

**SCP-220 CONTROLLER
COMMUNICATIONS OPTION**

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1. Overview

1.1. Communication Function

The communication function connects the Chamber to a computer or other external device via a communication interface. This interface makes it possible to control the chamber as well as monitor chamber control status and the program being run with commands sent from the computer.

Reference

Difference between "Computer Program" and "Test Program"

A "computer program" is a program created on a computer. It is different from the test program run in the chamber's program mode.

The communication interface is either GP-IB or RS-232C, selected at the time of purchase.

GP-IB (IEEE-488/HP-IB)

GP-IB (General Purpose Interface Bus) is a standard parallel interface used for attaching sensors and programmable instruments to a computer. It is officially known as IEEE-488 (Standard No. 488 of the Institute of Electrical and Electronic Engineers [USA]) and was based on the HP-IB (Hewlett-Packard Interface Bus) standard of Hewlett-Packard Company.

RS-232C

RS-232C (Recommended Standard-232) is a serial interface widely adopted for transmission between computers and peripheral devices, and a communication standard of the EIA (Electronic Industries Association). The interface connector will differ according to the connected computer. Check the specifications of your computer and prepare a cable that can make the signal connections given in "1.2 Communication Interface".

RS-485

RS-485 is a serial interface standard for multipoint communication lines, adopted by the EIA (Electronic Industries Association). Whereas RS-232C requires a 1-to-1 connection, RS-485 enables n-to-n connections. However, with this system, the connection is 1-to-n.

1.2. Communication Interface

GP-IB The GP-IB conforms to IEEE-488. Use a communication cable that also conforms to IEEE-488.

RS-232C The RS-232C interface is a serial modem (DCE). Use a cable with the interface connector specified for your computer.

RS-485 The RS-485 interface uses a DB-9 connector, but use the RS-485 cable specified by ESPEC.

1.3. Transmitted Data

This section explains data transmitted with the communication function. This data is the same for both GP-IB and RS-232C communications.

Types of Data Data is handled as either command data or response data.

Command Data Data sent from the computer to the chamber is treated as a command. Commands are of the following two basic types:

Monitor Commands – These commands are used to monitor the chamber's operating status or conditions inside the chamber.

Setting Commands – These commands are used to change the chamber's operating mode or conditions inside the chamber such as target temperature and humidity.

Response Data Data returned from the chamber in response to computer commands is treated as a response. Responses are of the following two basic types:

Reception Status – This response tells the computer whether the setting command sent was processed correctly or not.

< When the setting command is correctly processed>

"OK : setting command"

<When the setting command is not correctly processed>

"NA : error message"

(For details on error messages, see "1.3. Error Messages" .)

Monitor Data - This data is sent in response to monitor commands from the computer.

<When the monitor command is correctly processed>

"monitored data"

(For details on responses, see "3.2. Monitor Commands".)

<When the monitor command is not correctly processed>

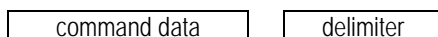
"NA : error message"

(For details on error messages, see "1.3. Error Messages".)

Data Format

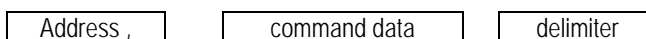
Command Data Format

Command data sent from the computer has the following format:



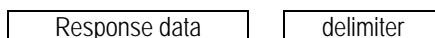
Reference

In the past an address was necessary with E-BUS communication commands and communication function commands. This is unnecessary with this option. Command data with the address header shown below can be recognized with this option.



Response Data Format

The response data returned from the chamber to the computer has the following format:

**Reference**

About Main Commands and Optional Parameters.

- Main commands and optional parameters are expressed as ASCII text in either capital or small case letters.
- Spaces between characters are automatically deleted.
- Temperature control output data is valid to one place below the decimal. All other numerical data is recognized as a whole number.

Error Messages

When command data sent from the computer is not correctly processed by the chamber, the chamber returns an "NA :." code attached with an error message. These messages and their meaning are explained below.

Error Message	Meaning	Example
CMD ERR	Chamber did not recognize the command data.	<ul style="list-style-type: none"> When "TENMP?" is sent as the command. The correct command is "TEMP?".
ADDR ERR	Address error	<ul style="list-style-type: none"> When an address is attached to a command which cannot be expressed with an address.
CONT NOT READY-1	The chamber could not execute the command.	<ul style="list-style-type: none"> When a humidity command is sent to a chamber which does not support humidity control.
CONT NOT READY-2	The chamber could not execute the command.	<ul style="list-style-type: none"> When a program related command is sent to a chamber that does not have a program initiated.
CONT NOT READY-3	The chamber could not execute the command.	<ul style="list-style-type: none"> When an SCP-220 Instrumentation command is sent to a chamber with a different controller.
CONT NOT READY-4	The chamber could not execute the command.	<ul style="list-style-type: none"> When the user attempts to lock keys while power is OFF.
CONT NOT READY-5	The chamber could not execute the command.	<ul style="list-style-type: none"> When the user attempts to change a time signal setting which cannot be changed.
DATA NOT READY	The requested data cannot be found.	<ul style="list-style-type: none"> When the user attempts to run a program which is not set up.
PARA ERR	Parameter error	<ul style="list-style-type: none"> The parameter is missing in the command. When the attached parameter can not be recognized because of typographical error, etc.
DATA OUT OF RANGE	Data is out of the specified range.	<ul style="list-style-type: none"> When the user attempts to set the target temperature beyond either the temperature high or low alarm.
PROTECT ON	Settings are protected against change by the protect setting.	<ul style="list-style-type: none"> When the user attempts to change the target temperature when the protection is ON.
PRGM WRITE ERR-1	Program editing error	<ul style="list-style-type: none"> When the user attempts to write data into a ROM pattern.
PRGM WRITE ERR-2	Program editing error	<ul style="list-style-type: none"> When the user attempts to write data without specifying the new program/overwrite mode.
PRGM WRITE ERR-3	Program editing error	<ul style="list-style-type: none"> When an edit request is sent while not in the new program mode.
PRGM WRITE ERR-4	Program editing error	<ul style="list-style-type: none"> When reception is OFF because a new program is being created.
PRGM WRITE ERR-5	Program editing error	<ul style="list-style-type: none"> When reception is OFF because overwriting is in process.
PRGM WRITE ERR-6	Program editing error	<ul style="list-style-type: none"> When an overwrite request is sent while not in the overwrite mode.

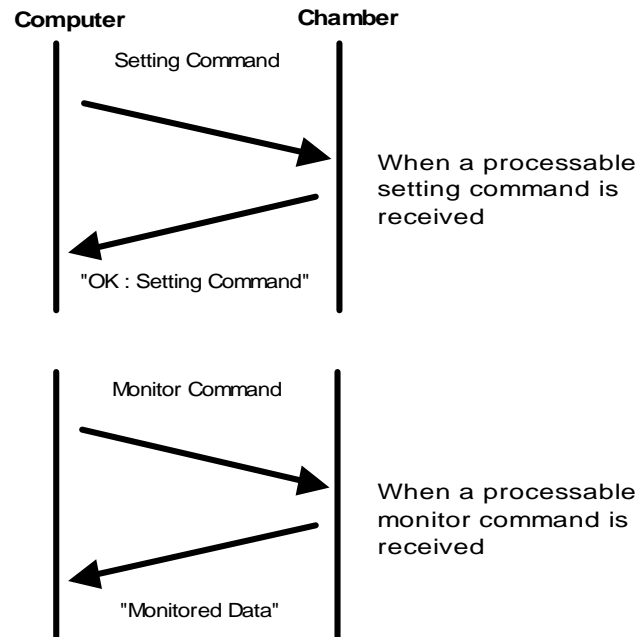
Cont. on next page

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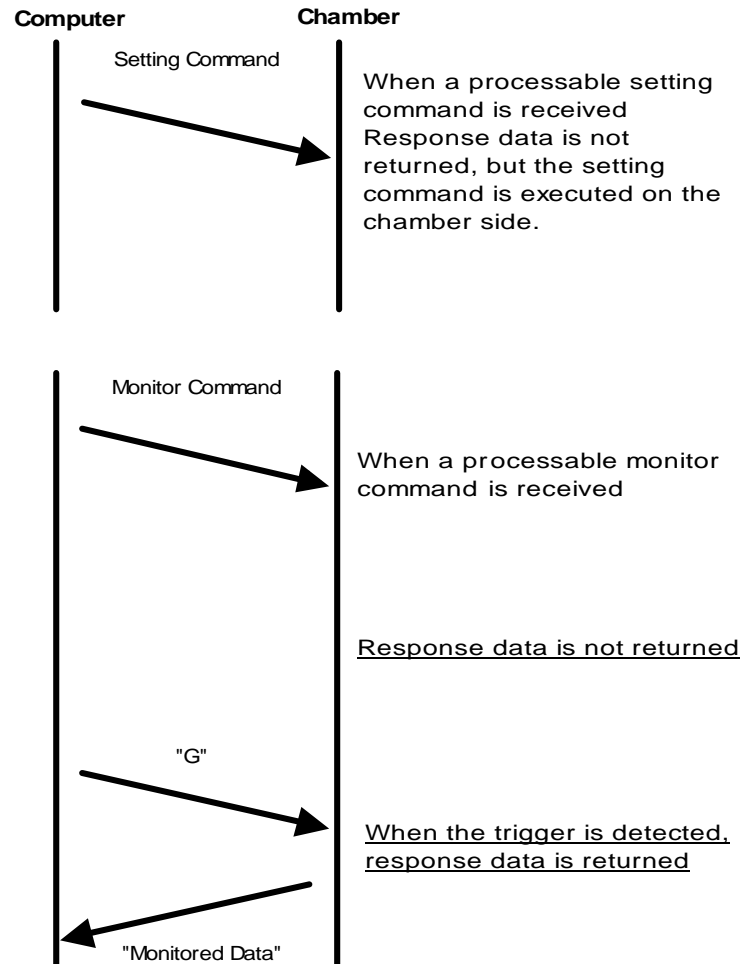
Error Message	Meaning	Example
PRGM WRITE ERR-7	Program editing error	<ul style="list-style-type: none"> When the program number specified on an individual line differs from the program being written to.
PRGM WRITE ERR-8	Program editing error	<ul style="list-style-type: none"> When non-continuous step numbers are specified.
PRGM WRITE ERR-9	Program editing error	<ul style="list-style-type: none"> When counter setup is wrong.
PRGM WRITE ERR-10	Program editing error	<ul style="list-style-type: none"> When the user attempts to change program data while the program is running.
PRGM WRITE ERR-11	Program editing error	<ul style="list-style-type: none"> When the user attempts to set a counter or the end mode without the necessary data.
PRGM WRITE ERR-12	Program editing error	<ul style="list-style-type: none"> When the user attempts to change a program created on the SCP-220 instrumentation.
PRGM WRITE ERR-13	Program editing error	<ul style="list-style-type: none"> When step data is invalid.
PRGM WRITE ERR-14	Program editing error	<ul style="list-style-type: none"> When the user attempts to set exposure time when ramp control is ON.
PRGM WRITE ERR-15	Program editing error	<ul style="list-style-type: none"> When the user attempts to turn humidity ramp control ON when humidity control is OFF.

1.4. Data Transfer

Date Transfer The computer sends commands (setting command or monitor command) to the chamber, and the chamber returns a response (reception status or monitor data) to the computer.



When the Echo Back is OFF - The chamber does not return a response to computer commands until it receives the data transfer trigger. With this communication function, "G" is used as the data transfer trigger instead of the command data. In this case, data transfer is as follows:



2. Communication Setup

2.1. SCP-220 Instrumentation

With the SCP-220 instrumentation, communications are set up in the chamber setup mode. For details, refer to the SCP-220 Controller Manual.

GP-IB Communication Setup

Procedure

1. Select "Communication Setup" on the Chamber Setup screen.

STOP [Battery Icon] 2/16 (FRI) 19:36:57

Communication Setup

E-BUS Setup

RS-232C Setup

GP-IB Setup

Press the boxes to select settings. Prev. Screen

2. Select "GP-IB Setup".

STOP [Battery Icon] 5/31 (THU) 13:50:19

GP-IB Setup

Chamber Address 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Delimiter ☒ CR ☒ LF ☐ EOI

Specify address and delimiter to enable communications. Prev. Screen

3. Set the address and delimiter. After completing the settings, return to the Chamber Monitor.

RS-232 Communication Setup

Procedure

1. Select "Communication Setup" on the Chamber Setup screen.

The screenshot shows the Chamber Setup screen. At the top, it says "STOP" and displays the date and time: 2/16 (FRI) 19:36:57. Below this, the "Communication Setup" menu is visible, with three options: "E-BUS Setup", "RS-232C Setup", and "GP-IB Setup". At the bottom, there is a prompt: "Press the boxes to select settings." and a "Prev. Screen" button.

2. Select "RS-232C" Setup".

The screenshot shows the RS232C Communication Setup screen. At the top, it says "STOP" and displays the date and time: 5/31 (THU) 15:15:08. Below this, the "RS232C Communication Setup" menu is visible. It contains several settings: "Delimiter" with options "CR" and "LF"; "Transmission Rate (bps)" with options "4800", "9600", and "19200"; "Parity" with options "none", "odd", and "even"; "Data bits" with options "8bit" and "7bit"; "Stop bits" with options "1bit" and "2bit"; and "Protocol" with options "Standard" and "E-BUS". There is also an "Echo Back" option set to "ON". At the bottom, there is a prompt: "Specify delimiter and transmission rate to enable." and a "Prev. Screen" button.

3. Set the delimiter and transmission rate. To use echo back, select the "E-BUS Conformity" box next to Protocol. After completing the settings, return to the Chamber Monitor.

3. Commands

This chapter explains setting commands and monitor commands. It provides format, response data and also examples.

3.1. Command List

Monitor commands and setting commands are listed in Tables 3.1 and 3.2.

Table 3.1. Monitor Command List

Command	Description
ROM?	Monitors ROM version.
DATE?	Monitors the date of the internal calendar.
TIME?	Monitors the present time of the internal clock.
SRQ?	Monitors SRQ status.
MASK?	Monitors the SRQ mask setting.
?	Monitors the processing result for the last processed command.
PRGM USE?	Monitors management information on registered programs.
TIMER USE?	Monitors the number of currently used timers.
TIMER LIST?	Monitors timer setup.
TIMER ON?	Monitors the number of active timers.
ALARM?	Monitors alarms that have occurred.
KEYPROTECT?	Monitors key lock status.
TYPE?	Monitors chamber information.
MODE?	Monitors chamber operating mode.
MON?	Monitors conditions inside the chamber.
TEMP?	Monitors temperature parameters for the constant mode.
HUMI?	Monitors humidity parameters for the constant mode.
SET?	Monitors refrigeration capacity control setup.
REF?	Monitors refrigeration output.
RELAY?	Monitors constant mode time signal ON/OFF setup.
%?	Monitors heater output.
PRGM MON?	Monitors run status of the current program.
PRGM SET?	Monitors program end mode of the current program.
PRGM DATA?	Monitors setup of the specified program.
RUN PRGM MON? *1	Monitors run status of the current remote program.
RUN PRGM? *1	Monitors program end mode of the current remote program.
PRGM LIST?	Monitors setup of the specified program.

The monitor commands listed below are additional monitor commands available when the chamber has been equipped with the product temperature control option.

MON PTC?	Monitors current temps for product & air and chamber operating mode.
TEMP PTC?	Monitors product temp control status and deviation settings.
PRGM DATA PTC?, RAM:	Monitors setup of the specified program, with the addition of product temperature control settings.
PTC?	Monitors product temperature control setup and tuning parameters.

*1 : The "program mode" mentioned herein refers to user Program Nos. 1 ~ 20 and ROM Program Nos. 21 ~ 30 which are created, edited, and run from the SCP-220 Instrumentation (ROM programs cannot be edited). The "remote program mode" refers to the 1-step program mode which enables editing, starting, and monitoring via this communication function or E-BUS communications. For details on the remote program mode, see "4.3 To Run Programs from Remote".

Table 3.2. Setting Command List

Command	Description
DATE	Changes the date of the internal calendar.
TIME	Changes the time of the internal clock.
MASK	Sets the SRQ status mask.
SRQ	Clears SRQ status.
RPGM ERASE	Deletes programs.
TIMER WRITE	Sets up timers.
TIMER ERASE	Deletes timers.
TIMER	Turns timers ON/OFF.
KEYPROTECT	Locks/Unlocks keys.
POWER	Turns control power ON/OFF.
TEMP	Sets temperature.
HUMI	Sets humidity.
SET	Sets refrigerator capacity control.
RELAY	Turns time signals ON/OFF.
PRGM	Controls the current program.
MODE	Sets operating mode.
PRGM DATA WRITE	Edits program data.
RUN PRGM ^{*1}	Creates and starts remote programs.
PRGM WRITE	Creates programs.

The setting commands listed below are additional setting commands available when the chamber has been equipped with the product temperature control option.

TEMP PTC	Turns product temperature control ON/OFF and sets product temp control deviation settings.
PTC	Sets product temperature control setup and tuning parameters.
PRGM DATA WRITE	Edits program data. (This command exists without the product temperature control option, but when the chamber is equipped with product temp control, this command is used to set the product temp control program settings.)

^{*1} : The "program mode" mentioned herein refers to user Program Nos. 1 ~ 20 and ROM Program Nos. 21 ~ 30 which are created, edited, and run from the SCP-220 Instrumentation (ROM programs cannot be edited). The "remote program mode" refers to the 1-step program mode which enables editing, starting, and monitoring via this communication function or E-BUS communications. For details on the remote program mode, see "4.3 To Run Programs from Remote".

3.2. Monitor Commands

Monitor commands have the following format:
main command [, optional parameter]

To Monitor ROM Version

Table 3.3. ROM Version Monitor Commands

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
ROM?	--	<Description> This command requests the chamber to return the version of the temperature controller ROM.
		<Example command> "ROM?"
		<Response format> "ROM type ROM version"
		<Example response> "JPC 2.00"
	DISP	<Description> This command requests the chamber to return the version of the SCP-220 Instrumentation ROM.
		<Example command> "ROM?, DISP"
		<Response format> "ROM type ROM version"
		<Example response> "DISP-P Ver 1.34"
	CONT	<Description> This command requests the chamber to return the version of the temperature controller ROM.
		<Example command> "ROM?, CONT"
		<Response format> "ROM type ROM version"
		<Example response> "JPC 2.00"

To Monitor the Date

Table 3.4. Date Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
DATE?		<Description> This command requests the chamber to return the date of the internal calendar.
		<Example command> "DATE?"
		<Response format> "year.month / day"
		<Example response> "98.2 / 14"

To Monitor the Time

Table 3.5. Time Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
TIME?		<Description> This command requests the chamber to return the time of the internal clock.
		<Example command> "TIME?"
		<Response format> "hour : minute : second"
		<Example response> "18:00:00"

To Monitor Interrupts

Table 3.6. Interrupt Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
SRQ?		<Description> This command requests the chamber to return the SRQ status.
		<Example command> "SRQ?"
		<Response format> "SRQ1 SRQ2 SRQ3 SRQ4 SRQ5 SRQ6 SRQ7 SRQ8"
		<Example response> "01000000" SRQ1 : Not in use SRQ2 : "1" is set if a chamber alarm occurs. SRQ3 : "1" is set when 1 step is completed in the remote program mode. SRQ4 : "1" is set when power is turned ON or OFF. SRQ5 : Not in use SRQ6 : Not in use SRQ7 : SRQ reserved for GP-IB communications. SRQ8 : Not in use (note) <ul style="list-style-type: none"> Unless the interrupt mask is set with the "MASK" setting command, the concerned SRQ is not set to "1" when the event assigned to the SRQ occurs. For details, see "3.3 Setting Commands". When set to "1", SRQ status is maintained even after the assigned event is cleared. SRQ status is reset as follows: <ol style="list-style-type: none"> When the "SRQ, RESET" command is sent When this command is sent with a "01" address attached ("01,SRQ?") When chamber primary power is shut OFF.

To Monitor Interrupt Mask Bit

Table 3.7. Interrupt Mask Bit Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
MASK?		<Description> This command requests the chamber to return the value of the interrupt mask bit.
		<Example command> "MASK?"
		<Response format> "SRQ1 SRQ2 SRQ3 SRQ4 SRQ5 SRQ6 SRQ7 SRQ8"
		<Example response> "01000000" For bit assignment, see the "SRQ?" monitor command.

To Monitor Echo

Table 3.8. Echo Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
?		<Description> This command requests the chamber to return the processing result of the last processed command.
		<Example command> "?"
		<Response format> "processing status : last command"
		<Example response> "OK : TEMP, S35.0" Processing status is described as follows: When processed correctly "OK : xxxxx" When not processed correctly "NA : xxxxx"

To Monitor Management Information on Registered Programs

Table 3.9. Registered Program Management Monitor Commands

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PRGM USE?	RAM	<Description> This command requests the chamber to return the number of registered programs and their numbers.
		<Example command> "PRGM USE?, RAM"
		<Response format> "number of registered programs [,Program No.] [,Program No.]..."
		<Example response> "5, 1, 2, 10, 15, 17"
	ROM : Program No.	<Description> This command requests the chamber to return the registered name and date of creation of a specified program.
		<Example command> "PRGM USE?, RAM : 1"
		<Response format> "program name, date created"
		<Example response> "SAMPLE-1 , 98 . 2 / 14" <ul style="list-style-type: none"> Program Nos. 1 ~ 20 can be specified for "RAM" programs and 21 ~ 30 for "ROM" programs.

To Monitor Registered Timers

Table 3.10. Registered Timer Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
TIMER USE?	--	<Description> This command requests the chamber to return the number of registered timers and their numbers.
		<Example command> "TIMER USE?"
		<Response format> "number of registered timers [,Timer No.] [,Timer No.]..."
		<Example response> "2, 1, 2"

To Monitor Timer Setup

Table 3.11. Timer Setup Monitor Commands

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
TIMER LIST?	1	<Description> This command requests the chamber to return the setup for timer 1 (start timer).
		<Example command> "TIMER LIST?, 1"
		<Response format> "timer number, start mode, operation mode"
		<Example response> See Table 3.12 ~ 3.14.
	2	<Description> This command requests the chamber to return the setup for timer 2 (end timer).
		<Example command> "TIMER LIST?, 2"
		<Response format> "timer number, start mode, end mode"
		<Example response> See Tables 3.12 ~ 3.14.

Table 3.12. Start Mode

Mode	Displayed Response Data	Example
1 Time	"MODE1, start day, start time"	"MODE1, 98.2/14, 10:00"
Day-by-Day	"MODE2, start day, start time"	"MODE2, SAT, 23:00"
Everyday	"MODE3, start time"	"MODE3, 0:00"

The start day is described as follows:

Monday : "MON"
 Tuesday : "TUE"
 Wednesday : "WED"
 Thursday : "THU"
 Friday : "FRI"
 Saturday : "SAT"
 Sunday : "SUN"

Table 3.13. Operation Mode

Mode	Displayed Response Data	Example
Program	"RUN, Program No., Step No."	"RUN, RAM : 1, STEP1"
Constant	"CONSTANT"	"CONSTANT"

The Program Number is described as follows:

User Program Nos. 1 ~ 20 : "RAM : 1" ~ "RAM : 20"
 ROM Program Nos. 21 ~ 30 : "ROM : 21" ~ "ROM : 30"

Table 3.14. End Mode

Mode	Displayed Response Data	Example
Standby	"STANDBY"	"STANDBY"
Control Power OFF	"OFF"	"OFF"

To Monitor Active Timers

Table 3.15. Active Timer Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
TIMER ON?	--	<Description> This command requests the chamber to return the number of active timers and their numbers.
		<Example command> "TIMER ON?"
		<Response format> "number of active timers [,Timer No.] [,Timer No.]"
		<Example response> "2, 1, 2"

To Monitor Alarm Status

Table 3.16. Active Status Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
ALARM?	--	<Description> This command requests the chamber to return the number of alarms that have occurred and their codes.
		<Example command> "ALARM?"
		<Response format> "number of alarms occurred [,alarm code] [,alarm code]..."
		<Example response> "2, 1, 7" <ul style="list-style-type: none"> For alarm codes, refer to the Instruction Manual.

To Monitor Key Lock Status

Table 3.17. Key Lock Status Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
KEYPROTECT?	--	<Description> This command requests the chamber to return the key lock status.
		<Example command> "KEY PROTECT?"
		<Response format> "key lock status"
		<Example response> "ON" <ul style="list-style-type: none"> Key lock status is returned as follows: When keys are locked : "ON" When keys are not locked : "OFF"

To Monitor Chamber Information

Table 3.18. Chamber Type Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
TYPE?	--	<Description> This command requests the chamber to return the type of sensor connected to the temperature controller, the type of temperature controller and the temperature range.
		<Example command> "TYPE?"
		<Response format> "type of dry-bulb sensor [,type of wet-bulb], type of temperature controller, temperature range"
		<Example response> "T, T, JPC 2.00 , 105.0" <ul style="list-style-type: none"> With temperature-only chambers, the type of wet-bulb sensor is omitted from the response.

To Monitor Operating Mode

Table 3.19. Operating Mode Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
MODE?	--	<Description> This command requests the chamber to return the chamber's operating mode.
		<Example command> "MODE?"
		<Response format> "operating mode"
		<Example response> "CONSTANT"
		Operating mode is returned as follows: When control power is OFF "OFF" When on standby "STANDBY" When in the constant mode "CONSTANT" When running a program "RUN"

To Monitor Chamber Conditions

Table 3.20. Chamber Conditions Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
MON?	--	<Description> This command requests the chamber to return the conditions inside the chamber.
		<Example command> "MON?"
		<Response format> "monitored temperature [,monitored humidity], operating mode, number of alarms occurred"
		<Example response> "23.0, 85, CONSTANT, 0" <ul style="list-style-type: none"> Operating mode is the same as that returned with the "MODE?" monitor command. With temperature-only chambers, the monitored humidity is omitted from the response. The monitored temperature is expressed to one place below the decimal. The monitored humidity is expressed as a whole number.

To Monitor Constant Mode Temperature Parameters

Table 3.21. Constant Mode Temperature Setup Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
TEMP?	--	<Description> This command requests the chamber to return the temperature parameters for the constant mode.
		<Example command> "TEMP?"
		<Response format> "monitored temperature, target temperature, high limit temperature, low limit temperature"
		<Example response> "23.0, 85.0, 105.0, -45.0"

To Monitor Constant Mode Humidity Parameters

Table 3.22. Constant Mode Humidity Setup Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
HUMI?	--	<Description> This command requests the chamber to return the humidity parameters for the constant mode.
		<Example command> "HUMI?"
		<Response format> "Monitored humidity, target humidity, high limit humidity, low limit humidity"
		<Example response> "25, 85, 100, 0" <ul style="list-style-type: none"> With temperature-only chambers, "NA : CONT NOT READY-1" is returned as a response.

To Monitor Refrigerator Capacity Control Setup

Table 3.23. Refrigerator Capacity Control Setup Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response								
Main Command	Optional Parameter									
SET?	--	<Description> This command requests the chamber to return the refrigeration capacity control setting.								
		<Example command> "SET?"								
		<Response format> "REF code"								
		<Example response> "REF9"								
		REF code is as follows: <table><tr><td>When set to 0%</td><td>"REF0"</td></tr><tr><td>When set to 20%</td><td>"REF1"</td></tr><tr><td>When set to 50%</td><td>"REF3"</td></tr><tr><td>When set to 100%</td><td>"REF6"</td></tr><tr><td>When set to auto capacity control</td><td>"REF9"</td></tr></table>	When set to 0%	"REF0"	When set to 20%	"REF1"	When set to 50%	"REF3"	When set to 100%	"REF6"
When set to 0%	"REF0"									
When set to 20%	"REF1"									
When set to 50%	"REF3"									
When set to 100%	"REF6"									
When set to auto capacity control	"REF9"									

To Monitor Refrigeration Output

Table 3.24. Refrigeration Output Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
REF?	--	<Description> This command requests the chamber to return the refrigeration output.
		<Example command> "REF?"
		<Response format> "number of compressors, operating status of compressor 1 [,operating status of compressor 2]"
		<Example response> "2, ON1, OFF2" <ul style="list-style-type: none"> When the chamber has only one compressor, the operating status of compressor 2 is omitted from the response.

To Monitor Active Time Signals

Table 3.25. Active Time Signal Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
RELAY?	--	<Description> This command requests the chamber to return the number of active time signals and their numbers.
		<Example command> "RELAY?"
		<Response format> "number of active time signals, time signal number, [, time signal number] [, time signal number] ..."
		<Example response> "2, 1, 2"

To Monitor Heater Output

Table 3.26. Heater Output Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
%?	--	<Description> This command requests the chamber to return the number of controllable heaters and their output value.
		<Example command> "%?"
		<Response format> "number of heaters, heater output value, [,humidifying heater output value]"
		<Example response> "2, 56.2, 19.3" <ul style="list-style-type: none"> With temperature-only chambers, the humidifying heater output value is omitted from the response. The heater output value is expressed to one place below the decimal.

To Monitor Program Run Status

Table 3.27. Program Run Status Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PRGM MON?	--	<p><Description> This command requests the chamber to return the program parameters for the current program.</p> <p><Example command> "PRGM MON?"</p> <p><Response format> "number of current step, target temperature [,target humidity], exposure time remaining to step end, number of cycles remaining in counter A, number of cycles remaining in counter B"</p> <p><Example response> "2, 27.0, 85, 0:58, 1, 2"</p> <ul style="list-style-type: none"> • If a program is not running "NA : CONT NOT READY-2" is returned as the response. (This command cannot be used to monitor the remote program mode.) • The control targets at the time this command is received by the chamber are returned as the target temperature (humidity). • With temperature-only chambers, the target humidity is omitted from the response.


To Monitor Program End Mode

Table 3.28. Program End Mode Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PRGM SET?	--	<p><Description> This command requests the chamber to return the Program No., program name and end mode of the current program.</p> <p><Example command> "PRGM SET?"</p> <p><Response format> "Program No., program name, end mode"</p> <p><Example response> "RAM:1, SAMPLE-1, END(OFF)"</p> <ul style="list-style-type: none"> • If a program is not running, "NA : CONT NOT READY-2" is returned as the response. (This command cannot be used to monitor the remote program mode.) • Program Number is returned as follows: User Program Nos. 1 ~ 20 : "RAM : 1" ~ "RAM : 20" User Program Nos. 21 ~ 30 : "ROM : 21" ~ "ROM : 30" • End mode is returned as follows: When to shut OFF the power at program end "END (OFF)" When to run in the constant at program end "END (CONSTANT)" When to hold the last step at program end "END (HOLD)" When to start another program at program end "END (RUN)"

To Monitor Program Setup

Table 3.29. Program Setup Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PRGM DATA?	RAM : Program No. ROM : Program No.	<Description> This command requests the chamber to return the setup of the specified program.
		<Example command> "PRGM DATA?, RAM : 1"
		<Response format> "number of steps, program name, counter A setup, counter B setup, end mode"
		<Example response> "5, <SAMPLE-1>, COUNT, A(1. 3. 10), B(0. 0. 0), END(OFF)"
		<ul style="list-style-type: none"> This command cannot be used to monitor the remote program mode. If the program contains no data, "NA : DATA NOT READY" is returned as the response. Program Nos. 1 ~ 20 can be specified for "RAM" programs and 21 ~ 30 for "ROM" programs. The program name is described in < >. Counters A and B are described as follows: <div style="text-align: center;"> COUNT, A (<u>1.</u> <u>3.</u> <u>10</u>) </div> <div style="display: flex; justify-content: center; align-items: center; margin-top: 10px;"> <div style="text-align: center; margin-right: 10px;">  </div> <div> <p>No. of repeat cycles</p> <p>No. of repeat cycle end step</p> <p>No. of repeat cycle start step</p> </div> </div> End mode is returned as follows: When to shut OFF the power at program end "END (OFF)" When to go on standby at program end "END (STANDBY)" When to run in the constant at program end "END (CONSTANT)" When to run the next program at program end "END (RUN : Program No.)"

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Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PRGM DATA?	RAM : Program No. STEPxx ROM : Program No. STEPxx	<Description> This command requests the chamber to return the setup of the specified step.
		<Example command> "PRGM DATA?, RAM : 1, STEP1"
		<Response format> "step number, target temperature, temperature ramp control setting [, target humidity, humidity ramp control setting], exposure time, soak control setting, REF code [, ON external alarm output]"
		<Example response> "5, TEMP23.0, TEMP RAMP ON, HUMI50, HUMI RAMP OFF, TIME99:59, GRANTY ON, RELAY ON1.2" <ul style="list-style-type: none"> • This command cannot be used to monitor the remote program mode. • If the step contains no data, "NA : DATA NOT READY" is returned as the response. • Program Nos. 1 ~ 20 can be specified for "RAM" programs and 21 ~ 30 for "ROM" programs. • With temperature-only chambers, the target humidity and humidity ramp control setting are omitted from the response. • When external alarm output is OFF, the external alarm output is omitted from the response.

To Monitor Remote Program Run Status

Table 3.30. Remote Program Run Status Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
RUN PRGM MON?	--	<Description> This command requests the chamber to return the status of the current remote program.
		<Example command> "RUN PRGM MON?"
		<Response format> "number of data sets, target temperature [, target humidity], time remaining until end, number of repeat cycles remaining"
		<Example response> "4, 35.9, 85, 1:00, 1" <ul style="list-style-type: none"> • If the chamber is not running a remote program, "NA : CONT NOT READY-2" is returned as the response. (This command cannot be used to monitor the program mode.) • With temperature-only chambers, the target humidity is omitted from the response. • The number of repeat cycles is not currently supported. "1" is automatically set as dummy data.

To Monitor Remote Program Setup

Table 3.31. Remote Program Setup Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
RUN PRGM?	--	<Description> This command requests the chamber to return the status of the current remote program.
		<Example command> "RUN PRGM?"
		<Response format> "start temperature, attainment temperature [, start humidity, attainment humidity], set exposure time"
		<Example response> "TEMP 10.0 GOTEMP 30.0 HUMI 10 GOHUMI 100 TIME 1:00 REF9" <ul style="list-style-type: none"> If the chamber is not running a remote program, the setting from the last run remote program is returned as the response. (This command cannot be used to monitor the program mode.) With temperature-only chambers, the start humidity and attainment humidity are omitted from the response.

To Monitor Program Size and Step Setup

Table 3.32. Program Size and Step Setup Monitor Commands

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PRGM LIST?	RAM : Program No.	<Description> This command requests the chamber to return the number of steps, storage area and program name of the specified program.
		<Example command> "PRGM LIST?, RAM:1"
		<Response format> "number of steps, storage area, program name"
		<Example response> "10, RAM: 5, SAMPLE-1"
	RAM : Program No., STEPxx ROM : Program No., STEPxx	<Description> This command requests the chamber to return the step setup of the specified program.
		<Example command> "PRGM LIST?, RAM:1, STEP1"
		<Response format> See Table 3.33.
		<Example response> See Table 3.33.

Table 3.33. Program Step Setup

Control Item	Displayed Response Data	Example
Start Temperature	TEMP	TEMP20.0
Attainment Temperature	GOTEMP	GOTEMP30.0
Start Humidity	HUMI	HUMI80
Attainment Humidity	GOHUMI	GOHUMI100
Exposure Time	TIME	TIME1:00
Refrigerator Capacity	REF	REF9
Time Signal ON/OFF	RELAY	RELAYON1,2
Repeat Setup	COUNT	COUNTA1.2
Pause Control	PAUSE	PAUSE
End Mode	END	"END (HOLD)" To hold the last step at program end "END (CONST)" To run in the constant at program end "END (OFF)" To shut OFF control power at program end "END (RUN)" To run the next program at program end

ADDITIONAL PRODUCT TEMPERATURE CONTROL (OPTION) COMMANDS

(Note: These commands will only function if the chamber is equipped with the Product Temperature Control Option)

To Monitor the Current Product and Air Temperatures and Chamber Operation Mode

Table 3.34. Current Product and Air Temperatures and Chamber Operation Mode Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
MON PTC?	--	<Description> This command requests the chamber to return the product, air, and humidity process variables and also the operating mode of the chamber.
		<Example command> "MON PTC?"
		<Response format> "monitored product temperature, monitored air temperature, monitored humidity, chamber operation mode, number of alarm"
		<Example response> "27.1, 25.2, 85, CONSTANT, 0" Operating mode is returned as follows: When control power is OFF "OFF" When on standby "STANDBY" When in the constant mode "CONSTANT" When running a program "RUN"

To Monitor the Product Temperature Control Status and Deviation Settings

Table 3.35. Product Temperature Control Status and Deviation Settings Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
TEMP PTC?	--	<Description> This command requests the chamber to return the product temperature control (i.e. PTC) target and monitored values as well as the positive and negative deviation settings for the product temperature control.
		<Example command> "TEMP PTC?"
		<Response format> "PTC status ON/OFF, monitored product temperature, monitored air temperature, target product temperature, target air temperature, PTC positive deviation setting, PTC negative deviation setting."
		<Example response> "ON, 27.7, 26.5, 30.0, 45.6, 20.0, 20.0,"

To Monitor Program Setup

Table 3.36. Program Setup Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PRGM DATA PTC?	RAM : Program No. ROM : Program No.	<Description> This command requests the chamber to return the setup of the specified program.
		<Example command> "PRGM DATA PTC?, RAM : 1"
		<Response format> "number of steps, program name, counter A setup, counter B setup, end mode"
		<Example response> "15, <PTCPRGM>, COUNT, A(1. 3. 10), B(0. 0. 0), END(OFF)" <ul style="list-style-type: none"> • This command cannot be used to monitor the remote program mode. • If the program contains no data, "NA : DATA NOT READY" is returned as the response. • Program Nos. 1 ~ 20 can be specified for "RAM" programs and 21 ~ 30 for "ROM" programs. • The program name is described in < >. • Counters A and B are described as follows: <div style="margin-left: 40px;"> COUNT, A (<u>1.</u> <u>3.</u> <u>10</u>) <div style="display: flex; align-items: center; margin-left: 100px;"> <div style="border-left: 1px solid black; width: 100px; height: 100px; position: relative;"> <div style="position: absolute; top: 0; right: 0; width: 50%; height: 50%; border-left: 1px solid black; border-top: 1px solid black;"></div> </div> <div style="margin-left: 10px;"> <p>No. of repeat cycles</p> <p>No. of repeat cycle end step</p> <p>No. of repeat cycle start step</p> </div> </div> </div> <ul style="list-style-type: none"> • End mode is returned as follows: When to shut OFF the power at program end "END (OFF)" When to go on standby at program end "END (STANDBY)" When to run in the constant at program end "END (CONSTANT)" When to run the next program at program end "END (RUN : Program No.)"

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PRGM DATA PRC?	RAM : Program No. STEPxx ROM : Program No. STEPxx	<Description> This command requests the chamber to return the setup of the specified step.
		<Example command> "PRGM DATA PTC?, RAM : 1, STEP1"
		<Response format> "step number, target temperature, temperature ramp control setting , PTC setting ON/OFF, target humidity [, humidity ramp control setting], exposure time, soak control setting, REF code [, ON external alarm output] , PTC positive deviation setting, PTC negative deviation setting"
		<Example response> "5, TEMP23.0, TEMP RAMP ON, PTC OFF, HUMI50, HUMI RAMP OFF, TIME99:59, GRANTY ON, REF9, RELAY ON1.2, DEVP10.0, DEVN15.0" <ul style="list-style-type: none"> • This command cannot be used to monitor the remote program mode. • If the step contains no data, "NA : DATA NOT READY" is returned as the response. • Program Nos. 1 ~ 20 can be specified for "RAM" programs and 21 ~ 30 for "ROM" programs. • With temperature-only chambers, the target humidity and humidity ramp control setting are omitted from the response. • When external alarm output is OFF, the external alarm output is omitted from the response.

To Monitor the Product Temperature Control Setup & Tuning Parameter Settings

Table 3.37. Product Temperature Control Setup & Tuning Parameter Monitor Command

Monitor Command		Description/Example Command/Response Format/Example Response
Main Command	Optional Parameter	
PTC?	--	<Description> This command requests the chamber to return the product temperature control (i.e. PTC) tuning parameter settings and the heating/cooling temperature limits.
		<Example command> "PTC?"
		<Response format> "heating limit, cooling limit, P tuning parameter, Filter tuning parameter, D tuning parameter, heating option, cooling option"
		<Example response> "150.0, -40.0, 1.0, 36.0, 2.0, 0.0, 0.0" <ul style="list-style-type: none"> • The heating and cooling option settings are not currently used.

3.3. Setting Commands

Setting commands have the format shown below.

main command [, optional parameter], setting data

To Set the Date

Table 3.34. Date Setting Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
DATE	--	Date Data	<Description> This command sets the date of the internal calendar.
			<Setting data format> "year. month / day. day of the week"
			<Example command> "DATE, 98.2 / 14. SAT" The day of the week is described as follows: Monday : "MON" Tuesday : "TUE" Wednesday : "WED" Thursday : "THU" Friday : "FRI" Saturday : "SAT" Sunday : "SUN"

To Set the Time

Table 3.35. Time Setting Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
TIME	--	Time Data	<Description> This command sets the time of the internal clock.
			<Setting data format> "hour : minute : second"
			<Example command> "TIME, 18:00:00"

To Set Interrupt Mask

Table 3.36. Interrupt Mask Setting Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
MASK	--	Mask Data	<Description> This command sets the interrupt mask.
			<Setting data format> "SRQ1 SRQ2 SRQ3 SRQ4 SRQ5 SRQ6 SRQ7 SRQ8" SRQ1 : Not in use SRQ2 : Sets "1" if a chamber alarm occurs. SRQ3 : Sets "1" when 1 step is completed in the remote program mode. SRQ4 : Sets "1" when power is turned ON or turned OFF. SRQ5 : Not in use SRQ6 : Not in use SRQ7 : SRQ reserved for GP-IB communications. SRQ8 : Not in use
			<Example command> "MASK, 01000000" <ul style="list-style-type: none"> By setting the interrupt mask with this command, SRQ status is set, if the event assigned to the SRQ occurs, the event can be checked with the "SRQ?" monitor command. (An SRQ interrupt is generated when using GP-IB communications.) Setting this command to "1" enables SRQ status setting.

To Reset SRQ Status

Table 3.37. SRQ Status Reset Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
SRQ	--	Resetting Command	<Description> This command clears SRQ status.
			<Setting data format> "reset command"
			<Example command> "SRQ, RESET" <ul style="list-style-type: none"> This command can also be cleared with the "SRQ?" monitor command attached with the 01 address (01, SRQ?)

To Delete User Programs

Table 3.38. Program Delete Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
PRGM ERASE	RAM : Program No.	--	<Description> This command deletes the specified program.
			<Setting data format> --
			<Example command> "PRGM ERASE, RAM : 1" <ul style="list-style-type: none"> This command deletes all steps in the specified program. With the SCP-220 Instrumentation, programs cannot be deleted via the communication function when a program screen is displayed. To delete from remote, it is necessary to switch to a screen other than a program edit screen. If the specified program contains no data, an error is generated when this command is sent. "NA : DATA NOT READY" will be returned as the response.

To Set Up the Timer

Table 3.39. Timer Setting Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
TIMER WRITE	NO1	Timer Data	<Description> This command sets or edits the start timer.
			<Setting data format> "start mode, operation mode"
			<Example command> "TIMER WRITE, NO1, MODE1, 98.2/14, 10:00, CONSTANT" <ul style="list-style-type: none"> For start mode and operation mode, see Table 3.40 and Table 3.41.
	NO2	Timer Data	<Description> This command sets or edits the end timer.
			<Setting data format> "start mode, end mode"
			<Example command> "TIMER WRITE, NO2, MODE2, SAT, 10:00 OFF" <ul style="list-style-type: none"> For start mode and end mode, see Table 3.40 and Table 3.42.

Table 3.40. Start Modes

Mode	Displayed Response Data	Example
1 Time	"MODE1, start day, start time"	"MODE1, 98.2/14, 10:00"
Day-by-Day	"MODE2, start day, start time"	"MODE2, SAT, 23:00"
Everyday	"MODE3, start time"	"MODE3, 0:00"

The start day is described as follows:

Monday : "MON"
 Tuesday : "TUE"
 Wednesday : "WED"
 Thursday : "THU"
 Friday : "FRI"
 Saturday : "SAT"
 Sunday : "SUN"

Table 3.41. Operation Modes

Mode	Setting Data Format	Example
Program	"RUN, Program No., Step No."	"RUN, RAM : 1, STEP1"
Constant	"CONSTANT"	"CONSTANT"

Program No. is described as follows:

User Program Nos. 1 ~ 20 : "RAM : 1" ~ "RAM : 20"
 ROM Program Nos. 21 ~ 30 : "ROM : 21" ~ "ROM : 30"

Table 3.42. End Mode

Mode	Setting Data Format	Example
Standby	"STANDBY"	"STANDBY"
Control Power OFF	"OFF"	"OFF"

To Delete Timers

Table 3.43. Timer Delete Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
TIMER ERASE	NO1		<Description> This command deletes the setup of the specified timer.
	NO2		<Setting data format> --
			<Example command> "TIMER ERASE, NO1" <ul style="list-style-type: none"> If the specified timer contains no data, an error is generated when this command is sent. "NA : DATA NOT READY" will be returned as the response.

To Turn Timers ON/OFF

Table 3.44. Timer ON/OFF Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
TIMER	ON	Timer No.	<Description> This command turns the specified timer ON.
			<Setting data format> "timer number"
			<Example command> "TIMER, ON, 1" <ul style="list-style-type: none"> If the specified timer contains no data, an error is generated when this command is sent. "NA : DATA NOT READY" will be returned as the response. Only Timer Nos. 1 and 2 can be specified as the setting data.
	OFF	Timer No.	<Description> This command turns the specified timer OFF.
			<Setting data format> "timer number"
			<Example command> "TIMER, OFF, 2" <ul style="list-style-type: none"> If the specified timer contains no data, an error is generated when this command is sent. "NA : DATA NOT READY" will be returned as the response. Only Timer Nos. 1 and 2 can be specified as the setting data.

To Lock/Unlock Keys

Table 3.45. Key Lock/Unlock Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
KEYPROTECT	--	ON	<Description> This command locks keys.
			<Setting data format> "ON"
			<Example command> "KEY PROTECT, ON"
	--	OFF	<Description> This command unlocks keys.
			<Setting data format> "OFF"
			<Example command> "KEY PROTECT, OFF"

To Turn Power ON/OFF

Table 3.46. Power ON/OFF Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
POWER	--	ON	<Description> This command turns control power ON. The chamber will start running in the constant mode.
			<Setting data format> "ON"
			<Example command> "POWER, ON"
	--	OFF	<Description> This command turns control power OFF, not primary power.
			<Setting data format> "OFF"
			<Example command> "POWER, OFF"

To Set Temperature

Table 3.47. Temperature Setting Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
TEMP	--	Target Temperature	<Description> This command sets or changes the target temperature in the constant mode.
			<Setting data format> "target temperature"
			<Example command> "TEMP, S23.0"
			<ul style="list-style-type: none"> Target temperature can be set between the high and low limit temperatures. Temperature data is valid to one place below the decimal. All smaller fractions are ignored.
	--	High Limit Temperature	<Description> This command sets or changes the high limit temperature.
			<Setting data format> "high limit temperature"
			<Example command> "TEMP, H100.0"
			<ul style="list-style-type: none"> High limit temperature can be set between the target temperature and the chamber's maximum allowable temperature. High limit temperature must be set higher than the target temperature. Temperature data is valid to one place below the decimal. All smaller fractions are ignored.
	--	Low Limit Temperature	<Description> This command sets or changes the low limit temperature.
			<Setting data format> "low limit temperature"
			<Example command> "TEMP, L-40.0"
			<ul style="list-style-type: none"> Low limit temperature can be set between the chamber's minimum allowable temperature and the target temperature. Low limit temperature must be set lower than the target temperature. Temperature data is valid to one place below the decimal. All small fractions are ignored.
	--	Target Temperature High Limit Temperature Low Limit Temperature	<Description> This command sets or changes the target temperature, high limit temperature, and low limit temperature in batch.
			<Setting data format> "target temperature high limit temperature low limit temperature"
			<Example command> "TEMP, S23.0 H100.0 L-40.0"
			<ul style="list-style-type: none"> Temperatures must be input in the order of target temperature ? high limit temperature ? low limit temperature.

To Set Humidity

Table 3.48. Humidity Setting Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
HUMI	--	Target Humidity	<Description> This command sets or changes the target humidity in the constant mode.
			<Setting data format> "target humidity"
			<Example command> "HUMI, S85"
			<ul style="list-style-type: none"> Target humidity can be set between the high and low limit humidity settings. Humidity data is treated as a whole number. All numbers below the decimal are ignored. To turn humidity control OFF, write "HUMI, SOFF".
	--	High Limit Humidity	<Description> This command sets or changes the high limit humidity.
			<Setting data format> "high limit humidity"
			<Example command> "HUMI, H100.0"
			<ul style="list-style-type: none"> High limit humidity can be set between the target humidity and the chamber's maximum allowable humidity. High limit humidity must be set higher than the target humidity. Humidity data is treated as a whole number. All numbers below the decimal are ignored.
	--	Low limit humidity	<Description> This command sets or changes the low limit humidity.
			<Setting data format> "low limit humidity"
			<Example command> "HUMI, L0"
			<ul style="list-style-type: none"> Low limit humidity can be set between the chamber's minimum allowable humidity and the target humidity. Low limit humidity must be set lower than the target humidity. Humidity data is treated as a whole number. All numbers below the decimal are ignored.
	--	Target Humidity High Limit Humidity Low Limit Humidity	<Description> This command sets or changes the target humidity, high limit humidity, and low limit humidity in batch.
			<Setting data format> "target humidity high limit humidity low limit humidity"
			<Example command> "HUMI, S85 H100.0 L0"
			<ul style="list-style-type: none"> With temperature-only chambers, an error is generated when this command is sent. "NA : DATA NOT READY" will be returned as the response. Humidity must be input in the order of target humidity ?high limit humidity ?low limit humidity.

NOTE: With temperature-only chambers, an error is generated when this command is sent. "NA : DATA NOT READY" will be returned as the response.

To Set Refrigerator Capacity

Table 3.49. Refrigeration Capacity Control Setting Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
SET	--	REF Code	<Description> This command sets refrigeration capacity for the constant mode.
			<Setting data format> "REF code"
			<Example command> "SET, REF9" <ul style="list-style-type: none"> REF code is as follows: REF0 : Refrigeration OFF REF1 ~ REF2 : 20% refrigeration capacity REF3 ~ REF5 : 50% refrigeration capacity REF6 ~ REF8 : 100% refrigeration capacity REF9 : Auto refrigeration capacity control

To Turn Time Signals ON/OFF

Table 3.50. Time Signal ON/OFF Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
RELAY	ON	Time Signal No.	<Description> This command turns the specified time signals ON in the constant mode.
			<Setting data format> "Time Signal No. [, time signal number], [, time signal number]..."
			<Example command> "RELAY, ON, 1, 2" <ul style="list-style-type: none"> With standard specification equipment, only Time Signals No. 1 and No. 2 can be specified as setting data. More can be set with the additional relay contact option.
	OFF	Time Signal No.	<Description> This command turns the specified time signals OFF in the constant mode.
			<Setting data format> "Time Signal No. [, time signal number], [, time signal number]..."
			<Example command> "RELAY, OFF, 1, 2" <ul style="list-style-type: none"> With standard specification equipment, only Time Signals No. 1 and No. 2 can be specified as setting data. More can be set with the additional relay contact option.

To Control Program Running

Table 3.51. Program Control Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
PRGM	RUN	Program No.	<Description> This command starts the specified program.
			<Setting data format> "Program No., start step number"
			<Example command> "PRGM, RUN, RAM : 1, STEP1"
			<ul style="list-style-type: none"> Program No. is described as follows: User Program Nos. 1 ~ 20 : "RAM : 1" ~ "RAM : 20" ROM Program Nos. 21 ~ 30 : "ROM : 21" ~ "ROM : 30"
	PAUSE	--	<Description> This command pauses the current program.
			<Setting data format> --
			<Example command> "PRGM, PAUSE"
	CONTINUE	--	<ul style="list-style-type: none"> If a program is not running, an error is generated when this command is sent.
			<Description> This command restarts the paused program.
			<Setting data format> --
	ADVANCE	--	<Example command> "PRGM, CONTINUE"
			If a program is not on pause, an error is generated when this command is sent.
			<Description> This command suspends the current step and advances the program to the next step.
			<Setting data format> --
			<Example command> "PRGM, ADVANCE"
			<ul style="list-style-type: none"> If a program is not running, an error is generated when this command is sent.

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Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
PRGM	END	End Mode Setting	<Description> This command ends the current program instantly and switches the chamber to the end mode specified here.
			<Setting data format> "end mode setting"
			<Example command> "PRGM, END, HOLD" <ul style="list-style-type: none"> If a program is not running, "NA : CONT NOT READY – 2" is returned as the response. (This parameter can be used to end a program run from remote.) End mode setting is described as follows: To hold the last step at program end: "END, HOLD" To run in the constant at program end: "END, CONST" To shut OFF the power at program end: "END, OFF" To put the chamber on standby at program end: "END, STANDBY"

To Set Operating Mode

Table 3.52. Operating Mode Setting Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
MODE	--	Operating Mode Setting	<Description> This command switches the chamber to the specified operating mode.
			<Setting data format> "operating mode status"
			<Example command> "MODE, OFF" <ul style="list-style-type: none"> Operating mode is expressed as follows: To turn control power OFF "OFF" To set the chamber on standby "STANDBY" To set the constant mode "CONSTANT" To run a program "RUN Program No." Program No. is described as follows: User Program Nos. 1 ~ 20 : "1" ~ "20" ROM Program Nos. 21 ~ 30 : "21" ~ "30"

To Edit Programs

Table 3.53. Program Edit Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
PRGM DATA WRITE	PRG : Program No.	Edit Data	<Description> This command edits programs.
			<Setting data format> See Table 3.54.
			<Example command> "PRGM DATA WRITE, PGM1, EDIT START" "PRGM DATA WRITE, PGM1, STEP1, TEMP10.0, TIME1:00" "PRGM DATA WRITE, PGM1, STEP2, HUM100, TIME1:00" "PRGM DATA WRITE, PGM1, COUNTA (1. 2. 10), B(0. 0. 0)" "PRGM DATA WRITE, PGM1, NAME, SAMPLE-1" "PRGM DATA WRITE, PGM1, END, OFF" "PRGM DATA WRITE, PGM1, EDIT END"

<Program Edit>

- The following two edit modes are available for editing programs:

New Program Mode : Creates a new program. It is necessary to set up steps from Step No. 1 forward.

Overwrite Mode : Edits specified steps in existing programs.

- To create a new program, perform the following steps:
 Set the new program start request.
 Set up Step No. 1.
 Set up Step No. 2.
 :
 Set up counters. (Counters can be omitted).
 Name the program. (Name program can be omitted).
 Set the end mode. (End mode can be omitted).
 Set the new program end request.

To overwrite an existing program, do the following:

Set the overwrite start request.

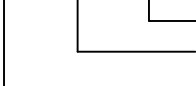
Set up the target step.

:

Set the overwrite end request.

- Request and setting data are described as follows:

Table 3.54. Request and Setting Data

Setup Request		Description
New Program Mode Requests	New Program Start	"EDIT START"
	New Program End	"EDIT END"
	New Program Cancel	"EDIT CANCEL"
Overwrite Mode Requests	Overwrite Start	"OVER WRITE START"
	Overwrite End	"OVER WRITE END"
	Overwrite Cancel	"OVER WRITE CANCEL"
Step Data Description		<p>"STEPxx, setup data"</p> <p>Setup data is described as follows:</p> <p>Target temperature "TEMPxx.X"</p> <p>Temperature ramp control ON/OFF "TRAMPON" or "TRAMPOFF"</p> <p>Target humidity "HUMlxx" (To turn humidity control OFF, write "HUMl OFF").</p> <p>Humidity Ramp Control ON/OFF "HRAMPON" or "HRAMPOFF"</p> <p>Exposure time "TIMExx:xx"</p> <p>Soak Control "GRANTY ON" or "GRANTY OFF"</p> <p>Refrigeration capacity control "REFxx"</p> <p>Time signal ON/OFF "RELAY ON x. x. ..." or "RELAY OFF x. x. ..."</p> <p>Pause control "PAUSE ON" or "PAUSE OFF"</p> <p>Whenever a parameter is omitted, the value of the previous step is automatically set.</p>
Other Program Setup Descriptions	Counter Setup	<p>"COUNT, A (x. x. x) [COUNT, B(x. x. x)]"</p> <p>A (x. x. x)</p>  <p>No. of repeat cycles</p> <p>No. of repeat cycle end step</p> <p>No. of repeat cycle start step</p> <ul style="list-style-type: none"> Both counters A and B can be omitted. To set both counters, separate them in the command by a ",". (ie : "COUNT, A (1. 2. 3), B (5. 7. 10)") When counters are omitted, 0 is automatically set.

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Setup Request		Description
	Program Name	"NAME, program name" <ul style="list-style-type: none"> Program names can be a maximum of 14 characters long. When the program name is omitted, "PMG-xx" is automatically set.
	End Mode	"END, end mode setting" <p>End mode setting is described as follows:</p> <p>To shut OFF the power at program end "OFF"</p> <p>To run in the constant at program end "CONSTANT"</p> <p>To hold the last step at program end "HOLD"</p> <p>To start another program at program end "RUN, program No."</p> <p>Program Nos. are described as follows:</p> <p style="text-align: center;"> "PTN <u>xx</u> " └───┬───┘ 1 ~ 30 </p> <ul style="list-style-type: none"> When the end mode is omitted, "END, OFF" is automatically set.

To Edit Remote Programs

Table 3.55. Remote Program Edit Commands

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
RUN PRGM	--	Program Data	<Description> This command sets up a program to be run from remote. The program is started automatically when setup is complete.
			<Setting data format> See Table 3.56.
			<Example command> "RUN PRGM, TEMP10.0 GOTEMP23.0 HUMI85 GOHUMI100 TIME1:00" <ul style="list-style-type: none"> With temperature-only chambers, an error is generated if humidity data is included in this command.

<Remote Program Edit>

- The remote program mode enables 1-step programs to be edited, started and stopped from the computer.
- With this command, the program to be run from remote is started automatically when setup is complete.
- The last step is held when the program ends. There is no end mode definition for remote programs.
- Remote program end can be detected by setting the interrupt mask. The interrupt mask must be set so that the SRQ status is set when the remote program ends.
- After the remote program ends, a regular program can be run by using the "PRGM" command.
- Setting data format is as follows:
 "start temperature attainment temperature start humidity attainment humidity exposure time REF code time signal"

Table 5.56. Remote Program Edit Parameters

Control Item	Format	Example
Start Temperature	"TEMP"	"TEMP23.0"
Attainment temperature (can be omitted)	"GOTEMP"	"GOTEMP30.0"
Start humidity (can be omitted)	"HUMI"	"HUMI100" (To turn humidity control OFF, write "HUMI OFF".)
Attainment humidity (can be omitted)	"GOHUMI"	"GOHUMI50"
Exposure time	"TIME"	"TIME99:59"
Refrigeration capacity (can be omitted)	"REF"	"REF9"
Time signal ON/OFF (can be omitted)	"RELAYON" or "RELAYOFF"	"RELAYON, 1, 2"

- When attainment temperature (humidity) is omitted, the start temperature (humidity) is automatically set.
- When refrigeration capacity or the time signals are omitted, the setup in the last remote program is automatically set. The refrigeration capacity default is "REF9" and all signals OFF for Time signals.
- Settings must be made in the given order.

To Write Programs

Table 3.57. Program Write Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
PRGM WRITE	RAM : Program No.	Step Data	<Description> This command writes programs.
			<Setting data format> "Step number, Step Data"
			<Example command> "PRGM WRITE, RAM:1, STEP1, TEMP23.0 GOTEMP30 TIME1:00" "PRGM WRITE, RAM:1, STEP2, TEMP30.0 HUMI100 TIME 1:00" "PRGM WRITE, RAM:1, STEP3, ENDHOLD, SAMPLE-1" <ul style="list-style-type: none"> • For step data details, see Table 3.58. • Step numbers must be continuous. • This command is not for editing specific steps. It is necessary to write data from Step. No. 1 to the end mode. • If the end mode is not specified and another program is specified, the program written with this command is deleted. • With SCP-220 Instrumentation, programs cannot be written via the communication function when a program screen is displayed. To write a program from remote, it is necessary to switch to a screen other than a program edit screen.

Table 3.58. Step Data

	Setting Data	Control Item	Example
1 Step Setup Data	TEMP	Start Temperature	TEMP10.5
	GOTEMP	Attainment Temperature (can be omitted)	GOTEMP23.0.
	HUMI	Start Humidity (can be omitted)	HUMI100
	GOHUMI	Attainment Humidity (can be omitted)	GOHUMI30
	TIME	Exposure Time	TIME1:00
	REF	Refrigeration Capacity (can be omitted)	REF9
	RELAYON	Time Signal ON (can be omitted)	RELAYON1.2
	RELAYOFF	Time Signal OFF (can be omitted)	RELAYOFF1.2
Program Index Data	COUNTA	Counter Setup (can be omitted)	COUNTA1.2 (Step number, number of repeat cycles)
	COUNTB	Counter Setup (can be omitted)	COUNTB1.3 (Step number, number of repeat cycles)
	PAUSE	Pause Control ON/OFF (can be omitted)	PAUSE
	END HOLD	End Mode (hold last step at program end)	END HOLD, SAMPLE-1
	END CONST	End Mode (run in constant mode at program end)	END CONST, SAMPLE-2
	END OFF	End Mode (shut control power OFF at program end)	END OFF, SAMPLE-3

- With temperature-only chambers, an error is generated if humidity data is included in this command. "NA : CONT NOT READY" will be returned as the response.
- Setting "0" for humidity items is interpreted as 0%. To turn humidity control OFF, write "HUMI, OFF".
- When attainment temperature (humidity) is omitted, the start temperature (humidity) is automatically set.
- When refrigeration capacity is omitted, "REF9" is automatically set.
- When the time signals are omitted, all settable time signals are turned OFF.
- When counters are omitted, "0" is automatically set.

ADDITIONAL PRODUCT TEMPERATURE CONTROL (OPTION) COMMANDS

(Note: These commands will only function if the chamber is equipped with the Product Temperature Control Option)

To Set Product Temperature Control Settings**Table 3.59. Product Temperature Control Setting Command**

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
TEMP PTC	--	PTC ON/OFF, Deviation settings	<p><Description> This command sets or changes the product temperature control temperature deviation settings in the constant mode and can be used to turn product temperature control ON/OFF.</p> <p><Setting data format> "PTC setting ON/OFF, positive deviation temperature value, negative deviation temperature value"</p> <p><Example command> "TEMP PTC, ON, DEVP10.0, DEVN10.0 "</p> <ul style="list-style-type: none"> Deviation values can be set between 0 and 100°C. Deviation setting values are optional, and can be omitted if the user does not wish to change the current deviation settings.

To Set Product Temperature Control Setup and Tuning Parameters**Table 3.60. Product Temperature Control Setup and Tuning Parameters Setting Command**

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
PTC	--	Temp limits, tuning parameters	<p><Description> This command sets or changes the product temperature control high and low temperature limits as well as the tuning parameters.</p> <p><Setting data format> "heating limit value, cooling limit value, P tuning parameter, Filter tuning parameter, D tuning parameter, heating option value, cooling option value"</p> <p><Example command> "PTC, 150.0, -40.0, 1.0, 36.0, 2.0, 0.0, 0.0"</p> <ul style="list-style-type: none"> The heating and cooling option settings are not currently used for any chamber control items. All setting data must be sent for the command to function correctly. The limits and tuning parameters have the following setting limits: <ul style="list-style-type: none"> Heating limit value: -200.0~200.0 Cooling limit value: -200.0~200.0 P value: 0.0~200.0 Filter value: 0.0~200.0 D value: 0.0~200.0 Heating option value: -200.0~200.0 Cooling option value: -200.0~200.0

To Edit Programs (with additional Product Temperature Control settings)

Table 3.61. Program Editing (with Product Temperature Control Settings) Command

Setting Command			Description/Setting Data Format/Example Command
Main Command	Optional Parameter	Setting Data	
PRGM DATA WRITE	--	Edit data	<p><Description></p> <p>This command edits programs. Its function is the same as the "PRGM DATA WRITE" command detailed in tables 3.53-3.54, but this table details additional settings available for product temperature control. For details on most operations of this command, reference tables 3.53-3.54.</p>
			<p><Setting data format></p> <p>"program number, step number, target temperature, temperature ramp control, product temp control ON/OFF, humidity target, humidity ramp control, exposure time, positive PTC deviation temperature value, negative PTC deviation temperature value"</p>
			<p><Example command></p> <p>"PRGM DATA WRITE, PGM4, STEP1, TEMP10, TRAMPOFF, <i>PTCON</i>, HUMIOFF, TIME0:30, <i>DEVP10.0</i>, <i>DEVN10.0</i>"</p> <ul style="list-style-type: none"> All data settings are the same as detailed in tables 3.53-3.54 except for the addition of PTC control ON/OFF and the positive and negative deviation settings for PTC. (Added settings are shown in bold italics in the example above.) When programming PTC on, the humidity control should be programmed off.

4. Example Applications

This chapter explains several applications with the communication function by means of flowcharts. Explanations have been generalized, therefore use the communication function as permitted by your computer, computer language and other communication hardware. Troubleshooting and system protection have been left out of explanations, therefore before use, take what necessary measures you have to deal with system errors.

Note

- Set up communications between the chamber and computer before starting the program.
- Communication quality can be lost in certain physical environments. It is recommended to add processing capabilities that re-send communications when settings are not updated or when an "OK : xxx" response is not returned. This can happen when commands are not correctly received, when keys are locked, or because of high or low limit alarms.
- Ensure safety in and around the chamber before starting operation.

4.1. To Monitor Chamber Control Status from Computer

Chamber control status can be monitored from a chamber using the monitor commands (see "3.2. Monitor Commands").

The following flowchart shows how to display target temperature and humidity, operating mode, and any alarms which have occurred.

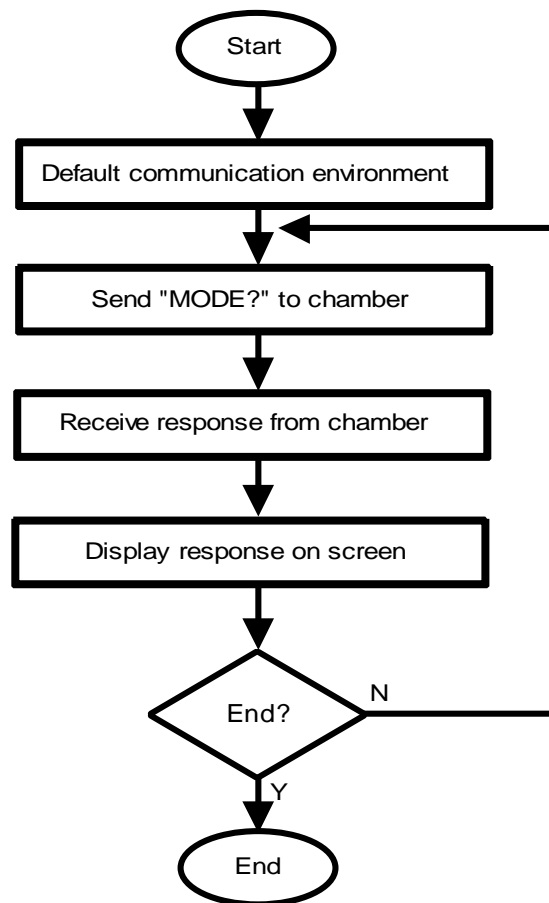


Fig. 4.1. Sample Program 1

4.2. To Edit Test Setup from Computer

Test setup can be changed from a computer using the setting commands (see "3.3. Setting Commands").

The following flowchart shows how to set target temperature to 50°C, target humidity to 80%, and the constant mode.

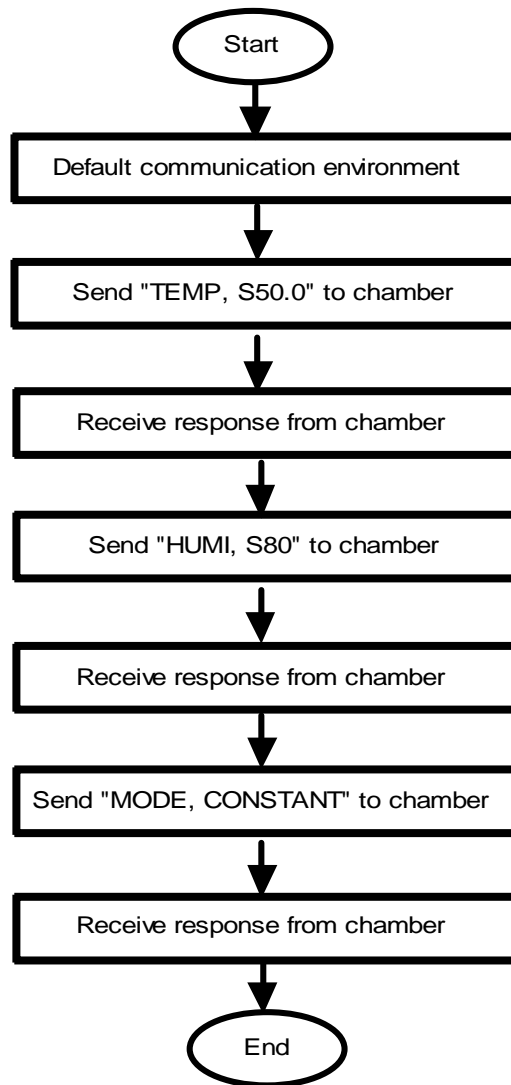


Fig 4.2. Sample Program 2

4.3. To Run Programs from Remote

The "RUN PRGM" command allows only a 1-step program to be run from remote. However in combination with the "SRQ?" interrupt monitor command and "PRGM" program control commands, multiple-step remote programs can be run.

The following flowchart shows how to run a 3-step program from remote and shut OFF control power at program end.

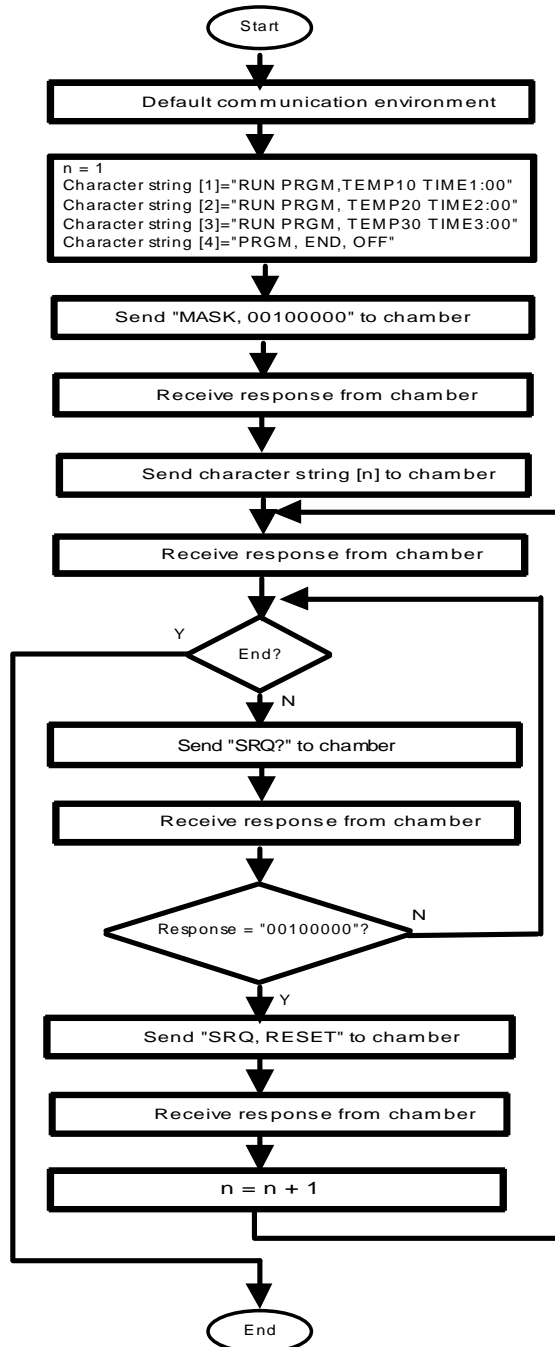


Fig. 4.3. Sample Program 3

4.4. To Use the SRQ Interrupt in GP-IB Communications

The SRQ interrupt available in GP-IB communications lets you create a higher level of program.

To Monitor Alarms

The "ALARM?" command is available for monitoring alarms which occur with the chamber, but this requires the command to be continually sent to the chamber. The SRQ interrupt uses interrupt processing to detect alarms, this places less load on the system.

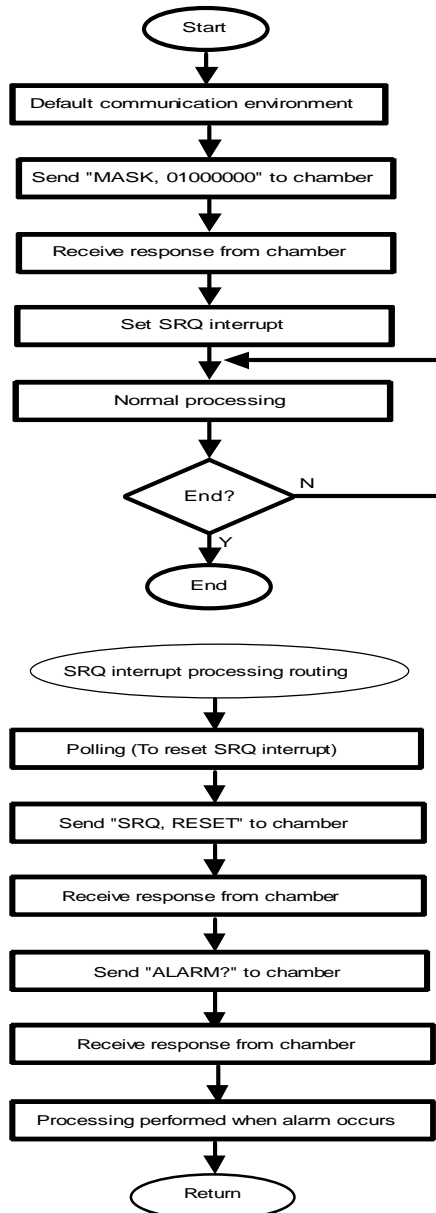


Fig. 4.4. Sample Program 4

To Run Programs from Remote

In the 1-step program in "4.3. To Run Programs from Remote", program end was detected by continually sending the "SRQ?" monitor command to the chamber. With the GP-IB SRQ interrupt, it is possible to detect the end of one step and send the next step's data to the chamber by interrupting the computer.

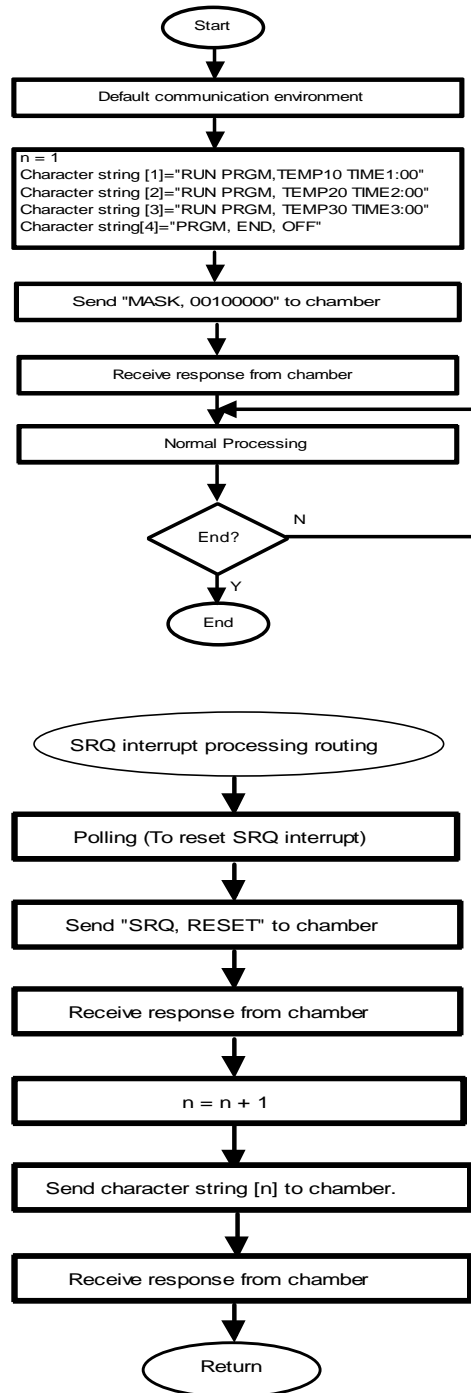


Fig. 4.5. Sample Program 5

5. Specifications

5.1. GP-IB Specifications

Cable and Signal Lines Cable and signal lines must conform to IEEE standard.

Table 5.1. Pin Assignment

Pin Number	Signal	Connection
1	DI01	Connected
2	DI02	Connected
3	DI03	Connected
4	DI04	Connected
5	EO1	Connected
6	DAV	Connected
7	NRFD	Connected
8	NDAC	Connected
9	IFC	Connected
10	SRQ	Connected
11	ATN	Connected
12	Shield	Connected
13	DI05	Connected
14	DI06	Connected
15	DI07	Connected
16	DI08	Connected
17	REN	Connected
18	DAV ground	Connected
19	NRFD ground	Connected
20	NDAC ground	Connected
21	IFC ground	Connected
22	SRQ ground	Connected
23	ATN ground	Connected
24	EO1 and REN ground	Connected

Address Address can be selected from 1 ~ 16 and changed from the instrumentation panel. It is not necessary to restart the system after changing the address.

Interface Support

Table 5.2. Interface Support

Function	Level	Remarks
Source handshake	SH1	<ul style="list-style-type: none"> Contains all source handshake capabilities.
Acceptor handshake	AH1	<ul style="list-style-type: none"> Contains all acceptor handshake capabilities.
Talker	T6	<ul style="list-style-type: none"> Basic talker Serial port Does not have talk only MLA talker cancel
Listener	L4	<ul style="list-style-type: none"> Basic listener Does not have listen only MTA listener cancel
Service request	SR1	<ul style="list-style-type: none"> Service request
Remote-Local	RL2	<ul style="list-style-type: none"> Contains all remote-local functions except local lockout. (However, does not support GTL address command.)
Parallel poll	PP0	<ul style="list-style-type: none"> Does not have parallel poll
Device clear	DC1	<ul style="list-style-type: none"> Contains all device clear functions
Device trigger	DT0	<ul style="list-style-type: none"> Does not have device trigger
Controller	C0	<ul style="list-style-type: none"> Does not have system controller Does not have IFC send/controller-in-charge Does not have REN send Does not have SRQ response Does not have interface message Does not have control receive Does not have control relinquish Does not have self control receive/relinquish Does not have parallel poll Does not have control receive/relinquish in synch with handshake

Control Bus Support

Table 5.3. Control Bus Support

Control Bus	Support	Remarks
ATN	Supported	Confirms to IEEE488
IFC	Supported	Confirms to IEEE488
REN	Supported	Confirms to IEEE488
SRQ	Supported	Confirms to IEEE488 (Supports serial poll but not parallel poll.)
EO1	Supported	Confirms to IEEE488

Universal Command Support

Table 5.4. Universal Command Support

Command	Support	Remarks
LLO	Not Supported	To make communication control unconditional when communications are enabled.
DCL	Supported	Operates the same as in IFC reception.
PPU	Not Supported	Does not have a parallel poll, so PPU support is unnecessary.
SPE	Supported	Support SRQ, therefore SPE support is necessary.
SPD	Supported	Support SRQ, therefore SPD support is necessary.

Address Command Support

Table 5.5. Address Command Support

Command	Support	Remarks
GTL	Not Supported	
SDC	Supported	Confirms to IEEE-488.
PPC	Not Supported	Does not have a parallel poll, so PPC support is unnecessary.
GET	Not Supported	To make communication control unconditional when communications are enabled.
TCT	Not Supported	Does not have controller capabilities.

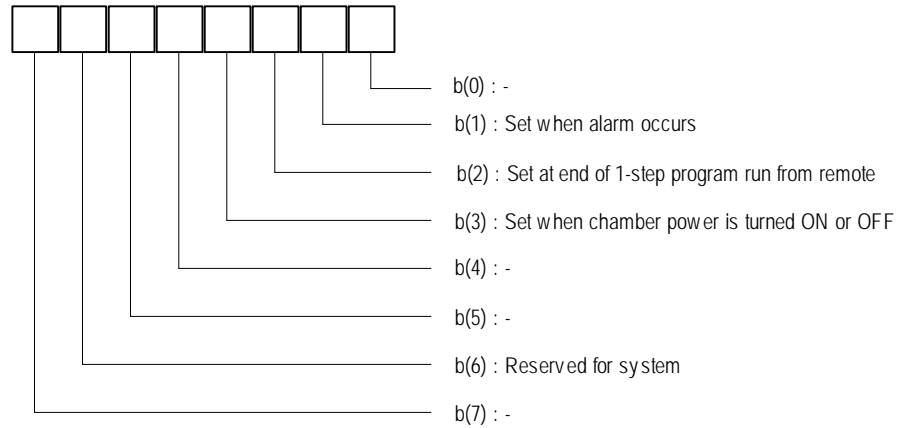


Fig. 5.1. SRQ Serial Poll Register

5.2. RS-232C Specifications

Cable and Signal Lines The cable must confirm the EIA RS-232C Standard or the JIS Standard – C-6361. Use a straight cable for signal (modem) connections.

Table 5.6. RS-232C Pin Assignment

Pin Number	Signal (JIS)	Signal	Connection
1	FG	Protective ground or cable shield	Not Connected
2	SD	Transmission data	Connected
3	RD	Reception data	Connected
4	DR	Data set ready	Connected
5	SG	Signal line ground	Connected
6	ER	Data terminal ready	Connected
7	CS	Transmission enabled	Connected
8	RS	Send request	Connected

Communication System Synchronized modulated full-depleting.

Transmission Rate Selectable from 4800, 9600 and 19200 bps. Can be selected from the instrumentation panel. It is not necessary to restart the system after changing the transmission rate.

Data Bit Data length 8
 Stop bits 1
 Parity check OFF
 The above setting cannot be changed by users.

Flow Control Xon/Xoff control OFF
 Si/So control OFF
 The above setting cannot be changed by users.

Local Echo Not supported

5.3. RS-485 Specifications

Table 5.7. RS-485 Pin Assignment

Pin Number	Signal (JIS)	Signal	Connection
1	SD+	Send Data +	Connected
2	SD-	Send Data -	Connected
3	RD+	Receive Data +	Connected
4	RD-	Receive Data -	Connected
5	GND	Signal Ground	Connected
6	GND	Signal Ground	Connected

Communication System	Bi-directional full duplex.
Transmission Rate	Selectable from 4800, 9600 and 19200 bps. Can be selected from the instrumentation panel. It is not necessary to restart the system after changing the transmission rate.
Maximum Transmission Distance	500M
Maximum Number of Chambers Connectable	16

6. Communications Software

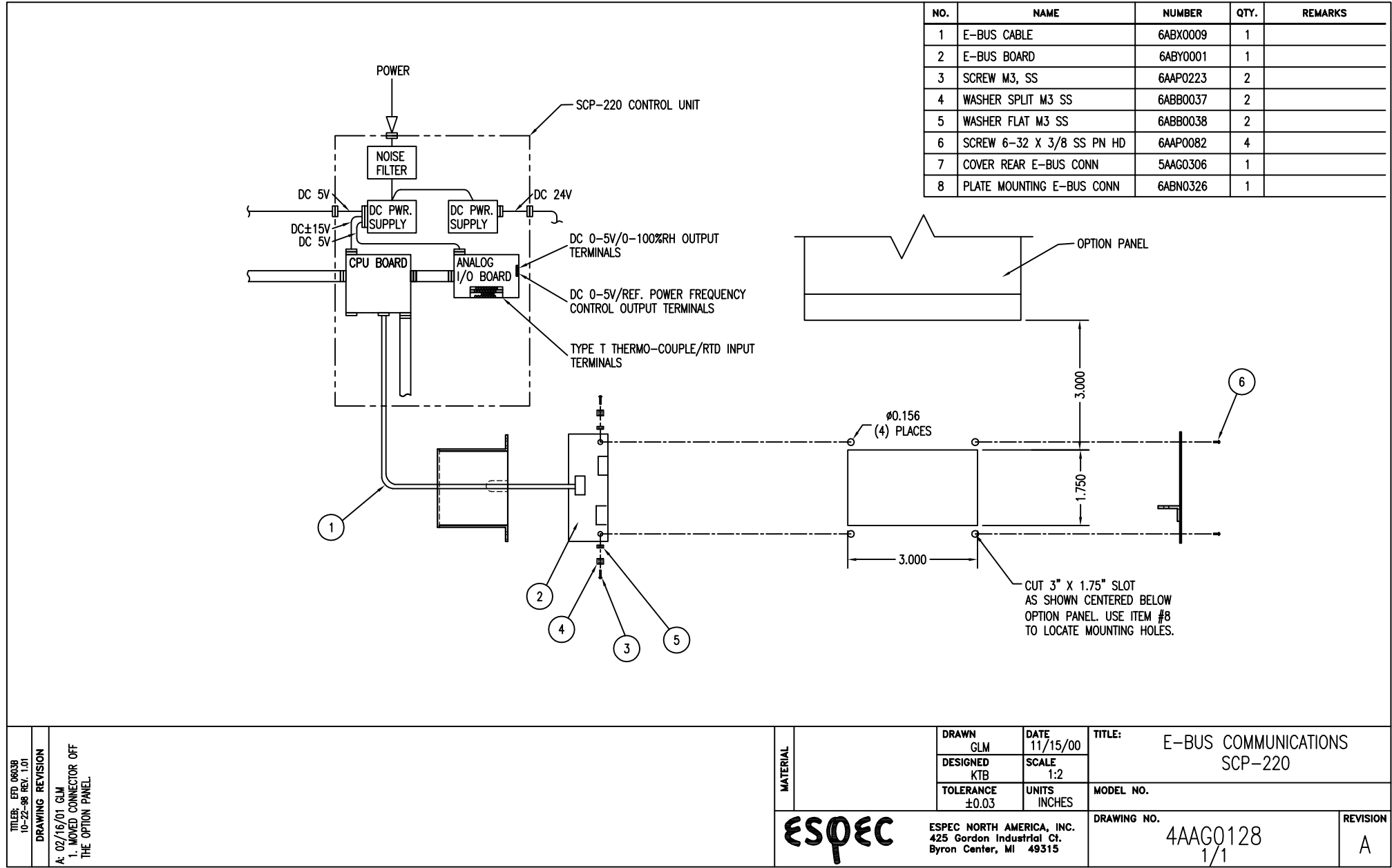
E-Pilot21 is a software product line with several options for using a PC to remotely control and data log from our chambers with SCP-220 instrumentation.

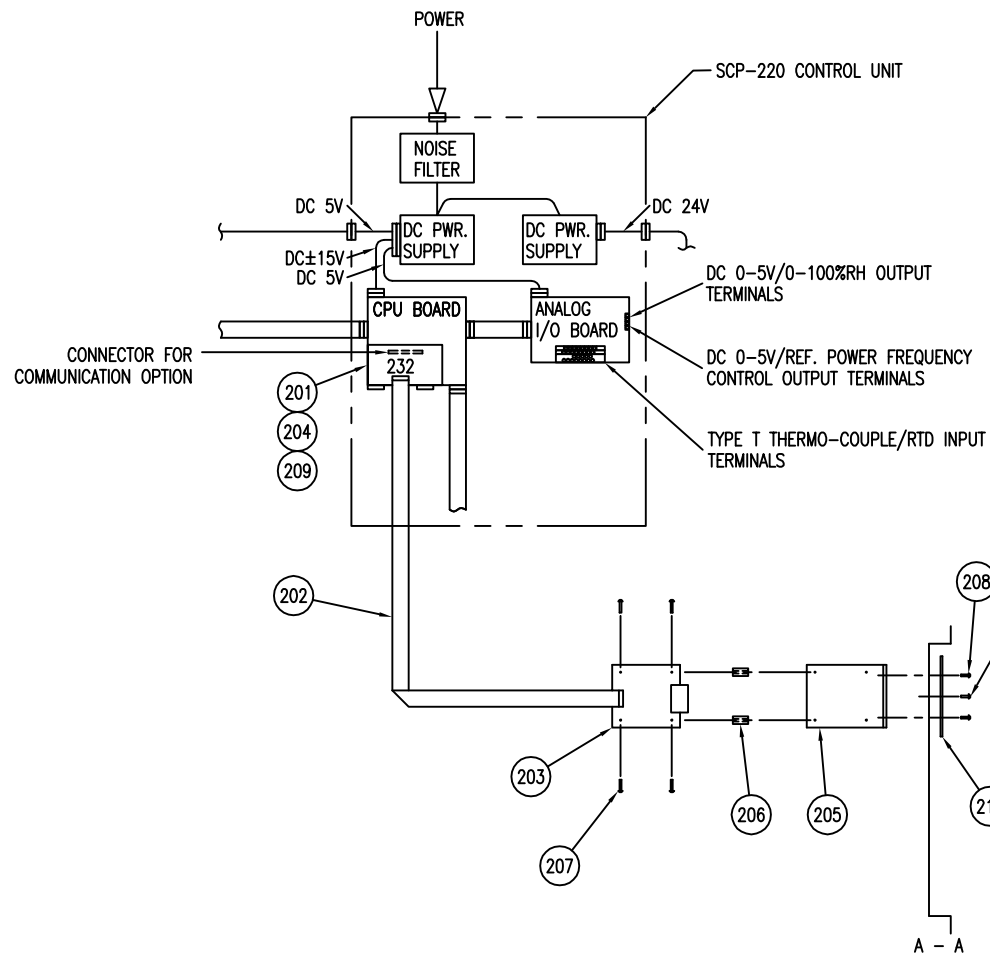
There are several choices available for free download:

- For a single chamber, the ERC-100S package offers an easy way for remote control using RS-232.
- Users who need to program their own solution can use LabVIEW drivers using a GP-IB interface.

Visit our web site at <http://www.espec.com/support> for a link to the E-Pilot21 web site for communication software downloads.

7. Assembly Drawings





NO.	NAME	NUMBER	QTY.	REMARKS
201	SCP-220 RS-232C BOARD	6ABN0221	1	
202	SCP-220 RS-232C CABLE 8 FT	5AAG0253	1	
203	RS-232C CONNECTOR BOARD	6ABN0223	1	
204	POST CKT BOARD SUPPORT	6ABN0257	2	
205	BRACKET RS-232 CONNECTOR	5ABG0505	1	
206	SPACER 1/4" NYLON	6ABS0045	4	
207	SCREW SS PH 6-32 X 1/2"	6AAP0041	4	
208	SCREW SS TH 8-32 X 1/4"	6AAP0241	2	
209	SCREW SS PH 8-32 X 3/8"	6AAP0240	3	
210	OPT BOX UPPER RS232C PANEL	5AAG0319	1	
211	OPT BOX UPPER BLANK PANEL	5AAG0321	-1	DELETE

TITLE: EFD 0603B
10-22-98 REV. 1.01

DRAWING REVISION

A 10/11/01 GLM
MODIFIED TO ADD UPPER
COMM PANEL (ITEM 210).
ITEM 209 QTY WAS 2

B: 3/28/06 JLL
DELETE 5AAG0321

C: 05/17/06 DRB
ADDED TESTING INSTRUCTIONS

MATERIAL

ESPEC

DRAWN BTP	DATE 3/15/00	TITLE: SCP-220 HARDWARE DIAGRAM RS-232C OPTION	
DESIGNED BTP	SCALE 1:1		
TOLERANCE ±0.03	UNITS INCHES	MODEL NO.	
ESPEC NORTH AMERICA, INC. 425 Gordon Industrial Ct. Byron Center, MI 49315		DRAWING NO.	REVISION
		4AAG0129 1/2	C

TITLE: EFD 0603B
10-22-98 REV. 1.01

DRAWING REVISION

RS-232 Verification for SCP

- 1) Plug RS 232 cable into chamber.
- 2) Turn computer on.
- 3) Click on SCP ALL COMMANDS VALIDATE.
- 4) Click start.
- 5) Light on chamber will flash & computer will read the ROM,DATE,TIME, ect.

MATERIAL

ESPEC

DRAWN
BTP

DATE
3/15/00

DESIGNED
BTP

SCALE
1:1

TOLERANCE
N/A

UNITS
N/A

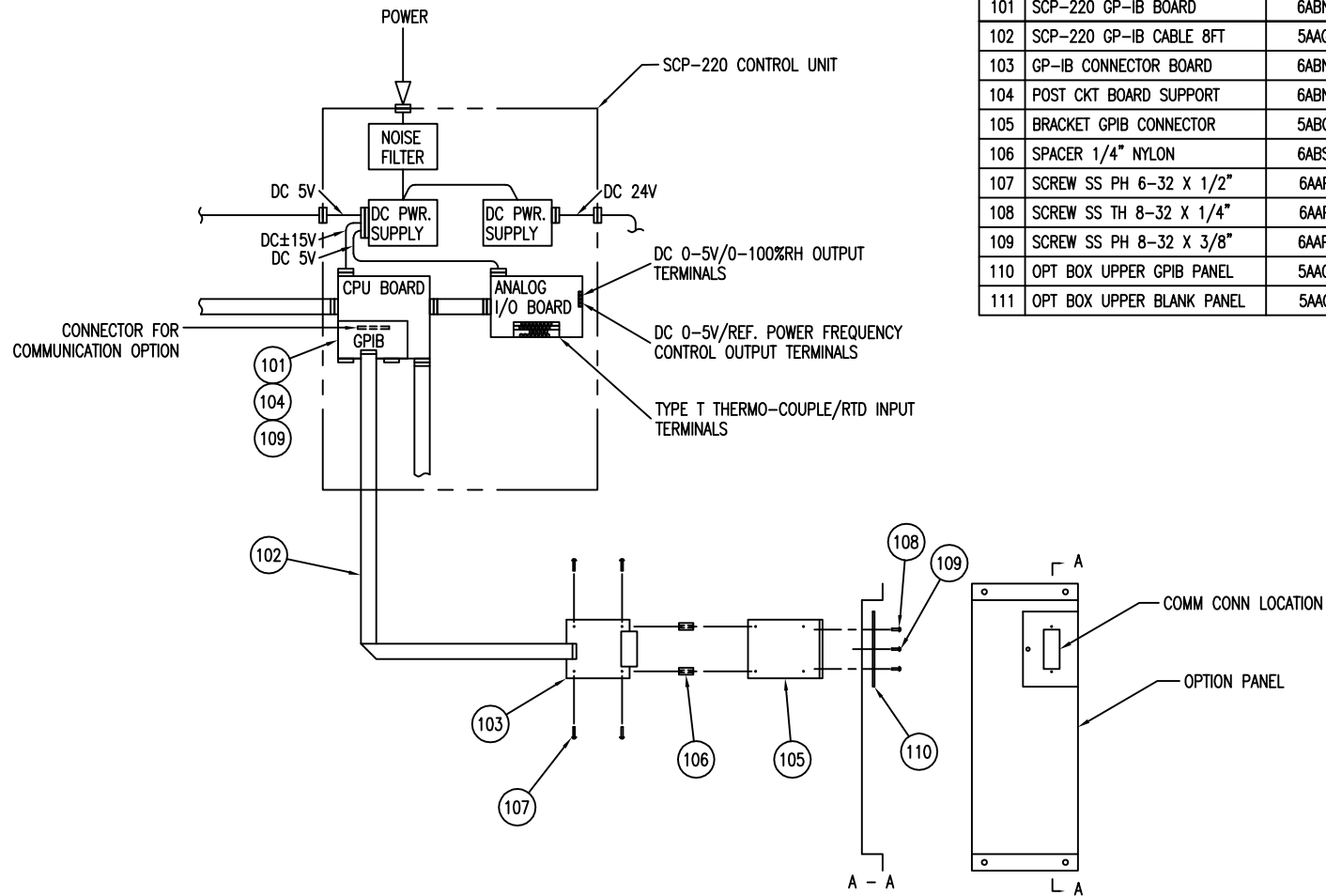
TITLE: SCP-220 HARDWARE DIAGRAM
RS-232C OPTION

MODEL NO.

DRAWING NO.
4AAG0129
2/2

REVISION
C

ESPEC NORTH AMERICA, INC.
425 Gordon Industrial Ct.
Byron Center, MI 49315



NO.	NAME	NUMBER	QTY.	REMARKS
101	SCP-220 GP-IB BOARD	6ABN0218	1	
102	SCP-220 GP-IB CABLE 8FT	5AAG0254	1	
103	GP-IB CONNECTOR BOARD	6ABN0220	1	
104	POST CKT BOARD SUPPORT	6ABN0257	2	
105	BRACKET GPIB CONNECTOR	5ABG0506	1	
106	SPACER 1/4" NYLON	6ABS0045	4	
107	SCREW SS PH 6-32 X 1/2"	6AAP0041	4	
108	SCREW SS TH 8-32 X 1/4"	6AAP0241	2	
109	SCREW SS PH 8-32 X 3/8"	6AAP0240	3	
110	OPT BOX UPPER GPIB PANEL	5AAG0319	1	
111	OPT BOX UPPER BLANK PANEL	5AAG0321	-1	DELETE

TITLE: EFD 0603B
10-22-98 REV. 1.01

DRAWING REVISION

A 10/11/01 GJM
MODIFIED TO ADD UPPER
COMM PANEL (ITEM 110)
ITEM 109 QTY WAS 2
B: 1/19/04 B.PATTERSON
ITEM 102 WAS 6ABX0030.
C: 3/28/06 JLL
DELETE 5AAG0321
D: 05/17/06 DRB
ADDED TESTING INSTRUCTIONS
TO PAGE 2

MATERIAL

ESPEC

DRAWN KTB	DATE 10/25/99	TITLE: SCP-220 HARDWARE DIAGRAM GP-IB OPTION	
DESIGNED KTB	SCALE 1:1		
TOLERANCE N/A	UNITS INCHES	MODEL NO.	
ESPEC NORTH AMERICA, INC. 4141 Central Parkway Hudsonville, MI 49426		DRAWING NO. 4AAG0130 1/2	REVISION D

GPIB Varification for SCP

- 1) Plug GPIB cable into the chamber.
- 2) Turn computer on.
- 3) Check to see that the green "READY" light is illuminated on the GPIB cable.
(if the green light is not on it maybe that the cable is plugged into the wrong USB port)
- 4) Click on SCP COMMANDS VERIFY
- 5) Click on COM setup
- 6) Communication setup window will come up and click on GP-IB in the Com selection.
- 7) Click ok
- 8) Click start.
- 9) Light on chamber should flash and computer will read ROM,DATE,TIME,ect

MATERIAL

ESPEC

DRAWN
KTB
DESIGNED
KTB
TOLERANCE
N/A

DATE
10/25/99
SCALE
N/A
UNITS
N/A

TITLE: SCP-220 HARDWARE DIAGRAM
GP-IB OPTION

MODEL NO.

DRAWING NO. 4AAG0130
2/2

REVISION
D

SCP-220 Communications Options for Standard Chambers
Instruction Manual

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