/min	1 mm/min to 100 mm/s
Max. Channel Width	100 mm	50 mm	250 mm	250 mm	250 mm	200 mm	100 mm
Inputs	3 direct settings, all Gould Signal Conditioners	Direct, all Gould Signal Conditioners	Strip chart Signal Conditioners only	Direct — 7 types of T/C; RTD; Voltage and Current	Gould ES 1000 Signal Conditioners	3 direct settings, all Gould Signal Conditioners	Strip chart and high speed Signal Conditioners
Input Impedance	100 kΩ	100 kΩ	—	1 MΩ	—	100 kΩ	—
Annotation	Standard: Left Edge Optimal: Interchannel	No	No	No	Full page	Left Edge	Left Edge
Event Markers	Standard: Right Edge Optimal: Interchannel, Bi-directional	Standard: Left Edge Time marker on Right Edge	Standard: Super-imposed on trace Optional on SC 280: Right Edge	No	Up to 100 markers	Left Edge	Right Edge
Number of Channels	2, 4, 6, 8 standard 1, 3, 5 by request only	1, 2, 3, 4, 6, 8	SC 270 - 4, 6 SC 280 - 4, 6, 8	1 to 30	1 to 32	1 to 8	1 to 3
Remote Control	RS-232C, IEEE-488, TTL (HC)	TTL	No	RS-232C, IEEE-488	IEEE-488, TTL	RS-232C Contact closure	RS-232C, IEEE-488
Paper	Ink - Rolls and semi-perf rolls Thermal - rolls, Z-fold	Thermal - Rolls	Rolls, Z-fold	Roll	Rolls, Z-fold	Z-fold	Roll
Options / Accessories	Chart take-up, Z-fold basket, IRIG time decoder, isolated power, cabinets, etc.	Chart take-up	Pen synchronization, chart take-up, rack mount kit (SC 280)	Alarms – 15 high – 15 low	8 channel and 16 channel EP Cath Lab for medical applications	5600IS, 4600 Signal Conditioners, 5900 Signal Conditioner Case	N/A
For more Information See Page(s)	60-63	74	76-77	75	64-67	69, 70	71

Ink and Thermal Recorders

Gould 3000 Series

NEW

- **Fully programmable recorder**
- **8-channel rack or portable models**
- **Permanent multi-color pressure ink or convenient thermal writing**
- **Inter-channel annotation**
- **Total remote control via IEEE-488 or RS-232 interfaces**
- **Programmable amplitude triggering**
- **IRIG time code capability**
- **Compatible with 40 Gould 4600 and 5600 signal conditioners**



Intelligent

Gould's new 3000 Series Recorder with the 5600 Programmable Amplifiers sets new standards for intelligent direct writing recorders. Microprocessor controlled, it features both programmable amplitude triggering so you record only the data of interest. In addition your chart record can be completely annotated with chart speed, date, time and a user message up to 256 characters long. With the new Gould 5600 Amplifiers and optional interchannel annotation feature amplifier gain and other settings can also be recorded alphanumerically. User text messages can be added through the convenient front-panel keypad, or via RS-232C or IEEE-488 interfaces. A recorder self test can be performed at the push of a button. All front panel settings are retained by non-volatile RAM.

Performance

Gould is the only recorder manufacturer to provide users a choice between permanent multi-color pressure ink or thermal writing. Either writing method gives you easy-to-read uniform traces that Gould has been providing users for over 30 years. The 3000's linearity and accuracy specifications are the best available! And we guarantee to meet them! Don't be fooled by others' typical specifications. Our patented Metrisite™ non-contact position sensor provides precise feedback control. Gould's rugged construction means you'll continue getting the same response after your 3000's been on the job for years.

Our patented stepper motor drive offers 14 front-panel selectable chart speeds with 4 adjustable chart speed modes. But that's not all! The 3000's exclusive variable chart speed allows selection between fixed speeds! And that speed is printed on the chart! Maximum chart speed is 500 mm/s so you can get even more resolution of high frequency signals or measure 2 ms timing differences between channels. For long-term, unattended monitoring, the 3000 Recorder can run continuously for more than 6000 hours on a single roll of chart paper.

A complete selection of readily available Gould manufactured Accuchart recording paper and supplies means maximum performance and reliability day in and day out.

Direct Writing Systems Recorder

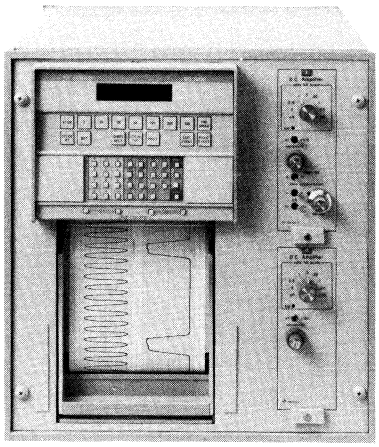
The 3000 is an ideal system output device. Completely programmable, it can supply permanent hard copy test data on demand under standard IEEE-488 or RS-232C computer control. IRIG time code signals can be continuously decoded and printed in alphanumeric format.

When used with an external pulse train, Gould 3000 Recorders can function in an XY mode, with chart movement controlled by the unit under test. This is ideal for well logging, measurements on rotating equipment, and process monitoring in metal rolling, paper coating and similar applications.

Easy to Use

Pen positions are easily set with the paired right/left push-buttons. If inputs are accidently reversed it's no problem with the 3000's polarity reversal feature. You can also rewind the chart back into the recorder to determine differences between samples when running the same test! Recorder settings are automatically stored in memory when the unit is turned off. When the recorder is powered up again, you can use the same stored values with a unique "warm start/cold start" function.

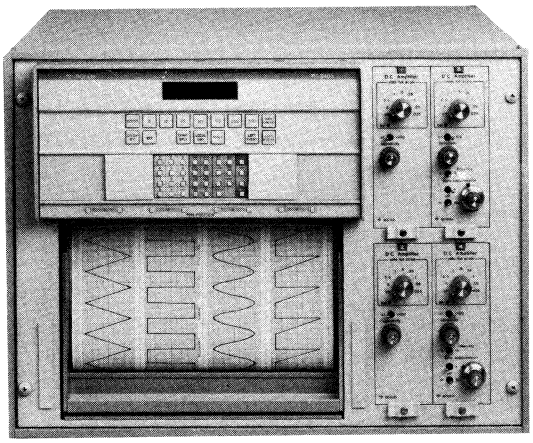
Paper is quick and easy to load. Plastic plugs slip into the chart paper core for accurate roll paper loading. Fanfold thermal paper is also easy to load. All recorders use a built-in pen guard that prevents accidental pen damage when loading paper.



RS 3200

Two Channel Recorder RS 3200

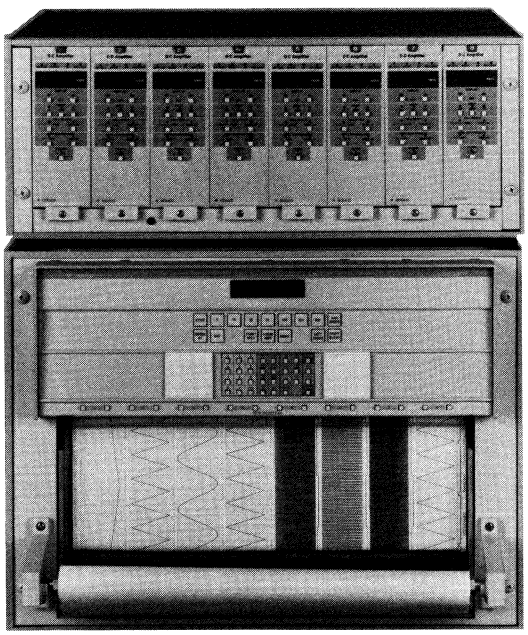
- Channel configurations available:
  – 2, 50 mm channels
  – 1, 100 mm channel
- Unit pictured:
  Two channel, portable ink unit with 2 resident signal conditioners; Model 30-V7202-10
- Dimensions:
  15 in. (38.1 cm) H x 14 in. (35.6 cm) W x 17.25 in. (43.8 cm) D



RS 3400

Four Channel Recorder RS 3400

- Channel configurations available:
  – 4, 50 mm channels
  – 2, 100 mm channels
  – 2, 50 mm channels; 1, 100 mm channel
- Unit pictured:
  Four channel, portable ink unit with 4 resident signal conditioners; Model 30-V7404-10
- Dimensions:
  15 in. (38.1 cm) H x 19.75 in. (50.1 cm) W x 17.25 in. (43.8 cm) D



RS 3800

Eight Channel Recorder RS 3800

- Channel configurations available:
  – 8, 40 mm channels
- Unit pictured:
  Eight channel, portable ink unit with 5900 signal conditioner cage; Model 30-V7808-12
- Dimensions:
  Recorder — 15 in. (38.1 cm) H x 19.75 in. (50.1 cm) W x 17.25 in. (43.8 cm) D
  Cage — 8.25 in. (20.9 cm) H x 19.75 in. (50.2 cm) W x 19 in. (48.3 cm) D

Six Channel Recorder RS 3600

- Channel configurations available:
  – 6, 50 mm channels

  Unit: not pictured

  Dimensions: Same as RS 3800

Contact your local Gould Sales Office (see pages 166 and 167) for other available configurations.

Common Recorder Options Include:

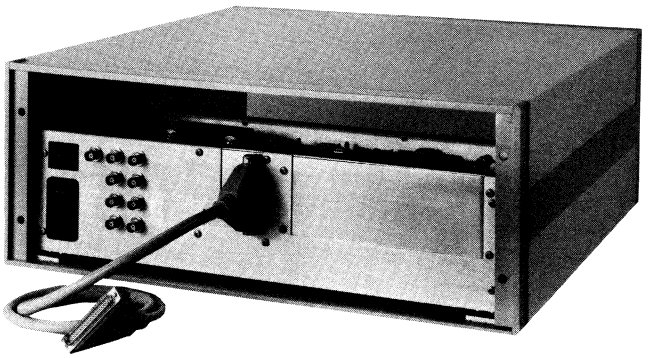
- Pressurized ink or thermal writing models
- Portable or rack mount configurations
- Roll or Z-fold paper
- Interchannel annotation and event marks
- RS-232C or IEEE-488 interfaces

All Standard System Configurations include:

- **3000 Recorder**
- **5900 Signal Conditioner Case (built-in on 3200 and 3400 versions; separate on 3600 and 3800 versions)**
- **3000 Connection Cable (necessary with 3600 and 3800 versions only)**
- **AC power cord**
- **Annotation on left chart edge**
- **Bi-directional event marker on right chart edge**

In addition, the following options and accessories are available:

- **Choice of signal conditioners**
- **Chart take-up**
- **Analog monitor output board (medical applications)**
- **Interchannel annotation board (one board per two channels)**
- **Interchannel annotation writing head (one per channel)**
- **Interchannel, bi-directional event marker (one per channel)**
- **Controller board (necessary for any digital communications)**
  - **— in 5900 signal conditioner case for 3600 and 3800 versions**
  - **— in 3000 recorder for 3200 and 3400 versions**
- **IEEE-488 interface board, or**
- **RS-232C interface board**
- **IRIG time decoder board (must be used with either interface board)**
- **Vertical cabinets**
  - **— Standard**
  - **— Tall**



Back panel of 5900 Cage with 3000-to-5900 Connection Cable.

Specifications

Gould 3000 Recorder

Standard Channel Configurations: One 100-mm channel; two 50-mm channels. Two 100-mm channels; one 100-mm and two 50-mm channels; four 50-mm channels. Six 50-mm channels. Eight 40-mm channels.

Hardware Configurations: Portable, Rackmount.

Frequency Response at 40-mm Full Scale: Flat to 60 Hz.

Linearity: >99.65% of full scale.

Marking Method: Pressurized ink or thermal.

Chart Speeds: Pushbutton selectable, 5, 10, 25, 50, 100, 250 and 500 mm/s with divide by 60, 100 and 1000.

Chart Speed Accuracy: ±0.25% at 25°C ±10°C.

Time Lines on Paper: One mm accentuated every 5 mm and 100 mm.

Input Signal: Internally selectable 2-, 5- and 10-volt span for 100-, 80-, 50- or 40-mm channels.

Chart Annotation: Date, time, chart speed, user entered comments.

Print Annotation Configuration: 5 x 7 dot matrix.

Maximum Annotation Speed: 500 mm/s less than 0.1 mm delay.

Interchannel Annotation or Event Markers: Up to 8 channels.

IRIG Time Code Interface Decoder (optional): Accepts IRIG A, B, E, and NASA 36, modulated or unmodulated.

Amplitude Triggering: Set on channel one input to Pin 31.

Chart Wander: ±0.25 mm for rolls. ±0.5 mm for fanfold, maximum.

Variable Speed Control: 5 mm/s to 500 mm/s in 5 mm/s increments.

Chart Rewind: In increments of 6 seconds at 50 mm/s (3 meters).

Operating Temperature: 0 to +50°C.

Storage Temperature: −40 to +70°C.

Full Backup Via Non-Volatile RAM: Battery backup for clock.

Paper: Pressurized ink and thermal, roll and Z-fold, 275 ft. (84 m) and 350 ft. (107 m) length, depending on type and configuration.

Thermal Colors: Standard, black; optional, blue.

Ink Colors: Standard, blue; optional, red, green, black.

Ordering Information

No. of Channels	Configuration	Model Number
	Recorders with Signal Conditioner Case and Connection Cable*	
Pressure Ink, Portable		
1	100 mm, 3200	30-V7210-10
2	50 mm, 3200	30-V7202-10
2	100 mm, 3400	30-V7420-10
3	1-100 mm, 2-50 mm, 3400	30-V7412-10
4	50 mm, 3400	30-V7404-10
6	50 mm, 3600	30-V7606-12
8	40 mm, 3800	30-V7808-12
Pressure Ink, Rack Mount		
1	100 mm, 3200	30-V7210-11
2	50 mm, 3200	30-V7202-11
2	100 mm, 3400	30-V7420-11
3	1-100 mm, 2-50 mm, 3400	30-V7412-11
4	50 mm, 3400	30-V7404-11
6	50 mm, 3600	30-V7606-13
8	40 mm, 3800	30-V7808-13
Thermal, Portable		
1	100 mm, 3200	30-V8210-10
2	50 mm, 3200	30-V8202-10
2	100 mm, 3400	30-V8420-10
3	1-100 mm, 2-50 mm, 3400	30-V8412-10
4	50 mm, 3400	30-V8404-10
6	50 mm, 3600	30-V8606-12
8	40 mm, 3800	30-V8808-12
Thermal, Rack Mount		
1	100 mm, 3200	30-V8210-11
2	50 mm, 3200	30-V8202-11
2	100 mm, 3400	30-V8420-11
3	1-100 mm, 2-50 mm, 3400	30-V8412-11
4	50 mm, 3400	30-V8404,11
6	50 mm, 3600	30-V8606-13
8	40 mm, 3800	30-V8808-13
	Recorder Only*	
Pressure Ink, Portable		
6	50 mm, 3600	30-V7606-10
8	40 mm, 3800	30-V7808-10
Pressure Ink, Rack Mount		
6	50 mm, 3600	30-V7606-11
8	40 mm, 3800	30-V7808-11
Thermal, Portable		
6	50 mm, 3600	30-V8606-10
8	40 mm, 3800	30-V8808-10
Thermal, Rack Mount		
6	50 mm, 3600	30-V8606-11
8	40 mm, 3800	30-V8808-11

Model Number	Description
	3000 Recorder Options
11-6283-01	Interface Kit, IEEE-488
11-6283-02	Interface Kit, RS-232C
11-6283-03	Interface Kit, IRIG Time Decoder (must be used with 11-6283-01 or 11-6283-02 Interface Kit)
11-4221-00	3000 Interpreter/Controller Board (digital**, 3200 and 3400)
11-4221-01	5900 Interpreter/Controller Board (digital**, 3600 and 3800)
11-4221-02	Auxiliary Analog Board Kit (Medical), for 3600 and 3800 Recorders
11-6293-01	Interchannel Annotation Head, Thermal***
11-6293-02	Interchannel Annotation Head, Ink***
11-6293-03	Interchannel (Annotation) Driver Kit, Thermal***
11-6293-04	Interchannel (Annotation) Driver Kit, Ink***
11-6223-01	Interchannel, Bi-Directional Event Marker Kit, Thermal, 50 mm***
11-6223-02	Interchannel, Bi-Directional Event Marker Kit, Ink, 50 mm***
11-6223-03	Interchannel, Bi-Directional Event Marker Kit, Thermal, 40 mm***
11-6223-04	Interchannel, Bi-Directional Event Marker Kit, Ink, 40 mm***
	3000 Recorder Accessories
698044	Rack Mount Kit for 3600 and 3800 Recorders
698045	Rack Mount Kit for 3400 Recorder
698046	Rack Mount Kit for 3200 Recorder
CL-811054	Enclosure for 3200 Recorder
CL-811055	Enclosure for 3400, 3600, 3800 Recorders
11-6402-16	Chart Take-up for 3200 Recorder
11-6402-17	Chart Take-up for 3400 Recorder
11-6402-18	Chart Take-up for 3600 and 3800 Recorder
290144	Phone Jacks (3000 Recorder)
11-4183-03	Portable 5900 Signal Conditioner Case***
11-4181-01	Rack mount 5900 Signal Conditioner Case***

Notes:

*Auxiliary Analog Boards (Kits) are built into all 3200 and 3400 Recorders. This board MUST BE ADDED to ALL 3600 and 3800 Recorders (in the 5900 Signal Conditioner Case) for ALL MEDICAL applications.

**Digital communications are necessary for status reporting (annotation) and programmable signal conditioners.

***Options must be installed at the factory or by a Gould Service Representative.

Electrostatic Recorder

Gould ES 1000

- **1 to 32 analog channels**
- **Real time video display monitor**
- **256 mm chart width**
- **Frequency response to 10 kHz**
- **40 μs full scale peak capture**
- **Comprehensive annotation via RS-232C or IEEE-488**
- **Analog and digital inputs**
- **Up to 100 event channels**

ES 1000 with Monitor and Remote Control Box

The Gould ES 1000 is a modular, highly versatile electrostatic array recording system. Its modular design allows you to configure a solution to meet current needs and to expand for future needs. The fixed, no-inertia electrostatic writing head has no moving parts, increasing reliability.

The 84 kHz sample rate provides transient response of 40 μs full scale. The ES 1000 simultaneously prints signal traces, grids and text over the full 256 mm (10 in.) usable chart width.

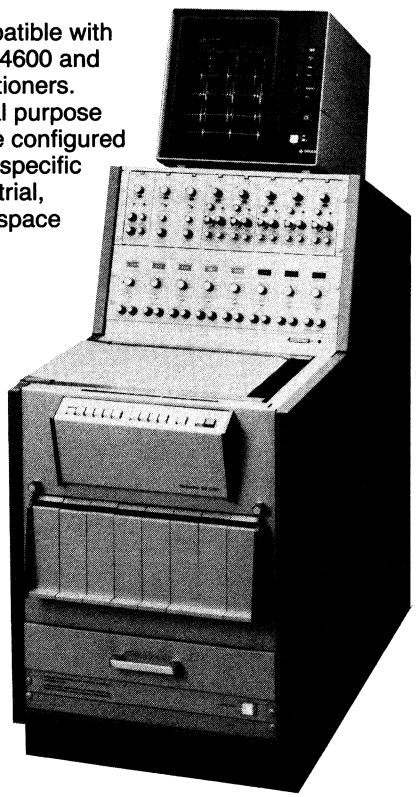
The high-contrast records produced are permanent and easily reproducible by office copiers or for publication. The inexpensive chart paper, available in roll or fanfold, costs only a fraction of the photosensitive papers used in light beam oscillographs.

In addition to 32 analog traces, the ES 1000 simultaneously prints grid lines, a complete range of alphanumeric annotations, and up to 100 event marker channels. The ES 1000 can receive 10-bit digital words from a computer or other storage media via a parallel interface and record them as analog traces.

The ES 1000 mainframe accommodates up to 8 plug-in input modules. An expansion housing allows an additional 8 modules. An optional high-frequency non-fade Monitor provides real-time display of all signals, and allows easy set-up and monitoring of data without using chart paper.

Standard features of the ES 1000 include full remote control via TTL, 4 event markers, 1s timer, 256 LED array displaying trace position in real time, externally controllable time lines, and switchable amplitude and time lines.

The ES 1000 is fully compatible with Gould's wide selection of 4600 and 5600 Series Signal Conditioners. These general and special purpose signal conditioners can be configured with the ES 1000 to meet specific requirements in the Industrial, Medical and Military/Aerospace markets.



ES 1000 in Low-boy console

Complete Annotation

The ES 1000's comprehensive annotation provides a complete chart record, using the optional M200 Alphanumeric Character Module. Chart speed, channel number and input sensitivity are automatically printed. In addition, the following information may be printed: real time, date, text of 24 lines by 50 characters, 10 "on-the-fly" 50 character messages, and 2, 15 character parameter identification lines per channel. The text can be printed once or repeated every page. Further, "on-the-fly" messages can be printed on demand by simply entering a message reference number.

All programmable annotation is easily entered using a dumb terminal, such as Lear Siegler ADM3A. This may also be done from a computer via the M200 RS-232C port or from the IEEE-488 bus with the optional Gould IT 488 Interface Module. All data entered is retained in the M200's memory up to 30 days with the recorder turned off.

Real Time Display

The Gould V1000 high-resolution, non-fade monitor clearly displays signals, event markers, grids and alphanumerics in real time. This data may be continuously monitored on the V1000 screen without running the chart.

On the high-frequency V1000, you can view signals up to 15 kHz on the screen. Four display modes are available:

Roll — Signals scroll continuously from right to left at the set ES 1000 chart speed.

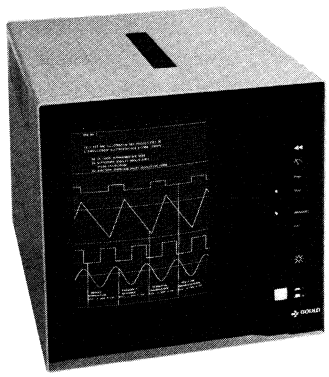
Refresh — Signals are updated by a line segment that sweeps from right to left.

Page — Display is updated once to show a full-page of data and is then frozen.

Stop — Freezes the display.

A hard copy of the display can be obtained on the chart paper on demand.

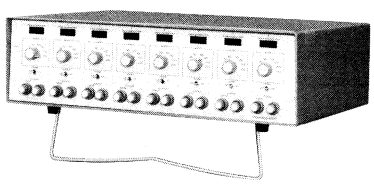
The optional Remote Control Box (Gould RC 1000) and up to two Slave Monitors are available to remotely monitor and control the system. The Gould RC 1000 provides for simultaneous control for both the ES 1000 and V1000. The Slave Monitors (12″ or 24″ screens) duplicate the V1000 display for up to 100 meters.



V1000 Real Time Monitor

SP 800 Interface

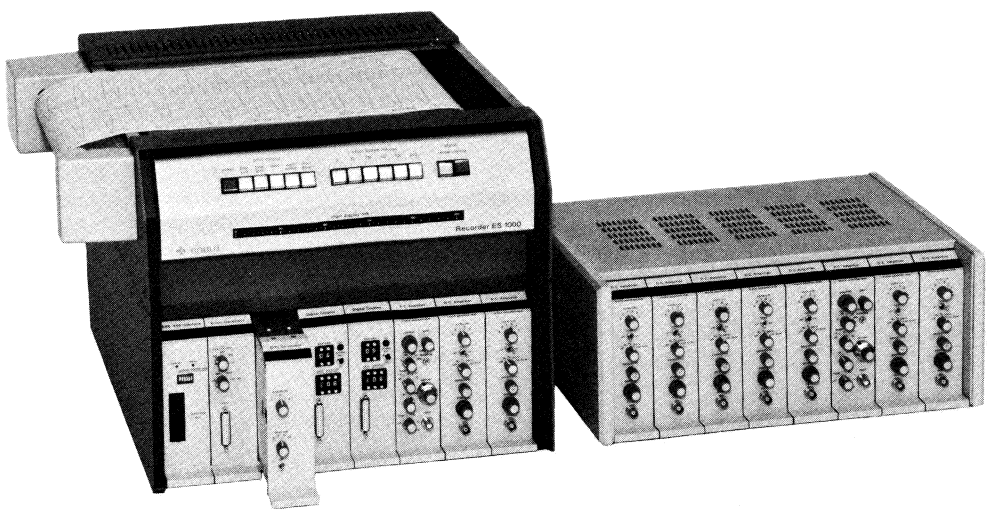
Permits use of any Gould 4600 or 5600 Series industrial or medical signal conditioner with the ES 1000 Recorder and provides multiplexing for up to eight 4600 or 5600 Signal Conditioners. Single ended, non-floating 100 kΩ. Sensitivity: ±2.5 V full scale. Channel boundary switch selectable: 25, 50, 100, 150, 200, 250 mm. Full scale positioning by 10-turn potentiometer. 3-Digit display of position in mm.



SP 800 Interface

Signal limiters. Input protection ±100 V peak AC or DC. 19-in. rack mount or portable configuration. (Separate cage required for 4600 and 5600 Signal Conditioners) Sampling frequency 10 kHz per channel.

An optional interface card **(SP800 IEEE-488 Data Output Card Model 23-2101-23)** allows for the transfer on the digitized signals via an IEEE-488 bus. Minimum and/or maximum values of any combination of the eight channels are available in binary, ASCII decimal, octal and hexadecimal codes.



ES 1000 Portable Configuration with PA 1000 8-channel Expansion Housing and optional chart take-up.

ES 1000 Plug-In Modules

SP100A: Single-channel Analog Input.

Medium Gain DC Amplifier, single ended, non-floating 100 kΩ input.

Sensitivities: 0.1, 0.2, 0.5, 1, 2 and 5 V/cm; 2.5 V to 125 VFS. Continuous gain control from x1 to x2.5. Input protection: 500 VDC or peak. Full-scale positioning by 10-turn potentiometer. Transient capture of 40 µs FS. Frequency response: DC to 25 kHz (−3 dB). Digital switchable filter (50 Hz). Sampling frequency: 84 kHz.

SP110A: Single channel High Gain Analog Input.

Differential DC Amplifier, balanced to floating common guarded 2 x 1 MΩ input.

Sensitivities: 5, 10, 20, 50, 100 and 200 mV/cm with x1 and x100 multipliers; 125 mV to 500 VFS. Full scale positioning by 10-turn potentiometer. Continuous gain control from x1 to x2.5. Input protection: 500 VDC or peak. Calibrated zero suppression ±1 V to ±500 V. Transient capture of 50 µs FS. Frequency response: DC to 8 kHz (−3 dB). Digital switchable filter (50 Hz). Sampling frequency: 84 kHz.

SP400A: Four-channel Analog Input.

Single ended, non-floating 100 kΩ.

Sensitivities: 0.1, 0.2, 0.5, 1, 2 V/cm; 2.5 V to 50 VFS. When used with 4600/5600 Signal Conditioner interface, channel widths: 25, 50, 100 and 250 mm. Full scale positioning by 10-turn potentiometer per channel. Frequency response: DC to 6 kHz (−3 dB) per channel. Input protection: 210 VDC or peak. Individual channel identification with M200. Sampling frequency: 32 kHz per channel.

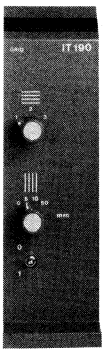
IT160A: Single-channel Digital Input.

Accepts digitized signals directly from computers or digital storage media; 6 to 10-bit parallel word input for data (TTL levels). 42,000 words/s max. transfer rate. 4-bit address for up to 16 IT160A modules. 3-bit transfer control. Position and amplitude controlled by front panel thumbwheels or by digital remote control. 3-bit amplitude for 1/1, 1/2, 1/4, 1/8 and 1/16 of full scale - 4 bit for position. Overload indication by front panel LED and/or trace modification.

IT164: Four-channel Digital Input, IEEE-488 compatible*.

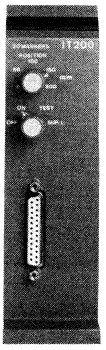
Accepts digitized signals directly from computers or controller via the standard IEEE-488 interface. Acceptor Handshake and Listener protocols. Addressable with MLA procedure and front panel miniswitches or by Listen Only procedure or by software. Full-scale 10 bit-resolution. 2-byte data format. Up to 32 channels with 8 modules in the same ES 1000. Individual channel identification with M200. Each channel may be addressed every 2 µs up to 32 µs.

*Not available in North America



IT190 Grid Generator

Provides 3 grid-line patterns in addition to standard pattern provided by ES 1000 mainframe. Patterns stored on interchangeable EPROMS. Other patterns can be custom programmed by special request. The time lines can be printed every 5, 10 and 50 mm or not at all.



IT200: 20-Event Marker Input

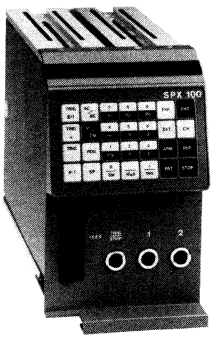
Marks up to 20 events. TTL and switch closure compatible. Position of each marker at rest shown by a thin line. When actuated, the marker line becomes 1.5 mm wide. Response time better than 1 ms. The group of 20 markers covers a 50 mm-wide band. This band can be placed at 5 successive locations over the full paper width. Five IT200 modules in the same ES 1000 mainframe provide 100 event channels.

IT300: Time Code Interface

Provides accurate synchronization of time with traces from telemetry station, tape recorder, or other source. Prints time in alphanumeric characters from modulated or demodulated IRIG A, B, E or H or NASA 36 time codes. Time data can be positioned anywhere on the chart.

IT488: IEEE-488 Interface

Allows for full remote control of the ES 1000 Recorder via the IEEE-488 bus: time and amplitude lines ON/OFF. Four standard event markers, chart drive ON/OFF and chart speed selection. Protocols implemented are AH, SH, MLA, MTA. Listener and talker modes. Direct access to M200 character generator board and all its functions.

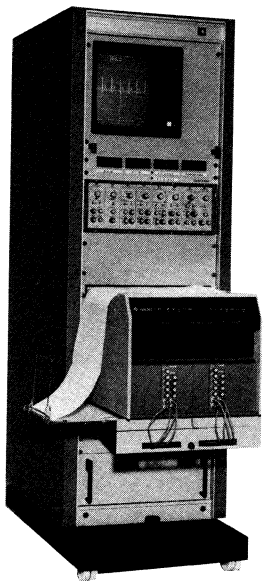


SPX100: Two channel Speed Expander Module.*

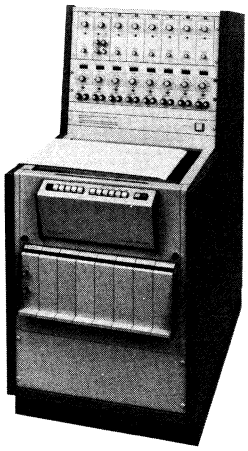
Two standard module slots wide. Expands the chart speed range from 10^{-4} mm/s to 25 m/s. Two differential non-floating 2x1 MΩ Inputs. Sensitivity: from 50 mV to 20 V/cm; 1.25 V to 500 VFS. 10-bit resolution. Acquisition time from 0.3 s to 91 hrs. Manual control via keyboard and 16-digit display in conversational mode. 64k word memory per channel (expandable to 128k) which can be divided into 2 to 5 blocks. Sampling frequency: 100 kHz.

*Not available in North America

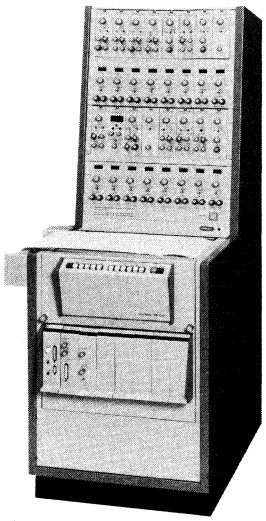
System Configurations



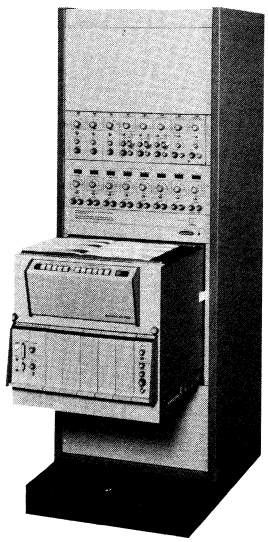
Tall Vertical Cabinet**
Overall Dimensions: 23.3 in. (59.3 cm) W x 74.8 in. (190 cm) H x 39.4 in. (100 cm) deep.



Lowboy Cabinet*
Overall Dimensions: 21 in. (53.3 cm) W x 43.5 in. (110.5 cm) H x 39 in. (99 cm) D.



High Turret Lowboy Console*
Overall Dimensions: 21 in. (53.3 cm) W x 58 in. (147.3 cm) H x 39 in. (99 cm) D.



Short Vertical Cabinet*
Overall Dimensions: 21 in. (53.3 cm) W x 63.38 in. (161 cm) H x 22 in. (55.9 cm) D.
Base Dimensions: 32.29 in. (82 cm) D x 21 in. (53.3 cm) W.

*North American models **Rest of the World models

Specifications

Paper Width: 11 in. (279.4 mm).

Usable Width: 10 in. (256 mm).

Resolution: 4 dots/mm along the vertical Y axis - 1000 dots/s along the horizontal time axis.

Marking Method: Fixed electrostatic array.

Type of Paper: Fan-fold (1000 sheets 216 x 279 mm; 8½ in. x 11 in.)
Roll plain or translucent (122 meters; 400 ft.)

Number of Plug-in Modules: 1 to 8 in the basic unit, up to 16 with addition of expansion housing (PA 1000).

Trace Position:

Analog: adjustable over full scale by 10-turn potentiometer.

Displayed in mm from 000 to 255. Coincidence indicator for whole number of millimeters.

Overload indication by blinking of LED display.

Digital: either by remote control or by thumbwheel located on front panel.

Identification: Optional - with M200 board.

Markers: There are 4 event markers, which can be actuated through the rear terminal bar. The first one can also be actuated from the front by a push-button. Other markers in groups of 20 can be added by using module IT200. (Maximum of 100 event markers).

Time marker: A 2 mm-long mark is printed every second above the upper margin of the chart.

Time lines: Vertical dotted lines spaced 5 mm apart are printed and correspond to fractions of a second. They can also be produced by an external time base.

Amplitude lines: Horizontal dotted lines spaced 5 mm apart, doubled every 50 mm can be printed. Module IT190 can replace them by other configurations.

Print rate: 1.000 lines per second.

Chart speeds: 1*, 5, 10, 25, 50, 100, 250 mm/s.

Motor: Servo-controlled DC motor, continuous drive.

Frequency Response: A 100 Hz sinewave is defined by 10 adjacent segments. The accuracy of the peak-to-peak amplitude is 0.1% at 1000 Hz; 0.2% at 1500 Hz; 2% at 10 kHz; 30% at 25 kHz (with SP100A). It is independent of signal amplitude and number of channels.

Nonlinearity: ±0.2% with SP100A.

Characters: Set of 64 characters in 7 by 9 matrix.

Alphanumeric annotations with M200: Channel number, sensitivity, chart speed, real time and date or stopwatch, 24-line message anywhere on the page, "on-the-fly" printing of 10 different messages. 1 to 64 parameters names on two lines of 15 characters.

Power: 100-240 V, 50/60 Hz, 250 Watts. Protected by resettable circuit breaker.

Dimensions of portable unit: 445 mm H x 445 mm W x 574 mm D (17½ in. H x 17½ in. W x 22⅝ in. D). 790 mm (31 in.) when table is open for loading paper.

Weight: 25 kg (55.1 lb.) plus 1.5 kg (3.3 lb.) per module.

Storage temperature: −40°C to +85°C.

Operating temperature: 13° to 33°C

*For North America, consult factory (option).

Ordering Information:

IMPORTANT: In North America, use Model Numbers in Column B. In rest of the World, use Model Numbers in Column A.

ES 1000 Recorders

Column A	Column B	Description
3009-1130-17	3009-1150-20**	Portable
3009-1131-17	3009-1156-20**	Rack Mounting kit (no cabinet supplied)
3009-1132-17*	3009-1151-20**	Lowboy configuration
3009-1133-17*	3009-1152-20**	High Turret Lowboy Configuration
3009-1134-17*	3009-1153-20**	Short 19″ Vertical Cabinet Configuration
Consult factory	3009-1154-20**	Tall 19″ Vertical Cabinet Configuration

* – 27 instead of – 17: with Medical Line Isolation
** – 30 instead of – 20: with Medical Line Isolation

Options and Accessories

Column A	Column B	Description
23-2111-19	23-2101-19	M200 Character Generator Board with menu in English
23-2111-29	N/A	M200 Character Generator Board with menu in French
23-2111-39	N/A	M200 Character Generator Board with menu in German
23-2111-21	23-2101-21	CRT keyboard terminal for M200
23-1111-00	23-1101-00	IT100 Blank plug-in module
23-3111-01	23-3101-01	Chart Take-up for roll paper (25 m; 82 ft. capacity)
23-3111-07	23-3101-02	Paper Folding Basket (1000 sheets capacity)
23-4111-01P/R*	P/R*23-4101-01	PA 1000 8-Module Expansion Housing
23-4111-14P/R*	N/A	PA 4600 4-4600 Series signal conditioner interface with 4 channel cage
P/R23-1111-04*	P/R*23-1101-04	SP800 8-4600 Series signal conditioner interface
P/R11-1202-28*	P/R11-1202-28	Cage for 8 conditioners to be used with SP800
23-2101-23	23-2101-23	SP800-IEEE-488 Data Output Card
23-3111-04P/R*	P23-3111-04	V1000 High Resolution Non-fade Monitor Scope
23-3111-06	23-3111-08	V100 12″ Monitor Scope
23-3111-12	23-3101-12	V200 24″ Slave Monitor Scope
N/A	11-1202-34	Rack mount kit, vertical for V1000
11-1605-14	11-1605-145355	Input/Output Panel
23-3111-09	23-3111-09	RC1000 Remote Control Box for ES 1000 and V1000
X51792	ALX-51792	20 m Cable for V1000/V100 or V200
X51905	ALX-51905	5 m Cable for V1000/V100 or V200

*P: Portable - R: Rackmountable

Plug-In Modules

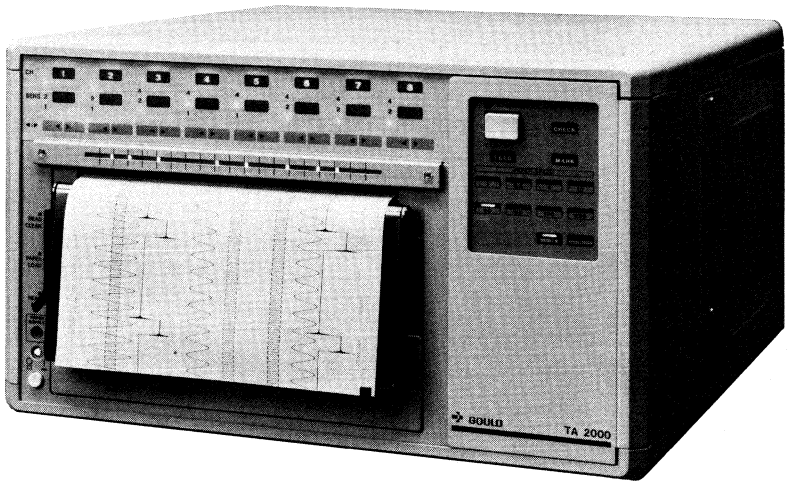
Column A	Column B	Description
23-1111-11	23-1101-11	SP100A Analog Input, single-channel DC Amplifier
23-1111-12	23-1101-12	SP110A Analog Input, single-channel DC Amplifier, isolated zero suppression
23-1111-14	23-1101-14	SP400A 4-channel, Analog Input
23-2111-20	23-2101-20	IT160A Digital Input, Single channel
23-2111-14	N/A	IT164 Digital Input, Four-channel IEEE-488 compatible
23-2111-16	23-2101-16	IT488 IEEE-488 Interface (programmation and M200)
23-2111-06	23-2101-06	IT190 Grid Line Generator
23-1111-03	23-1101-03	IT200 20 Event Marker
23-2111-17	23-2101-25	IT300 Time Code Interface
23-2111-15	N/A	SPX100 Speed Expander, 2-channel
23-2111-35	N/A	SPX100 Speed Expander, 2-channel with memory extension

Thermal Array Recorder

TA 2000

NEW

- **1 to 8 analog channels**
- **Frequency response <2% down on envelope of continuous 2.5 kHz sine wave**
- **Peak capture of events 150 μs or longer**
- **200 dots/in. amplitude resolution (8 dots/mm)**
- **200 mm/s maximum chart speed**
- **Overlapping traces**
- **Compatible with Gould 4600 and 5600 Signal Conditioners**



TA 2000 Stand Alone Unit

The penless digital writing system of the TA 2000 features a high resolution (8 dots/mm) linear thermal array head. This head is composed of closely spaced stationary heating elements which allow simultaneous printing of traces, grid lines and alphanumeric annotation. Because the writing system has no moving parts, there are no mechanical or inertial limits usually associated with pens or galvanometers. The result is high frequency response, no trace overshoot, and the ability to overlap traces. Also, traces may be written across the full 200 mm chart width.

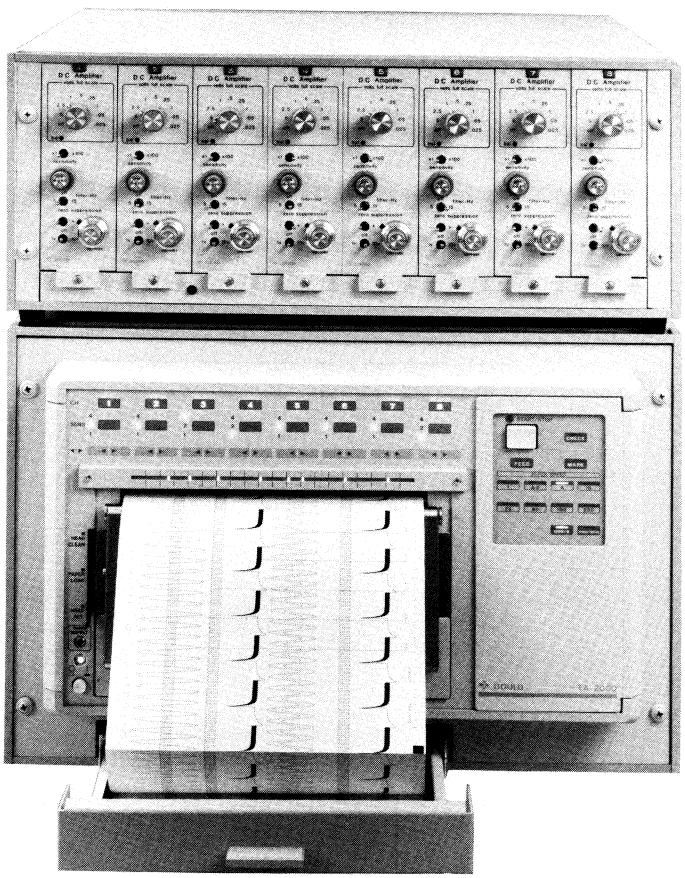
The TA 2000 was designed with the user in mind. The front panel is composed of instantly recognizable keys that provide positive audible, tactile and visual feedback. Position keys allow movement of the trace in precise 10-mm increments across the chart making formatting a simple task. A row of LEDs just above the paper exit follows all signals in real time eliminating the need to run the chart during setup.

Frequency response is an impressive 2% down on a continuous 2.5 kHz sine wave. Peak capture of events as short as 150 μs with no trace degradation is another benefit of TA 2000 array technology.

Three modes of chart operation allow continuous recording, or paper conservation when ongoing recording is not needed. The user simply programs the chart to run and stop or change speeds at specific time intervals.

Real time, day/date and chart speed annotation are printed once per page. Channel identification can be enabled from the front panel. Full page of user text and 8-character parameter identification can be entered via the RS-232C interface a host computer. Also, most front panel functions can be remotely controlled via the RS-232C interface.

When combined with Gould's more than 40 general and special purpose signal conditioners, the TA 2000 provides unparalleled application flexibility to meet your specific recording requirements.



TA 2000 Bench Top Unit

Specifications

Number of Analog Channels: 1 to 8 channels real time recording.

Event Marker: 2 mm wide mark at left chart edge when MARK key is depressed or activated via remote control connector.

Marking Method: Single fixed thermal array head.

Recording Width: 200 mm FS (recording is possible across full 8½ inches of chart paper).

Amplitude Resolution: 200 dots/in. (8 dots/mm).

Time Axis Resolution: 8 lines/mm (at 200 mm/s). 16 lines/mm (at 100 mm/s). 32 lines/mm (at 50 mm/s). 48 lines/mm (at 25 mm/s).

Frequency Response: Less than 2% down on envelope of 2.5 kHz continuous sine wave. Full peak capture of events 150 µs or longer. Both specs independent of number of channels recorded or trace amplitude.

Analog Inputs: Single Ended, Single Common at Earth Ground ±5 V FS (10 V span).

Input Impedance: 100 kΩ ±10%.

Sensitivity: x1, 1 V/cm; x2, 0.5 V/cm; x4, 0.25 V/cm.

Chart Speeds: 1, 2.5, 5, 10, 25, 50, 100, 200 mm/s and mm/min.

Timing Marks: Recorded in three lengths along both edges of chart paper.

		Print Interval					
Range	**Long**	**Normal**	**Short**	**Speed**	**Long**	**Normal**	**Short**
mm/s	10 s	1 s	0.1 s	1	x	x	-
mm/min.	10 min.	1 min.	0.1 min.	2.5	x	x	-
				5	x	x	-
				10	x	x	-
				25	x	x	x
				50	-	x	x
x Printed				100	-	x	x
- Not Printed				200	-	x	x

Chart Speed Accuracy: ±3%.

Motor: Servo-controlled DC motor, quiet continuous drive.

Recording Modes: Continuous — Manual chart drive start/stop from front panel. Periodic — Chart drive starts and stops automatically at time intervals selected from front panel. Alternate — Chart drive switches between two chart speeds at time intervals selected from front panel.

Grid Line Printing: Selectable from front panel; Grids OFF, 10x10 mm and 5x10 mm grids each with selectable 1x1 mm fine grid.

Annotation: Date, Time and Chart Speed are printed once per page. User defined full page (48 lines x 80 columns) and 8 character parameter identification possible via RS-232C interface.

Channel Identification: Channels successively identified once per page by a thin line from the corresponding trace to a three character field (CH1, CH2, etc.). Turned on or off from IDENT Key.

Chart Paper Description: High Sensitivity Thermal Paper, 8½ x 11 inch, Z-fold, 11-inch fold length, 350 sheets.

Chart Paper Capacity: 325 ft. (107 m).

Chart Paper Take-up Drawer: Collects full paper capacity. (Standard with rack mount and portable systems.)

Remote Control: Chart Start/Stop and Event Mark can be controlled from rear panel remote connector via contact closure.

RS-232C Interface: The following functions are possible via the interface; control of all front panel functions, full page (48 lines x 80 columns) of annotation, 8 character parameter identification.

Operating Input Voltage: Range — 100-125 VAC or 200-240 VAC (depending on model). Limit — ±5%. Frequency — 50/60 Hz.

Input Power: Typical — 100 VA. Maximum 500VA.

Battery Back-Up: Maintains front panel settings and time/date for 30 days.

Weight: Stand Alone — 53 lbs. (24 kg). Portable System — Recorder 65 lbs. (29.5 kg). Cage 34 lbs. (15.4 kg).

Dimensions: Stand Alone — 17 in. (430 mm) W x 10 in. (248 mm) H x 17 in. (430 mm) D. Bench Top: Recorder — 20 in. (506 mm) W x 13.5 in. (341 mm) H x 17 in. (430 mm) D. Cage — 20 in. (506 mm) W x 8.25 in. (209 mm) H x 19 in. (480 mm) D. Rack mount — 19 in. (480 mm) W x 12.25 in. (310 mm) H x 17 in. (430 mm) D.

Operating Temperature: 5° to 40° C.

Standard Models

Model Number	Description
3008-8510-43	Stand Alone Unit 115 V 50/60 Hz
3008-8510-44	Stand Alone Unit 230 V 50/60 Hz
3008-8511-43	Bench Top Unit (less Signal Conditioners) 115V 50/60 Hz
3008-8511-44	Bench Top Unit (less Signal Conditioners) 230 V 50/60 Hz
3008-8512-43	Rack Mount System (less Signal Conditioners) 115 V 50/60 Hz
3008-8512-44	Rack Mount System (less Signal Conditioners) 230 V 50/60 Hz

Accessories

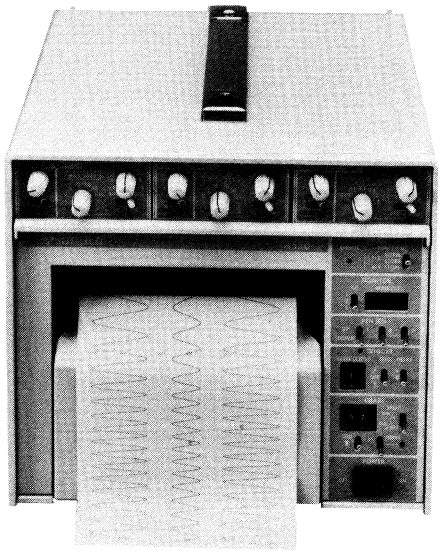
Model Number	Description
11-1202-37	Rack Mount Kit for Stand Alone Unit
CL-810971	Input Cable ("Blue Ribbon" to 8 Molex)
11-4310-25	Molex-BNC adapter
11-4310-23	Molex-Spade Lug adapter
11-4310-24	Molex-Bantam Plug adapter
369500-21509	RS-232C Cable (TA 2000 - IBM PC/XT)
369500-21508	RS-232C Cable (TA 2000 - IBM AT)
887005-G	*Blank Signal Conditioner Panel
249334-14	Input Connector
245537-9	Remote Control Connector (order with below)
284428-9	Remote Connector Shell

*Provided free of charge when ordered with systems.

Thermal Recorder

Gould TA 550

- **Up to 3 channels**
- **Chart annotation for identification, scale, time, event**
- **50 Hz frequency response**
- **1 ms sampling rate**
- **2 ms peak capture**
- **Pre- and post-event triggering**



Using an innovative fixed array of thermal writing styli, the Gould TA 550 Recorder offers Y/t and XY recording for applications in industrial, laboratory and biophysical areas.

The writing system has no moving parts. It is highly reliable, and all analog channels can go full scale and overlap in any desired relationship. You can choose to display signal traces in non-overlapping channels.

Plain thermal paper can be used because grids are selected and printed with the signal traces. This ensures accuracy between the grid and the signal, despite possible paper expansion or contraction due to the environment. Pre- and post-event triggering also are provided to assure recording of only signals of interest, saving chart paper.

Specifications

Number of Channels: 1, 2 or 3, selectable.

Chart Width: 101.2 mm.

Resolution: 6 dots/mm.

Frequency Response: Up to 50 Hz, peak capture for pulse signal over 2 ms.

Grid Format: Printed during operation; single 98-mm wide; dual, 48-mm wide, or triple, 30-mm wide.

Event Marker: Right hand.

Chart Speeds: 1 mm/min to 100 mm/s in 199 ranges, front panel or remote. Synchronized to external pulse.

Trigger: Level with 10% full-scale increments ± slope, ±200-ms delay.

Memory: 2 kbytes, optional 64 kbytes.

Interface: Optional IEEE-488 or RS-232.

Operating Line Voltage: Selectable plug — 110, 115, 200, 220, 240 VAC ±10%, 50-60 Hz.

Weight: 25 pounds (11.3 kg).

Dimensions: 8.7 in. (218 mm) W x 8.0 in. (199 mm) H x 14.0 in. (350 mm) D.

Ordering Information

Standard Systems. Includes recorder with 1 to 3 channels selectable, limit switch, 64k memory; 3 rolls paper; fuse; power cord; remote connector; operator/service manual.

Multi-Range Pre-amplifiers

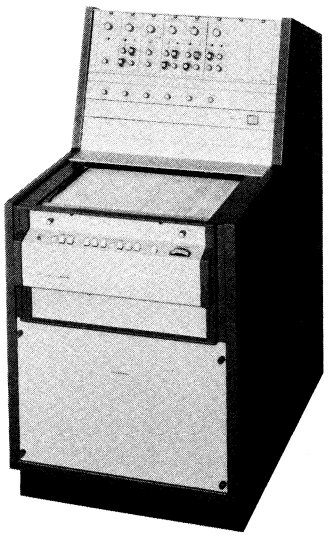
Select one per channel for TA 550, SC 270 and SC 280 Recorders

Model Number	Description
	DC Voltage
210-110001-1	1 V and 10 V full scale (non-isolated)
210-110002-1	100 mV to 500 mV, 1 to 10 V full scale (non-isolated), 7 ranges
210-110003-1	1 mV to 500 mV, 1 V to 200 V full scale, 17 ranges (isolated 200 V max input)
	DC Voltage with ±400% Bias
210-120003-1	1 mV to 500 mV, 1 V to 200 V full scale, 17 ranges (isolated 200 V max input)
	DC Current
210-210006-1	1 µA to 50 µA, 6 ranges
210-210007-1	0.1 mA to 5 mA, 6 ranges
210-210008-1	10 mA to 500 mA, 6 ranges
	Thermocouples
210-310031-1	Type E, 3 ranges, 0° to 800°C
210-310032-1	Type J, 3 ranges, 0° to 800°C
210-310033-1	Type K, 3 ranges, 0° to 1200°C
210-310034-1	Type R, 3 ranges, 0° to 1600°C
210-310035-1	Type S, 3 ranges, 0° to 1600°C
210-310036-1	Type T, 3 ranges, −100° to +400°C
210-510000-1	**Blank Module**

Recorder
Gould MK200

New MK200A Available
3rd Quarter 1987

- **Up to 850 ft. chart paper capacity**
- **Vertical and horizontal configurations**
- **Rise time - 5 ms**
- **4600 Series Signal Conditioners compatible**
- **Pressure ink writing for trace crispness, clarity and uniformity**



Gould 200 Series Recorders have been the standard of the industry since the early 1960's with over 100,000 channels in use at leading research centers, hospitals, schools, government establishments, and manufacturing facilities. Noted for their reliability, these rugged recorders have been the proving ground for many Gould recorder innovations . . . such as Gould's exclusive pressurized-ink writing system, Metrisite® noncontact pen position feedback transducer, and true rectilinear pen linkage.

Exceptional dependability, accuracy, and versatility have made the Gould 200 Series Recorders the standard for analog signal recording in industrial, scientific, and medical research applications. Hundreds of these recorders were relied upon to record vital data in the NASA Mercury, Gemini, and Apollo programs.

Contact your nearest Gould Sales Office, Representative or Distributor for information of the new MK200A Recorder.

Specifications

(without signal conditioners)

Number of Channels and Channel Span: Four standard models: eight 40-mm channels, one 80-mm and six 40-mm channels, two 80-mm and four 40-mm channels, or four 80-mm channels.

Event Markers: Left and right margin, bi-directional markers are standard. Optional: up to seven interchannel event markers.

Frequency Response

40-mm channel

At 50 div.: flat within ±2% of full scale from DC to 60 Hz.
At 10 div.: flat within ±2% of full scale from DC to 135 Hz.

Rise Time: 10% to 90% full scale with less than 1% overshoot: 40-mm (50 div.), 5 ms; 80-mm (50 div.), 8 ms.

Non-Linearity: <0.35% full scale DC, enforced by noncontact pen position feedback system.

Trace Presentation: Rectilinear.

Marking Method: Pressurized fluid.

Input Sensitivity: ±2.5 VDC or peak AC FS.

Pen Position Control: Range ±100% FS — nominal. One per channel.

Input Impedance: 100 kΩ ±1%.

Input Circuit: Single ended. Each channel isolated to maximum of 500 VDC or peak AC.

Maximum Input Signal Voltage (to avoid damage): ±50 VDC or peak AC.

Maximum Common-Mode Voltage: 500 VDC or peak AC.

Common-Mode Rejection: 60 dB at 60 Hz (R_s = 1 kΩ), 80 dB at DC (R_s = 1 kΩ).

Chart Speeds: Pushbutton selected 5, 10, 25, 50, 100, and 200 mm/s and stop, plus divide-by-100 (divide-by-60 optional).

Chart Paper Capacity: High contrast roll: 500 feet. Reproducible roll: 850 feet.

Input Power: 115 VAC ±10%, 60 Hz, 700 VA (also available for 50 and 400 Hz and 220 VAC input power).

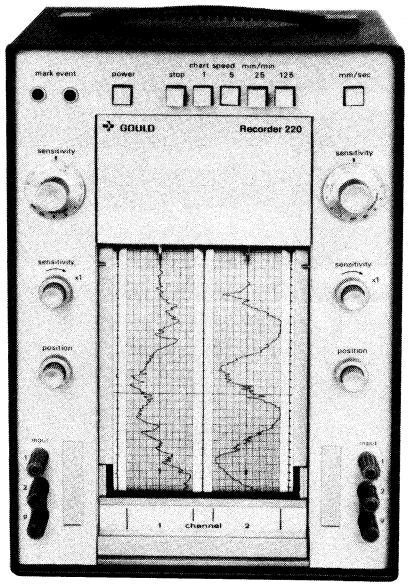
Ordering Information

Contact your nearest Gould Sales Office, Representative or Distributor for information of the new MK200A Recorder.

Portable Recorders

Gould 220 and 222

- **Pressure ink writing for trace crispness, clarity and uniformity**
- **Battery powered (Gould 222)**
- **Built-in preamplifiers**
- **Wide sensitivity range (1 millivolt to 500 VAC built-in preamps)**
- **Operates in any position**



Gould 220 Recorder

The solid-state Gould 220 is a completely self-contained portable recorder, weighing only 25 pounds. It has two 40 mm channels and measures 9 inches x 13½ inches x 7¾ inches. Built-in preamplifiers give you a measurement range of 1 mV per chart division to 500 V full scale without recalibration.

A pen-position servo system, based on a non-contact transducer, guarantees 99.5% linearity.

Pressure ink is still the standard of writing quality and the Gould fine-line thermal recorder approaches that standard closer than any other thermal writing unit. The thermal model is especially suited for applications calling for slow speed or unattended operation.

Gould 222 Recorder

You get famous Gould quality and performance in a 2-channel general purpose recorder that operates anywhere. The Gould 222 has an internal battery supply and charger, permitting it to be used away from external power sources as well as from them. Imagine the many additional measurements you can record with this unit — quickly, conveniently, cordlessly.

Specifications

Gould 220 Recorder

Number of Channels: 2 analog, 2 event located on left and right margins.

Channel Span: 40 mm (50 divisions).

Frequency Response
At 50 divisions: Flat within ±2% of full scale from DC to 40 Hz.

Nonlinearity: Less than ±0.5% FS.

Marking Method: Pressurized Fluid, or Thermal.

Measurement Range: 1 mV per chart division to 500 VDC FS.

Maximum Allowable Input Voltage to Avoid Damage: 500 VDC or peak AC either terminal to ground.

Maximum Common-mode Voltage both terminals (No. 1 and No. 2) off ground: Up to 500 VDC or peak to peak AC.

Input Circuit: Differential, balanced-to-ground.

Input Impedance: 10 MΩ balanced, 5 MΩ each terminal to ground.

Chart Speeds: 1 to 125 mm/s and mm/min.

Chart Capacity: High-contrast — 275 ft. (84 m).

Power Input: 120 watts, 175 VA.

Weight: 25 pounds (11.3 kg).

Gould 222 Recorder

Frequency Response
At 50 div.: Flat within ±2% of full scale from DC to 30 Hz.

Nonlinearity: ±0.5% FS DC.

Measurement Range: 1 mV/chart division to 500 VDC FS.

Maximum Safe Differential Input Voltage: 500 VDC or peak AC either terminal to guard or ground.

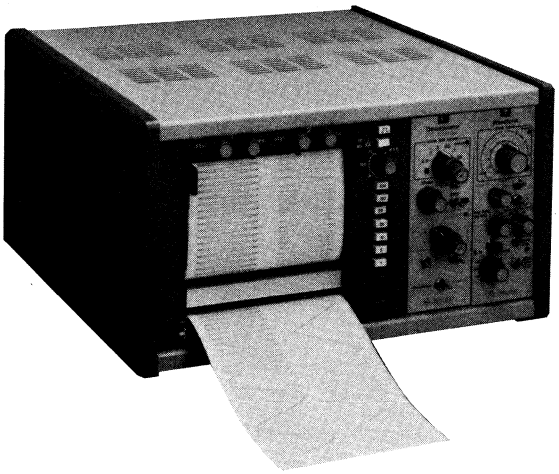
Maximum Common Mode Voltage: 500 VDC or peak AC at any attenuator setting between input terminals and chassis ground.

Input Circuit: Three terminal. Differential floating, balanced to guard. Chassis terminal at rear for connection to ground (if desired).

Input Impedance: 10 MΩ balanced; 5 MΩ each terminal to guard.

Thermal Writing Recorders
Gould 8000S

- **1 to 8 channel models**
- **Lightweight and compact**
- **1 mm/h to 200 mm/s chart speeds**
- **100 Hz frequency response**
- **Compatible with Gould 4600 series signal conditioners**



The Gould 8000 Series is a line of portable, compact and modular oscillographic recorders. Rugged design and compact size makes them especially suitable for field use and for applications where there is limited available space.

The 8000S is available in one to six 50-mm channel and eight 40-mm channel configurations. Frequency response is 50 Hz at 40 mm amplitude and 100 Hz at 10 mm amplitude. The stepping motor drive provides 21 accurate chart speeds from 1 mm/hr to 200 mm/s in 1, 5, 10, 25, 50, 100, and 200 steps.

The 8000's thermal writing system is simple, reliable and inkless. It provides excellent trace quality and accuracy, and is especially suited for unattended operation.

Signals with ±2.5 V fixed sensitivity can be input directly or any Gould 4600 Series Signal Conditioners can be used. Signal conditioners are mounted in the one, two and three channel models; they are mounted in separate cages for the four, six and eight channel models. An external short run chart takeup is available.

Specifications

Number of Analog Channels and Channel Span: One, two, three, four and six 50-mm channels or eight 40-mm channels.
Marker Channels: Right time marker and left event marker.
Frequency Response: At 40-mm amplitude: DC to 50 Hz ±2mm. At 10 mm amplitude: DC to 100 Hz ±3 mm.
Rise Time: Less than 10 ms.
Nonlinearity: ±0.5% of full scale.
Trace Presentation: Rectilinear.
Marking Method: Heated stylus on heat-sensitive paper.
Input Sensitivity: ±2, 5 V full scale (without preamplifiers).
Pen Position: Adjustable over 120% of channel width.
Input Impedance: 100 kΩ ±10% (without amplifiers).
Input Circuit: Single ended, floating (isolated from ground).
Pen Limiting: Mechanical and electronic adjustable.
Chart Speeds: Pushbutton selected 1, 5, 10, 25, 50, 100, 200 mm/s mm/min, mm/h.
Chart Capacity: 60 m (196 ft.).

Accessories for all models

Model Number	Description
X50521	Analog pen
X50744	Marker pen
X51377	Additional event marker for 3, 4 and 6-ch. factory mounted

Refer to Bulletin 106-2 for more information.

Dimensions and Weight (350 mm depth)	Height mm	Width mm	Weight* kg	Power VA**
1 ch. with housing	203	250	5.5	95
2 ch. with housing	203	360	8.5	130
3 ch. with housing	203	480	11.5	165
4 ch. - recorder only	203	360	11	200
4 ch. with housing	403	360	11.5	200
6 ch. - recorder only	203	480	13	270
6 ch. with housing	403	480	18.5	270
8 ch. - recorder only	203	480	15	340
8 ch. with housing.	403	480	21.5	340

*Without signal conditioner. **50/60 Hz.

Recorder Ordering Information

Model Number	Description
8188-1102-0X*	1 ch. with signal conditioner case
8188-2202-0X	2 ch. with signal conditioner case**
8188-3302-0X	3 ch. with signal conditioner case**
8188-4400-0X	4 ch. without signal conditioner case**
8188-6600-0X	6 ch. without signal conditioner case**
8188-8800-0X	8 ch. without signal conditioner case**

*X: 1 = 115 V 50/60 Hz; 6 = 220 V 50/60 Hz; 9 = 240 V 50/60 Hz
**Also available in rack mount version (-XXIX- instead of -XX0X-).

8188-402	Portable Case for 4 signal conditioners
8188-602	Portable Case for 6 signal conditioners
8188-802	Portable Case for 8 signal conditioners

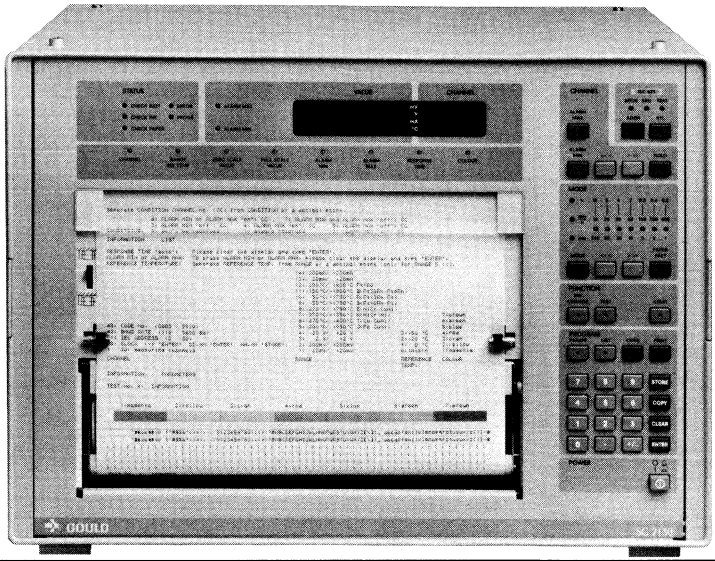
All cases are also available in rack mount version (-XIX instead of -X0X).

Logging Recorder

Gould SC 2130

NEW

- **30 Channels**
- **Fully programmable**
- **Inputs: temperature, voltage, current**
- **4 Recording formats**
- **7 Color trend recording**
- **30 Alarms: 15 high and 15 low**
- **Permanent ink jet writing**



The Gould SC 2130 is a versatile 30-channel data logger with the ability to acquire inputs from all standard thermocouples, PT-100 RTD's, voltages and currents. It is microprocessor-controlled with all key functions remotely controllable via computer, using either the IEEE-488 or RS-232C interfaces.

The SC 2130 is easily programmed by entering channel parameters using the front-panel keypad and 3½-digit LED display. Signals may be recorded in seven different colors showing continuous overlapping waveshapes, or as an alpha-numeric table.

Specifications

Number of Channels: 30.

Display: 3½ digit, ±, magnitude, for programming and measuring display.

Input: Floating; 1 MΩ.

Voltage DC: ±20 mV, ±200 mV, ±2 V, ±20 V.

Current DC: ±20 mA, ±200 mA, via clip-on shunt.

Temperature: Via thermocouples

J (Fe-CuNi)	−200°C to + 950°C	R (Pt13Rh-Pt)	−50°C to +1750°C
T (Cu-CuNi)	−270°C to + 400°C	B (Pt30Rh-Pt6Rh)	+150°C to +1800°C
K (NiCr-Ni)	−270°C to +1350°C	Via RTDs (Four-wire connection)	
E (NiCr-CuNi)	−270°C to + 750°C	Pt 100	−200°C to + 600°C
S (Pt10Rh-Pt)	−50°C to +1750°C		

Linearization: Built-in thermocouples J, T, K, E, S, R, B (DIN IEC 584) and Pt 100 (DIN IEC 751, DIN 43760).

Reference Temperature: Internal
External 0°C, 20°C, 50°C.

Limit Values (optional): Marking on print-out when limits are exceeded or not reached; open collector output.

Operating Modes: LED digital display; analog print-out with digital display; digital print-out with digital display output; alternate analog and digital print-out.

Measuring Cycle: Every 3 s dependent on the paper drive.

Recording Cycle: Every 0.25 mm (for 600 mm/hour every 0.5 mm = 3 seconds).

Paper Drive: 10 to 600 mm/hour; automatic print-out of time and division grid in the trend mode (black).

Recording Width: 250 mm.

Print Colors: Text and paper divisions in black; curves and channel numbers in crimson (magenta), yellow, blue, red, cyan, green and brown. Ink jet printing.

Power: 240/230/220 V, 50 Hz; 110/115/120 V, 60 Hz.

Dimensions: 462 mm W x 342 mm H x 458 mm D.

Ordering Information

LR - X X X 0 X - XX

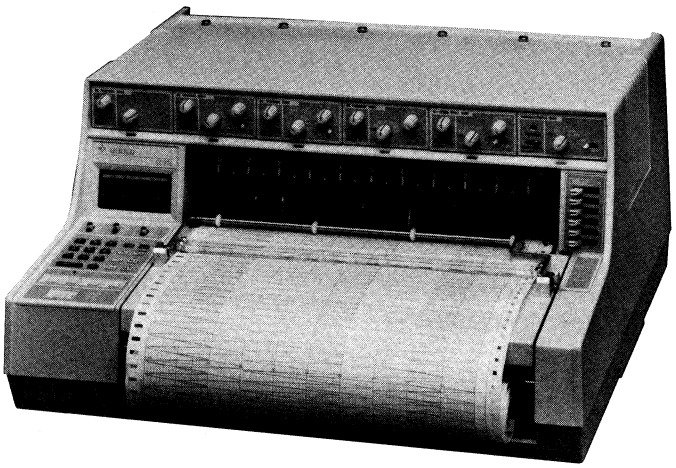
Type of Recorder	
Portable	P
Rack mount	R
Interfaces	
None	0
RS-232C	1
IEEE-488	2
RS-232C and IEEE-488	3
Alarms	
None	0
With Alarms	1
Power Cords	
U.S.A.	0
UK	1
Germany	2
Power	
110/115/120 Volts, 60 Hz	00
220/230/240 Volts, 50 Hz	06

Options

Model Number	Description
CL-211200	RS-232C Interface
CL-211201	IEEE-488 Interface
CL-211202	Alarms
CL-211203	Set of 5 shunts (10 Ω)
CL-211204	IEC Adaptor (24 to 25 pins)

Strip Chart Recorder
Gould SC 270

- **4 or 6 channels**
- **0.3 s response time**
- **Auto, manual and preset recording modes**
- **Programmable recorder functions**
- **Offset compensation between channels**



The SC 270's standard features include function programming, built-in pen offset compensation, automatic chart take-up and electric pen-lift.

Plug-in single and multi-range input pre-amplifiers are available for measuring DC voltage from 1 mV to 200 V full scale; current from 1 μA to 500 mA full scale and temperature through a variety of thermocouple inputs.

With a range of front panel selectable chart speeds from 0.1 cm/hr to 100 cm/min., the SC 270's sophisticated flexibility includes Auto, Manual and preset recording modes.

The SC 270's fast response of 0.3 s full scale and accuracy of ±0.25% ensures reliable recording of even highly variable signals. A standard pen offset compensation feature fully synchronizes all channels eliminating the gap normally found in lower performance strip chart recorders.

Specifications

Number of Channels: 4 and 6 channels.

Event Markers: Superimposed on each channel.

Channel Offset Compensation: Standard built-in pen offset.

Recording System: Automatic zero balance DC servo.

Trace Presentation: Servo-linear, with right hand zero.

Response Time: <0.3 s, 99% full scale.

Recorder Nonlinearity: ±0.25%.

Dead Band: ±0.10%.

Writing Method: Disposable fiber-tipped pen, identical for all channels, 8 colors.

Pen Lift: Standard all channel electric pen lift. Pens also may be manually operated.

Input Signal: Full range of single and multi-range plug-in amplifier modules for:
- DC voltage, 1 mV to 200 V FS;
- DC voltage with ±400% bias, 1 mV to 200 V FS;
- DC current, 1 μA to 500 mA FS*

Thermocouple E, J, K, R, S, T, −100° to 1600°C.

*Range depends on type selected.

Writing Chart Width: 250 mm.

Chart Drive System: Stepper motor, sprocket drive.

Chart Speeds: From 0.1 cm/hr to 100 cm/min.

Chart Format: 20-m roll or Z-fold, rewind provided.

Chart Take-Up: Standard roll chart 20-m take-up.

Operating Line Voltage: Selectable plug — 100, 115, 200, 220, 240 VAC within 10% at 50-60 Hz; optional DC-DC inverter (12 VDC).

Input Power: Max 140 VA (6-channel model).

Weight: 4 channel: 38.5 pounds (17.5 kg).
6 channel: 42.0 pounds (19.1 kg).

Ordering Information

Standard Systems

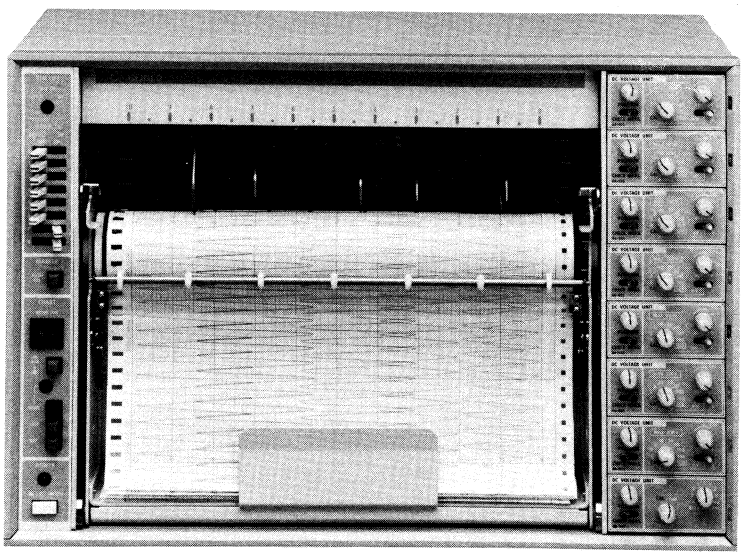
Model numbers include three rolls paper, one set of pens, fuse, power cord, dust cover and operator/service manual.

Flat Bed Strip Chart Recorders

Model Number	Description
274-111122-1	SC 274, 4-channel recorder, event marker superimposed on each channel, electric pen lifts, roll chart take-up, pen offset synchronizer
276-111122-1	SC 276, 6-channel recorder, event marker superimposed on each channel, electric pen lifts, roll chart take-up, pen offset synchronizer

Strip Chart Recorder
Gould SC 280

- **4, 6, or 8 channels**
- **0.3 s response time**
- **Multiple plug-in modules: voltage, current and temperature**
- **Optional offset compensation**
- **On-trace event markers**
- **Accepts both roll and Z-fold paper**



Standard features include on trace event markers and compatibility with both roll and Z-fold paper. Disposable pens, interchangeable between channels, are available in various colors. Plug-in single and multi-range input amplifiers are available for measuring voltage, current or temperature. Optional pen offset compensation allows the Gould SC 280 to provide overlapping traces without the time delay of lower performance multi-channel systems.

Specifications

Number of Channels: 4, 6 or 8.

Event Markers: Standard superimposed on trace; optional right-hand margin.

Channel-to-Channel Offset: 4 mm.

Channel Offset Compensation: Optional channel synchronizer.

Recording System: Automatic zero balance DC servo.

Trace Presentation: Servo-linear, with right hand zero.

Response Time: <0.3 s, 99% full scale.

Recorder Nonlinearity: $\pm 0.5\%$.

Dead Band: $\pm 0.15\%$.

Writing Method: Disposable fiber-tipped pen, identical for all channels, 8 colors.

Pen Lift: Standard front panel manual; optional electric remote.

Input Signal: Full range of single and multi-range plug-in amplifier modules for:
- DC voltage, 1 mV to 200 V FS;
- DC voltage with $\pm 400\%$ bias, 1 mV to 200 V FS;
- DC current, 1 µA to 500 mA FS

Thermocouple E, J, K, R, S, T, $-100°$ to 1600°C.

Writing Chart Width: 250 mm.

Chart Drive System: Stepper motor, sprocket drive.

Chart Speeds: 1 cm/hr to 100 cm/min in 199 ranges. Can be synchronized to external pulse; remote controllable; fast forward and rewind provided.

Chart Format: 20-m roll or Z-fold, metric grid.

Chart Take-Up: Built-in Z-fold tray; optional roll.

Ordering Information

Standard Systems

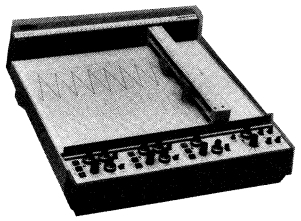
Model numbers include three packs paper, one set of pens, fuse, power cord, dust cover and operator/service manual.

Strip Chart Recorders

Model Number	Description
284-111111-1	SC 284, 4-channel recorder (event marker superimposed on each channel)
286-111111-1	SC 286, 6-channel recorder (event marker superimposed on each channel)
288-111111-1	SC 288, 8-channel recorder (event marker superimposed on each channel)

XY Recorder

Gould 50000S Series



- **Wide range of analog — 5 μV/cm maximum sensitivity**
- **1 pen XY and 2 pen XYY configurations**
- **A4 and A3 paper sizes**
- **Mute control on both axes**
- **Electronic servo and amplifier protection prevents overload damage**
- **Options include chart drive, chart advance attachments**

The flexible 5000S Series Recorder functions as either an analog XY/XYY recorder or an intelligent digital XY plotter.

Analog plug-in modules let users easily increase performance of the mainframes. A high sensitivity linear amplifier (with 5 μV/cm sensitivity) has zero offset of −1000 cm, letting users zoom in on a small portion of the plot. The logarithmic amplifier, has a 5.5 decade range so both small and large signals can be recorded on one sheet of logarithmic paper. Acceleration as high as 10 G, slew rates of up to 250 cm/s and low overshoot make the 50000S ideal for recording fast changing signals.

Specifications

Mainframe Types: Single pen; second pen optional for A3 size.

Plotting Area: A4 — 27 x 19 cm (8.5 x 11 in.); A3 — 38 x 27 cm (11 x 17 in.) expandable to 36 cm x 28 cm (11 x 16.5 in.).

Paper Hold Down: Electrostatic; magnetic strips or vacuum options.

Pen: Fiber tipped disposables. Optional capillary pens with rechargeable reservoirs.

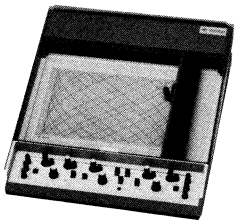
Linearity, Repeatability: Better than 0.1% FS.

Power Requirements: 110 V or 230 V ±15%; 80 VA
45 Hz to 400 Hz (most models).
45 Hz to 100 Hz (vacuum models).

Weight: Typically 11 kg, but varies with model.

XY Recorder

Gould 60000XY



- **18 ranges — from 50 μV/cm to 20 V/cm**
- **Mute facility on both axes**
- **A3 and A4 paper formats**
- **Eight speed ranges**
- **Timebase is standard**
- **Uses standard fiber pens, optional Rotring**

High acceleration and quick writing speed, coupled with a wide sensitivity range and many special features, make the 60000XY an excellent general purpose laboratory tool.

A built-in timebase has eight calibrated ranges, going from 0.1 cm/s to 20 cm/s, with variable control between ranges.

Specifications

Mainframe

Plotting Area: A4: 28 x 19 cm; A3: 38 x 28 cm.

Paper Hold Down: Electrostatic.

Pen Types, Controls: Up to 5 fiber-tipped color pens with 3 position switches on front panel (EXT/Up/Down).

Servo Mute: Mute/On switch on control panel.

Pen Dotting Frequency: 3 points/s, optional 20 points/s.

Writing Speed: Y axis: 120 cm/s. X axis: 60 cm/s.

Acceleration: Y axis: 3 G. X axis 1.5 G (from standing start).

Overshoot (Max.): Both axes: <1.5% (A4); <1.1% (A3) FS.

Linearity, Repeatability: ±0.1%.

Power Requirements: 110 V or 230 V ±10%; 45 to 65 Hz. 38 VA maximum.

Dimensions: A4 — 390 x 458 x 160 mm; A3 — 490 x 550 x 163 mm (including smoked perspex dust cover).

Weight: Unpacked A4 — 9 kg; A3 — 13 kg.

X and Y Input Amplifiers

Maximum Input Signal Voltage: ±350 V on all ranges.

Input Filter: Built-in 300 dB NMRR at all frequencies.

Input Impedance: Constant 1 MΩ on all ranges.

Sensitivity: 18 calibrated ranges with variable control between ranges: 0.05 to 20.0 mV/cm and V/cm.

Common Mode Rejection Ratio: Min. 90 dB AC at line frequency. Min. 120 dB DC.

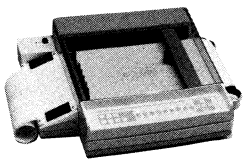
Max. Common Mode Voltage: 500 V.

Pen Zero/Offset: ±200% f.s.d. by 10 turn potentiometer.

Digital Plotters

Gould 6310 and 6320 Colorwriter

- 7 and 10 pen models
- Choice of A/A4 and B/A3 media sizes
- Plots on 4 types of media
- RS-232C or IEEE-488 interfaces
- 40 cm/s writing speed
- .001 in. (0.025 mm) position resolution
- HPGL compatible
- Optional automatic chart advance



The 7 pen, Model 6310 provides A/A4 plots and the 10 pen, Model 6320 provides up to B/A3 plots. Both models offer a roll chart option that can automatically advance the chart between plots.

Four types of media are supported — paper, transparency, engineering vellum and mylar film; three pen types are available — fiber tip, roller ball and disposable liquid ink drafting pens.

The 6300 Series provides 16 kbyte standard buffer memory for complex plots and a digitizing function to feedback information to a computer for storage, analysis and re-plotting.

Specifications

Media Size: Model 6310: 8.5 in. x 11 in. (ANSI A) (210 mm x 297 mm) (DIN A4). **Model 6320:** 11 in. x 17 in. (ANSI B) (297 mm x 420 mm) (DIN A3).

Media Types: Coated and bond paper in sheet or rolls, transparencies, vellum, mylar.

Pen Types: 10 Colors — 0.3 mm and 0.7 mm general purpose/transparency plastic tip. 10 Colors — 0.3 mm long life roller ball tips. 4 Colors — Disposable drafting pens.

Pen Speed: 40 cm/s programmable in 1 cm/s steps.

Resolution/Acceleration: 0.001 in. (0.025 mm). Greater than 1 g.

Command Language: HPGL compatible.

Factory Installed Interfaces: RS-232C or IEEE-488.

Dimensions: Model 6310: 15.4 in. x 18.0 in. x 7.4 in. (390 mm x 458 mm x 188 mm). **Model 6320:** 19.3 in. x 22.0 in. x 7.8 in. (490 mm x 558 mm x 198 mm).

Weight: 30 lbs. (13.6 kg).

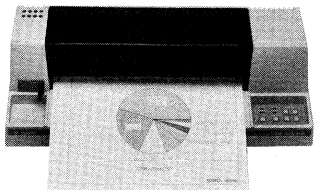
Ordering Information

RS-232C	8½ x 11 in. Models	IEEE-488
6310-2615-00	120 V, 50/60 Hz	6310-1615-00
6310-2615-02	220 V, 50/60 Hz	6310-1615-02
	11 x 17 in Models	
6320-2615-00	120 V, 50/60 Hz	6320-1615-00
6320-2615-02	220 V, 50/60 Hz	6320-1615-02

See Bulletin 390-2 for more detailed information.

Digital Plotters

Gould 6120 Colorwriter



- 7 pen carriage
- Choice of A/A4 and B/A3 media sizes
- Plots on paper and transparency film
- RS-232C and Centronics interfaces
- 20 cm/s writing speed
- .002 in. (0.05 mm) position resolution
- HPGL compatible

The Gould 6120 is a low cost, general purpose digital plotter that provides high quality color graphics for business, engineering, and scientific applications. The 6120 creates hard copy graphics in two chart sizes; 8½ x 11 inch A/A4 format for measured data from instrument systems, business management reports and technical reports or 11 x 17 inch B/A3 format for PERT charts and engineering diagrams.

Simple front-panel controls help operate and monitor plotter conditions. Controls include paper Load, Self test, and Pause to view plot.

The 6120 generates high quality plots on paper using either .3 mm ceramic tip or roller ball pens and high quality transparencies using .5 mm fiber tip pens.

Specifications

Media Size: 8.5 in. x 11 in. and 11 in. x 17 in. (210 mm x 297 mm) (DIN A4) and (297 mm x 420 mm) (DIN A3).

Pens: 7 individual pens, automatically exchanged.

Media Types: Coated or bond paper and transparencies.

Pen Types: 7 Colors — 0.3 mm general purpose ceramic tip — 0.3 mm long life roller ball tips — 0.5 mm fiber tip for transparency.

Pen Speed: 20 cm/s programmable.

Resolution: 0.002 in. (0.05 mm).

Acceleration: 1 g.

Command Language: HPGL compatible.

Built-in Interfaces: RS-232C and CENTRONICS PARALLEL.

Dimensions: 18.6 in. x 8.8 in. x 5.5 in. (459 mm x 192 mm x 133 mm).

Weight: 13 lbs. (6 kg).

Ordering Information

Model Number	Description
6120-3111-00	120 V, 50/60 Hz
6120-3111-02	220 V, 50/60 Hz
6120-3111-06	240 V, 50/60 Hz

See Bulletin 474-2 for more detailed information.

Rack Mount Enclosures

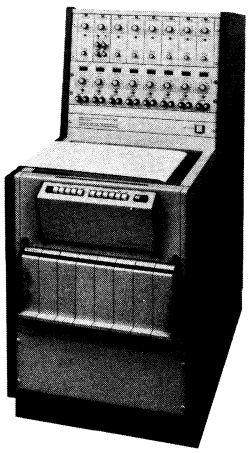
There are four basic cabinet configurations for Gould recorders: Lowboy cabinet for the 8 channel ES 1000; High Turret cabinet for 16 channel ES 1000; Slope-front cabinet for the MK 200; and two vertical cabinets for rack mounting Gould 8000 Series, TA 2000 and 3000 Series recorders and other instruments.

These cabinets are designed to meet EIA (Electronic Industries Association) specifications. They accommodate instruments with a 19-in. front-panel width, a 1.75-in. (or multiple) front-panel height and a maximum depth of 20 in. All cabinets are mounted on wheeled dollies equipped with quick release locking brakes.

The standard cabinets are listed below with their dimensions.

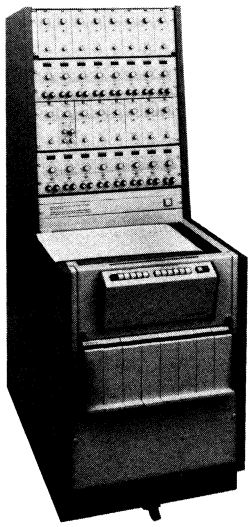
Lowboy Systems

Lowboy Console
Model Number: 11-1112-72



Overall dimensions: 21 in. (53.3 cm) wide x 43.5 in. (110.5 cm) high x 39 in. (99 cm) deep.

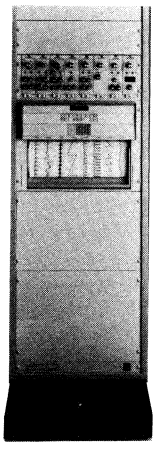
High Turret Console
Model Number: 11-1112-73



Overall dimensions: 21 in. (53.3 cm) wide x 58 in. (147.3 cm) high x 39 in. (99 cm) deep.

Vertical Rack Systems

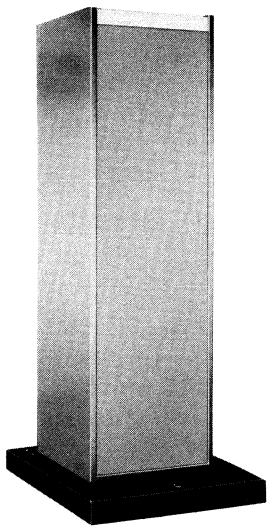
Short Vertical Rack
Model Number: 11-1154-61/parchment
11-G1154-61/gray



Overall dimensions: 21 in. (53.3 cm) wide x 63.38 in. (161 cm) high x 22 in. (55.9 cm) deep.

Base dimensions: 32.29 in. (82 cm) deep x 21 in. (53.3 cm) wide.

High Vertical Rack
Model Number: 11-1170-62/parchment
11-G1170-62/gray

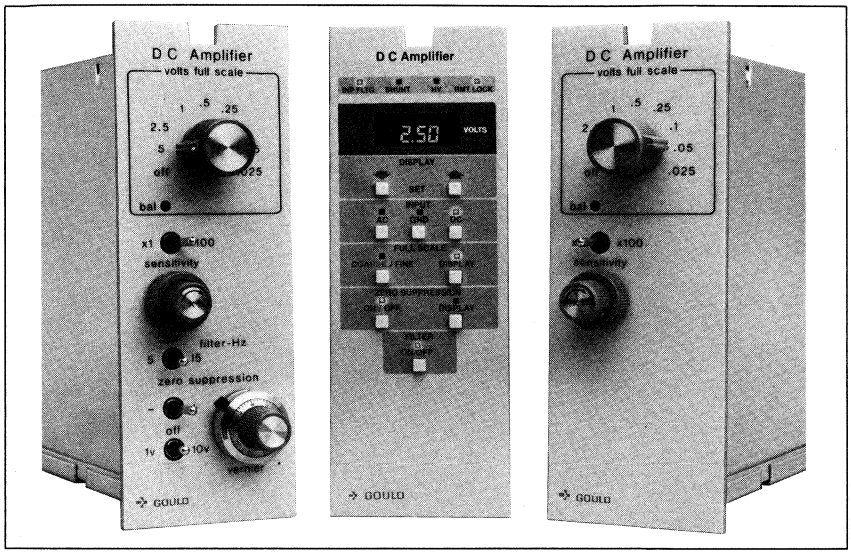


Overall dimensions: 21 in. (53.3 cm) wide x 77.38 in. (196.5 cm) high x 22 in. (55.9 cm) deep.

Base dimensions: 36.13 in. (91.8 cm) deep x 29 in. (73.7 cm) wide.

Note: Consult your local Gould Sales Office, Representative or Distributor for Ordering Information.

- **Fully programmable 5600 Series**
- **45 specialty and general purpose models**
- **Completely modular and interchangeable**
- **Excellent stability and linearity**
- **High input impedance**



Gould is the established leader in signal conditioning. Its broad line of 45 general and special purpose 4600 Series Signal Conditioners is recognized as the industry standard for applications in industrial, medical and aerospace environments.

Gould now establishes a new standard of excellence with the 5600 Series Signal Conditioners which are fully programmable and can be operated remotely via computer.

Significant benefits of the 5600 Series include consistent and repeatable setup; reduction of setup time; and the elimination of "useless" data caused by improper front-panel settings.

Data Acquisition and Signal Recording starts with a "real world" (analog) signal that must be accurately reproduced.

Gould's broad range of signal conditioners are engineered to insure low level signal integrity. Features include floating and guarded input, high common mode rejection, excellent linearity, low noise output, and insensitivity to environmental changes.

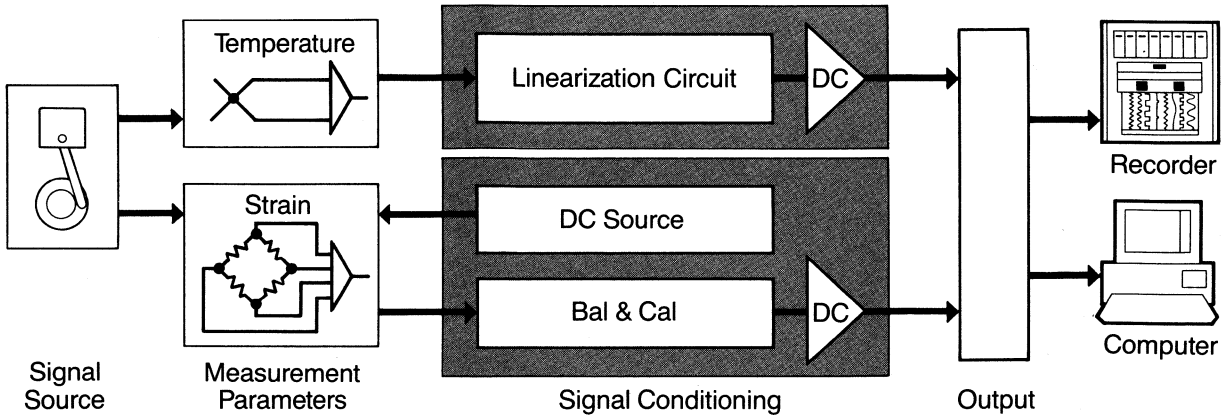
Additional features of some Gould signal conditioners include:

- Attenuation
- Filtering
- Isolation
- Zero Suppression
- Digital Storage
- Calibrated Output
- High Off Ground Measurement

Further, the versatile Gould 4600 and 5600 Series are compatible with all Gould recording technologies. Whether it's the direct writing 3000, thermal array TA 2000, the electrostatic ES 1000, or the DASA computer-based data acquisition systems.

From DC and AC voltage/current to phase modulation and integration, Gould has a signal conditioner to meet your measurement requirements.

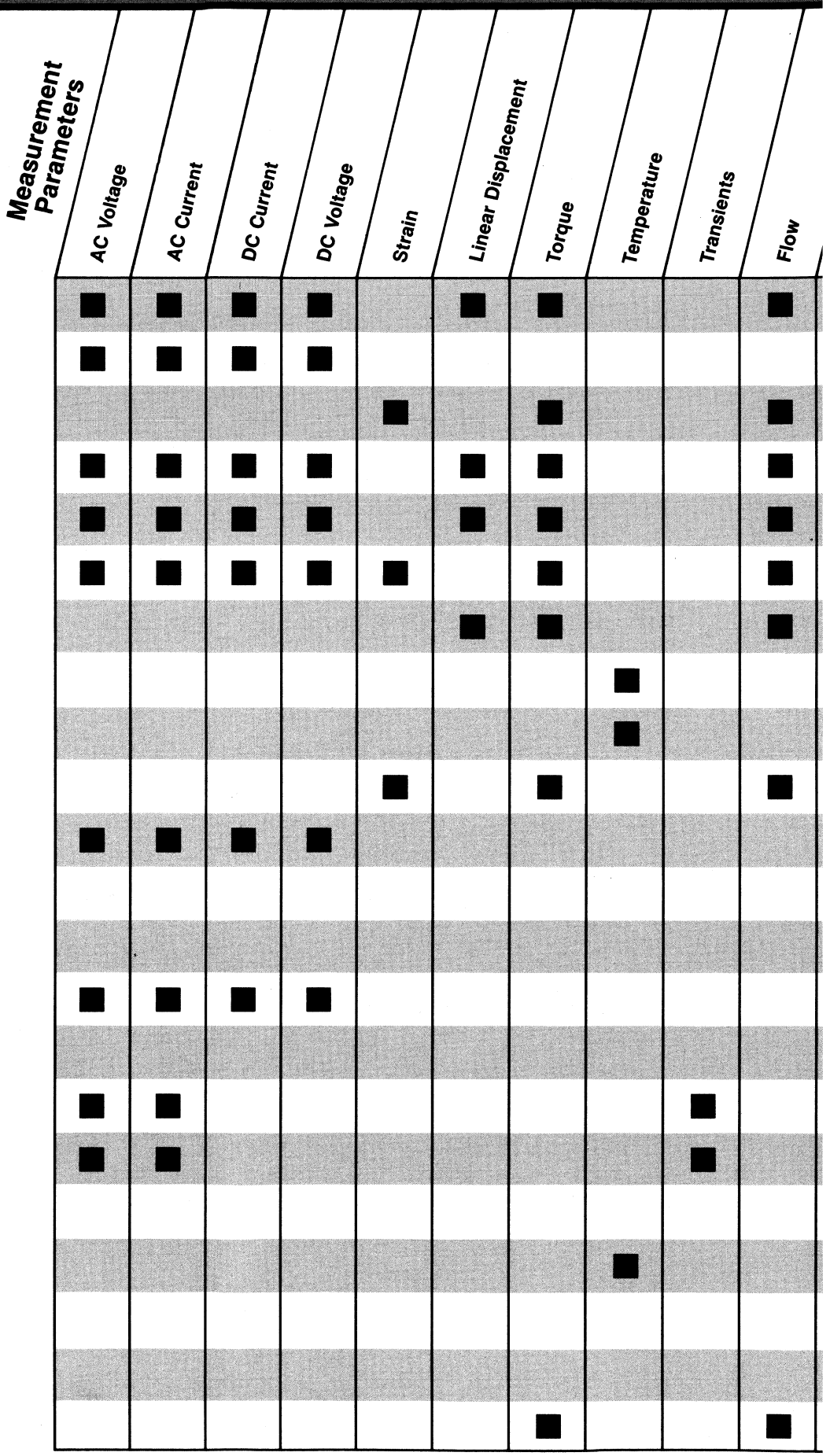
Use the Selection Chart on the following pages to choose the appropriate signal conditioner for your general and special purpose applications. Use the Selection Chart on pages 114 and 115 to choose the appropriate signal conditioner for your medical applications.



Signal Conditioners

Gould Signal Conditioners

Note: All signal conditioners have identical dimensions 6.1 in. (15.5 cm) H x 2.18 in. (5.5 cm) W x 13.0 in (33.0 cm) D, weigh 3 to 4 lbs., and are totally interchangeable between recorders and portable cages.



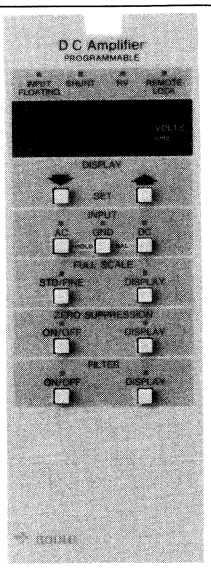
Frequency
Phase
Pressure
Force
Linear Acceleration
Linear Velocity
Humidity
Viscosity
Sound
Power
Angular Acceleration
Angular Velocity
Angular Displacement

Programmable DC Amplifier

Model 56-1300-00

NEW

- **Controllable from computer or front panel**
- **Memory retention**
- **Measurement range 10 mV to 750 V**
- **AC/DC coupling**
- **Input to output isolation**
- **250 kHz bandwidth (non-isolated)**



The Amplifier can be either computer controlled or operated manually from the front panel. Its 250-kHz bandwidth makes it an ideal front end for stand-alone use with other high-frequency devices. Outstanding features of the Gould 56-1300-00 include: microprocessor control of gain and operating modes; input-to-output isolation; AC/DC coupling; true zero suppression; automatic zero balance; high impedance differential or single ended inputs; and 10 mV to 1000 V full-scale sensitivity.

Specifications

Measurement Range: 10 mV to 1000 V FS.

Standard Select: 10, 25, 50, 100, 250, 500 mV; 1, 2.5, 5, 10, 25, 50, 100, 250, 500, 1000 V FS.

Fine Adjust (calibrated):
1-mV steps between 10 mV and 1 V FS.
10-mV steps between 1 V and 10 V FS.
100-mV steps between 10 V and 100 V FS.
1-V steps between 100 V and 1000 V FS.

Zero Suppression: ±1000 V.

Frequency Response (filter switch off):

DC coupled: flat DC to ≥250 kHz.

AC coupled: −3 dB at ≤2.5 Hz to −3 dB at ≥250 kHz.

(Switching in the 15 Hz low-pass filter eliminates unwanted high frequency signal components in the output.)

Input Coupling: AC or DC, differential and balanced to common.

Input Impedance

Differential: 2 MΩ shunted by 5 pF.

Single-ended: 1 MΩ shunted by 10 pF.

Common Mode Rejection

AC Coupled, either input to common, 1-kΩ unbalance, 60 Hz sine wave: 45 dB.

DC Coupled, either input to common, 1-kΩ unbalance, 60 Hz sine wave: 55 dB.

Inputs to Output, 1-kΩ unbalance, 60 Hz sine wave: 100 dB.

Maximum Allowable Input Voltage: 100 VRMS or ±100 VDC ≤1 V full scale; 1000 VRMS or ±1000 VDC ≥1 V (differential input).

Output Voltage: ±6 V into 2 kΩ or greater.

Output Impedance: <1Ω DC to 10 kHz.

Nonlinearity: ±0.03% of full scale.

Output Noise: <10 μV p-p 0.1 Hz to 100 Hz; <30 μV p-p 0.1 Hz to 10 kHz.

Signal Connector: Burndy Bantamate or equivalent, mounted on rear of signal conditioner.

I/O Connector: 48-pin DIN. Power, control and signal out. Note: The +15 V and −15 VDC power to the Amplifier is available on pins of the input connector and referred to the input common for external use at 25 mA max. either supply.

Options and Accessories

Isolated High Voltage Option: Allows shunt measurements to be made in the presence of high common mode voltages, up to 1500 V peak. It has a voltage gain of 10 and is chassis grounded.

High Voltage Option (non-isolated): Allows high voltage measurements to be made safely. It is a passive system with an attenuation of 1000 and its chassis is grounded.

Ordering Information

Model No.	Description
56-1300-00	**Programmable DC Amplifier**
CL-810413	Isolated High Voltage Connector
CL-810814	High Voltage Connector
56-1302-00	**Programmable True RMS Amplifier:** an isolated, programmable signal conditioner to use with signal levels from 10 mV to 750 VRMS FS.
56-1301-00	**Programmable Transducer Amplifier:** an isolated, programmable signal conditioner for use with strain gage based transducers. Sensitivities from 100 μV to 1 V FS.

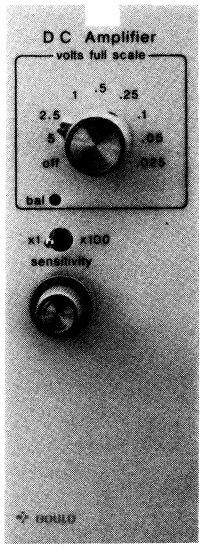
See Bulletin 475-2 for more detailed information.

IS Series DC Amplifiers

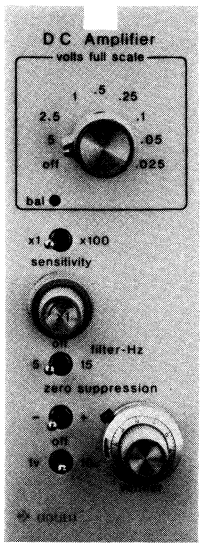
Models 56-1340-00 and 56-1440-00

NEW

- **Wide input range: 25 mV to 500 V**
- **Calibrated zero suppression**
- **Input-to-output isolation**
- **Status reporting: front panel status for recorder annotation**
- **Wide frequency range: 10 kHz isolated**



Gould 56-1440-00 Basic DC Amplifier



Gould 56-1340-00 General Purpose DC Amplifier

These general-purpose, direct-coupled Amplifiers are designed to be used with Gould direct writing recorders or as stand-alone units. Each is isolated from input to output and operates at up to 500 V off ground. A low-pass filter is provided to eliminate objectionable high frequency signal components.

The optional, user-installable, Status Reporting Board supplies all status information to the inter-channel annotation of the Gould 3000 Series Recorder.

For the Gould 56-1340-00, true input signal Calibrated Zero Suppression is provided with 8 full-scale ranges. A calibrated reading, with a resolution of one part per thousand, is provided on each full-scale range. This allows the static portion of a complex signal to be suppressed a *known* amount and the dynamic portion to be amplified for a more detailed evaluation.

Specifications

For 56-1440-00 Basic DC Amplifier and 56-1340-00 General Purpose DC Amplifier

Measurement Range: 25 mV FS to 500 V FS.

Attenuator Steps: 0.025, 0.05, 0.1, 0.25, 0.5, 1.0, 2.5 and 5.0 V FS, OFF plus x100 multiplier.

Sensitivity Vernier: Provides up to 2.5 times calibrated setting.

Input Impedance

X1 Multiplier: 2 MΩ differential; 1 MΩ each terminal to common.

X100 Multiplier: 100 MΩ differential; 56 MΩ each terminal to common.

Common Mode Rejection

DC at 1-kΩ unbalance: Greater than 120 dB.

60 Hz at 1-kΩ unbalance: Greater than 100 dB.

Maximum Allowable Input Voltage: 500 VDC or peak AC; inputs to input common.

Frequency Response

With Isolator Module: 10 kHz.

Without Isolator Module: 35 kHz.

For 56-1340-00 Amplifier Only

Frequency Response

Filter Switch Off: Less than 3 dB down at 10 kHz, 35 kHz without isolation module.

Zero Suppression Ranges: ±10, ±1 VDC and OFF. Can be multiplied x100 (usable only to ±500 maximum).

Resolution: ±0.1% of full suppression range.

Status Reporting Board, 11-4220-00

Front Panel Settings Indicated: Volts full scale (the numerical value), sensitivity, input divider, model type and zero suppression (on/off).

Status Connector Cable: 6 in., 20-pin DIN cable.

Rear Connector: 48-pin DIN connector.

Weight: 0.35 lbs.

Dimensions: 5 in. (12.7 cm) H x 9.1 in. (23.1 cm) L.

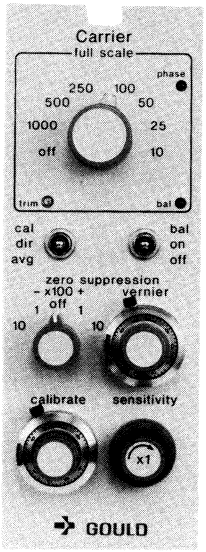
Power Requirements: Less than 50 mA at +5 V.

See Bulletin 459-35 for more detailed information.

Carrier

Model 13-4615-35

- **Measures pressure, force, position**
- **Provides AC excitation for LVDT, variable reluctance and strain gage transducers**
- **Push-button auto balance**
- **Calibrated zero suppression**
- **Easy synchronization of multiple units**



The Gould Carrier Amplifier measures pressures, forces, and displacement with unprecedented ease. By replacing separate, interactive R and C balance controls with electronic auto balance, as well as auto phase lock of excitation and signal, it provides features never before available to users of AC excited transducers. In multiple transducer applications, two features are important — Carrier oscillators can be synchronized to eliminate interference, and all Carrier Amplifiers can be balanced with a single command.

See page 118 for more details.

Specifications

Measurement Range: 50 µV to 10.5 VRMS FS.

Input Configuration: Differential balanced to guard, and isolated from ground. Impedance: 1 MΩ at 2.5 kHz each input.

Sink Risk Leakage Current: <10 µA at 120 VRMS, 60 Hz between any input (including excitation terminals) and chassis.

Noise (350-Ω unbalance): 10 µV p-p referred to input, residual carrier at output <0.25% of FS.

Common Mode Rejection: >120 dB at 60 Hz with 350-Ω unbalance measured at 100 µVRMS FS, input to chassis.

Step Sensitivity: 10 - 1000 units plus x100 input attenuator.

Zero Suppression: 0 to ±100 or 0 to ±1000 units.

Auto Balance

Range: 0 to ±10 mVRMS referred to input (R and C balance), variable via plug-in balance resistor.

Resolution: 1 : 2048.

Remote Balance Command: TTL compatible or momentary short to common will initiate action.

Frequency Response: Direct DC to 200 Hz plus mean.

Transducer Excitation

Voltage: Adjustable from 2 to 10 VRMS, isolated from chassis; maximum load 0.285 W.

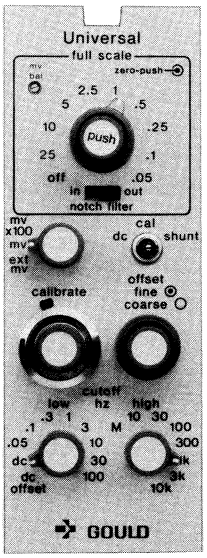
Frequency: 2500 Hz ±5% sine wave.

Synchronization: Jumper selectable master or slave.

Universal™

Model 13-4615-58

- **General purpose AC or DC signals from 25 µV to 10 V FS.**
- **Pressures, forces and displacements from strain gage transducers directly in units of measure.**
- **Combines high input impedance, wide bandwidth, low noise and low drift into one amplifier.**



This 10-kHz Amplifier combines high impedance input, high gain, and low noise required for precise recordings. One-mV or 50-µV cal signals and a full range of high-pass and low-pass filters permit the Amplifier to easily reproduce the most demanding signal.

The Universal Amplifier's stable DC excitation makes precise measurements of pressure, force, and position. The optional Isolated Preamplifier provides isolation and true AC coupling, while putting the first gain stage close to the signal source to reduce signal loss and noise.

See page 116 for more details.

Specifications

Input Configuration: Differential and balanced to chassis ground.

Sink Risk Leakage Current (with preamp): <10 µA at 230 VRMS, 60 Hz, inputs to chassis.

Input Impedance: >100 MΩ each input to chassis.

Measurement Range (full scale): 25 µV to 10 V FS.

Frequency Response (Adjustable): DC-10 kHz (−3 dB).

Maximum Safe Input Voltage: 120 VRMS input to chassis.

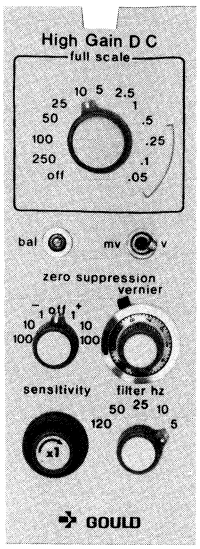
Internal Calibration Signal: Selectable between 50 µV and 1 mV within ±1% to 25°C.

Bridge Excitation (mV and mV x100 only): 5 VDC ±5 mV (adjustable via plug-in resistor), polarity reversible.

High Gain DC

Model 13-4615-20

- **High gain – 50 μV full scale**
- **Solid state input chopper**
- **Calibrated zero suppression**
- **Input-output isolation**
- **Common mode rejection >160 dB**
- **Low-pass output filter – 5 positions from 5 Hz to 120 Hz**



This versatile high gain DC amplifier has a measurement range from 50 μV to 250 V full scale. The solid-state input chopper does not wear out, become noisy or require periodic replacement. In addition, the calibrated zero suppression resolves one part per thousand on each of the 12 ranges.

Specifications

Measurement Range: 50 μV to 250 V FS.

Attenuator Steps: 0.05, 0.1, 0.25, 0.5, 1, 2.5, 5, 10, 25, 50, 100, 250 mV FS and OFF plus millivolts-volts multiplier switch.

Attenuator Inaccuracy: ±0.5% of calibrated step.

Sensitivity Vernier: Provides up to 2.5 times calibrated setting.

Input Circuit: Differential, floating, isolated and guarded.

Input Impedance: 1 MΩ on all ranges.

Common Mode Rejection

DC at 1 kΩ unbalance: >160 dB on most sensitive range.

60 Hz at 1 kΩ unbalance: >140 dB on most sensitive range.
120 VRMS on millivolts ranges.
250 VRMS on volts ranges.
250 VDC or peak AC.

Output Noise: Less than 3% of full scale, peak-to-peak at max. sensitivity DC to 50 Hz.

Frequency Response: DC to 120 Hz, down 3 dB. Flat within 0.5 dB DC to 50 Hz.

Filter Selector Switch: 3 dB down at 120 Hz, 50 Hz, 25 Hz, 10 Hz or 5 Hz.

Filter Rolloff: 12 dB/octave or 40 dB/decade.

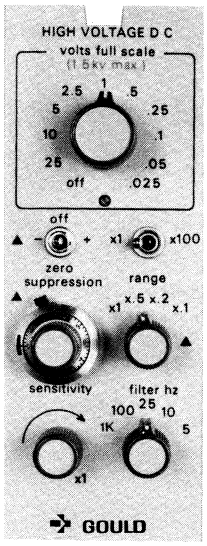
Calibrated Zero Suppression Ranges: +100, +10, +1, OFF, −1, −10, −100 V or mV.

See Bulletin 459-19 for more detailed information.

High Voltage

Model 13-4615-90

- **Calibrated zero suppression**
- **Broad range – 2.5 mV to 1500 V**
- **Five low-pass output filters**
- **Operates off ground to 1500 V**
- **High input impedance**
- **"High-Pot" tested at 4000 VDC**



The High Voltage DC Amplifier is a medium bandwidth, differential DC amplifier with an isolated output and fully floating, guarded input, capable of rejecting common mode voltages up to ±1500 V full scale. This special purpose DC amplifier has a common mode rejection greater than 140 dB and is designed to provide clean, crisp output signals in hostile industrial environments or in areas where high inrush currents, high voltages or other electrical noise is expected.

Specifications

Measurement Range: 2.5 mV FS to 1500 V FS.

Attenuator Steps: 0.025, 0.05, 0.1, 0.25, 0.5, 1, 2.5, 5, 10, 25 V FS, OFF, plus x100 multiplier ±0.4% of calibrated step.

Attenuator Inaccuracy: ±0.4% of calibrated step.

Sensitivity Vernier: Provides up to 2.5 times calibrated setting.

Input Circuit: Fully floating, isolated, guarded and fused.

Input Impedance: 1.0 MΩ in x1 and 10.00 MΩ in x100 Sensitivity multiplier position.

Common Mode Rejection:

DC at 1 kΩ unbalance: Greater than 140 dB.

60 Hz at 1 kΩ unbalance: Greater than 120 dB.

Rated Input Voltage: ±1500 VDC or peak AC.

Rated Common Mode Voltage: ±1500 VDC or peak AC.

High Pot. Test (all inputs to chassis): 4000 VDC for 10 s.

Frequency Response:

With filter at 1 kHz: Flat 0 to 100 Hz ±1.0%; 6 dB down at 1.0 kHz ±10%.

With filter at 100 Hz: 6 dB down at 100 Hz ±10%.

With filter at 25 Hz: 6 dB down at 25 Hz ±10%.

Filter Roll-off: 12 dB/octave or 40 dB/decade.

Calibrated Zero Suppression

Span: 0 to 100% of each input attenuator position.

Ranges: 40 ranges from ±2500 V to 25 mV.

Resolution: ±0.1% of suppression range.

Nonlinearity: ±0.25% of suppression range.

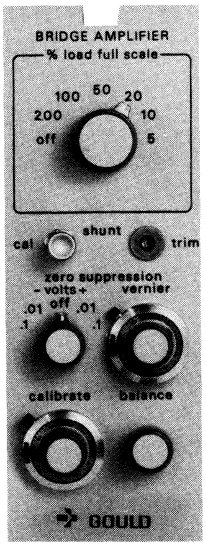
Inaccuracy (At 25°C and nominal line): ±0.5% of suppression range.

See Bulletin 459-15 for more detailed information.

DC Bridge

Model 13-4615-30

- 25 to 10,000 microinches/in. full scale
- Direct front panel calibration
- Selectable bridge excitation
- Low-pass output filtering
- Adjustable shunt calibration
- Calibrated zero suppression



This high-gain DC Bridge Amplifier is designed for operation with strain gages, passive transducers, resistance temperature devices and low-level DC input signals. This amplifier has internal switching for selection of 5 or 10 VDC excitation, positive or negative shunt calibration and bridge polarity reversal. Internal binding posts are provided for mounting bridge completion resistors assuring compatibility with virtually all transducers including half bridge and quarter bridge.

Specifications

Measurement Range (Using a four-active-arm bridge with a gage factor of 1): 250 µV FS to 100 mV FS. 25 microinches per inch FS to 10,000 microinches per inch FS.

Sensitivity or Gage Factor: Direct front panel calibration for transducers of 1 mV/V to 10 mV/V sensitivity. (100 Ω to 1000 Ω strain gage based transducers)

Attenuator Steps: 5, 10, 20, 50, 100 and 200% of load FS and OFF.

Attenuator Inaccuracy: ±0.5% of calibrated step.

Calibrate Vernier: Provides calibrated sensitivity adjustment from 1 mV/V to 10 mV/V.

Input Circuit: Differential and floating.

Input Impedance: 50 kΩ.

Common Mode Rejection

DC at 350 Ω unbalance: Greater than 130 dB on most sensitive range.

60 Hz at 350 Ω unbalance: Greater than 100 dB on most sensitive range.

Max. Allowable Input Voltage: 50 VDC or peak AC across input terminals. 500 VDC or peak AC from common to chassis.

Frequency Response

Without Filter: DC to 100 Hz ±0.5% (Less than 3 dB down at 5 kHz).

With Internal 5 Hz Filter: 3 dB down at 5 Hz ±10%.

Filter Rolloff: 12 dB/octave or 40 dB/decade.

Calibrated Zero Suppression

Ranges: ±100, ±10 mVDC and OFF.

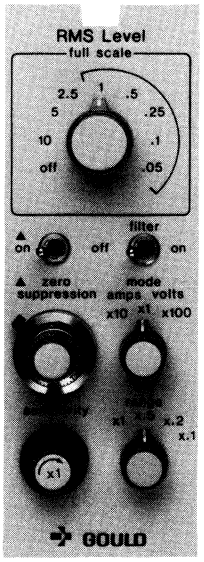
Resolution: ±0.1% of full suppression range.

See Bulletin 459-57 for more detailed information.

True RMS

Model 13-4618-10

- Bandwidth down 3 dB at 100 kHz
- Input protected to 1000 VRMS
- Full floating 1500 V off ground
- Calibrated zero suppression
- Crest factor up to 10:1
- Wide measurement range – 5 mV to 1000 VRMS, 50 mA to 10 ARMS



This wide-band True RMS Level Amplifier permits precise amplitude measurement of AC voltage and current waveforms with crest factors as high as 10:1. It calculates the true RMS value of any incoming AC waveform by continuously squaring the input signal, averaging the result and extracting the square root. This becomes a DC voltage level that is the true RMS value of the incoming waveform. Fast response (less than 25 ms) to a step input allows the True RMS Amplifier to detect power line surge or sag anomalies.

Specifications

Measurement Range: 5 mV RMS FS to 1000 VRMS FS. 50 mA RMS FS to 10 A RMS FS.

Attenuator Steps: .05, .1, .25, .5, 1, 2.5, 5, 10 V FS, OFF plus x100 multiplier and .5, 1, 2.5, 5, 10 A FS and OFF.

Range Steps: x1, x.5, x.2, x.1.

Attenuator Inaccuracy: x1 V Mode: ±0.2% reading; x100 V Mode: ±1.5% reading; x10 A Mode: ±1.5% reading.

Sensitivity Vernier: Provides up to 2.5 times calibrated setting.

Input Circuit: Differential, floating and shielded.

Imput Impedance

x100 V Mode: 1 MΩ.

x1 V Mode: 100 kΩ.

Current Mode: 0.1 Ω.

Crest Factor: 10 to 1.

Common Mode Rejection Voltage (60 Hz with 100 Ω unbalance): 80 dB on most sensitive range.

Maximum Allowable Input Voltage: 1000 VRMS on any range.

Input Voltage Isolation: 1500 V peak AC, from input to output.

Output Noise (at 50 Hz)

Filter Switch Off: Less than 25 mV FS on x1 range.

Filter Switch On: Less than 2.5 mV FS on x1 range.

Frequency Response: 50 Hz to 5,000 Hz. Less than 0.1 dB down; 10,000 Hz. Less than 0.2 dB down; 50,000 Hz. Less than 1 dB down; 35 Hz to 100,000 Hz. Less than 3 dB down.

Rise Time (10% to 90% full scale)

Filter Switch Off: Less than 25 ms.

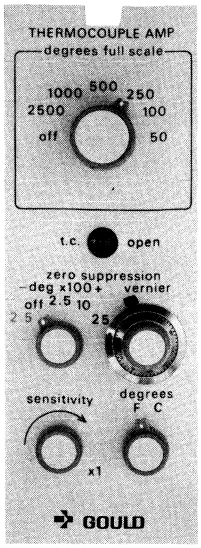
Filter Switch On: Less than 60 ms.

See Bulletin 459-5 for more detailed information.

Thermocouple

13-4615-40 Type J
13-4615-41 Type K
13-4615-42 Type T
13-4615-43 Type E
13-4615-44 Type R
13-4615-45 Type S

- **Cold junction compensation**
- **Electronic linearization**
- **Direct read-out in °F or °C**
- **Open thermocouple indication**



This high gain Thermocouple Amplifier permits precise temperature recording directly in degree Fahrenheit or degree Celsius over a wide range from −250 to +2500 full scale. A 15-point electronic thermocouple linearizer provides automatic correction for the nonlinearity of each standard thermocouple type. Calibrated Zero Suppression is provided to suppress the static portion of any complex temperature signal, allowing the dynamic portion to be expanded for more detailed evaluation.

Specifications

Measurement Range: −250 to +2500 °C or °F, dependent on thermocouple type.

Attenuator Steps: 50, 100, 250, 500, 1000 and 2500° FS, plus OFF.

Attenuator Inaccuracy: ±0.25% of calibrated step.

Sensitivity Vernier: Multiplies calibrated setting up to 2.5 times.

Input Circuit: Single-ended to floating common.

Input Impedance: 1.0 MΩ.

Maximum Source Resistance: 100 Ω.

Common Mode Rejection

DC at 100 Ω unbalance: Greater than 120 dB.

60 Hz at 100 Ω unbalance: Greater than 80 dB.

Maximum Allowable Input Voltage: 500 VDC or peak AC from common to chassis.

Nonlinearity (Over linearized range)

Thermocouple types "J", "K", "T", and "E": Within 0.55°C or 1.0°F.

Thermocouple types "R" and "S": Within 1.5°C or 3.0°F.

Frequency Response

Internal Filter Off: 3 dB down at 200 Hz.

Internal Filter On: 3 dB down at 5 Hz ±10%.

Filter Rolloff: 6 dB/octave or 20 dB/decade.

Calibrated Zero Suppression

Ranges: −250°, OFF, +250°, +1000° and +2500°.

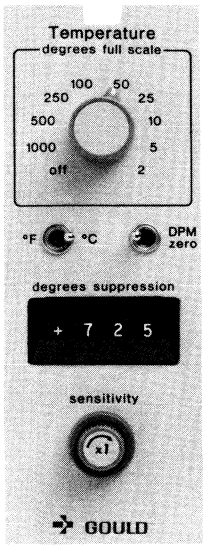
Resolution: ±0.1% of suppression range.

See Bulletin 459-2 for more detailed information.

Temperature

Model 13-4615-47

- **High sensitivity – up to 2° full scale**
- **Digital zero suppression**
- **Wide range – 2 to 1000°F/°C**
- **Supports copper or nickel RTDs**
- **Input floats 500 V off ground**



The Gould Temperature Amplifier is an excellent choice in applications where maximum temperature resolution is required. At full sensitivity of 2°, temperature resolution of 1/100 of a degree is attained in normal operation without any special calibration. Gould's innovation in the art of continuous analog temperature measurement, gives digital zero suppression with a range from ±1° to ±999° and precise electronic linearization, up to 0.2% of full scale for platinum RTDs.

Specifications

Measurement Range (Directly in °F or °C): ±2° to ±1000°.

Attenuator Steps: 2, 5, 10, 25, 50, 100, 250, 500, 1000° FS, plus OFF.

Attenuator Inaccuracy: ±0.25% of calibrated step.

Standard Input Sensors (No recalibration required): 100, 200, 500 or 1000 Ω, 4-wire, Platinum (385) RTDs or Yellow Springs Instrument (YSI), 400 Series Thermistor Probes.

Sensitivity Vernier: Multiplies calibrated setting up to 2.5 times.

Input Circuit: 4-wire, differential to floating common.

Input Impedance: 1.0 MΩ.

Maximum Allowable Input Voltage: 260 VRMS across input terminals. 500 VDC or peak AC from common to chassis.

Output Noise (on most sensitive range): Less than ±0.2% of full scale.

Frequency Response: 3 dB down at 10 Hz ±20%.

Calibrated Zero Suppression: 0 to ±999° in 1-degree steps.

Resolution: 1°F or 1°C.

Inaccuracy (at 25°C and nominal line): ±0.2% of suppression reading ±0.05°.

Platinum RTD Excitation Current: 2 mA at 100 Ω 1 mA at 200 Ω; 0.4 mA at 500 Ω; 0.2 mA at 1 kΩ.

Display Output Voltage: 100 mV/°F or °C, 0 to 100° max.; 10 mV/°F or °C, 0 to 1000° max.

Thermistor Probe Operation: Use YSI 400 Series Thermistor Probes.

Range: 0-42°C.

Linearity: Within ±0.5°C from 4°C to 40°C. Within ±1°C from 0°C to 42°C.

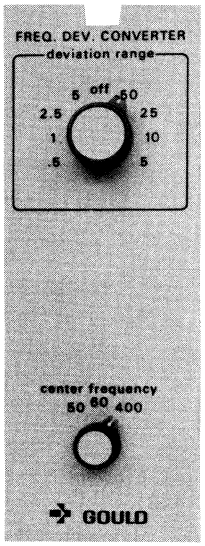
Excitation: Approx. 765 mVDC, internally supplied.

See Bulletin 459-25 for more detailed information.

Frequency Deviation

Model 13-4618-00

- **Excellent frequency resolution**
- **Three center frequencies**
- **Input voltage 10 to 500 VRMS**
- **Isolation — 1500 V input to output isolation**
- **Response time <100 ms**



The Gould Frequency Deviation Converter detects the zero crossing of any AC waveform and outputs a DC voltage which is directly proportional to the frequency above or below the standard center frequencies of 50, 60 or 400 Hz. Applications cover a wide variety, from monitoring the speed regulating governors and electronic synchronizing equipment to detecting fluctuations in frequency due to system instability, step changes in load and transmission line switching anomalies.

Specifications

Center Frequency: (factory preset): 50 Hz, 60 Hz, or 400 Hz ±0.025%.

Measurement Ranges (full scale): 49.5-50.5, 49-51, 47.5-52.5 or 45-55 Hz; 59.5-60.5, 59-61, 57.5-62.5 or 55-65 Hz; 395-405, 390-410, 375-425 or 350-450 Hz.

Range Switch Inaccuracy: ±0.2% of reading.

Input Circuit: Fully floating and isolated from output.

Input Impedance: 100 kΩ (20 W).

Common Mode Rejection

DC at 1000 Ω unbalance: 120 dB at 100-V input.

60 Hz at 1000 Ω unbalance: 80 dB at 100-V input.

Input Voltage (nominal rating): 10 to 500 VRMS.

Maximum Safe Input Voltage: 700 VRMS

Input Voltage Isolation: 1500 V-P, from input to output or input to chassis.

Zero Line Instability (After 30-minute warm-up): ±0.02% of center frequency for 24 hours; ±0.02% of center frequency per °C.

Gain Instability (After 30-minute warm-up): ±0.02% of reading for 24 hours; ±0.08% of reading per °C.

Output Noise (peak-to-peak): >10 mV.

Rise Time: >100 ms (10%-90%).

Overshoot: >0.5% of selected range.

Operating Temperature: 0°C to +50°C (+32°F to +122°F).

Storage Temperature: −40°C to +75°C (−40°F to +167°F).

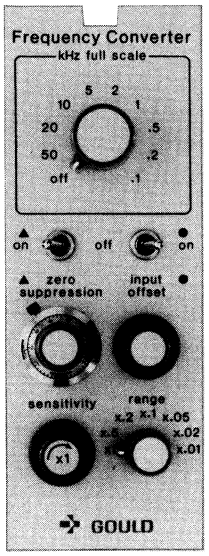
Humidity: 95% to +35°C (+95°F) non-condensing.

See Bulletin 441-59 for more detailed information.

Frequency-to-Voltage

Model 13-4618-20

- **Wide frequency measurement range 10 Hz to 50 kHz**
- **Wide voltage range 10 mV to 500 V**
- **Calibrated zero suppression**
- **Floating input – 1500 V isolation from input to output**



This wide-band Frequency-to-Voltage Converter permits direct measurement of frequency or signal repetition rate over a range from 10 Hz to 50 kHz. It detects the zero crossing of any AC waveform, converting it to a DC voltage directly proportional to input frequency. The Converter input is virtually insensitive to voltage, converting AC waveforms between 10 mVRMS and 500 VRMS. The dynamic portion of the signal is easily expanded using the zero suppression to suppress up to 90% of the original signal.

Specifications

Measurement Range: 10 Hz FS to 50 kHz FS.

Attenuator Steps: 0.1, 0.2, 0.5, 1, 2, 5, 10, 50 kHz FS.

Range Steps: x1, x0.5, x0.2, x0.1.

Attenuator Inaccuracy: ±0.01%.

Sensitivity Vernier: Provides up to 2.5 times calibrated setting.

Input Circuit: Input No. 1 – Single ended floating.
Input No. 2 – For use with optical couplers.
Available LED current – 50 mA maximum at 12 V (with 220 Ω in series). Current Sink Requirement – 120 µA ±10%.

Input Impedance: 100 kΩ.

Common Mode Rejection: (60 Hz at 1 kΩ unbalance): 80 dB.

Input Voltage: 10 mV RMS to 500 V RMS.

Maximum Allowable Input Voltage: 700 V DC or peak AC.

Input Voltage Isolation: 1500 V peak from input to output or input to chassis.

Output Noise: Less than 5 mV peak-to-peak.

Rise Time (10% to 90% full scale with less than 2% overshoot. Rise time is not affected by range switch):

0.1, 0.2, 0.5 kHz FS: <200 ms.

1, 2, 5 kHz FS: <20 ms.

10, 20, 50 kHz FS: <2 ms.

Calibrated Zero Suppression

Ranges: 0 to 100% of selected attenuator setting.

Resolution: 0.1% of full scale.

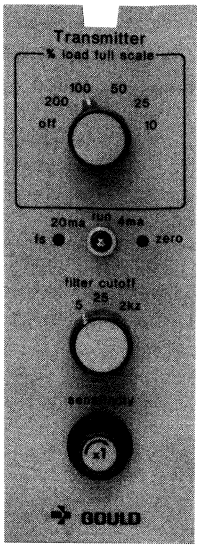
Signal Input Connector: Guarded multi-pin mating connector supplied with each Converter (Model No. 11-5407-03).

See Bulletin 459-7 for more detailed information.

Transmitter

Model 13-4618-40

- **Accommodates all standard current output transmitters**
- **Internal voltage source**
- **Adjustable zero suppression**
- **Low pass output filter: 5 Hz, 25 Hz and 2 kHz**
- **Low-gain DC amplifier**



The Gould Transmitter Amplifier is ideal for accurately and dependably measuring process data from industrial transmitters and high signal output transducers. Its output can drive a digital indicator for numeric display and/or Gould recorder for permanent chart records. Exceptional measurement resolution is provided by a five-step front panel sensitivity control which has a range of 10 to 200% of rated full scale input. An adjustable voltage source provides up to 50 mA at 28 VDC for 2- and 4-wire transmitters.

Specifications

Measurement Range: 1-5 mA, 4-20 mA, 10-50 mA and 0-5 VDC (Internally Selectable).

Attenuator Steps: 10, 25, 50, 100 and 200% of load FS plus OFF.

Sensitivity Vernier: Provides up to 2.5 times calibrated setting with a maximum of 200% of percent load full scale.

Input Circuit

Current Mode: Single ended, floating common.
Voltage Mode: Differential, floating.

Input Impedance

1-5 mA Range: 1000 Ω.
4-20 mA Range: 250 Ω.
10-50 mA Range: 100 Ω.
0-5 VDC: 1 MΩ.

Common Mode Rejection (350 Ω unbalance):

DC unbalance to common: 65 dB on most sensitive range.
60 Hz unbalance to common: 65 dB on most sensitive range.
60 Hz unbalance to chassis: 80 dB on most sensitive range.

Maximum Input Voltage

Current Mode: 28 VDC or peak AC normal mode or 500 V-P common mode (input signal leads to case).
Voltage Mode: 200 VDC or peak AC normal mode.

Over Current Protection: 0.025 A fast blow fuse.

Frequency Response: Flat DC to 100 Hz ±0.5%.

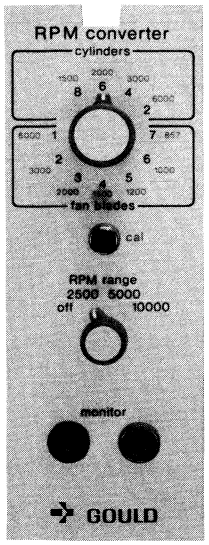
Transmitter/Transducer Voltages: (provided by amp): +28 VDC ±2 V at 50 mA (internally variable). ±15 VDC ±5% at 50 mA.

See Bulletin 459-20 for more detailed information.

RPM Converter

Model 13-4618-30

- **Multiple input: ignition, magnetic proximity and optical**
- **Four-engine ranges: 2, 4, 6 or 8 cylinders (4-cycle engine)**
- **Seven fan-blade ranges**
- **Internal crystal oscillator**
- **Front panel monitor**



The RPM Converter is a multi-range frequency-to-voltage converter calibrated to read out directly in revolutions/minute for greater convenience in tachometry applications. Its versatility makes it indispensable for all types of testing on engines, cooling fans, variable speed drives, farm machinery and other rotating systems. State-of-the-art design assures oscillator stability and high electrical noise immunity to ensure acceptance of a wide range of waveforms such as sine, square, triangle, ramp and pulse.

Specifications

Measurement Ranges: 0 to 2,500, 0 to 5,000, and 0 to 10,000 RMP plus "OFF".

Input Circuits: Ignition coil input; Magnetic sensor input; Optical pickup input; All single ended to floating common.

Input Selector Positions: Engine Cylinders, 2, 4, 6 or 8; Fan Blades or Impulses/Revolution, 1, 2, 3, 4, 5, 6 or 7.

Input Impedance

Ignition Coil Input: 1500 Ω, LOAD less than 10 mA AVG; Buffered, rectified and filtered.

Magnetic Pickup Input: 68 Ω.

Optical Pickup Input: 40 kΩ, 0.12 mA ±10% sink current.

Input Voltage

Ignition Coil Input: From 7 to 500 V, peak-to-peak.

Magnetic Pickup Input: From 1 to 100 V, peak-to-peak, 10% duty cycle.

Optical Pickup Input: 5.0 V, internally supplied.

LED Excitation: 5.0 VDC at 100 mA maximum.

Output Ripple: 1% for 4 cylinders and 2500-RPM range; 0.5% for 6 cylinders and 2500-RPM range; 0.2% for 8 cylinders and 2500-RPM range.

Rise Time (10% to 90% full scale): 120 ms for 4 cylinders and 2500-RPM range; 90 ms for 4 cylinders and 5000-RPM range.

Calibration Inaccuracy: ±0.1%, from −20°C to +70°C.

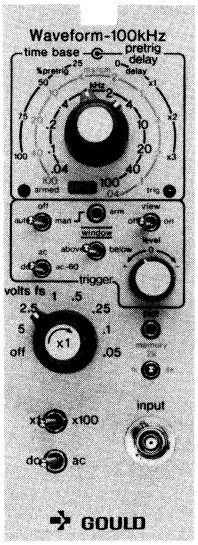
Front Panel Monitor: 1 mV per RPM into 2 kΩ or greater.

See Bulletin 459-9 for more detailed information.

High Frequency Waveform Storage

Model 13-4616-20A

- **Wide bandwidth – DC to 100 kHz**
- **Transient response to 3 μs**
- **Automatic or manual arm**
- **Master/slave of up to 8 units**
- **Pretrigger up to 100% or delay up to 300%**
- **Low frequency trigger rejection**



The High Frequency Waveform Module is ideal for analyzing waveforms up to 100 kHz and capturing transients as fast as 3 μs at full amplitude. Random transients are recorded in the order of their occurrence, with no wasted chart paper between events. Upon capture, a transient can be replotted repeatedly, at different chart speeds for the best presentation or resolution. Triggering is accomplished using ABOVE, BELOW or in WINDOW criteria, while pretrigger gives the signal history prior to a trigger event.

Specifications

Amplitude Input Range: 50 mV to 500 V FS.

Attenuator Steps: .05, .1, .25, .5, 1, 2.5, 5 V FS plus OFF and x100 multiplier.

Input Coupling: DC or AC (low frequency cutoff −3 dB at 2.5 Hz).

Input Circuit: Single ended with floating common.

Input Impedance: 1 MΩ to common, shunted by < = 40 pF.

Common Mode Rejection: DC to 60 Hz w/1 kΩ unbalance, 90 dB on most sensitive range.

Maximum Input Voltage: 500 V peak.

Time Base: 4 MHz ±0.005% crystal controlled clock.

Capture Bandwidth: Based on 10 samp./cycle: DC to 100 kHz.

External Trigger: Contact closure or 13-mA current sink.

Trigger Levels: ±2% to ±100% of full scale for Above, Below or Window.

Trigger Filter: DC, AC or AC-HF reject. AC-HF uses a 2 pole high pass filter down 3 dB at 1200 Hz.

Trigger Modes: Automatic, manual or off.

Recording Modes: 100%, 75%, 50%, 25% of pretrigger or 100%, 200% or 300% of trigger delay.

Sampling Rate: 400 Hz to 1 MHz in 1-2-4 sequence.

Record Time: 4 ms to 10 s in a 1-2-4 sequence.

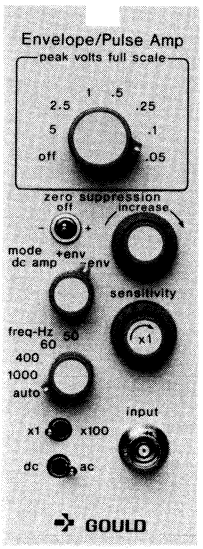
Output Data Rate: 200 data points per second.

See Bulletin 459-27 for more detailed information.

Envelope/Pulse Amplifier

Model 13-4616-30/31

- **Outputs peak envelopes up to 100 kHz**
- **True amplitude 50-μs pulse**
- **Wide bandwidth DC amplifier**
- **Full range zero suppression**
- **Accepts external sync.**
- **50 mV to 500 V full scale range**



The Gould Envelope/Pulse Amplifier is a cost effective solution for recording the peak envelopes of analog signals up to 100 kHz and detecting pulses as short as 50 μs. As such, it presents an economical alternative to expensive high-frequency recording devices such as light beam recorders and waveform digitizers. The ability of this amplifier to output peak envelope of a signal and/or the occurrence of fast pulses and transients makes it ideal for numerous industrial and medical applications.

Specifications

Measurement Range: 50 mV to 500 V in 1, 2.5, 5 steps.

Maximum Input Voltage: 500 V peak between inputs or input to ground.

Input Circuit: Single ended to floating common.

Common Mode Rejection: 80 dB at 60 kHz, 1 kΩ unbalance (most ranges).

Zero Suppression: ±100% full scale.

Envelope Mode

DC to 40 Hz: Displays true input signal.

40 Hz to 100 kHz: Displays positive or negative envelope.

Pulse Response

Minimum Detectable Pulse Width: 50 μs for true amplitude.

Minimum Detectable Amplitude:
No carrier: 5% of full scale.
Carrier present: 5% of full scale outside of envelope.

Minimum dV/dt for Detection: 40% of full scale per ms.

Maximum Repetition Rate for Unipolar Pulses: 30 pulses/s.

Maximum Repetition Rate for Bipolar Pulses (13-4616-31 only): 20 pulses/s.

Pulse Hold Time: 15 ms.

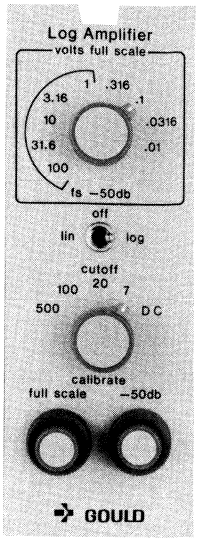
Event Marker Output (13-4616-31 only): 30 ms pulse per input pulse. Isolated and capable of driving standard event marker.

See Bulletin 459-27 for more detailed information.

Log-Linear

Model 13-4614-01

- **AC Log/Linear Operation from 10 to 100 kHz**
- **DC Log/Linear Operation from DC to 400 Hz**
- **130 dB measurement range**
- **Internal AC calibration**
- **10 MΩ input impedance**



The Log-Linear Amplifier is a specialized wide-band direct-coupled AC or DC Amplifier whose logarithmic output is calibrated in decibels below a preset full-scale value. When operated as a Log Amplifier, the preset full-scale amplitude appears on the left chart edge, and right chart edge is an amplitude which is exactly 50 dB down from the full-scales value. In the AC mode it senses the average value of incoming signals and is calibrated in terms of the RMS values of a sinusoidal waveform.

Specifications

Measurement Range:
AC: 10 mVRMS FS to 100 VRMS FS.
DC: 1 V FS to 100 V FS.

Attenuator Steps: 0.01, 0.0316, 0.1, 0.316, 1, 3.16, 10, 31.6, 100 VRMS FS plus FS, and −50 dB.

Attenuator Inaccuracy: ±0.2 dB.

Maximum Sensitivity: Log: 50 dB FS. AC: 10 mV FS. DC: 1 V FS.

Input Circuit: Single ended to common.

Input Impedance: 10 MΩ, constant, shunted by less than 80 pF (on all attenuator positions).

Maximum Allowable Input Voltage: 10x input attenuator setting – up to 300 V maximum.

Maximum Safe Input: 100 VDC or peak AC on .01 to 1 V ranges; 300 V on 3.16 to 100 V ranges.

Maximum Off-Ground Voltage: 500 V to chassis.

Frequency Response
AC Mode: Less than 1 dB down at 100 kHz.
Less than 3 dB down at 150 kHz.
DC Mode: Less than 1 dB down at 200 Hz.
Less than 3 dB down at 400 Hz.

Rise Time (10-90%) for 50 dB Change.
Filter Position in 7 Hz Cut-off: Less than 400 ms.
Filter Position in 20 Hz Cut-off: Less than 100 ms.
Filter Position in 100 Hz Cut-off: Less than 20 ms.
Filter Position in 500 Hz Cut-off: Less than 4 ms.
Filter Position in DC Cut-off: Less than 2 ms.

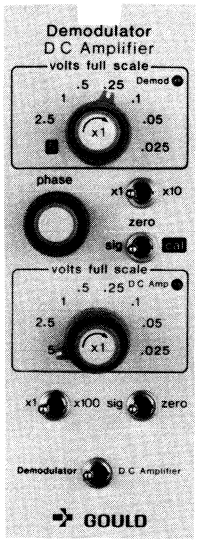
Internal Calibration (FS): 1.000 VRMS at 1000 Hz/1 VDC.

See Bulletin 459-8 for more detailed information.

Phase Sensitive Demodulator

Model 13-4616-00

- **Independent demodulator and DC amplifier sections**
- **Selectable 60, 400 or 1200 Hz reference frequency**
- **2 MΩ input impedance**
- **Internal calibration**



This Amplifier combines demodulation with a medium gain, general purpose DC amplifier. Both may be selected without disturbing the setting of the other. Operating with modulated carrier systems, the Amplifier becomes part of the system under test; yet, it does not influence system performance. Unmodulated system reference voltages pass through separate amplifier channels, each isolated from ground and each other to deliver a clean envelope of peak levels and error signals.

Specifications

AC Specifications

Reference Channel
Input Circuit: Differential, floating.
Impedance: 1 MΩ – transformer coupled.
Range: 10 to 200 VRMS.
Frequency: 60 Hz, 400 Hz, 1200 Hz.

Error Channel
Input Circuit: Differential, floating.
Impedance: 1 MΩ – transformer coupled.
Measurement Range: 25 mV to 125 V peak/full scale.
Common Mode Rejection: DC: 140 dB at 1-kΩ unbalance. 50 or 60 Hz: 90 dB at 1-kΩ unbalance.
Quadrature Rejection: Greater than 40 dB with amplifier Phase Control adjusted for maximum output; 100:1 or 0.1 division, whichever is greater, for carrier frequencies 60 Hz and above.

Internal Calibration Signal
Inaccuracy: Internally derived, calibrated within ±1% throughout range of reference voltage and frequency. Selectable by front panel switch.

DC Specifications

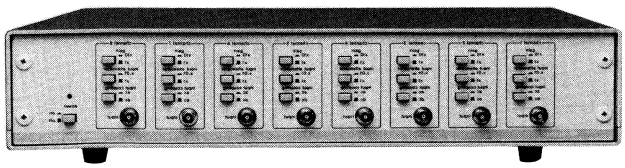
Input Circuit: Differential, balanced to floating common.

Impedance: 2 MΩ differential; 1 MΩ each input to common.

See Bulletin 459-24 for more complete information.

8-Channel Isolator

Model 13-4681-00



- **Input/output and channel to channel isolation**
- **Selectable gain or attenuation**
- **AC or DC coupling**
- **Operates off ground**
- **High input impedance — 1 MΩ**

The 8-Channel Isolator is designed to allow safe accurate measurement of multiple off ground signals up to ±500 VDC or peak AC on instruments whose input circuits are single ended with respect to common or chassis ground. Multichannel instruments that frequently have single ended input circuits include magnetic tape recorders, waveform recorders, data acquisition systems and strip chart recorders. Each channel has a bandwidth up to 50 kHz and features front panel selection of AC or DC coupling.

Specifications

Input Isolation

±500 VDC or peak AC max. safe isolation from chassis ground.

±500 VDC or peak AC channel to channel isolation from chassis ground.

±500 VDC or peak AC max. linear input from + input to common.

Input Circuit

Input Connector: Triaxial (front panel).

Configuration: Single ended floating.

Impedance: 1 MΩ shunted by 40 pF.

Coupling: DC or AC (AC input coupling low frequency cut-in −3 dB at ≤ 2.5 Hz).

Frequency Response

50 kHz −3 dB at ≤ ±100 VDC or peak AC with full x0.01 attenuation.

12 kHz at ±500 VDC or peak AC with full x0.01 attenuation (slew rate limited to 0.3 V/µs worst case).

Common Mode Rejection (Atten. = x1, Gain = x10)

AC: >84 dB with 1 kΩ source unbalance at 60 Hz, decreasing on other ranges.

DC: >90 dB with 1 kΩ source unbalance, decreasing on other ranges.

Cross Talk to Adjacent Channels: >120 dB from DC to 1 kHz; >100 dB above 1 kHz to 50 kHz.

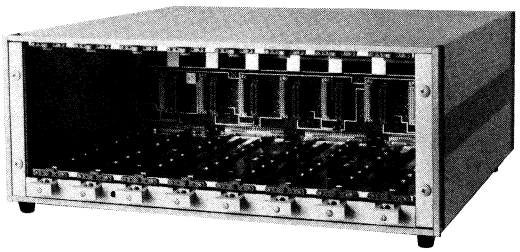
Inaccuracy (at 24°C ±10°C)

Nonlinearity: ±.2% of 5 V full scale output.

Zero Error: ±.03 VDC referenced to output.

See Bulletin 459-2 for more detailed information.

5900 Signal Conditioner Case



- **Portable and rack mount**
- **Supports 5600 and 4600 Signal Conditioners**
- **Stand-alone, 3000 and TA 2000 configurations**
- **Convenient insertion and removal of signal conditioners via front panel**

The 5900 Signal Conditioner case is totally interactive with Gould's new 5600 Programmable and 5600IS Status Reporting Signal Conditioners. It functions as a state-of-the-art "front end" for stand-alone applications or for use with 3000 or TA 2000 recorders. It allows either direct operation of these signal conditioners or total remote control via RS-232C or IEEE-488 digital interfaces. The 5900 also supports the comprehensive 4600 signal conditioner line.

Specifications

Dimensions

Portable: 8.13 in. (20.6 cm) H x 20 in. (50.8 cm) W x 19 in. (48.2 cm) D.

Rack Mount: 7 in (17.8 cm) H x 18 in. (45.7 cm) W x 17.8 in. (45.2 cm) D.

Number of Signal Conditioner Slots: 8.

Power Requirements, Voltage and Frequency: 90 to 130 VAC and 200 to 260 VAC, 45 to 445 Hz.

Weight: 27 lbs. (est.).

Ordering Information

Model Number	Description
5900 Signal Conditioner Case	
11-4183-03	Portable with 3000 interface board and cable
11-4781-01	Rack mount with 3000 interface board and cable
11-4183-04	Stand-alone portable
11-4783-02	Stand-alone rack mount
5900 Options and Accessories	
CL-211222-1	3 Ft. 3000 interface cable
CL-211222-2	6 Ft. 3000 interface cable
11-4221-02	Auxiliary analog board kit
11-4221-03	RS-232C interface board kit
11-4221-04	IEEE-488 interface board kit
11-4221-06	3000 interface board kit

Accessories for Gould 4600 and 5600 Series Signal Conditioners

DC and True RMS Accessories

Model No.	Description
11-5407-02	Connector (4-pin and guard), mates with 13-4615-00, 13-4615-10, 13-4615-20, and 13-4615-90 Amplifier input connectors
11-5407-03	Connector (7-pin and guard), mates with 13-4618-10 and 13-4618-30 Amplifier input connectors
11-5407-09	Connector Adapter, 3 binding posts to Gould 4-pin and guard molded connector 11-5407-02
11-5407-50	Connector (12-pin Deutsch), mates with 13-4615-58, 13-4615-70, 13-4615-71 Amplifier input connectors
11-5407-55	Connector Adapter, 3-pin binding posts to 12-pin Deutsch connector.
High Voltage DC Input Cables for 13-4615-90 Amplifier	
892684-1	Complete Assembly, 25-ft. long
892684-2	Complete Assembly, 50-ft. long
892684-3	Complete Assembly, 100-ft. long
264130	High Voltage Cable (Belden Number 83393; minimum order 100-ft.)
High Voltage AC Input Cables for 13-4618-10 Amplifier	
888973-1	Complete Assembly, 10 ft. long
888973-2	Complete Assembly, 20 ft. long
369500-2003	AC Current Pick-Up (Clamp On)
Fuses	
248490-1	High Voltage Amplifier (F501, 502) 1/8 A.
281592-4	RMS Amplifier (F201) 10 A.

Transducer Signal Conditioner Accessories

Model No.	Description
11-5407-03	Connector (7-pin and guard), mates with 13-4615-30, 13-4618-40 Amplifier input connectors
11-5407-50	Connector (12-pin Deutsch), mates with 13-4615-35, 13-4615-50 Amplifier input connectors
11-5407-10	Connector (14-pin), mates with 13-4616-00 Amplifier input connector
11-5407-06	Connector Adapter, adapts input connector (11-5407-03) to 6-pin Cannon connector receptacle
1-265969-15001	Balance Resistor (DC Bridge Amplifier)
25-265969-10002	Balance Resistor (Transducer Amplifier)
Cal Resistor (DC Bridge, Transducer Amplifier)	
25-265969-15001	15 kΩ (120 Ω bridge)
25-265969-50001	50 kΩ (350 Ω bridge)
Bridge Completion Resistors (DC Bridge, Transducer Amplifier)	
242879-121	120 Ω bridge
10-240368-350R0	350 Ω bridge
25-265969-25000	±5 VDC Bridge Excitation Resistor (Transducer Amplifier)
369500-104	Adapter Cable, WK-6 Cannon to 12-pin Deutsch (Transducer Amplifier)

Transducer Signal Conditioner Accessories — *(continued)*

Model No.	Description
Current Range Resistors, R206 (Transmitter Amplifier)	
3-290003-10000	1-5 mA, 1000 Ω.
3-290003-100R0	10-50 mA, 100 Ω
3-290003-250R0	4-20 mA, 250 Ω
1-288308-30000	Zero Suppression Extended Range Resistor, R246
102625-2	Fuse, (F201) 1/8 A

Frequency Signal Conditioner Accessories

Model No.	Description
11-5407-01	Connector (4-pin and guard), mates with 13-4618-00 Amplifier input connector
291955	Connector (5-pin Cannon), mates with 13-4618-30 Amplifier input connector

Temperature Signal Conditioner Accessories

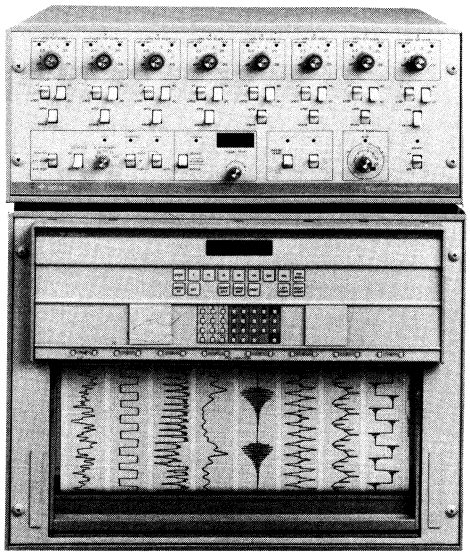
Model No.	Thermocouple Input Connector (male)
288063-3	Iron-Constantan (Type "J")
288063-1	Chromel-Alumel (Type "K")
288063-2	Copper-Constantan (Type "T")
288063-4	Chromel-Constantan (Type "E")
288063-6	Platinum-Platinum 10% Rhodium (Type "S")
288063-5	Platinum-Platinum 13% Rhodium (Type "R")
Conversion Kit Assembly	
11-4308-40	Iron-Constantan (Type "J")
11-4308-41	Chromel-Alumel (Type "K")
11-4308-42	Copper-Constantan (Type "T")
11-4308-43	Chromel-Constantan (Type "E")
11-4308-45	Platinum-Platinum 10% Rhodium (Type "S")
11-4308-44	Platinum-Platinum 13% Rhodium (Type "R")
11-5407-03	Connector (7-pin and guard), mates with 13-4615-47 Amplifier input connector
11-5407-47	Connector Adapter, for YSI 400 Series Temperature Probes

Specialty Signal Conditioner Accessories

Model No.	Description
Waveform Recorder	
896413	Cable Harness Assembly
896412	Speed Control Cable Assembly
296661	Triax to BNC Adapter
11-4310-03	Cable Assembly, Triax to Alligator Clips (10′)
895990	Auxiliary power supply assembly, external rack mounted 28 V supply
11-4310-15	Power supply adapter assembly for 4600 Series carrying cases
369500-6502	PB12 80 MHz Probe Kit x10/x1 Head
369500-6503	PB13 80 MHz Probe Kit x10 Head

Waveform Recorders 96

- **Independent acquisition**
- **IEEE-488 addressable**
- **Real time monitor output**
- **DC amplifier mode**
- **External digital and analog triggering**
- **Analog outputs for hard copy**
- **Easy setup**
- **Pre-trigger capture**
- **Serial or parallel communications**



Whatever your requirements for transient and waveform studies, there is a Gould high frequency multichannel recording system to do the job. These systems include analog recorders with a wide range of capabilities and writing methods. Gould covers the entire performance spectrum from the economical thermal 8000W and programmable 3000W to high performance array recorders like the thermal TA 2000W and the electrostatic ES 1000W.

These powerful measurement systems are configured around the Gould 4300 Series Waveform Recorder which greatly increases recorder performance. This digital front-end acquires up to 8 analog signals sampling then simultaneously at rates from 500 Hz to .333 MHz, and stores the data in up to 32 k samples/channel of memory. The data is then reconstructed and output to any Gould recorder for hard copy or to an instrumentation tape for mass storage.

Comprehensive analog and digital triggering capabilities allow you to capture select test signal segments, one-time events, or responses to test stimuli. This eliminates the acquisition of nonessential data and provides for automatic, unattended data acquisition. Further a 0 to 100% pre-trigger feature allows for the study of cause-and-effect relationships between captured signals.

With Gould's DASA menu driven software, an IEEE interface and an IBM PC/XT or PC/AT, these waveform recording systems become turnkey data acquisition and analysis systems that acquire, display, analyze and output data.

Use the selection chart at right to choose the appropriate Gould Waveform Recording System. Refer to the appropriate catalog pages for more detailed product data.

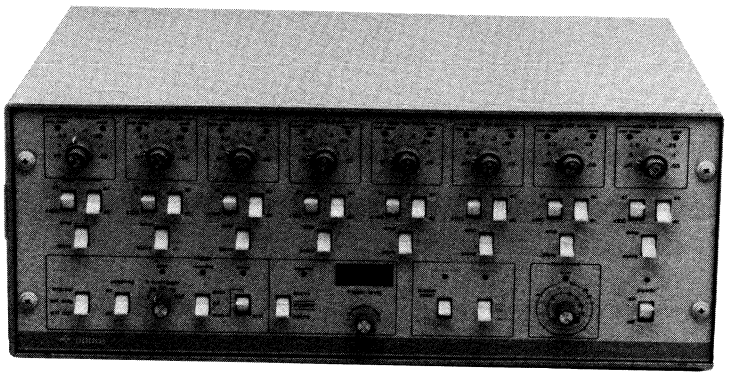
Gould Waveform Recorders

Waveform Features	8000W	3000/4300	ES 1000W	TA 2000/4300
No. of Channels	4, 6, or 8	4, 6, or 8	8 to 32	1 to 8
Channel Span	40 mm or 50 mm per channel	40 mm or 50 mm per channel	Up to 256 mm overlapped	Up to 200 mm Overlapped
Writing Method	Thermal	Thermal or Pressurized Ink	Electrostatic Array	Thermal Array
Chart Speeds Actual	1 to 200 mm/s, mm/min or mm/hr	1 to 500 mm/s, mm/min or mm/hr; ÷60, ÷100, and ÷1000 and variable speed	5 to 250 mm/s	1 to 200 mm/s or mm/min
Digital Equivalent	2.5 to 1667 times actual (up to 333.3 m/s)	2.5 to 1667 times actual (up to 833 m/s)	5 to 4167 m/s times actual (up to 416.7 m/s)	2.5 to 1667 times actual (up to 333.3 m/s)
Annotation	No	Left edge - standard; interchannel - optional	Anywhere on chart; 24 lines x 50 characters	Anywhere on chart (48 lines x 80 characters)
Overlapping Traces	No	No	Yes	Yes
Ext. Chart Drive	TTL	TTL, (HC)	NA	NA
Remote Start/Stop	Contact Closure	Contact Closure	Contact Closure	TTL/Contact Closure
Frequency Response Amplifier Mode	@ 40 mm, DC-50 Hz ±2 mm @ 10 mm, DC-100 Hz ±3 mm	@ 40 mm, DC-60 Hz ±2% @ 10 mm, DC-180 Hz ±3 dB	DC-6 kHz −2 dB (sq. wave)	DC-2.5 kHz <2% down on continuous sine wave
Store Mode	50 kHz @ full scale	50 kHz @ full scale	50 kHz @ full scale	50 kHz @ full scale
Rise Time Amplifier Mode	10 ms @ 40 mm	4 ms @ 40 mm, 5 ms @ 50 mm	NA	NA
Store Mode	10 µs	10 µs	10 µs	10 µs
Trigger Clock	No	Yes	Yes	Yes
IRIG Input	No	Yes	Yes	No

Waveform Recorder

Gould 4300 Series

- **4, 6 or 8 channels**
- **Each channel usable as wideband DC amplifier or high-speed digitizer**
- **Channels sampled simultaneously at 500 Hz to 1/3 MHz**
- **Large 32 k word/channel memory**
- **Flexible triggering, up to 100% pretrigger data capture**
- **Captures 50-kHz signals, 10-μs transients**
- **Analog and digital outputs; IEEE-488 standard, RS-232C optional**



These are the vital front ends for all Gould high frequency multichannel waveform recording systems and DASA systems. Setting up a 4300 for the measurements you want to make is extremely flexible and easy. With 13 calibrated input ranges from 50 mV to 500 V full scale plus variable gain, you can record each channel at maximum resolution. LEDs indicate any over-range or uncal conditions, and you can select AC or DC signal coupling. You can also set each channel for real time (amplifier) or store mode.

All channels in store mode are sampled simultaneously to avoid time skew between channels. Simply set the time base for the highest frequency you want to record. Sample interval and chart scale factor are also shown. Flexible triggering lets you precisely capture the waveform or transient you want, with up to 100% pretrigger data for cause-effect analysis. Stored data can be output repeatedly for analog plotting at various speeds or in digital form at high speed via standard interfaces.

Specifications

Number of Channels: 4, 6 or 8.

Input Voltage Range: ±50 mV to ±500 V in 1-2-5 sequence, continuously variable >2.5 to 1 between steps.

Amplifier Characteristics: Bandwidth (−3 dB) 85 kHz; input impedance 1 MΩ shunted by ≤55 pF; AC or DC coupling.

Store Mode Characteristics

Bandwidth: (−3 dB) 50 kHz.

Sampling Rate: 500 samples/s to 1/3 megasamples/s in 1-2-5 sequence. All channels sampled simultaneously.

A/D Resolution: 8-bit (1 part in 256).

Memory: 32 k/channel.

Recording Time: 100 ms at 50-kHz bandwidth; 65.5 s at 50-Hz bandwidth using full 32 k word/channel memory.

Triggering

Internal: true level above, below or window; 0 to ±100% of range continuously selectable; AC or DC coupled.

External Analog: true level above, below or window; 0 to ±50 V continuously selectable; AC or DC coupled.

External Digital: TTL or contact closure.

Trigger Position: 5 selectable positions at −100%, −75%, −50%, −25% and 0% of memory.

Recording/Arm Modes: MAN switch arms unit for a single recording after a trigger; AUTO switch arms unit for babysitting.

Analog Outputs: Data stored in each channel is reconstructed to analog form and output simultaneously at 200 sample/s rate.

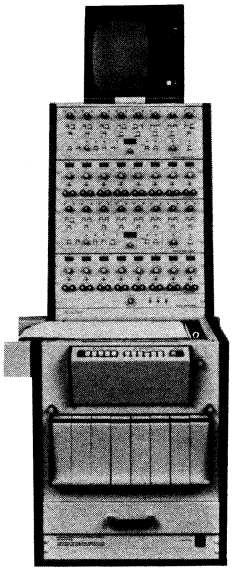
Digital Outputs: Via standard IEEE-488 interface or optional RS-232C.

Ordering Information

Model Number	Description
13-4146-02	4-Channel Waveform Recorder, 32 k/channel, IEEE-488 interface, rack mounting kit
13-4166-02	6-Channel Waveform Recorder, 32 k/channel, IEEE-488 interface, rack mounting kit
13-4186-02	8-Channel Waveform Recorder, 32 k/channel, IEEE-488 interface, rack mounting kit
13-4346-02	4-Channel Waveform Recorder, 32 k/channel, IEEE-488 interface, portable case
13-4366-02	6-Channel Waveform Recorder, 32 k/channel, IEEE-488 interface, portable case
13-4386-02	8-Channel Waveform Recorder, 32 k/channel, IEEE-488 interface, portable case

Waveform Recording System
Gould ES 1000W

- **Up to 32 independently positioned channels**
- **Chart playback speeds up to 416.7 m/s**
- **Wide, 10-in. channel span**
- **Overlapping trace capability**
- **Complete annotation anywhere on chart**
- **IRIG time generation**
- **Optional real time monitor**
- **Accepts wide range of analog and digital signal conditioners**



16 Channel ES 1000W System in High Turret Console

The ES 1000W System offers response up to 50 kHz for stored signals and can record frequencies up to 6 kHz in real time, while awaiting a trigger. Fast transients can be captured without interrupting real time data.

Data captured on the ES 1000W can be automatically output to the high-resolution electrostatic recorder. Actual chart speeds range from 1 mm/s to 250 mm/s and equivalent chart speeds during playback can exceed 416 m/s. An optional V1000 Video Display Monitor (page 66) lets you view all signals sent to the writing head with or without generating hard copy.

The ability of the ES 1000W to accept a full range of digital and 4600 Series Signal Conditioners greatly enhances its flexibility. Also available are modules for grid generation, up to 100 TTL-activated event marks, annotation, IRIG input, and IEEE-488.

Specifications

Number of Channels: 8, 16 or 32.

Writing System: Electrostatic, digital, no moving parts; paper width 11 in. (10-in. usable span); fan fold or roll. Resolution: 4 dots/mm in Y axis, 1000 dots/s in time axis.

Chart Speeds: 5, 10, 25, 50, 100 and 250 mm/s ±3%.

Trace Position: Adjustable over full 10-in. span by 10-turn pot. Traces may overlap and each is identified by a thin connecting line from chart border. (Optional M 200 Annotation Card permits identification of each trace's parameters.)

Event Markers: 4 event markers standard. (Up to 100 additional TTL or contact closure-activated markers can be added in groups of 20 per optional IT 200 Module.)

Time: A 2-mm long mark is printed every second. User-activated grid marks are printed every 5 mm. (Other grid line patterns available with optional IT 190 Grid Generator.)

Annotation: Channel ID, sensitivity, name of parameter, chart speed, real time and date or stopwatch, 24-line by 50-character message, and up to 10 lines by 50 characters of "on the fly" printing. (All annotation requires optional M 200 Character Generator Board.)

Remote Control: Complete TTL-compatible control of chart drive ON/OFF, chart speed, time lines ON/OFF, amplitude lines ON/OFF, trace ID ON/OFF and event markers ON/OFF. (With optional IT 488 Interface, these same functions can be controlled via IEEE-488 bus.)

Ordering Information

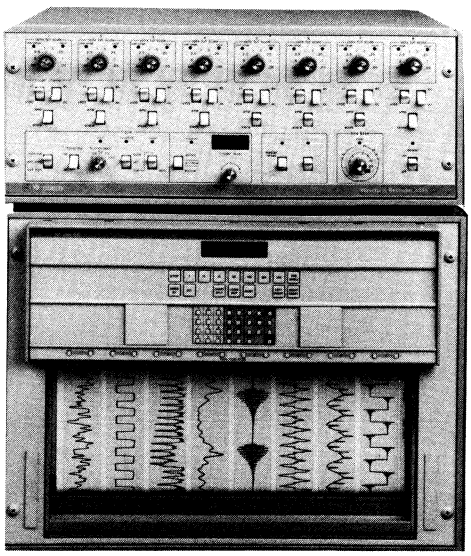
Model Number	Description
3039-1151-20	8 Channel, lowboy console system, 115 V
3039-1153-20	8 Channel, short vertical rack system, 115 V
3039-1151-26	8 Channel, lowboy console system, 230 V
3039-1153-26	8 Channel, short vertical rack system, 230 V

Accessories

Refer to pages 66 and 67.

Waveform Recording System
Gould 3000/4300

- **4, 6 or 8 channels**
- **Chart playback speeds up to 833 m/s**
- **Thermal or pressurized ink writing**
- **Chart edge annotation**
- **Accurate triggering with pretrigger viewing**
- **Low-cost hard copy**
- **IBM PC Series compatible**



Rugged, stand alone and rack-mounted Gould 3000/4300 Systems are the undisputed performance standards of the industry. By merging digital storage technology with a superb direct writing oscillograph, these systems combine powerful date capture capabilities with accurate, clean hard copy of multiple analog signals. In fact, you can slave several 3000/4300 Systems to process up to 112 analog input signals simultaneously.

With DC to 50 kHz response, equivalent chart speeds to 833 m/s and 10 µs transient response, the 3000/4300 outperforms all other recorders. It's faster, uses low-cost pressurized ink or thermal paper, provides the best trace quality, and is easy to use.

Significant features include: chart edge annotation of time, date, chart speed and user message; IRIG B input; trigger mark; remote start/stop and speed control; and a computer interface for detailed analysis of stored data.

Specifications

Number of Channels: 4 at 50 mm, 6 at 50 mm or 8 at 40 mm.

Input Voltage Range: ±50 mV to ±500 V in 1-2-5 sequence, continuously variable >2.5 to 1 between steps.

Amplifier Characteristics: Bandwidth (−3 dB) 85 kHz; input impedance 1 MΩ shunted by ≤55 pF; AC or DC coupling.

Store Mode Characteristics:

Bandwidth: (−3 dB): 50 kHz.

Sampling Rate: 500 samples/s to 1/3 megasamples/s in 1-2-5 sequence. All channels sampled simultaneously.

A/D Resolution: 8-bit (1 part in 256).

Memory: 32 k/channel.

Recording Time: 100 ms to 65.5 s.

Triggering:

Internal: True level above, below or window; 0 to ±100% of range continuously selectable; AC or DC coupled.

External Analog: True level above, below or window; 0 to ±50 V continuously selectable; AC or DC coupled.

External Digital: TTL or contact closure.

Trigger Position: 5 selectable positions at −100%, -75%, −50%, −25% and 0% of memory.

Recording/Arm Modes: MAN switch arms unit for a single recording after a trigger; AUTO switch arms unit for babysitting.

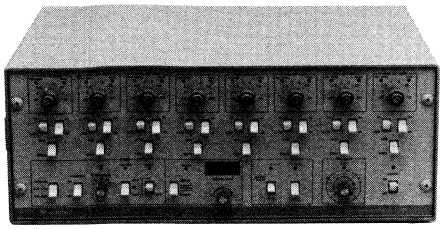
Analog Outputs: Data stored in each channel is reconstructed to analog form and output simultaneously at 200 sample/s rate.

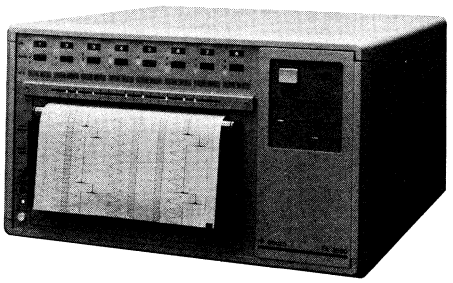
Digital Outputs: Via optional RS-232C or IEEE-488 interface.

Waveform Recording System

Gould TA 2000 / 4300

- **Up to 8 channels**
- **Chart playback speeds up to 333.3 m/s**
- **Thermal array writing**
- **200 mm maximum chart width**
- **Overlapping traces**
- **Full-page annotation**
- **x1, x2 and x3 trace expansion**





The TA 2000/4300 Waveform Recording System is based on the 4300 Waveform Recorder and the fastest thermal array recorder in the industry. Signals with frequencies up to 50 kHz can be captured and stored and signals up to 2.5 kHz can be recorded in real time.

Data captured on the TA 2000/4300 System can be automatically output to the high-performance TA 2000 Thermal Array Recorder. Actual chart speeds range from 1 to 200 mm/s or mm/min; equivalent digital playback chart speeds reach 333.3 m/s.

The TA 2000/4300 provides several unique features: When data is played back from storage, a chart edge event marker identifies the exact position of the trigger point and a front-panel gain feature expands traces up to 0.25 V/cm.

Specifications

Number of Channels: 1 to 8.

Event Marker: 2 mm wide mark at left chart edge when MARK key is depressed.

Writing Method: Single fixed thermal array head.

Recording Width: 200 mm FS.

Amplitude Resolution: 200 dots/in. (8 dots/mm).

Time Axis Resolution: 8 lines/mm (at 200 mm/s); 16 lines/mm (at 100 mm/s); 32 lines/mm (at 50 mm/s); 48 lines/mm (at 25 mm/s).

Sensitivity: x1, 1 V/cm; x2, 0.5 V/cm; x4, 0.25 V/cm.

Chart Speeds: 1, 2.5, 5, 10, 25, 50, 100, 200 mm/s and mm/min.

Timing Marks: Recorded in three lengths along both edges of chart paper.

Annotation: Date, Time, and Chart Speed are printed once per page. User defined full page (48 lines x 80 columns) and 8 character parameter identification possible via RS-232C interface.

Remote Control: Chart Start/Stop and Event Mark can be controlled from the rear panel remote connector via contact closure.

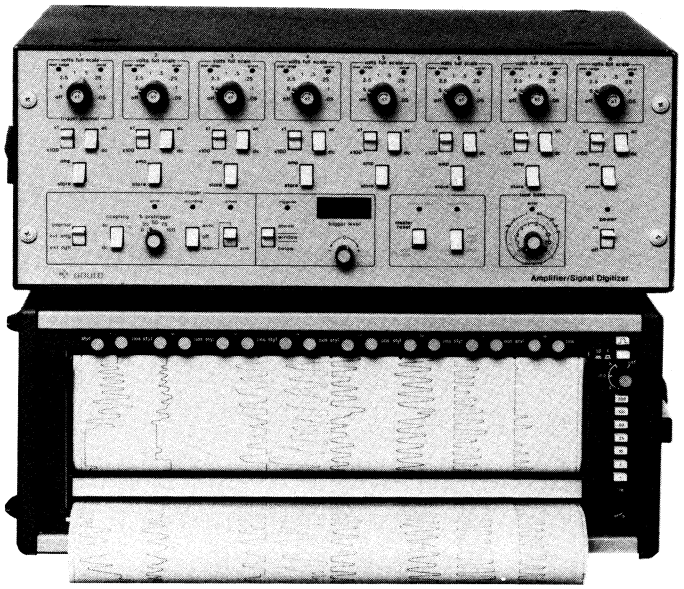
RS-232C Interface: Controls all TA 2000 front panel functions, full page (48 lines x 80 columns) of annotation, 8 character parameter identification.

Ordering Information

Model No.	Description
3008-8513-43	Benchtop TA 2000, 115 V 50/60 Hz
3008-8513-44	Benchtop TA 2000, 230 V 50/60 Hz
11-1508-11	Interface Cable Kit (Analog input and remote start/stop cables)
13-G43X6-02	8 channel waveform recorder

Waveform Recording System
Gould 8000W

- **4, 6 or 8 channels**
- **Chart playback speeds up to 333.3 m/s**
- **Thermal writing (blue or black)**
- **Lightweight, two-piece portable**
- **Low profile for minimum rack space**
- **Optional chart takeup**
- **RS-232C or IEEE-488 interfaces**



The portable 8000W System is a cost-effective combination of digital storage technology and an economical direct-writing oscillograph. Its capabilities far exceed those of conventional instruments such as lightbeam recorders.

The two-piece, portable system gives excellent trace resolution and high quality records and is available in four, six or eight channel configurations. Chart paper cost is a fraction of the cost of photosensitive paper required by lightbeam recorders.

This system is ideal for long-term monitoring of real time analog signals and high-frequency waveform recording.

IEEE-488 or RS-232C interfaces allow stored data to be transmitted and/or computer-analyzed.

Specifications

Number of Channels: 4 at 50 mm, 6 at 50 mm or 8 at 40 mm.

Input Voltage Range: ±50 mV to ±500 V in 1-2-5 sequence, continuously variable >2.5 to 1 between steps.

Amplifier Characteristics: Bandwidth (−3 dB) 85 kHz; input impedance 1 MΩ shunted by ≤55 pF; AC or DC coupling.

Store Mode Characteristics:

Bandwidth: (−3 dB): 50 kHz.

Sampling Rate: 500 samples/s to 1/3 megasamples/s in 1-2-5 sequence. All channels sampled simultaneously.

A/D Resolution: 8-bit (1 part in 256).

Memory: 32 k/channel.

Recording Time: 100 ms to 65s.

Triggering:

Internal: True level above, below or window; 0 to ±100% of range continuously selectable; AC or DC coupled.

External Analog: True level above, below or window; 0 to ±50 V continuously selectable; AC or DC coupled.

External Digital: TTL or contact closure.

Trigger Position: 5 selectable positions at −100%, −75%, −50%, −25% and 0% of memory.

Recording/Arm Modes: MAN switch arms unit for a single recording after a trigger; AUTO switch arms unit for babysitting.

Analog Outputs: Data stored in each channel is reconstructed to analog form and output simultaneously at 200 sample/s rate.

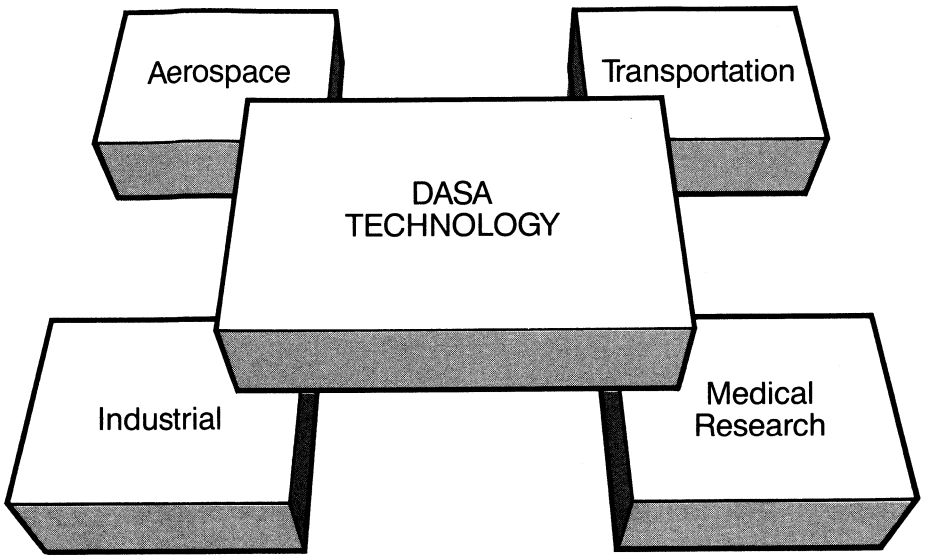
Digital Outputs: Via optional RS-232C or IEEE-488 interface.

Ordering Information

Model Number	Description
8232-4400-00	4 Channel, portable, 115 V, 50-60 Hz
8232-6600-00	6 Channel, portable, 115 V, 50-60 Hz
8232-8800-00	8 Channel, portable, 115 V, 50-60 Hz
8233-4400-06	4 Channel, portable, 220 V, 50-60 Hz
8233-6600-06	6 Channel, portable, 220 V, 50-60 Hz
8233-8800-06	8 Channel, portable, 220 V, 50-60 Hz

DASA Technology

- **IBM PC Series based**
- **DC to 50 kHz input frequency range**
- **Menu-driven software**
- **Recorder control**
- **Hard-copy output**
- **Compatible with Gould 4600 and 5600 Series Signal Conditioners**



Gould's *DASA technology* is a group of hardware and software products which can be configured into integrated systems for industrial, medical research, aerospace and transportation applications. DASA technology enhances traditional analog signal conditioning and recording with PC-based data acquisition and analysis.

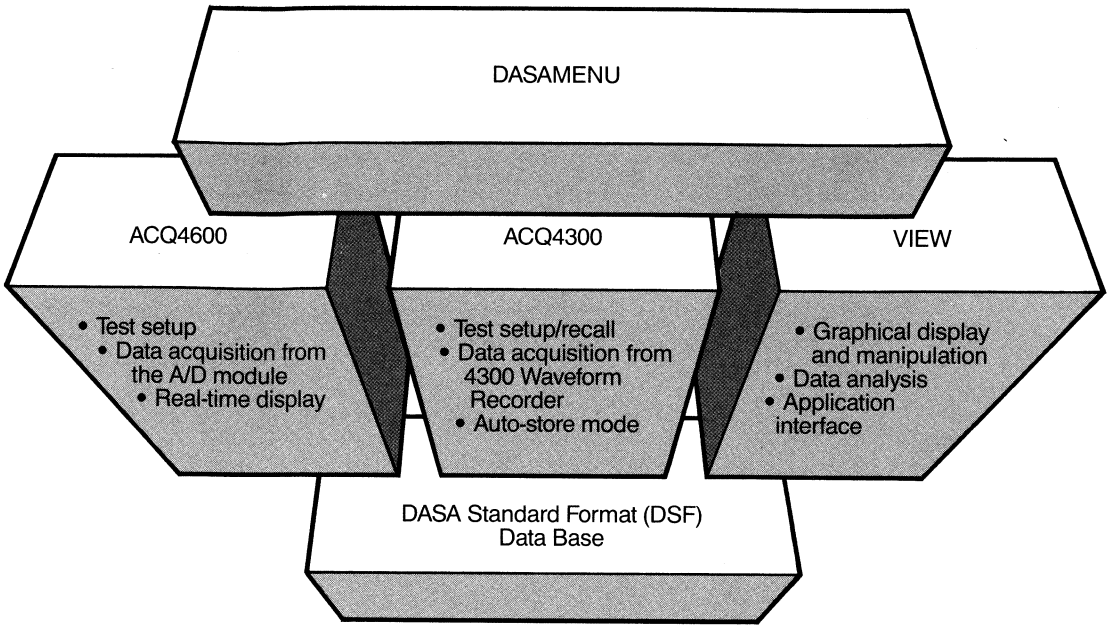
Currently, DASA technology includes two data acquisition systems. The first is composed of PC-bus plug-in boards providing up to 40 kHz continuous data throughput to disk for up to 16 channels and the real time display of up to 8 waveforms. The second is a computer front-end providing from DC to 50-kHz frequency response and 10-µs transient capture. Both are supported by menu-driven DASA software.

DASA software is composed of interactive acquisition, display and analysis software modules. *DASAMENU* is a menu program that provides DASA with a consistent user-interface. All other DASA modules and utilities to list, copy and delete files can be executed from DASAMENU without using DOS commands. *ACQ4600* and *ACQ4300* are used to set-up acquisition parameters and control data acquisition and storage; *VIEW* is the common graphics and analysis package utilized by both acquisition modules.

All data acquired with DASA technology is stored in a standard database. This DASA Standard Format (DSF) insures that data acquired with current Gould hardware and software will be compatible with future Gould hardware and software. DSF also facilitates the integration of third party software packages and custom, user-written programs with DASA technology. Gould's DASA technology provides hardware and software products that meet your application requirements from data acquisition and display to analysis and hard-copy output.

Software Architecture

Gould's unique software architecture utilizes several separate yet interactive menu-driven modules for acquisition / storage and for display / manipulation /analysis. Also, it provides several methods for conveniently integrating user-written application programs to the Gould data base.



Software Modules

DASAMENU

This module is a "shell" from which an operator can directly execute any program without using DOS commands. It also includes utilities to:

- Remove entire experiments or parts of experiments from the data base;
- Copy experiments between specified drives for backup or for transport;
- Listing of all experiments and runs.

ACQ4600

This module provides simple menus for the entry of all acquisition, storage, and real time display parameters for the DASA 4600. Features include:

- 40 kHz (max.) throughput direct to disk;
- Real time scrolling waveform display (of up to 8 non-overlapping waveforms) in monitor only and monitor and acquire modes;
- Keystroke, time, external digital (high/low, positive/negative, and change of state), internal (above, below, outside window, inside window), trigger modes;
- Halt and re-start acquisitions (without exiting the test);
- Digital marks to identify significant events;
- A Recall Test function that loads stored test parameters for execution;
- A Command Line function that allows a sequence of tests to be automatically loaded and executed.

ACQ4300

This module provides simple menus for acquisition, display, storage, and analysis of data for the DASA 9000. Features include:

- Display of front-panel settings of the Gould 4300 waveform recorder;
- Transmission of 1 to 32 k (max.) samples acquired by the 4300 Waveform Recorder, with or without offset to any position in the 4300 buffer;
- Transmit, arm, and trigger acquisition modes with delay by time or event;
- Automatic time-based acquisition of up to 99 events;
- Easy recall of test data, parameters, and 4300 front panel settings;
- On-line help for all commands.

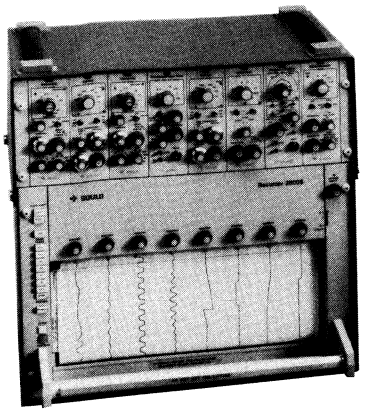
VIEW

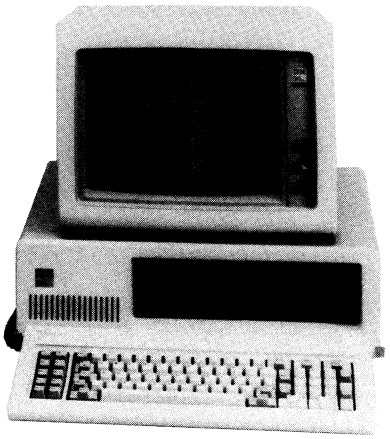
This module provides all data display, formatting, editing, annotation, and output functions. Features include:

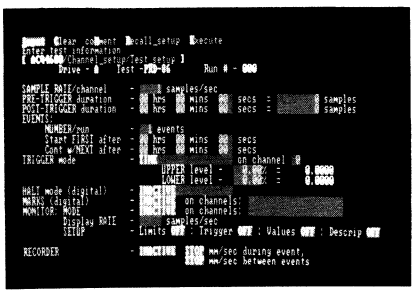
- Overlapping (up to eight) traces from one test or from a series of tests; scrolling the display forward or backward in time; toggling channels on and off for clarity; and selecting the number of baselines 1-2-4-8;
- Using a cursor to automatically display time from trigger and engineering units at each waveform intersection and to add "marks" to identify data segments of interest;
- Add graticules to the display;
- Enter annotation anywhere on the screen;
- Perform 20 advanced calculations with a single keystroke: RMS, average, standard deviation, area, max-min, slope, etc.;
- Perform basic math functions (add, subtract, multiply, divide, integrate, and differentiate) between channels or between a channel and a constant;
- Output screen data and text to a plotter;
- An "application interface" to conveniently link user-written programs to the Gould data base (DSF);
- An ASCII conversion utility to provide a link to off-the-shelf statistics and report generating programs like LOTUS 1-2-3, RS/1, etc.

Gould DASA 4600

- **16 analog inputs**
- **40 kHz continuous throughput direct to disk**
- **Real-time scrolling CRT display**
- **Extensive triggering**
- **Halt mode**







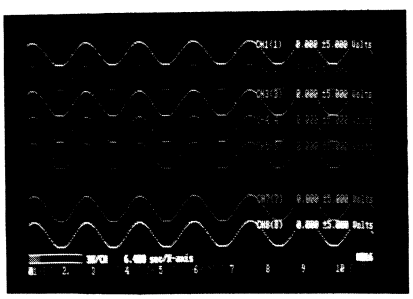
The Gould DASA 4600 is a low-cost data acquisition system designed for industrial and life-science research applications.

Gould's 4600 Series signal conditioners and direct writing recorders have been meeting the needs of research professionals for over 50 years and are recognized as industry standards.

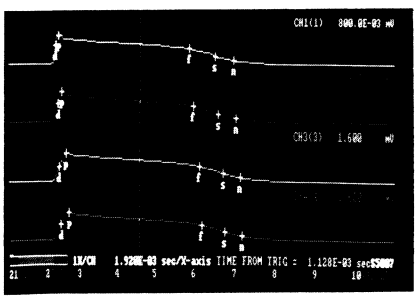
Traditional research-oriented data acquisition is analog-trace oriented, requiring visual interpretation by an experienced operator who manually annotates, analyzes and documents test results. The procedure is tedious, time consuming, and prone to computational errors. But now, with the DASA 4600, all data acquisition, storage, analysis, and reporting can be accomplished with computer speed and accuracy.

The DASA 4600 works with Gould and other signal conditioners and direct writing recorders, and it complements the performance of these traditional analog devices with special features like: continuous throughput to disk; real-time scrolling CRT display; sophisticated triggering; test sequence automation; and recorder support.

Post Acquisition Display and Analysis Software



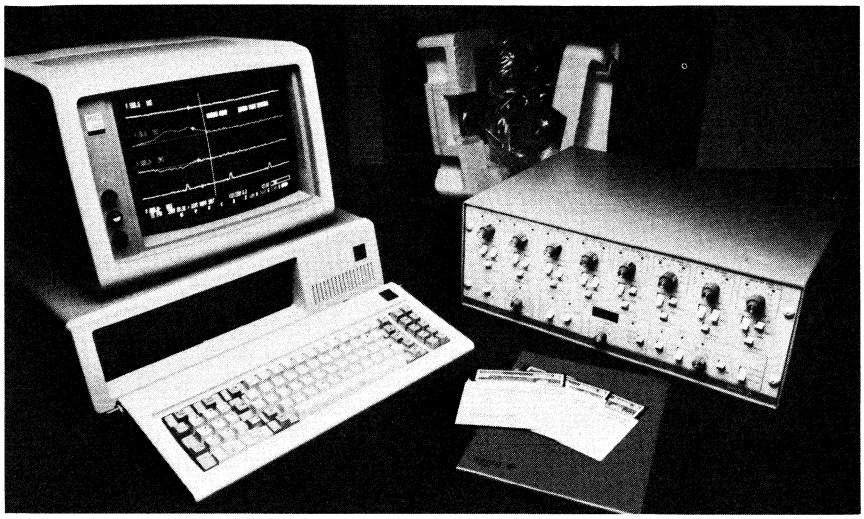
Graphical Display and Manipulation
Display, group and overlap up to 8 waveforms from the same or different tests for convenient comparison. Scroll through data and use the cursor to display time from trigger and Engineering Units at each waveform intersection.

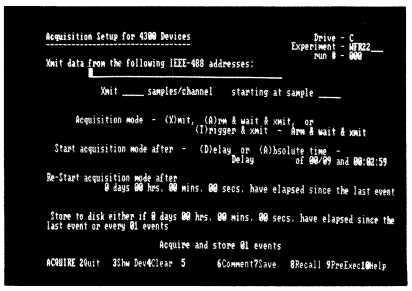


Marks
Use a cursor to mark events or points of interest which can then be annotated and stored.

Gould DASA 9000

- **Up to 112 channels**
- **DC to 50 kHz response**
- **10 μs transient capture at full amplitude**
- **32 k RAM per channel**
- **50 mV to 500 V full-scale sensitivity**
- **Accurate, versatile triggering**
- **Hard copy output**



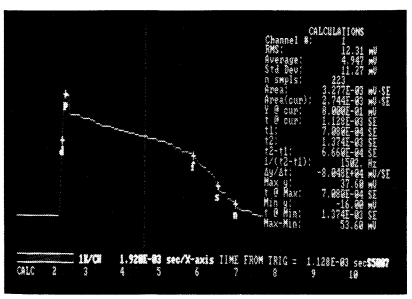


The Gould DASA 9000 combines the versatile, multi-channel capabilities of the 4300 Waveform Recorder with a powerful, specially programmed microcomputer! It brings flexibility and ease of use to acquiring, displaying, and analyzing data on up to 112 analog signals from DC to 50 kHz, and transients as fast as 10 μs.

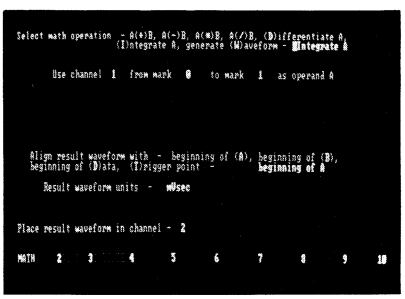
Gould DASA 9000's user-friendly menu-driven software and easy-to-use waveform recorder allow capture of data minutes after unpacking the system.

Auto-store mode provides "babysitting" during unattended operation. This facilitates analysis of random transients, such as power-line faults or data stream overshoots, which occur over long monitoring periods.

DASA 9000's multichannel capacity, frequency response, ease of setup and operation, auto store to disk, and flexible acquisition modes make it ideal for a variety of physical, industrial, and medical research or monitoring applications.



CALC
Calculate 20 values on a selected data segment. Computed values include: RMS, average, standard deviation, max./min., and slope.



MATH
Add, subtract, multiply, divide, integrate and differentiate signals with each other or constants.

DASA System Comparison Chart

Feature	DASA 4600	DASA 9000
Number of Analog Channels	16 max	112 max
Sample Rate	40 kHz aggregate	500 Hz to 333 kHz
Frequency Response	DC to 4 kHz	DC to 50 kHz
Memory / Storage	Up to max. hard disk capacity	32 k samples/channel
Throughput	Continuous to Disk	—
Pre-trigger	Yes	Yes
Triggering:		
Keystroke	Yes	—
Time	Yes	—
External Digital	Yes	Yes
Internal	Yes	Yes
External Analog	Yes	Yes
Real-Time Display	Yes	—
Hard-Copy Output	Yes	Yes
Recorder Control	Yes	Yes

Specifications

DASA 4600

Analog Inputs:

Channels: 16 single ended (Hi/GND); switch selectable (will be set to 16 single ended).

Accuracy: ±1 bit.

Input Range: ±10 V, ±5 V, ±1 V, ±0.5 V or 0-10 V, 0-5 V, 0-2 V, 0-1 V; switch selected (will be set to ±5 V).

Coding: Offset binary: True binary: unipolar 0 ± inputs (will be set to bipolar).

Overvoltage: Continuous single channel to ±35 V.

Input Current: 10 nA max 25°C.

Input Impedance: 1 MΩ.

Temperature Co-efficient: Gain or full seek, ±25 ppm/°C max. Zero, ±12 ppm/°C max.

A/D Type: Successive approximation.

Conversion Rate: 50,000 samples/s maximum.

Interchannel Skew: Constant at 20 µs.

Linearity: ±½ bit.

Zero Drift: ±10 ppm/°C max.

Gain Drift: ±30 ppm/°C max.

Trigger Modes:

Software Selectable:
Keystroke.
Time.
External digital (high/low, positive/negative, and change of state).
Internal (above, below, outside window, inside window).

Digital Outputs: 4 TTL Status Outputs (high/low)

Bit 1.
Start test/End test.

Bit 2.
Start pre-trigger/Pre-trigger filled.

Bit 3.
Trigger enabled/Trigger occurred.

Bit 4.
Start post-trigger/Post-trigger filled.

DASA 9000

Gould 4300 Series Front End

General

Number of Channels: 4, 6 or 8.

Maximum Number of Front Ends/DASA System: 14 (up to 112 channels).

Measurement Range: ±50 mV to ±500 V FS in 14 steps, continuously variable >2.5 to 1 between steps.

Store Mode Characteristics

Bandwidth (−3 dB): DC to 50 kHz.

Time Base

Sample Rate: 500 Hz to 1/3 MHz in 1-2-5 sequence.

Synchronization: All channels sampled simultaneously.

Clock Accuracy: 0.01%.

A/D Resolution: 8-bit successive approximation.

Internal Memory

Size: Switch selectable into 8 k or 32 k words/channel.

Record Time: 2 s/1k of memory to 3 ms/1k of memory.

Triggering

Internal: True level: above, below or window; continuously selectable from 0% to ±100% of range as indicated on 2½-digit LED; AC or DC coupled. (Events on Channel 1 trigger the unit.)

External Analog: True level: above, below or window; continuously selectable from 0 to ±50 VDC or peak AC; AC or DC coupled.

External Digital: TTL or contact closure.

Acquisition Modes: ARM mode arms the recorder, but does not trigger. TRIGGER mode arms and triggers the waveform recorders. XMIT mode transfers data in the waveform recorder memory to the computer.

Trigger Position: 100%, 75%, 50%, 25% and 0% of memory.

Outputs

Stored Digital Data: Via IEEE-488 bus to Signal Analysis subsystem.

Reconstructed Analog: Digital data in memory is converted to analog and outputted for oscillographic recording.

Amplifier Mode Characteristics

(Functions as a wideband amplifier for continuous, real time recording.)

Amplifier bandwidth (−3 dB): DC to 85 kHz.

Ordering Information

DASA 4600 Configuration

Model Number	Description
CL-710315	DASA Base Kit (A/D) A/D and timer modules, graphic adapter, and DASAMENU, VIEW, and ACQ4600 software

All systems below include Computer, 512 kb RAM, serial and parallel ports, math co-processor, color graphics with CRT display, A/D subsystem, timer module, and the DASAMENU, VIEW, and ACQ4600 software packages.

9006-1031-02	DASA Base PC/XT System (A/D) including one 360 kb floppy and one 10 Mb hard disk
9007-1041-02	DASA Base PC/AT System (A/D) including one 1.2 Mb floppy and one 20 Mb hard disk
9011-1051-02	DASA Base PC/AT System (A/D) including one 1.2 Mb floppy and one 30 Mb hard disk

DASA 9000 Configuration

Model Number	Description
CL-710314	DASA Base Kit (IEEE) IEEE-488 interface, graphics adapter, and DASAMENU, VIEW, and ACQ4300 software

All systems below include Computer, 512 kb RAM, serial and parallel ports, math co-processor, color graphics with CRT display, IEEE-488 interface module, and the DASAMENU, VIEW, and ACQ4300 software packages.

9006-1031-01	DASA Base PC/XT System (IEEE) including one 360 kb floppy and one 10 Mb hard disk
9007-1041-01	DASA Base PC/AT System (IEEE) including one 1.2 Mb floppy and one 20 Mb hard disk
9011-1051-01	DASA Base PC/AT System (IEEE) including one 1.2 Mb floppy and one 30 Mb hard disk

Options

Model Number	Description
9009-1941-00	Rack-mountable PC/AT
9009-1041-01	PC/AT in short rack
9009-1041-02	PC/AT in tall vertical rack
CL-710690	Rack-mountable color monitor

Custom Systems

Gould Test and Measurement instruments offer superior value in stand-alone and system configurations. This flexibility facilitates application specific and custom product solutions.

Flexibility and modular design facilitate the configuration and reconfiguration of Gould's instrument products to meet customer requirements. Physical, electrical and software interfaces are designed to provide cost effective "best-fit" configurations.

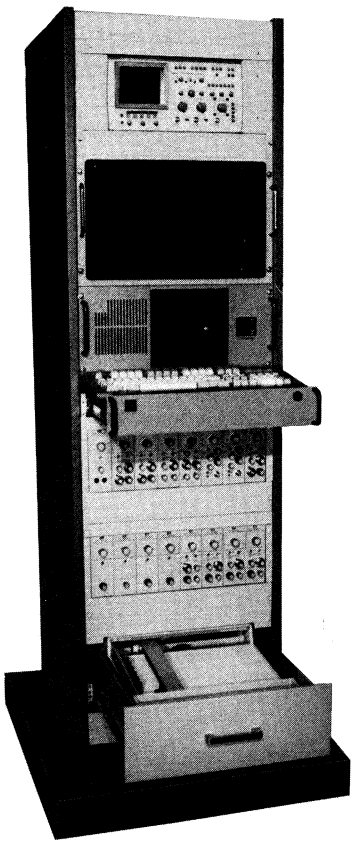
This configurability provides three direct customer benefits: **First,** "best fit" potentially eliminates excess capacity and functionality by the efficient matching of equipment to application requirements. No excess capacity or capability lies idle. **Second,** system expansion provides for incremental additions to meet future application requirements. And, **third,** the "value added" by Gould Engineering results in a higher return on your investment.

Gould has a long history of working directly with customers to identify, define and meet their requirements. This working relationship has provided Gould with a solid understanding of application requirements in the industrial, aerospace and medical markets. It also has shaped a product strategy that has resulted in a range of modular and configurable standard products and systems.

Gould designs and manufactures Application Specific Products and Systems to meet the special requirements of particular market segments. These include products that have been modified and systems that have been configured for dedicated applications. A selection of these products and systems are included on the following pages.

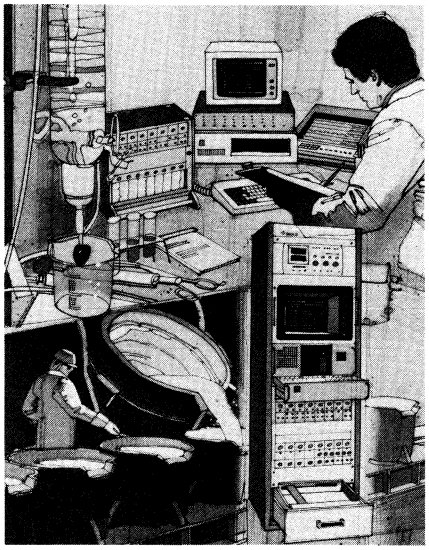
Gould also provides a customization service that utilizes internal resources and third-party products and resources to work with end-users to develop and implement custom solutions on a contractual basis.

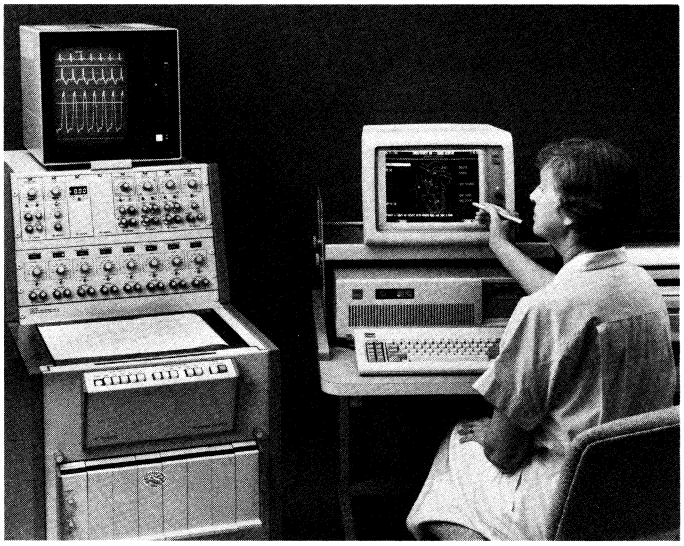
Contact your local Gould Sales Engineer for more information on how Gould can work with you to meet your special Test and Measurement requirements.

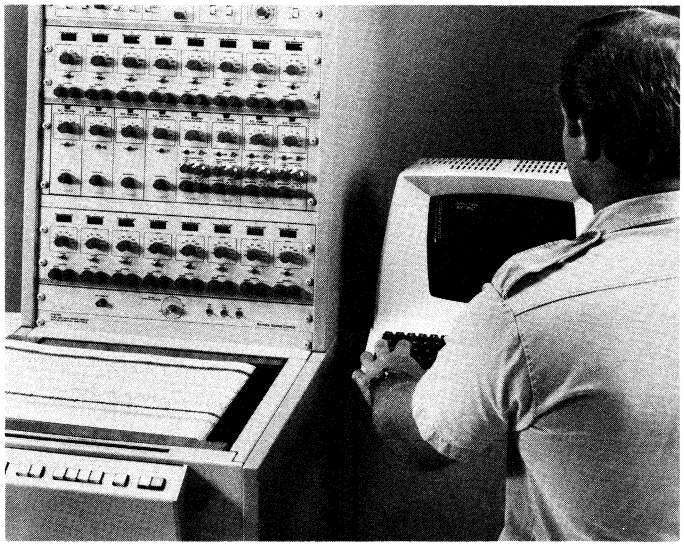


Industrial.
Gould provided a large automotive manufacturer with a special mobile rack mount system configured around Gould's DASA 9000 and DASA 4600 Data Acquisition Systems. Also included were an industrial IBM PC/AT; DC, Bridge, and High Gain 4600 Signal Conditioners and a Gould Digital Storage Oscilloscope.

- **Standard products and systems**
- **Application specific products and systems**
- **Custom products and systems**







Medical/Research

For the medical research community Gould has developed a dedicated Blood Pressure Analysis System. It includes all hardware and menu-driven software required to automatically acquire, compute and log systolic, diastolic, mean pressure and heart rate for up to eight inputs.

Medical/Clinical

In a joint effort with Trinity Computing Systems, a leader in hospital information management, Gould developed an Integrated Hemodynamic Analysis System. This System is based on Gould's Cath Lab Recording System, menu-driven acquisition, analysis and report generation software and an IBM PC/AT computer.

Aerospace/Telemetry

To meet the specific requirements of the aerospace and aviation industries, Gould has developed a Telemetry Monitoring System. The System is composed of Gould 4600 DC Signal Conditioners, ES 1000 Electrostatic Recorder, 4300 Waveform Recorder (optional), IRIG and NASA decoder and V1000 Real Time Monitor.

Aerospace/Power Monitoring

Gould developed a 32-channel airborne power monitoring system for a leading aerospace company. This system tracks the origin and propagation of power line disturbances. It is composed of 32 single-channel Waveform Storage Modules, an 8-channel isolator, and a DASA 4600 Data Acquisition System. It provides 100-kHz frequency response, 10-µs transient capture, per channel triggering and channel-to-channel isolation.

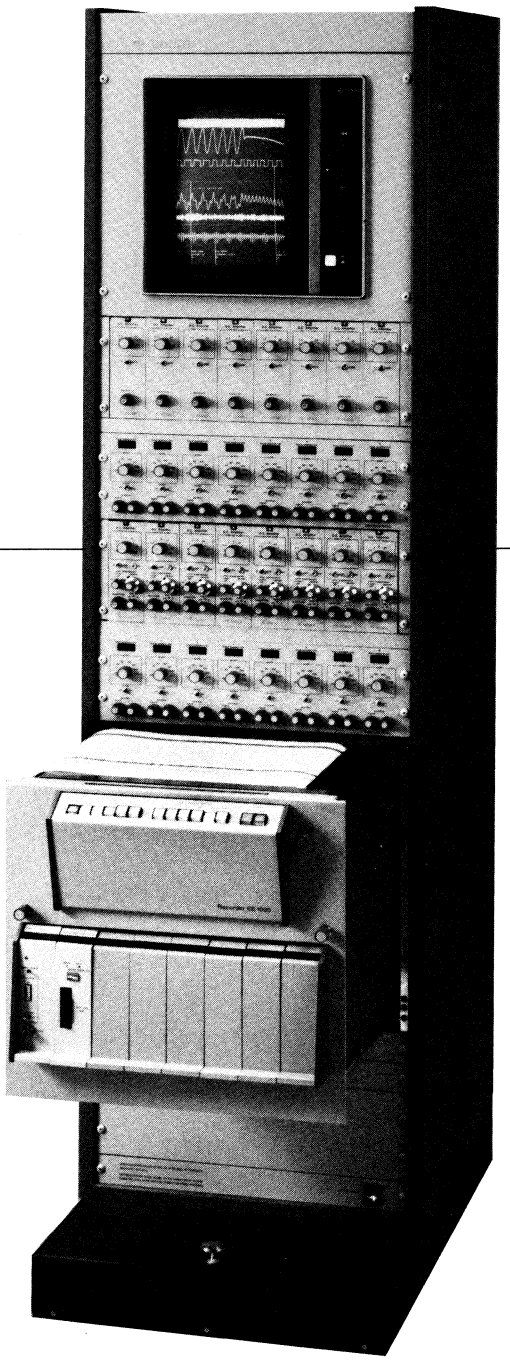
Telemetry Data System

- **State-of-the-science system to record and monitor telemetered signals**
- **Records up to 32 analog, 15 digital or 100 event channels plus alpha-numeric time code printing**
- **Provides customized hard-copy output with selectable channel widths, grids patterns, and full annotation via IEEE-488 or RS-232C**
- **Advanced Real Time Video Monitor provides "quick look" capability**
- **Fully remote controllable via TTL or IEEE-488 interface**

The Gould Telemetry Data Systems are the most advanced recording systems available for the aerospace and aviation industries. These units are designed to provide the utmost in flexibility for your flight test and flight data processing needs.

The systems accept signals from magnetic tape, data reduction computer, or directly from your front-end equipment. They provide basic DC signal conditioning for analog signals and formatting for digital signals.

IRIG and NASA time codes are decoded by our special interface, which translates the code into alphanumeric print. This saves valuable data channels for test signals. You can also print real time information concurrently with IRIG print. And if you need to print the code on the chart, the Telemetry Data System displays the code with the fidelity needed for time correlation. The adjustable trace feature allows you to position half of the code signal on the edge of the chart which minimizes the use of chart space for code recording.



Gould Telemetry Data System in Tall Vertical Cabinet

Customized Hard Copy Outputs. Each channel width is adjustable from zero to full scale to increase the resolution of selected channels. You can position each channel anywhere on the chart, providing both discrete channels and overlapping traces.

The standard annotation feature allows you to pre-enter (load) up to 24 message lines via the optional terminals. Also, you can program messages to be printed on-the-fly to note important test events. Each trace is identified with a number and preprogrammed parameter message.

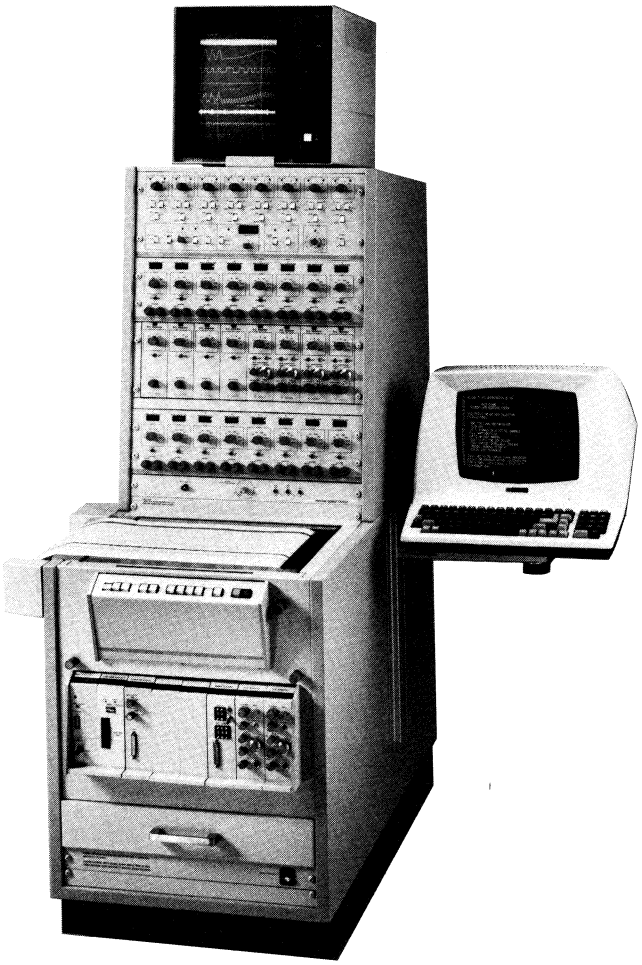
Real Time "Quick Look" Monitor. The high resolution video monitor provides "quick look" display of telemetered signals that is identical to those on the moving chart. The monitor can be used without running the chart until hard copy is required, thus saving chart paper. A special hard copy feature allows you to make a copy of the screen with the touch of a button. Optional slave monitors (12-in. and 24-in. screens) provide remote signal display.

Signal Conditioning. The Advanced Telemetry Data System Provides DC signal conditioning for 16 analog channels. It provides zero suppression, 25-mV sensitivity and external low pass filtering. Frequency response is up to 3 kHz.

Remote Control. The recording system can be remotely controlled via either its standard TTL interface (0-5 V), an optional IEEE-488 Interface, or an optional Remote Control Box.

Options. An expansion housing allows you to increase data input channels. Add up to 16 analog channels with 2.5 V to 50 V full scale sensitivity or up to 15 digital channels with up to 10-bit digital words at a transfer rate of up to 42 k words/s.

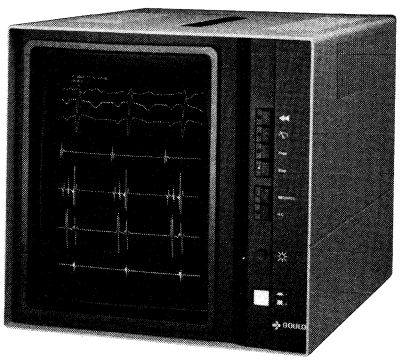
Additional options include a transient capture capability, providing high frequency waveform recording (signals to 50 kHz) and automatic amplitude triggering, and a digital interface for computer storage and analysis.



Gould Telemetry Data System in Hi-Turret Lowboy Configuration

Specifications and Ordering Information:

Consult your local Gould Sales Office or Representative (pages 166 and 167) for more information.



Gould Real Time Monitor

Medical Products and Systems

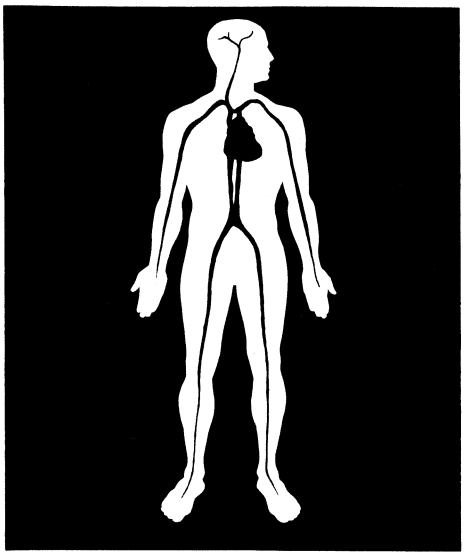
Gould's involvement in high-quality medical instrumentation dates back to the 1930's, when we introduced the first practical, portable electrocardiograph. Since then, we have developed a full line of medical systems for measuring, displaying, and recording a wide range of variables in medical research, clinical, and teaching environments.

Quality, accuracy, and reliability are hallmarks of all Gould Recording Systems Division products — one reason why our medical instrumentation is used in leading research centers, hospitals, and medical schools throughout the world.

Our commitment to the highest quality, state-of-the-art equipment, plus a worldwide sales and service network, offer a total solution for your medical instrumentation requirements. This complete product-plus-support approach assists you from system specification and selection through startup and post-sale service.

Medical instrumentation described on these pages represents our current products. Major systems, recorders, amplifiers, displays, and accessories provide the broadest selection of medical instrumentation products to meet your exacting measurement requirements.

- **50 years experience in medical instrumentation and systems**
- **Complete systems for research and clinical applications**
- **Broadest range of high performance recorders**
- **Comprehensive selection of medical signal conditioners**
- **Integrated Blood Pressure Analysis System**
- **Integrated Hemodynamic Analysis System**
- **Worldwide service support**

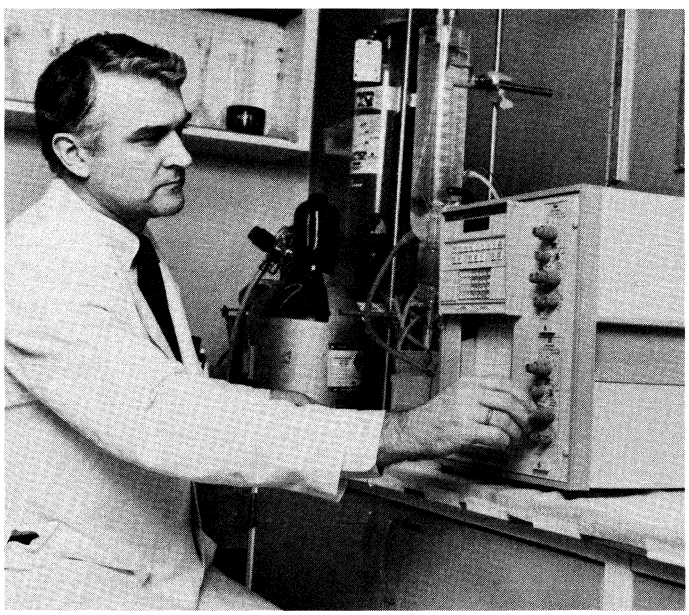


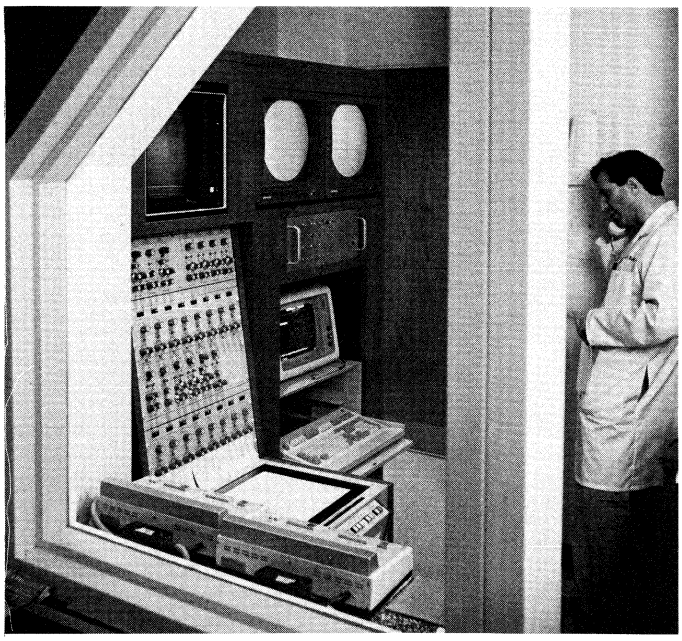
All Gould 4600 Series Medical Instrumentation Amplifiers* are plug-in compatible with our 3000 Series, TA 2000, and ES 1000 Recorders. They also operate independently in portable and rackmounted cases. Units described on the following pages are designed specifically for life sciences research and clinical applications.

Gould Medical Systems and Medical Instrumentation products meet your exact investigative, diagnostic or demonstration needs.

We welcome your comments and suggestions concerning our Medical Instrumentation products. If you need more information or help, please contact your local Gould Medical Sales Specialist. (See pages 166 and 167.)

*These interchangeable units are 6.1 in. (15.5 cm) high x 2.18 in. (5.5 cm) wide x 13.0 in. (33 cm) deep, including attentuator knob and chassis-mounted connector.





Gould Instrumentation Chart
for Monitoring Physiological Variables

Use these definitive charts to determine which of the wide variety of Gould signal conditioners you can combine with an appropriate transducer and Gould recorder to meet your specific physiological recording needs. For assistance in methodology and in all phases of system design, specifications and pricing, call on your nearest Gould medical instrumentation specialist.

Bioelectric Measurements

Application/Description	Frequency Range	Transducer/ Accessory	Applicable Gould Amplifier
Electrocardiogram (ECG or EKG) — A record of the electrical activity of the heart usually recorded from body surface electrodes.	0.05-500 Hz	Patient Cable Kit	13-4615-64A ECG 13-4615-65A ECG/Biotach
Electrophysiology (E.P.) — Invasive study of the electrical activity of the heart. Electrode tipped catheters are placed inside the heart to record local potentials. Electrodes may be surgically placed on or in the heart muscle (myocardium).	0.05-1000 Hz	Multipolar catheter, custom electrodes	13-4615-58 Universal with 11-5407-58 Isolated preamp
Electroencephalogram (EEG) — Record of the electrical activity of the brain. Recorded from surface electrodes on the scalp.	1-100 Hz	Surface electrodes	13-4615-58 Universal with 11-5407-58 Isolated preamp
Electromyogram (EMG) — Record of the electrical activity of a muscle. An index of total activity can be obtained by integrating the primary signal.	5-2000 Hz	Surface electrodes, needle electrodes, or custom electrodes	13-4615-58 Universal with 11-5407-58 Isolated preamp 13-4615-70 Integrator
Electronystagmogram (ENG) — A record of changes in eye position using electrodes placed near the eyes. Rate of movement is calculated by differentiating the primary signal.	DC-100 Hz	Ag/AgCl surface electrodes	13-4615-58 Universal with 11-5407-58 Isolated preamp 13-4615-71 Differentiator
Electroretinogram (ERG) — A record of the electrical activity of the retina.	0.01-200 Hz	Custom "contact lens" electrodes	13-4615-58 Universal with 11-5407-58 Isolated preamp
Direct Nerve Recordings — Record of the electrical activity of a single nerve or nerve bundle made by placing electrodes directly on (in) the nerve or bundle. An index of activity can be obtained by integrating the primary signal.	DC-10,000 Hz	Custom electrodes	13-4615-58 Universal with 11-5407-58 Isolated preamp 13-4616-20 Waveform 13-4615-70 Integrator

Computed Measurements (Primary signal usually obtained from other medical amplifier.)

Application/Description	Primary Signal	Applicable Gould Amplifier
Heart Rate — Beats per minute (beat-by-beat or average).	ECG waveform, Pulsatile pressure waveform or Pulsatile blood flow waveform	13-4615-65A ECG/Biotach 13-4615-66 Biotach
Respiratory Rate — Breaths per minute.	Respiratory flow waveform, Chest movement or Respiratory activity waveform	13-4615-66 Biotach
Respiratory Volume — Volume of air expired in a single breath or per minute.	Respiratory flow (pneumotach)	13-4615-70 Integrator
LV dP/dt — An index of myocardial contractility computed using the first derivative of the left ventricular blood pressure.	Left ventricular blood pressure	13-4615-71 Differentiator
Rate of Muscle Contraction — An index of isotonic muscle contraction computed using the first derivative of the muscle length signal.	Muscle length (Isotonic signal)	13-4615-71 Differentiator
d force/dt — The rate at which a muscle develops force while length is held constant.	Force of contraction (Isometric signal)	13-4615-71 Differentiator
Nerve Activity — An index is developed by measuring the area under the curve (integral) representing the sum of nerve action potentials.	Direct nerve recording	13-4615-70 Integrator
Muscle Activity — An index is developed by measuring the area under the curve (integral) representing the sum of muscle action potentials.	Electromyogram	13-4615-70 Integrator

Gould 4600 Series Medical Instrumentation Amplifiers

All Gould 4600 Series Medical Instrumentation Amplifiers are plug-in compatible with Gould RS 3000 Series and TA 2000 Series Recorders, as well as Gould ES 1000 Electrostatic Recorders. They may be operated independently in portable and rack-mounted cases.

Units described on the following pages are designed specifically for life sciences research and clinical applications. We are continually developing new Amplifiers and welcome your inquiries.

All 4600 Series Medical Amplifiers are of rugged, solid state design and their direct-reading front panel controls are clearly labeled by function. These interchangeable units are 15.5 cm (6.1 in.) high x 5.5 cm (2.18 in.) wide x 33 cm (13.0 in.) deep, including attenuator knob and chassis-mounted connector.

Transduced Measurements

Application/Description	Primary Signal	Frequency Range	Applicable Gould Amplifier
Blood Pressure — Hydrostatic pressure of blood in any vessel of the body.	Pressure transducers	DC-200 Hz	13-4615-35 Carrier 13-4615-58 Universal 13-4615-50 Transducer 13-4615-52 Pressure Processor
Phonocardiogram — Record of heart sounds. May be taken from the chest surface using a microphone or invasively using a transducer-tipped catheter.	Heart sound microphone Transducer-tipped catheter	16-2000 Hz	13-4615-58 Universal
Carotid Pulse/Apex Pulse — Indirect recording of the blood pressure pulse waveform in the carotid artery, or mechanical movement of the heart.	Apex/carotid pulse sensor	0.1-60 Hz	13-4615-58 Universal 13-4615-64A ECG 13-4615-65A ECG/Biotach 13-4615-66 Biotach
Photoplethysmograph — A qualitative recording of arterial pulse waveform made by sensing changes in the volume of blood in a finger, ear lobe, etc.	Photoelectric finger, radial, or ear pulse sensors	0.05-30 Hz	13-4615-64A ECG 13-4615-65A ECG/Biotach 13-4615-66 Biotach
Respiratory Flows and Volumes — Primary signal is the rate of flow of air into or out of the lungs in liters/second. Integrating this signal gives volumes of air expired (inspired) in liters.	Pneumotach with differential pressure transducer	DC-40 Hz	13-4615-35 Carrier with 13-4615-70 Integrator
Respiratory Activity — Motion of the chest associated with respiration — qualitative only.	Pneumotrace respiratory belt	DC-2 Hz	13-4615-58 Universal or 13-4615-66 Biotach
Temperature — Body temperature, or temperature of an organ, region, water bath, or chemical reaction.	YSI thermistor RTD	DC-10 Hz	13-4615-474029 Temperature
Isotonic Muscle Contraction — Change in muscle length while holding force constant.	Gould Metripak®	DC-200 Hz	13-4615-104029 DC 13-4615-004029 DC 13-4615-58 Universal 13-4615-50 Transducer
Isometric Muscle Contraction — Force of contraction of muscle held at constant length.	Gould Metrigram®	DC-200 Hz	13-4615-58 Universal 13-4615-50 Transducer 13-4615-35 Carrier
Esophageal Pressure — Force exerted by the esophagus when moving food from the mouth to the stomach.	Multi-lumen catheter, infusion system and pressure transducers or multi-transducer catheter.	DC-20 Hz	13-4615-50 Transducer 13-4615-35 Carrier 13-4615-58 Universal

Preconditioned Measurements

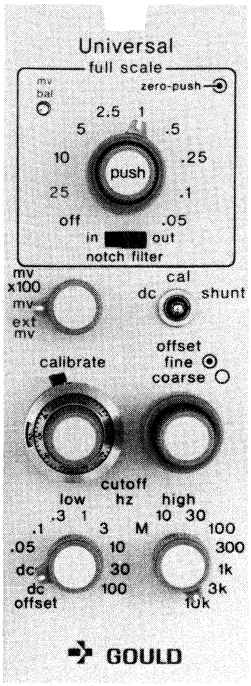
Transcutaneous blood gases; Respiratory O_2, CO_2; pH; organ blood flows are quantities that are preconditioned using specialized external amplifiers with DC outputs. Examples of specific applications are:

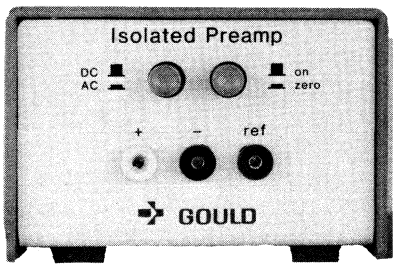
Application/Description	Specialized Signal Conditioner	Applicable Gould Amplifier
Stroke Volume — Volume of blood ejected by the heart in one beat.	Blood flow signal from electromagnetic flow meter around ascending aorta.	13-4615-70 Integrator
Cardiac Output — Volume of blood pumped by the heart per minute.	Blood flow signal from electromagnetic flow meter around ascending aorta.	13-4615-70 Integrator
Cardiac Output (indicator dilution) — Volume of blood pumped by the heart per minute.	Dye or thermal dilution signal from cuvette densitometer or cardiac output computer.	13-4615-004029 DC 13-4615-104029 DC 13-4615-58 Universal

Universal™ Amplifier

Model 13-4615-58

- **This Amplifier permits excellent measurements of**
  - **General purpose AC or DC signals from 25 μV to 10 V FS.**
  - **Pressures, forces and displacements from strain gage transducers directly in units of measure.**
  - **Bioelectric potentials when used with Isolated Preamp from high frequency nerve potentials to DC coupled eye potentials.**
- **Combines high input impedance, wide bandwidth, low noise and low drift into one amplifier.**





This 10-kHz Amplifier provides the high impedance inputs, high gain, and low noise characteristics required for recording bioelectric potentials including HIS Bundle, EMG, EOG, ENG, and ECG. One-mV or 50-μV cal signals and a full range of high-pass and low-pass filters permit the Amplifier to easily reproduce the most demanding bioelectric signal.

The Universal Amplifier's stable DC excitation provides precise measurements of pressure, force, and position. Calibration is simple and precise in physiological units of measure.

As a general purpose AC or DC signal conditioner, it is also compatible with piezoelectric heart sound, and apex/carotid pulse microphones.

The optional Gould Isolated Preamplifier provides patient isolation* and true AC coupling, while putting the first gain stage close to the signal source. This reduces signal loss and noise associated with long signal cables, high impedance electrodes and non-isolated amplifiers.

*For bioelectric recordings only. For pressure measurements, patient isolation is provided by the transducer.

Specifications

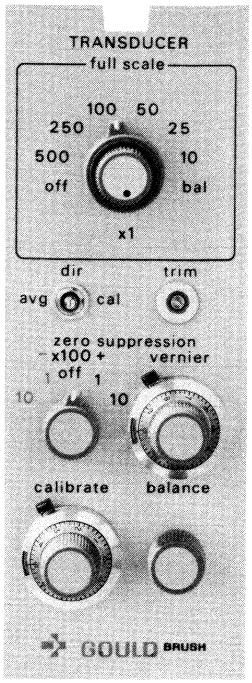
	Universal Amplifier Alone	Universal Amplifier with Isolated Preamp 11-5407-58
Input Configuration	Differential and balanced to chassis ground	Isolated and guarded, differential and balanced to isolated reference
Sink Risk Leakage Current	Not applicable	<10 μA at 230 VRMS, 60 Hz, inputs to chassis
Input Impedance	>100 MΩ each input to chassis	DC coupled: >1000 MΩ shunted by <30 pF AC coupled: ≈ 100 MΩ shunted by <30 pF
Measurement Range (full scale)	25 μV to 10 V FS	25 μV to 260 mV FS
Frequency Response (Adjustable)	DC to 10 kHz (−3 dB)	DC to 10 kHz (−6 dB)
Maximum Safe Input Voltage	120 VRMS input to chassis	50 V peak input to reference 500 V peak input to chassis
Internal Calibration Signal	Selectable between 50 μV and 1 mV within ±1% to 25°C	
Shunt	Connects shunt calibration resistor across one arm of bridge transducer circuit	
Bridge Excitation (mV and mV x100 only)	5 VDC ±5 mV (adjustable via plug-in resistor), polarity reversible.	Not applicable
Recorder and Monitor Outputs	5 V into 50 kΩ, single ended to ground	
Digital Display Output Voltage	(Unaffected by step sensitivity. Mean or direct signal via jumper wire) 10 mV per unit input	

See Bulletin 459-22 for more detailed information.

Transducer Amplifier

Model 13-4615-50

- **Pressure, force, and position measurement**
- **Simple, precise calibration directly in mmHg, grams, cm, etc.**
- **Front panel selection of direct or average (mean)**
- **Calibrated zero suppression in units of measure**
- **Low pass output filter**
- **Multiple simultaneous outputs for recorder, digital display, and monitor**



The Gould Transducer Amplifier is a precision signal conditioner for measuring pressure, force, or position. It provides ultra-stable excitation for DC strain gage transducers while providing for plug-in bridge completion resistors.

Precision calibration directly in mmHg, grams, or cm is provided by the front-panel controls. Calibrated zero suppression permits adding or subtracting a constant from the input signal, which is especially useful for moving the baseline without interrupting a procedure or recalibrating.

Multiple simultaneous outputs are available for recorder, digital display, and monitor. An internally selectable low-pass filter permits you to further tailor this Amplifier to your specific measurement requirements.

Specifications

Measurement Range: 50 μV to 5 V FS (10 mmHg to 500 mmHg FS with Gould blood pressure transducers).

Bridge Excitation: ±2.5 VDC standard (variable to ±5.0 VDC with plug-in resistor) regulated to ±0.05%.

Frequency Response

Direct Mode: DC to 1 kHz (−3 dB) internally selected filter.

Average Mode: Mean pressure (3.2 second time constant).

Input Circuit: Differential balanced to ground.

Input Impedance: 50 kΩ.

Recorder and Monitor Outputs: 5 V single-ended to ground into 2 kΩ or greater.

Display Output: 10 mV/unit or 100 mV/unit into 2 kΩ or greater (internally selected).

Calibrated Zero Suppression: Add or subtract zero to 100 or zero to 1000 units (i.e., mmHg) with resolution of 0.1%.

Accessories

Model Number	Description
11-5407-50	Input Connector, 12-pin Deutsch (supplied)
369500-18501	P23XL Isolated Blood Pressure Transducer
369500-18502	P10EZ Miniature Isolated Blood Pressure Transducer
793341-04042	Isotonic Muscle Transducer, Gould Metripak® for use only with Universal Amplifier 13-4615-58 and Transducer Amplifier 13-4615-50

Isometric Force Transducer, Gould Metrigram®

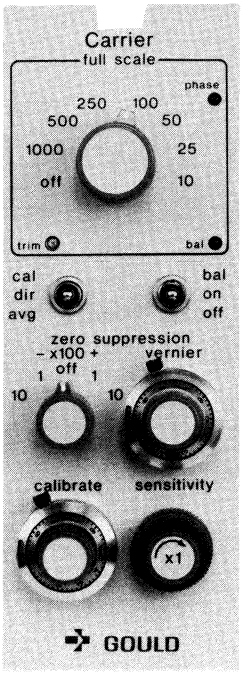
797159-1	±10 gm
797159-2	±25 gm
797159-3	±50 gm
797159-4	±100 gm

See Bulletin 459-1 for more detailed information.

Gould Carrier Amplifier

Model 13-4615-35

- **Measures pressure, force, position**
- **Provides AC excitation for LVDT, variable reluctance and strain gage transducers**
- **Push-button auto balance**
- **Simple calibration in physiological units such as mmHg, grams, cm**
- **Calibrated zero suppression**
- **Easy synchronization of multiple units**



The Gould Carrier Amplifier measures pressures, forces, and displacement with unprecedented ease. By replacing separate, interactive R and C balance controls with electronic auto balance, as well as auto phase lock of excitation and signal, it provides features never before available to users of AC excited transducers. Eliminates time-consuming setup or phase errors. Just flip a switch and it's balanced. It works equally well with LVDT, variable reluctance, and strain gage transducers.

Calibration in physiological units is a simple, one-step process. In multiple transducer applications, two features are important — Carrier oscillators can be synchronized to eliminate interference, and all Carrier Amplifiers can be balanced with a single command. Isolating inputs and excitation permits operation with non-isolated transducers by limiting leakage current to less than 10 μA.

Specifications

Amplifier Input Configuration: Differential balanced to guard, and isolated from ground. Impedance: 1 MΩ at 2.5 kHz each input.

Sink Risk Leakage Current: <10 μA at 120 VRMS, 60 Hz between any input (including excitation terminals) and chassis.

Measurement Range: 50 μV to 10.5 VRMS FS, includes internally selectable x1-x100 input divider.

Noise (350-Ω unbalance): 10 μV p-p referred to input, residual carrier at output $<0.25\%$ of FS.

Common Mode Rejection: >120 dB at 60 Hz with 350-Ω unbalance at 100 μVRMS FS and from input to chassis.

Step Sensitivity: 10 - 1000 units plus x100 input attenuator.

Zero Suppression: 0 to ± 100 or 0 to ± 1000 units plus "OFF".

Auto Balance

Range: 0 to ± 10 mVRMS referred to input (R and C balance), variable via plug-in balance resistor.

Resolution: 1:2048.

Remote Balance Command: TTL compatible or momentary short to common will initiate action.

Recorder and Monitor Outputs: 5 V into 2 kΩ or greater, single ended to ground.

Digital Display Output: 10 mV per unit or 100 mV per unit, internally selected.

Frequency Response: Direct DC to 200 Hz plus mean (3.2-s time constant).

Transducer Excitation

Voltage: Adjustable from 2 to 10 VRMS, isolated from chassis; maximum load 0.285 W.

Frequency: 2500 Hz $\pm 5\%$ sine wave.

Synchronization: Jumper selectable master or slave.

See Bulletin 459-26 for more detailed information.

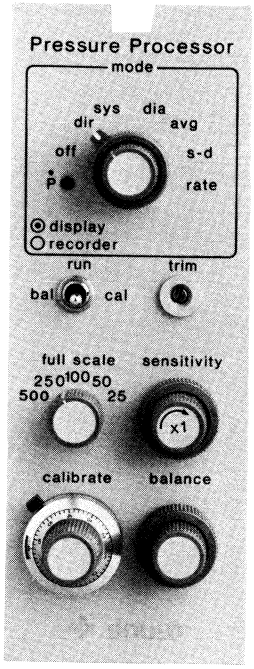
Accessories

Model Number	Description
11-5407-50	Input Connector, 12-pin Deutsch (supplied)
242879-351	350-Ω Bridge Completion Resistor
369500-18501	P23XL Isolated Blood Pressure Transducer
369500-18502	P10EZ Miniature Isolated Blood Pressure Transducer
369500-57035	Differential Pressure Transducer, Validyne 0 to ± 20 mm H_2O
369500-57036	Differential Pressure Transducer, Validyne 0 to ± 9 mm H_2O

Pressure Processor Amplifier

Model 13-4615-525863

- **Connects directly to blood pressure transducers**
- **Calibrated directly in millimeters of mercury**
- **Computes parameters of blood pressure waveform**
- **Systolic, diastolic, mean, and pulse pressures**
- **Calculates and displays parameters beat-by-beat or on 2-, 4-, or 8-beat average**
- **Unaffected by electrosurgical noise**
- **Simultaneous multiple outputs**



The Gould Pressure Processor extracts the discrete parameters of the dynamic arterial blood pressure waveform from strain gage blood pressure transducers. In addition to conditioning the signal and displaying the waveform in the direct mode, the following outputs are available for graphic display on a recorder, or independently, for numeric readout on a digital display: systolic pressure, diastolic pressure, mean pressure, pulse pressure, and pulse rate. All outputs are simultaneously available for use with remote digital displays.

The discrete values of systolic, diastolic and pulse pressures are available per cardiac cycle or the average values may be obtained every 2, 4 or 8 cardiac cycles.

A visual alarm indicating the absence of a proper pressure pulse is incorporated and derived from dP/dt. The alarm condition causes the computed parameters to switch from a peak-reading mode to a self-scan condition thus, even in alarm, a replica of the incoming signal is displayed.

Specifications

Measurement Range: 125 μV to 7.5 V FS.

Attenuator Steps: 25 to 500 mmHg or bpm FS plus x1 to x2.5 vernier.

Input Circuit (EMI suppressed): Differential and balanced to ground.

Input Impedance: 1 MΩ shunted by 200 pF to ground.

Recorder Output: 5 V into 50 kΩ or greater, single-ended to ground.

Display Output: 6 V into 50 kΩ or greater. Scaled at either 10 or 100 mV/mmHg or bpm (internally selected).

Frequency Response (−6 dB): DC to 1000 Hz, 100-Hz filter internally selectable.

See Bulletin 459-16 for more detailed information.

Bridge Excitation: ±2.5 VDC standard, polarity reversible, regulated to ±0.05%.

Trigger Requirements (dP/dt): Minimum signal for reliable trigger: a pulse pressure greater than 25 mmHg and changing at greater than 100 mmHg/second.

Display Update Pulse: TTL compatible positive pulse, ≈ 10 ms in duration initiated by dP/dt pulse.

Accessories

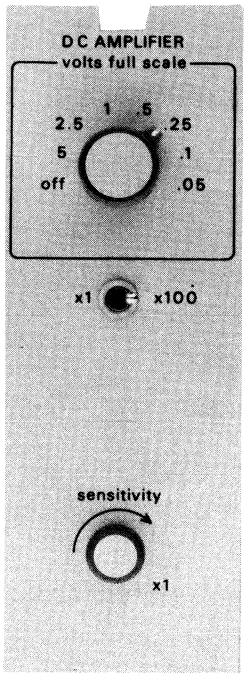
Model Number	Description
11-5407-50	Input Connector, 12-pin Deutsch (supplied)
369500-18501	P23XL Isolated Blood Pressure Transducer
369500-18502	P10EZ Miniature Isolated Blood Pressure Transducer

Basic DC Amplifier

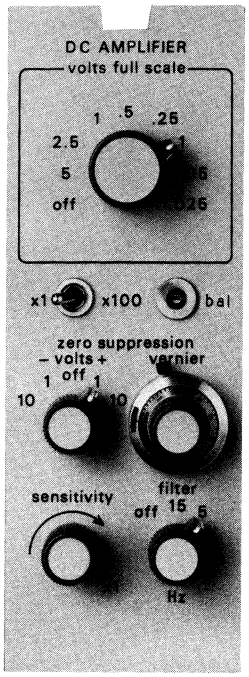
Model 13-4615-004029
Model 56-1240-006158

General Purpose DC Amplifier

Model 13-4615-104029
Model 56-1140-006158



- **Wide measurement range**
- **Calibrated zero suppression**
- **Low pass output filter**



Basic DC Amplifier 13-4615-004029 shown left.

General Purpose DC Amplifier 13-4615-104029 shown right.

These economical, direct-coupled amplifiers are useful for general purpose monitoring and recording of DC voltages in laboratory and research applications. They expand the measurement range of Gould Recorders for any signal from 25 mV full scale to 500 V full scale. Up to 16 factory-set, fixed-gain measurement ranges are provided, plus a variable sensitivity control that permits operation at any point between the fixed-gain ranges. Low-pass output filtering is selectable to eliminate objectionable high-frequency signal components. Refer to pages 84 and 85 for more information on Models 56-1240-006158 and 56-1140-006158.

Specifications

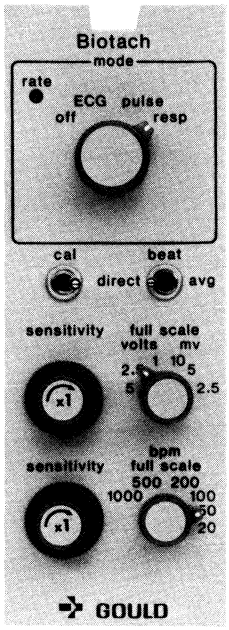
Model Number	Basic DC 13-4615-004029	General Purpose DC 13-4615-104029	Basic DC IS 56-1240-006158	General Purpose DC IS 56-1140-006158
Measurement Range	50 mV FS to 500 V FS	25 mV FS to 500 V FS		
Frequency Response	Filter out: DC to 2 kHz Filter in: −3 dB at 5 Hz; 12 dB/octave	Filter out: DC to 2 kHz Filter in: −3 dB at 15 Hz; −3 dB at 5 Hz; 12 dB/octave	Filter out: DC to 35 kHz Filter in: plug-in user selectable	Filter out: DC to 35 kHz Filter in: −3 dB at 15 kHz; −3 dB at 5 Hz; 12 dB/octave
Calibrated Zero Suppression Range	Not applicable	Add or subtract 0 to 1 or 10 VDC with resolution of 0.1%	Not applicable	Add or subtract 0 to 1 or 10 VDC with resolution of 0.1%
Input Circuit	Balanced to ground			
Output Voltage	5 V FS into 2 kΩ or greater, single ended to ground			

Accessories

Model Number	Description
11-5407-50	Input Connector for 13-4615-004029 and 13-4615-104029 (supplied)
793341-14042	Isotonic Muscle Transducer, Gould Metripak® for use only with DC amplifiers 13-4615-004029 and 13-4615-104029

Biotach™ Amplifier
Model 13-4615-66

- **Computes biological rates beat-by-beat or time averaged from hummingbirds to whales**
- **Extremely reliable triggering**
- **ECG, pulse and respiration modes**
- **Peripheral pulse sensor input**
- **20 bpm to more than 2000 bpm full scale**
- **Five separate simultaneous outputs**
- **TTL compatible sync pulse for system control**
- **Alarm mode**
- **Separate 10 mV/bpm output for digital rate display**



The Biotach Amplifier computes and outputs the beat-by-beat or average rate of repetitive biological events, including cardiac and respiratory. Inputs include signals originating from ECG, pulse, and respiratory events, and can come from other signal conditioners or directly from photoelectric pulse sensors. For accurate rate computation, special circuitry, of which the ECG, Pulse, and Respiration mode switch is a part, ensures that only a legitimate input event triggers the Amplifier.

The Biotach Amplifier is capable of multiple simultaneous outputs: 1) the direct reproduction of the input signal; 2) the computed rate for recorder or monitor; and 3) 10 mV/bpm rate signal for digital display. In addition, it provides a TTL compatible sync pulse coincident with the R-wave of the ECG signal or the rise of a blood pressure, flow, or respiratory waveform. This pulse is useful for resetting integrators, updating digital displays, or controlling computers.

Specifications

Photoelectric Pulse Sensor Excitation Current: 25 mA DC ±5 mA.

Signal Input Sensitivity: 2.5 mV FS to 5 V FS plus x1 (detent) to x2.5 vernier (single ended to ground).

Rate Sensitivity: 20 to 1000 bpm FS plus x1 (detent) to x2.5 vernier.

Recorder and Direct Monitor Outputs: 5.0 V FS; single ended to ground.

Rate Display Output: Single ended to ground. 0 to +10 V. Rate signal only for digital display, 10 mV = 1 bpm. Either beat-by-beat or average.

Rate Monitor Output: 5.0 V FS; single ended to ground. Either beat-by-beat or average selected by same internal jumper as Rate Display output.

Sync Output: TTL compatible, 20 ms (±20%) positive pulse remains high in alarm mode.

Function	ECG*	Pulse	Respiration
Frequence Response (−3 dB)	0.05 Hz to 200 Hz ±20%	0.5 Hz to 20 Hz ±20%	0.05 Hz to 10 Hz ±20%
Rate Trigger Requirement (Minimum signal)	15% of full scale changing at 30 mV/s	20% of full scale, changing at 3 mV/s	20% of full scale, changing at 1 mV/s

*ECG signals must be preconditioned by either a Gould ECG Amplifier (Model 13-4615-64A) or a Gould Universal Amplifier (Model 13-4615-58).

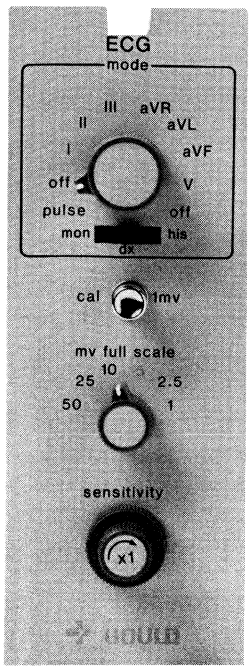
Accessories

Model Number	Description
287169	Apex/Carotid Piezoelectric Pulse Sensor, with phone plug
287165	Ear Pulse Sensor, with 4-pin Winchester connector
287163	Radial Pulse Sensor, with 4-pin Winchester connector
288305	Finger Pulse Sensor, with 4-pin Winchester connector
369500-10002	Small Respiratory Bellows; used with Gould 287169 Piezoelectric Pulse Sensor to monitor respiration
11-5407-50	Input connector

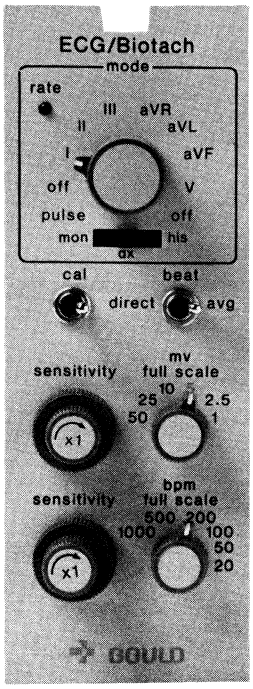
See Bulletin 459-23 for more detailed information.

ECG Amplifier
Model 13-4615-64A

ECG/Biotach™ Amplifier
Model 13-4615-65A



- **Full 7-lead ECG selection**
- **Peripheral arterial pulse sensor input**
- **Patient isolated and defibrillator protected**
- **Monitor/Diagnostic/HIS bandwidth selector**
- **Automatic reset on overload, lead change or 1 mV calibration**
- **TTL compatible QRS sync pulse**
- **High level inputs to 5 V**
- **High common mode rejection, low noise amplifier**
- **Specialized circuitry for exceptionally reliable triggering**
- **Unipolar HIS electrogram**



Model 13-4615-64A

Combining three amplifiers in one, the Gould 13-4615-64A conditions signals from ECG and peripheral pulse sensors and accepts signals from tape recorders or other amplifiers. A built-in pulse circuit receives inputs from finger, ear, radial, or carotid pulse sensors to provide blood pressure waveforms as a second method for monitoring the heart during electrocautery or stress-producing procedures. The sync pulse, when triggered by the R-wave or the rising portion of the pulse waveform, is useful for resetting integrators, synchronizing defibrillators, or for computer control.

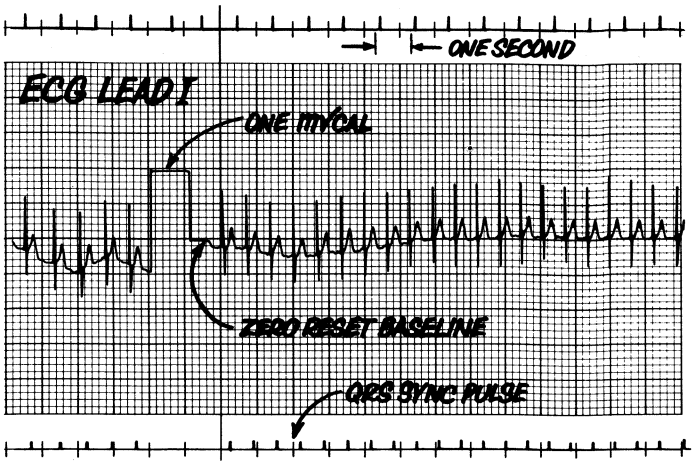
Specifications of the Gould ECG Amplifier exceed the American Heart Association's recommendation for electrocardiography. Full isolation per ANSI/AAMI* safe current limits for electromedical apparatus is standard, as is defibrillator protection.

*American National Standards Institute/Association for Advancement of Medical Instrumentation Specification Number SCL 12/78.

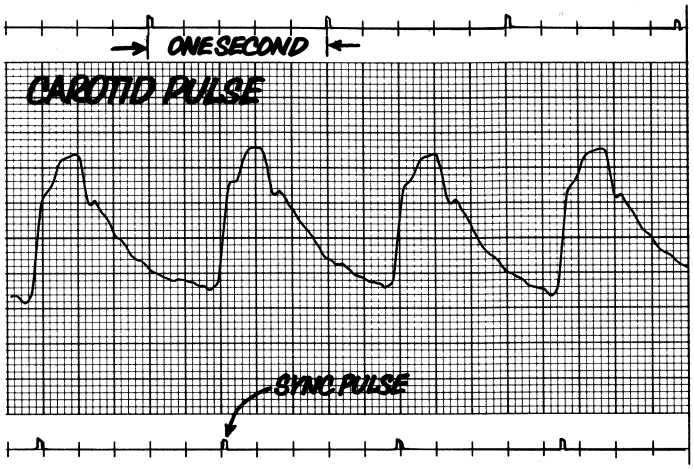
Specifications

Models 13-4615-64A and -65A Amplifiers	ECG (Normal)	ECG (Fetal)	Pulse	External Input
Step Sensitivity FS	1, 2.5, 5, 10, 25, 50 mV	500 µV, 1.25, 5, 12.5, 25 mV	2, 5, 10, 20, 50, 100 mV	100, 250, 500 mV, 1, 2.5, 5 V
Input Circuit Configuration	Five ECG leads electrically isolated from chassis and power		Single ended to chassis	
Frequency Response (−3 dB)				
Diagnostic (±20%)	0.05 Hz to 500 Hz		0.5 Hz to 20 Hz	0.05 Hz to 100 Hz
Monitor (±20%)	0.5 Hz to 30 Hz		0.75 Hz to 20 Hz	0.5 Hz to 100 Hz
HIS (±20%)	30 Hz to 500 Hz			
Common Mode Rejection	Isolated inputs to chassis: 140 dB at DC; 100 dB at 60 Hz Isolated inputs to reference leads: 85 dB with 5-kΩ unbalance		Not applicable	
Sync Pulse Trigger*	15% of full scale, changing at 30 mV/s		20% of full scale, changing at 3 mV/s	
Amplifier Output Configuration	5 V, single ended to chassis, 50 Ω			
Overload Recovery	Automatic reset restores baseline in less than 1 s. Manual reset via the CAL pushbutton or lead selector change.			

*Rate Trigger on -65A, Minimum Requirement.



Full-size ECG (left) and Pulse (right) waveforms shown above are reproduced directly from the Gould 13-4615-64A ECG Amplifier. The sync pulse was applied to an event marker. Special circuitry prevents double triggering.



These same traces can be produced by the Gould 13-4615-65A ECG/Biotach™ Amplifier.

Note the clarity of the traces from the pressurized fluid writing Gould Recorder, which produces uniform trace density under all conditions.

Model 13-4615-65A

- **Two amplifiers in one with independent outputs of waveforms and rate**
- **Physiologic rate determination from ECG, arterial pulse or high level signals from other amplifiers, such as pressure or flow**
- **Computes biological rates beat-by-beat or time-averaged**
- **Simultaneous multiple outputs**

Isolated ECG and biological rate measurement capabilities make the Gould 13-4615-65A a versatile, multifunction signal conditioner. It has two separate outputs for simultaneous recording and monitoring of waveform and rate. In addition, it outputs rate in two forms: an analog rate signal for recording, and a 10 mV/bpm signal for digital rate display by Gould Digital Display/Alarm/Controller Units.

Additional available outputs include blood pressure waveforms from finger, ear, radial, or carotid pulse sensors (instead of ECG signals); a sync pulse coincident with the R-wave or the rising portion of a blood pressure waveform to control other equipment per cardiac cycle; and a 10 mV/bpm signal for digital display of computed beat-by-beat or average rate.

(Model 13-4615-65A ECG/Biotach™ Amplifier only)

Rate Measurement Range: 20, 50, 100, 200, 500, 1000 bpm FS plus x1 to x2.5 vernier between steps.

Time to Alarm: 5 s ±20%. Variable by changing internal plug-in resistor.

Accessories

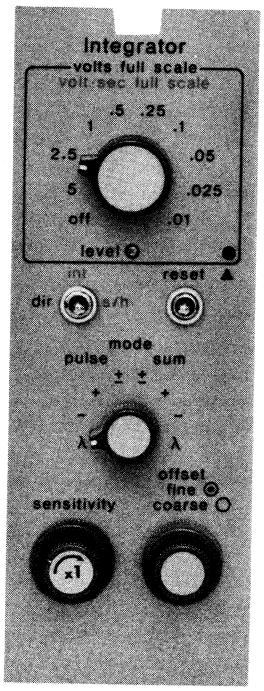
(Models 13-4615-64A and -65A Amplifiers)

Model Number	Description
369500-28000	Five-Lead ECG Cable Kit; includes 10-ft, low-noise patient cable, five color-coded shielded lead wires with snap adapters, five color-coded shielded lead wires with banana-plug type needle adapters, and a sample of disposable electrodes
369500-28003	Five-Lead ECG Cable Kit; same as above with input connectors to drive three -64A or -65A amplifiers simultaneously
369500-28010	Ten-Lead Patient Cable Kit with V_1 through V_6 selector; includes 10-ft., low-noise patient cable, 10 color-coded shielded lead wires with snap adapters, and a sample of disposable electrodes
287163	Radial Pulse Sensor, with 4-pin Winchester connector
	Finger Pulse Sensor, with 4-pin Winchester connector
287169	Apex/Carotid Piezoelectric Pulse Sensor, with phone plug
11-5407-50	Input Connector, 12-pin Deutsch (supplied)
11-5407-64	Multiple input adapter allows connection of patient cables via 12-pin Deutsch connector, photoelectric pulse transducers via 4-pin Winchester connector and phone jack input for apex/carotid pulse transducers
11-5407-66	Input Adapter, photoelectric pulse sensor, 4-pin Winchester to 12-pin Deutsch

Integrator Amplifier

Model 13-4615-70

- **Single-step calibration**
- **Flip-of-switch integration**
- **Programmable reset timer**
- **Full-wave rectified (λ) mode**
- **Preview of signal to be integrated (DIRECT)**
- **Peak integral recording (SAMPLE/HOLD)**
- **10 mV • s to 50 V • s full scale integrate range**
- **An excellent 10 mV full scale DC amplifier**
- **Can be reset externally from other Gould amplifiers**



The Gould Medical Integrator Amplifier determines the area under an input function waveform per unit of time. Whether the input signal is positive, negative, or bipolar, the signal may be offset, half-wave rectified, or full-wave (λ) rectified before integration. The integral can be reset externally via switch closure or TTL pulse, or internally via amplitude level, zero crossing, or internal timer. In addition, the value of the integral may be sampled and held prior to any reset function, thus allowing for use with digital displays.

Some applications include: determination of stroke volume from aortic blood flow; expiratory or inspiratory volume from respiratory air flow; or even the relative index of activity from electromyograms or neurograms. A unique feature of the Gould Integrator Amplifier is the ease with which it may be calibrated to any input function commonly coming from the outputs of other Gould amplifiers. This eliminates tedious calibrations using external test equipment. In the direct mode, the Integrator is an excellent 10-mV FS amplifier.

Specifications

Measurement Range (plus x1 to x2.5 vernier)

Direct Function: 10 mV to 50 V FS.

Integrate Function: 10 mV • s to 50 V • s FS.

Amplifier Input Circuit: Single ended to ground. Impedance: 1 MΩ.

Amplifier Outputs (single ended to ground)

Recorder to Monitor: ±5 V into 50 kΩ or greater.

Digital Voltmeter Display: 10 V into 50 kΩ or greater; 10 mV per unit input (adjustable).

Noise (DC to 1 kHz): Less than 50 μV P-P referred to input with 50-Ω source.

Offset

Range: ±6 V (±60 V with internal attenuator in x10 position) ±20% RTI.

Resolution: 1 part in 50,000 with dual concentric 10-turn Coarse-Fine controls.

Frequency Response: DC to 8 kHz (−3 dB with 6 dB/octave rolloff) to integrator. DC to 300 Hz (−3 dB with 12 dB/octave rolloff) in DIRECT at amplifier output.

See Bulletin 459-18 for more detailed information.

Mode Selector (Direct or Integrate Functions): Selects both the Direct waveform to be integrated and the Integrate reset method employed. Adjusts for signals greater than reference zero (+), less than reference zero (−) or bipolar about reference zero (±). Also permits full wave rectification of a bipolar signal to determine its absolute value (λ).

Pulse: Reset of integrator with zero crossing — may be offset.

Sum: Reset of integrator on time, external TTL pulse, or integral amplitude (level).

Level: 10% to 100% of full scale.

Time: In either 1-s increments to 63 s, or 1/60 s increments to 1 s (1/50 for 50 Hz operation).

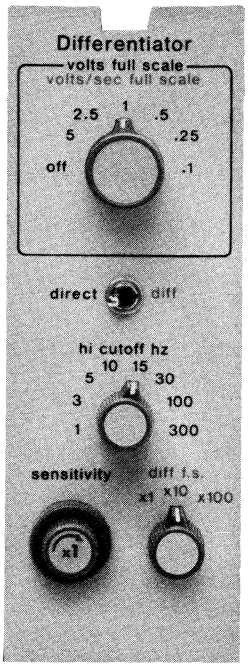
Accessories

Model Number	Description
11-5407-50	Input Connector (supplied)
369500-153	Adapter — Male BNC to 12-pin Deutsch. 24 in. long; allows signal from input/output panel or high level signals from drive amplifier monitor output to drive integrator input

Differentiator Amplifier

Model 13-4615-71

- **Single-step calibration**
- **Flip-of-switch differentiation**
- **100 mV/s to 500 V/s fs differentiate range**
- **100 mV to 5 V fs direct measurement range**
- **Selectable low pass filter**



The Gould Medical Differentiator Amplifier determines the rate of change of an input function . . . to determine acceleration from velocity or velocity from position. Some common applications include the determination of blood acceleration from blood flow, the determination of eye velocity from eye position while recording the electronystagmogram or as an index of contractility by taking the first derivative of pressure from the left ventricle of the heart. The most unique feature of the Gould Differentiator Amplifier is the ease with which it may be calibrated when used with other Gould amplifiers. This eliminates the need for auxiliary test equipment and tedious calibrations. In the direct mode, the Differentiator Amplifier is an excellent 100-mV full-scale DC amplifier.

Specifications

Measurement Range (plus x1 to x2.5 vernier)

Direct Mode: 100 mV FS to 5 V FS.

Differentiate Mode: 100 mV/s FS to 500 V/s FS.

Amplifier Input Circuit: Single ended to ground. Impedance: 1 MΩ.

Amplifier Outputs (all single ended to ground)

Recorder: 5 V FS into 50 kΩ.

Monitor: 5 V FS into 50 kΩ.

Noise (100 mV or 100 mV/s FS, input shorted)

Direct Mode: 50 μV P-P RTI

Differentiate Mode: 50 μV/s P-P at 1 Hz increasing to 6 mV/s P-P at 100 Hz RTI.

Frequency Response (high cutoff): −3 dB at 1, 3, 5, 10, 15, 30, 100, 300 Hz, ±20% with −18 dB/octave nominal rolloff.

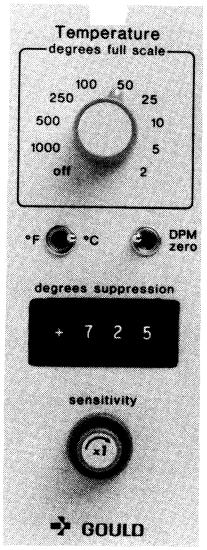
Accessories

Model Number	Description
11-5407-50	Input Connector (supplied)
369500-153	Adapter - Male BNC to 12-pin Deutsch. 24 in. long; allows signals from input/output panel or high level signals from drive amplifier monitor output to drive differentiator input

Temperature Amplifier

Model 13-4615-474029

- **Measures temperature directly from YSI 400 Series Thermistor Probes or selected 500 Series Probes**
- **High sensitivity and wide measurement range — from 2° to 1000°C or °F full scale**
- **Digital zero suppression — up to ±999°C or °F**
- **Direct readout in degrees Celsius or Fahrenheit**
- **No special calibration required**



The Gould Medical Temperature Amplifier is a precision instrument designed for accurate, long-term monitoring and wide ranging, dynamic temperature recording. Low drift allows the measurement of small temperature changes over time, even at the most sensitive range setting. And, its broad measurement range accommodates widely fluctuating temperatures.

Front-panel controls simplify calibration, which is accomplished directly in degrees Celsius or Fahrenheit as desired. The combination selector/indicator permits easy zero suppression setting and verification in one-degree steps.

The Temperature Amplifier uses YSI 400 Series Thermistor Probes and selected YSI 500 Series Thermistors. For applications outside the range of YSI probes and thermistors, the amplifier uses platinum RTDs.

Specifications

Measurement Range: ±2° to ±1000°C or °F.

Standard Input Sensors: 100, 200, 500, or 1000 Ω, 4-wire Platinum (385) RTDs or Yellow Springs Instrument (YSI) 400 or selected 500 Series Thermistor Probes.

Input Circuit: 4-wire, differential to floating common. Impedance: 1 MΩ.

Output Voltage: 5 V into 2 kΩ.

Frequency Response: DC to 10 Hz ±20% (−3 dB).

Calibrated Zero Suppression: 0° to ±999° in 1-degree steps (°F or °C).

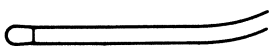
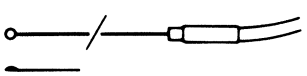
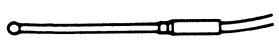
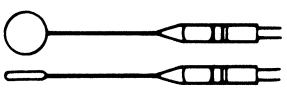
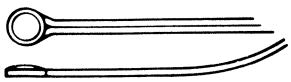
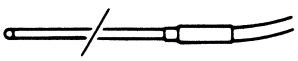
Display Output (internally selected): 100 mV/°F or °C, or 10 mV/°F or °C, 10 V max.

Thermistor Probe Operation: Use YSI 400 Series Thermistor Probes.

Range: 0° to 42°C.

Linearity: Within ±0.5°C from 4°C to 40°C; within ±1°C from 0°C to 42°C.

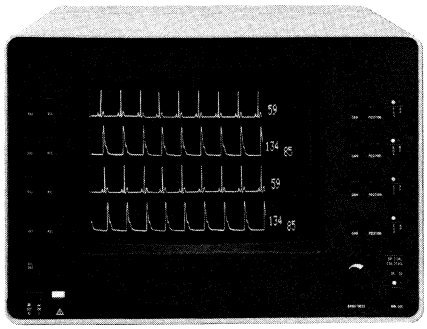
Temperature Probes

Probe	Description	Probe	Description
 YSI 401	General Purpose, Vinyl, most rugged probe. Esophageal or rectal temperatures in humans and animals. TC, 7.0 s. Gould 369500-18010	 YSI 427	Small Surface Temperature. Cuvette, water bath, leaf, and other surfaces. 24-in. Teflon® covered flexible wire. Stainless steel disc with epoxy back. Non-detachable lead, non-autoclavable. TC, 0.3 s. Gould 369500-18016
 YSI 423	Small Semiflexible Nylon. Esophageal and rectal readings. Nylon with expoxy tip. TC, 1.4 s. Gould 369500-18012	 YSI 408	Banjo Surface Temperature. Skin, oral, axillary, water bath, and flat surface temperatures. Stainless steel. TC, 0.6 s. Gould 369500-18013
 YSI 409	Attachable Surface Temperature. Tape on skin or flat surfaces. Stainless steel cup, epoxy backed. TC, 1.1 s. Gould 369500-18014	 YSI 402	Small Flexible Vinyl. Rectal temperatures of small animals. Esophageal temperatures of infants. Vinyl sheath and tip. TC, 3.2 s. Gould 369500-18011

See Bulletin 459-25 for more detailed information.

Four Channel Monitors

Models 51-4142-00, 51-4142-20



- **Nonfade 9-in. display with 12-bit resolution per channel**
- **Numeric option for S/D pressure and rate**
- **Trace freeze in place**
- **Overlapping traces**
- **Trace cascade function**

Gould 4-channel monitors feature non-glare, bright phosphor displays for excellent trace clarity. Their light weight and compact design are perfect for laboratories where space is at a premium. Digital display of heart rate or systolic/diastolic pressure on each channel can be selected as an option, and features simple one button calibration.

Specifications

Viewing Dimensions: 13.3 cm x 17.8 cm.
Deflection Method: Electromagnetic.
Focus Method: Electrostatic.
Phosphor Type: C 124.
Input Impedance: 100 kΩ, single ended.
Maximum Useable Input: ±15 V.
Absolute Max. Input: ±30 V.
Frequency Response at Sweep: 25 mm/s >45 Hz; 50 mm/s >90 Hz.
QRS Range: 20-240 bpm.
QRS Accuracy: 20 bpm, 20 ±1 bpm; 80 bpm, 80 ±1 bpm; 240 bpm, 240 ±2 bpm.
Digital Field Update Rate: 1/s.
Dimensions: 9.5 in. (24.1 cm) H x 13.0 in. (33.0 cm) W x 14.5 in. (36.8 cm) D.
Weight: 31 lbs. (14 kg).
Cables (must be ordered separately)
All cables are 20 m long.

Part Number	Terminating Connector	Recorder Type(s)
	Miniature Spade Lug	2000S, 8000S
	Quick Disconnect	2000S, 8000S Rackmount
	BNC	RS3000, Medical I/O Panel
	Bare Wire	RS3000

Eight Channel Monitor

Models 53-3183-10, 53-3283-10

- **20-in. Oscilloscope monitor**
- **High resolution CRT display**
- **Front panel position and gain control**
- **300-Hz frequency response**
- **Sweep speeds 25, 50 and 100 mm/s**
- **Overlapping traces**

The Gould 8-channel monitor features a 300-Hz frequency response for monitoring intercardiac electrograms and other high frequency recordings in the medical research laboratory. Front panel mounted position and gain controls permit maximum versatility for setting up the display. The high resolution CRT display provides excellent viewability from a distance. The 8-channel monitor complements any of Gould's Medical Instrumentation Recording Systems for the research laboratory.

Specifications

Viewing Dimensions: 20.0 cm x 25.0 cm.
Input Z: 1 MΩ, single ended.
Maximum Input: 100 V.
Frequency Response: DC to 300 Hz (−3 dB).
Dimensions: 19.5 in. (49.5 cm) H x 17.8 in. (45.2 cm) W x 17.6 in. (44.7 cm) D.
Weight: 60.0 lbs. (27.2 kg).
Cables (must be ordered separately)
All cables are 20 m long.

Part Number	Terminating Connector	Recorder Type(s)
	Miniature Spade Lug	2000S, 8000S
	Quick Disconnect	2000S, 8000S Rackmount
	BNC	RS3000, Medical I/O Panel
	Bare Wire	RS3000

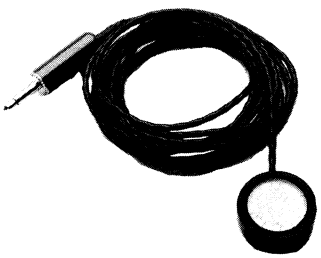
Display Modules

Model No.	Description
13-4611-12	**Digital Display/Alarm/Controller Module** 3½ digit display; two adjustable alarm/ controller set points. 2 output relays for controlling other equipment. Size of 4600 Series Signal Conditioners.
13-4611-10	**Digital Display Module** 3½ digit display
790642	**Plug-in Audio Alarm Card**

Medical Instrumentation Accessories

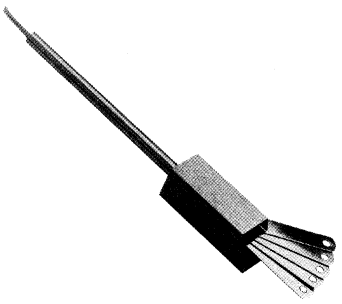
In order to ensure system compatibility, ease of operation, and accurate measurement, Gould provides a complete line of Medical Instrumentation accessories. Consult amplifier pages to determine which accessories are compatible with a specific amplifier.

Reuseable Silver/Silver Chloride Biopotential Electrodes
Reuseable Ag/AgCl electrode with snap fastener built into back of unit. Ideal for EMG, EEG, EOG, and other measurements of bioelectric activity. **369500-31502**



Piezo-Electric Pulse Transducer
Self-generating, high output transducer senses pulses from fingers, rat's tails, etc. Can also be used as a swollow microphone. Output 10 to 100 mV. Comes with 6-ft., low-noise cable terminating in a Deutsch connector. For 13-4615-58 Universal Amplifier. **369500-31512**

Pneumotrace Respiratory Belt and Interface
This light weight belt is made of Spandex and has a Velcro closure to provide a comfortable fit for the chest or abdomen of both adults and children. Its solid-state circuitry produces a linear output to changes in thoracic or abdominal circumference due to respiration. This change can be displayed on a Gould Basic DC Amplifier. **369500-31508**



Low-Cost Student-Grade Force Transducer
A semi-isotonic, strain gauge transducer incorporating a stack of five stainless steel leaf springs. Full-scale measurement range is increased by adding more leaves to increase the stiffness of the spring. Sensitivity range is 10 mg to 10 kg. Comes with 10-ft. cable terminating in a Deutsch connector. Used with any Gould Medical Instrumentation Amplifier with transducer input. **369500-31506**

Low-Cost Student-Grade Displacement Transducer
A semi-isometric strain-gage cantilever-beam device to measure motion in physiological preparations. The 12-in. stainless steel lever may be placed in any position, affording the user a broad spectrum of experimental design. Comes with a 10-ft. cable terminating in a Deutsch connector. Used with any Gould Medical Instrumentation Amplifiers with transducer input. **369500-31507**

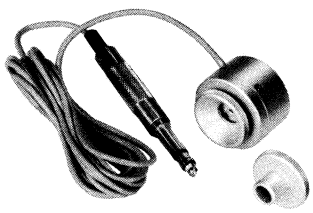
Checktrode Mk II Electrode Tester
Assures clean bioelectric data without artifacts. Instant digital readout indicates the quality of electrode/skin contact using a safe 10-μA constant current source. **369500-31501**

Medical Instrumentation Accessories

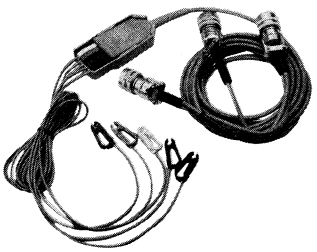
Apex/Carotid Piezoelectric Pulse Sensor, with phone plug. **286700**

New infra-red, photoelectric plethysmograph records changes in pulsatile blood flow from fingers, toes, ear, forehead, etc. Miniature transducer attaches with velcro strap (supplied) or electrode type adhesive collars. Matched optics together with a unique two-stage IR-filter reduce the effects of ambient light and patient motion. **369500-31519**

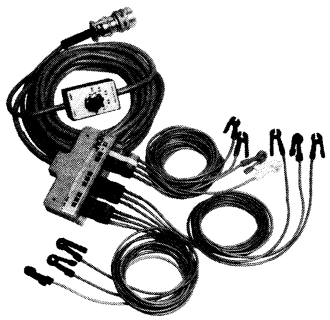
Ear Pulse Sensor, with 4-pin Winchester connector. **287165**



Heart Sound Sensor, Piezoelectric (non-isolated) with phone plug. **287169**



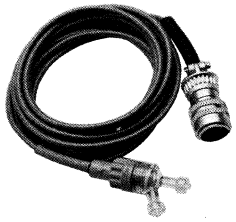
Five-Lead ECG Cable Kit. Includes 10-ft. low-noise patient cable; five color-coded shielded lead wires with snap adapters; five color-coded shielded lead wires with banana-plug type needle adapters, and a sample of disposable electrodes. **369500-28003**



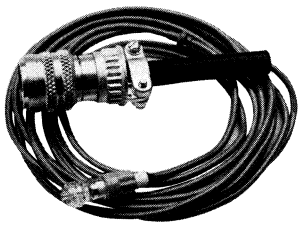
Ten-Lead Patient Cable Kit with V_1 through V_6 selector. Includes 10-ft. low-noise patient cable; 10 color-coded shielded lead wires with snap adapters, and a sample of disposable electrodes. **369500-28010**

Three-Lead Universal Amplifier Bioelectric Input Cable Kit, non-isolated and not for use on human subjects. Includes three color-coded shielded lead wires with banana-plug type needle adapters. **369500-28058**

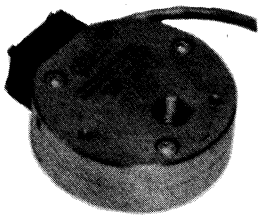
Transducers



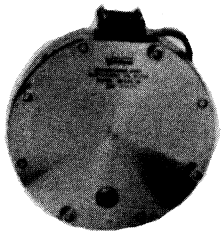
P23XL Gould isolated physiological pressure transducer with 12-pin Deutsch Connector. −50 to +300 mm Hg. Patient safety assured by isolated plastic case and isolated sensing mechanism. Defibrillator protected. **369500-18501**



P10EZ Gould miniature isolated physiological pressure transducer with 12-pin Deutsch connector. −50 to +300 mm Hg. Patient safety assured by isolated plastic case and isolated sensing mechanism. Defibrillator protected. **369500-18502**

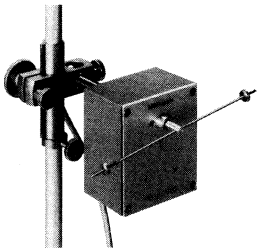


Differential pressure transducer (Validyne) with 12-pin Deutsch connector for pneumotachography and plethysmography. Extremely accurate and stable ±20 mm H_2O. Only for use with 13-4615-35 Carrier Amplifier. **369500-57035**



Low range Differential pressure transducer (Validyne) with 12-pin Deutsch connector. For pneumotachography and plethysmography requiring a more sensitive transducer. ±9 mm H_2O. Only for use with 13-4615-35 Carrier Amplifier. **369500-57036**

Metripak® Isotonic Muscle Transducer
This completely self contained DC-DC type position transducer incorporates the non-contact, frictionless Metrisite® position sensor proven in hundreds of thousands of applications. It provides infinite stepless resolution in a rugged low inertia design that includes a ⅜" stainless steel rod for clamping to laboratory stands.



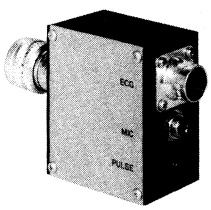
Metripak with 12-pin Deutsch connector wired for use ONLY with:
13-4615-50 Transducer Amplifier
13-4615-58 Universal.
793341-04042
13-4616-004029 DC Amp
13-4615-104029 DC Amp
793341-14042

Metrigram Isometric Force Transducer
A truly isometric force transducer, the beam travel for a full-scale deflection is less than 0.003 mm. The seamless, stainless steel body is 6 in. long and ⅜ in. in diameter. The measuring beam is recessed to prevent accidental damage, and has a countersunk hole to attach the preparation. The Metrigram's extremely high output of 125 mV for a full-scale deflection makes it one of the most sensitive isometric transducers available.

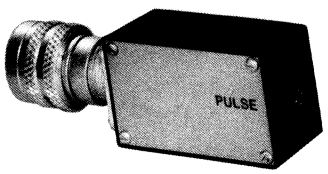
797159-1 ±10 gm
797159-2 ±25 gm
797159-3 ±50 gm
797159-4 ±100 gm
797159-5 ±150 gm
797159-6 ±300 gm

Adapters

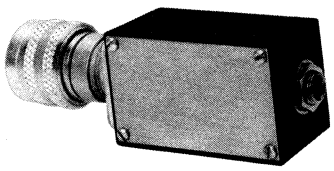
Input Adapter. YSI temperature probes to 12-pin Deutsch. **11-5407-54**



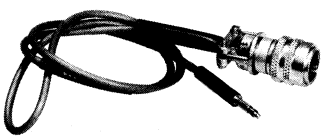
Multiple input adapter allows connection of patient cables via 12-pin Deutsch connector, photoelectric pulse transducers via 4-pin Winchester connector and phone jack input for apex/carotid pulse transducers. **11-5407-64**



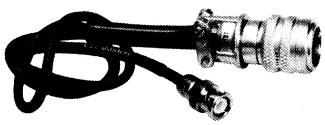
Input Adapter, photoelectric pulse sensor, 4-pin Winchester to 12-pin Deutsch. **11-5407-66**



Input Adapter, phone jack to 12-pin Deutsch. **11-5407-57**

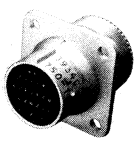


Bantam Plug to 12-pin Deutsch Adapter. 36 in. long; allows high-level signals from drive amplifier monitor output to feed amplifier high-level inputs. **369500-152**



Male BNC to 12-pin Deutsch Adapter. 24 in. long; allows high-level signals from Input/Output Panel to drive high-level input of Amplifiers. **369500-153**

Input Connector kit, 12-pin Deutsch Male. **11-5407-50**



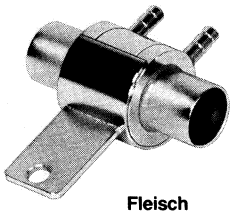
Connector kit, 12-pin Deutsch Female. For panel mount or line. **11-5407-51**

Pneumotachs

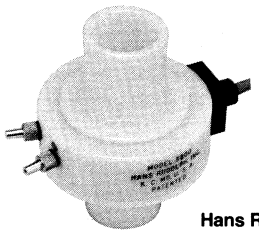
Fleisch and Hans Rudolph Pneumotachs measure respiratory air flow and are calibrated to give accurate readings regardless of direction of air movement. Fleisch models can be used for deliveries exceeding those listed by 50% with only slight discrepancy. Heaters prevent condensation of water vapor.

Fleisch Model	Delivery	Inside Diameter	Length	Dead Space	Gould Model Number
0000	1.2 l/min	6 mm	60 mm	1.7 ml	369500-45001
000	3 l/min	6 mm	60 mm	1.7 ml	369500-45002
00	6 l/min	6 mm	60 mm	1.7 ml	369500-45003
0	18 l/min	10 mm	60 mm	4.7 ml	369500-45004
1	60 l/min	18 mm	60 mm	15 ml	369500-45005
2	180 l/min	29 mm	60 mm	40 ml	369500-45006
3	360 l/min	44 mm	60 mm	92 ml	369500-45007
4	840 l/min	61 mm	70 mm	200 ml	369500-45008
6-volt heater supply for all Fleisch pneumotachs					369500-45009

NOTE: Use Transducer Model No. 369500-57035 with all the above Fleisch models. Full scale differential pressure (typical) for all the above models is 10 mm H_2O.



Fleisch



Hans Rudolph

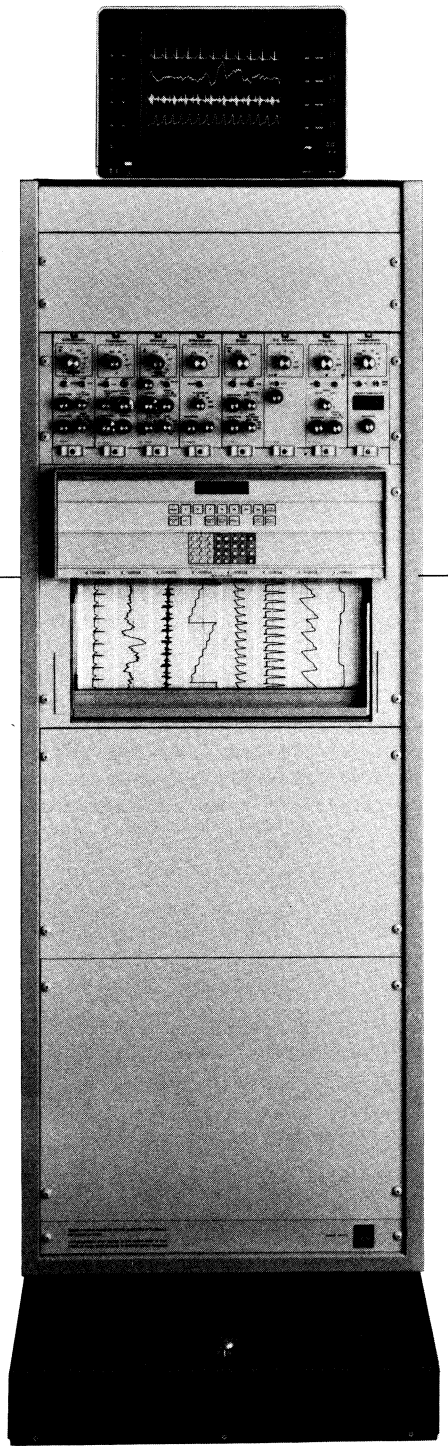
Application	Fleisch Model
Rats	0000
Cats, small dogs	00 to 000
Babies, neonates	00
Infants (1 - 4 years)	0 to 1
Children (over 4 years), rest breathing	1 or 2
Adults, rest breathing	2
Children (over 4 years), forced respirations, exercise	3 or 4
Adults, forced respirations, exercise	4

Hans Rudolph Heated Pneuomtachs

Application	Flow Range	Full Scale Differential Pressure (typical)	Dead Space	Part/Model Numbers		
				Hans Rudolph	Gould	Transducer
Pediatric	0-0.2 l/sec 0-12 l/min	2.5 mm H_2O	10 cc	3600	369500-32501	369500-57036
Clinical	0-1.7 l/sec 0-12 l/min	9.0 mm H_2O	15 cc	3700	369500-32503	369500-57035
Pulmonary	0-17 l/sec 0-1200 l/min	9.0 mm H_2O	80 cc	3800	369500-32505	369500-57035

Gould RS3000 Medical Instrumentation Recording Systems for Research

- **Pressurized ink or thermal writing system**
- **Pushbutton pen position**
- **1 to 8 channels, 40, 50 or 100 mm wide**
- **Unmatched frequency response**
- **Chart annotation standard**
- **Programmable system parameters**
- **Remote controllability**

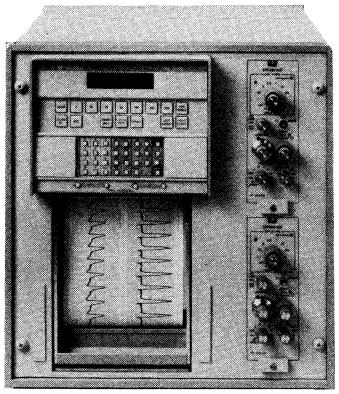


Gould RS3800 Cardiovascular Research Recording System

For 50 years Gould has been providing the standard in direct writing oscillographic recorders for the medical research community. Gould's exclusive pressurized ink writing method produces the crisp, uniform traces required for publication, and Gould's 4600 Series of Medical Instrumentation Amplifiers have long been accepted as the state-of-the-art choice for the exacting requirements of the medical researcher.

Gould now proudly introduces the RS3000 Recorder for the medical research laboratory. Whether you choose the rugged bench top recorder or customize a system for a complete solution to your recording needs, you can be assured of the highest quality from the leader in medical research instrumentation.

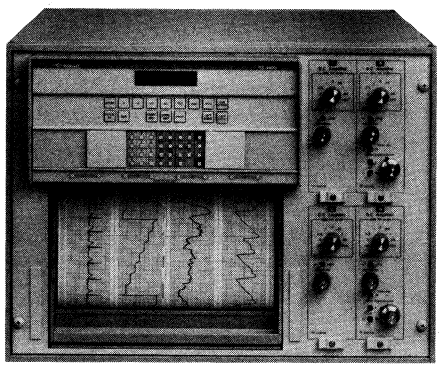
Gould RS3000 Medical Instrumentation Benchtop Recorders for Research



Gould Portable Two-Channel RS3200 Recorder (Model 30-V7202-10)

Gould RS3200 One- and Two-Channel Recorders

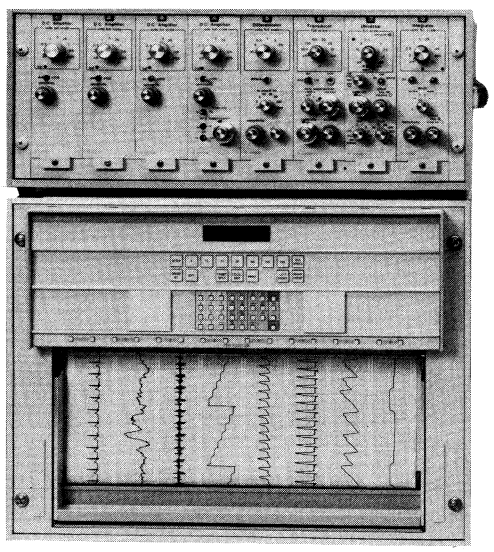
Description	No. Powered Amp. Positions[1]	Model Number[2]	Starter Kit[3]
Two 50-mm channels, pressurized ink writing	2	30-V7202-10	11-36250-07
One 100-mm channel, pressurized ink writing	1	30-V7210-10	11-36250-02
Two 50-mm channels, thermal writing	2	30-V8202-10	11-36250-04
Chart takeup		11-6402-16	



Gould Portable Four-Channel RS3400 Recorder (Model 30-V7404-10)

Gould RS3400 Two-, Three- and Four-Channel Recorders

Description	No. Powered Amp. Positions[1]	Model Number[2]	Starter Kit[3]
Four 50-mm channels, pressure ink writing	4	30-V7404-10	11-36250-17
Two 100-mm channels, pressurized ink writing	2	30-V7420-10	11-36250-09
One 100-mm and two 50-mm channels, pressurized ink writing	3	30-V7412-10	11-36250-11
Four 50-mm channels, thermal writing	4	30-V8404-10	11-36250-12
Chart takeup		11-6402-17	



Gould Benchtop Eight-Channel RS3800 Recorder (Model 30-V7808-12). Configuration for benchtop six-channel RS3600 Recorder is the same, with amplifiers on top.

Gould RS3600 and RS3800 Six- and Eight-Channel Recorders

Description	No. Powered Amp. Positions[1]	Model Number[2]	Starter Kit[3]
Six 50-mm channel, pressurized ink writing	6	30-V7606-12	11-36250-22
Six 50-mm channel, thermal writing	6	30-V8606-12	11-36250-19
Eight 40-mm channel, pressurized ink writing	8	30-V7808-12	11-36250-27
Eight 40-mm channel, thermal writing	8	30-V8808-12	11-36250-24
Chart takeup		11-6402-18	

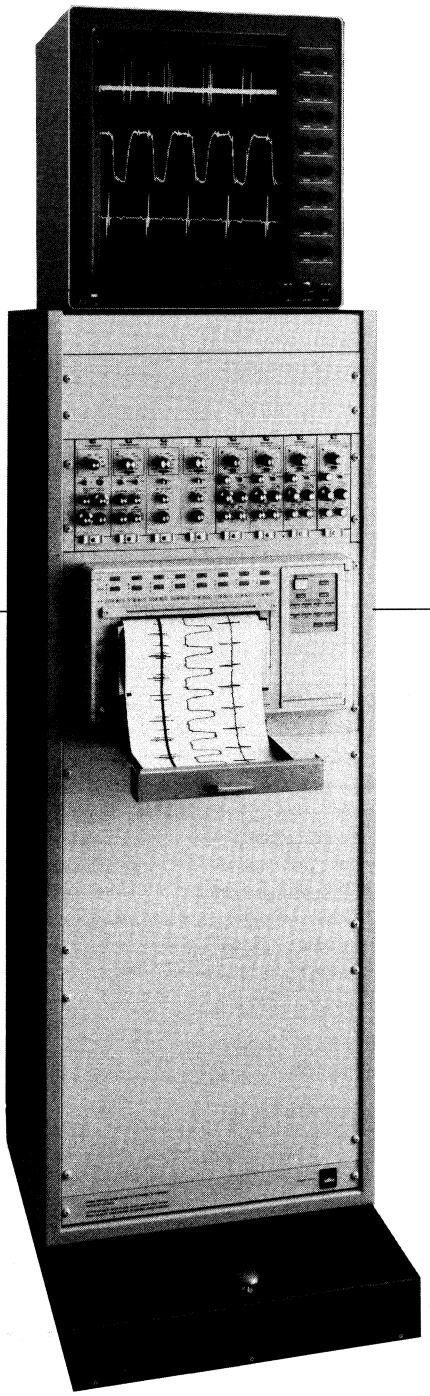
[1]Powers one signal conditioner per recorder channel.

[2]Model Numbers for 115 VAC, 50-400 Hz operation. Replace 00 with 01 for 100 VAC; 06 for 230 VAC; or 07 for 200 VAC operation.

[3]Starter Kit includes 12 rolls of chart paper, analog pen and time line gauge.

Gould TA 2000 Medical Instrumentation Recording Systems for Research

- **Eight-channel thermal array writing system**
- **2.5 kHz frequency response**
- **8 dots/mm resolution**
- **x1, x2, x3 trace expansion**
- **Overlapping traces**
- **200 mm/s chart speed**
- **Fully compatible with Gould 4600 Series Medical Amplifiers**



Gould TA 2000 Electrophysiology Research Recording System

The Gould TA 2000 provides the performance and versatility required in a medical instrumentation recorder. Whether it is high frequency response for recording intracardiac electrograms and nerve traffic, or overlapping traces to display pressure gradients, the TA 2000 does it all. Eight dot per mm linear thermal array writing assures dependable, trouble-free operation, and provides complete chart annotation capability. The TA 2000 can be configured to suit your specific requirements such as the Electrophysiology Research Recording System shown below.

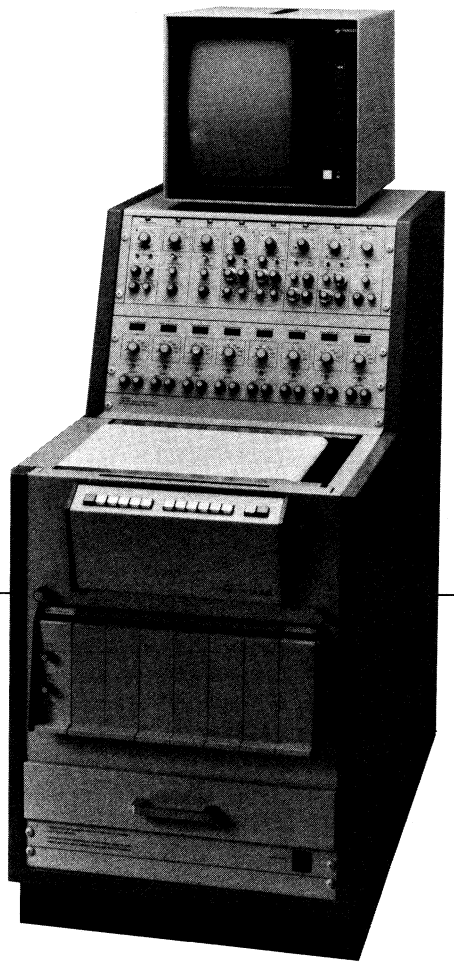
Gould Medical Instrumentation Isolated Power Supplies

Gould RS3000 and TA 2000 Recorders are frequently used in applications where the recorder must be electrically isolated from the power line for patient safety. Gould Medical Instrumentation Power Supplies limit the maximum current leakage to chassis to 30 μA. Both sides of the AC line are switched, and circuit breakers open on both sides of the AC line. A hospital-grade low-leakage cord and plug are included. The unit is UL 544 listed.

Model Number	Description
893136-1	Rackmount Isolated AC Power Supply
G884208-5	Portable Isolated AC Power Supply

Gould ES 1000 Medical Instrumentation Recording Systems for Research

- **Up to 32 channels on 10-inch chart**
- **Digital electrostatic writing**
- **10 kHz frequency response**
- **Signal limiters**
- **Low-cost non-fade paper**
- **Full annotation capability**
- **Fan-fold paper or roll**
- **IEEE-488 remote control**



When eight channels aren't enough, and high frequency response is the requirement, Gould's ES 1000 Medical Instrumentation Recorders are the only choice. Proven in medical research and clinical laboratories for the last 10 years, Gould's ES 1000 Medical Instrumentation Recording Systems have been at the forefront in the fields of electrophysiology and nerve traffic recording.

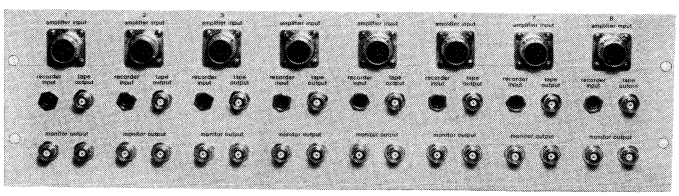
Overlapping traces, full compatibility with Gould 4600 Series Medical Instrumentation Amplifiers, and the exclusive V1000 Non-fade Digital Monitor make this recorder ideal for any medical research application. Choose from the benchtop module or a number of system configurations to suit your particular requirements.

Gould ES 1000 Medical Research Recording System.

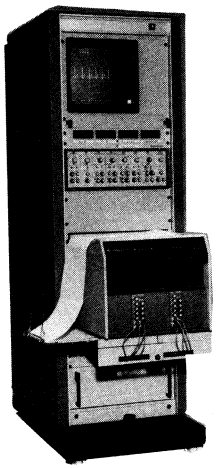
Gould Medical Instrumentation Input/Output Panel

Model 11-1605-145355

The Gould Medical Instrumentation Input/Output Panel simplifies input and output connections to and from the amplifiers and the recorder. Front or rear mounting of the panel provides safe, convenient access to the signal connectors. Direct access to the recorder drive amplifier is as easy as inserting a standard phone plug, while outputs are available on three BNC connectors for connection to tape recorders, computers, monitors or other amplifiers. All connections are labeled for easy identification and provide room for additional labeling if the user desires to change the signal available at an output BNC connector.

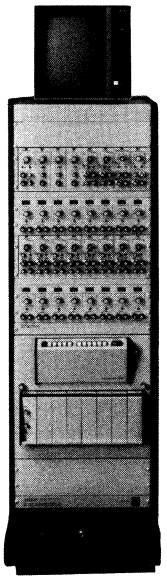


Gould Clinical EP/Cath Lab Recording Systems



Available in Europe and rest of the world

- **High quality, high resolution tracings**
- **Inexpensive, 256-mm wide paper**
- **Chart speeds from 1 mm to 250 mm/s**
- **Stable, archival copy**
- **Full-scale peak capture to 40 μs**
- **8, 16 or 32 channel capability**
- **Non-fade, high resolution Monitor**

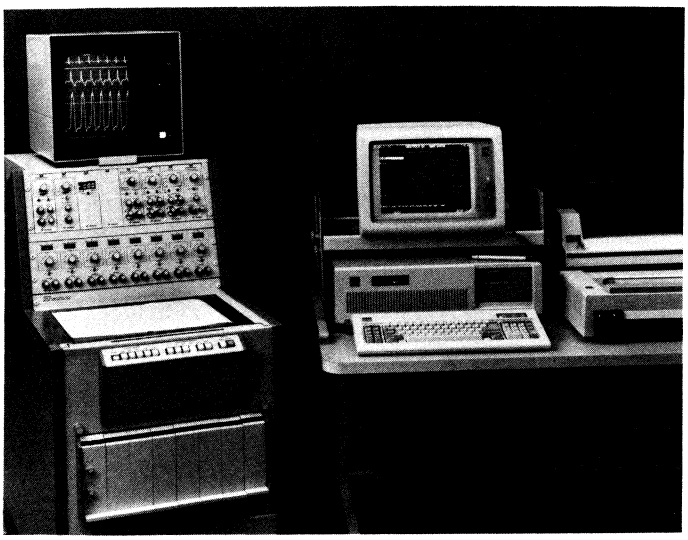


Available in U.S. and Canada

Gould has long been a leading manufacturer of medical instrumentation for the research and clinical laboratory. In 1937, Brush Instruments developed the first portable ECG Recorder, and today Gould/Brush continues to set standards for physiologic recording. The Gould Electrostatic Recorder, configured with application specific 4600 and 5600 Series Amplifiers, form an integrated system that meets the demanding requirements for electrophysiology and hemodynamic recording.

The Gould EP/Cath Lab Recording Systems offer frequency response up to 10 kHz and a full-scale peak capture up to 40 μs. This insures reliable, accurate acquisition of up to 32 channels of physiologic data. Fully archival recording is accomplished on inexpensive high quality 256 mm wide paper. Available in four formats: continuous roll, perforated roll, Z-fold (stack to stack) and translucent roll. Additional system features include full annotation, high resolution non-fade monitors, I/O panels, RS-232C interface, and other accessories.

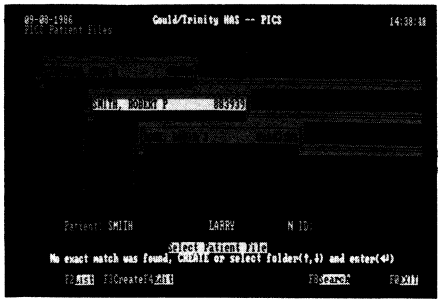
Gould/Trinity Hemodynamic Analysis System



Gould/Trinity Hemodynamic Analysis System
Available in U.S. only

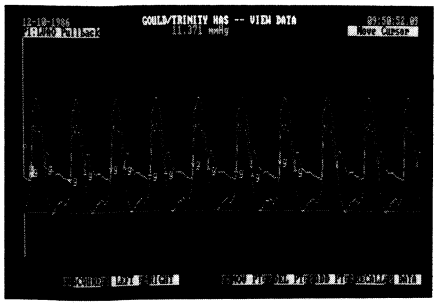
Gould's new computerized, hemodynamic analysis system for the clinical cardiac cath lab maximizes your resources. This PC-based system offers application specific software for the convenient entry of patient demographics, using either a keyboard or easy to use light pen. The system acquires up to eight channels of real time data, calculates standard hemodynamic data, and generates complete reports. Also, raw data waveforms can be immediately edited and analyzed or stored for future retrieval, editing and analysis. A comprehensive Procedure Log (chronological record) of all data is available at the end of the procedure. The Gould/Trinity Hemodynamic Analysis System with the Gould Cath Lab Recording System provides a complete solution for your hemodynamic cardiac catheterization laboratory.

Gould/Trinity Hemodynamic Analysis System



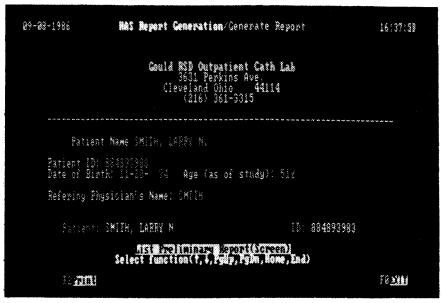
EASY REGISTRATION AND SEARCH

To save valuable lab time patients may be pre-registered and patient search is easy using a minimum of keystrokes. Patient demographic data may be edited during the procedure and appear in the final report. Single entry of patient information saves time and decreases the chance of error.



RELIABLE ACQUISITION AND ANALYSIS

Up to eight channels of continuously monitored data may be acquired in real time. The acquired raw data (waveforms) and computed data is available for viewing. If necessary raw waveforms may be edited and re-computed.

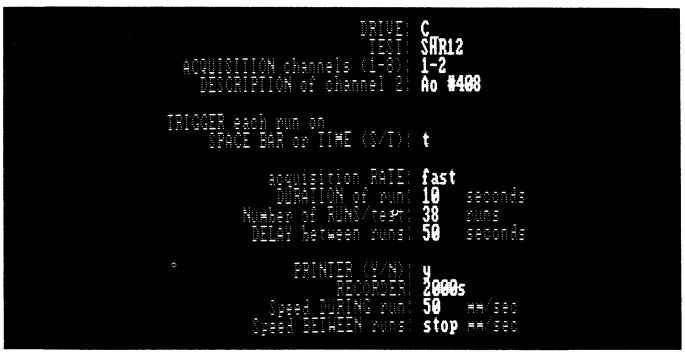


FLEXIBLE REPORT GENERATION

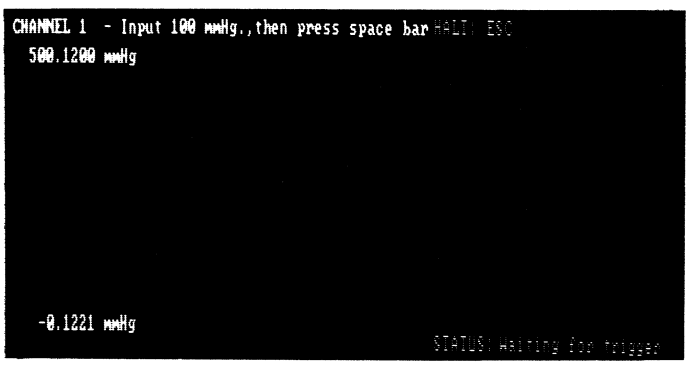
The final report may contain any or all of the procedure data. It may be customized to include the institution letterhead and specific data of interest to the user. Further it may be tailored for the particular requirements of medical records, administration, referring physician or cath lab physician.

Blood Pressure Analysis v. 1.0

This software computes systolic, diastolic, mean pressure, and heart rate for up to 8 channels. Pressure and rate are computed automatically after each timed acquisition period for all channels being monitored. Length of acquisition periods and triggers (manual or timed) are specified by the user. The Blood Pressure Analysis Software is designed to be used with Gould's DASA 4600 Data Acquisition System and an IBM PC/AT computer.



Easy experimental setup makes using this software simple and fast. Descriptions for each channel assure accurate documentation of the pressure monitoring site and identification of the subject. Test parameters are stored with the waveforms for future reference. When using a printer, computed data is printed after each acquisition period, as well as being displayed on the CRT.



Calibration of the system, using Gould's Medical Instrumentation Amplifiers, is as easy as pressing the space bar. Gould's exclusive shunt-cal system assures positive, accurate calibration by electronically simulating a 100 mm Hg pressure load using transducer and amplifier circuitry. The scaled output from the Gould's amplifers means the computer input is not affected by changes in the full scale setting of the amplifier.

Specifications and Ordering Information:

Consult your local Gould Sales Office listed on pages 166 and 167 for more information.

Supplies

In-Plant Control Assures Uniform Quality.

Gould Accuchart chart papers are printed in the Gould factory on a high-accuracy gravure press, designed and constructed to the company's specifications.

Chart papers are handled under constant tension and kept at uniform temperature and humidity year-round in their specially built press and spooling rooms.

Gould exercises complete quality control in its own printing facility. Any technical charts, manufactured elsewhere at our request, are not accepted without assuring that each individual roll meets Gould's high standards. Compare our specifications.

The Printed Record —
Accurate, Crisp, Clean, Permanent.

The ultimate purpose of Gould Recording Systems is to produce accurate, permanent records of the signals being measured. This means that all of the high-performance characteristics and quality features built into every Gould recorder focus at the point where the recording pen or styli meet the chart paper. Therefore, Gould has engineered chart papers that are expressly designed for use on Gould recorders. Substitute papers from other sources are merely adapted and do not measure up to Gould's standards to give the fine line resolution and trace fidelity for which Gould recorders are renowned.

Gould chart paper stocks insure high tensile strength and dimensional stability.

Writing surfaces are exceptionally smooth and specially processed for instant acceptance of the trace with minimum pen or styli friction. All cores are precision fitted to prevent slippage. Each roll is wound under constant tension to assure tightness and perfect alignment.

Attention to such details makes the difference. Only Gould chart papers fulfill the stringent requirements of Gould recording equipment.

Pens and Styli are Lightweight, Yet Rigid.

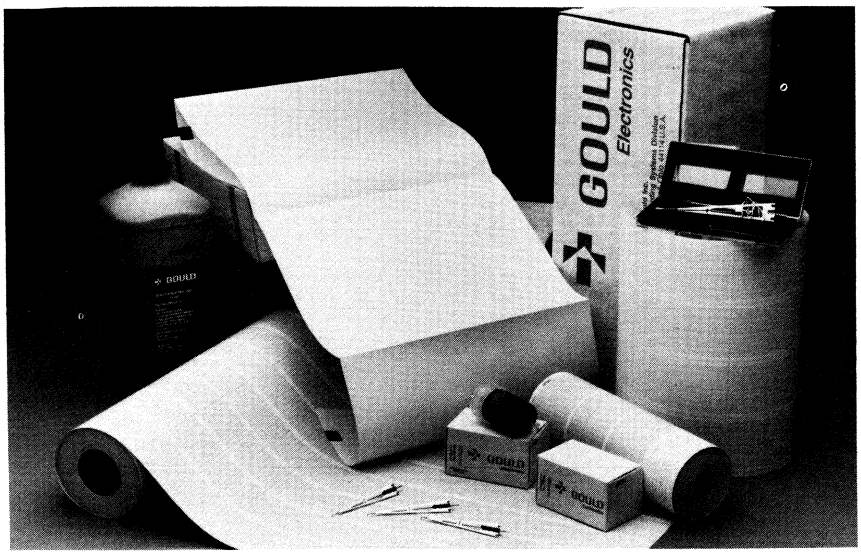
Gould pens and styli are simple and rugged, engineered to give hundreds of hours of accurate recordings. Gould oscillograph pens and styli combine light weight with exceptional rigidity.

A critical factor is that Gould pens and styli are dynamically matched with Gould penmotors to insure proper operation; there are no substitutes.

Gould Inks a "Must" for Gould Pens.

All Gould Ink is specially formulated to insure proper flow and trace from within the Gould engineered pen. All inks are packaged in specially prepared containers that meet all of Gould's rigid inspection and operation requirements.

- **In plant production facilities**
- **25 years experience in printing chart paper**
- **Accurate gravure printing**
- **Precision pens and styli**
- **Wide variety of writing media**
- **Supplies customized for Gould Recorders**
- **Emergency deliveries available from Gould supplies bank**



General Chart Paper Specifications

(A) Printing. Overall accuracy of printed grid lines is better than 0.15% of any dimension.

(B) Grid-paper Edge Registration. Paper is trimmed so that distance between the centerline of any channel and the edge of the paper does not vary more than ±0.13 millimeters throughout entire length of roll.

(C) Coiling Accuracy. In passing through the recorder, lateral drift of the paper due to coiling errors or to core misalignment is held to ±0.008 inch.

(D) Width of Paper. Overall tolerance better than ±0.015 inch.*

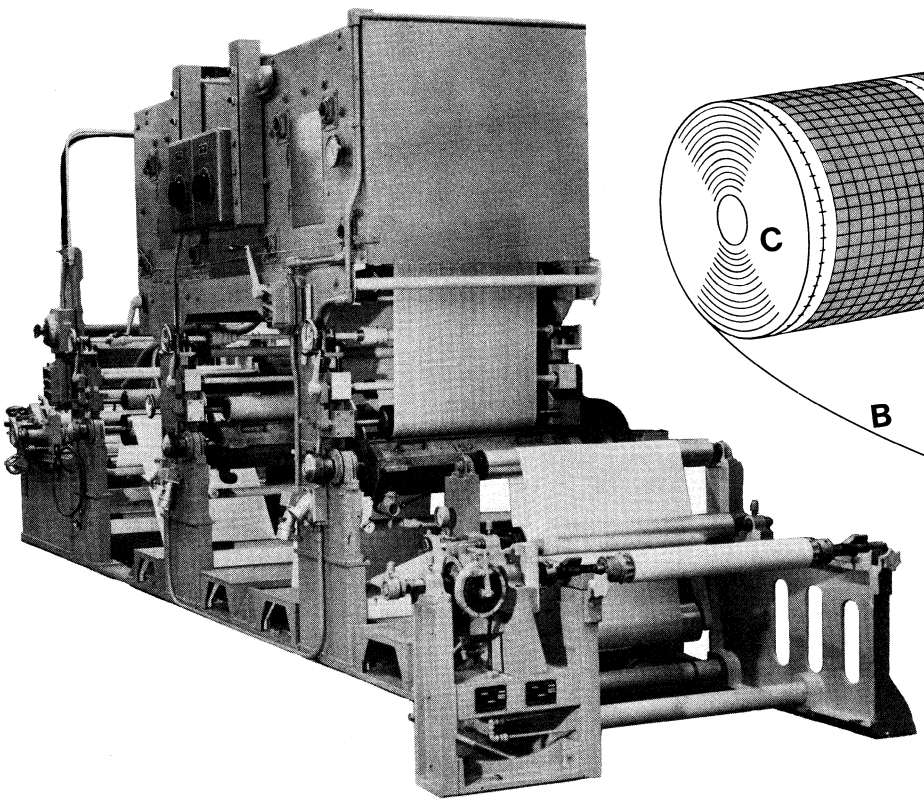
Coiling Tension. Rolls are coiled with uniform tension sufficient to prevent "telescoping" during normal use in Gould recorders.

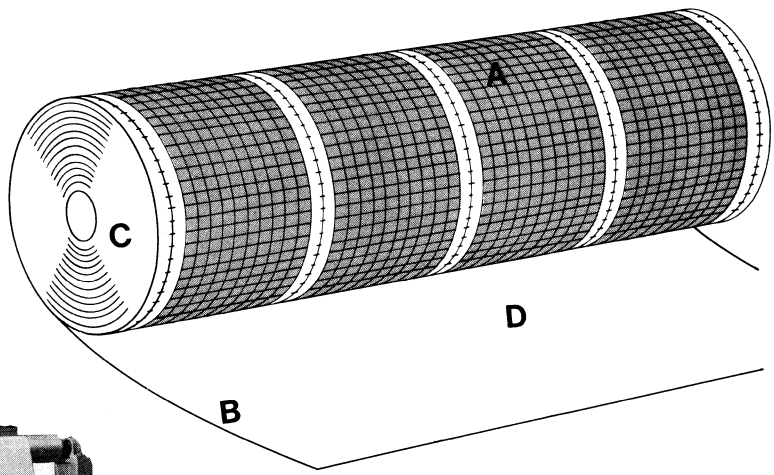
Uniformity. There are no printing errors or other discontinuities in a complete roll.

Compatibility with Gould Recorders. We certify that Gould chart paper will not compromise the accuracy or reliability of the recorder for which it is designed.

*All dimensional specifications based on a sustained condition of 50% relative humidity.

"Accuchart" is a registered trademark of Gould Inc., Instruments Division.





Supplies for:

Strip Chart Recorder 105, Model Series 15-42X8-XX
110, Model Series 15-4XX8-XX
270, Model Series 27X-111122-1
280, Model Series 28X-111111-1
2130, Model Series LR-XXX00-0X
Thermal Array Recorder TA550, Model Series 253-X22111-1
TA600, Model Series 3008-06XX-XX
TA2000, Model Series 3008-851X-4X

Strip Chart Recorder Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	Analog Channel Width	Div. Per Channel	No. of Event Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2913-19	**105**	**15-42X8-00**	2	10 in.	100	1	Capillary ink roll, English grid	11	120	1.25	12
11-2913-23	**105**	**15-42X8-10**	2	25 cm	250	1	Capillary ink roll, metric grid	11.5	120	1.25	12
11-2913-100	**105**	**15-42X8-10**	2	25 cm	250	1	Capillary ink folded pack, metric grid	11.5	100	1.5	1 pkg.
11-2913-101	**105**	**15-42X8-00**	2	10 in.	100	1	Capillary ink folded pack, English grid	11	100	1.5	1 pkg.
11-2915-10	**110**	**15-4XX8-00**	1-2	9.75 in.	100	—	Thermal black trace roll, English grid	11	120	1.25	12
11-2915-11	**110**	**15-4XX8-10**	1-2	24.8 cm	100	—	Thermal black trace roll, metric grid	11	120	1.25	12
11-2915-12	**110**	**15-4XX8-00**	1-2	7.67 in.	100	—	Thermal black trace roll, English grid, with integrator channel	11	120	1.25	12
11-2915-13	**110**	**15-4XX8-10**	1-2	19.5 cm	100	—	Thermal black trace roll, metric grid, with integrator channel	11	120	1.25	12
297701	**SC270** **SC280**	**27X-111122-1** **28X-111111-1**	4-6 4-8	250mm	—	4-6 4-8	Capillary ink roll, metric grid	11.1	66	.9	10
297702	**SC270**	**27X-111122-1**	4-6	250mm	—	4-6	Capillary ink folded pack, metric grid	11.1x 150mm	133 pgs.	.8	10
297711	**SC280**	**28X-111111-1**	4-8	250mm	—	4-8	Capillary ink folded pack, metric grid	11.1x 60mm	333 pgs.	.7	10
CL-211212	**SC2130**	**LR-XXX00-XX**	30	250mm	—	—	Box of 6 rolls ink jet paper	10.6	108.3	8/carton	6

Thermal Array Recorder Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
CL-211007	**TA 550**	**253-X22111-1**	Thermal black trace roll, no grid	4.49	114.9	.7	6
11-6905-31	**TA 600**	**3008-06XX-XX**	Thermal blue trace roll, no grid	6.0	300	1.8	12
11-6905-301	**TA600**	**3008-06XX-XX**	Thermal blue trace fanfold pack, no grid, 4 in. folds	6.0	250	1.5	1
CL-211097	**TA2000**	**3008-851X-4X**	Thermal black trace fanfold pack, no grid, 11 in. folds	8.5	325	3.0	6

Ink Strip Chart Recorder Pens

Recorder/Description	Analog Pen Model Number	Event Pen Model Number
105 Series Strip Chart Recorder		
Upper Red	290863-1	
Lower Blue	290862-2	
Left Black		290863-2
270/280 Series Strip Chart Recorder		
Color: Red	297703-1	297704-1
Green	297703-2	(Red for SC270)
Brown	297703-3	297705-1
Light Green	297703-4	(Red for SC280)
Blue	297703-5	297705-2
Orange	297703-6	(Green for SC280)
Light Blue	297703-7	
Violet	297703-8	

Supplies for:
Strip Chart Recorders and Thermal Array Recorders (continued)

Ink Jet Tanks

Recorder	Description	Model Number
2130 Series Logging Recorder	Set of 4 basic color ink jet tanks (magenta, cyan, yellow, black)	CL-211210
	Individual black ink jet tank	CL-211211
	Rubber squeeze bulb	CL-211213

Thermal Strip Chart Styli

Recorder	Analog Styli Model Number	Event Styli Model Number
110		
Upper Channel	11-2824-36	
Lower Channel	11-2824-37	
Left Event		11-2874-11
Right Event		11-2874-12

Supplies for:
Mark 200 Recorder, Model Series 1704, 1707, RF 1783, 15-1787

Oscillographic Rectilinear Chart Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	Analog Channel Width	Div. Per Channel	No. of Event Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2933-50	**200**	**8888-1707 Series**	—	—	—	32	High contrast ink roll	15	500	12.0	4
11-2943-51	**200**	**1111-17XX Series**	4	80mm	50	5	High contrast ink roll	15	500	12.0	4
1222-2943-502	**200**	**1222-17XX Series**	7	(1) 80mm (6) 40mm	50	8	High contrast ink semi-perf roll	15	500	12.0	4
11-2963-502	**200**	**1122-17XX Series**	6	(2) 80mm (4) 40mm	50	7	High contrast ink semi-perf roll	15	500	12.0	4
11-2983-504	**200**	**2222-17XX Series RF 1783 Series 15-1787 Series**	8	40mm	50	9	High contrast ink semi-perf roll	15	500	12.0	4
RA2983-503164	**200**	**2222-17XX Series RF 1783 (8 Chan.) 15-1787 Series**	8	40 mm	50	9	High contrast ink roll	15	500	12.0	4
11-2983-903164	**200**	**2222-1707 Series RF 1788 (8 Chan.) 15-1787 Series**	8	40mm	50	9	Reproducible ink roll	15	850	14.5	4

For chart papers not listed consult factory.

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
200 (RF 1783 Series)	RA 2823-30	RA 2821-20
200 (1707 Series)	11-2823-31	RA 2821-20
200 (15-1787 Series)	11-2823-31	RA 2821-20
200 (1704 Series)	11-2823-35	11-2821-22

Ink for Pressurized Ink Pens

Recorder	Blue Ink Model Number	Capacity (Ounces)	Container
200, RF1783 Series 15-1787 Series, 1704 Series 1707 Series	11-2734-02	2	Plastic Syringe
Ink remover	282920		

Continued on next page.

Supplies for:
Strip Chart Recorders and Thermal Array Recorders (continued)

Starter Kits
Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 12 packs of paper (depending on type of chart ordered), 1 analog pen, and a gram gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	Description of Chart Paper
200	11-2983-504	11-6250-37	8-40mm	9	High contrast ink semi-perf roll

Supplies for:
220 Recorder, Model Series 15-6327-XX, 15-6327-572601
222 Recorder, Model Series 15-6325-XX

Oscillographic Rectilinear Chart Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	Analog Channel Width	Div. Per Channel	No. of Event Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2923-32	**220/222**	**15-6327 Series**	2	40mm	50	3	High contrast ink roll	4.285	275	1.8	12
11-2923-38	**220/222**	**15-632X Series**	—	—	—	—	High contrast ink roll, no grid	4.285	275	1.8	12
11-2923-45	**220/222**	**15-632X Series**	2	40mm	50	3	Reproducible ink roll	4.285	400	1.8	12
11-2925-30	**220**	**15-6327 Series**	2	40mm	50	3	Thermal blue trace roll	4.285	300	1.7	12
11-2925-32	**220/222**	**15-6327 Series**	2	40mm	50	3	Thermal black trace roll	4.285	300	1.5	12

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
220, 222, 260, 440 & 480 Series	11-2823-33	11-2873-20

Longer-Life Pressurized Ink Pens

Recorder Group	Pen Number	Description
220, 240, 260, 440, and 480 Series	11-2823-34	Longer-Life, tungsten-carbide pressurized ink pen (Replaces 11-2823-33)

Thermal Oscillographic Styli

Recorder	Analog Styli Model Number	Event Styli Model Number
220 (15-6327 Series)	11-2824-35	11-2874-21

Ink for Pressurized Ink Pens

Recorder	Blue Ink Model Number	Capacity (Ounces)	Container
220, 222, 250, 260, 440, and 480 Series 2000, 2000S, 2000W	11-2730-01	1	Cartridge
For use in same Recorders as 11-2730-01	11-2730-012908 (Red)	1	Replaces 11-2730-01
	11-2730-015902 (Black)	1	Replaces 11-2730-01
Ink remover	282920		

Starter Kits
Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 12 packs of paper (depending on type of chart ordered), 1 analog pen, and a gram gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	Description of Chart Paper
220/222	11-2923-32	11-6250-00	2	3	High contrast ink roll
	11-2925-32	11-6250-002601	2	3	Thermal black trace roll
	11-2923-32	11-6251-00 (This is 220 Replacement Supplies Kit)	2	3	High contrast ink roll

Supplies for:

260 Recorder, Model Series 15-6367-XX

Oscillographic Rectilinear Chart Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	Analog Channel Width	Div. Per Channel	No. of Event Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2963-21	**260**	**15-6367 Series**	6	40mm	50	4	High contrast ink roll	12.52	225	4.9	12
11-2963-31	**260**	**15-6327 Series**	6	40mm	50	4	Reproducible ink roll	12.52	325	4.2	12
11-2963-200	**260**	**15-6327 Series**	6	40mm	50	4	High contrast ink semi-perf roll	12.52	225	4.9	12

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
220, 222, 260, 440 & 480 Series	11-2823-33	11-2873-20

Longer-Life Pressurized Ink Pens

Recorder Group	Pen Number	Description
220, 240, 260, 440, and 480 Series	11-2823-34	Longer-Life, tungsten-carbide pressurized ink pen (Replaces 11-2823-33)

Ink for Pressurized Ink Pens

Recorder	Blue Ink Model Number	Capacity (Ounces)	Container
220, 222, 250, 260, 440, and 480 Series 2000, 2000S, 2000W	11-2730-01	1	Cartridge
For use in same Recorders as 11-2730-01	11-2730-012908 (Red)	1	Replaces 11-2730-01
	11-2730-015902 (Black)	1	Replaces 11-2730-01
Ink remover	282920		

Starter Kits

Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 12 packs of paper (depending on type of chart ordered), 1 analog pen, and a gram gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	Description of Chart Paper
260	11-2963-21	11-6250-02	6	4	High contrast ink roll

Supplies for:

Electrostatic Recorder ES1000, Model Series 30X9-113X-X7, Model Series 30X9-115X-XX.

Electrostatic Recorder Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	Paper Description	Chart Paper Width (in./mm)	Chart Paper Length (ft./m)	Shipping Weight Per Roll/ Pack (lb./kg.)	Rolls/ Packs Per Ctn.
23-51*1-10	**ES 1000**	30X9-113X-X7 30X9-115X-XX	Electrostatic standard roll, no grid	11/276	400/122	39/17.5	6
23-51*1-11			Electrostatic folded pack, no grid	11 x 8½" 276x217	1000 pgs.	59/5.3	5 pk./ 1 pk.
23-51*1-12			Electrostatic translucent roll, no grid (requires modification of "Paper Out" sensor on ES-1000A)	11/276	400/122	41/18.5	6
23-51*1-13			Electrostatic perforated roll, no grid	11/276	400/122	39	6

*For chart paper for 30X9-113X-X7 Series, use "1".
For chart paper for 30X9-115X-XX Series, use "0".

Continued on next page.

Supplies for:
Electrostatic Recorder (continued)

Electrostatic Toner and Supplies

Recorder Group	Recorder Model Number	Supply Model Number	Description
ES 1000	30X9-113X-X7 30X9-115X-XX	23-5101-01	Toner, box of 4 – 1 qt. bottles
		23-5111-01	Toner, box of 6 bottles - one bottle packaged
		490735	Cleaner for Electrostatic Recorders, 1 qt.

Starter Kits

Each starter kit contains the right high quality Gould manufactured supplies needed to achieve maximum recorder performance. ES 1000 Starter Kits contain 12 rolls of paper or 10 packs of paper, 1 box toner, 1 bottle cleaner, and 1 roll or pack of another type of paper.

Recorder Group	Channel Number	Starter Kit: Model No. for Series 30X9-115X-XX	Starter Kit: Model No. for Series 30X9-113X-X7	Chart Paper Included	Configuration Width (mm)	Paper Description
ES 1000	Up to 40	11-6250-57	X52083	23-51*1-11†	276	Electrostatic folded pack, no grid
	Up to 40	11-6250-58	X52084	23-51*1-10††	276	Electrostatic standard roll, no grid
	Up to 40	11-6250-59	X52085	23-51*1-13††	276	Electrostatic perforated roll, no grid

†Also includes 1 roll p/n 23-51*1-13
††Also includes 1 pack p/n 23-51*1-11
*For 30X9-113X-X7 Series, use "1"
For 30X9-115X-XX Series, use "0"

Supplies for:
2200 Recorders, Model Series 2X07-2XXX-XX, 2X08-2XXX-XX

Chart Paper (50mm channels have 50 divisions; 100mm channels have 100 divisions)

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2913-30	2200	2X07-21XX-XX	1-100mm	2	—	High contrast ink roll	5.2	275	2.2	12
11-2923-35	2200	2X07-22XX-XX	2-50mm	3	—	High contrast ink roll	5.2	275	2.2	12
11-2923-39	2200	2X07-22XX-XX	—	—	—	High contrast ink roll, no grid	5.2	275	2.2	12
11-2923-46	2200	2X07-22XX-XX	2-50mm	3	—	Reproducible ink roll	5.2	400	2.0	12
11-2925-31	2200	2X08-22XX-XX	2-50mm	3	1	Thermal blue trace roll	5.2	275	1.9	12
11-2925-33	2200	2X08-22XX-XX	2-50mm	3	1	Thermal black trace roll	5.2	275	1.5	12
11-2927-31	2200	2X07-22XX-XX	2-50mm	2	1	High contrast ink roll, with thermal annotation stripe	5.2	275	2.2	12

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
2200, 2400 & 2600 Series	11-2823-42	267884-5

Longer-Life Pressurized Ink Pens

Recorder Group	Pen Number	Description
2200, 2400, and 2600 Series	11-2823-422608	Longer-life pen, replaces 11-2823-42

Thermal Oscillographic Styli

Recorder	Analog Styli Model Number	Event Styli Model Number
2000 Series — 2200, 2400 & 2600	11-2824-39	11-2874-34

Supplies for:
2200 Recorders (continued)

Ink for Pressurized Ink Pens

Recorder	Blue Ink Model Number	Capacity (Ounces)	Container
2000, 2000S, 2000W 2200, 2400, 2600, 2800	11-2730-01	1	Cartridge
For use in same Recorders as 11-2730-01	11-2730-012908 (Red)	1	Replaces 11-2730-01
	11-2730-015902 (Black)	1	Replaces 11-2730-01
Ink remover	282920		

Starter Kits
Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 12 packs of paper (depending on type of chart ordered), 1 analog pen, and a gram gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	No. of Annot. Ch's	Description of Chart Paper
2200/2200S	11-2913-30	11-6250-14	1-100mm	2	—	High contrast ink roll
	11-2923-35	11-6250-13	2-50mm	3	—	High contrast ink roll
	11-2925-31	11-6250-56	2-50mm	3	1	Thermal blue trace roll
	11-2925-33	11-6250-35	2-50mm	3	1	Thermal black trace roll
	11-2927-31	11-6250-48	2-50mm	2	1	High contrast ink roll

Supplies for:
2400 Recorders, Model Series 2X07-4XXX-XX, 2X08-4XXX-XX

Chart Paper (50mm channels have 50 divisions; 100mm channels have 100 divisions)

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2923-34	**2400**	**2X07-42XX-XX**	2-100mm	3	—	High contrast ink roll	9.84	275	4.0	12
11-2923-301	**2400**	**2X07-42XX-XX**	2-100mm	3	—	High contrast ink semi-perf roll	9.84	275	4.0	12
11-2933-30	**2400**	**2X07-43XX-XX**	1-100mm 2-50mm	4	—	High contrast ink roll	9.84	275	4.0	12
11-2933-300	**2400**	**2X07-43XX-XX**	1-100mm 2-50mm	4	—	High contrast ink semi-perf roll	9.84	275	4.0	12
11-2943-30	**2400**	**2X07-44XX-XX**	4-50mm	5	—	High contrast ink roll	9.84	275	4.0	12
11-2943-41	**2400**	**2X07-44XX-XX**	4-50mm	5	—	Reproducible ink roll	9.84	400	4.0	12
11-2943-300	**2400**	**2X07-44XX-XX**	4-50mm	5	—	High contrast ink semi-perf roll	9.84	275	4.0	12
11-2943-304011	**2400**	**2X07-44XX-XX**	—	—	—	High contrast ink roll, no grid	9.84	275	4.0	12
11-2945-30	**2400**	**2X08-44XX-XX**	4-50mm	5	1	Thermal blue trace roll	9.84	275	3.8	12
11-2945-31	**2400**	**2X08-44XX-XX**	4-50mm	5	1	Thermal black trace roll	9.84	275	3.0	12
11-2945-305160	**2400**	**2X08-44XX-XX**	4-50mm	5	1	Thermal black trace semi-perf roll	9.84	275	3.8	12
11-2947-31	**2400**	**2X07-44XX-XX**	4-50mm	4	1	High contrast ink roll, with thermal annotation stripe	9.84	275	4.1	12
11-2947-300	**2400**	**2X07-44XX-XX**	4-50mm	4	1	High contrast ink semi-perf roll with thermal annotation stripe	9.84	275	4.1	12

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
2200, 2400 & 2600 Series	11-2823-42	267884-5

Continued on next page.

Supplies for:
2400 Recorders (continued)

Longer-Life Pressurized Ink Pens

Recorder Group	Pen Number	Description
2200, 2400, and 2600 Series	11-2823-422608	Longer-life pen, replaces 11-2823-42

Thermal Oscillographic Styli

Recorder	Analog Styli Model Number	Event Styli Model Number
2000 Series — 2200, 2400 & 2600	11-2824-39	11-2874-34

Ink for Pressurized Ink Pens

Recorder	Blue Ink Model Number	Capacity (Ounces)	Container
2000, 2000S, 2000W 2200, 2400, 2600, 2800	11-2730-01	1	Cartridge
For use in same Recorders as 11-2730-01	11-2730-012908 (Red)	1	Replaces 11-2730-01
	11-2730-015902 (Black)	1	Replaces 11-2730-01
Ink remover	282920		

Starter Kits
Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 12 packs of paper (depending on type of chart ordered), 1 analog pen, and a gram gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	No. of Annot. Ch's	Description of Chart Paper
2400/2400S/ 2400W	11-2923-34	11-6250-05	2-100mm	3	—	High contrast ink roll
	11-2923-301	11-6250-18	2-100mm	3	—	High contrast ink semi-perf roll
	11-2933-30	11-6250-03	1-100mm 2-50mm	4	—	High contrast ink roll
	11-2933-300	11-6250-16	1-100mm 2-50mm	4	—	High contrast ink semi-perf roll
	11-2943-30	11-6250-04	4-50mm	5	—	High contrast ink roll
	11-2943-300	11-6250-17	4-50mm	5	—	High contrast ink semi-perf roll
	11-2945-30	11-6250-55	4-50mm	5	1	Thermal blue trace roll
	11-2945-31	11-6250-34	4-50mm	5	1	Thermal black trace roll
	11-2947-31	11-6250-47	4-50mm	4	1	High contrast ink roll

Supplies for:
2600 Recorders, Model Series 2X07-6XXX-XX, 2X08-6XXX-XX

Chart Paper (50mm channels have 50 divisions; 100mm channels have 100 divisions)

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2933-31	**2600**	**2X07-63XX-XX**	3-100mm	4	—	High contrast ink roll	15	275	6.3	6
11-2933-313054	**2600**	**2X07-63XX-XX**	3-100mm	4	—	High contrast ink semi-perf roll	15	275	6.3	6
11-2953-30	**2600**	**2X07-65XX-XX**	1-100mm 4-50mm	6	—	High contrast ink roll	15	275	6.3	6
11-2963-30	**2600**	**2X07-66XX-XX**	6-50mm	7	—	High contrast ink roll	15	275	6.3	6
11-2963-40	**2600**	**2X07-66XX-XX**	6-50mm	7	—	Reproducible ink roll	15	400	6.1	6
11-2963-300	**2600**	**2X07-66XX-XX**	6-50mm	7	—	High contrast ink semi-perf roll	15	275	6.3	6

Supplies for:
2600 Recorders (continued)

Chart Paper (50mm channels have 50 divisions; 100mm channels have 100 divisions) - *(continued)*

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2965-30	2600	2X08-66XX-XX	6-50mm	7	1	Thermal black trace roll	15	275	4.5	6
11-2965-300	2600	2X08-66XX-XX	6-50mm	6	1	Thermal blue trace semi-perf roll	15	275	5.8	6
11-2965-301	2600	2X08-66XX-XX	6-50mm	7	1	Thermal black trace semi-perf roll	15	275	5.8	6
11-2965-500	2600	2X08-66XX-XX	6-50mm	6	1	Thermal blue trace fanfold pack 30cm folds, 500 pages	15	492	9.4	4 pk.
11-2965-501	2600	2X08-66XX-XX	6-50mm	6	1	Thermal black trace fanfold pack 30cm folds, 500 pages	15	492	9.4	4 pk.
11-2967-301	2600	2X07-66XX-XX	6-50mm	6	1	High contrast ink semi-perf roll with thermal annotation stripe	15	275	6.3	6
11-2983-32	2600 2800	2X07-66XX-XX 2X07-88XX-XX	—	—	—	High contrast ink roll, no grid	15	275	6.3	6

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
2200, 2400 & 2600 Series	11-2823-42	267884-5

Longer-Life Pressurized Ink Pens

Recorder Group	Pen Number	Description
2200, 2400, and 2600 Series	11-2823-422608	Longer-life pen, replaces 11-2823-42

Thermal Oscillographic Styli

Recorder	Analog Styli Model Number	Event Styli Model Number
2000 Series — 2200, 2400 & 2600	11-2824-39	11-2874-34

Ink for Pressurized Ink Pens

Recorder	Blue Ink Model Number	Capacity (Ounces)	Container
2000, 2000S, 2000W 2200, 2400, 2600, 2800	11-2730-01	1	Cartridge
For use in same Recorders as 11-2730-01	11-2730-012908 (Red)	1	Replaces 11-2730-01
	11-2730-015902 (Black)	1	Replaces 11-2730-01
Ink remover	282920		

Starter Kits

Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 12 packs of paper (depending on type of chart ordered), 1 analog pen, and a gram gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	No. of Annot. Ch's	Description of Chart Paper
2600/2600S/ 2600W	11-2963-30	11-6250-41	6-50mm	7	—	High contrast ink roll
	11-2963-300	11-6250-10	6-50mm	7	—	High contrast ink semi-perf roll
	11-2965-30	11-6250-43	6-50mm	7	1	Thermal black trace roll
	11-2965-300	11-6250-54	6-50mm	6	1	Thermal blue trace semi-perf roll
	11-2965-301	11-6250-33	6-50mm	7	1	Thermal black trace semi-perf roll
	11-2965-500	11-6250-52	6-50mm	6	1	Thermal blue trace fanfolded pack
	11-2965-501	11-6250-53	6-50mm	6	1	Thermal black trace fanfolded pack
	11-2967-301	11-6250-46	6-50mm	6	1	High contrast ink semi-perf roll

Supplies for:

2800 Recorders, Model Series 2X07-88XX, 2X08-88XX-XX

Chart Paper (40mm channels have 50 divisions)

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2983-31	**2800**	**2X07-88XX-XX**	8-40mm	9	—	High contrast ink roll	15	275	6.3	6
11-2983-32	**2600** **2800**	**2X07-66XX-XX** **2X07-88XX-XX**	—	—	—	High contrast ink roll, no grid	15	275	6.3	6
11-2983-301	**2800**	**2X07-88XX-XX**	8-40mm	9	—	High contrast ink semi-perf roll	15	275	6.3	6
11-2985-32	**2800**	**2X08-88XX-XX**	8-40mm	9	—	Thermal black trace roll	15	275	4.5	6
11-2985-36	**2800**	**2X08-88XX-XX**	8-40mm	8	1	Thermal black trace roll	15	275	4.5	6
11-2985-300	**2800**	**2X08-88XX-XX**	8-40mm	8	1	Thermal blue trace semi-perf roll	15	275	5.8	6
11-2985-301	**2800**	**2X08-88XX-XX**	8-40mm	9	—	Thermal black trace semi-perf roll	15	275	5.8	6
11-2985-304	**2800**	**2X08-88XX-XX**	8-40mm	8	1	Thermal black trace semi-perf roll	15	275	5.8	6
11-2985-500	**2800**	**2X08-88XX-XX**	8-40mm	8	1	Thermal blue trace fanfold pack 30cm folds, 500 pages	15	492	9.4	4 pk.
11-2985-501	**2800**	**2X08-88XX-XX**	8-40mm	8	1	Thermal black trace fanfold pack 30cm folds, 500 pages	15	492	9.4	4 pk.
11-2987-302	**2800**	**2X07-88XX-XX**	8-40mm	8	1	High contrast ink semi-perf roll with thermal annotation strips	15	275	6.3	6

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
2800 (2007-88XX-XX)	11-2823-35	11-2873-20

Longer-Life Pressurized Ink Pens

Recorder Group	Pen Number	Description
2800 Series	11-2823-352608	Longer-life pen, replaces 11-2823-35

Thermal Oscillographic Styli

Recorder	Analog Styli Model Number	Event Styli Model Number
2800	11-2824-38	11-2874-35

Ink for Pressurized Ink Pens

Recorder	Blue Ink Model Number	Capacity (Ounces)	Container
2000, 2000S, 2000W 2200, 2400, 2600, 2800	11-2730-01	1	Cartridge
For use in same Recorders as 11-2730-01	11-2730-012908 (Red)	1	Replaces 11-2730-01
	11-2730-015902 (Black)	1	Replaces 11-2730-01
Ink remover	282920		

Supplies for:
2800 Recorders (continued)

Starter Kits

Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 12 packs of paper (depending on type of chart ordered), 1 analog pen, and a gram gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	No. of Annot. Ch's	Description of Chart Paper
2800/2800S/2800W	11-2983-31	11-6250-42	8-40mm	9	—	High contrast ink roll
	11-2983-301	11-6250-15	8-40mm	9	—	High contrast ink semi-perf roll
	11-2985-32	11-6250-32	8-40mm	9	—	Thermal black trace roll
	11-2985-36	11-6250-60	8-40mm	8	1	Thermal black trace roll
	11-2985-300	11-6250-51	8-40mm	8	1	Thermal blue trace semi-perf roll
	11-2985-301	11-6250-36	8-40mm	9	—	Thermal black trace semi-perf roll
	11-2985-304	11-6250-61	8-40mm	8	1	Thermal black trace semi-perf roll
	11-2985-500	11-6250-49	8-40mm	8	1	Thermal blue trace fanfold pack
	11-2985-501	11-6250-50	8-40mm	8	1	Thermal black trace fanfold pack
	11-2987-302	11-6250-45	8-40mm	8	1	High contrast ink semi-perf roll

Supplies for:
3200 Recorders, Model Series 30-V72XX-1X, 30-V82XX-1X

Chart Paper (50mm channels have 50 divisions; 100mm channels have 100 divisions)

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2915-31	3200	30-V8210-1X 30-V7210-1X	1-100mm	1	1	Thermal black trace roll (can be used with ink recorder)	5.2	350	2.0	12
11-2917-30	3200	30-V7210-1X	1-100mm	1	1	High contrast ink roll, with annotation stripe	5.2	275	2.0	12
11-2925-35	3200	30-V8202-1X 30-V7202-1X	2-50mm	1	2	Thermal black trace roll (can be used with ink recorder)	5.2	350	2.0	12
11-2925-37	3200 2200	30-V8202-1X 30-V7202-1X 2X08-22XX-XX with Annot.	2-50mm	2	1	Thermal black trace roll (can be used with ink recorder)	5.2	350	2.0	12
11-2925-503	3200	30-V8202-1X	2-50mm	2	1	Thermal black trace folded pack 15cm folds, 500 pgs.	5.2	246	1.4	8
11-2925-504	3200	30-V8202-1X	2-50mm	1	2	Thermal black trace folded pack 15cm folds, 500 pgs.	5.2	246	1.4	8
11-2927-31	3200 2200	30-V7202-1X 2X07-22XX-XX with Annot.	2-50mm	2	1	High contrast ink roll, with annotation stripe	5.2	275	2.2	12

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
3000, with 40/50mm CH	11-2823-3A	11-2873-2A
3000, with 80/100mm CH	11-2823-4A	11-2873-2A

Thermal Pens

Recorder	Analog Pen Model Number	Event Pen Model Number
3000, with 40/50mm CH	11-2824-3A	11-2874-2A
3000, with 80/100mm CH	11-2824-4A	11-2874-2A

Ink for Pressurized Ink Pens

Recorder	Ink Model Number	Capacity	Container
3000, all Ink Recorders	11-2731-01	1 oz.	Cartridge

Continued on next page.

Supplies for:
3200 Recorders (continued)

Miscellaneous Supply Items

Recorder	Description of Item	Model Number
3000, all Recorders	Gram Gage (for setting pen pressure)	240601-910
	Ink Remover	282920
	Time Line Gage (for setting pen position)	CL-310999

Starter Kits

Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 8 packs of paper (depending on type of chart ordered), 1 analog pen, a gram gage, and a time line gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	No. of Annot. Ch's	Description of Chart Paper
3200	11-2915-31	11-36250-01	1-100mm	1	1	Thermal black trace roll
	11-2917-30	11-36250-02	1-100mm	1	1	High contrast ink roll
	11-2925-35	11-36250-03	2-50mm	1	2	Thermal black trace roll
	11-2925-37	11-36250-04	2-50mm	2	1	Thermal black trace roll
	11-2925-503	11-36250-05	2-50mm	2	1	Thermal black trace folded pack
	11-2925-504	11-36250-06	2-50mm	1	2	Thermal black trace folded pack
	11-2927-31	11-36250-07	2-50mm	2	1	High contrast ink roll

Supplies for:
3400 Recorders, Model Series 30-V74XX-1X, 30-V84XX-1X

Chart Paper (50mm channels have 50 divisions; 100mm channels have 100 divisions)

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2925-36	**3400**	**30-V8420-1X 30-V7420-1X**	2-100mm	2	1	Thermal black trace roll (can be used with ink recorder)	9.84	350	3.9	12
11-2927-300	**3400**	**30-V7412-1X**	2-100mm	2	1	High contrast ink semi-perf roll, 30cm between perfs, with annotation stripe	9.84	275	4.1	12
11-2935-30	**3400**	**30-V8412-1X 30-V7412-1X**	1-100mm 2-50mm	3	1	Thermal black trace roll (can be used with ink recorder)	9.84	350	3.9	12
11-2937-300	**3400**	**30-V7412-1X**	1-100mm 2-50mm	3	1	High contrast ink semi-perf roll, 30cm between perfs, with annotation stripe	9.84	275	4.1	12
11-2945-32	**3400**	**30-V8404-1X 30-V7404-1X**	4-50mm	1	4	Thermal black trace roll (can be used with ink recorder)	9.84	350	3.9	12
11-2945-33	**3400 2400**	**30-V8404-1X 30-V7404-1X 2X08-44XX-XX with Annot.**	4-50mm	4	1	Thermal black trace roll (can be used with ink recorder)	9.84	350	3.9	12
11-2945-503	**3400**	**30-V8404-1X**	4-50mm	4	1	Thermal black trace folded pack 15cm folds, 500 pgs.	9.84	246	2.7	4
11-2945-504	**3400**	**30-V8404-1X**	4-50mm	1	4	Thermal black trace folded pack 15cm folds, 500 pgs.	9.84	246	2.7	4
11-2947-31	**3400 2400**	**30-V7404-1X 2X07-44XX-XX with Annot.**	4-50mm	4	1	High contrast ink roll, with annotation stripe	9.84	275	4.1	12
11-2947-300	**3400 2400**	**30-V7404-1X 2X07-44XX-XX with Annot.**	4-50mm	4	1	High contrast ink semi-perf roll, 30cm between perfs, with annotation stripe	9.84	275	4.1	12

Supplies for:
3400 Recorders (continued)

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
3000, with 40/50mm CH	11-2823-3A	11-2873-2A
3000, with 80/100mm CH	11-2823-4A	11-2873-2A

Thermal Pens

Recorder	Analog Pen Model Number	Event Pen Model Number
3000, with 40/50mm CH	11-2824-3A	11-2874-2A
3000, with 80/100mm CH	11-2824-4A	11-2874-2A

Ink for Pressurized Ink Pens

Recorder	Ink Model Number	Capacity	Container
3000, all Ink Recorders	11-2731-01	1 oz.	Cartridge

Miscellaneous Supply Items

Recorder	Description of Item	Model Number
3000, all Recorders	Gram Gage (for setting pen pressure)	240601-910
	Ink Remover	282920
	Time Line Gage (for setting pen position)	CL-310999

Starter Kits

Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 8 packs of paper (depending on type of chart ordered), 1 analog pen, a gram gage, and a time line gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	No. of Annot. Ch's	Description of Chart Paper
3400	11-2925-36	11-36250-08	2-100mm	2	1	Thermal black trace roll
	11-2927-300	11-36250-09	2-100mm	2	1	High contrast ink semi-perf roll
	11-2935-30	11-36250-10	1-100mm 2-50mm	3	1	Thermal black trace roll
	11-2937-300	11-36250-11	1-100mm 2-50mm	3	1	High contrast ink semi-perf roll
	11-2945-32	11-36250-12	4-50mm	1	4	Thermal black trace roll
	11-2945-33	11-36250-13	4-50mm	4	1	Thermal black trace roll
	11-2945-503	11-36250-14	4-50mm	4	1	Thermal black trace folded pack
	11-2945-504	11-36250-15	4-50mm	1	4	Thermal black trace folded pack
	11-2947-31	11-36250-16	4-50mm	4	1	High contrast ink roll
	11-2947-300	11-36250-17	4-50mm	4	1	High contrast ink semi-perf roll

Supplies for:

3600 Recorders, Model Series 30-V76XX-1X, 30-V86XX-1X

Chart Paper (50mm channels have 50 divisions; 100mm channels have 100 divisions)

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2965-33	3600	30-V8606-1X 30-V7606-1X	6-50mm	1	6	Thermal black trace roll (can be used with ink recorder)	15.0	350	5.8	6
11-2965-34	3600 2600	30-V8606-1X 30-V7606-1X 2X08-66XX-XX with Annot.	6-50mm	6	1	Thermal black trace roll (can be used with ink recorder)	15.0	350	5.8	6
11-2965-503	3600	30-V8606-1X	6-50mm	6	1	Thermal black trace folded pack 15cm folds, 500 pgs.	15.0	246	4.1	4
11-2965-504	3600	30-V8606-1X	6-50mm	1	6	Thermal black trace folded pack 15cm folds, 500 pgs.	15.0	246	4.1	4
11-2967-301	3600 2600	30-V7606-1X 2X07-66XX-XX with Annot.	6-50mm	6	1	High contrast ink semi-perf roll, 30cm between perfs with annotation stripe	15.0	275	6.3	6

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
3000, with 40/50mm CH	11-2823-3A	11-2873-2A

Thermal Pens

Recorder	Analog Pen Model Number	Event Pen Model Number
3000, with 40/50mm CH	11-2824-3A	11-2874-2A

Ink for Pressurized Ink Pens

Recorder	Ink Model Number	Capacity	Container
3000, all Ink Recorders	11-2731-01	1 oz.	Cartridge

Miscellaneous Supply Items

Recorder	Description of Item	Model Number
3000, all Recorders	Gram Gage (for setting pen pressure)	240601-910
	Ink Remover	282920
	Time Line Gage (for setting pen position)	CL-310999

Starter Kits

Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 8 packs of paper (depending on type of chart ordered), 1 analog pen, a gram gage, and a time line gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	No. of Annot. Ch's	Description of Chart Paper
3600	11-2965-33	11-36250-18	6-50mm	1	6	Thermal black trace roll
	11-2965-34	11-36250-19	6-50mm	6	1	Thermal black trace roll
	11-2965-503	11-36250-20	6-50mm	6	1	Thermal black trace folded pack
	11-2965-504	11-36250-21	6-50mm	1	6	Thermal black trace folded pack
	11-2967-301	11-36250-22	6-50mm	6	1	High contrast ink semi-perf roll

Supplies for:

3800 Recorders, Model Series 30-V78XX-1X, 30-V88XX-1X

Chart Paper (40mm channels have 50 divisions)

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	No. of Event Channels	No. of Annot. Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
11-2985-37	3800	30-V8808-1X 30-V7808-1X	8-40mm	1	8	Thermal black trace roll (can be used with ink recorder)	15.0	350	5.8	6
11-2985-38	3800 2800	30-V8808-1X 30-V7808-1X 2X08-88XX-XX with Annot.	8-40mm	8	1	Thermal black trace roll (can be used with ink recorder)	15.0	350	5.8	6
11-2985-503	3800	30-V8808-1X	8-40mm	8	1	Thermal black trace folded pack 15cm folds, 500 pgs.	15.0	246	4.1	4
11-2985-504	3800	30-V8808-1X	8-40mm	1	8	Thermal black trace folded pack 15cm folds, 500 pgs.	15.0	246	4.1	4
11-2987-302	3800 2800	30-V7808-1X 2X07-88XX-XX with Annot.	8-40mm	8	1	High contrast ink semi-perf roll, 30cm between perfs, with annotation stripe	15.0	275	6.3	6

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
3000, with 40/50mm CH	11-2823-3A	11-2873-2A

Thermal Pens

Recorder	Analog Pen Model Number	Event Pen Model Number
3000, with 40/50mm CH	11-2824-3A	11-2874-2A

Ink for Pressurized Ink Pens

Recorder	Ink Model Number	Capacity	Container
3000, all Ink Recorders	11-2731-01	1 oz.	Cartridge

Miscellaneous Supply Items

Recorder	Description of Item	Model Number
3000, all Recorders	Gram Gage (for setting pen pressure)	240601-910
	Ink Remover	282920
	Time Line Gage (for setting pen position)	CL-310999

Starter Kits

Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper or 8 packs of paper (depending on type of chart ordered), 1 analog pen, a gram gage, and a time line gage. (Complete description of chart found in "CHART PAPER" section.)

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	No. of Annot. Ch's	Description of Chart Paper
3800	11-2985-37	11-36250-23	8-40mm	1	8	Thermal black trace roll
	11-2985-38	11-36250-24	8-40mm	8	1	Thermal black trace roll
	11-2985-503	11-36250-25	8-40mm	8	1	Thermal black trace folded pack
	11-2985-504	11-36250-26	8-40mm	1	8	Thermal black trace folded pack
	11-2987-302	11-36250-27	8-40mm	8	1	High contrast ink semi-perf roll

Supplies for:
8000S Recorders, Model Series 8188-XXXX-XX

Oscillographic Rectilinear Chart Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	Analog Channel Width (mm)	Div. Per Channel	No. of Event Channels	Type of Chart	Chart Paper Width (mm)	Chart Paper Length (m)	Shipping Weight Per Roll (kg)	Rolls/ Packs Per Ctn.
X-72411	**8100**	**8188-110X-XX**	1	50	50	2	Thermal blue trace roll	66	60	0.2	24
X-72511			1	50	50	2	Thermal black trace roll	66	60	0.2	24
X-72421	**8200**	**8188-220X-XX**	2	50	50	2	Thermal blue trace roll	126	60	0.5	12
X-72521			2	50	50	2	Thermal black trace roll	126	60	0.5	12
X-72431	**8300**	**8188-330X-XX**	3	50	50	2	Thermal blue trace roll	196	60	0.8	12
X-72531			3	50	50	2	Thermal black trace roll	196	60	0.8	12
X-72441	**8400**	**8188-4400-XX**	4	50	50	2	Thermal blue trace roll	249	60	1.1	12
X-72541			4	50	50	2	Thermal black trace roll	249	60	1.1	12
X-73441			4	50	50	2	Perforated thermal blue trace	249	60	1.1	12
X-72461	**8600**	**8188-66XX-XX**	6	50	50	2	Thermal blue trace roll	377	60	1.5	12
X-72561			6	50	50	2	Thermal black trace roll	377	60	1.5	12
X-73461			6	50	50	2	Perforated thermal blue trace	377	60	1.5	12
X-72481	**8800**	**8188-88XX-XX**	8	40	50	2	Thermal blue trace roll	377	60	1.5	12
X-72581			8	40	50	2	Thermal black trace roll	377	60	1.5	12
X-73481			8	40	50	2	Perforated thermal blue trace	377	60	1.5	12

Thermal Oscillographic Styli

Recorder	Analog Styli Model Number	Event Styli Model Number
8000S Series (All)	X-50521	X-50744

Starter Kits

Choose a starter kit based on the type of chart paper wanted. Each kit contains 12 rolls of paper (except for 1 ch kit which contains 24 rolls). One, two, and three channel kits contain 1 analog pen, 1 event marker pen, and 1 fuse. Four, six, and eight channel kits contain 2 analog pens, 2 event pens, and 2 fuses.

Recorder Group	For Chart Paper	Order: Starter Kit Model No.	Channel Config.	No. of Event Ch's	Description of Chart Paper
8100	X-72411	X-51743	1-50mm	2	Thermal blue trace roll
8200	X-72421	X-51744	2-50mm	2	Thermal blue trace roll
8300	X-72431	X-51745	3-50mm	2	Thermal blue trace roll
8400	X-72441	X-51746	4-50mm	2	Thermal blue trace roll
8600	X-72461	X-51747	6-50mm	2	Thermal blue trace roll
8800	X-72481	X-51748	8-40mm	2	Thermal blue trace roll

Supplies for:
Colorwriter Digital Plotters: 6120-3111-00 Series, 63X0-X615-00 Series, 15-7XXX-00 Series

XY Chart Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	Description	Grid Description	Size	Unit Shipping Wt. Lbs.
11-2913-40				**** USE 63010-630 ****		
BR-62010-500				**** USE 63010-622 ****		
BR-62020-500				**** USE 63020-622 ****		
BR-62030-500				**** USE 63011-611 ****		
BR-62040-500				**** USE 63021-611 ****		
63010-622			Unruled Pack of 100 sheets, high contrast	—	8.5 x 11 inches	1.5
63020-622	**Colorwriter**	**15-7XXX-00 6120-3111-00 63X0-X615-00**	Unruled Pack of 100 sheets, high contrast	—	11 x 17 inches	3.2
63010-620			Unruled Pack of 100 sheets, standard paper	—	8.5 x 11 inches	1.2
63020-620			Unruled Pack of 100 sheets, standard paper	—	11 x 17 inches	2.3

Supplies for:
Colorwriter Digital Plotters (continued)

XY Chart Paper - *(continued)*

Chart Paper Model Number	Recorder Group	Recorder Model Number	Description	Grid Description	Size	Unit Shipping Wt. Lbs.
63010-630	**Colorwriter**	**15-7XXX-00** **6120-3111-00** **63X0-X615-00**	Unruled Pack of 50 sheets, clear film	—	8.5 x 11 inches	1.5
63020-623			Unruled Pack of 50 sheets, vellum (for use with drafting pens)	—	11 x 17 inches	1.2
63011-611			Unruled roll, 30 meters length Standard paper (for Model 6310)	—	8.5 x 11 inches	1.2
63021-611			Unruled roll, 30 meters length Standard paper (for Model 6320)	—	11 x 17 inches	1.7

Pens for Colorwriter Plotters

Pens for 6120 Series

	General Purpose Fine line, 0.3mm ceramic tip, pack of 7		**Long Life** Fine line, 0.3mm roller ball tip, pack of 7		**Transparency/ General Purpose** High impact, 0.5mm felt tip, pack of 7			
Item	**Model Number**		**Model Number**		**Model Number**			
Multi-color	61000-210 (black, brown, red, orange, green, blue, violet)		61000-751 (black, brown, red, orange, green, blue, violet)		61000-211 (black, brown, red, orange, green, blue, violet)			
Single Color								
black	61000-200		61000-240		61000-250			
brown	61000-201		61000-241		61000-251			
red	61000-202		61000-242		61000-252			
orange	61000-203		61000-243		61000-253			
green	61000-205		61000-245		61000-255			
blue	61000-206		61000-246		61000-256			
violet	61000-207		61000-247		61000-257			

Pens for 6300 Series

	General Purpose/ Transparency Fine line, 0.3mm plastic tip, pack of 5		**General Purpose/ Transparency** Wide, 0.7mm plastic tip, pack of 5		**Long Life** Fine line, 0.3mm roller ball tip, pack of 5		**Drafting*** Liquid ink, 0.3mm steel tip, disposable, pack of 4 (for Vellum Media only)	
Item	**Model Number**		**Model Number**		**Model Number**		**Model Number**	
Multi-color	63000-210 (black, red, cyan, green, blue)		None	—	63000-711 (black, red, green, blue, violet)		63000-752 (black, red, green, blue)	
Single Color								
black	63000-200		63000-220		63000-240		63000-760	
brown	63000-201		63000-221		63000-241		—	
red	63000-202		63000-222		63000-242		63000-762	
orange	63000-203		63000-223		63000-243		—	
yellow	63000-204		63000-224		63000-244		—	
green	63000-205		63000-225		63000-245		63000-765	
blue	63000-206		63000-226		63000-246		63000-766	
violet	63000-207		63000-227		63000-247		—	
magenta	63000-208		63000-228		63000-248		—	
cyan	63000-209		63000-229		63000-249		—	

*Requires adapter 63000-28. Unit also accepts standard Koh-i-noor Rapid-o-graph drafting and Pentel Ceramicon pens with adapter 62000-27.

Continued on next page.

Supplies for:
Colorwriter Digital Plotters (continued)

Plot-Pak™ Supply Sampler Kits for Colorwriter Plotters
Plot-Paks provide a useful sampling of the major supply items available for your Colorwriter, packaged to meet the typical needs of your specific model. Higher quantities of specific items of interest can then be purchased separately.

Kit	Description	Model Number	
Gould 6310 Basic Kit	Media — 8½ in. x 11 in., •paper, high contrast, 100 sheets •paper, standard, 100 sheets •transparency, 50 sheets Pens — pack of 5 each •general purpose/transparency, 0.3mm plastic tip, multi-color •general purpose/transparency, 0.7mm, plastic tip, black •long life, 0.3mm roller ball, multi-color	63010-601	
Gould 6310 Kit for Lotus 1-2-3, Symphony and the IBM PC, PC/XT	Media — 8½ in. x 11 in., •paper, high contrast, 100 sheets •paper, standard, 100 sheets •transparency, 50 sheets Pens — pack of 5 each •general purpose/transparency, 0.3mm plastic tip, multi-color •general purpose/transparency, 0.7mm, plastic tip, black •long life, 0.3mm roller ball, multi-color Cable — IBM PC/Colorwriter RS-232 Application Notes — •Using Lotus Symphony with the Gould Colorwriter •Using Lotus 1-2-3 with the Gould Colorwriter	63010-602	
Gould 6320 Basic Kit	Media — 11 in. x 17 in., •paper, high contrast, 100 sheets •paper, standard, 100 sheets •vellum, 50 sheets — 8½ in. x 11 in., •transparency, 50 sheets Pens — pack of 5 each •general purpose/transparency, 0.3mm plastic tip, multi-color •general purpose/transparency, 0.7mm plastic tip, black •long life, 0.3mm roller ball •disposable liquid ink drafting pens and adapters, pack of 4, multicolor	63020-601	
Gould 6120 Basic Kit	Media — 8½ in. x 11 in., •paper, high contrast, 100 sheets •paper, standard, 100 sheets •transparency, 50 sheets Pens — multi-color, pack of 7 each •transparency/general purpose, 0.5mm, felt tip •long life, 0.3mm roller ball	61020-601	
Gould 6120 Kit for Lotus 1-2-3, Symphony and the IBM PC, PC/XT	Media — 8½ in. x 11 in., •paper, high contrast, 100 sheets •paper, standard, 100 sheets •transparency, 50 sheets Pens — multi-color, pack of 7 each •transparency/general purpose, 0.5mm felt tip •long life, 0.3mm roller ball Cable — IBM PC/Colorwriter RS-232 Application Notes — •Using Lotus Symphony with the Gould Colorwriter •Using Lotus 1-2-3 with the Gould Colorwriter	61020-602	
Gould 6120 Kit for Lotus 1-2-3, Symphony and the IBM PC/AT	Media — 8½ in. x 11 in., •paper, high contrast, 100 sheets •paper, standard, 100 sheets •transparency, 50 sheets Pens — multi-color, pack of 7 each •transparency/general purpose, 0.5mm felt tip •long life, 0.3mm roller ball Cable — IBM PC/AT to Colorwriter RS-232 Application Notes — •Using Lotus Symphony with the Gould Colorwriter •Using Lotus 1-2-3 with the Gould Colorwriter	61020-603	

Supplies for:

Analog XY Recorders: **500, Model Series 15-3327-10**
305X, Model Series 15-3307-XX
50000, Model Series 13-9XXX-XX
50000, Model Series 15-9XXX-XX
60000, Model Series BR-60XXX-X0

XY Chart Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	Description	Grid Description	Size	Unit Shipping Wt. Lbs.
11-2913-34			English grid, three-hole punched Pack of 100 sheets, standard paper	15 x 10 inches 150 x 100 divs	11 x 16.5 inches	2.8
11-2913-35			Metric grid, three-hole punched Pack of 100 sheets, standard paper	38 x 25 cm 380 x 250 divs	11 x 16.5 inches	2.8
11-2913-36	**500, 3052, 3054, 3056 XY**	**15-3327-10 15-3307-XX**	Unruled, three-hole punched Pack of 100 sheets, standard paper	—	11 x 16.5 inches	2.8
11-2913-37			English grid, three-hole punched Pack of 100 sheets, high contrast	15 x 10 inches 150 x 100 divs	11 x 16.5 inches	3.0
11-2913-38			Metric grid, three-hole punched Pack of 100 sheets, high contrast	38 x 25 cm 380 x 250 divs	11 x 16.5 inches	3.0
11-2913-39			Unruled, three-hole punched Pack of 100 sheets, high contrast	—	11 x 16.5 inches	3.0
11-2913-35			Metric grid, three-hole punched Pack of 100 sheets, standard paper	38 x 25 cm 380 x 250 divs	11 x 16.5 inches	2.8
11-2913-36			Unruled, three-hole punched Pack of 100 sheets, standard paper	—	11 x 16.5 inches	2.8
11-2913-38	**50000 XY**	**15-9XXX-XX 13-9XXX-XX**	Metric grid, three-hole punched Pack of 100 sheets, high contrast	38 x 25 cm 380 x 250 divs	11 x 16.5 inches	3.0
11-2913-39			Unruled, three-hole punched Pack of 100 sheets, high contrast	—	11 x 16.5 inches	3.0
BR-50010-600			Unruled, transparent Pack of 100 sheets, clear film	—	8.3 x 11.5 inches	2.4
BR-50840-500			Metric grid roll, 30 m. length One roll standard paper	28 cm wide 280 divs	32 cm wide	1.4
11-2913-34			English grid, three-hole punched Pack of 100 sheets, standard paper	15 x 10 inches 150 x 100 divs	11 x 16.5 inches	2.8
11-2913-35			Metric grid, three-hole punched Pack of 100 sheets, standard paper	38 x 25 cm 380 x 250 divs	11 x 16.5 inches	2.8
11-2913-36			Unruled, three-hole punched Pack of 100 sheets, standard paper	—	11 x 16.5 inches	2.8
11-2913-37			English grid, three-hole punched Pack of 100 sheets, high contrast	15 x 10 inches 150 x 100 divs	11 x 16.5 inches	3.0
11-2913-38	**60000 XY**	**BR-60XXX-X0**	Metric grid, three-hole punched Pack of 100 sheets, high contrast	38 x 25 cm 380 x 250 divs	11 x 16.5 inches	3.0
11-2913-39			Unruled, three-hole punched Pack of 100 sheets, high contrast	—	11 x 16.5 inches	3.0
11-2913-41			English grid Pack of 100 sheets, high contrast	10 x 7 inches 100 x 70 divs	8.5 x 11 inches	1.5
11-2913-42			Metric grid Pack of 100 sheets, high contrast	25 x 18 cm 250 x 180 divs	8.5 x 11 inches	1.5
396220-12			**** USE 11-2913-42 ****			

Continued on next page.

Supplies for:
Analog XY Recorders (continued)

Felt Tip Pens for Analog XY Recorders

3052, 3054, 3056 XY Series	Model Number
Color: Black	295220-1
Blue	295220-2
Red	295220-3
Green	295220-4
Note: Pack of Five	

50000S XY Series	
Single Pen	
Color: Red, 1Y	BR-50000-87
Blue, 1Y	BR-50000-88
Black, 1Y	BR-50000-89
Green, 1Y	BR-50000-90
Red, 2Y	BR-50000-526
Black, 2Y	BR-50000-527
Multi-color Turret	
Six Color Mix: red, green, blue, black, violet, brown	396220-25

Multi-color Turret - *continued*	Model Number
Package of five 396220-25	396220-26
Two Color Mix: three each of red and black	396220-27
Package of five 396220-27	396220-28
Transparency Pen	
Red	BR-50000-111
Black	BR-50000-112
Green	BR-50000-113
Blue	BR-50000-114

60000 Series XY	
Color: Red	396220-1
Black	396220-2
Blue	396220-3
Green	396220-4

Supplies for Obsolete Recorders:

BL-201, BL-202	
ESR 200	**Model Series 3009-1110-00**
Mark II	**Model Series 2521, 2522**
OEM Modules, Vert.	**Model Series XXXX-69XX-00**
OEM Modules, Horiz.	**Model Series XXXX-68XX-00**
Operations Monitor	**Model Series 15-6327-XX1018, RE-3X03-1X**
RD-2322	
RD-2631	
240	**Model Series 2200-6607-XX**
250	**Model Series 15-6X17-0X**
280	**Model Series 1100-6607-XX, 15-6327-XX**
440	**Model Series 15-6347-XX**
480, 481	**Model Series 15-668X-XX**
816	**Model Series 15-6X17-4X, 15-6X18-2X**
842	**Model Series 13-6624-00**
2100	**Model Series 15-631X-6X**
4800 Printer Plotter	**All Model Series**
6500 Tape Recorder	**All Model Series**

Oscillographic Rectilinear Chart Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	Analog Channel Width	Div. Per Channel	No. of Event Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
1 Channel Paper											
11-2913-10	**250**	**15-6X17-OX**	1	4.5 in.	50	2	High contrast ink roll	6.0	100	1.0	12
11-2913-22	**OEM Modules** **2100**	**XXXX-6917-00 or XXXX-6817-00** **15-6317-60** **15-6317-66**	1	50mm	50	—	High contrast ink roll	2.47	150	0.5	100
11-2915-20	**OEM Modules** **2100**	**XXXX-6918-00 or XXXX-6818-00** **15-6318-60** **15-6318-66**	1	50mm	50	—	Thermal black trace roll	2.47	150	0.6	100
2 Channel Paper											
RA-2921-30	**BL/RD**	**BL 202/RD 2321-00**	2	40mm	40	—	Capillary ink roll, curvilinear grid	3.47	300	0.9	12
RA-2921-32	**Mark II**	**2521 Series**	2	40mm	40	—	Capillary ink roll, curvilinear grid	3.72	300	1.0	12
RA-2922-22	**Mark II**	**2522 Series**	2	40mm	40	—	Electric writing roll, curvilinear grid	3.72	150	0.9	12
11-2923-20	**280**	**1100-6607 Series** **15-6327 Series**	2	80mm	50	3	High contrast ink roll	7.9	275	3.4	12
11-2923-23	**OEM Module**	**XXXX-6927-00 or XXXX-6827-00**	2	50mm	50	—	High contrast ink roll	5.0	150	1.0	50
3 and 4 Channel Paper											
2200-2923-30	**240** **440**	**2200-6607 Series** **15-6347 Series**	4	40mm	50	5	High contrast ink roll	7.9	275	3.4	12

Supplies for:
Obsolete Recorders (continued)

Oscillographic Rectilinear Chart Paper - *continued*

Chart Paper Model Number	Recorder Group	Recorder Model Number	No. of Analog Channels	Analog Channel Width	Div. Per Channel	No. of Event Channels	Type of Chart	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
7 and 8 Channel Paper											
11-2983-30	**480**	**15-6687 Series**	8	40mm	50	9	High contrast ink roll	15	300	6.8	6
11-2983-300	**480**	**15-6687 Series**	8	40mm	50	9	High contrast ink semi-perf roll	15	300	6.8	6
11-2985-33	**480**	**15-6688 Series**	8	40mm	50	9	Thermal black trace roll	15	300	5.0	12
Event Channel / Miscellaneous Paper											
RA 3903-20	**Operations Monitor (Event Recorder)**	**15-6327-XX1018 RE 3303-10/3603-10 RE 3303-15**	—	0.095 in.	—	30	Electric writing roll	3.72	150	1.0	12
Strip Chart Recorder Paper											
11-2913-120	**816**	**15-6X17-4X 15-6X18-2X**	1-8	4.5 in.	50	—	Capillary ink fanfold pack	5.97	75	8.0	6
11-2915-120	**816**	**15-6318-20**	1-8	4.5 in.	50	—	Thermal black trace roll	5.97	75	8.0	6

Electrostatic Recorder Paper

Chart Paper Model Number	Recorder Group	Recorder Model Number	Paper Description	Chart Paper Width (in.)	Chart Paper Length (ft.)	Shipping Weight Per Roll/ Pack (lb.)	Rolls/ Packs Per Ctn.
5880-01	**4800**	All Models	Electrostatic roll, no grid	11	400	39	6
5880-02			Electrostatic roll, no grid	8.5	400	30	6
5880-11	**ESR 200**	3009-1110-00	Electrostatic roll, no grid	11	1,000	19	1

Electrostatic Toner and Supplies

Recorder Group	Recorder Model Number	Supply Model Number	Description
ESR 200	3009-1110-00	23-5101-03	Toner, 3 qts. in gallon container
4800	All Models	84606-1	Toner Kit — Obsolete Use ES 1000 supplies instead
		84605-1	Humidty Salts, 3 oz.

Magnetic Recording Tape and Take-up Reels (for 6500 Tape Recorder)

Model Number	Description	Model Number	Description
295912-1	Wideband ¼″ x 2300′, 7″ reel	295913-1	Take-up reel, 7″ dia. for ¼″ tape
295912-2	Wideband ½″ x 2300′, 8″ reel	295913-2	Take-up reel, 8″ dia. for ½″ tape
295912-3	Wideband ¼″ x 3300′, 8¼″ reel	295913-3	Take-up reel, 8″ dia. for ¼″ tape

Pressurized Ink Pens

Recorder Group	Analog Pen Model Number	Event Pen Model Number
280 (15-6327 Series)	11-2823-31	RA2821-20
220, 222, 260, 440 & 480 Series	11-2823-33	11-2873-20
240 (6607 Series)	11-2823-33	RA2821-20
1 & 2 Channel Modules Low Profile Design (XXXX-68X7-00)	11-2823-33	11-2873-20
250 (15-6X17-0X)	11-2823-40	RA 2821-20

Continued on next page.

Supplies for:
Obsolete Recorders (continued)

Pressurized Ink Pens - *continued*

Recorder Group	Analog Pen Model Number	Event Pen Model Number
1 & 2 Channel Modules Vertical Design (XXXX-69X7-00)	11-2823-40	11-2873-30
2100 (15-631X-6X)	11-2823-43	11-2873-30

Longer-Life Pressurized Ink Pens

Recorder Group	Pen Number	Description
220, 240, 260, 440, and 480 Series	11-2823-34	Longer-Life, tungsten-carbide pressurized ink pen (Replaces 11-2823-33)

Thermal Oscillographic Styli

Recorder	Analog Styli Model Number	Event Styli Model Number
Mark 842 (13-6624-00)	11-2824-33	
480 (15-6688-00)	11-2824-35	11-2874-23
481 (15-6688-10)	11-2824-35	11-2874-23
1 & 2 Channel Low Profile Design (XXXX-68X8-00)	11-2824-35	11-2874-21
1 & 2 Channel Modules Vertical Design (XXXX-69x8-00)	11-2824-41	11-2874-32
816 (15-6X18-2X)	11-2824-42	
2100 (15-631X-6X)	11-2824-43	11-2874-32
Mark 848 (13-6684-XX)		11-2874-10

Electric Styli

Mark II-RD 2522 Series	RA-2822-31	RA-2822-31
RD 2322-00	RA-2822-31	
RD 2631-00	RA-2822-31	

Capillary Ink Pens

Recorder	Analog Styli Model Number	Event Styli Model Number
BL 201	BL 963	

Ink for Pressurized Ink Pens

Recorder	Blue Ink Model Number	Capacity (Ounces)	Container
220, 222, 250, 260, 440, and 480 Series			
2000, 2000S, 2000W 2200, 2400, 2600, 2800	11-2730-01	1	Cartridge
Dual Channel Modules			
For use in same Recorders as 11-2730-01	11-2730-012908 (Red)	1	Replaces 11-2730-01
	11-2730-015902 (Black)	1	Replaces 11-2730-01
200, RF1783 Series 15-1787 Series, 1704 Series 1707 Series	11-2734-02	2	Plastic Syringe
280, 6327 Series, 240, 6607 Series			
Single Channel Modules	11-2735-04	4cc	Cartridge

Shipping, Prices and Terms and Conditions

Placing Your Order

U.S.A.: Gould Test and Measurement Sales Engineers are available at the nearest Gould Sales Office to help you with equipment selection, pricing, availability and custom system definition.

Refer to the list of Gould Test and Measurement Sales and Service (TMSD) offices listed on page 166.

Orders for all products except Logic Analyzers should be placed at:

Gould Inc.
Recording Systems Division
3631 Perkins Avenue
Cleveland, OH 44114
Telephone: 216-361-3315

Orders for Logic Analyzers should be placed at:

Gould Inc.
Design and Test Systems Division
19050 Pruneridge Avenue
Cupertino, CA 95014-0718
Telephone: 408-988-6800

Emergency Supplies Orders

In conjunction with Federal Express, Gould provides next day delivery of emergency supply orders. Call toll free 1-800-437-7759 (216-361-3315 within Ohio) before 5 p.m. Eastern Time, and 213-404-1919 until 8 p.m. Eastern Time (5 p.m. Pacific Time) to place your order.

GSA Contracts

For Gould products sold under GSA contracts, contact either your local Gould Sales Office or Gould Inc., Recording Systems Division, 3631 Perkins Avenue, Cleveland, OH 44114 (216-361-3315) for more information.

Canada: For ordering, pricing and delivery information contact your local Allan Crawford Associates, Ltd. office listed on page 166.

Outside of North America: For ordering, pricing and delivery information contact your local Gould Sales Office, Gould Representative or Distributor. Refer to page 167 for more information.

Terms of Sale

U.S.A.: Payment terms are net 30 days from date of invoice. Invoices paid late will carry a 1.5% interest charge per month on the unpaid balance.

All products except Logic Analyzers are F.O.B. factory, Cleveland, OH. Transportation is collect via best method in Gould's opinion unless shipping method is stipulated.

Logic Analyzers are F.O.B. factory, Cupertino, CA. Transportation for Logic Analyzers depends upon the delivery required. Logic Analyzers are shipped prepaid with customer invoicing unless otherwise specified. Customers wanting shipment collect should so specify on their order. Contact the nearest Gould Sales Office for transportation charges.

Outside of U.S.A.: Contact your local Gould Sales Office, Representative or Distributor regarding terms for orders placed with them.

Lease Agreements

Gould Inc., Test and Measurement Group offers leasing terms to meet most requirements. Contact your local Gould Sales Office for terms and rates.

Minimum Orders

The minimum order amount is $50.00 for U.S.A. orders. Outside U.S.A., contact your local Gould Sales Office, Representative or Distributor.

Delivery Schedule

Shipment of most orders will be made in 15 to 60 days after receipt of order. Actual shipping schedule will be acknowledged after receipt of purchase order.

Certification

Gould's Quality Assurance program certifies that products manufactured by Gould Recording Systems Division have been inspected under U.S. Government Inspection System Requirements of MIL-I-45208A. The standards used in calibrating and testing the products are directly traceable to the National Bureau of Standards as required by the Calibration System Requirements of MIL-STD-45662.

Packaging

All items will be packaged and packed in accordance with best commercial practices. Consult factory for extra charges when compliance with MIL specifications covering packing, packaging, waterproof containers, or marking is required. An extra charge will be made for packing and packaging for ocean freight shipments.

Replacement Parts

Prices for Product Replacement Parts are available from your local Gould Test and Measurement Sales and Service Office or Gould Representative.

Product Changes

Gould Inc., Test and Measurement reserves the right to change prices, specifications, designs and models without notice.

Warranty

All Gould Test and Measurement Group products are warranted to meet high standards of quality and workmanship. For specific warranty provisions, refer to the warranty statements on page 165.

Customer Service

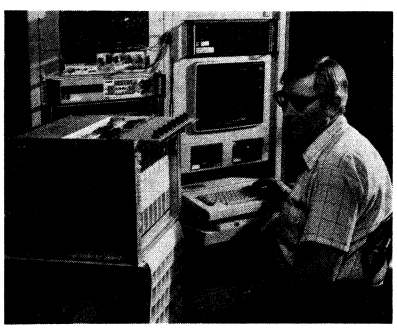
Gould's Test and Measurement Sales and Service Division (TMSD) provides customer service on all Gould products from each of the four T&M divisions: Recording Systems Division (RSD), Instrument Systems Division (ISD), Design and Test Division (DTD), and Array Recording Division (ARD). TMSD's strategically located Service Centers provide the users of Gould T&M instruments convenient factory-authorized service.

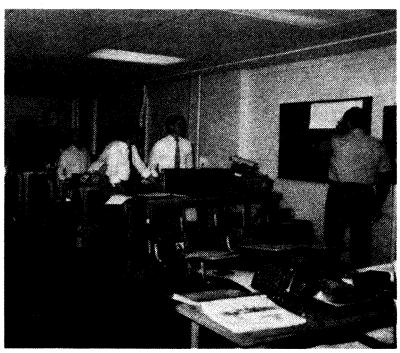
Field Engineers

Gould Field Service Engineers can provide on-the-spot assistance whenever and wherever required. Every field service engineer has received intensive and thorough factory training, but his greatest strength comes from his field experience. He is familiar with your requirements and is an expert with your product. Further, he is backed by one of the world's most experienced in test and measurement organizations.

Factory Service Centers

Gould factory Service Centers support Gould instruments, Gould-supplied IBM PCs and peripherals, and Gould-supplied accessories. Therefore, you can be confident of prompt, effective results when you turn to one of our service centers for assistance.





Our prompt repair service is especially valuable to those companies that do not have their own service facilities. By using the nearest Gould Service Center as its maintenance depot, a Gould instrument user can be confident that his instruments will continue to provide uninterrupted performance.

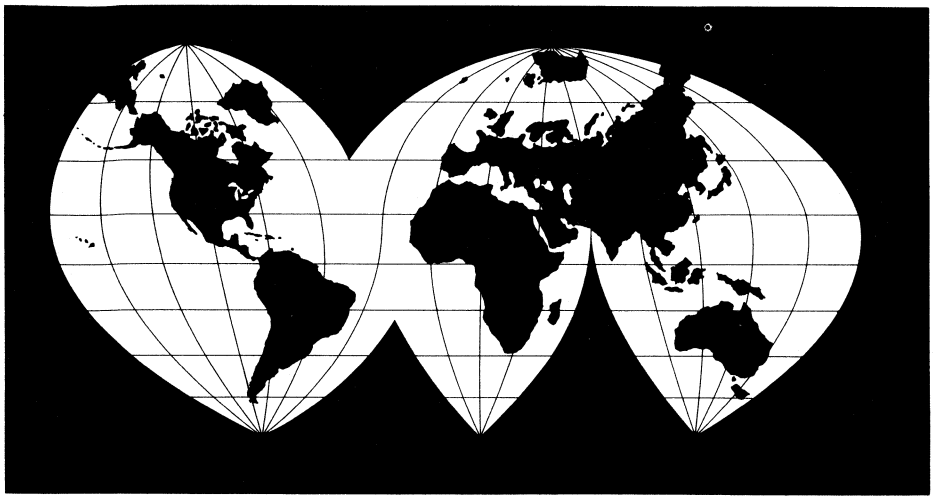
Even companies with their own repair facilities find it economical to be protected by a Gould service contract. This provides them with fast turn-around and eliminates the additional expense of carrying an inventory of instrument parts, accessories, and supplies.

Available Services

Gould provides extensive post sale support services, including:

Equipment installation — The Gould Field Service Engineer can be contracted to unpack, set-up, and check out all Gould equipment at your location.

- **Equipment installation**
- **Factory product training**
- **Extended (3 to 5 year) warranty**
- **Parts and supplies**
- **16 U.S. Service Centers**
- **More than 50 Service Centers outside the U.S.**

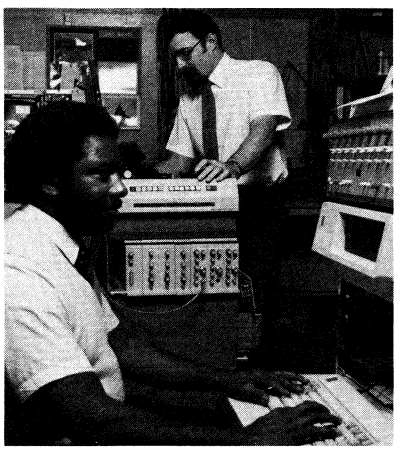


Factory product training — Formal training classes at Gould cover detailed theory, repair, and maintenance procedures. Also, informal classes are available at your location to cover basic operation and maintenance issues.

Extended warranty — An optional 3 to 5 year extended warranty is available for new products and a 1 year extended warranty is available for used equipment. Both reduce overall operating cost by minimizing major breakdowns.

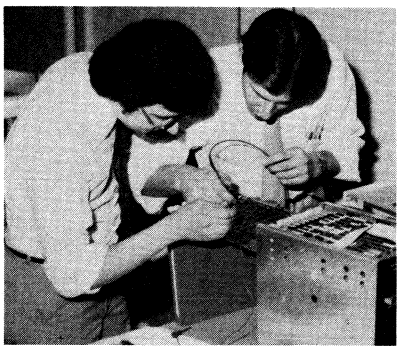
Parts and supplies — To meet emergency customer needs, each service center is fully stocked with factory approved parts and supplies for all Gould Test and Measurement instruments and systems.

Call your nearest Gould Service Center for more details on these programs.



Board Exchange Program

Gould T&M Service provides additional savings to its customers via a Board Exchange Program that supplies repaired boards for units *no longer under warranty.* To qualify, customers must return a board to a Gould Service Center to make sure it can be repaired. Exchange rates are based on a percentage of the current list price. For further details, contact your nearest Gould Service Center.



Gould Technical Support

Gould Technical Support Specialists are as close as your telephone to answer any questions you have on the operation, repair, or implementation of Gould instruments. Save time and expense by calling 216-361-3315 in the U.S. to talk directly to a specialist who can provide immediate product and system information. Outside the U.S., contact your local Gould Service Center, Representative or Distributor. (See page 167.)

24-Hour Information System

A 24-hour Customer Information Systems is accessible via modem. It provides sales and service locations, parts/pricing information, warranty policy, sales training programs, and contract/installation options. In addition, it provides you with the ability to leave special requests. Either refer to page 164 or request the booklet *Customer Information Systems* for details.

Introduction

Gould Inc., Test and Measurement designs and manufactures products and systems recognized as industry standards because of their high quality and reliability. This equipment is complemented by Gould's commitment to properly match products and systems to applications and to provide proper installation, operator education, servicing and maintenance.

To optimize the usefulness of these products and systems, Gould provides extensive customer services.

Installation: With this option the Gould Technical Support Specialist will unpack, set up and check out all Gould equipment.

Training: Gould Technical Support Specialists can conduct short, informal training courses — either on-site or at his facility — covering basic product operation and routine maintenance.

Customer Education

Formal classroom training is available at factory and major Gould Sales and Service Offices consisting of Familiarization and Basic Instrument Operation, Modular Theory of Operation, Repair and Maintenance Procedures, and Testing.

Application Consulting

Gould Product Specialists are available for pre-sale support. They are experts with Gould products and can help you match the proper Gould product or configure the proper Gould system to meet your application requirements.

Hardware Support

A Trained Technical support specialist can quickly identify and resolve any hardware related problem. To help you keep your Gould equipment performing properly Gould provides the below services.

Maintenance Contracts: In addition to standard product warranties Gould provides 3- and 5-year Extended Warranty agreements.

Board Exchange Program: Under this program defective boards are replaced with working boards in equipment that is no longer under warranty.

Software Support: The Software Upgrade Agreement provides you with all software upgrades, at no charge, for DASA software for a period of one year.

For availability of these services in your area: Contact your local Gould Sales and Service Office listed on page 166, use the 24-hour Bulletin Board (see below), or refer to the Service Section on page 163.

Telephone Support: A Gould Service Engineer is available to answer your operation, repair and application questions. Call any of the Gould facilities listed on pages 166 and 167 and ask for the Technical Support Department.

24-Hour Bulletin Board: A 24-hour , on-line computer bulletin board is available in the U.S.A. and Canada to record your service requests and to provide current information on all service programs. This service may be accessed by any computer/modem configured at: 1200 baud, 8 data bits, no parity and 1-stop bit. The telephone number is (216) 431-1752.

Ordering Support

Gould Sales Engineers are available to help you with pre-sale product selection and system configuration.

Toll Free Numbers

For information on the location of your nearest Gould Sales and Service Office, the name of your Gould Sales Engineer or information on any Gould product or service, call:

Domestic:

Canada, Mexico, United States	1-800-468-5310

International:

Denmark	043-402-561
France	19-05-90-1345
Germany	0130-9860
Korea	800-900-8295
The Netherlands	06-022-0321
Sweden	020-795-6061
Switzerland	046-05-3939
United Kingdom	0-800-89-1095

Hardware Warranty

All products manufactured and sold by Gould Inc., Test and Measurement Group are warranted to conform to the applicable published specifications in effect at the time of shipment, and to be free from defects in material or manufacture for the applicable periods set forth in the table below, when used with recommended Gould associated equipment and/or supplies. If any such product proves defective during the applicable warranty period, Gould, at its option, will either repair the defective product without charge for parts and labor or provide a replacement in exchange for the defective product.

The obligations of Gould or its designated service centers with respect to the provisions of this warranty are expressly limited to the original purchaser and the country of initial purchase unless otherwise agreed and stated in the terms and conditions of any order for products accepted by Gould.

In order to obtain service under this warranty, Buyer must notify Gould or its designated service center of the defect before the expiration of the warranty period and make suitable arrangements for either the return of the defective product or on-site performance of service. Buyer shall be responsible for packaging and shipping the defective product, transportation prepaid, to Gould's designated service center. Gould will provide on-site performance of warranty service only upon prior agreement and subject to payment of an additional charge by Buyer.

Gould reserves the right to determine the cause and existence of a defect under this warranty and this warranty shall not apply to any products which have been subjected to misuse, improper installation, repair, alteration, neglect, accident, inundation, fire or operation outside their published maximum ratings.

Product Category	Warranty Period
Analog & Digital Oscilloscopes	2 YEARS from date of shipment
Logic Analyzers*, Oscillographic Recorders, Strip Chart Recorders, Array Recorders, Waveform Recording Products, DASA Data Acquisition (AT computers), DASA Data Acquisition (Accessories), Analog XY Recorders, Monitor Scopes & Digital Displays, Chart Paper	1 YEAR from date of shipment
Digital Plotters	6 MONTHS from date of shipment

*Except for disk drive memory storage devices which are warranted for 90 days.

GOULD'S LIABILITY UNDER SUCH WARRANTY IS LIMITED TO SERVICING OR REPLACING DEFECTIVE PARTS EXCEPT PENS, STYLI, FUSES, BATTERIES AND CATHODE RAY TUBES, AND DOES NOT INCLUDE CALIBRATION AND MINOR MAINTENANCE AS OUTLINED IN GOULD OPERATING MANUALS. IN NO EVENT SHALL GOULD BE LIABLE UNDER ANY CIRCUMSTANCES, FOR ANY LOSS OF PROFITS OR OTHER CONTINGENT, CONSEQUENTIAL OR SPECIAL DAMAGES. THE FOREGOING WARRANTY IS EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS OF ANY OTHER OBLIGATION AND SHALL CONSTITUTE THE SOLE REMEDY OF THE BUYER AND SOLE LIABILITY OF GOULD.

For further details regarding specific product extended warranty arrangements, please consult your local sales or service office.

Software Warranty

All software products which are licensed by Gould and listed in Gould's current Products Price List are furnished "as is" without warranty of any kind, either expressed or implied; except that Gould warrants media upon which such software is delivered to the licensee will be free from any defects in material and workmanship for a period of 90 days from the time of shipment. If any such medium proves defective during this warranty period, Gould will provide a replacement in exchange for the defective medium. Gould does not warrant that the functions contained in the software product will meet customer's requirements or that operation of the programs will be uninterrupted or error-free or that errors will be corrected. Gould will correct all reported substantial non-conformities in unaltered media for 90 days from time of shipment, provided such reports are made in accordance with Gould's standard reporting procedure, and such non-conformities are confirmed by Gould.

GOULD'S LIABILITY UNDER SUCH WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT OF THE MEDIA, AT GOULD'S OPTION. IN NO EVENT SHALL GOULD BE LIABLE UNDER ANY CIRCUMSTANCES, FOR ANY LOSS OF PROFITS OR OTHER CONTINGENT, CONSEQUENTIAL OR SPECIAL DAMAGES ARISING OUT OF ANY DEFECT IN OR FAILURE OR INADEQUACY OF PERFORMANCE OF ANY SOFTWARE PRODUCT FURNISHED BY GOULD. THE FOREGOING WARRANTY IS EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS AND OF ANY OTHER OBLIGATION AND SHALL CONSTITUTE THE SOLE REMEDY OF THE BUYER AND SOLE LIABILITY OF GOULD.

For further details regarding specific product extended warranty arrangements, please consult your local Sales or Service office.

Gould Test and Measurement Sales and Service Offices and Representatives

ARIZONA

Phoenix
525 W. Southern, Suite 12
Mesa, AZ 85202
Phone: (602) 833-1602

CALIFORNIA

•**Los Angeles**
16310 Arthur Street
Cerritos, CA 90701
Phone: (213) 404-1919

•**San Francisco**
26102 Eden Landing Road
Suite 5
Hayward, CA 94545
Phone: (415) 782-0852

COLORADO

•**Denver**
8480 East Orchard Road
Suite 2000
Englewood, CO 80111
Phone: (303) 741-4600

DISTRICT OF COLUMBIA

•**Washington (Medical)**
6301 Ivy Lane, Suite 106
Greenbelt, MD 20770
Phone: (301) 345-0050

Washington
Creative Marketing Assoc., Ltd.
12 Taft Court
Rockville, MD 20850
Phone: (301) 251-4100

FLORIDA

•**Orlando**
774 North Lake Blvd., #1000
Altamonte Springs, FL 32701
Phone: (305) 830-0695

GEORGIA

•**Atlanta**
1710 Wilwat Dr., Suite D
Norcross, GA 30093
Phone: (404) 441-5556

HAWAII

Honolulu
Hawaiian Industrial Instruments
1154 Fort St. Mall,
Suite 200
Honolulu, HI 96813-2709
Phone: (808) 533-4232

ILLINOIS

•**Chicago**
40 Gould Center
Rolling Meadows, IL 60008
Sales: (312) 640-4135
Service: (312) 640-4380

INDIANA

Indianapolis
6525 East 82nd Street
Suite 115
Indianapolis, IN 46250
Phone: (317) 842-4484

MASSACHUSETTS

•**Boston**
Middlesex Technical Center
Building 5
900 Middlesex Turnpike
Billerica, MA 01821
Phone: (617) 667-8550

MICHIGAN

•**Detroit**
32307 Mally Road
Madison Heights, MI 48071
Phone: (313) 588-4020

MINNESOTA

Minneapolis
Westview Business Center
620 Mendelssohn, Suite 199
Minneapolis (Golden Valley),
MN 55427
Phone: (612) 544-5253

MISSOURI

St. Louis
244 Cross Keys Shopping Center
Florissant, MO 63033
Phone: (314) 921-3444

NEW MEXICO

Albuquerque
P.O. Box 13494
Albuquerque, NM 87192
Phone: (505) 292-4063

NEW YORK

•**Metropolitan New York**
405 Murray Hill Parkway
East Rutherford, NJ 07073
Phone: (201) 935-1717

•**Upstate**
30 Corporate Wood, #215
Rochester, NY 14623
Phone: (716) 272-7400

NORTH CAROLINA

Greensboro
P.O. Box 16212
Greensboro, NC 27406
Phone: (919) 275-1978

OHIO

•**Cleveland**
3631 Perkins Avenue
Cleveland, OH 44114
Phone: (216) 361-3315
TELEX: 196113 GLD RS UT

•**Dayton**
432 Windsor Park Drive
Centerville, OH 45459
Phone: (513) 433-9586

PENNSYLVANIA

•**Philadelphia**
One Great Valley Parkway East,
Suite 6
Malvern, PA 19355
Phone: (215) 647-2214

•**Pittsburgh**
585 Rugh Street, Suite A
Greensburg, PA 15601
Phone: (412) 838-7700

TEXAS

Dallas
3001 L.B.J. Freeway,
Suite 130
Dallas, TX 75234
Phone: (214) 243-1479

•**Houston**
10500 Northwest Freeway
Houston, TX 77092
Phone: (713) 680-1121

WASHINGTON

Seattle
P.O. Box 3068
Redmond, WA 98073-3068
Phone: (206) 882-7525

CANADA

•**Calgary, AB**
Allan Crawford Associates, Ltd.
6815 8 Street, N.E., #135
Calgary, AB T2E 6Z5
Phone: (403) 295-0822
Telex: 389-3821186

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