ENVIRONMENTAL CHAMBER EC1A

- **0.37 FT³ WORKING VOLUME**
- **INTEGRAL USER**
  Temperature Probe
- **LCO$_2$, -73˚C TO +315˚C COOLING**
  Optional LN$_2$, -184ºC to +315ºC
- **IEEE-488, RS232, RS422**
  Remote Communication
- **EXPANDED I/O ARCHITECTURE**
  Analog Input Ports
  Analog Output Ports
  Auxiliary I/O Drivers
  Digital Parallel Port
  High Speed Serial Link
- **LOCAL TEMPERATURE**
  Controlled Ramping
- **19" RACK MOUNTABLE**

The EC1A is an advanced environmental chamber intended for automated test system and laboratory applications. Standalone operations is supported by a full function keyboard with a 2 line, 16 character LCD display. The chamber temperature and the user temperature probe readings are normally displayed continuously. User programs are easily entered into the EC1a using a BASIC like command set programming language. In an automated test system, the EC1A functions as a remote data acquisition and control system using the capability of its expanded I/O architecture.

The electrically isolated user temperature probe allows for direct monitoring of critical temperatures on the device under test or certain areas inside the test chamber. As well as being displayed on the front panel, readings are accessible from the IEEE-488 or RS232/422 interfaces.

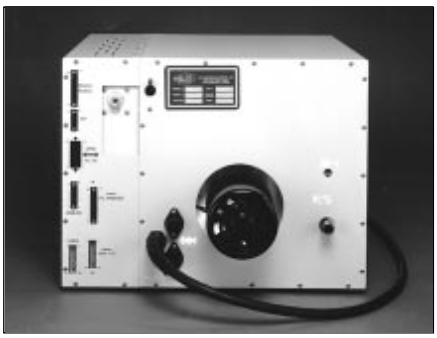
The EC1A command set, whether entered from the local keyboard or downloaded over the IEEE-488 or RS232/422 interfaces, provides for setting chamber temperature, temperature ramping rate and soak time at temperature, temperature deviation limits and temperature upper and lower limits.

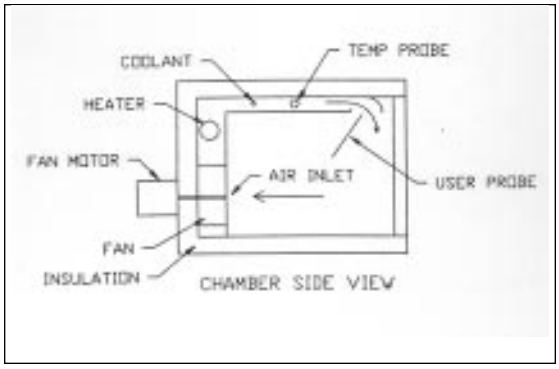
Probe calibration procedures are built into the EC1A using local menu driven format. Special communication commands allow for communication to the analog I/O ports, the high speed serial port (SPI) and the parallel port. The chamber can be controlled remotely from the RS232/422 port or the IEEE-488 bus interface. When the IEEE-488 bus interface is used, transparent communication from the IEEE-488 bus to the RS232/422 port is supported. Programs and parameters are stored in battery-backed memory.

The PID coefficients used in the EC1A are user adjustable from the keyboard and remote interfaces. In addition, alarm function and sound level, BAUD rate, interrupt assignments and other communication port options are configurable from the front panel using an easy, menu driven format.

The EC1A supports several safety features including a mechanically adjustable over temperature thermostat, upper and lower software temperature limits, processor watchdog timer and open and short probe detection.

The EC1A is designed to be adaptable to your system application. If you have special requirements, call Sun Systems for solutions.





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GENERAL SPECIFICATIONS *(subject to change without notice)*

MECHANICAL

Internal Dimensions .....(25.4cmW x 20.3cmH x 20.3cmD).....10.0"W x 8.0"H x 8.0"D
Test Volume .....(0.010m³).....0.37ft³
Overall Dimensions .....(44.5cmW x 33.7cmH x 50.8cmD).....17.5"W x 13.25"H x 20.0"D
Exterior Construction .....Painted Aluminum Alloy
Door (see options) .....Blank door supplied with chamber
Interior Construction .....Stainless Steel, with exhaust port
Coolant Input .....LCO_2, 37° male fitting, 1/4" tube
(optional) LN_2, 45° male fitting, 1/2" tube
Exhaust .....3/8" NPT, male
Weight .....(17 kg typical; 25 kg shipping).....38 lbs typical; 55 lbs shipping

PERFORMANCE

Set Temperature Range (LCO_2) .....(-100ºF to +600ºF)..... -73°C to +315°C
With LN_2 Option .....(-300ºF to +600ºF).....-184°C to +315°C
Temperature Ramping Rate Range (Heating and Cooling).....(0.02ºF to 54ºF/min)..... 0.01ºC to 30ºC/min
Number of Programmable Temperature Setpoints .....Typically 100+

Time at Temperature Setpoint Range.....1.0 sec to 99 hr, 59 min, 59 sec
Number of Programmable Set Times .....Typically 100+

Air Circulation .....60 CFM, vertical

Absolute Error Over Temp Range (not including probe error).. .....(±0.9ºF).....±0.5°C
Temperature Resolution (approx.).....(0.04°F).....0.02ºC
Long Term Stability (per month).....(±0.4ºF).....±0.2°C
Line Voltage Sensitivity .....(±0.2ºF).....±0.1°C for 105 VAC to 125 VAC
Temperature Control Technique .....Dual PID Algorithm, PWM
Ambient Temperature Operating Range .....(32ºF to 122ºF).....0°C to 50°C

Local Control.....29 Key Keyboard (2 Line LCD Display)
Remote Control.....RS232 / RS422 / IEEE-488 bus
IEEE-488 to RS232/RS422 ..... Software/Bidirectional Transparent Operation

SAFETY

Line Voltage Dropout ..... Program and Parameters Stored in Battery Backed Memory
(Programmable Automatic Restart after Power Loss)
Fail Safe .....Open/Short Probe Detection, Watch-dog Timer,
Software Temperature Limits, Over-temperature Thermostat

ELECTRICAL

Heating Input .....1200 Watts
Power Requirements .....1600 Watts max, 120 VAC, 50/60 Hz, 1 phase
Optional 208 VAC, 100 VAC (50 Hz) and 240 VAC (see Options)

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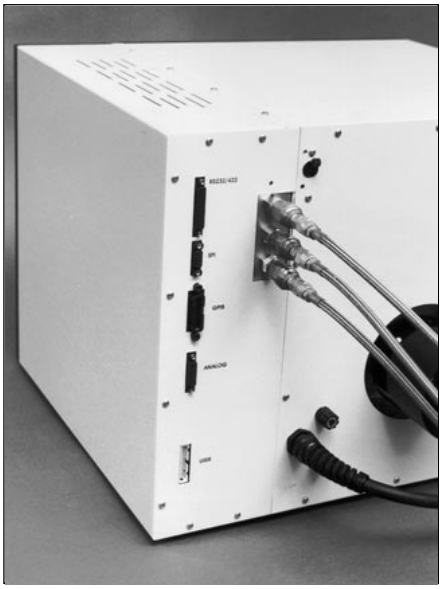

LOCAL AND REMOTE CONTROL INTERFACES

The EC1A supports stand-alone operation with a full function keyboard, a 2-line LCD and a powerful programming language. For automated test systems, a complete talker/listener IEEE-488 interface is available with serial and parallel poll capability. For remote operation over long distances, RS232 and RS422 serial interfaces are provided. With few exceptions, the commands for the local keyboard and RS232/422 and IEEE-488 interfaces are identical.

FRONT PANEL

Application.....EC1A Local Control
Operator Manual Program, Parameter Input.....29 Key Keyboard
Operator Menu-Driven Visual Output.....2 Line Alpha-numeric LCD
Visual Indicators.....Cool, Heat, Failsafe, Remote, Timeout, Heat Enable, Cool Enable, Power
Audible Alarm.....User Programmable for Volume and Function

IEEE-488 BUS INTERFACE

Application.....EC1A Remote Control
Protocol.....Talker / Listener
Bus Address.....0-30, Set from Keyboard
Interrupt Capability.....SRQ / Serial Poll and Parallel Poll

RS232 / RS422 SERIAL INTERFACE

Application.....EC1A Remote Control or IEEE-488 Bi-directional Transparent Operation
Protocol.....ASCII Character Oriented with Selectable XON/XOFF Protocol, Character ECHO, Parity
Data Rates.....300-9600 BAUD

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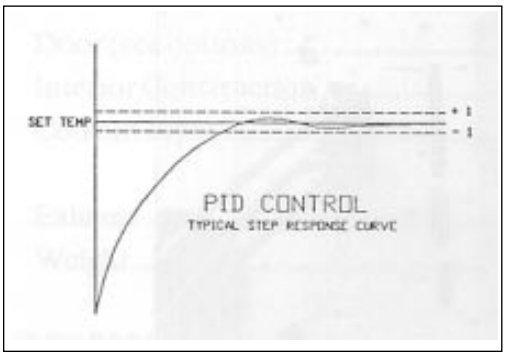
TEMPERATURE CHAMBER FEATURES

PID CONTROL

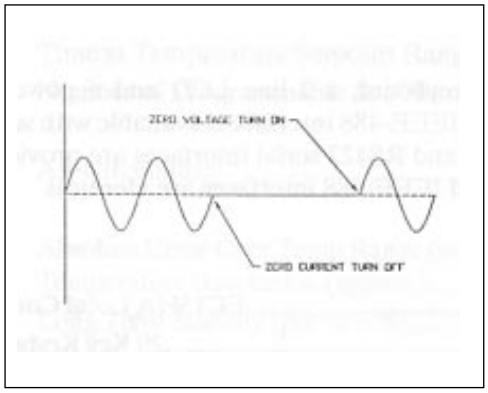


Optimum accuracy and stability in the test environment are ensured by the use of Proportional, Integral and Derivative (PID) control algorithms for both heating and cooling.

The PID coefficients define system response to the difference between set temperature and actual chamber temperature, the length of time that a difference in temperature may exist and the rate of change of the error temperature.

The default settings for the PID coefficients are generally suitable for most uses but, if necessary, each can be tailored to a particular application.

ZERO VOLTAGE SWITCHING



Control of power to the heaters and cooling solenoid is provided by zero voltage switching solid state relays to provide reliability and to reduce electrical noise.

SPECIAL FEATURES

Chart Recorder

Custom Fixturing

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EXPANDED I/O ARCHITECTURE

The expanded I/O architecture provides for easy test fixture interfacing, strip chart recorder drive and additional sensor interfacing. Each interface is accessed by using the device IN and OUT commands.

ANALOG INPUT/OUTPUT INTERFACE

Input Channels.....4 Channel, 8 Bit A/D Converter
- Applications.....Analog Data Acquisition
- Input Range.....0 to +5 VDC (0 or 4 to 20 mA Input Jumper Selectable for Channel 0)
- Input Leakage.....1 µA
- Conversion Time.....26 µsec

Output Channels.....4 Channel, 8 Bit D/A Converter
- Applications.....Chart Recording and Analog Data Control
- Output Ranges (Software Selectable)
  - UniPolar Voltage.....0 to +5 VDC
  - BiPolar Voltage.....-5 to +5 VDC
  - Current (Channel 3 Only).....0 to 20 mA
- Settling Time.....10 µsec

Common Specifications
- Non-Linearity.....1/2 LSB
- Absolute Accuracy.....±1 LSB
- Conversion Rate.....I/O Limited
- Device Address.....DEV#3
- Connector.....15 Pin D Type

USER PARALLEL PORT

Applications.....Local Automated Switch and Test Accessories
Protocol.....16 Bit Address / 8 Bit Bi-Directional Data Multiplexed, Byte Oriented
Interface Voltage.....TTL Levels
DC Supply Voltage Provided to User.....+12 VDC Unregulated
DC Supply Current (fuse protected).....1.0 Amp max.
Device Address.....DEV#1
Connector.....26 Pin Flat Cable Header

HIGH SPEED SYNCHRONOUS SERIAL PORT

Applications.....Distributed Processor Communication Link
Protocol.....Byte Oriented, Master
Data Rate.....56K BAUD
Interface Voltage.....RS422 Levels
Device Address.....DEV#2
Connector.....9 Pin D Type

AUXILIARY I/O INTERFACE

Applications.....Relay Drive
Protocol.....Bit SET/RESET/SENSE
Interface Voltage.....High Current Open Collector Drive / TTL Sense
Device Address.....DEV#4
Connector.....Terminal Block or 26 Pin Flat Connector (located internal to the unit)

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MENU-DRIVEN CONTROLLER SETUP (Front Panel)

CALIBRATION

[GREEN SHIFT] [CAL] [ENTER]	Enter CAL Mode.
Calibrate Probes? [Yes/No]	Enter YES if you really want to calibrate probes. Enter NO if you only desire to set units .
CAL Access Code? *{Access Code}*	Enter Access Code. (Set Access Code in Interrupts Menu.)
Calibrate Chamber Probe? [Yes/No]	Enter YES to calibrate Chamber Probe. Enter NO to modify Chamber and User display units (ºC,ºF,ºK).
{Selection of Probe Types, V or A}? [Yes/No]	Select Probe type, Voltage or Current.
{Temperature Set Points and Units}? [Yes/No]	If Probe selected, set 0ºC and 100ºC and select display units (ºC, ºF, ºK).
{Scale Inputs and Values}? [Yes/No] or [Value]	If Voltage or Current selected, set Inputs and Values.
Calibrate User Probe? [Yes/No]	Repeat calibration procedure for User Probe.
Modify Chamber Scale? [Yes/No]	Enter YES to modify display units for Chamber Probe.
Desired Scale? 1=ºC, 2=ºF, 3=ºK	Enter prefered scale.
Modify User Scale? [Yes/No]	Repeat selection procedure for User Probe display units.

DEFAULT VALUES

[GREEN SHIFT] [SDEF] [ENTER]	Enter SET DEFAULT Mode.
Set Up Defaults? [Yes/No]	Enter YES if you really want to modify defaults.
GPIB Address? [0-30]	Enter GPIB Address.
GPIB Lockup Time? [0, 2-59 sec]	Enter GPIB Interface maximum lockup time (0 to disable).
Timeout Pre_Time? [0 to 59 sec]	Enter GPIB SRQ or Serial Interface advanced interrupt generation before actual wait period timeout.
Power Down Restart? [0-59 min]	Disables automatic restart of controller above set minutes.
D/A Output *{A, B, C, D}*? *{Voltage Range}*	Select 0 to +5 V or -5 to +5V for channels A, B, C and D.
Serial Port Mode? *{RS232 or RS422}*	Select Serial Port.
RS Char Echo On? [Yes/No]	Enter YES for serial port character echo.
Baud Rate? *{Required Baud Rate}*	Select Baud rate from 300 to 9600 Baud.
RS DTR-CTS On? [Yes/No]	Enter YES for hardware handshake.
Buzzer Volume? *{Desired Volume}*	Select buzzer volume.
Line Frequency? *{60Hz or 50Hz}*	Set correct line frequency.
Chart CHAM On A? [Yes/No] *{Select Values}*	Chart chamber temperature on D/A channel A. If YES, enter High/Low values.
Chart USER On B? [Yes/No] *{Select Values}*	Chart user probe on D/A channel B. If YES, enter High/Low values.
PID to D/A C? [Yes/No]	Enter YES to output PID control to D/A channel C.
+/- AT SET TRIG?	Enter tolerance at which controller detects that the temperature setpoint is reached.
Auto Cool Off? [Yes/No]	Enter YES to turn off cool enable when expectorant tank becomes empty.

INTERRUPTS

[GREEN SHIFT] [SINT] [ENTER]	Enter SET INTERRUPT Mode.
Set up Interrupts? [Yes/No]	Enter YES if you really want to modify interrupts.
BUZZ LP Timeout? [Yes/No]	Enter YES to enable BUZZER after each temperature segment timeout during local program execution.
BUZZ LP Done? [Yes/No]	Enter YES to enable BUZZER when the end of a local program is encountered.
BUZZ Single T.O.? [Yes/No]	Enter YES to enable BUZZER at the end of each temperature segment timeout in single temp. mode.
INT LP Timeout? [Yes/No]	Enter YES to enable Timeout Interrupts after each temp. segment timeout during local program execution.
INT LP Done? [Yes/No]	Enter YES to enable LP Done Interrupt when the end of a local program is encountered.
INT Single T.O.? [Yes/No]	Enter YES to enable Single Temp. Timeout Interrupt at end of each temp. segment in single temp. mode.
DEVIATION INT? [Yes/No]	Enter YES to enable Deviation Interrupts.
CMD ERROR INT's? [Yes/No]	Enter YES to enable Command Error Interrupts.
BKPNT INTERRUPT? [Yes/No]	Enter YES to enable Breakpoint Interrupts.
P_POLL{1-8} 0=NO	Enter 0 to disable Parallel Poll or 1 thru 8 to set bit position for Parallel Poll.
CAL Menu Access Code?	The number that is entered will become the code that the CAL menu will expect to grant access. 0 to disable.

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COMMAND SUMMARY

nn.n = Any fixed or floating point number
hh:mm:ss = Hours:Minutes:Seconds
[ ] = Optional
In = One of the ten global I variables

SINGLE COMMANDS	SET	EXAMINE
Segment Temperature	SET = nn.n [C, F, K]	SET? or C
Read Current Chamber Temperature	(n/a)	TEMP? or T
Read Current Set Temperature During Ramping	(n/a)	CSET?
Read Current User Probe Value	(n/a)	UCHAN?
Temperature Soak Period	WAIT = hh:mm:ss or WAIT = mm or mmM or WAIT = Forever	WAIT? OR M
Temperature Ramping Rate	RATE = nnn.n	RATE?
Upper Temperature Limit	UTL = nnn.n or nnnUTL	UTL?
Lower Temperature Limit	LTL = nnn.n	LTL?
Deviation Limit	DEVL = nn.n TC01 DEVL	DEVL?
Heating PID Adjust	PIDH = nn.n, nn.n, nn.n	PIDH?
Cooling PID Adjust	PIDC = nn.n, nn.n, nn.n	PIDC?
Pulse Width Modulation Adjust	PWMP = nn	PWMP?
Device I/O Commands	OUT (dev. no.):(addr.),(data)	IN (dev. no.):(addr.),In
Time of Day	TIME = hh:mm:ss	TIME?
Read Units of Temperature	(n/a)	Scale#n? (n=1 or n=2)
Controller Power On/Off	ON or OFF	(n/a)
Heater Enable On/Off	HON or HOFF	(n/a)
Coolant Enable On/Off	CON or COFF	(n/a)

PROGRAM COMMANDS

Execution Commands	STOP; RUNn; RUNn TIME=hh:mm:ss (Start RUN at Time of Day)
Edit Commands	EDITn; INS; DELL; DELPn; LISTn; STOREn
Control Commands	FOR In; NEXT In; GOSUBn; END
Debug Commands	BKPNTn

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Standard Options

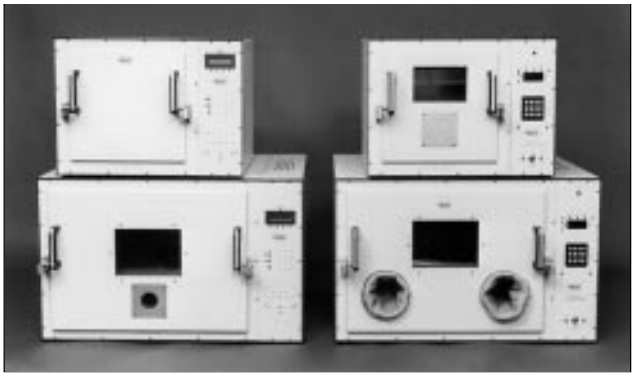
- 115 VAC, 50/60 Hz *
- 220 VAC, 50/60 Hz *
- 100 VAC, 50 Hz (International) *
- 240 VAC, 50 Hz (International) *
- LCO_2, 850psi (hose supplied) *
- LCO_2, 300psi
- LN_2, 100psi
- LN_2, 25psi
- 3-Tank LCO_2 Manifold
- Ambient Air Blower
- Blank Door *
- Door with 4" x 6" Window
- Hinge Option for Door
- 1", 2", 3" or 4" Dia Left Side Access Port
- 2 Year Warranty *
- Custom Work §
- Fast Delivery

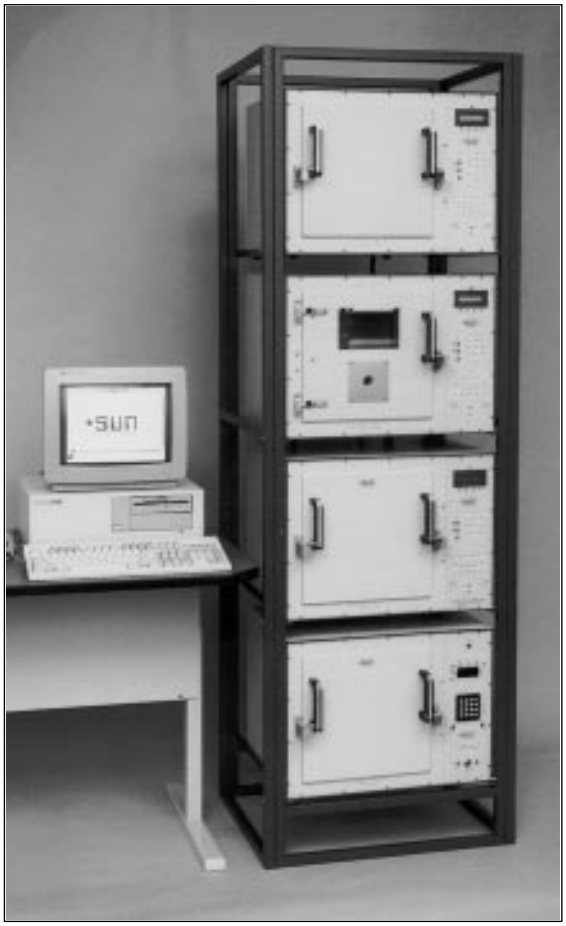
(All dimensions nominal.)

* no charge items

§ Due to the variety of applications, Sun Systems provides Custom Work per your specification. Call Sun Systems for solutions to your custom temperature testing requirements.

(Data subject to change)





Accessories

Sun Systems can provide a wide variety of test system accessories in support of your temperature testing requirements. Blank doors and doors specifically modified for component temperature cycle testing are available along with switch matrix cards that can be tailored to your test fixture requirements. Extra LCO_2 and LN_2 hoses and fittings, equipment racks and temperature probes can be provided at your request.

We want to work with you.

12/02

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