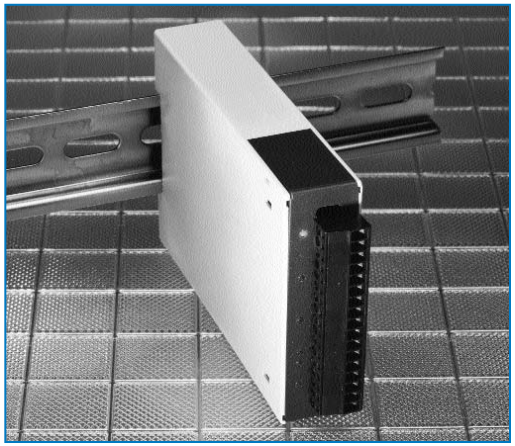
ATHENA®

SERIES 1ZC

COMMUNICATING SUB-PANEL TEMPERATURE CONTROLLER

Operating Instructions



For Technical Assistance,
Call Toll Free **800.782.6776** (in the U.S.)
or **610.828.2490** (from anywhere in the world),
or e-mail **techsupport@athenacontrols.com**.

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Introduction

The Series 1ZC is a nonindicating control module, designed to be mounted on a standard DIN rail, that may be used to control the temperature of a single control zone via a remote personal computer, PLC, or other serial communications device. It features two independent outputs, each configurable as either direct-acting, reverse-acting, or alarm. Discrete LEDs illuminate to provide an indication of system status and output activity.

To configure the 1ZC, set up control parameters, and communicate with the controller via its standard RS-485 interface, a communications program that incorporates the Athena+ Protocol data message formats is required. Athena's Multi-Comm™ software, which may be used to control up to 254 Series 1ZC controllers remotely from a PC*, may be used for this purpose.

Precautions

After unpacking, inspect the instrument and shipping carton for any physical damage that may have occurred in shipping. **Never attempt to install and use a damaged unit.** Save all packing materials and report any damage to the carrier immediately. Verify that the ordering code on the instrument label matches what was ordered before proceeding.

*PC requirements: 386SX or better, 1 Mb of free hard disk space, MS-Windows 3.1 and MS-DOS 5.0 or later, and RS-485 interface (or RS-232 with RS-485 converter).

Features

DIN Rail (NS-35/7.5) Mountable Enclosure Stackable to Required Number of Zones

Each Zone Independently Powered

Pluggable Terminal Block for Easy Wiring

Optically Isolated Inputs and Outputs

Selectable Thermocouple, RTD, Current, or Voltage Input

On/Off Through Full PID Operation

Autotuning - Heat or Cool

Adjustable On/Off Output Hysteresis and Deadband

Dual Outputs, Each Configurable as Reverse/Direct-Acting or Alarm

Alarm Inhibit Mode

Loop Break Alarm

Safety Warnings

In addition to presenting a potential fire hazard, high voltage and high temperature can damage equipment and cause severe injury or death. When installing or using this instrument, follow all instructions carefully and use approved safety controls. Electrical connections and wiring should be performed only by suitably trained personnel.

Do not locate this instrument where it is subject to excessive shock, vibration, dirt, moisture, oil, or other liquids. The safe operating temperature range for this unit is 32°F to 140°F (0°C to 60°C).

Pre-Wire Setup

Note: ***Do not use a screwdriver or other metal object to pry open the case. Only slight hand pressure is required.***

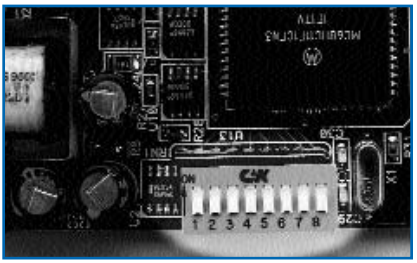
Note: ***The 1ZC communicates according to the RS-485 standard. This allows for up to 32 devices to be on a single twisted pair. Use of a signal repeater will allow more devices to be addressed.***

Before wiring the 1ZC controller, the network address of each unit must be set using a binary DIP switch located on the controller's circuit board. **DO NOT ATTEMPT TO CONNECT POWER WIRING BEFORE COMPLETING THIS STEP.**

Pull apart case sides to disengage locking tabs while pulling out the black bezel.

Locate the 8-position DIP switch and assign a unique network ID to each controller by setting the DIP switch to the appropriate binary number (Fig.1). Valid network IDs are 1 to 254. (Zero and 255 may not be used.)

Figure 1. Binary Code DIP Switch for setting network IDs for each controller.



When reassigning a network ID after Input/ Output/Power wiring is attached, disconnect wiring connector, then remove board as noted earlier. **NEVER ATTEMPT TO REMOVE CIRCUIT BOARD WITH POWER WIRING ATTACHED. HAZARDOUS VOLTAGE IS PRESENT ON CIRCUIT BOARD.**

1ZC DIP Switch Settings

Address Descriptions	Switch Number								Hex Equivalent	Decimal Equivalent
	1	2	3	4	5	6	7	8		
Factory Use ONLY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	00h	0
First usable address	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	01h	1
Second usable address	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	02h	2
Third usable address	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	03h	3
Fourth usable address	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	04h	4
Last usable address	OFF	ON	ON	ON	ON	ON	ON	ON	FEh	254
Default communications settings: 2400 Baud; 8, n, 1	ON	ON	ON	ON	ON	ON	ON	ON	FFh	255

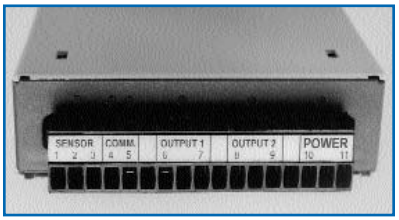
Input, Output, Communications, and Power Wiring

IMPORTANT: All electrical wiring connections should be made only by trained personnel, and in strict accordance with the National Electrical Code and local regulations.

The 1ZC controller has built-in circuitry to reduce the effects of electrical noise (RFI) from various sources. However, power and signal wires should always be kept separate. We recommend separating connecting wires into three bundles: power; signal; and output. These bundles should then be routed through individual conduits. Shielded sensor cables should always be terminated to earth ground at the controller end only.

If additional RFI attenuation is required, install a noise suppression device such as an R.C. snubber across the external noise source. If you wish, you may order this suppressor directly from Athena; specify part number 235Z005U01.

Figure 2. 1ZC Contact Identification



Legend:

1 **Sensor (-)** – Thermocouple, RTD, or Process
2 **Sensor (+)** – Thermocouple, RTD, or Process
3 **Sensor** – Bias for RTD
4 **Communications** – RS-485 "A" I/O line, bidirectional
5 **Communications** – RS-485 "B" I/O line, bidirectional
6 **Output 1, Relay** – N.O., solid-state relay: Load; Process: (+)
7 **Output 1, Relay** – Common, solid-state relay: Load; Process: (-)
8 **Output 2, Relay** – N.O., solid-state relay: Load; Process: (+)
9 **Output 2, Relay** – Common, solid-state relay: Load; Process: (-)
10 **Power, Input** – L2 (reference only, no polarity required)
11 **Power, Input** – L1 (reference only, no polarity required)

Input Wiring

Note: ***Thermocouple circuit resistance should not exceed 100 ohms for rated accuracy; errors will occur at higher resistance values. If shielded thermocouple wire is used, terminate the shield only at controller end.***

Figure 3. Thermocouple Input Wiring.

Make sure that you are using the appropriate thermocouple and extension wire. Connect the negative lead (generally colored red in ISA-type thermocouples) to contact #1; connect the positive lead to contact #2. Extension wires must be the same polarity as the thermocouple.

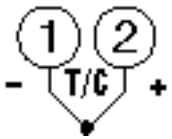
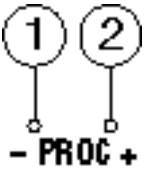


Figure 4. 2- and 3-Wire RTD Input Wiring.

The 1ZC accepts input from 2- or 3-wire, 100 ohm platinum resistance temperature detectors (RTDs). Connect 2-wire RTDs to contacts #1 and #2, with a jumper across contacts #2 and #3. Keep leads short and use heavy gauge copper extension wire to minimize lead resistance, which can result in a reading error of 5°F per ohm. For long runs, 3-wire RTDs should be used.

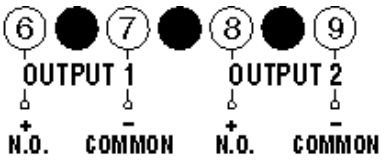
Figure 5. Process and Linear Input Wiring.

Voltage Inputs: Connect the positive voltage input to contact #2; the negative input to contact #1. Current Inputs: Connect the positive current input to contact #2; the negative input to contact #1.



Output Wiring

Figure 6. Output Wiring. The 1ZC has two outputs. Each can be configured with any one of four types of outputs: mechanical relay, solid-state relay, pulsed dc, and 4-20 mA.



Legend:

Output 1

Contact #6: Relay-N.O. (Normally Open contact)
Solid-state relay: Load
Process: (+)

Contact #7: Relay-Common
Solid-state relay: Load
Process: (-)

Output 2

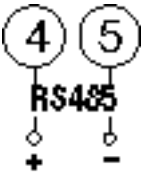
Contact #8: Relay-N.O. (Normally Open contact)
Solid-state relay: Load
Process: (+)

Contact #9: Relay-Common
Solid-state relay: Load
Process: (-)

Communications Wiring

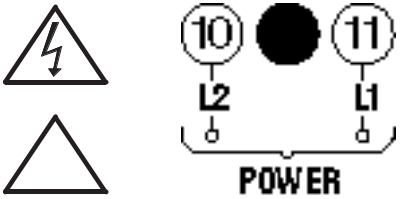
Figure 7. Communications Wiring.

The 1ZC conforms to the RS-485 communications standard. Connect communications wiring to contacts #4 and #5 as indicated in the diagram below. If the host computer does not have an RS-485 communications board, then an RS-232 to RS-485 converter will need to be used. Note: Contact Athena for a recommended RS-485 converter. Connect the converter to your host computer's serial communications port. Default communications settings are: Baud rate = 2400 and Data format = 8-N-1.



Power Wiring

Figure 8. Connect power wiring to contacts #10 and #11 as shown.



Mounting and Repositioning

Follow the instructions for mounting and repositioning the1ZC given in Figures 9-13 below.

Mounting the Controller

Figure 9. Orient the controller so that the wiring label is visible after the unit is attached to the DIN rail.

Figure 10. Place fixed catch onto DIN rail, rotate unit downward. The 1ZC will snap onto the rail.

Repositioning the Controller

Figure 11. To reposition the 1ZC, insert a thin-shank straight blade screwdriver into the slot on the underside of the unit.

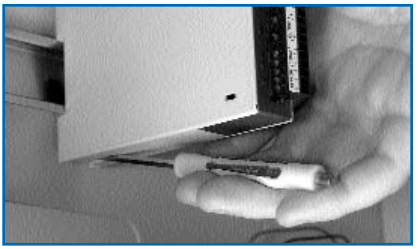


Figure 12. Apply a squeezing motion against the screwdriver and opposite side of the case. This will disengage the sliding catch.

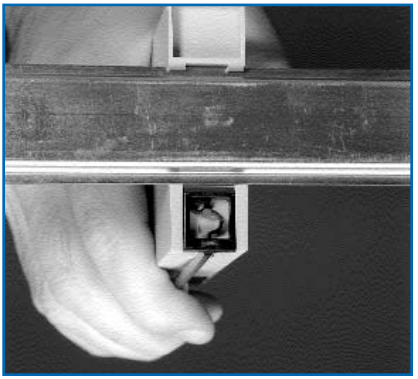
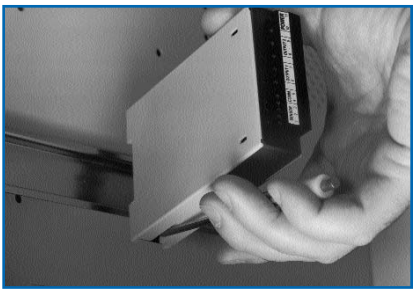


Figure 13. While squeezing the screwdriver and case, rotate the 1ZC upward. This will release the unit from the DIN rail.



Outputs

Note: ***The Type "B" output is a mechanical device and subject to wear. To extend the life of the relay, set the Cycle Time for the relay output to the longest duration that still affords good control.***

Type "B" relay outputs should not be used in proportional applications to switch load power directly.

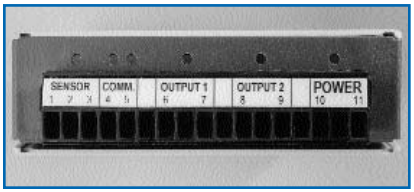
When you ordered your 1ZC controller, specific output types were specified, designated as "B", "F", "S", or "T". You also had the option of configuring your controller with either one or two output actions. The numbers below are the suggested cycle times for most typical applications.

For Control Output Type		Select Cycle Time (in seconds)
B	Electromechanical Relay	>15
F	4 to 20 mA	0.2
S	Pulsed 20 Vdc	0.2
T	Solid-State Relay	15*

*"T" outputs directly driving non-inductive loads (small heaters) can have cycle times as low as 0.2 seconds.

Operation

Figure 14. LED status indicators.



The 1ZC has six status indicators (Fig. 14), described in the table, right.

Table 1. LED indicators, location, and function.

Label	Location (Above Contact #)	Function
SENSOR ERROR	#2	Illuminates when sensor is disconnected or out of range (causes Outputs 1 and 2 to be disabled).
RXD	#4	Illuminates when receiving data.
TXD	#5	Illuminates when transmitting data.
OUTPUT 1	Between #6 and #7	Illuminates when energized.
OUTPUT 2	Between #8 and #9	Illuminates when energized.
POWER/ RUN	Between #10 and #11	Blinks when power is applied and unit is running.

The Series 1ZC controller is a nonindicating instrument designed for use with an external communications program. Athena offers Multi-Comm™, a Windows-based graphical user interface for setting and controlling up to 254 1ZC controllers. For a demo copy of this program, call 1-800-782-6776 or contact an Athena Controls representative.

If you are writing your own software, be sure that it complies with the Athena+ messaging protocol and parameter identification codes as described on the following pages.

Startup

When power is first applied, the LED indicators will illuminate momentarily while the instrument goes through a series of diagnostic checks to verify proper operation.

IMPORTANT: On initial startup, there is a possibility that outputs may be activated.

Parameters

On initialization, default parameter settings relating to controller configuration and communications were loaded into the controller's memory. To change these parameters to suit your specific application requirements, you must use the Athena+ protocol communications message syntax described in the section titled "Communications Message Examples."

On the next page is a list of legal parameters and the information required within your program to configure them. For examples of typical communications messages, refer to pages 16-18.

We recommend setting parameters in the following order:

1) Communications (Network ID set by DIP switch)
   - Baud Rate
   - Data Format
   - Transmit Delay
2) Input Type
3) Input Low Scale and High Scale (if linear input is specified)
4) Output Type (Two independent outputs are available)
5) Output Modes
   - For PID Outputs:
     - Output Action
     - Cycle Time
     - Low and High Limits
   - For Outputs Configured as Alarms:
     - Output Alarm Action
     - Output Alarm Operation
     - Output Alarm Delay
     - Output Alarm Inhibit Time
   - For On/Off Outputs:
     - Output Action
6) Operating Mode (Normal, Autotune, Manual, Standby)
7) Load default communication parameters procedure:
   - Disconnect power
   - Set all DIP switches to ON position
   - Apply power
   - Disconnect power
   - Set ID 2 - 255
   - Default communication parameters are 2400 Baud, 8-N-1

1ZC Parameter Codes

"X"s mark parameters that are supported by the 1ZC and "O"s that are not supported.

Number	Name	Read	Write	Data Field Value
1	Controller Type	X	0	4
2	Software Version	X	0	
3	Communications Version	X	0	
4	Status Byte	X	0	This field contains the ASCII representation of an 8-bit value in which the bit assignments are as follows:
			X	Process Input Error
			0	Always Zero
			0	Always Zero
			X	Loop Break
			0	Always Zero
			0	Always Zero
			X	01 (Alarm) Active
			X	02 (Alarm) Active
				If a bit at a location marked as "X" is set, then the condition is TRUE. For example, a "03.000" in the data field means that both alarm 1 and alarm 2 are active and everything else is FALSE.
5	Process Value	X	0	
6	Operating Mode	X	X	1 - Manual 2 - Standby 3 - Normal (automatic) 4 - Initiate Autotune 5 - Recipe Run 6 - Recipe Hold
9	Setpoint, RAM, EEPROM	X	X	
10	Setpoint, RAM Only	X	X	
14	Recipe Setpoint	X	0	
16	Output 1 Percentage	X	0	
17	Output 2 Percentage	X	0	
18	Manual Control Output 1 Percentage	X	X	
19	Manual Control Output 2 Percentage	X	X	
20	Output 1 Deadband	X	X	
21	Output 1 Hysteresis	X	X	
22	Output 1 Proportional Band	X	X	
23	Output 2 Proportional Band	X	X	
30	Rate (Derivative) Value	X	X	
32	Reset (Integral) Value	X	X	

Number	Name	Read	Write	Data Field Value
34	Manual Reset (Integral) Value	X	X	
37	Output 2 Deadband	X	X	
38	Output 2 Hysteresis	X	X	
39	Autotune Damping	X	X	1 - Low 2 - Normal 3 - High
40	Recipe Option	X X X	X X X	0 - Disabled 1 - Single Step 2 - Multi-Step
41	Single-Setpoint Ramp Time	X	X	
42-49	Ramp Times 1-8	X	X	
58-65	Soak Levels 1-8	X	X	
66-73	Soak Times 1-8	X	X	
82	Recycle Number	X	X	
83	Holdback Band	X	X	
84	Termination State	X	X	0 - Last Setpoint 1 - Default Setpoint 2 - Recipe to Standby Mode
85	Power Fail Resume Enable	X	X	1 - Resume Off 2 - Resume On
86	Input Bias	X	X	
87	Input Low Scale	X	X	
88	Input High Scale	X	X	
89	Lower Setpoint Limit	X	X	
90	Upper Setpoint Limit	X	X	
91	Input Filter	X	X	
92	Input Type	X	X	0 - B Thermocouple 1 - C Thermocouple 2 - E Thermocouple 3 - J Thermocouple 4 - K Thermocouple 5 - N Thermocouple 6 - NNM Thermocouple 7 - R Thermocouple 8 - S Thermocouple 9 - T Thermocouple 10 - Platinel® II Thermocouple 11 - RTD (Integer) 12 - RTD (Decimal) 13 - 0-20 mA 14 - 4-20 mA 15 - 0-10 mV 16 - 0-50 mV 17 - 0-100 mV 18 - 10-50 mV 19 - 0-1 V 20 - 0-5 V 21 - 0-10 V 22 - 1-5 V

Number	Name	Read	Write	Data Field Value
94	Output 1 Type	X	X	1 - Inactive/Disabled 2 - PID 4 - On/Off 5 - Alarm
95	Output 1 Action	X	X	1 - Direct 2 - Reverse
96	Output 1 Alarm Action	X	X	1 - Off 2 - Normal 3 - Latched
97	Output 1 Alarm Operation	X	X	1 - Process High 2 - Process Low 3 - Deviation High 4 - Deviation Low 5 - Normal Band 6 - Inverse Band
98	Output 1 Alarm Delay	X	X	
99	Output 1 Alarm Inhibit	X	X	
A0	Output 1 Process Alarm Setpoint	X	X	
A1	Output 1 Deviation Alarm Setpoint	X	X	
A2	Output 1 Cycle Time	X	X	
A3	Output 1 Low Limit	X	X	
A4	Output 1 High Limit	X	X	
A5	Output 2 Type	X	X	0 - Inactive/Disabled 1 - PID 3 - On/Off 4 - Alarm
A6	Output 2 Action	X	X	1 - Direct 2 - Reverse
A7	Output 2 Alarm Action	X	X	1 - Off 2 - Normal 3 - Latched 4 - Event
A8	Output 2 Alarm Operation	X	X	1 - Process High 2 - Process Low 3 - Deviation High 4 - Deviation Low 5 - Normal Band 6 - Inverse Band
A9	Output 2 Alarm Delay	X	X	

Number	Name	Read	Write	Data Field Value
B0	Output 2 Alarm Inhibit	X	X	
B1	Output 2 Process Alarm Setpoint	X	X	
B2	Output 2 Deviation Alarm Setpoint	X	X	
B3	Output 2 Cycle Time	X	X	
B4	Output 2 Low Limit	X	X	
B5	Output 2 High Limit	X	X	
B6	TC/RTD Decimal Position	X	X	
B7	Linear Decimal Position	X	X	
B9	Display Units	X	X	1 - Fahrenheit 2 - Celsius 3 - Kelvin
D4	Communications Protocol	X	0	1 - Athena +
D5	Communications ID			
D6	Baud Rate	X	X	0 - 75 1 - 150 2 - 300 3 - 600 4 - 1200 5 - 2400 6 - 4800 7 - 9600
D7	Data Format	X	X	0 - 7-0-1 1 - 7-E-1 2 - 7-N-2 3 - 7-0-2 4 - 7-E-2 5 - 8-N-1 6 - 8-0-1 7 - 8-E-1 8 - 8-N-2
D8	Communications Transmit Delay	X	X	
E1	Output 1 Failsafe %	X	X	
E2	Output 2 Failsafe %	X	X	
E3	Loop Break Time	X	X	
E4	Highest Reading	X	X	
E5	Lowest Reading	X	X	
E9	TC Zero Calibration	X	X	
F0	TC Span Calibration	X	X	
F1	RTD Zero Calibration	X	X	
F2	RTD Span Calibration	X	X	
F3	Low-Voltage Zero Calibration	X	X	
F4	Low-Voltage Span Calibration	X	X	

Number	Name	Read	Write	Data Field Value
F5	High-Voltage Zero Calibration	X	X	
F6	High-Voltage Span Calibration	X	X	
F7	Current Zero Calibration	X	X	
F8	Current Span Calibration	X	X	
H2	Autotune State	X	0	0 - Success 1 - Aborted 2 - Error: No PID Output 3 - Error: No Deviation 4 - Error: No Output 5 - Error: Timed Out 6 - Error: Bad Tune 7 - Waiting for PV to Settle 8 - Reverse Tune In Progress 9 - Direct Tune In Progress
H3	Recipe State	X	0	0 - Done 1 - Aborted 2 - Error: Empty Recipe 3 - Error: No Deviation 4 - Recipe On Hold 5 - Ramping 6 - Soaking 7 - Ramp Holdback 8 - Soak Holdback
H5	Current Recipe Segment	X	0	
H6	Active Setpoint	X	X	
H7	Resume Exhaustion Flag	X	0	
H8	LED Status Indicator	X	0	This field contains the ASCII representation of a 16-bit value in which the bit assignments are as follows: 7 - Output 1 Active 6 - Output 2 Active 5 - Sensor Fault 4 - No Significance 3 - Receiving Data 2 - Transmitting Data 1 - No Significance 0 - No Significance Bits numbered from the least significant bit to the most significant bit in increasing numbers starting at 0.
H9	RTD Decimal Zero Calibration	X	X	
I0	RTD Decimal Span Calibration	X	X	

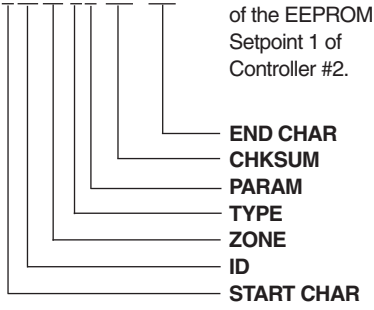
Communications Message Examples

The Read Request

The Read Request is used to query parameter values and it has the following message format:
[STARTCHAR][ID][ZONE][TYPE][PARAM] [CHKSUM][END CHAR]

Field Description:
TYPE Must contain the uppercase letter 'R'.

Request Message	Description
$Ø1Ø1RØ5C1<CR>	Queries the value of the Process Variable of Controller #1.
$Ø1Ø1RØ9C5<CR>	Queries the value of the EEPROM Setpoint 1 of Controller #1
$Ø2Ø1RØ9C6<CR>	Queries the value of the EEPROM Setpoint 1 of Controller #2.



Checksum

The formula for the checksum is:

Checksum =
SUM_OF_MESSAGE_ASCII_ VALUES % 256

Where SUM_OF_MESSAGE_ASCII_ VALUES Is the sum of the ASCII values of all characters in the message (excluding the Start Of Message, the End Of Message, and the checksum characters). Stop and parity bits are not used to compute this sum. % Is the modulus operator.

The value of the checksum shall be represented by the Message Code Numbering System.

Message code numbering system:
100 = AØ
101 = AI
110 = BØ
It is illustrated in parameter table.

Examples of the responses to these requests are given in later sections on **Response Messages.**

The Write Request

Note: ***Temperature values must be in currently selected units (°F, °C, °K or custom units). This selection is determined by parameter number B9.***

The Write Request is used to modify parameter values and it has the following message format: [START CHAR][ID] [ZONE] [TYPE][PARAM][DATA] [CHKSUM][END CHAR]

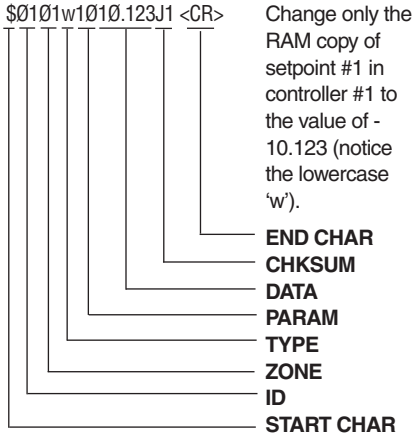
Field Description:

TYPE–This field must contain one of the following two characters.

W–Value in DATA is a positive value.
w–Value in DATA is a negative value.

DATA–A six-character ASCII representation of a numeric value.

Request Message	Description
$Ø1Ø1WØ91Ø.123G7<CR>	Change both the RAM and EEPROM copies of Setpoint #1 in controller #1 to the value of 10.123

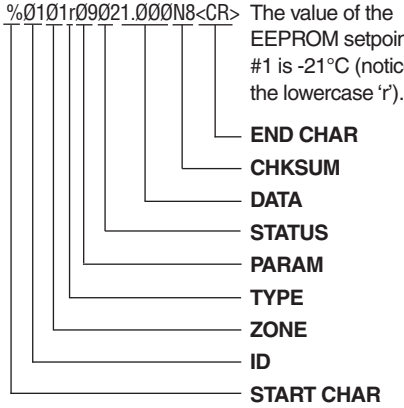


The Read Response:

Note: ***Temperature values are reported in currently selected units (°F, °C, °K or custom units). This selection is determined by parameter number B9.***

The Read Response will be sent in response to a Read Request. Some examples:

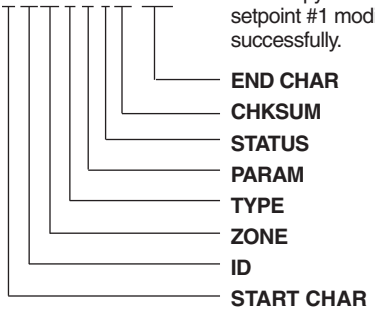
Request Message	Description
%Ø1Ø1RØ5Ø21.123K8<CR>	The value of the Process Variable is 21.123°C.
%Ø2Ø1R1Ø1G7<CR>	A serial transmission has occurred: Framing Error



The Write Response:

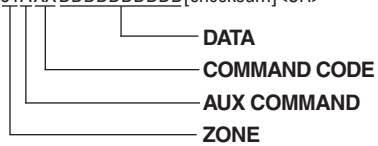
The Write Response will be sent in response to a Write Request. Some examples:

Request Message	Description
%Ø1Ø1WØ93I1<CR>	A serial transmission error has occurred: Parity error. Write failed.
%Ø1Ø1w1ØØK2<CR>	RAM copy of setpoint #1 modified successfully.



Auxiliary Commands

Request Message	Description
$[ID]01AXXDDDDDDDDD[checksum]<CR>	



Command: **Load Parameter Defaults**

Parameter #: 01

Description: Restore all menu parameters to their default values.

Request Data Field: Ignored.

Response Data Field: Ignored.

Command: **Perform Process Low Calibration**

Parameter #: 02

Description: Performs a Low Calibration. The data field in the request message specifies the process. Make sure the prerequisite for the calibration is satisfied before issuing a calibration command. For instance, the RTD calibration command must only be used when the input sensor type is chosen as RTD or RTD w/Decimal.

Request Data Fields: A 10 character ASCII representation of a numeric value specifying what to calibrate.

0 - Thermocouple

1 - RTD, Resistive Thermal Device

2 - Linear

Response Data Field: Ignored.

Command: **Perform Process High Calibration**

Parameter #: 03

Description: Performs a High Calibration. The data field in the request message specifies the process. Make sure the prerequisite for the calibration is satisfied before issuing a calibration command. For instance, the RTD calibration command must only be used when the input sensor type is chosen as RTD or RTD w/Decimal.

Request Data Field: A 10 character ASCII representation of a numeric value specifying what to calibrate.

0 - Thermocouple

1 - RTD, Resistive Thermal Device

2 - Linear

3 - RAS, Remote Analog Setpoint

Troubleshooting

Symptom	Possible Cause	Solution
No power	Power off External fuse blown/ breaker tripped Safety interlock disconnected Separate system limit control latched Open wiring Voltage < 22 Vac/dc	Check external connections
No comm-unications	DIP-switch controller ID incorrectly set Baud rate, protocol, and/or parity settings incorrect RS485 wiring incorrect Assigned PC COM port incorrect	Adjust settings and/or wiring
Sensor error	Input wiring incorrect Wrong input type set Measurement temperature exceeded Loop break Calibration error	1. Check sensor and/or condition 2. Adjust settings

Communications Error Codes

The following table lists all possible errors when receiving or processing request messages. Since only one error can be reported to the Bus Master in each response, the errors are prioritized in order to resolve conflicts when multiple errors occurred for a request. This table lists the errors in the highest to lowest priority order.

Error Code	Error Type	Description
0	No Error	
1	Framing Error	One or more data frames were received with one or more stop bits missing.
2	Hardware Error	The serial hardware encountered an error while receiving one or more data frames.
3	Parity Error	Parity does not match.
4	Bad Request	The request received has a predefined Action Code in it; however, the request is either too short or too long.
5	Bad Checksum	The checksum of the received request does not compute to the checksum received.
6	Bad Zone	Zone ID in request does not exist.
7	Bad Command	The request has an invalid Action Code in it. It cannot be understood.
8	Unsupported	The auxiliary command is not supported Auxiliary Command in the controller.
9	Bad Parameter ID	Parameter requested is either not defined or it's not supported in the controller.
A	Bad Data/High	Data misrepresented in the data field or Limit Exceeded data exceeded the high limit.
B	Write Violation	Attempt to write to a read-only parameter.
C	Active Parameter	Attempt to write to a parameter that is currently active in the controller's menu system.
D	Data Low Limit Exceeded	Data exceeded the low limit.

Specifications

Operating Limits

Ambient Temperature	32° F to 131° F (0° C to 55° C)
Relative Humidity Tolerance	90%, non-condensing
Power	100-250 V, 50/60 Hz (single-phase) 24 Vac ±10% (for 24V option) 22 to 37 Vdc (for 24V option)
Power Consumption	Less than 6 VA

Performance

Accuracy	±0.20% of full scale (±0.10% typical), ±1 digit
Setpoint Resolution	1 count / 0.1 count
Repeatability	±1 count
Temperature Stability	5 µV/°C (maximum)
TC Cold-End Tracking	0.05°C/°C ambient
Noise Rejection	100 dB common mode
Process Sampling	10 Hz (100 ms)

Control Characteristics

Proportional Band	2 to span of sensor
Integral	0 to 9600 seconds
Derivative	0 to 2400 seconds
Cycle Time	200 ms; 1 to 120 seconds
Control Hysteresis	1 to span of sensor
Autotune	Operator initiated
Manual Control	Operator initiated

Mechanical Characteristics

Status Indicators	Discrete LED's for Sensor Error, RXD, TXD, Output 1, Output 2, Power/Run
Connections	Screw terminals
Weight	4.8 oz (136g)
Dimensions	4.8" (12.2 cm) H x 0.9" (2.3 cm) W x 3.0" (7.6 cm) D
Mounting Rail	DIN EN-50-022 (NS-37/7.5)

Inputs

Thermocouple	B, C, E, J, K, N, NNM, R, S, T, Platinel® II Maximum lead resistance 100 ohms for rated accuracy
RTD	Platinum 2- and 3-wire, 100 ohms at 0°C, DIN curve standard (0.00385)
Linear	0-50 mV/10-50 mV, 0-20 mA/4-20 mA, 0-10 mV/0-50 mV, 0-100 mV, 0-1 V/0-5 V, 0-10 V, 1-5 V

Outputs

B	5A/3A (120/240 Vac) relay, normally open
F	4-20 mA, full output to load with 500 ohm impedance, max.
S	20 Vdc pulsed output
T	1A @ 120/240 Vac, solid-state relay, zero voltage-switched

Communications Type

RS-485 Standard

Specifications subject to change without notice.

Range Information

Input	Range
"B"	32 to 3308°F (0 to 1820°C)
"C"	32 to 4199°F (0 to 2315°C)
"E"	-238 to 1832°F (-150 to 1000°C)
"J"	-328 to 1400°F (-200 to 760°C)
"K"	-454 to 2250°F (-270 to 1232°C)
"N"	-450 to 2372°F (-268 to 1300°C)
"NNM"	32 to 2570°F (0 to 1410°C)
"R"	-58 to 3214°F (-50 to 1768°C)

Input	Range
"S"	-58 to 3214°F (-50 to 1768°C)
"T"	-454 to 752°F (-270 to 400°C)
Platinel II	-148 to 2250°F (-100 to 1232°C)

Ordering Information

1ZC – □□ – □ – □ – □□

Input Calibration
Code
CT = Thermocouple
CR = RTD
CS = Compressed RTD
CM = Millivolt Linear
CV = Volt Linear
CC = Current Linear

Output 1
Code
0 = None
B = Relay (N.O.)
F = 4 to 20 mA
S = Pulsed 20 Vdc
T = Solid-State Relay

Output 2
Code
0 = None
B = Relay (N.O.)
F = 4 to 20 mA
S = Pulsed 20 Vdc
T = Solid-State Relay

Special Options

Consult Factory.

Warranty/Repairs

Two-Year Limited Warranty

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Unit Repairs

It is recommended that units requiring service be returned to an authorized service center. Before a controller is returned for service, please consult the service center nearest you. In many cases, the problem can be cleared up over the telephone. When the unit needs to be returned, the service center will ask for a detailed explanation of problems encountered and a Purchase Order to cover any charge. This information should also be put in the box with the unit. This should expedite return of the unit to you.

This document is based on information available at the time of its publication. While efforts have been made to render accuracy to its content, the information contained herein does not purport to cover all details or variations in hardware, nor to provide for every possible contingency in connection with the installation and maintenance. Features may be described herein which are not present in all hardware. Athena Controls assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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