

CA5000-N

Liquid Nitrogen Backup System



OPERATING INSTRUCTIONS MANUAL



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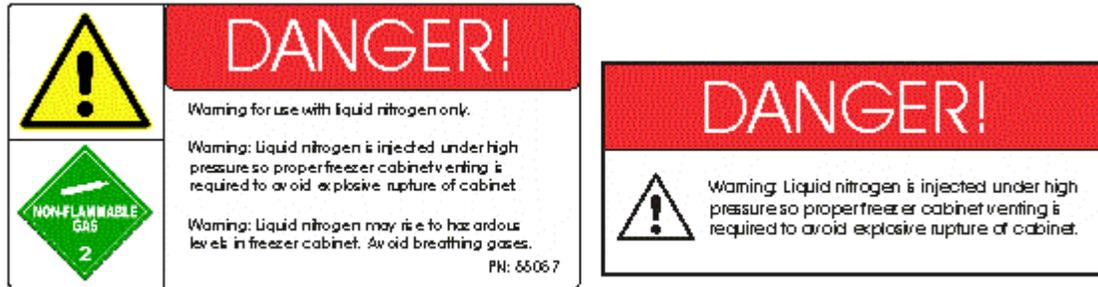
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TABLE OF CONTENTS

Safety Information	2
Unpacking Information.....	3
Tools/Materials required for setup	3
Introduction.....	4
Features	4
Specifications	4
Installation	
Sensor Probe.....	5
LN2 Tank and Delivery Tube	5
Door Safety Switch	6
Battery - Valve Module (BVM)	6
CA5000 Alarm Module	7
Operational Check.....	7
CA5000 Alarm Module	
Front Panel Display and Operating Mode Instructions	7-8
Table of Programming Parameters and Settings.....	9
CA5000 Programming Mode General Instructions	10
Detailed Description of Available Programming Parameters	11
Standard Parameters	11
High Alarm Setting.....	11
Alarm Delay Period.....	11
Relay Delay Period.....	12
Alarm Silence/Mute Period	12
Coolant Control Parameters	
Set Point.....	13
“On” Injection Time	13
“Off” injection Time	14
Elapsed Time Records and Manual Valve Control	
Suspend	14
Purge Command	15
Current coolant Usage.....	15
Coolant Start Time.....	16
Total coolant Usage.....	16
Periodic Maintenance	17
Troubleshooting Guide	17
Warranty Information	18

SAFETY WARNING

Please read this manual in its entirety before beginning installation.



-  **Injected liquid nitrogen is under pressure, proper cabinet venting is required.**
-  **Liquid nitrogen suppresses oxygen levels so use care and appropriate ventilation in enclosed spaces to avoid suffocation.**
-  **Installation and testing of the system must be performed by a qualified service technician.**
-  **This product contains a sealed-lead-acid battery. Do not use if battery is damaged or leaking. Replace the battery only with a recommended Hampshire Controls part.**
-  **Do not modify or change system components. Using this equipment in a manner other than expressly intended may cause serious injury or death. Hampshire Controls shall not be liable for any incidental or consequential damages. The user assumes all risk and liability associated with the end use of this product.**
-  **Nitrogen cylinders that supply liquid must be used to provide proper system operation. Do not use high pressure gas. All connections from the supply cylinder to the freezer require a minimum working pressure rating of 150 psi.**
-  **Liquid nitrogen is extremely cold and will damage unprotected skin. Always wear protective clothing and eyewear when performing work with liquid refrigerants.**
-  **Please consult current O.S.H.A. regulations to ensure compliance with applicable safety requirements.**
-  **Empty the contents of the freezer and allow it to warm to ambient temperature prior to performing any work inside the enclosed space. Working in the chamber at its operating temperature may result in frostbite, or other physical harm.**

UNPACKING INFORMATION

The CA5000-N is shipped in a single custom box. Please check the carton for the following:

- ❑ Alarm Display/Control Module
- ❑ AC Power to BVM Power Supply
- ❑ Battery-Valve-Module (BVM)
- ❑ BVM to Control Module Cable
- ❑ Magnetic Interlock Switch and Cable
- ❑ Thermocouple, 10' type 'T' (May not match the photo)
- ❑ Output copper tube, 1/4" x 8'
- ❑ Pipe to Flare adapter for nitrogen output

TOOLS/MATERIALS REQUIRED FOR SETUP

- ❑ Tubing tools for flaring and bending of 1/4" copper.
- ❑ Wrenches 9/16" through 7/8"
- ❑ Drill with 3/32 bit, for door switch installation (Double sided tape is sometimes used)
- ❑ Sealant to reseal access port(s)

Introduction

The Hampshire Controls Corporation CA5000-N system is a unique combination of field proven, highly reliable Hampshire Controls alarm systems and a liquid nitrogen injection system, providing security for your products to ultra-low temperatures. It offers user-programmable control set points, alarm set points and alarm delay timers. Parameters are stored in non-volatile memory, and are maintained even when power is lost.

The customer-supplied liquid nitrogen is maintained at 22 psi pressure, ready to be injected into a freezer cabinet or system. When a malfunction occurs and the freezer warms above the user-defined setpoint an alarm will sound, if the warming continues, a controlled amount of liquid nitrogen is injected into the freezer. Since the boiling point of nitrogen is -196 °C the injected nitrogen boils and absorbs heat, protecting your product to temperatures as low as -175 °C.

The CA5000-N is simple to operate. After plugging in the unit and placing the probe and output tube in the freezer chamber, the display will read the temperature of that location. Connecting the cryogen lines and the door switch will complete the installation. Pushing three buttons allows the user to program all alarm set points and controls.

FEATURES

- ❑ An internal battery keeps the system running for at least 48 hours during a power outage.
- ❑ BAT indicator indicates a low battery voltage or that there is no line power and the system is running on internal battery power.
- ❑ Temperature can be maintained as low as -175 °C.
- ❑ Typical backup consumption of < 4 L Nitrogen / hour. (25 cubic ft freezer, -65°C setpoint.)
- ❑ Independent user-programmable controls for system alarms and liquid nitrogen injection.
- ❑ Visible and audible indicators for system status.
- ❑ Alarm delay timer available to minimize nuisance or false alarms.
- ❑ Relay outputs for central alarm systems or automatic dialers.
- ❑ A door interlock switch prevents nitrogen injection while freezer is being accessed.

SPECIFICATIONS

- ❑ Unit Ambient Operating Temperature: 0°C to +40°C
- ❑ Display Temperature Range: -200°C to +50°C
- ❑ Absolute Accuracy: +/- 2°C
- ❑ Display Resolution: 1°C
- ❑ Power Supply: 15 VDC, included power adapter 100-250VAC 50/60Hz.
- ❑ Relay Output: SPDT NO/NC dry contact, 30VDC/1A max. (non-inductive)
- ❑ Door Switch Input: User-selectable Normally Open or Normally Closed contact
- ❑ Backup Battery: 12V-12Ah Sealed lead-acid rechargeable
- ❑ Thermocouple: pluggable Hampshire Controls Type 'T'
- ❑ Factory Calibration: 1 Year

Installation

SENSOR PROBE

The probe supplied with the CA5000-N is a highly accurate Type 'T' thermocouple. It has excellent long-term stability and should not need recalibration in normal usage. However, if the probe is subjected to temperature extremes outside of the normal operating range for the unit, or if the probe is damaged it should be replaced.

NOTE: If the display shows a continuous reading of 1999, the probe circuit has failed. Verify proper wiring and replace the probe as required.

Probe Installation

The probe may be used in air or in simulated product. When installing the sensor in a freezer cabinet, whenever possible, install the probe through an existing access port or pass-thru port provided by the cabinet manufacturer, then reseal the port. The ¼" output tubing can go through this same port, if no port is available consult the manufacturer of the freezer BEFORE drilling any holes.

Inside the cabinet, route the probe wire so that it will not become snagged during loading, unloading, maintenance, or cleaning procedures.

Probe Location

Install the sensor probe in a location where it will respond to the average temperature of the space being monitored, and not to local conditions caused by routine door openings. The probe location should be optimized to provide safety for the area being monitored without generating false or nuisance alarms. For example, locating the sensor probe on the bottom of a chest freezer will result in the alarm being sounded later than if it was located near the top. Locating the sensor too close to the top of a chest freezer could result in the alarm being sounded due to lid openings. Choose a probe location that offers the safety desired for the enclosure contents. Near the center of the side opposite the door is generally effective; do not place where liquid nitrogen will spray on the probe-tip.

Nitrogen delivery tubing

Input and output fittings of the BVM are mounted in insulating foam; do not allow the torque of adding fittings to break the foam.

The output tube, 1/4" copper tubing, will connect to the ¼" NPTF fitting on the BVM, a 45° flare adapter is provided as well as a flare nut. The output spray location should be away from the temperature probe, and not pointing toward it; it should be installed near the back, either across or down the back of the cabinet. Do not allow the spray to point toward the door or be blocked by product. Since nitrogen is heavier than air it will fill the freezer from the bottom up. Route the tube out of the freezer through an access port and to the BVM. Cut off excess tubing; add insulation and the flare nut before flaring the tube.

Nitrogen Supply

Connect the liquid nitrogen tank using an insulated flexible cryogenic-liquid rated tube of at least 3/8" size. (A ½" 45° flare adapter is provided.)

Check the supply pressure on the tank gauge; it must be between 18 and 24 psi and there should not be a flow-check valve.

During a tank change, be sure to vent the delivery tubing immediately after closing the supply tank valve. This may be done by carefully loosening the line at the tank or via the Purge Function, see **Manual Valve Control**, page 15.

DOOR SAFETY SWITCH

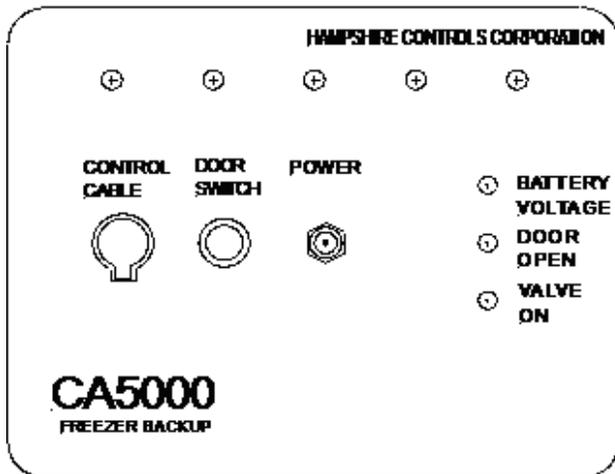
Install the supplied door switch so that it will activate upon opening the freezer or cabinet door. When installed and properly wired, it will interrupt the injection of nitrogen into the freezer. Verify this functionality by observing the visual indicator on the “Battery Valve Module” (BVM), a door open LED will light when the door is open, nitrogen injection is prevented when the red door-open LED indicator is illuminated.

BATTERY VALVE MODULE

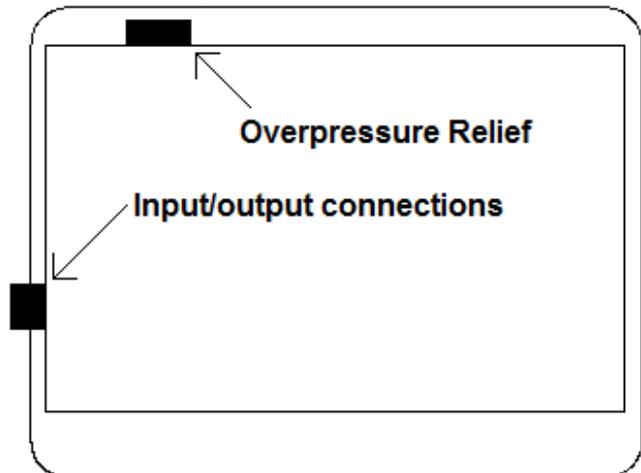
The Battery-Valve Module contains the backup battery and charger, 6-pin connector for the CA5000 Alarm Module, door switch interlock, the appropriate fitting for connection to the backup siphon-type liquid coolant supply tank, and the coolant discharge tube.

The CA5000 door switch interlock circuit is factory shipped to accept a “normally closed” contact (NC) for normal operation. It may be changed to “normally open” (NO) if desired, consult the factory.

BVM FRONT VIEW



BVM REAR VIEW



Visual LED indicators display system status:

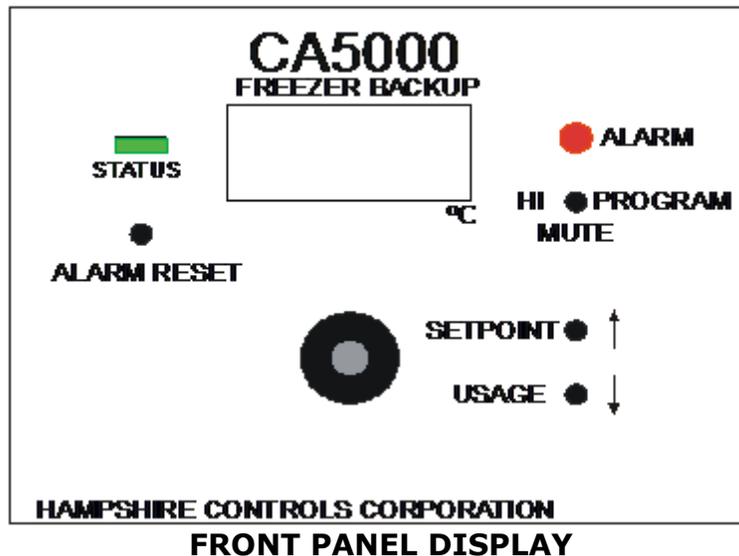
- ❑ BATTERY VOLTAGE: is a 2 color LED.
 - ❑ Green is battery good, charge circuit good.
 - ❑ Red = Low output voltage.
- ❑ DOOR OPEN: Red indicates that the door is open.
- ❑ VALVE ON: Yellow indicates that power is applied to the solenoid valve which injects coolant.

CA5000 ALARM MODULE

Connect the CA5000 control cable to the Battery-Valve-Module (BVM). Connect the door switch wire and the output alarm relay to your system as required. Power for the CA5000 system is provided via the internal BVM battery, charged by the power supply plugged into the POWER jack on the front panel of the BVM.

OPERATIONAL CHECK

Plug the CA5000 system cable into the BVM. The display will show the current probe temperature, or 1999 if no probe. Plug the AC adapter into mains power and into the power jack on the BVM. The STATUS LED flashes every second indicating the unit is operating normally.



CA5000 OPERATING MODE

The CA5000 has two modes of operation: *Operating and Programming*. In Operating mode, the unit displays process temperature and provides alarms and outputs based on user-specified parameters.

- ❑ The **ALARM RESET** button is a system reset which clears alarms and sets the values of the current coolant usage and start times to zero.
- ❑ The **HI/MUTE/PROGRAM** button displays the Hi alarm temperature at which a warning alarm is sounded. This button also mutes the beeper after an alarm, for a preset time interval. Each successive press of this button resets the mute timer. Additionally, this button accesses Programming mode.
- ❑ The **SETPOINT/Up arrow** button displays the temperature setpoint at which coolant injection begins.
- ❑ The **USAGE/Down arrow** button displays the coolant usage for the current event.

The CA5000-N compares the probe's temperature to the user-set limits to determine out-of-range states. An out-of-range state is a temperature that is equal to or beyond the user-defined limit. The STATUS LED flashes green when the temperature is in-range and flashes red when the temperature is out of range. Orange flash indicates an injection event has occurred.

CA5000-N OPERATING MODE (Continued)

The BEEPER sounds alarm conditions and user activity:

- ❑ In alarm mode, it provides a long beep.
- ❑ In alarm mute mode, it provides a short chirp.
- ❑ It provides an audible tick to indicate a button has been pressed.

The CA5000-N will not alarm until the out-of-range state has continued for a specified time (the “alarm delay” - see **Programming** section, page 10). This alarm delay time will prevent nuisance alarms as might occur when opening the freezer door if the probe location is close to the door.

When an alarm condition occurs, the beeper will sound and the LED will flash. Pressing the **HI/MUTE/PROGRAM** button silences the beeper for the user-specified (**SIL**) time, changing the sound to short ‘chirps’. When the temperature returns within range and there are no additional out-of-range readings for thirty seconds, chirping stops and the alarm condition resets. When the next out-of-range condition occurs, the beeper resumes at full volume. After the user-programmable SILENCE parameter (**SIL**) elapses and if the CA5000-N is still in an alarm condition, the beeper will resume at full volume.

When probe temperature exceeds the control setpoint and coolant is injected into the system, the alarm state elevates with a visual amber indication on the STATUS LED. The STATUS indicator that alternately blinked green/off for temperatures below the user-defined (**Hi**) limit, and blinked red/off for temperatures equal to or above the **Hi** limit, now blinks green/amber for temperatures below the **Hi** limit, and red/amber for temperatures equal to or above the **Hi** limit. This amber LED indication persists and does not clear until the unit **ALARM RESET** is pressed, providing the user a visual indicator that a fault occurred and coolant has been injected into the system.

The **HI/MUTE/PROGRAM** button has multiple functions:

- ❑ In Operating mode, it displays the user-defined **Hi** alarm setting.
- ❑ In Operating mode, pressing this button mutes the beeper after an alarm is sounded, for a preset time. Each successive button press also resets the mute timer.
- ❑ Pressing the button for two seconds places the CA5000-N into Programming mode and mutes the beeper.
- ❑ In Programming mode, pressing the button cycles through the list of user parameters.

The **SETPOINT/Up arrow** button has a different function for each mode:

- ❑ In Operating mode, pressing the button displays the coolant injection control setpoint.
- ❑ In Programming mode, pressing the button increases the displayed parameter value.

The **USAGE/Down arrow** button has a different function for each mode:

- ❑ In Operating mode, pressing the button displays the current coolant usage.
- ❑ In Programming mode, pressing the button decreases the displayed parameter value.

CA5000-N OPERATING MODE (Continued)

A built in circuit monitors the status of the backup battery inside the BVM. Should a problem arise with the battery and the CA5000-N is plugged into line power, the **BAT** indicator will illuminate on the display, the Alarm LED will flash and the beeper will sound. Contact Hampshire controls for service, or for a replacement battery.

The door switch interlock circuit monitors the status of the freezer door to ensure it is closed. When wired with a door switch as recommended and the door has not been properly closed, after a fixed time of 15 minutes the **door** fault indication will be displayed, the red Alarm LED will flash and the beeper will sound. Pressing the **MUTE** button will cause the beeper to sound short 'chirps', but the Alarm LED remains flashing and the 'chirps' remain audible until the door is closed.

**TABLE 1
Detailed Programming Parameters and Settings**

		Low Limit	High Limit	Factory Default	Unit	Resets?
Standard Alarm Parameters						
Hi	High Temperature Alarm Limit <i>Note that "Hi" cannot be warmer than "SP" (below)</i>	-200	50	-65	°C	No
Ad	Alarm Delay Period	0	30	5	Minutes	No
Rd	Relay Delay Period	0	30	10	Minutes	No
SIL	Silence Mute Period	5	120	20	Minutes	No
Coolant Control Parameters						
SP	Set Point temperature to initiate liquid coolant injection <i>Note that "SP" cannot be colder than "Hi" (above)</i>	-200	40	-60	°C	No
On	On time for coolant valve	5	900	10	Seconds	No
OFF	Off time for coolant valve	10	900	50	Seconds	No
Timers and Manual Valve Control						
SUS	Suspends coolant injection	0	59	0	Minutes	Automatic
Pur	Activates coolant valve to purge delivery tube	0	1	0	-	Automatic
CCO	Reported Current coolant usage	-	-	-	Minutes	Automatic
CSt	Reported coolant Injection start timer	-	-	-	Minutes	Automatic
tCO	Reported Total coolant usage	-	-	-	Minutes	Manual

- ❑ To edit the Standard Parameters, press and hold the **HI/MUTE/PROGRAM** button.
- ❑ To edit the coolant Control Parameters, first press the **SETPOINT** button, and while holding it, also press and hold the **HI/MUTE/PROGRAM** button. The 3 control parameters are available.
- ❑ To access the Timers and Manual Valve Control, first press the **USAGE** button, and while holding it, also press and hold the **HI/MUTE/PROGRAM** button. The 3 reported timers, 1 control timer, and the valve control option are available.

CA5000 PROGRAMMING MODE INSTRUCTIONS

To program the CA5000:

1. Press and hold the **HI/MUTE/PROGRAM** button for two seconds to bring the unit into Standard Programming mode. For the coolant Control Parameters, press and hold the **SETPOINT** and **PROGRAM** buttons to activate. For the Timers and Manual Valve Control, press and hold the **USAGE** and **PROGRAM** buttons to activate. While in programming mode, a small arrow is indicated in the upper-left corner of the LCD display.
2. The display will show the first parameter that may be programmed (see the Detailed Programming Parameters on page 11). The name of the parameter will flash, and then the current value of that parameter is displayed.
3. The flashing STATUS tricolor LED indicates the current status of the unit:
 - Green = Normal Display Mode
 - Amber = Programming Mode
 - Red = Temperature is out of range
4. To change the value of any parameter, press the **SETPOINT/Up arrow** or **USAGE/Down arrow** buttons. Pressing either button will change the parameter value by one count.
5. Pressing and holding either button for half a second will change the parameter value by 10 counts. It will continue to step by ten counts on subsequent button presses, as long as they occur within approximately one second.
6. Waiting more than one second before the next press of the **SETPOINT/Up arrow** or **USAGE/Down arrow** buttons will cause the step size to revert back to one.
7. Once the CA5000-N is in Programming mode, each time the **HI/MUTE/PROGRAM** button is pressed, the unit steps to the next parameter. As the unit steps to the next parameter, the value of the previous parameter is saved. Once the final parameter is reached, pressing the **HI/MUTE/PROGRAM** button exits to Operating mode, storing the final parameter.
8. While in Programming mode, if no buttons are pressed for approximately 30 seconds, the CA5000-N will revert back to Operating mode.
9. The **ALARM RESET** button is a system reset which clears alarms, returns the CA5000-N to Operating mode, and also sets the values of the current coolant usage and start times to zero.

The **CA5000-N** functions as a monitoring and output device, and will provide an alarm at the value programmed into the standard parameter '**Hi**'. Three parameters perform the coolant control: Set Point **SP**, "On seconds" **On**, and "Off seconds" **OFF**. When the temperature rises above the Set Point value, the unit injects coolant for "On seconds", then waits "Off seconds" before determining if more cooling is needed. Software monitors how many minutes elapse from the start of the coolant injection, how many minutes of "On" time (coolant usage) accumulate for this current event, and the total time that the coolant has been on, **tCO**, since the coolant tank was first started.

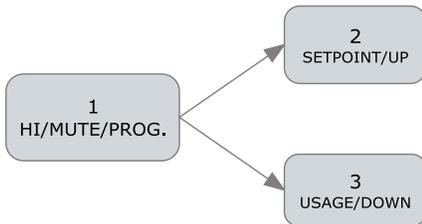
Important note: Resetting the coolant Alarm with **ALARM RESET** will also clear the coolant Start time counter **CSt**, the Suspend timer **SUS**, and Current Usage timer **CCO**. Previous data related to any coolant injection times is lost, so record these values first if this data may be required for Maintenance or Engineering purposes. However, the total coolant usage timer **tCO** keeps accumulating, until this value is reset manually to zero. This is accomplished by editing the value of the **tCO** parameter as follows: Press the **USAGE/Down arrow** button while in programming mode **tCO**, and a **YES** prompt is displayed for the user to confirm before resetting that value to zero. A press of the **Usage/Down arrow** button then sets the value to zero. See the detailed description of parameter **tCO** in the Available Programming Parameters section for additional information.

Detailed Description of the Available Programming Parameters:

Standard Parameters (Press and hold the HI/PROGRAM/MUTE button to activate)

Hi (High Alarm Setting, °C)

This is the high temperature alarm. In Operating mode, the alarm will activate if the probe reads a temperature equal to or above the High Alarm setting. The high alarm cannot be set above the injection setpoint (SP).

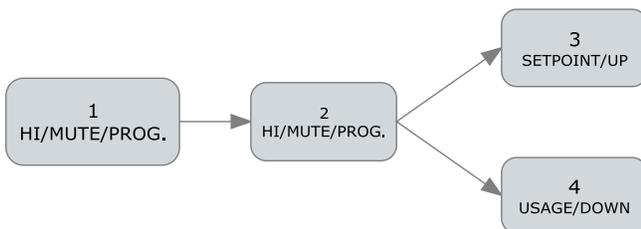


From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM button for two seconds to enter the Standard Programming mode. Release the button, the display will read **Hi** momentarily, and then its current value.
2. Press SETPOINT/UP ARROW to increase the value.
3. Press USAGE/DOWN ARROW to lower the value.

Ad (Alarm delay time, minutes)

If desired, the CA5000-N will not provide an alarm until the out-of-range state has continued for a specified time. The alarm delay time may be used to prevent transient or nuisance alarms. This parameter may be set from 0 to 30 minutes.



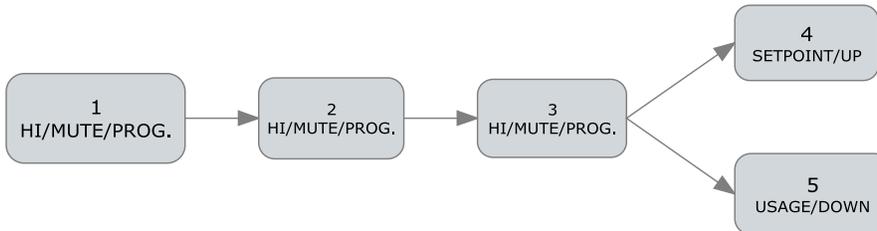
From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM button for two seconds to enter the Standard Programming mode.
2. Press HI/MUTE/PROGRAM button a second time, the display will read **Ad** momentarily, and then its current value.
3. Press SETPOINT/UP ARROW to increase the alarm delay.
4. Press USAGE/DOWN ARROW to decrease the alarm delay.

Standard Parameters (continued)

rd (Relay delay time, minutes)

This timer delays activation of the CA5000-N output. Nitrogen injection and the external relay will be delayed by up to 30 minutes, the default is 10 minutes

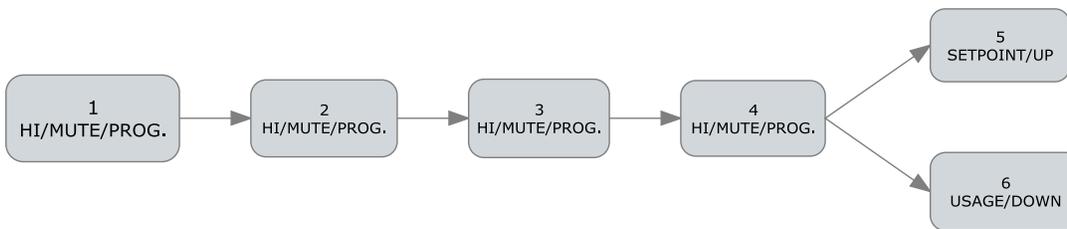


From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM button for two seconds to enter the Standard Programming mode.
2. Press HI/MUTE/PROGRAM a second time.
3. Press HI/MUTE/PROGRAM a third time, the display will read **rd** momentarily, and then its current value.
4. Press SETPOINT/UP ARROW to increase the relay delay period.
5. Press USAGE/DOWN ARROW to decrease the relay delay period.

SIL (Alarm silence time, minutes)

This parameter sets the number of minutes the beeper will “chirp” after the Mute button is pressed during an alarm condition. After the Silence Time elapses and the alarm condition still exists, the beeper will resume at full volume. This parameter may be set from 5 to 120 minutes.



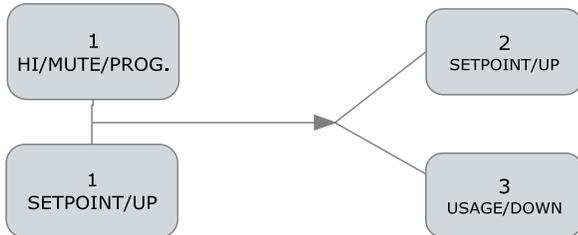
From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM button for two seconds to enter the Standard Programming mode.
2. Press HI/MUTE/PROGRAM a second time.
3. Press HI/MUTE/PROGRAM a third time.
4. Press HI/MUTE/PROGRAM a fourth time, the display will read **SIL** momentarily, and then its current value.
5. Press SETPOINT/UP ARROW to increase the number of minutes.
6. Press USAGE/DOWN ARROW to decrease the number of minutes.

Coolant Control Parameters

SP (Injection set point, °C)

This is the user-defined temperature set point at which coolant will be injected into the system. This parameter may be set from –160 to +40 °C and can be delayed by the rd parameter.

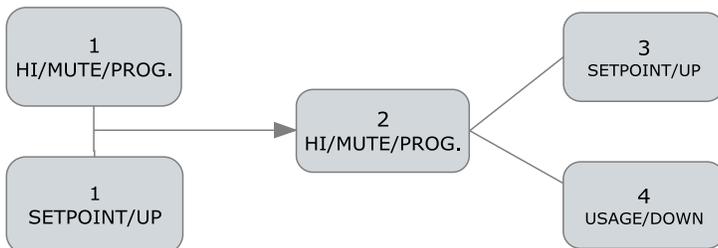


From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM and SETPOINT/UP ARROW buttons at the same time, the display will read **SP** momentarily, and then its current value.
2. Press SETPOINT/UP ARROW to raise the coolant injection temperature setting.
3. Press USAGE/DOWN ARROW to lower the coolant injection temperature setting.

On (Injection on time, seconds)

This is the user-defined time interval for coolant injection into the system. This parameter may be set from 5 to 900 seconds.



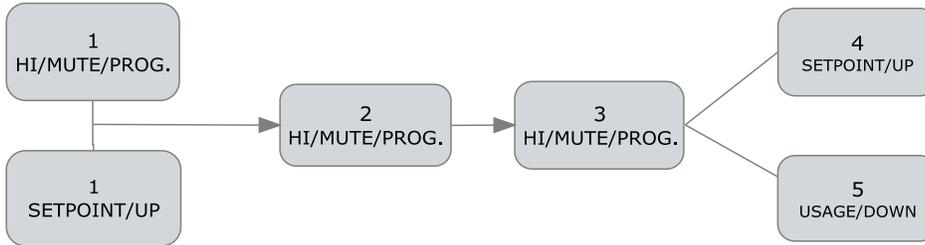
From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM and SETPOINT/UP ARROW buttons at the same time.
2. Press HI/MUTE/PROGRAM, the display will read **On** momentarily, and then its current value.
3. Press SETPOINT/UP ARROW to increase the coolant injection on time.
4. Press USAGE/DOWN ARROW to decrease the coolant injection on time.

Coolant Control Parameters (continued)

OFF (Minimum time between injections, seconds)

This is the user-defined time interval between coolant injections. This parameter may be set from 10 to 900 seconds.



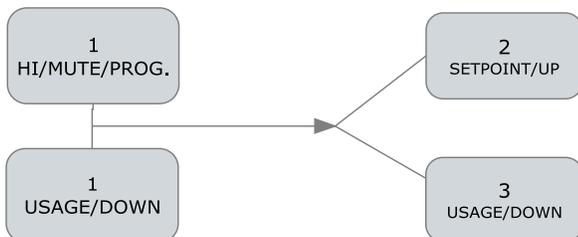
From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM and SETPOINT/UP ARROW buttons at the same time.
2. Press HI/MUTE/PROGRAM.
3. Press HI/MUTE/PROGRAM a second time, the display will read **Off** momentarily, and then its current value.
4. Press SETPOINT/UP ARROW to increase the off time.
5. Press USAGE/DOWN ARROW to decrease the off time.

Elapsed Time Records and Manual Valve Control

SUS (Suspend)

This parameter suspends the coolant injection for a specified time from 1 to 59 minutes, while both coolant injection and Hi Alarms are ignored and current process monitoring continues. The status light continues to flash green/red as normal, and the alarm LED provides a fast, short blink to indicate this special 'no-alarm' mode. When the **SUS** time expires, the system returns to normal monitoring and indication. The Suspend timer is displayed while in this mode, and the current process temperature may still be viewed by pressing the USAGE/Down arrow button. The timer is reset to zero by pressing the ALARM RESET button, or by manually setting it to zero.



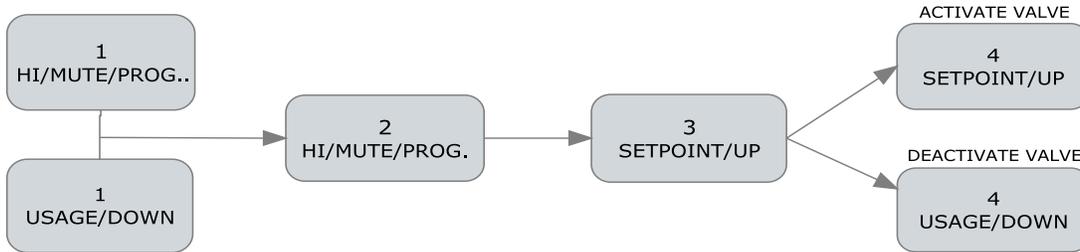
From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM and USAGE/DOWN ARROW buttons at the same time, the display will read **SUS** momentarily, and then its current value.
2. Press SETPOINT/UP ARROW to increase the suspend time.
3. Press USAGE/DOWN ARROW to decrease the suspend time.

Elapsed Time Records and Manual Valve Control (continued)

Pur (Purge)

This parameter is a manual control for activation of the coolant valve, used when the delivery tube must be purged for safety and/or maintenance purposes. Choices are 0 for valve off, 1 for valve on. It is only active while in programming mode, and upon exiting programming mode the value always resets to 0 (off). The user must confirm the displayed **YES** prompt before selecting 1 for valve on.

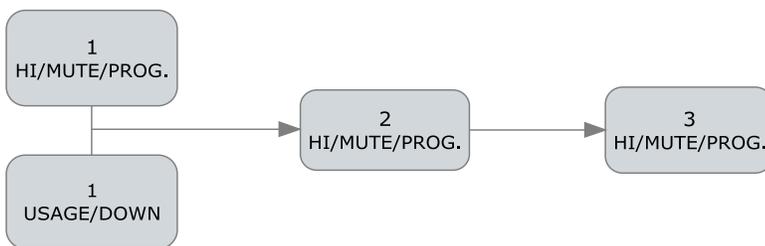


From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM and USAGE/DOWN ARROW buttons at the same time.
2. Press HI/MUTE/PROGRAM, the display will read **Pur**.
3. Press SETPOINT/UP ARROW for a **YES** prompt to confirm 'valve on' request.
4. Press SETPOINT/UP ARROW to activate the valve, the display will read **1**. Pressing the USAGE/DOWN ARROW button sets the displayed value to **0** to deactivate the valve.

CCO (Current coolant usage, minutes)

This parameter reports the current coolant usage in minutes and is reset to zero by pressing the ALARM RESET button.



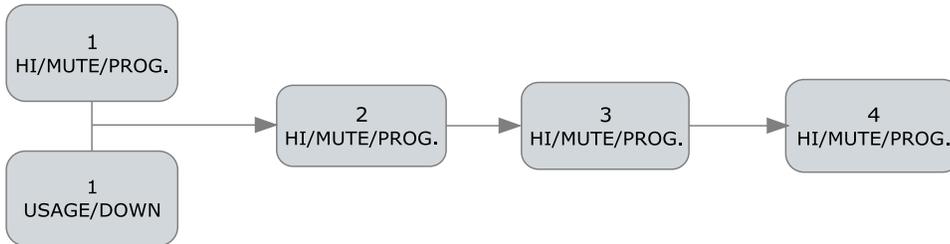
From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM and USAGE/DOWN ARROW buttons at the same time.
2. Press HI/MUTE/PROGRAM.
3. Press HI/MUTE/PROGRAM again, the display will read **CCO** momentarily, and then its current value.

Elapsed Time Records and Manual Valve Control (continued)

CSt (coolant start time, displays in minutes ago)

This parameter reports the number of minutes since the first coolant usage injection into the system in the current alarm is reset to zero by pressing the ALARM RESET button.

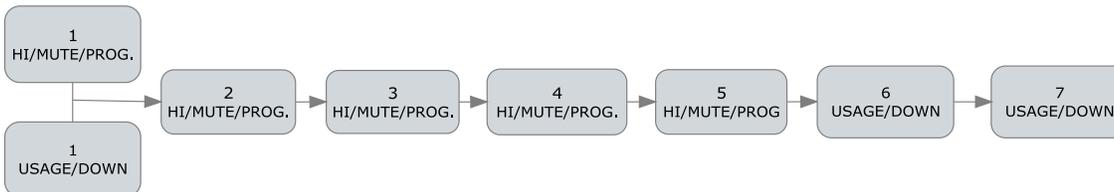


From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM and USAGE/DOWN ARROW buttons at the same time.
2. Press HI/MUTE/PROGRAM.
3. Press HI/MUTE/PROGRAM a second time.
4. Press HI/MUTE/PROGRAM again, the display will read **CSt** momentarily, and then its current value.

tCO (Total coolant usage, displays in minutes)

This parameter reports the total minutes of coolant usage since the supply tank was installed if the user reset it back to zero. It may only be reset to zero by using the decrement (USAGE/down Arrow) button. Pressing the ALARM RESET button does NOT reset this value to zero.



From Operating mode:

1. Press & hold the HI/MUTE/PROGRAM and USAGE/DOWN ARROW buttons at the same time.
2. Press HI/MUTE/PROGRAM.
3. Press HI/MUTE/PROGRAM a second time.
4. Press HI/MUTE/PROGRAM a third time.
5. Press HI/MUTE/PROGRAM a fourth time, the display will read **tCO** momentarily, and then its current value.
6. Press USAGE/DOWN ARROW to display a **YES** prompt to confirm before resetting the value to zero, if desired.
7. Press USAGE/DOWN ARROW a second time to reset **tCO** to zero.

PERIODIC MAINTENANCE

Hampshire Controls Corporation recommends the following minimum periodic maintenance to ensure proper system operation:

- ❑ After 3 years of use, replace the internal battery in the BVM. Contact HCC for the correct replacement battery, and installation should be performed only by a qualified service technician. Recycle or dispose of the used battery properly.
- ❑ Manually test the system to verify the control valve that supplies coolant operates properly. Use the **Pur** command as described in the Programming Parameters section of this manual.
- ❑ Test functionality of the door interlock switch circuit.
- ❑ Test all external systems controlled by the output relay.
- ❑ Observe all visual indicators function and are properly illuminated.
- ❑ Verify that an adequate supply of coolant is available for the system to operate properly.
- ❑ Verify the accuracy of the sensor calibration.

TROUBLESHOOTING GUIDE

CA5000 Display is blank

- ❑ Verify Line power is connected.
- ❑ Verify interconnect cable is installed between the display and the Battery-Valve Module.

CA5000 Display reads incorrectly

- ❑ If the display shows a continuous reading of 1999 or other unexpected values, the probe or associated wiring has failed. Repair wiring or replace the probe as necessary.

Display reads: xx (numeric value)

- ❑ The Suspend timer is active. To view the actual process temperature press the **USAGE/Down arrow** button. To exit Suspend mode press **ALARM RESET** or press and hold the **USAGE/Down arrow** and **PROGRAM** buttons to adjust the timer to zero.

Constant Alarm Condition

- ❑ Verify the parameters are programmed correctly for your installation and process being monitored. See page 10 for Programming Mode Instructions.

Unit locks up or does not respond

- ❑ Temporarily remove cable between display and BVM (either end) to reset unit.

LIMITED WARRANTY

Hampshire Controls Corporation warrants each manufactured item against defects in material and workmanship, when used as recommended, for a period of one year from original purchase. Products believed to have such defects must be returned to the factory by prepaid transportation.

Hampshire Controls' obligation under this warranty is limited to the repair or replacement, at its option, of those items which upon examination prove to be defective. Such repair or replacement will be made without charge.

This warranty will be void if repairs or alterations are made or attempted without factory authorization; or if the item has been subject to misuse, negligence or accident.

Hampshire Controls Corporation assumes no liability for consequential damages of any kind. The purchaser, by acceptance of the product, assumes all liability of the consequence of its use or misuse.

Hampshire Controls Corporation makes no other warranty, whether expressed or implied, in connection with the sale or use of this product.