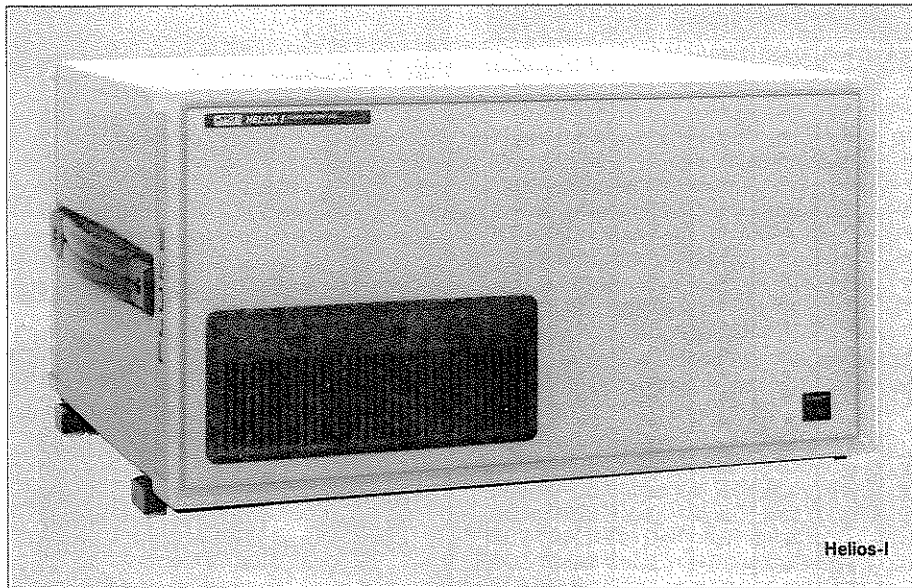


# Computer Front End

## Helios-I (2289A)

RS-232



### Helios-I Computer Front End

Wide range of measurement and control options

Eliminates hardware integration problems

Simple and powerful commands

Supports modem communication

Software available for total solution

### Performance

You can use Helios-I to add high performance measurement capability to any of your computers, from lap-top to mainframe. Helios-I uses the same data acquisition and control options as the Fluke 2280 Series. These options have been proven in thousands of applications world-wide. You can be confident that your system will perform accurately and reliably for years to come.

Helios-I gives your computer the power to read:

- Voltage
- Frequency
- Temperature
- Flow
- Strain
- Pressure
- Speed
- Many, many more...

The high performance Analog to Digital Converter, in conjunction with data conversion capabilities built into Helios-I, means unsurpassed resolution, repeatability and accuracy in thermocouple, RTD and strain gage measurements.

These proprietary algorithms are both highly efficient and very accurate. They are optimized for Helios-I hardware giving performance that would be hard to match if host computer routines were required.

### Independent Operation

The Scan/Alarm Option (2289A-201) adds autonomous capability to Helios-I. Scan/Alarm allows routine data acquisition tasks to be performed by Helios-I, reducing the load on the host computer and the communications link. This results in a more efficient data acquisition system for remote applications or anytime it is useful to partition tasks between the host computer and the data acquisition front end.

With the Scan/Alarm Option Helios-I will scan measurement points and store up to 18,000 readings for later access by the computer. The Scan/Alarm Option also adds limit checking, alarm output, alarm acknowledge, and local data output to a printer.

### Value

Helios-I is designed to give you the best price/performance hardware solution available for computer based measurement and control applications. Combine this with Fluke's commitment to support and service and you have a system that will continue to be a value for years to come.

### Hardware Configuration

You can configure Helios-I to tailor it to your exact needs. One Helios-I mainframe can house up to 6 I/O modules, each with 20 channels. Communication between the I/O modules is by means of a high speed serial link.

A wide range of I/O cards is available. Several of them are multifunctional and as such are time and cost savers where a wide range of inputs is necessary or configuration changes frequently.

### Extended Systems

Remote expansion chassis are available to bring the total configuration to 1500 channels. The distance between an extender chassis and the mainframe may be up to 1200 meters. Connections may be made in daisy chain, star and maze configurations so that cable routing can easily be adapted to the physical layout of your facility.

Multiple Helios-I mainframes may be arranged in a multidrop configuration. This allows you to address up to 10 Helios-I units on a serial link.

### LabTech Notebook Software (S2290)

Fluke and Laboratory Technologies Corp. have teamed up to create a complete system for data acquisition and control. LABTECH Notebook® transforms the IBM® PC, XT or AT and compatibles along with Helios-I into a powerful data acquisition, analysis and real-time display system and no programming is required.

Data generated using Helios-I and LABTECH Notebook® is recorded in formats compatible with major analysis, spreadsheet and database programs. These include LOTUS 1-2-3®, Symphony®, RS/1® and NWStatpak®.

A menu driven format makes the operator interface easy to learn and to use. Complicated procedures can be reduced to single button operations. The result for you is fast system setup and increased efficiency in operation. Once the measurement and control activities are defined they can be stored on disk for easy recall.

Data acquisition can be started immediately or triggered externally. Data can be time stamped with either time of day or relative time.

LABTECH Notebook® allows other PC programs to be run concurrently. LABTECH Notebook® can perform data acquisition and control in the background while another program operates in the foreground. Your efficiency is increased considerably especially during long tests.

### Helios Toolbox for BASIC Programmers (2289A-901)

Helios Toolbox is intended for the data acquisition system builder. It is a set of subroutines designed to provide building blocks for a complete system software package. By providing fully debugged and tested routines of common, and some not so common, system software tasks, software costs can be drastically reduced.

The primary purpose of Helios Toolbox is to handle all communications between the host computer and Helios-I. To accomplish this Helios Toolbox provides routines to:

- Establish the communication channel.
- Define the Helios-I hardware configuration.
- Scan measurement points and read individual channels.
- Set status and analog outputs.
- Utilities that translate error codes, clear communication buffers, control Helios-I self tests.
- Log data directly into Lotus 1-2-3 worksheet file

Sources are provided for translation or user modification.

### Prologger\_HCL (S2289)

Prologger\_HCL is a communications utility for the IBM Personal Computer and the Fluke Helios Computer Front End. This software tool establishes serial communication with Helios-I and links Helios-I and the IBM to provide data acquisition capability for the IBM. Extensive use of IBM function keys provide an easy to use package.

This software package provides an environment in which you can record data from Helios-I in LOTUS 1-2-3 format, log data to a printer, create and save definitions and Macros on disk, graph in real time a selected Helios-I parameter and remotely control Helios-I.

Prologger\_HCL includes diskette, manual and a 2 meter cable for use with the IBM PC. Prologger\_HCL is compatible with MS-DOS™ version 2.1 and above.

*Helios-I is a trademark of John Fluke Mfg. Co., Inc. LABTECH is a registered trademark of Laboratory Technologies Corporation; IBM is a registered trademark of International Business Machine Corporation; Lotus 1-2-3 and Symphony are trademarks of Lotus Development Corporation; RS/1 is a trademark of BBN Software Products Company; NWAStatpak is a trademark of Northwest Analytical, Inc.*

### Command Set

If you desire to configure Helios-I with your own host computer software, Helios-I provides an environment that makes this interaction easy to create.

The Helios-I Operating System (HOS) resides in ROM together with the Helios-I Command Line Interpreter (HCLI). HOS takes care of task scheduling and contains driver software to control the functioning of the hardware. HCLI analyses the commands and translates them into appropriate actions.

Only six types of commands are necessary to control a standard Helios-I. Each has various parameters to change the scope of operation giving a command set that is conceptually easy yet powerful.

**ASSIGNMENT:** Assigns a value to a system variable or output channel.

**DEFINITION:** Identifies the type of sensors connected to Helios-I and if desired interpolation tables for each sensor.

**LIST:** Returns to the host computer channel definitions and user defined interpolation tables and errors detected by Helios.

**RESET:** Resets system or specified channels to power up state.

**SEND:** Returns data to host computer.

**TEST:** Tests all or part of the system and reports any detected problems.

## Specifications

### Helios-I Mainframe (2289A)

The Helios-I mainframe is a cardcage unit that includes a CPU, power supply, RS-232 and RS-422 interfaces.

#### Controller

**CPU:** TMS-9995, 16 bit, 12 MHz clockrate

**Memory:** 40K bytes ROM, 72K bytes non-volatile RAM

**Clock/Calendar:** Accuracy 0.003% or 2.6 seconds/day at 25°C; battery backed

**Battery Back-Up:** 90 days typical, 30 days minimum

**Interface:** On-board command interpreter for high level instructions

#### Interfaces

**Type:** RS-232 or RS-422; asynchronous; selectable baud rate, parity, character bits and stop bits

**Protocol:** XON/XOFF or none; terminal or computer mode

**RS-232:** Compatible with auto-answer, full duplex modems; automatic hang-up

**RS-422:** Allows operation at extended distances from the host computer; allows point to point or multidrop configurations

**Capacity:** Six slots for input and output options. One of the six slots must contain an A to D Converter option when one or more analog input options is used. Each analog input option accommodates 20 channels so that up to 100 channels per chassis is available. Each digital I/O option accommodates 20 channels so that up to 120 channels per chassis is available.

**Power:** 90-132V ac or 180-264V ac; 47-440 Hz; less than 40W

**EMI and RFI Emissions:** Tested to FCC part 15, Subpart J, Class A; VDE 0871, Class B

**Operating Temperature:** 0°C to 50°C

**Storage Temperature:** -40°C to 70°C

**Relative Humidity:** (without condensation) below 25°C, <95%; 25°C to 40°C, <75%; 40°C to 50°C, <45%

**Altitude:** 12 km (40,000 ft), non-operating; 3 km (10,000 ft), operating

**Shock and Vibration:** Meets MIL-T-28800C, Class 5, Style F Standard

**Weight:** 8.5 kg (18.7 lb) without options

**Size:** 23.8 cm H x 43.9 cm W x 35.9 cm D (9.35 in H x 17.3 in W x 14.13 in D), (8.75 in H without feet)

### 2281A Extender Chassis

**Capacity:** Same as mainframe. Multiple extender chassis allow up to 1500\* channels.

**Power:** Normally supplied by Helios-I via 2281A-402 cable or equal. An optional built-in power supply, 2281A-431, may also be used and may be required for some configurations.

**Operating Temperature:** -20°C to +70°C

### Options

#### Scan/Alarm Option (-201)

##### Scanning

**Number of Groups:** 4

**Trigger Mode:** Time interval

##### Data Buffers

**Number of Buffers:** 4

**Size:** User defined

**Format:** Each scan record includes time stamp and channel status

##### Limit Checking

**Number:** 4 per channel, two high and two low

**Alarm Hysteresis:** User selected

**Master Alarm Annunciation:** Visual and audible

**Master Alarm Acknowledge:** Edge sensitive input for external pushbutton

**Individual Alarm Output:** Up to 20, one per channel (requires -168 Option)

##### Printer Port

**Type:** RS-232C

**Connector:** Pins (DTE)

**Selectable:** Baud, parity, data bits, stop bits

##### Host Timer

**Interval:** User defined

**Timeout Result:** All alarm information sent to printer port

### High Performance A/D Converter Option (-161)

One per 2289A and 2281A required for any analog measurement inputs.

**Dynamic Range:** 100,000 counts

**Ranges:** ±64 mV, ±512 mV, ±8V, and ±64V dc

**Resolution Using DC Scanner Option:** 1 μV on 64 mV range, 10 μV on 512 mV range, 100 μV on 8V range, 1 mV on 64V range

**Common Mode Noise Rejection:** ≥170 dB at 50 or 60 Hz ±0.1%; ≥160 dB at dc; 100 ohm unbalance

**Normal Mode Noise Rejection:** ≥60 dB at 50 or 60 Hz ±0.1%

**Operating Temperature:** -20°C to 70°C

\*Maximum capacity with -201 Option is 1000 channels

# Computer Front End

## Helios-I (2289A)

### Measurement and Output Selection Guide

	Connector	Scanner	Channels	Max Chan/ Chassis
Thermocouple	-175	-162 <sup>1</sup>	20	100
Direct Voltage	-175 or -176	-162 <sup>1</sup>	20	100
Direct Current	-171	-162 <sup>1</sup>	20	100
Alternating Voltage	-160	-162 <sup>1</sup>	10 ch. V= 10 ch. V=	50 ch. V= 50 ch. V=
RTD	-177	-163 <sup>1</sup>	20	100
RTD	-174	-164 <sup>1,2</sup>	20	40
Resistance	-177	-163 <sup>1</sup>	20	100
Resistance	-174	-164 <sup>1,2</sup>	20	40
Strain Gauge	-174	-164 <sup>1,2</sup>	20	40
Frequency/Event Counting	Included	-167	6	36
Status Input	-179	-168	20	120
Binary Input	-179	-168	1	6
BCD Input	-179	-168	1	6
Status Output	-169	-168	20	120
Analog Output	Included	-170	4	24

<sup>1</sup> A/D Converter (-161) required in each chassis

<sup>2</sup> A dc voltage scanner and companion connector Option (-162 and -176) are also required for each Transducer Excitation Option -164 used for RTDs, Ohms, or Strain measurements

### Voltage, Thermocouple Current Inputs

#### AC Voltage Input Connector Option (-160)

**Channels:** Ten 2-wire sets of terminals for ac voltage and ten for dc voltage

**Voltage Range for AC:** 5V rms to 250V rms measurable. 250V rms ac or dc maximum between any two terminals on the assembly

**Frequency Range for AC:** 45 Hz to 450 Hz

**Accuracy for AC:** 1% of reading  $\pm 0.1V$  for 90 days. Average-responding conversion; calibrated for rms value of sinewaves

**Voltage Range for DC:** 64V maximum measurable. 250V rms ac or dc maximum between any two terminals on the assembly

**Accuracy for DC:** Same as for Option -162 with Option -176

**Compatibility:** Plugs onto scanner module, Option -162

#### Thermocouple and DC Scanner Option (-162)

**Channels:** Twenty per option. One 3-pole dry reed relay for each channel (Hi, Lo, Shield)

**Ranges:** 64 mV, 512 mV, 8V, and 64V, software-selectable

**Input Impedance:**  $\geq 200 M\Omega$  on 64 mV and 512 mV ranges, 10 M $\Omega$  on 8V, and 64 ranges

**Thermal Offset:**  $\leq 1 \mu V$  each channel

**Maximum Input Voltage:** 250V dc or rms ac between Hi and Lo terminals

**Maximum Common Mode Voltage:** 250V dc or rms ac between Hi or Lo and ground or between two adjacent channels

#### RTDs, Ohms, & Strain Excitation Option (-164)

Five constant current sources for measuring RTDs and/or resistances and a constant voltage source for measuring strain. Channels are configurable in groups of four for either voltage or current excitation. These current sources are factory configured for 1 mA output and are user-modifiable for other ranges. The voltage supply is switch-selectable for either 2V or 4V and can supply up to 250 mA. A bridge completion network is provided for 1/2- and 1/4-bridge strain gages. Requires Connector Option -174. Option -174 and -164 plug together and occupy one I/O slot in Helios-I or 2281A, usually adjacent to the corresponding Scanner Option -162, which is also required.

#### RTDs, Ohms, & Strain Connector Option (-174)

**Channels:** Twenty 5-wire sets of screw terminals for connections to RTDs or strain gages. Terminals also provide access to the bridge completion network of Option -164

**Compatibility:** Plugs onto excitation module, Option -164

#### Ohms Mode Specifications (Option -164, -174)

Max Resistance	Accuracy* $\pm$ (% of Rdg + m $\Omega$ )	Resolution	Excitation Current
64 $\Omega$	0.02% + 7	1 m $\Omega$	1 mA
512 $\Omega$	0.02% + 30	10 m $\Omega$	1 mA

\* Total Instrument Accuracy, 15°C to 35°C for 90 days.

#### RTD Mode Specifications (Option -164, -174)

RTD channel definitions allow you to tailor the instrument to the known characteristics of your probe with a conformity error less than 0.05°C

**Resolution:** 0.02°C

#### Temperature Measurement Accuracy\*

RTD Type & Range	Maximum Instrument Error
<b>100<math>\Omega</math> Platinum RTDs</b>	
-200°C to +200°C	0.1°C
200°C to 600°C	0.15°C
<b>10<math>\Omega</math> Copper RTDs</b>	
-75°C to +150°C	1.0°C

\* Total Instrument Accuracy, 13°C to 33°C for 90 days.

**Repeatability:**  $\pm 0.08^\circ C$  for Platinum RTDs,  $\pm 0.2^\circ C$  for Copper RTDs

**Temperature Coefficient:**  $\pm 10$  ppm/°C

#### Strain Mode Specifications (Option -164, -174)

##### Full-Bridge Strain

Capacity: Twenty 350 $\Omega$  or 120 $\Omega$  bridges with 2V supply or ten 120 $\Omega$  bridges with 4V supply

Resolution: 0.25 microstrain

Total System Accuracy:  $\pm(0.05\%$  of rdg + 2 microstrain)\*

Temperature Coefficient:  $\pm 10$  ppm/°C

##### 1/2-Bridge Strain

Capacity: Twenty 350 $\Omega$  or 120 $\Omega$  bridges

Resolution: 0.5 microstrain

Total System Accuracy:  $\pm(0.05\%$  of rdg + 13 microstrain)\*

Temperature Coefficient:  $\pm 15$  ppm/°C

##### 1/4-Bridge Strain

Capacity: Twenty bridges

Resolution: 0.5 microstrain

Total System Accuracy:  $\pm(0.05\%$  of rdg + 25 microstrain)\*

Temperature Coefficient:  $\pm 20$  ppm/°C

\*20°C to 30°C for 90 days

#### Current Input Connector Option (-171)

**Channels:** Twenty 2-wire pairs of screw terminals for current inputs. Typically for 4 to 20 mA or 10 to 50 mA inputs

**Maximum Measurable Current:** 64 mA per channel

**Current-Sense Resistors:** 8 $\Omega \pm 0.02\Omega$

**DC Current Accuracy:**  $\pm(0.25\%$  of reading + 4 counts) for 90 days

**Compatibility:** Plugs onto scanner module, Option -162

#### Isothermal Input Connector Option (-175)

**Channels:** Twenty 3-wire sets of screw terminals for thermocouple or voltage input wires. Large, insulated aluminum block serves as reference junction

**Maximum Measurable Voltage:** 64V dc

**Compatibility:** Plugs onto scanner module, Option -162

### Temperature Measurement Accuracy, Thermocouples\*

Thermocouples		Accuracy <sup>1 3</sup>		
Type & Range	Temperature °C	90 Days 15°C to 35°C	1 Year 15°C to 35°C	1 Year <sup>2</sup> 0°C to 50°C
J -200 to 760°C	-100 to -25 -25 to 760	0.45 0.35	0.5 0.4	0.8 0.7
K -275 to 1350°C	0 to 900 900 to 1350	0.4 0.52	0.45 0.65	0.7 1.3
T -230 to 400°C	-100 to 75 75 to 150 150 to 400	0.58 0.35 0.3	0.65 0.39 0.34	1.1 0.7 0.6
E -250 to 838°C	-100 to -25 -25 to 750 750 to 900	0.47 0.3 0.33	0.54 0.33 0.4	0.9 0.6 0.8
R 0 to 1767°C	250 to 450 450 to 1767	0.9 0.8	1.0 0.9	1.3 1.4
S 0 to 1767°C	200 to 1767	0.97	1.1	1.6
B 200 to 1820°C	600 to 800	1.4 0.96	1.6 1.1	1.9 1.3
N <sup>4</sup> -200 to 400°C	-100 to 150 150 to 400	0.6 0.4	0.7 0.44	1.1 0.7
C 0 to 2315°C	200 to 1000 1000 to 2000 2000 to 2315	0.57 0.90 1.3	0.66 1.2 1.7	0.94 2.1 2.9
JDIN -200 to 900°C	-100 to -25 -25 to 900	0.5 0.4	0.56 0.45	0.9 0.7
TDIN -200 to 600°C	0 to 200 200 to 600	0.48 0.37	0.53 0.41	0.8 0.7

<sup>1</sup> Total instrument accuracy. Includes all instrument errors such as A/D errors, scanner errors, power supply warm-up, reference junction errors, conformity errors, etc.

<sup>2</sup> Total instrument accuracy using Option -162 and -175 in 2281A chassis.

<sup>3</sup> A/D Converter must be in 2281A for operation to -20°C or 70°C.

<sup>4</sup> For AWG 28 wire.

3-wire modes (both with lead-wire resistance compensation). One 3-wire mode eliminates reed resistance errors

**Ranges:** Three; 256Ω, 2048Ω, and 64 kΩ (or user selectable), software programmed

**Current Sources:** Two; 1 mA and 32 μA (or user selectable)

**Input Isolation:** 250V dc or ac rms between separate scanner modules. 250V dc or ac rms between the two decades of channels within a scanner module. 250V dc or ac rms between all channels in two of the three measurement modes. 30V dc or 24V ac rms between terminals of a channel

### Ohms Specifications (Option -163, -177)

Range	Resolution @ 60 Hz	±(% of Rdg + Ω)	
		Accuracy	Repeatability
256Ω	2.4 mΩ	0.017% + 5.7 mΩ	0.0065% + 5.7 mΩ
2048Ω	19 mΩ	0.017% ±38 mΩ	0.0060% ±38 mΩ
64 kΩ	0.6 mΩ	0.06% ±1.22Ω	0.0075% ±1.22Ω

\* Total Instrument Accuracy, 15°C to 35°C for 90 days.

### Voltage Input Connector Option (-176)

**Channels:** Twenty 3-wire sets of screw terminals for dc voltage input wires

**Maximum Measureable Voltage:** 64V dc

**Compatibility:** Plugs onto scanner module, Option -162

### DC Voltage Accuracy: ±(% of Rdg + Volts)\*

Range	90 Days	1 Year	1 Year**
	15°C to 35°C		0°C to 50°C
64mV	0.005%+7μV	0.01%+8μV	0.03%+9μV
512mV	0.005%+30	0.01%+40	0.03%+50
8V	0.005%+700	0.01%+800	0.03%+900
64V	0.009%+3mV	0.02%+4mV	0.05%+5mV

\* Total instrument accuracy using Option -162 and -176

\*\* A/D Converter must be in 2281A for operation to -20°C to 70°C

### RTDs & Ohms Connector Option (-177)

Plugs onto the Option -163 circuit card module. Contains five terminals per channel for 20 channels of RTD and resistance input wires.

#### RTD Specifications, Six Classes

**A** — User-defined high resolution Platinum RTDs

**B** — High resolution Platinum 385 DIN RTDs

**C** — User-defined high temperature Platinum RTDs

**D** — High temperature Platinum 385 DIN RTDs

**E** — Ten Ohm Copper RTDs, not grounded, electrically insulated

**F** — Ten Ohm Copper RTDs, grounded (special, consult factory)

### RTDs & Ohms Scanner Option (-163)

A 20-channel scanner module for provision measurements of RTDs and/or resistances.

**Measurement Modes:** 4-wire or one of two

RTD Class	Temperature	System		
		Resolution	Accuracy*	Repeatability*
A, B	-200 to +150°C	0.006°C	0.1°C**	0.04°C**
	+150 to +420°C	0.006°C	0.15°C**	0.04°C**
C	-200 to +600°C	0.05°C	0.27°C***	0.16°C***
D	-200 to +600°C	0.05°C	0.28°C***	0.16°C***
E	- 75 to +150°C	0.06°C	0.3°C**	0.17°C**
F	- 75 to +150°C	0.06°C	1.25°C**	0.3°C**

\* Total Instrument Accuracy, 15°C to 35°C for 90 days.

\*\* RTD Temperature ≤150°C

\*\*\* RTD Temperature ≤600°C

Note: Classes A and C allow the user to perform an ice point initialization and improve total system accuracy to be the sum of repeatability plus 0.03°C for 390 and 392 RTDs. The same procedure for a 385 DIN RTD yields total system accuracy to be the sum of repeatability plus 0.03°C plus the RTD probe conformity error.

### Frequency Measurement and Event Totalization (-167)

**Channels:** Six

**Functions:** Event counting and frequency measurement, selectable per channel pair

#### Inputs

**Signal Types:** TTL, CMOS, contacts, analog waveforms

**Adjustments:** Threshold, deadband, and debouncing

**Isolation:** Each group of six channels isolated from ground

**Frequency Measurement:** 400 kHz maximum frequency, 0.001% resolution

#### Event Counting

**Maximum Counts:** 8,388,607

**Counting Rate:** DC to 400 kHz

**Operation:** Count is reset after each scan

**Connector:** Screw terminal connector supplied



# Computer Front End

## Helios-I (2289A)

### Digital & Status Inputs & Outputs

#### Digital Input/Output Module Option (-168)

For controlling up to 20 input or output lines. Handles either 20 status inputs, (one 5-digit BCD input) or one 17-bit binary input. Or handles 20 status outputs.

**Inputs:** Zero volts or contact closures for low, +6 volts maximum for high

**Common Mode Voltage:** 30V rms ac or dc, maximum

**Outputs:** Open collector NPN transistors, diode clamped, 28V maximum, 100 mA at 1V

**Compatibility:** Requires connector Option -179 for inputs or connector Option -169 for outputs

#### Digital/Status Input Connector Option (-179)

**Channels:** Twenty 2-wire pairs of terminals for Option -168 plus terminals to select BCD and binary clocking format

#### Status Output Connector Option (-169)

**Channels:** Twenty 2-wire pairs of terminals for Option -168. Also terminal provided for clamping diodes when used to drive relays

#### Analog Output Option (-172)

**Outputs:** Four per module. Each output has a selectable choice of mode: 0V to 10V, 4 to 20 mA, or 0 to 20 mA

**Resolution:** 2.44 mV in voltage range, 3.9  $\mu$ A in 4 to 20 mA range, 4.8  $\mu$ A in 0 to 20 mA range

**Accuracy:**  $\pm$ 0.1% of range for 90 days, 15°C to 35°C (calibrated on 0 to 10V range)\*

**Isolation:** Each group of four channels isolated from ground and other channels up to 45V

**Compliance Current in Voltage Mode:** 5 mA sinking, 20 mA sourcing

**Compliance Voltage in Current Mode:** 10V

**Temperature Range:** -20°C to +70°C, operating in 2281A

**Connector:** Included with option

\* 0.1% accuracy also obtainable on current ranges with recalibration. Current ranges have accuracy of  $\pm$ 0.25% when shipped from the factory

### 2281A Power Supply Option (-431)

Although power for a 2281A Extender Chassis is normally supplied by a 2289A mainframe via a 2281A-402 Cable, a built in power supply Option (2281A-431) is available and is required when the distance to a 2281A and/or the current drain of the 2281A is heavy because of the number of options installed. The 2281A-431 power supply will operate on ac power or a 12V or 24V dc supply, either of which will trickle charge a 12V battery for battery backup in the event of a power failure. Ask your Fluke Sales Office or Representative for Configuration Form F605 to determine what options may be installed in a 2281A at what distances without Option 2281A-431.

**Operating Temperature:** -20°C to +70°C

## Ordering Information

### Models

January 1988 prices

2289A Helios-I Mainframe	\$2200
22810A Helios-I (including -161, -162 and -175)	3790
2281A Extender Chassis	800

### Hardware Options (for above Models)

-160 AC Voltage Connector	275
-161 High Performance A/D Converter	800
-162 Thermocouple/DC Voltage Scanner	625
-163 RTD/Resistance Scanner	995
-164 Transducer Excitation Assembly	620
-167 Counter/Totalizer, w/connector	900
-168 Digital I/O Assembly	700
-169 Status Output Connector	100
-170 Analog Output Assembly w/connector	995
-171 Current Input Assembly	200
-174 Transducer Excitation Assembly	375
-175 Thermocouple Input Connector	175
-176 DC Voltage Connector	100
-177 RTD/Resistance Connector	200
-179 Digital/Status Connector	100
-201 Scan/Alarm Option	990
-402 Extender Chassis Cable	4
-403 Connector Pair for -402 Cable	95
-431 Extender Chassis Power Supply	495

### Software Options

2289A-901 Helios Toolbox for BASIC Programmers	295
S2289 ProLogger_HCL Application Software	295
S2290 LABTECH Notebook Application Software	995

(Also see page 468)

Y1702 RS-232C Null Modem Cable, 2m	125
Y1703 RS-232C Null Modem Cable, 4m	150
Y1705 RS-232C Null Modem Cable, 30cm	75
Y1707 RS-232C Standard Cable, 2m	125
Y1708 RS-232C Standard Cable, 10m	150
Y2044 24" Rack Slide and 8 3/4" Rack Mount Kit	195
Y2045 8 3/4" Rack Mount Kit	120
Y2047 Extender Chassis 3-Way Connector	75

### Sales & Support

#### Warranty

One-year product warranty. See page 453 for further information on warranty terms and conditions.

#### Extended Warranty

SC1-2289A Repair (w/calibration)	392
SC1-2289A Repair (cal w/in or out data)	427
SC1-2289A Repair (cal w/in and out data)	462
SC2-2289A Cal (1 yr recommended)	94
SC2-2289A Cal (1 yr w/in or out data)	129
SC2-2289A Cal (1 yr w/in and out data)	164
SC1-22810A Repair (w/calibration)	392
SC1-22810A Repair (cal w/in or out data)	427
SC1-22810A Repair (cal w/in and out data)	462
SC2-22810A Cal (1 yr recommended)	94
SC2-22810A Cal (1 yr w/in or out data)	129
SC2-22810A Cal (1 yr w/in and out data)	164
SC1-2281A Repair (w/calibration)	226
SC1-2281A Repair (cal w/in or out data)	261
SC1-2281A Repair (cal w/in and out data)	296
SC2-2281A Cal (1 yr recommended)	94
SC2-2281A Cal (1 yr w/in or out data)	129
SC2-2281A Cal (1 yr w/in and out data)	164

See page 454 for further information on Extended Warranty Service.