

dL 1 dL 2 dL 3	Delay 1, 2 and 3 - Delay time to start control. Upon power-on, control OUTPUT 1 is kept <i>off</i> until the time programmed in dL 1 is elapsed. Its usage is intended to prevent multiple compressors to start simultaneously after the turn-on of a system with several controllers. Value in seconds, 0 to 250 s.
oF 1 oF 2 oF 3	Off time 1, 2 and 3 - Defines the minimum <i>off</i> time for control OUTPUT. Once OUTPUT 1 is turned off, it remains so for at least the time programmed in oF 1 . For thermocouple inputs this parameter is not available. This parameter is intended for refrigeration systems where longer compressor life is desired. For heating systems, program oF 1 to zero. Value in seconds, 0 to 999 s.
on 1 on 2 on 3	On time 1, 2 and 3 - Defines the minimum <i>on</i> time for control OUTPUT 1. Once turned on, OUTPUT 1 remains so for at least the time programmed in on 1 . For thermocouple inputs this parameter is not available. This parameter is intended for refrigeration systems where increased compressor life is desired. For heating systems, program on 1 to zero. Value in seconds, 0 to 999 s.
2t 1 3t 1 <i>Timer T1</i>	Time interval T1 for alarm temporization. Defines the temporization mode and interval, as shown in Table 4. Adjustable from 0 to 1999 seconds. Available only when outputs 2 or 3 are configured as alarms.
2t 2 3t 2 <i>Timer T2</i>	Time interval T2 for alarm temporization. Defines the temporization mode and interval, as shown in Table 4. Adjustable from 0 to 1999 seconds. Available only when outputs 2 or 3 are configured as alarms.
Rdd	Address - Controllers with the optional RS485 Modbus RTU communication interface have the Rdd parameter at the Configuration level. Set a unique Modbus address for each equipment connected to the network. Address range is from 1 to 247.

Level 3 – Calibration Level

The controller is factory calibrated. The following parameters should be accessed only by experienced personnel. To enter this cycle, the **P** key must be kept pressed for 4 seconds.

Don't press the **▲** and **▼** keys if you are not sure of the calibration procedures. Just press the **P** key a few times until the temperature measurement level is reached again.

PAS	Password - Enter the correct password to unlock write operations for the parameters in the following levels.
CAL	Calibration low - Offset value of the input. It adjusts the lower measurement range of the sensor.
CAH	Calibration High - Gain calibration. It adjusts the upper measurement range of the sensor.
CJL	Cold Junction Offset calibration - This parameter is available only for thermocouple.
FAC	Factory Calibration - Restores factory calibration parameters. Change from 0 to 1 to restore the calibration parameters with factory values.
Pr t	Protection - Defines the levels of parameters that will be password protected. See "Configuration Protection" for details.
PAC	Password Change - Allows changing the current password to a new one. Values from 1 to 999 are allowed.
Sn 2	Serial number - First part of the controller electronic serial number.
Sn 1	Serial number - Second part of the controller electronic serial number.
Sn 0	Serial number - Third part of the controller electronic serial number.

WORKING WITH THE CONTROLLER

Multiple output controllers are suited for controlling multiple stage systems. Other applications require OUTPUT 1 to be the control output and OUTPUT 2 to be the alarm. In a multiple stage application, **SP 1**, **SP 2** and **SP 3** are configured to operate at different temperatures, creating a progressive sequence for turning on the outputs (compressors) in response to a system demand.

The output delays for turning on the compressors (**dL 1**, **dL 2** and **dL 3**) cause the compressors to be turned on one by one, minimizing energy demand.

Another usage for multiple output controllers is in systems that require automatic selection between cool and heat action. In these applications, one output is configured as reverse action (heating) and the other as direct action (refrigeration).

Alarm Functions

There are eight distinct alarm functions implemented in OUTPUT 2 and 3, selected by the parameter **Rc 2** and **Rc 3**, described below:

- 2** - Low temperature alarm – OUTPUT is turned on when the measured temperature falls **below** the respective set point value.
- 3** - High temperature alarm – OUTPUT is turned on when the measured temperature exceeds the respective set point value.
- 4** - Inside range alarm – OUTPUT 2 is turned on when the measured temperature is within the range defined by:
(SP 1 – SP 2) and **(SP 1 + SP 2)** or **(SP 1 – SP 3)** and **(SP 1 + SP 3)**
- 5** - Outside range alarm: OUTPUT 2 is turned on when the temperature falls outside the range defined by:
(SP 1 – SP 2) and **(SP 1 + SP 2)** or **(SP 1 – SP 3)** and **(SP 1 + SP 3)**

Functions **6**, **7**, **8** e **9** are identical to the above ones except that they incorporate the Initial Blocking feature, which inhibits the output if an alarm condition is present at start-up. The alarm will be unblocked after the process reaches a non-alarm condition for the first time.

Alarm Timer

Alarms can be configured for timed operation. Three operation modes can be programmed: alarm delay, alarm timed pulse or alarm oscillator. Alarm temporization is available only for outputs 2 and 3 and is configured through parameters: **2t 1**, **3t 1**, **2t 2** and **3t 2**.

Table 4 shows these advanced functions. Times T1 and T2 can be programmed from 0 to 1999 seconds. Programming 0 (zero) in the timer parameters T1 and T2 disables the timer function.

The output status led P2 and P3 in the controller panel, signals when the control output is on.

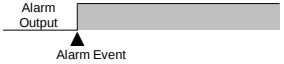
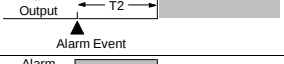
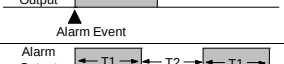
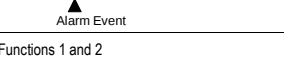
Advanced Function	T1	T2	ACTION
Normal Operation	0	0	
Delayed	0	1 to 1999 s	
Pulse	1 to 1999 s	0	
Oscillator	1 to 1999 s	1 to 1999 s	

Table 4 – Timer Alarm Functions 1 and 2

CONFIGURATION PROTECTION

A protection system to avoid unwanted changes to the controller parameters is implemented. The level of protection can be selected from partial to full. The following parameters are part of the protection system:

- PAS** When this parameter is presented, the correct password should be entered to allow changes of parameters in the following levels.
- Pr t** Defines the level of parameters that will be password protected:
 - 1 - Only calibration level is protected (factory configuration);
 - 2 - Calibration and Configuration levels are protected;
 - 3 - All levels are protected - calibration, Configuration and setpoints.
- PAC** Parameter for definition of a new password. Since it is located in the calibration level, can only be changed by a user that knows the current password. Valid passwords are in the range 1 to 999.

CONFIGURATION PROTECTION USAGE

PAS parameter is displayed before entering a protected level. If the correct password is entered, parameters in all following levels can be changed. If wrong or no password is entered, parameters in the following levels will be read only.

Important notes:

- 1- After **five** consecutive attempts to enter a wrong password, new tentative will be blocked for the next 10 minutes. If the current valid password is unknown, the **master password** can be used only to define a new password for the controller.
- 2 - The password for a brand new device is **111**.

ERROR MESSAGES

Sensor measurement errors force the controller outputs to be turned off. The cause for these errors may have origin in a bad connection, sensor defect (cable or element) or system temperature outside the sensor working range. The display signs related to measurement errors are shown below:

	Measured temperature exceeded maximum allowed range for the sensor. Broken Pt100, Pt1000 or T/C. Short circuited NTC sensor.
	Measured temperature is below minimum measurement range of the sensor. Short circuited Pt100, Pt1000 or T/C. Broken NTC.

PRODUCT IDENTIFICATION

The label attached to the controller case identifies the model and the optional present in the product, as described below:

MODEL: **N323 - A - B - C**, where:

- A:** Input Sensor: **NTC** or **Pt100** or **Pt1000** or **J/K/T** (Thermocouples)
- B:** Digital communication: **blank** or **485** (RS485, Modbus protocol)
- C:** Voltage rating: **blank** (100-240 Vac/dc) or **24V** (24 Vac/dc);

TECHNICAL ASSISTANCE

If you encounter a problem with your controller, review the configuration with regard to inputs, outputs, alarms, etc. If the problem persists, contact your supplier or Novus at info@novus.com.br.