Atlas Scientific™
Environmental Robotics

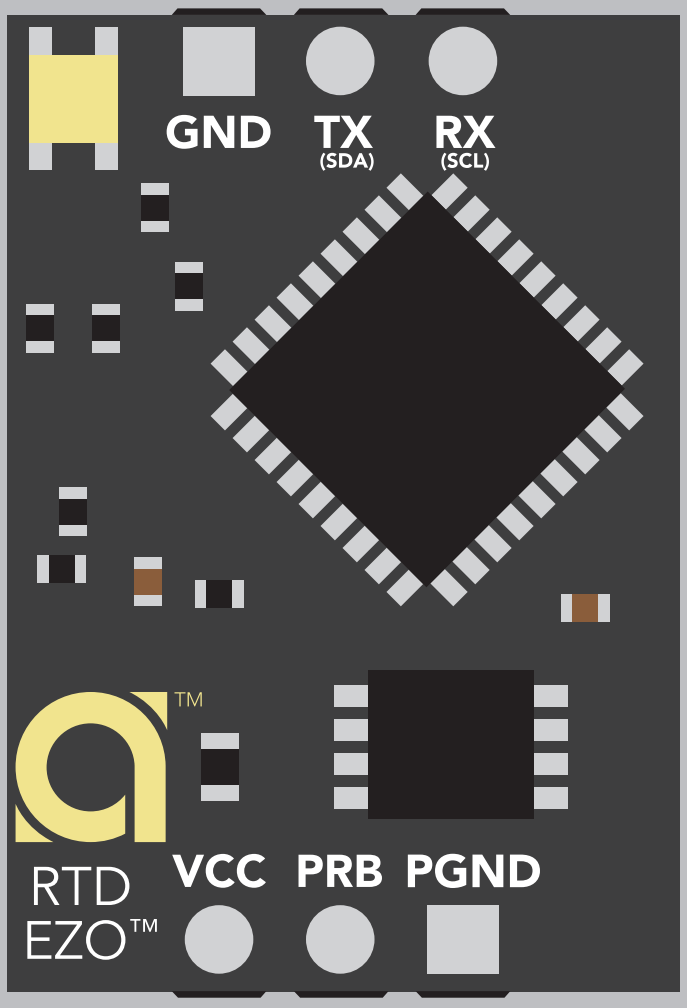
V 3.7

Revised 10/24

EZO-RTD™

Embedded Temperature Circuit

Reads	**Temperature**
Range	**-126.000 °C – 1254 °C**
Resolution	**0.001**
Accuracy	**+/– (0.1 + 0.0017 x °C)**
Response time	**1 reading per sec**
Supported probes	**Any type & brand PT-100 or PT-1000 RTD**
Calibration	**Single point**
Temperature output	**°C, °K, or °F**
Data protocol	**UART & I²C**
Default I²C address	**102 (0x66)**
Operating voltage	**3.3V – 5.5V**
Data format	**ASCII**
Onboard Data Logger	**50 Readings**



Electrical Isolation not needed

RoHS COMPLIANT

Written by Jordan Press
Designed by Noah Press

This is an evolving document, check back for updates.

✓ Available data protocols

UART

Default

I²C

X Unavailable data protocols

SPI

Analog

RS-485

Mod Bus

4–20mA

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STOP

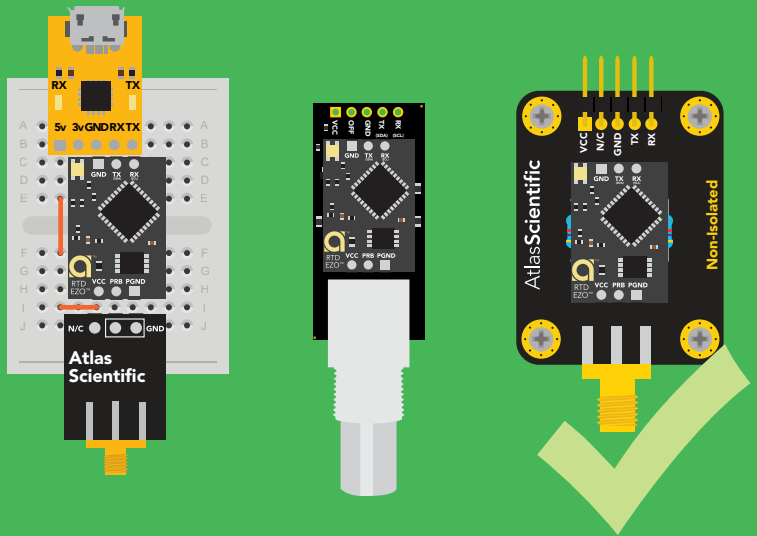
SOLDERING THIS DEVICE VOIDS YOUR WARRANTY.

Are there specific soldering instructions? **Yes, see page 66.**

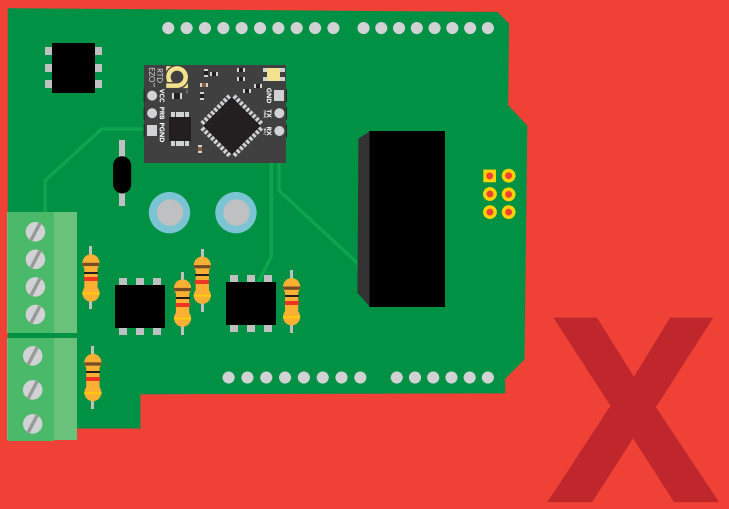
Can you make a warranty claim after soldering? **No.**

If you have not used this product before; Observe how a properly working sensor behaves *BEFORE* embedding it into your PCB.

Get this device working using one of these methods first.



Do not embed before you have experience with this sensor.



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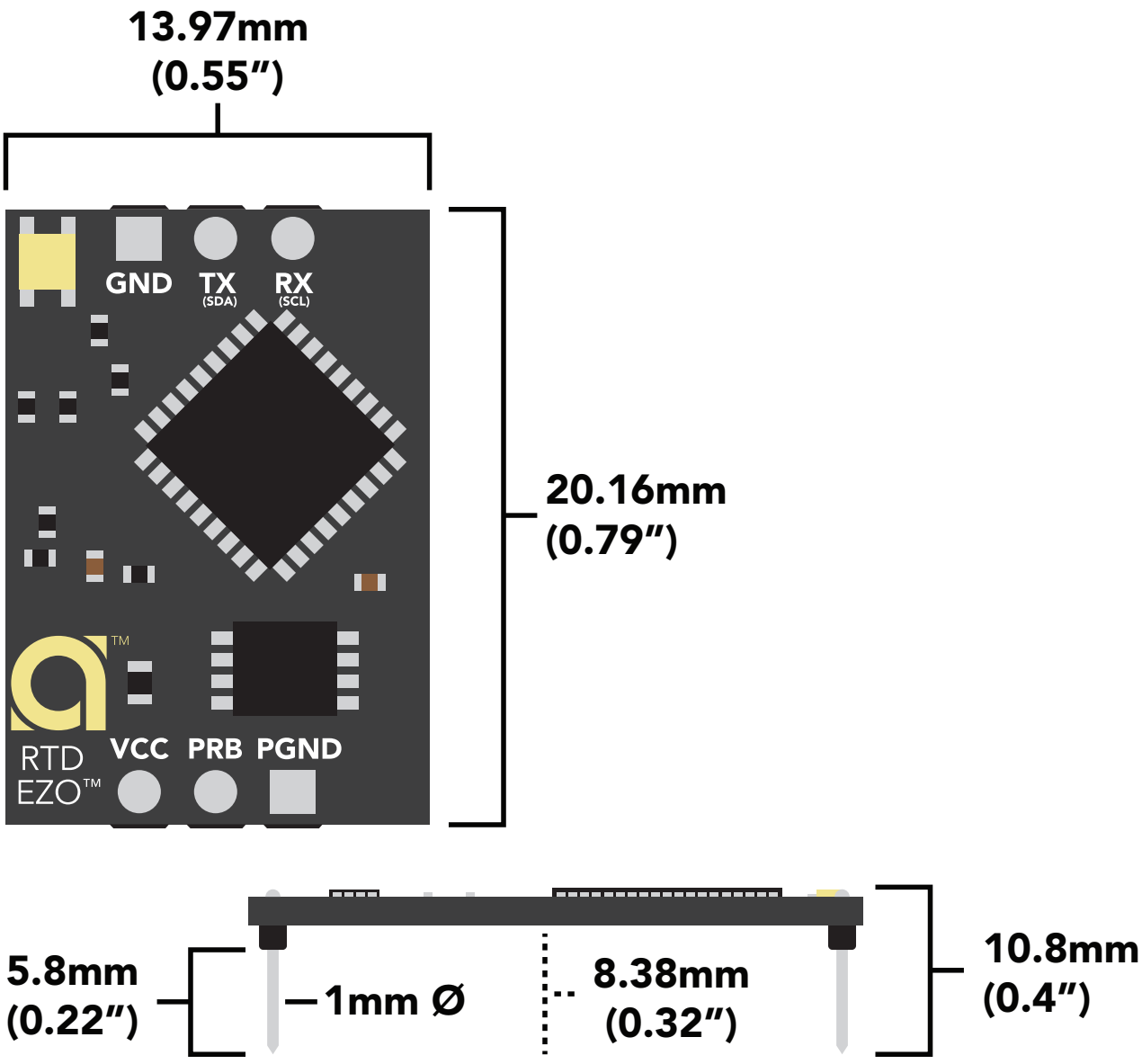
EZO™ circuit dimensions



Power consumption

	LED	MAX	STANDBY	SLEEP
5V	ON	16 mA	15.4 mA	0.4 mA
	OFF	15.3 mA	15 mA	
3.3V	ON	14.3 mA	13.8 mA	0.09 mA
	OFF	14 mA	13.6 mA	

Absolute max ratings

Parameter	MIN	TYP	MAX
Storage temperature (EZO™ RTD)	-65 °C		125 °C
Operational temperature (EZO™ RTD)	-40 °C	25 °C	85 °C
VCC	3.3V	5V	5.5V

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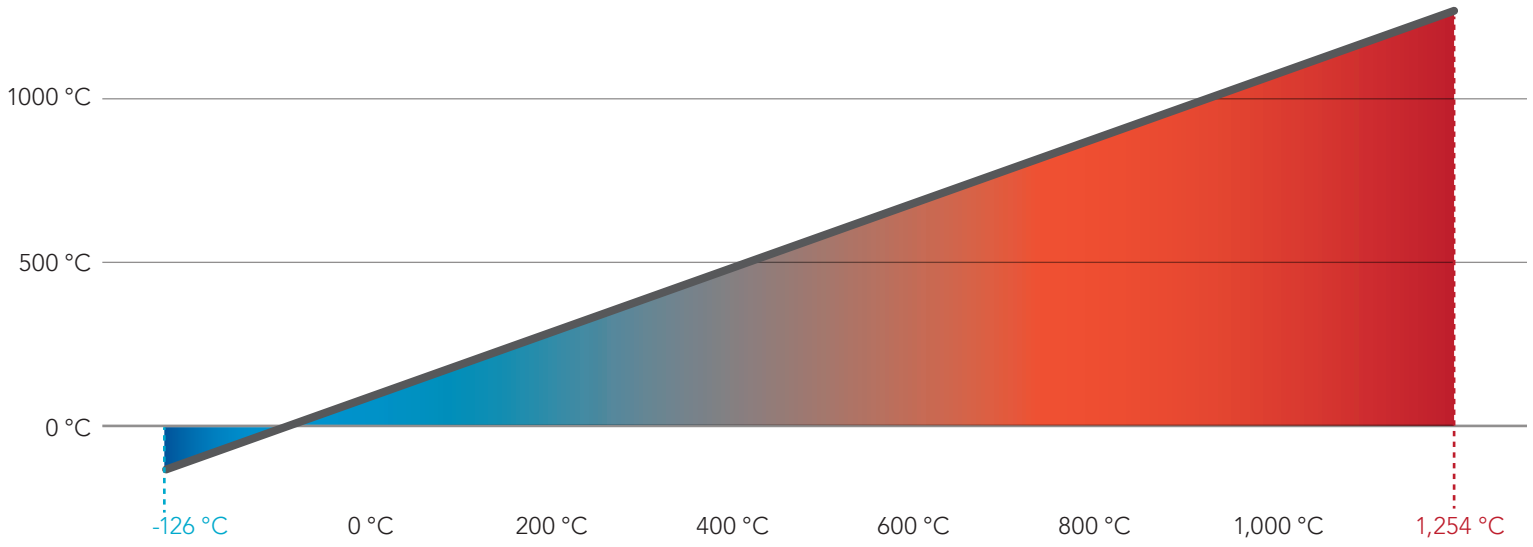
Electrical isolation

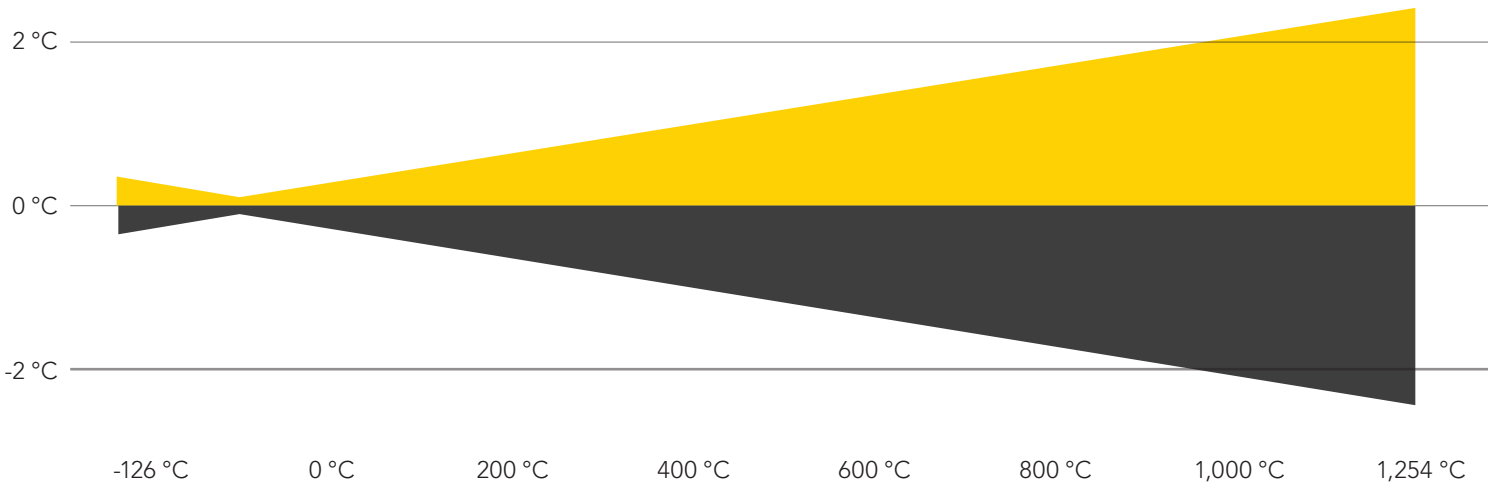
The measurement process of the EZO-RTD involves detecting resistance changes, the potential for noise to affect the accuracy of this measurement is extremly low.

Electrical isolation is often necessary to prevent noise from external sources (*other probes & devices)* from contaminating the readings. However; The design and method of measurement used by the EZO-RTD are inherently stable, making electrical isolation unnecessary for accurate temperature readings.

EZO-RTD™ temperature sensing range



EZO-RTD™ temperature sensing accuracy



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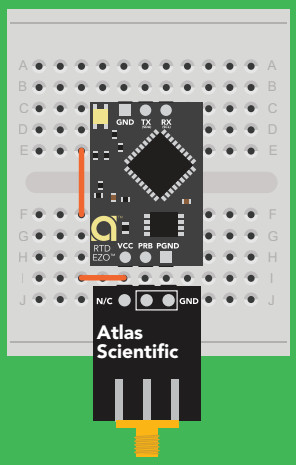
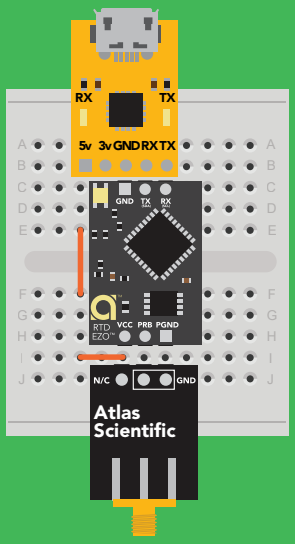
✓ Correct wiring

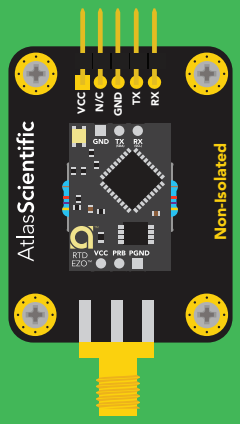


Bread board

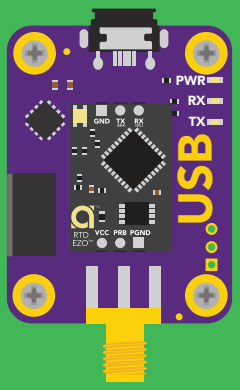


Bread board via USB

Carrier board



Non-Isolated
EZO™ Carrier Board

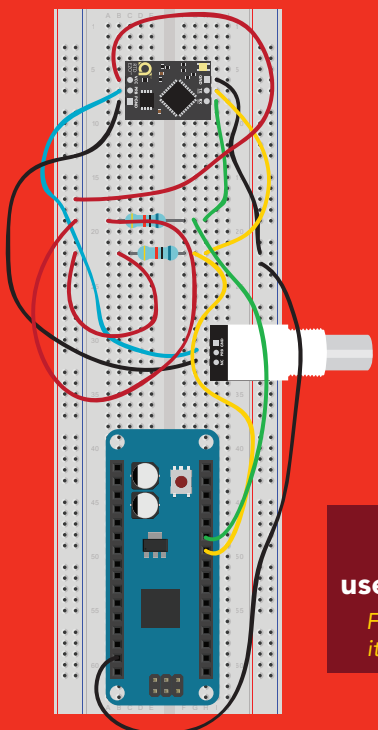


USB
Carrier board

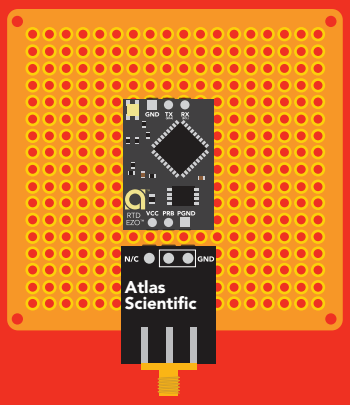
X Incorrect wiring

Extended leads

Sloppy setup

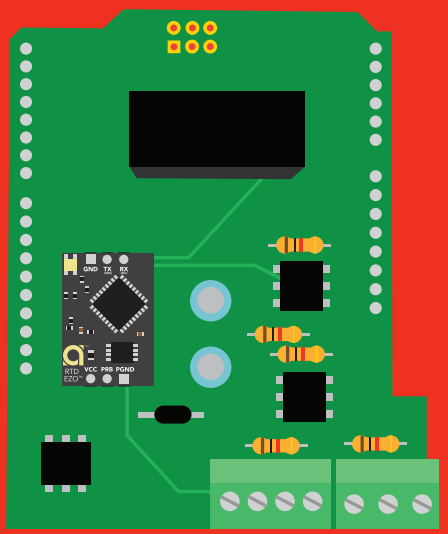


Perfboards or Protoboards



NEVER
use Perfboards or Protoboards
Flux residue and shorting wires make it very hard to get accurate readings.

*Embedded into your device



***Only after you are familar with EZO™ circuits operation**

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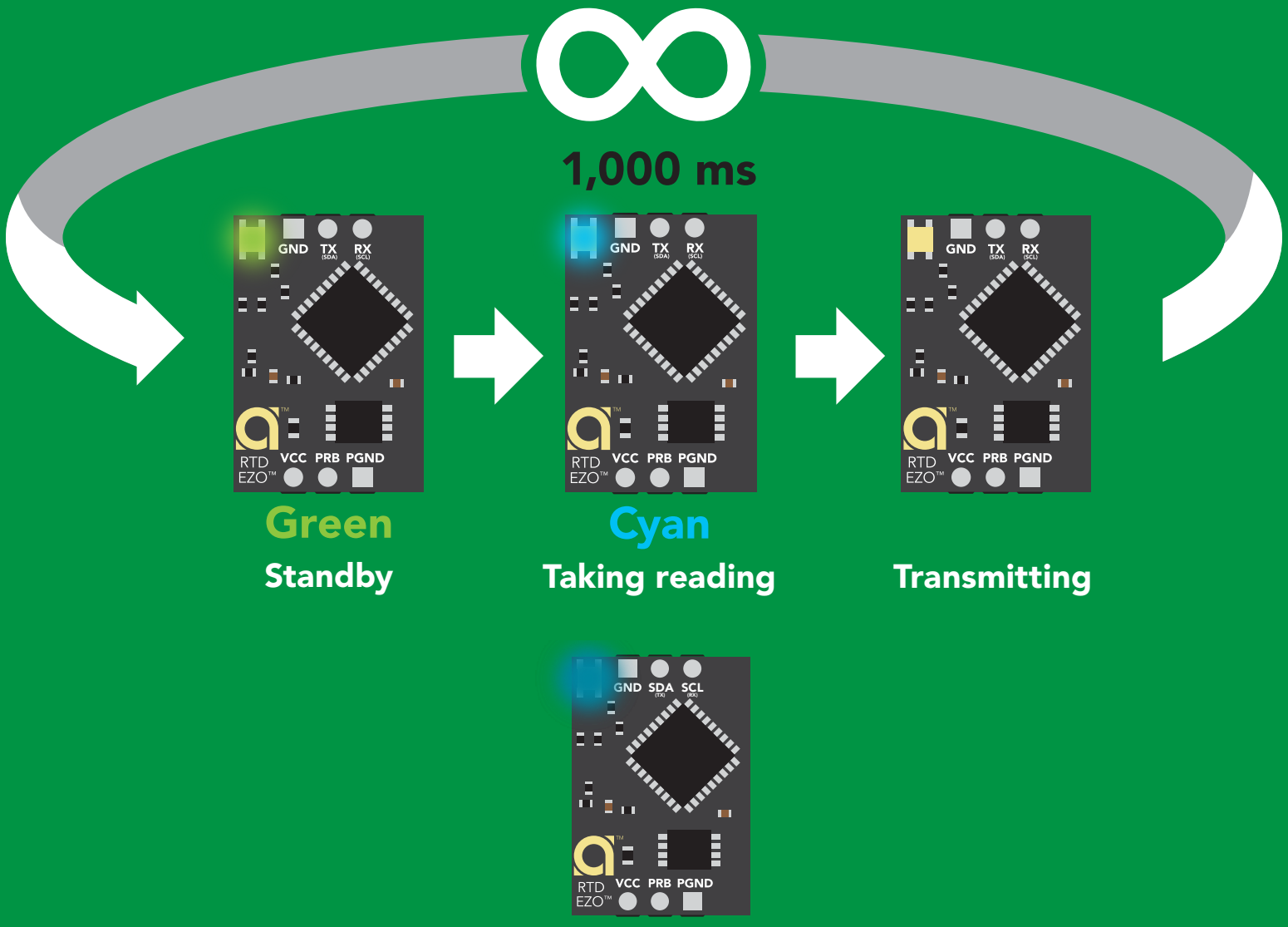
Environmental Robotics

Default state
UART mode

Baud	**9,600**	**With probe**	**ttt.ttt**
Temperature	**°C**	**Without probe**	**-1023.000**
Readings	**continuous**	**LED**	**on**
Speed	**1 reading per second**		



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UART mode

8 data bits	no parity
1 stop bit	no flow control

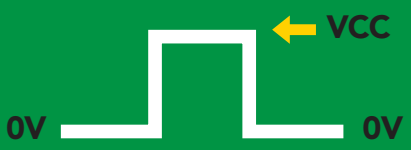
Baud

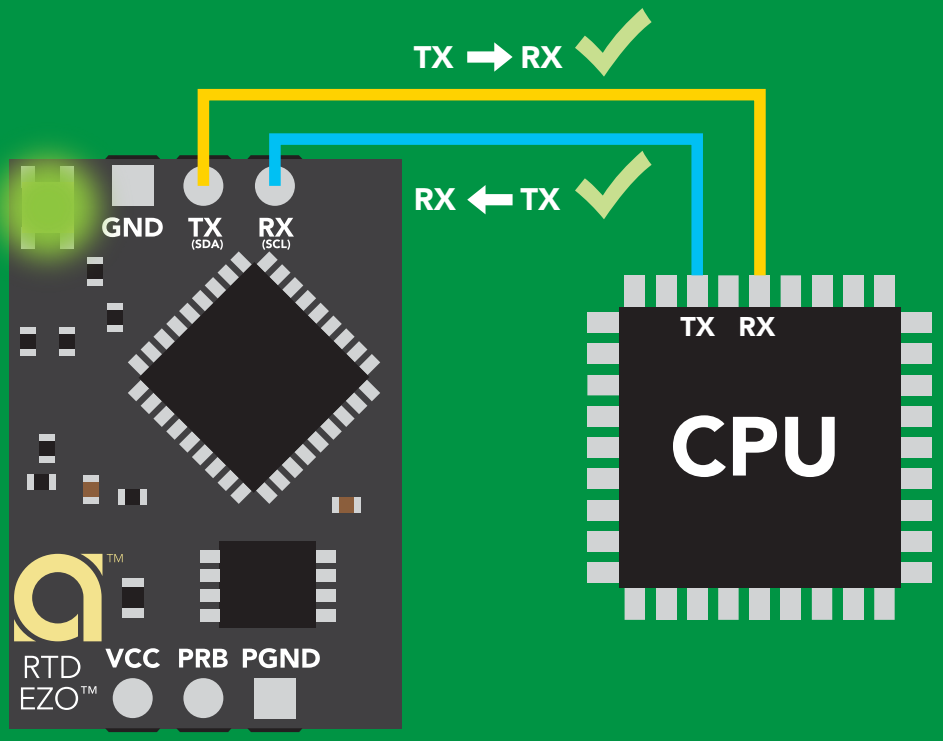
300
1,200
2,400
9,600 default
19,200
38,400
57,600
115,200

RX
Data in

TX
Data out

Vcc 3.3V – 5.5V





Data format

Reading	temperature	**Data type**	floating point
Units	°C, °K, or °F	**Decimal places**	3
Encoding	ASCII	**Smallest string**	4 characters
Format	string	**Largest string**	40 characters
Terminator	carriage return		

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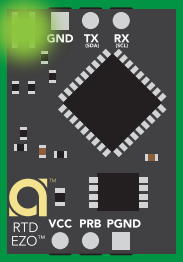
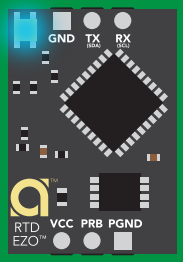
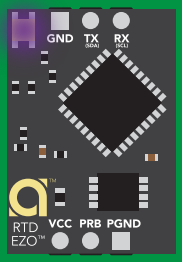
LED color definition



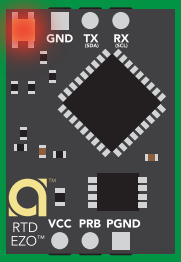
Green
UART standby



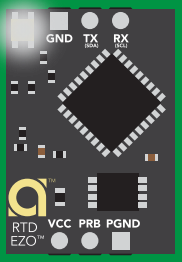
Cyan
Taking reading



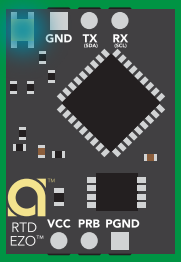
Purple
Changing baud rate



Red
Command not understood



White
Find



Blue
I2C standby

	LED ON
5V	**+0.4 mA**
3.3V	**+0.2 mA**

Settings that are retained if power is cut

Baud rate
Calibration
Continuous mode
Temperature scale
Device name
Enable/disable response codes
Hardware switch to I²C mode
LED control
Protocol lock
Software switch to I²C mode

Settings that are *NOT* retained if power is cut

Find
Sleep mode

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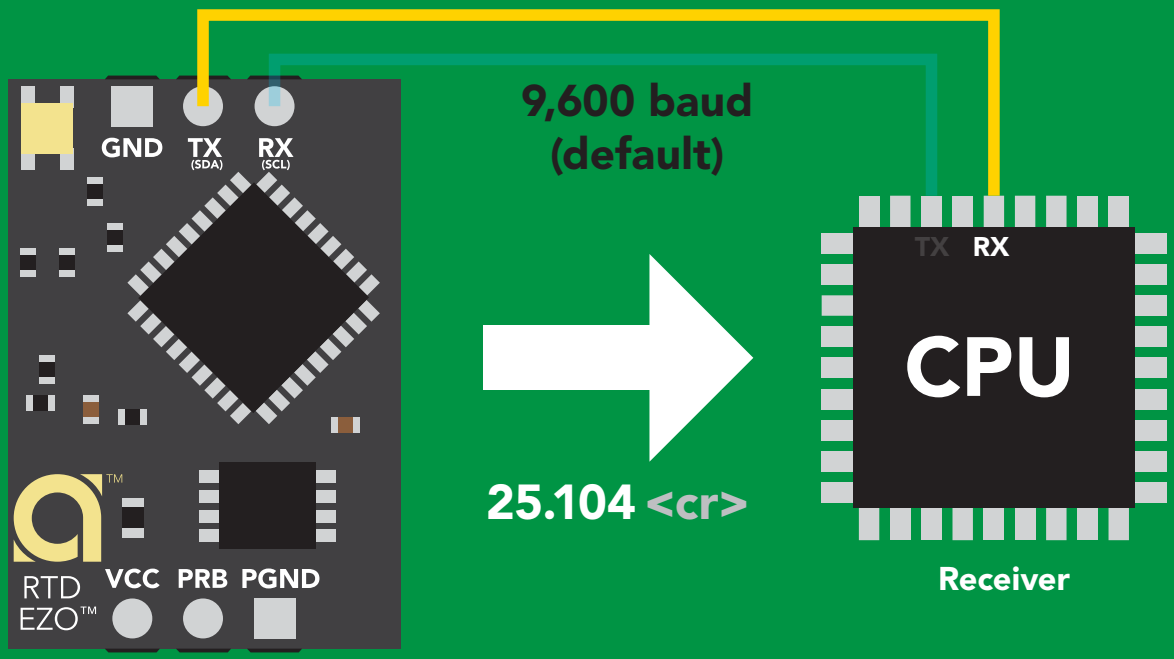
Receiving data from device

2 parts

ASCII data string
Command

Carriage return <cr>
Terminator



Advanced

ASCII:	2	5	.	1	0	4	<cr>
Hex:	32	35	2E	31	30	34	0D
Dec:	50	53	46	49	48	52	13

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Sending commands to device

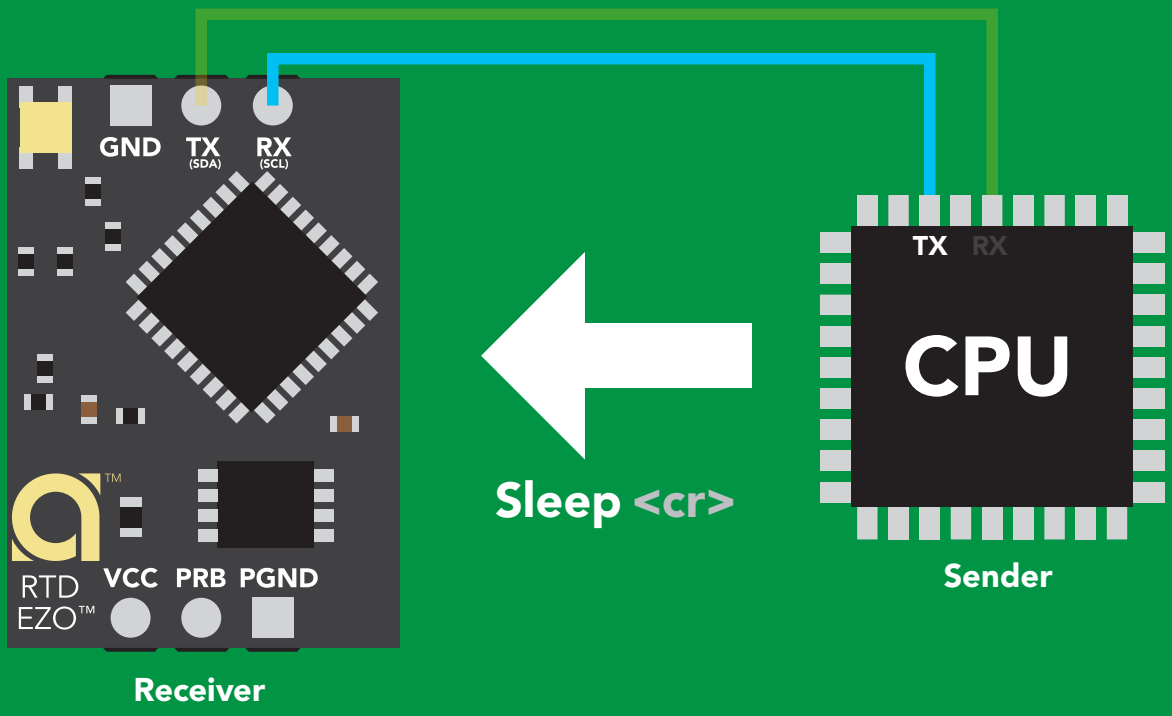
2 parts

Command (not case sensitive)

ASCII data string

Carriage return <cr>

Terminator



Advanced

ASCII:	S	l	e	e	p	<cr>
Hex:	53	6C	65	65	70	0D
Dec:	83	108	101	101	112	13

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UART mode
command quick reference

All commands are ASCII strings or single ASCII characters.

Command	Function		Default state
Baud	change baud rate	pg. 30	9,600
C	enable/disable continuous reading	pg. 16	enabled
Cal	performs calibration	pg. 18	n/a
D	enable/disable data logger	pg. 22	disabled
Export	export calibration	pg. 19	n/a
Factory	enable factory reset	pg. 32	n/a
Find	finds device with blinking white LED	pg. 15	n/a
i	device information	pg. 26	n/a
I2C	change to I²C mode	pg. 33	not set
Import	import calibration	pg. 20	n/a
L	enable/disable LED	pg. 14	enabled
M	memory recall/clear	pg. 23	n/a
Name	set/show name of device	pg. 25	not set
Plock	enable/disable protocol lock	pg. 31	disabled
R	returns a single reading	pg. 17	n/a
S	temperature scale (°C, °K, °F)	pg. 21	celsius
Sleep	enter sleep mode/low power	pg. 29	n/a
Status	retrieve status information	pg. 28	n/a
*OK	enable/disable response codes	pg. 27	enable

LED control

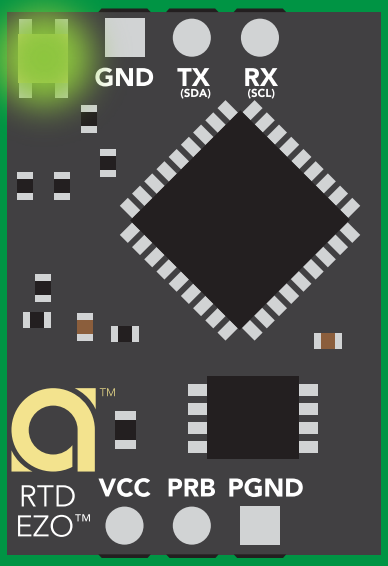
Command syntax

L,1 <cr> LED on **default**

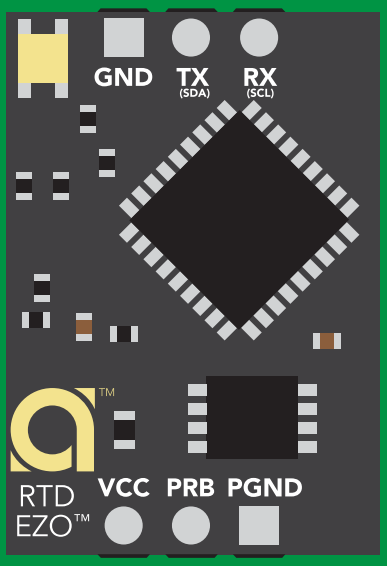
L,0 <cr> LED off

L,? <cr> LED state on/off?

Example	Response
L,1 <cr>	*OK <cr>
L,0 <cr>	*OK <cr>
L,? <cr>	?L,1 <cr> or ?L,0 <cr> *OK <cr>



L,1



L,0

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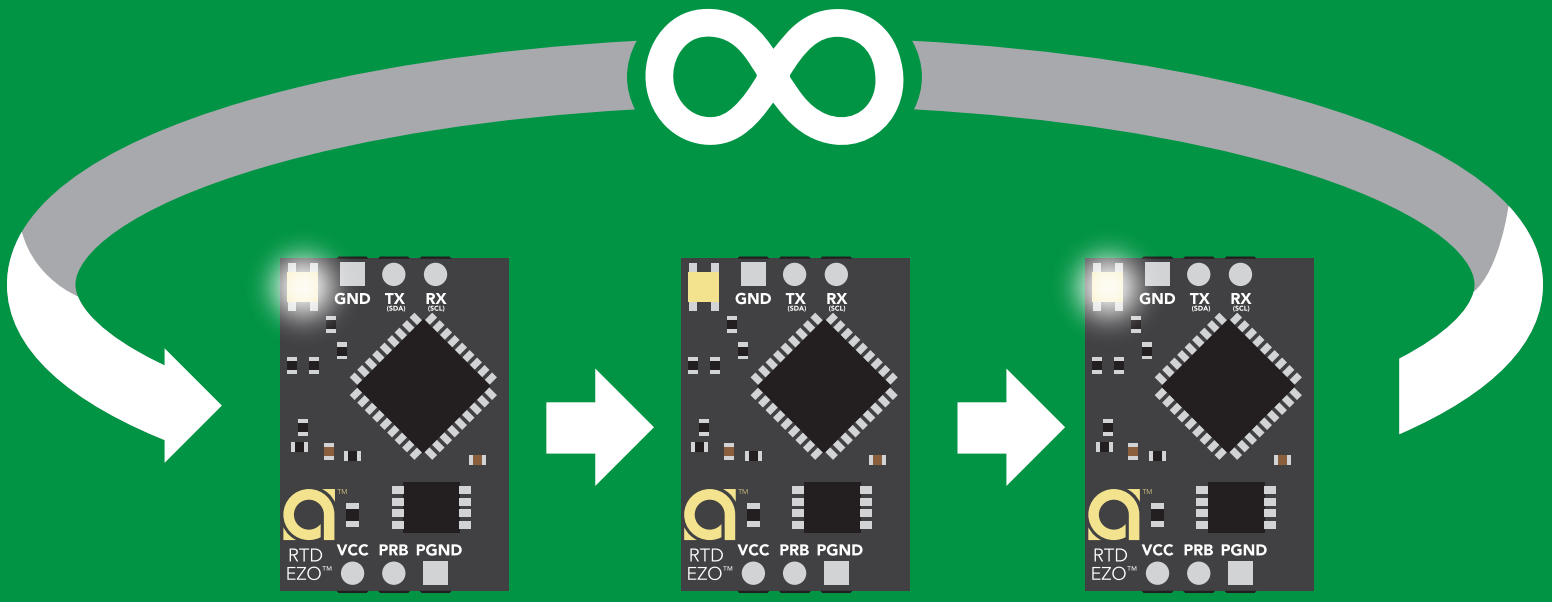
Find

Command syntax

This command will disable continuous mode
Send any character or command to terminate find.

Find <cr> **LED rapidly blinks white, used to help find device**

Example	Response
Find <cr>	***OK** <cr>



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Continuous reading mode

Command syntax

C,1 <cr> enable continuous readings once per second **default**

C,n <cr> continuous readings every n seconds (n = 2 to 99 sec)

C,0 <cr> disable continuous readings

C,? <cr> continuous reading mode on/off?

Example	Response
C,1 <cr>	*OK <cr> °C (1 sec) <cr> °C (2 sec) <cr> °C (n sec) <cr>
C,30 <cr>	*OK <cr> °C (30 sec) <cr> °C (60 sec) <cr> °C (90 sec) <cr>
C,0 <cr>	*OK <cr>
C,? <cr>	?C,1 <cr> or ?C,0 <cr> or ?C,30 <cr> *OK <cr>

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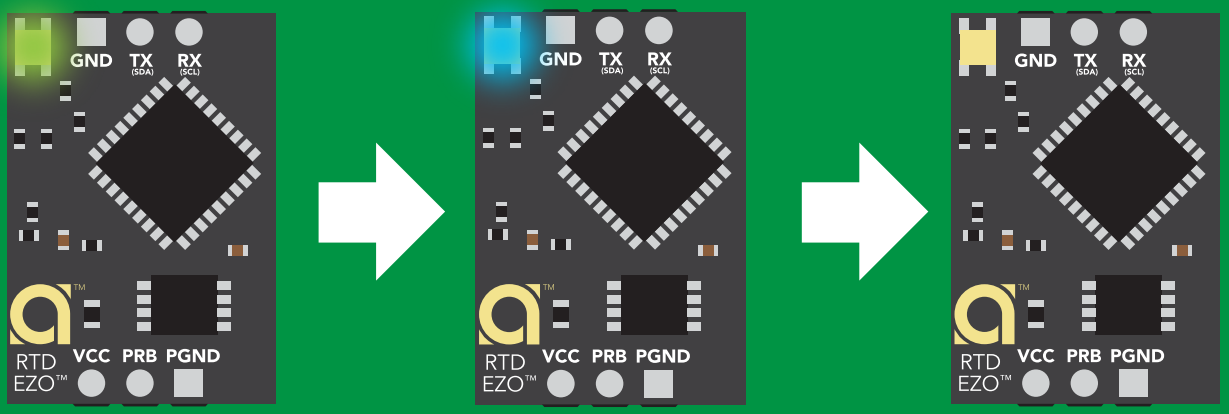
Single reading mode

Command syntax

R <cr> takes single reading

Example	Response
R <cr>	25.104 <cr> *OK <cr>



Green
Standby

Cyan
Taking reading

Transmitting

600 ms

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Calibration

Command syntax

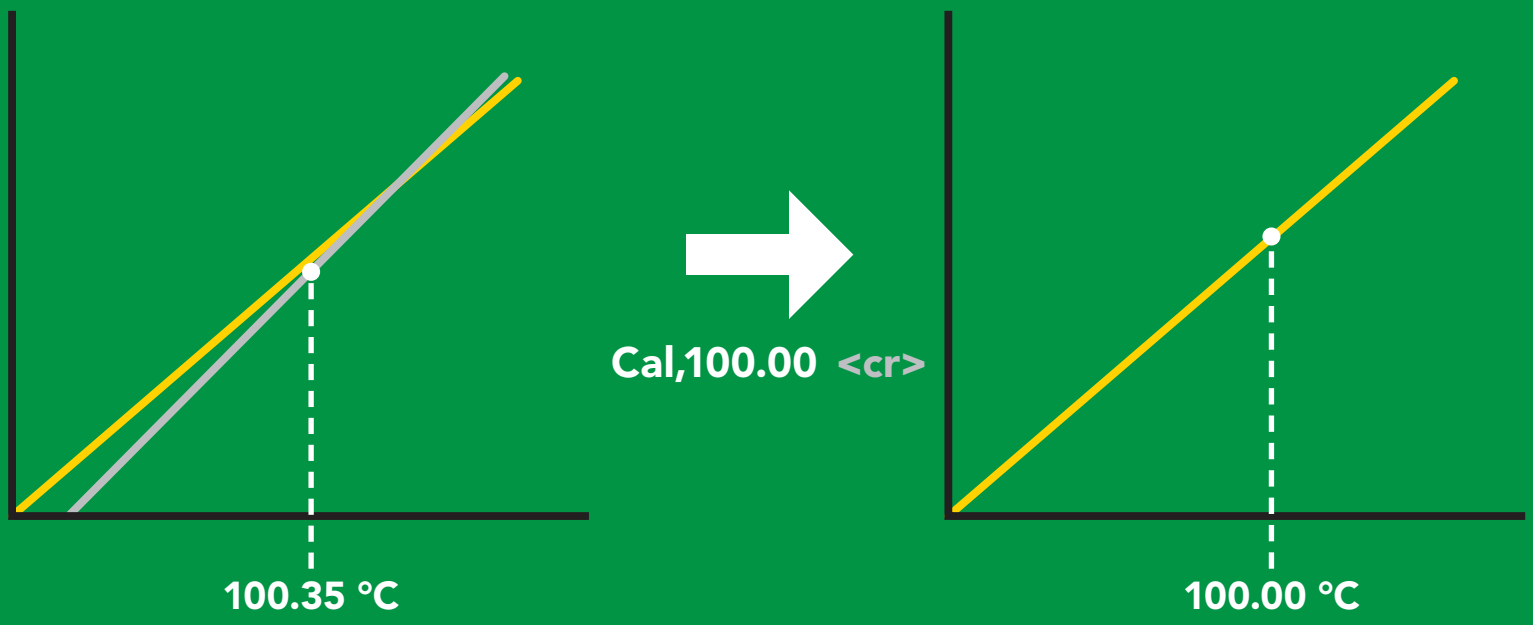
The EZO™ RTD circuit uses single point calibration.

Cal,t <cr> t = any temperature

Cal,clear <cr> delete calibration data

Cal,? <cr> device calibrated?

Example	Response
Cal,100.00 <cr>	*OK <cr>
Cal,clear <cr>	*OK <cr>
Cal,? <cr>	?Cal,1 <cr> or ?Cal,0 <cr> *OK <cr>



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Export calibration

Command syntax

Export: Use this command to download calibration settings

Export,?	<cr>	calibration string info
Export	<cr>	export calibration string from calibrated device

Example

Response

Export,? <cr>

10,120 <cr>

Response breakdown

10, **120**

↑ # of strings to export

↑ # of bytes to export

Export strings can be up to 12 characters long, and is always followed by <cr>

Export <cr> — **59 6F 75 20 61 72 <cr>** **(1 of 10)**

Export <cr> — **65 20 61 20 63 6F <cr>** **(2 of 10)**

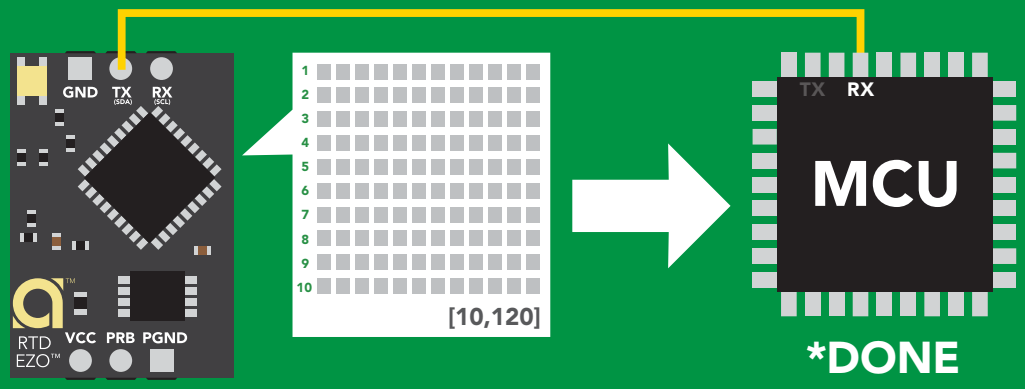
(7 more) — ⋮

Export <cr> — **6F 6C 20 67 75 79 <cr>** **(10 of 10)**

Export <cr> — ***DONE**

Disabling *OK simplifies this process

Export <cr>



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Import calibration

Command syntax

Import: Use this command to upload calibration settings to one or more devices.

Import,n <cr> import calibration string to new device

Example

Import, 59 6F 75 20 61 72 <cr> (1 of 10)

Import, 65 20 61 20 63 6F <cr> (2 of 10)

⋮

Import, 6F 6C 20 67 75 79 <cr> (10 of 10)

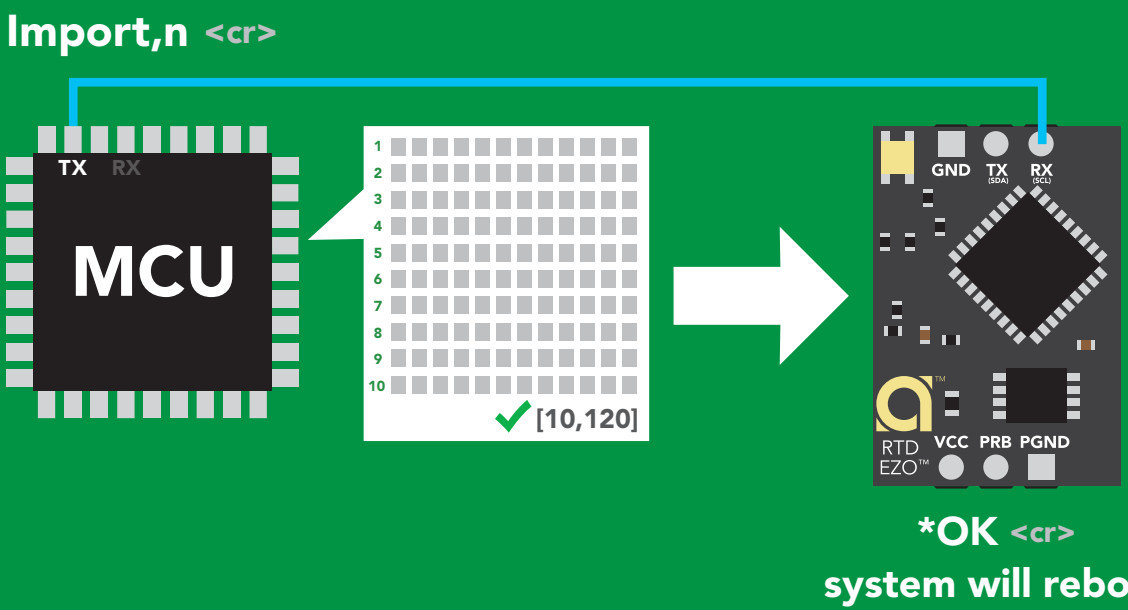
Response

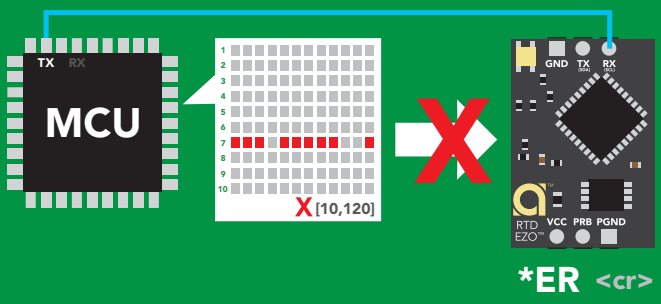
*OK <cr>

*OK <cr>

⋮

*OK <cr>





*** If one of the imported strings is not correctly entered, the device will not accept the import, respond with *ER and reboot.**

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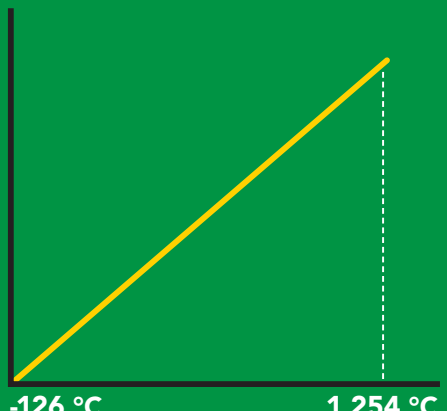
Temperature scale (°C, °K, °F)

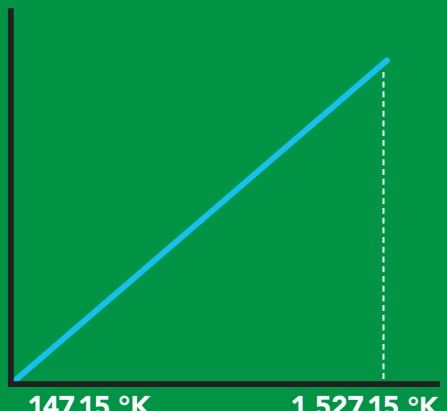
Command syntax

S,c <cr> celsius **default**
S,k <cr> kelvin
S,f <cr> fahrenheit
S,? <cr> temperature scale?

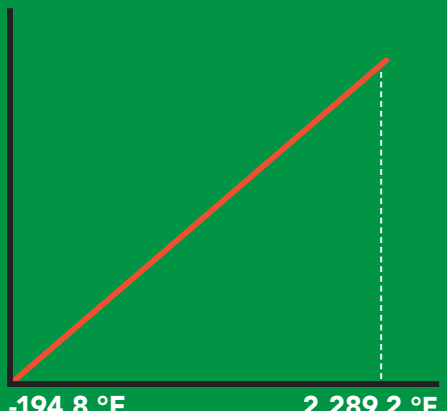
Example	Response
S,c <cr>	*OK <cr>
S,k <cr>	*OK <cr>
S,f <cr>	*OK <cr>
S,? <cr>	?S,c <cr> or ?S,k <cr> or ?S,f <cr> *OK <cr>



(celsius)



(kelvin)



(fahrenheit)

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Enable/disable data logger

Command syntax

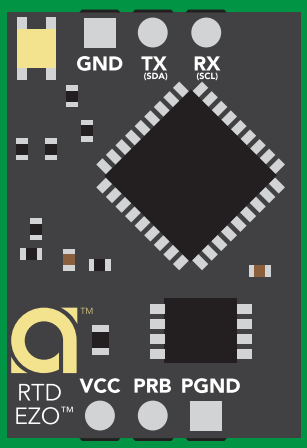
The time period (n) is in 10 second intervals and can be any value from 1 to 32,000.

D,n <cr> n = (n x 10 seconds)

D,0 <cr> disable **default**

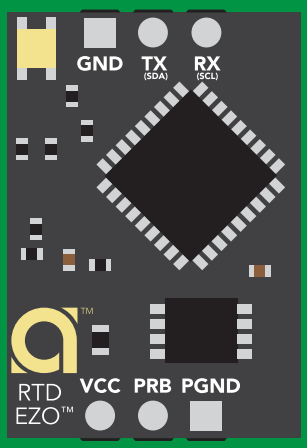
D,? <cr> data logger storage interval?

Example	Response
D,6 <cr>	*OK <cr>
D,0 <cr>	*OK <cr>
D,? <cr>	?D,6 <cr> *OK <cr>



D,6

60 seconds



* <cr>

* indicates reading has been logged

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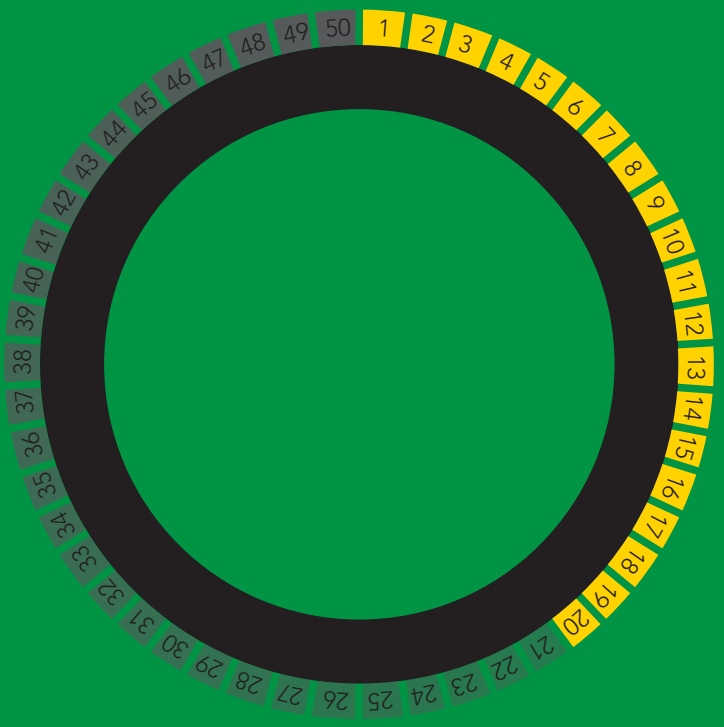
Memory recall

Command syntax

Disable data logger to recall memory.

M	<cr>	recall 1 sequential stored reading
M,all	<cr>	recall all readings in a CSV string
M,?	<cr>	display memory location of last stored reading

Example	Response
M <cr>	1,100.00 <cr> 2,104.00 <cr> *OK <cr>
M,all <cr>	100.00,104.00,108.00,112.00 <cr> Oldest Newest
M,? <cr>	?M,4 <cr> *OK <cr>



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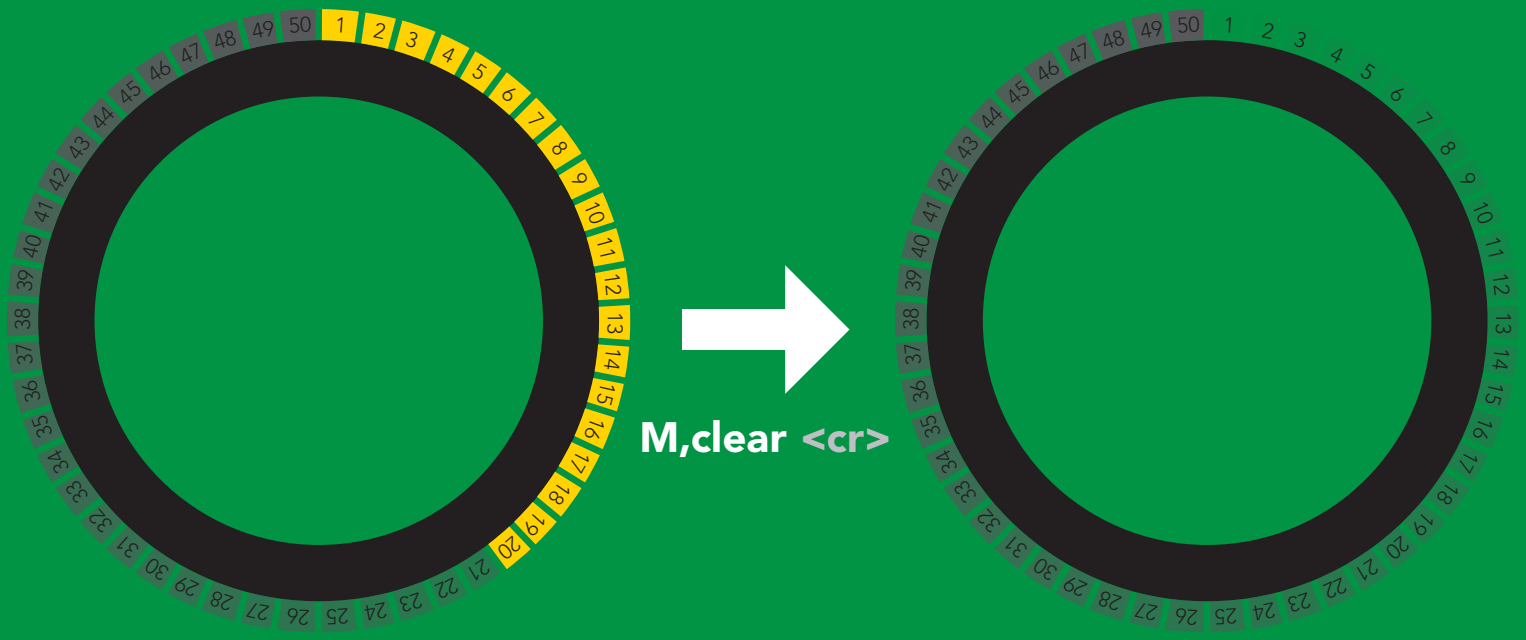
Memory clear

Command syntax

M,clear <cr> clear all stored memory

Example	Response
M,clear <cr>	*OK <cr>



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Reading device status

Command syntax

Status <cr> **voltage at Vcc pin and reason for last restart**

Example	Response
Status <cr>	**?Status,P,5.038** <cr> ***OK** <cr>

Response breakdown

?Status, P, 5.038

- P, → Reason for restart
- 5.038 → Voltage at Vcc

Restart codes

P	powered off
S	software reset
B	brown out
W	watchdog
U	unknown

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Sleep mode/low power

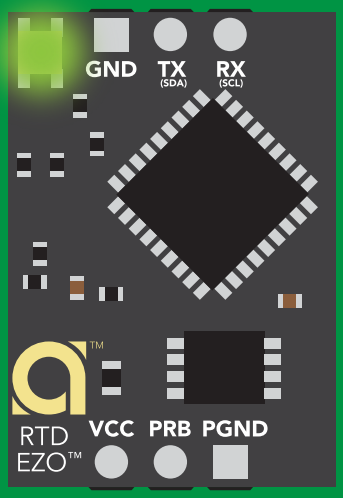
Command syntax

Send any character or command to awaken device.

Sleep <cr> enter sleep mode/low power

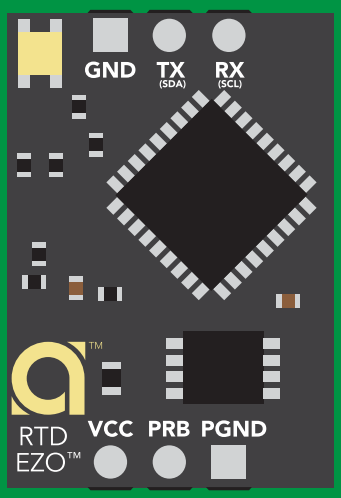
Example	Response
Sleep <cr>	*OK <cr> *SL <cr>
Any command	*WA <cr> wakes up device

	STANDBY	SLEEP
5V	15.40 mA	0.4 mA
3.3V	13.80 mA	0.09 mA



Standby
15.40 mA

Sleep <cr>



Sleep
3.00 mA

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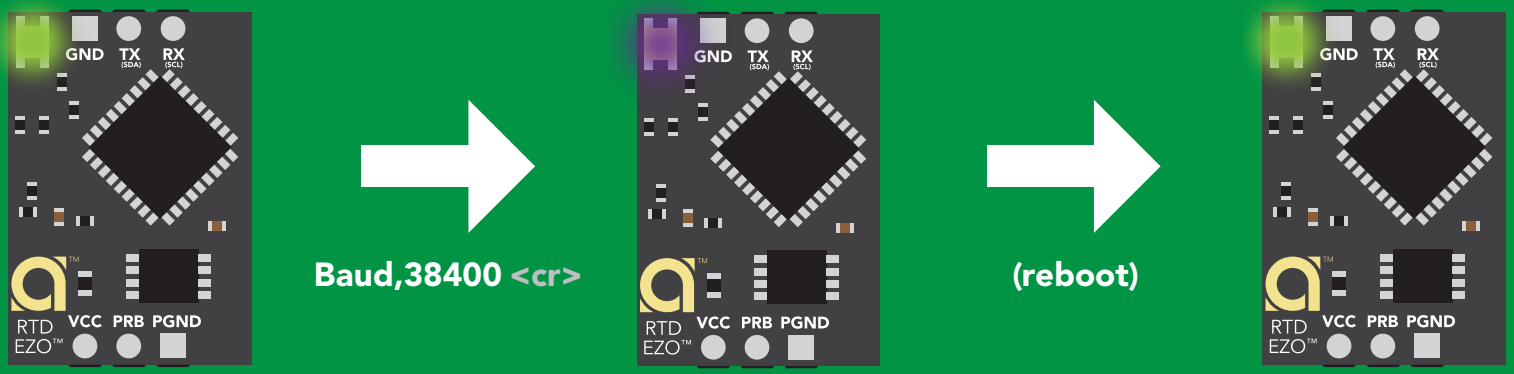
Change baud rate

Command syntax

Baud,n <cr> change baud rate

Example	Response
Baud,38400 <cr>	*OK <cr>
Baud,? <cr>	?Baud,38400 <cr> *OK <cr>

n =
- 300
- 1200
- 2400
- **9600 default**
- 19200
- 38400
- 57600
- 115200



Standby

Changing baud rate

*OK <cr>

Standby

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Protocol lock

Command syntax

Locks device to UART mode.

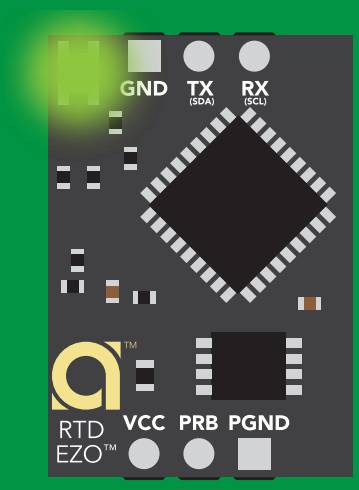
Plock,1 <cr> enable Plock

Plock,0 <cr> disable Plock **default**

Plock,? <cr> Plock on/off?

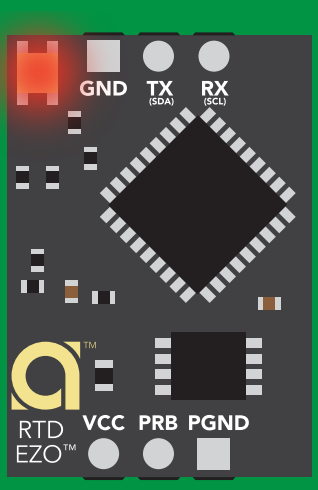
Example	Response
Plock,1 <cr>	*OK <cr>
Plock,0 <cr>	*OK <cr>
Plock,? <cr>	?Plock,1 <cr> or ?Plock,0 <cr>

Plock,1



*OK <cr>

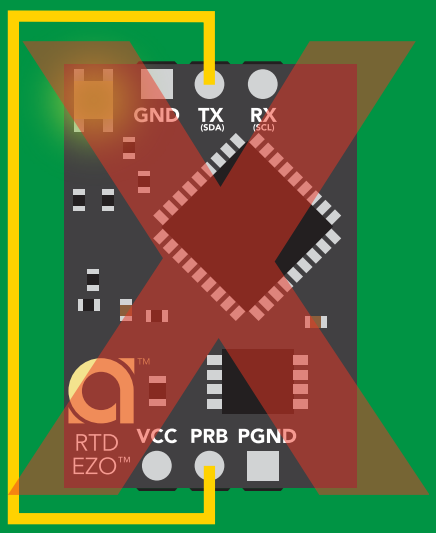
I2C,100



cannot change to I²C

*ER <cr>

Short



cannot change to I²C

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Factory reset

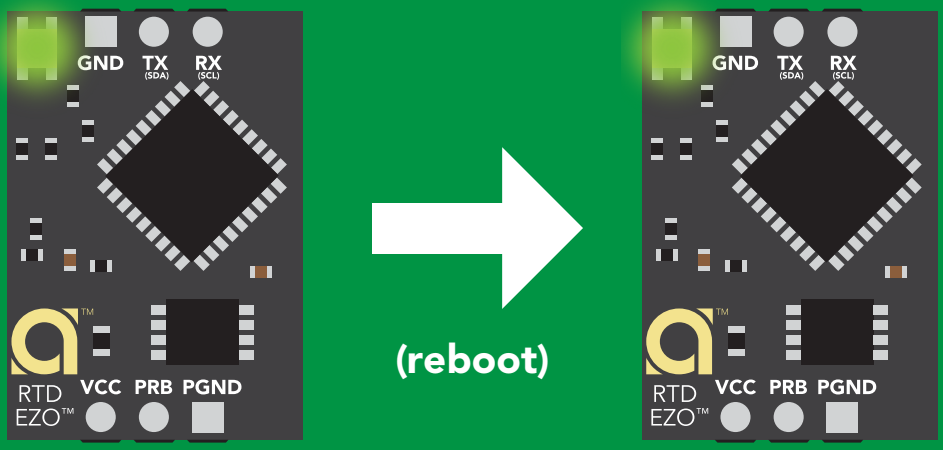
Clears calibration
LED on
"*OK" enabled
Clears data logger

Command syntax

Factory <cr> enable factory reset

Example	Response
Factory <cr>	***OK** <cr>

Factory <cr>



***OK** <cr>

***RS** <cr>
***RE** <cr>

Baud rate will not change

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Change to I²C mode

Command syntax

Default I²C address 102 (0x66)

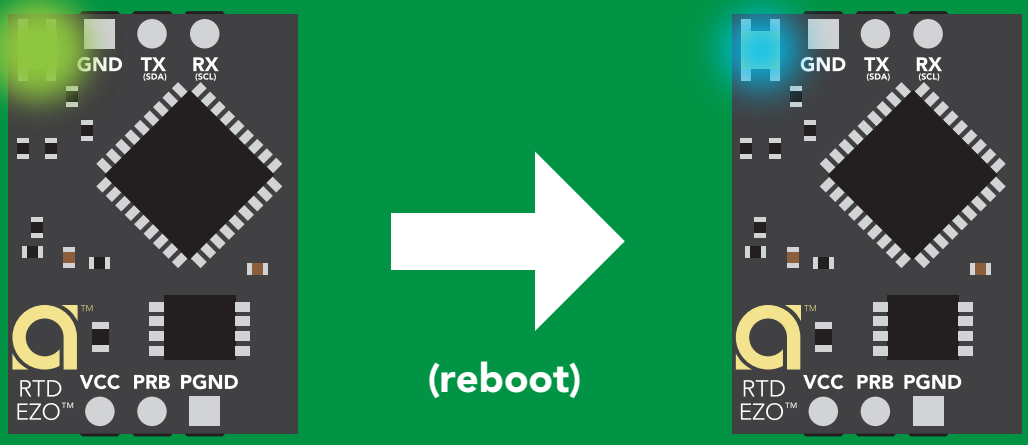
I2C,n <cr> sets I²C address and reboots into I²C mode

n = any number 1 – 127

Example	Response
I2C,100 <cr>	*OK (reboot in I²C mode)

Wrong example	Response
I2C,139 <cr> n ≯ 127	*ER <cr>

I2C,100



Green
*OK <cr>

Blue
now in I²C mode

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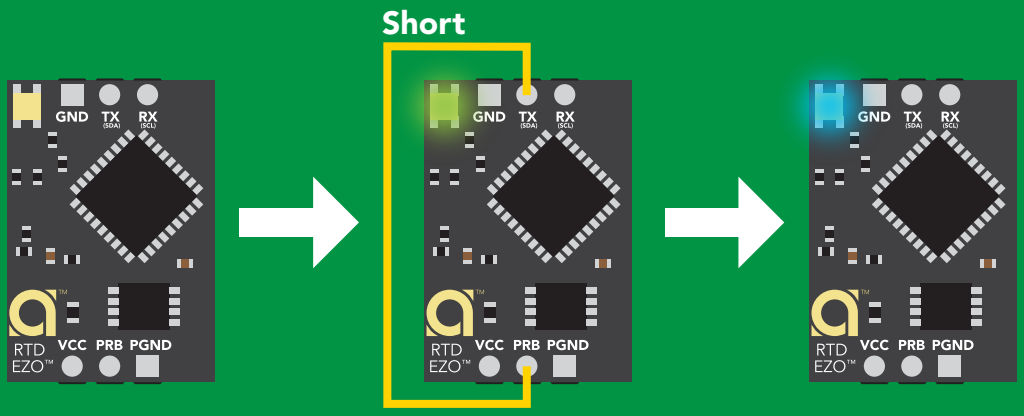
Manual switching to I²C

- Disconnect ground (power off)
- Disconnect TX and RX
- Connect TX to PRB
- Confirm RX is disconnected
- Connect ground (power on)
- Wait for LED to change from Green to Blue
- Disconnect ground (power off)
- Reconnect all data and power

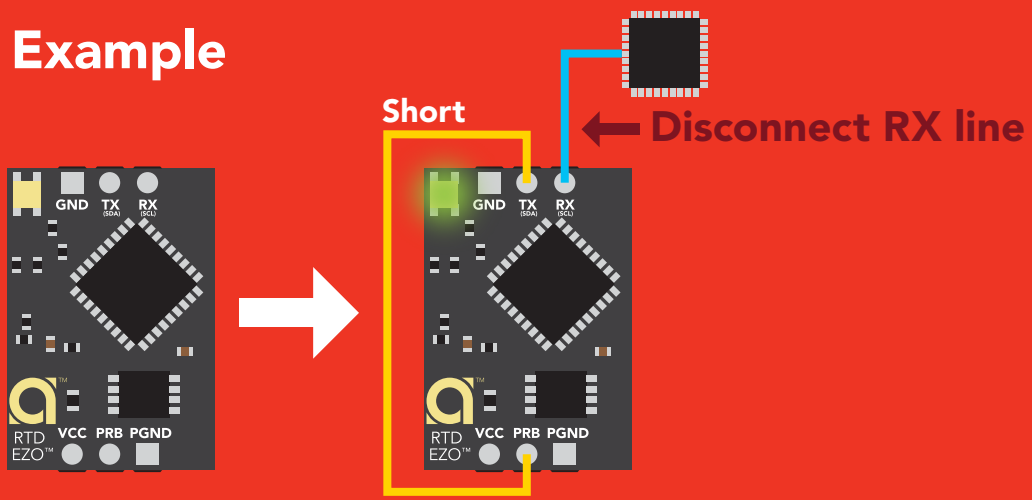
Connecting TX to PRB only works for the EZO-RTD™ and the EZO-FLO™ circuits

Manually switching to I²C will set the I²C address to 102 (0x66)

Example



Wrong Example



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I²C mode

The I²C protocol is *considerably more complex* than the UART (RS–232) protocol. Atlas Scientific assumes the embedded systems engineer understands this protocol.

To set your EZO™ device into I²C mode click here

Settings that are retained if power is cut

Calibration
Change I²C address
Temperature scale
Hardware switch to UART mode
LED control
Protocol lock
Software switch to UART mode

Settings that are *NOT* retained if power is cut

Find
Sleep mode

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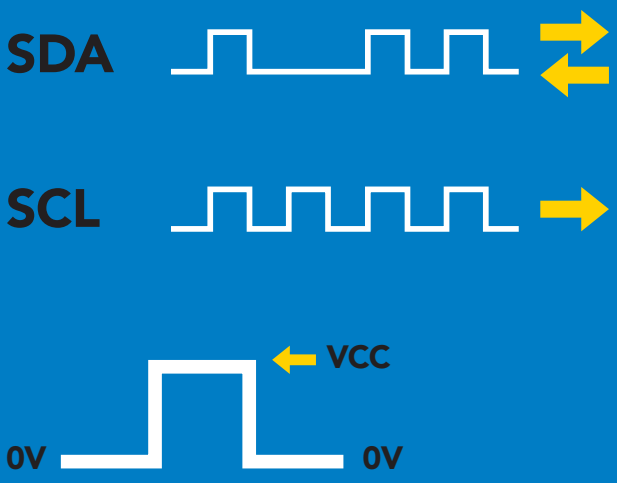
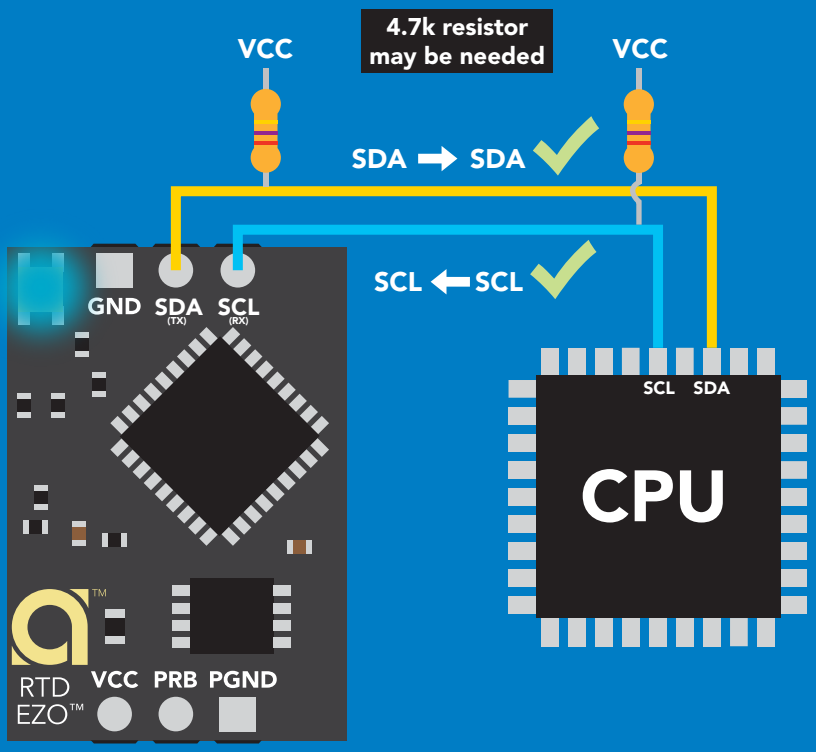
I²C mode

I²C address (0x01 – 0x7F)
102 (0x66) default

Vcc 3.3V – 5.5V

Clock speed 100 – 400 kHz





Data format

Reading	**temperature**	**Data type**	**floating point**
Units	**°C, °K, or °F**	**Decimal places**	**3**
Encoding	**ASCII**	**Smallest string**	**4 characters**
Format	**string**	**Largest string**	**40 characters**

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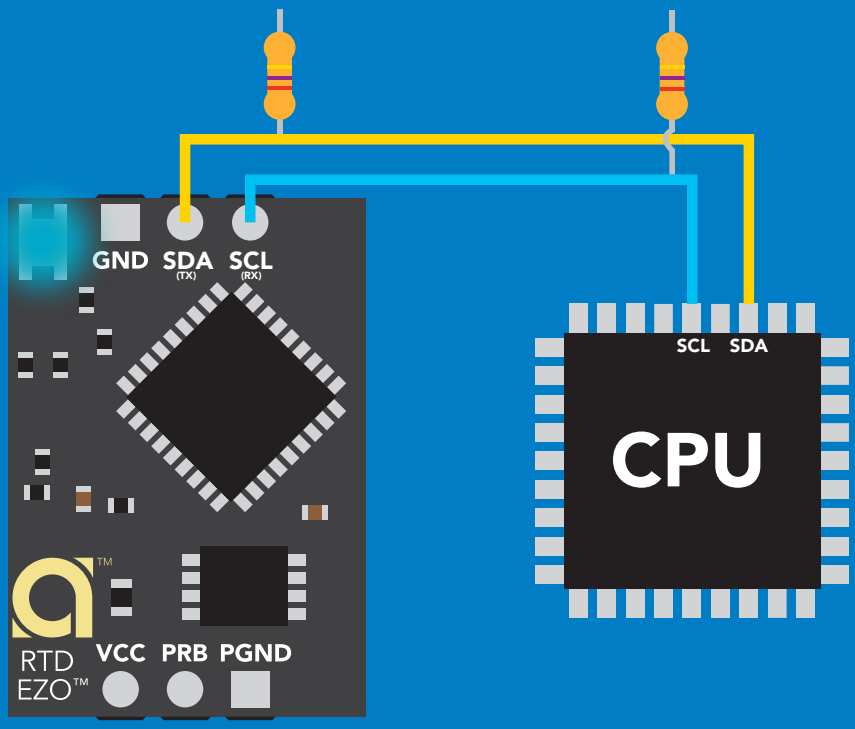
Sending commands to device

5 parts

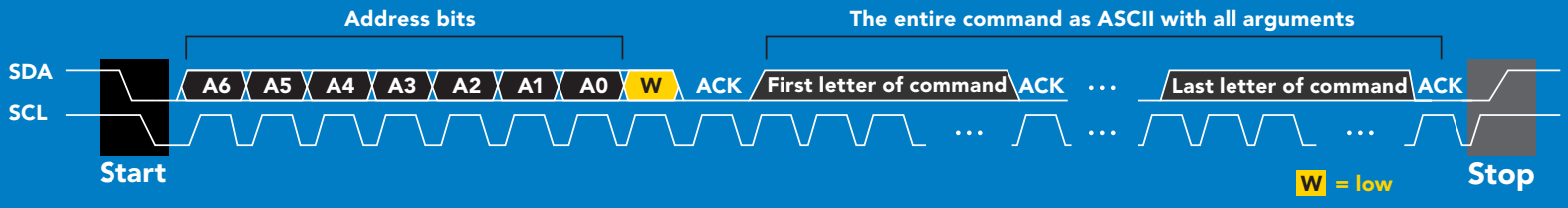
Start	I²C address	Write	Command (not case sensitive)	Stop
	102 (0x66)		ASCII command string	

Example

Start	102 (0x66)	Write	Sleep	Stop
	I²C address		Command	



Advanced



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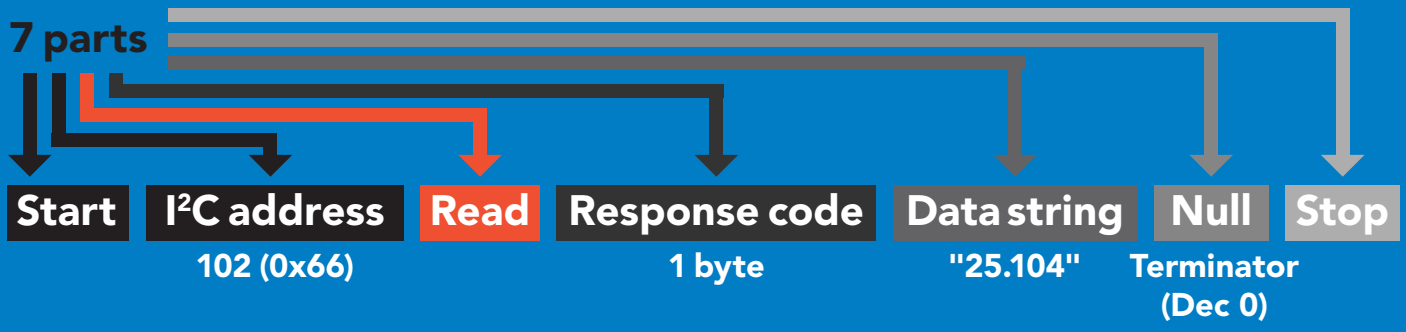
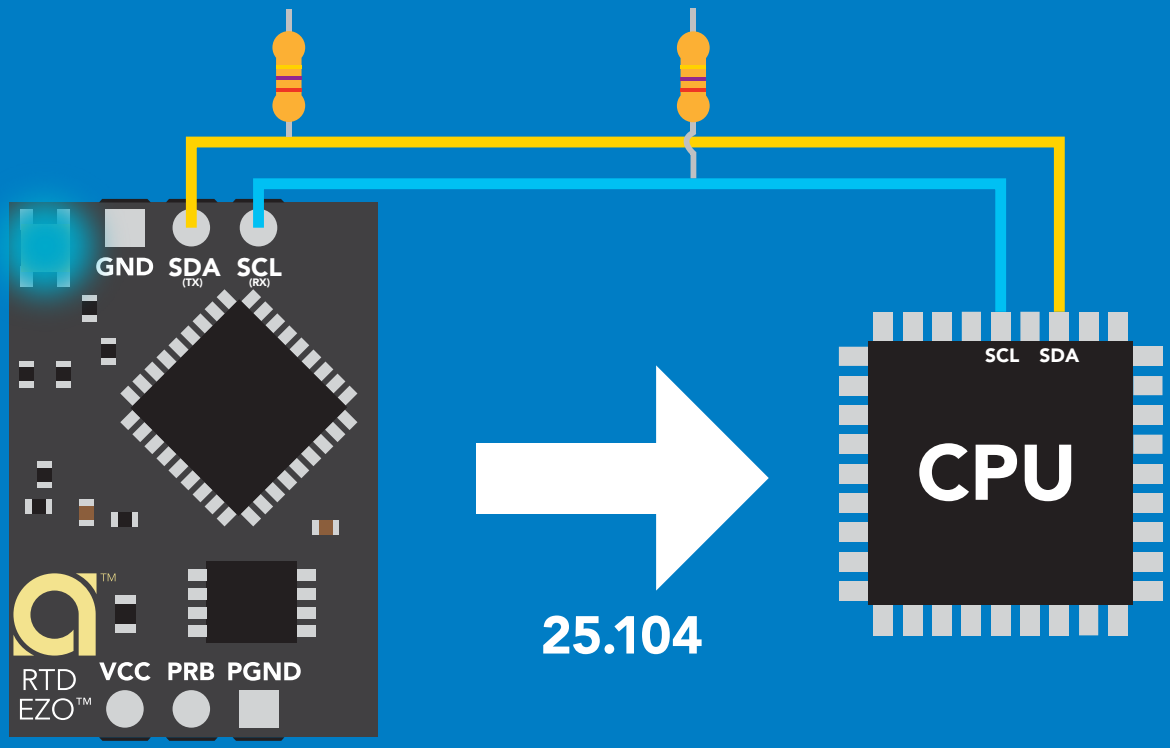
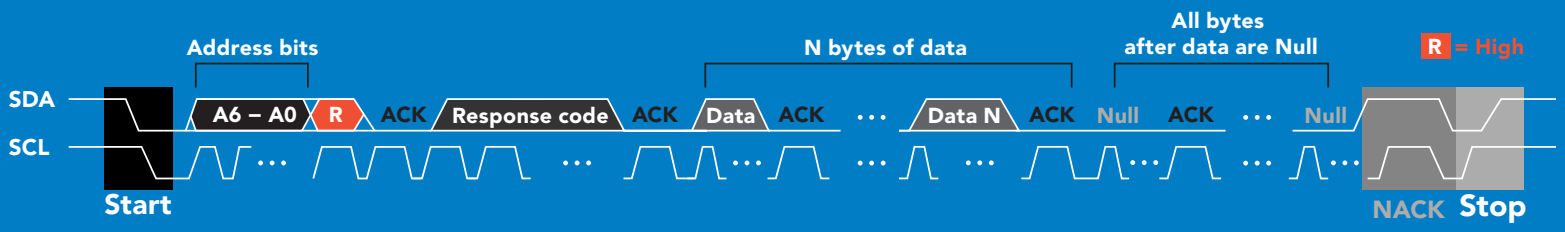
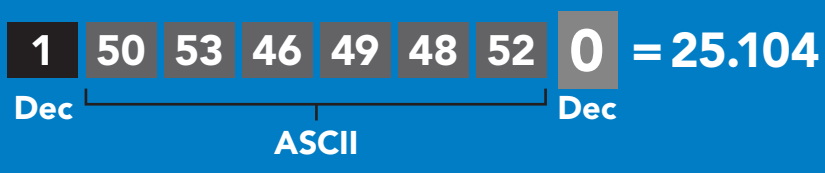
Requesting data from device





Advanced





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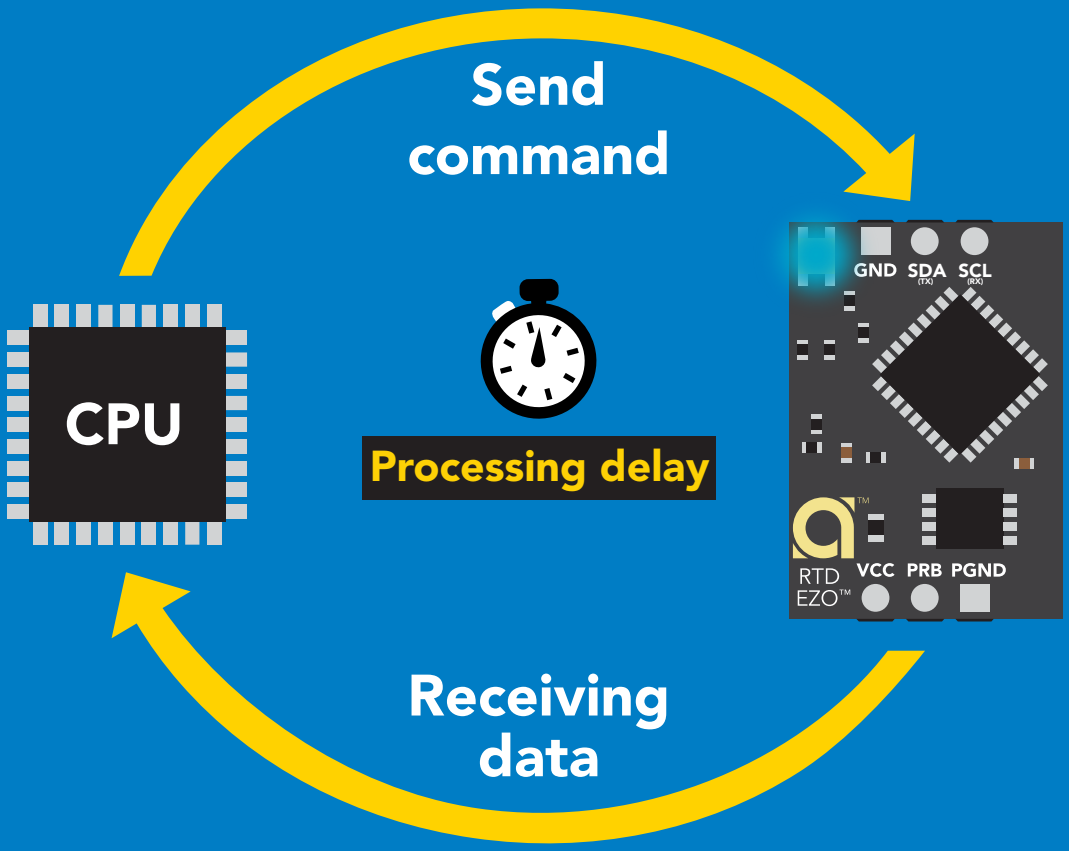
Response codes

After a command has been issued, a 1 byte response code can be read in order to confirm that the command was processed successfully.

Reading back the response code is completely optional, and is not required for normal operation.



Example

```
I2C_start;
I2C_address;
I2C_write(EZO_command);
I2C_stop;

delay(300);   Processing delay

I2C_start;
I2C_address;
Char[ ] = I2C_read;
I2C_stop;
```

If there is no processing delay or the processing delay is too short, the response code will always be 254.

Response codes

Single byte, not string

255	no data to send
254	still processing, not ready
2	syntax error
1	successful request

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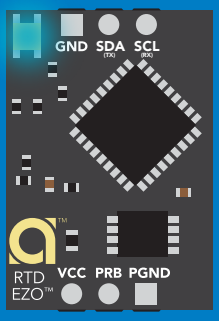
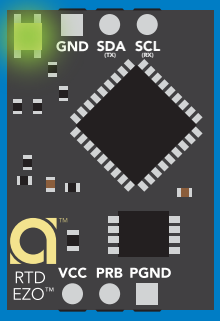
LED color definition



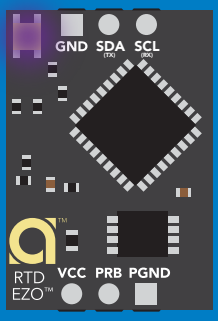
Blue

I²C standby



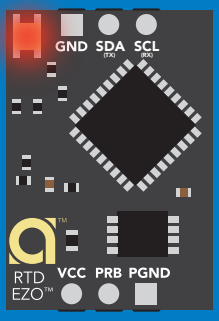
Green

Taking reading



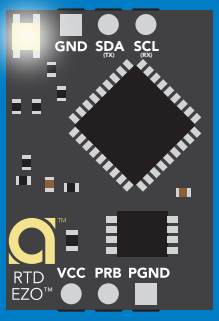
Purple

Changing I²C address



Red

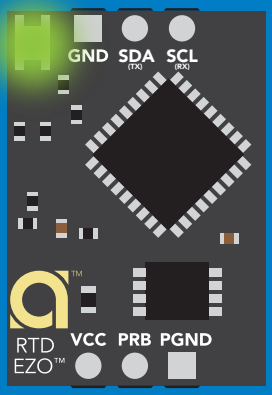
Command not understood



White

Find

	LED ON
5V	**+0.4 mA**
3.3V	**+0.2 mA**



Solid Green LED

in UART mode
Not I²C ready

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I²C mode
command quick reference

All commands are ASCII strings or single ASCII characters.

Command	Function	
Baud	switch back to UART mode	pg. 59
Cal	performs calibration	pg. 45
D	enable/disable data logger	pg. 49
Export	export calibration	pg. 46
Factory	enable factory reset	pg. 58
Find	finds devices with white blinking LED	pg. 43
i	device information	pg. 53
I2C	change I²C address	pg. 57
Import	import calibration	pg. 47
L	enable/disable LED	pg. 42
M	memory recall/clear	pg. 50
Name	set/show name of device	pg. 52
Plock	enable/disable protocol lock	pg. 56
R	returns a single reading	pg. 44
S	temperature scale (°C, °K, °F)	pg. 48
Sleep	enter sleep mode/low power	pg. 55
Status	retrieve status information	pg. 54

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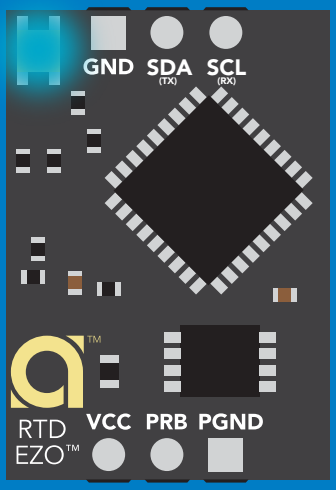
LED control

Command syntax

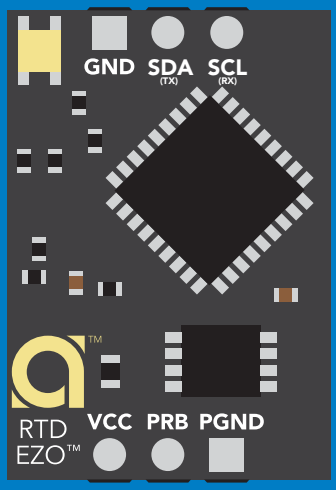
300ms processing delay

L,1	LED on	default
L,0	LED off	
L,?	LED state on/off?	

Example	Response
L,1	Wait 300ms 1 Dec 0 Null
L,0	Wait 300ms 1 Dec 0 Null
L,?	Wait 300ms 1 Dec ?L,1 ASCII 0 Null or 1 Dec ?L,0 ASCII 0 Null



L,1



L,0

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Find

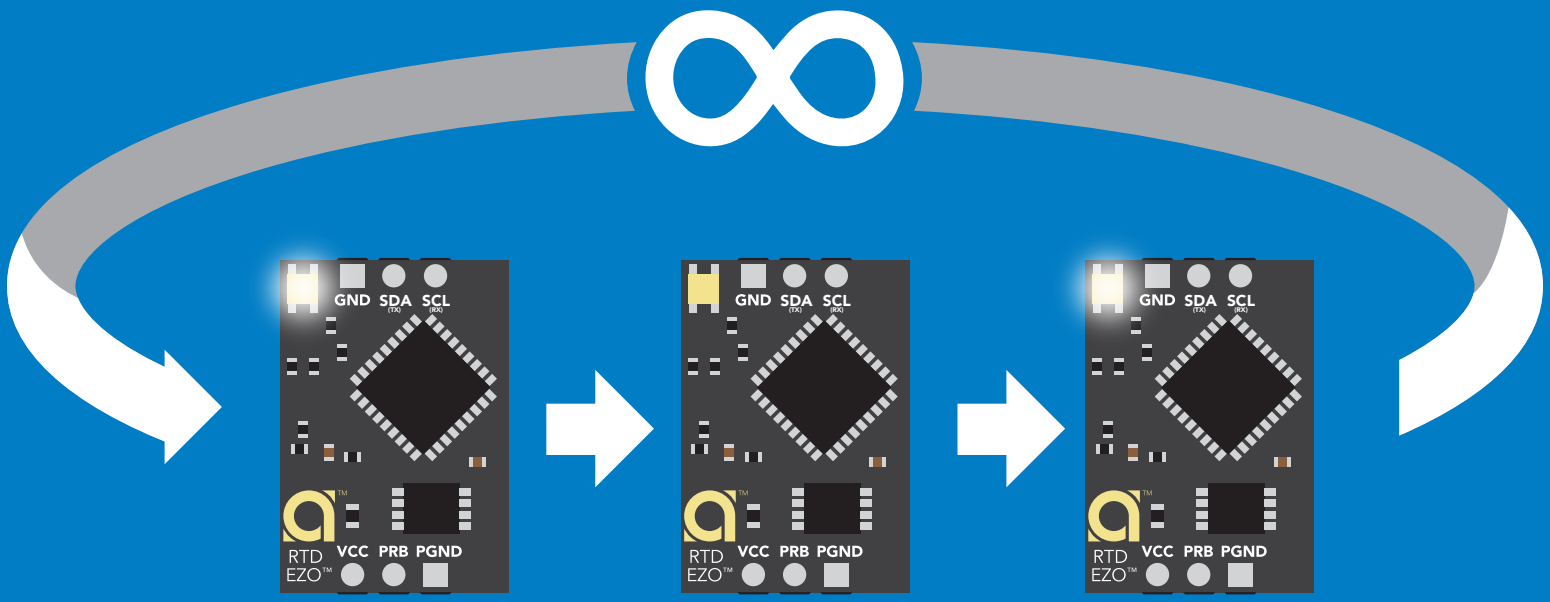
300ms processing delay

Command syntax

This command will disable continuous mode
Send any character or command to terminate find.

Find LED rapidly blinks white, used to help find device

Example	Response
Find <cr>	Wait 300ms 1 Dec 0 Null



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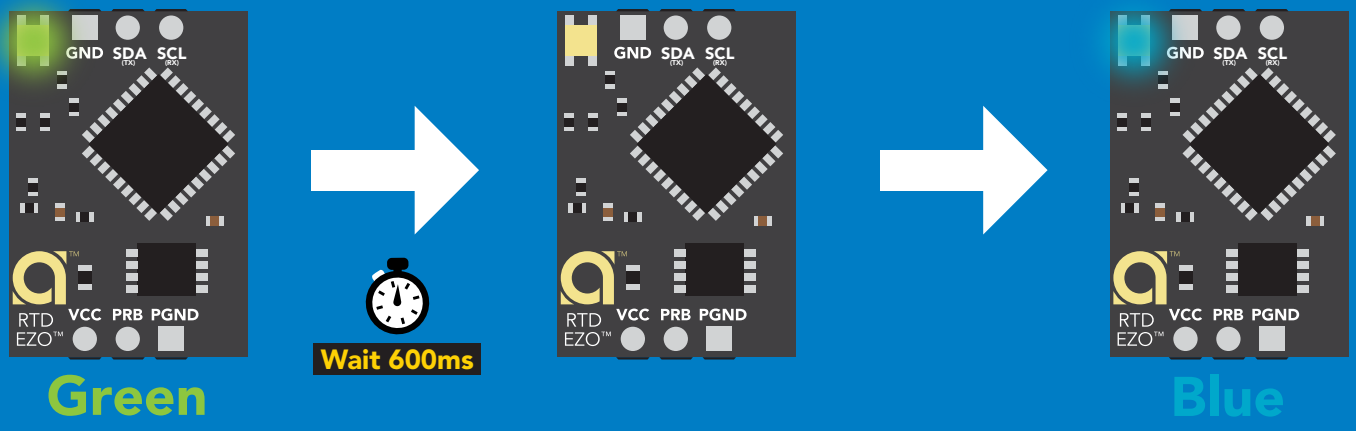
Taking reading

Command syntax

600ms processing delay

R return 1 reading

Example	Response
R	Wait 600ms 1 Dec 25.104 ASCII 0 Null



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Calibration

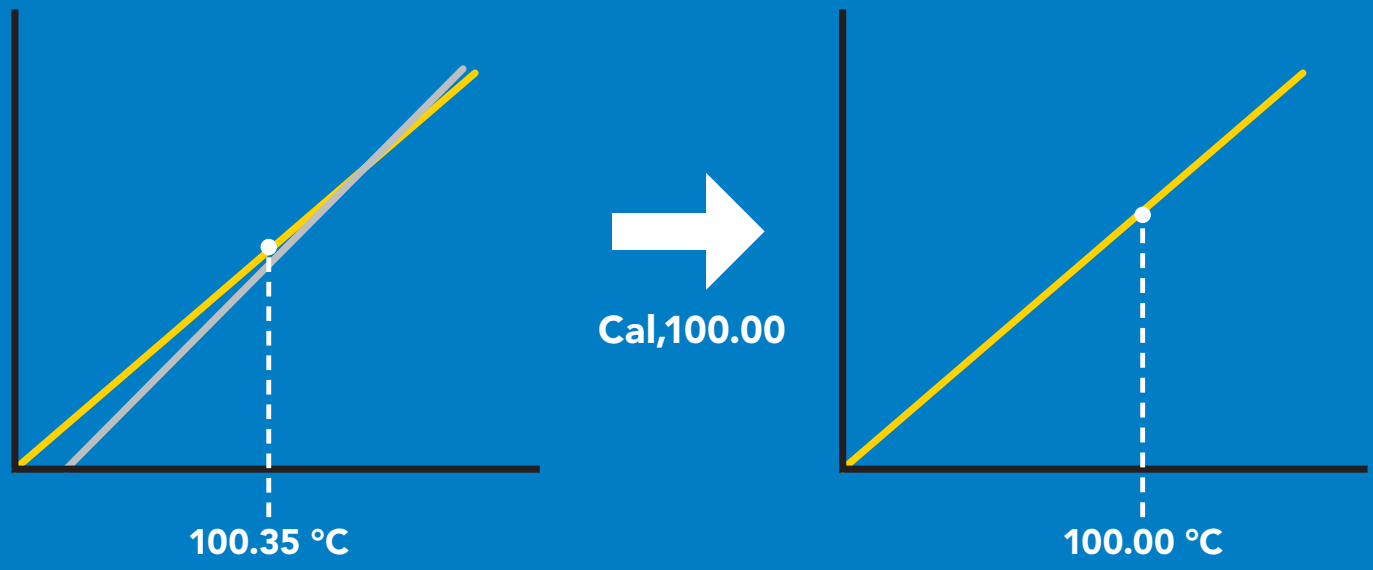
Command syntax

600ms processing delay

Cal,t	t = any temperature
Cal,clear	delete calibration data
Cal,?	device calibrated?

EZO™ RTD circuit uses single point calibration.

Example	Response
Cal,t	Wait 600ms → 1 (Dec) 0 (Null)
Cal,clear	Wait 300ms → 1 (Dec) 0 (Null)
Cal,?	Wait 300ms → 1 (Dec) ?Cal,1 (ASCII) 0 (Null) or 1 (Dec) ?Cal,0 (ASCII) 0 (Null)



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Export calibration

300ms processing delay

Command syntax

Export: Use this command to download calibration settings

Export,?	calibration string info
Export	export calibration string from calibrated device

Example

Response

Export,?

1	10,120	0
Dec	ASCII	Null

Response breakdown

10, 120

# of strings to export — # of bytes to export

Export strings can be up to 12 characters long

Export

1	59 6F 75 20 61 72	0
Dec	ASCII	Null

(1 of 10)

Export

1	65 20 61 20 63 6F	0
Dec	ASCII	Null

(2 of 10)

(7 more)

Export

1	6F 6C 20 67 75 79	0
Dec	ASCII	Null

(10 of 10)

Export

1	*DONE	0
Dec	ASCII	Null

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Import calibration

300ms processing delay

Command syntax

Import: Use this command to upload calibration settings to one or more devices.

Import,n import calibration string to new device

Example

Import, 59 6F 75 20 61 72 (1 of 10)

Import, 65 20 61 20 63 6F (2 of 10)

⋮

Import, 6F 6C 20 67 75 79 (10 of 10)

Response

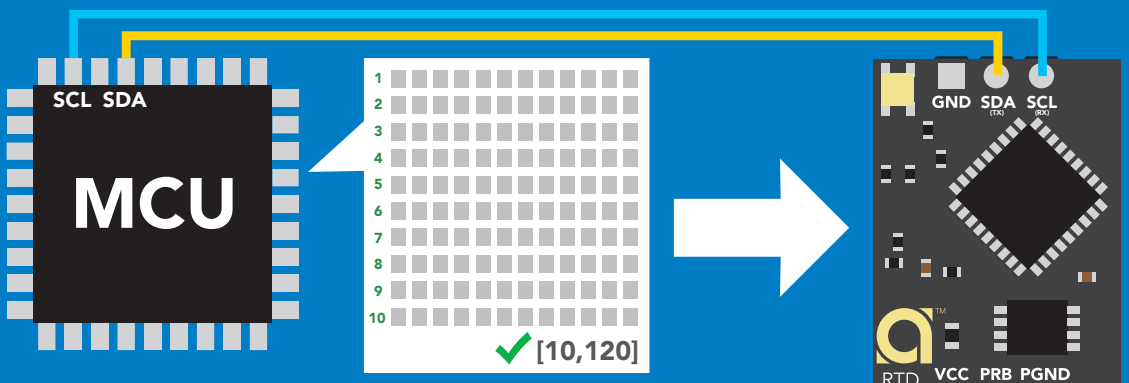
Wait 300ms 1 Dec 0 Null

Wait 300ms 1 Dec 0 Null

⋮

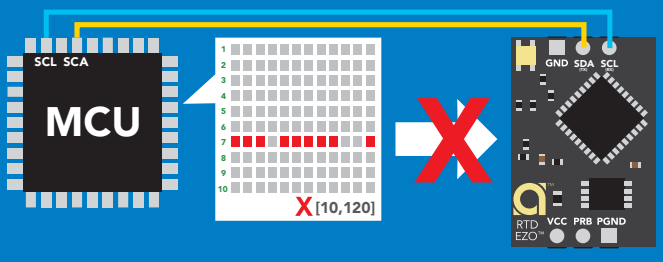
Wait 300ms 1 Dec 0 Null

Import,n



1 Dec *Pending ASCII 0 Null

system will reboot



reboot

*** If one of the imported strings is not correctly entered, the device will not accept the import and reboot.**

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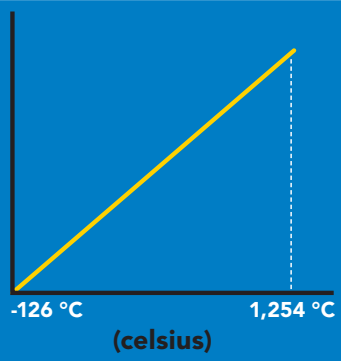
Temperature scale (°C, °K, °F)

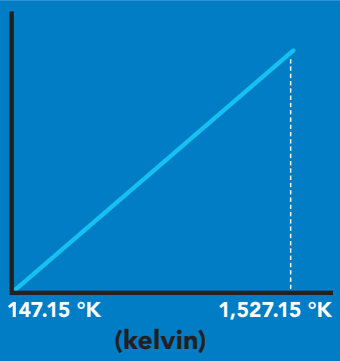
Command syntax

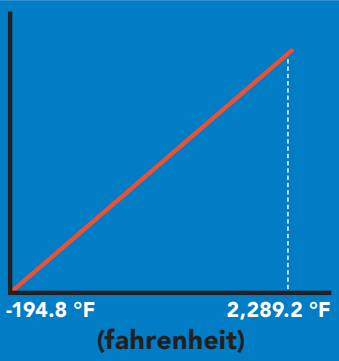
300ms processing delay

S,c	celsius	default
S,k	kelvin	
S,f	fahrenheit	
S,?	temperature scale?	

Example	Response
S,c	Wait 300ms — 1 (Dec) 0 (Null)
S,k	Wait 300ms — 1 (Dec) 0 (Null)
S,f	Wait 300ms — 1 (Dec) 0 (Null)
S,?	Wait 300ms — 1 (Dec) ?S,f (ASCII) 0 (Null) or 1 (Dec) ?S,k (ASCII) 0 (Null) or 1 (Dec) ?S,k (ASCII) 0 (Null)







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Enable/disable data logger

Command syntax

300ms processing delay

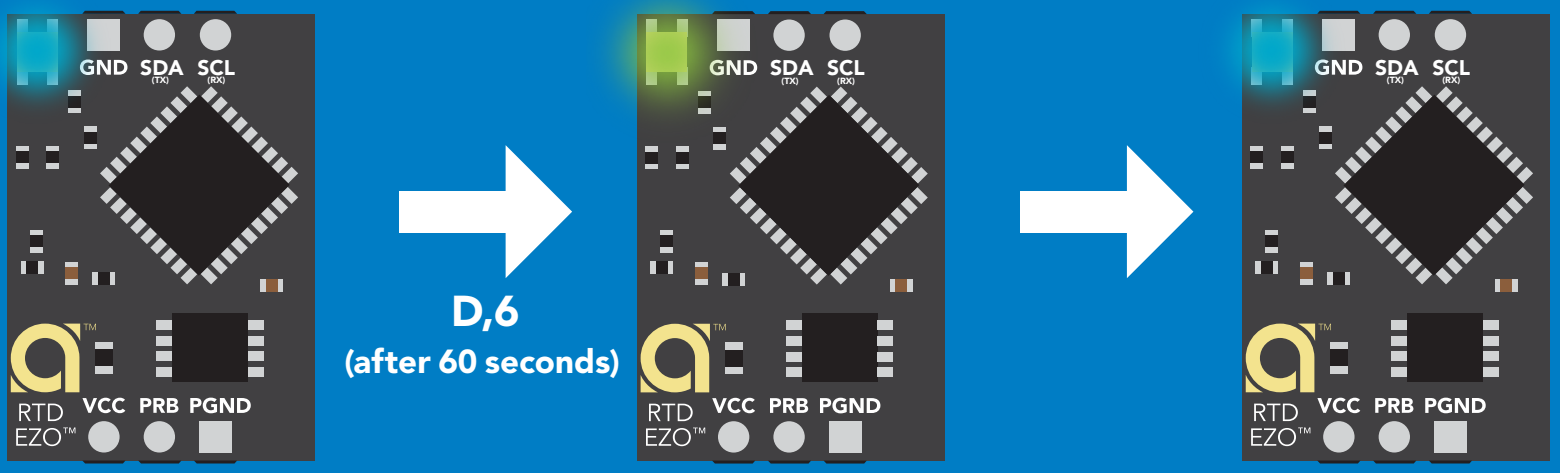
D,n n = (n x 10 seconds)

D,0 disable

D,? data logger storage interval?

The time period (n) is in 10 second intervals and can be any value from 1 to 32,000.

Example	Response
D,6	Wait 300ms — 1 (Dec) 0 (Null)
D,0	Wait 300ms — 1 (Dec) 0 (Null)
D,?	Wait 300ms — 1 (Dec) ?D,6 (ASCII) 0 (Null)



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Memory recall

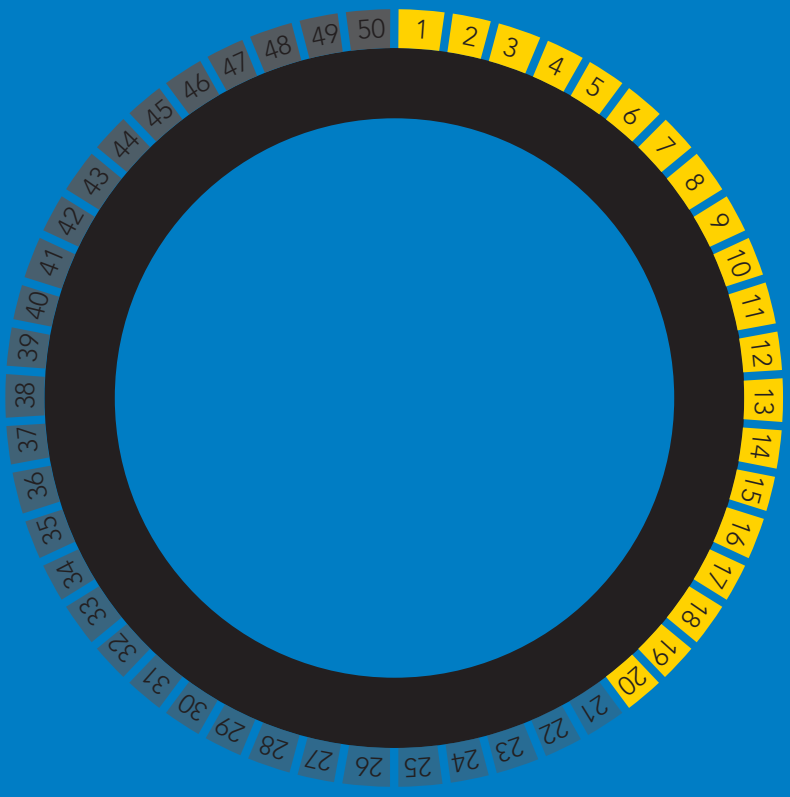
Disable data logger to recall memory.

Command syntax

300ms processing delay

M	**recall 1 sequential stored reading**
M,?	**display memory location of last stored reading**

Example	Response
M	Wait 300ms — **1** Dec — **1,100.00** ASCII — **0** Null
M,?	Wait 300ms — **1** Dec — **4,112.00** ASCII — **0** Null



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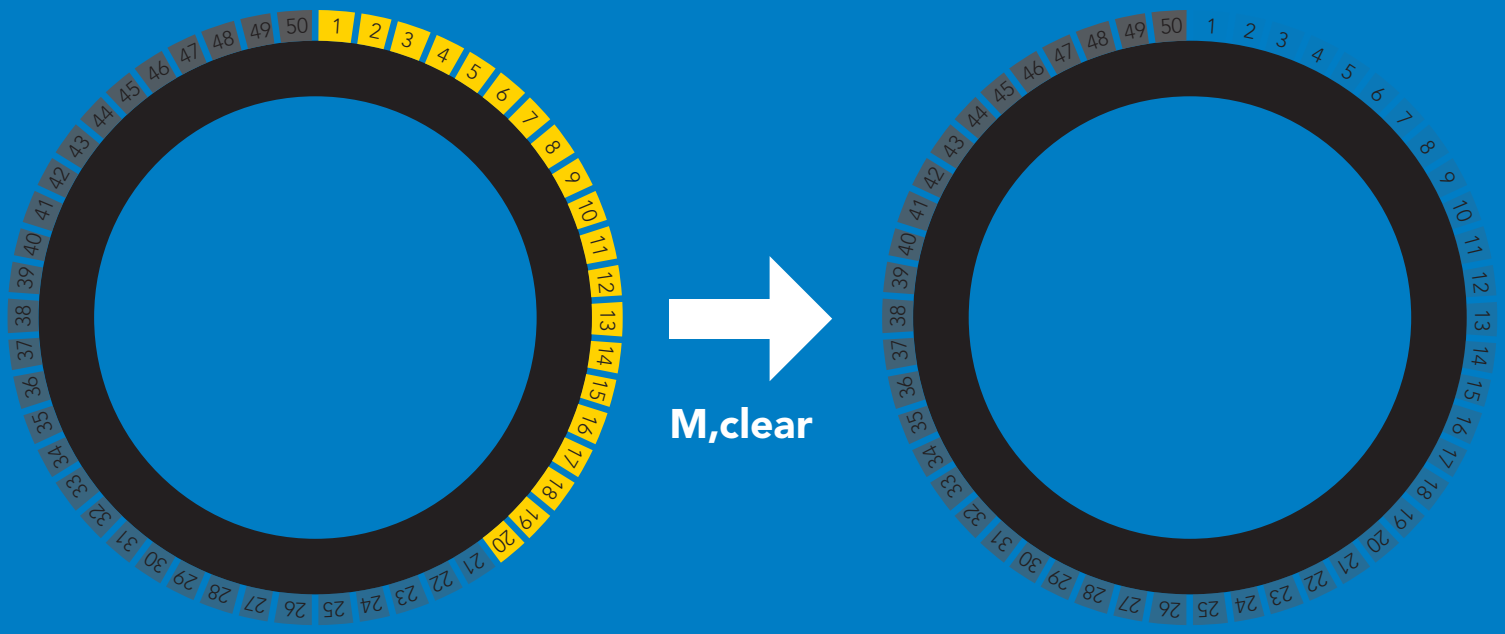
Memory clear

Command syntax

300ms processing delay

M,clear clear all stored memory

Example	Response
M,clear	Wait 300ms 1 Dec 0 Null



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Naming device

300ms processing delay

Command syntax

Do not use spaces in the name

Name,n	set name
Name,	clears name
Name,?	show name

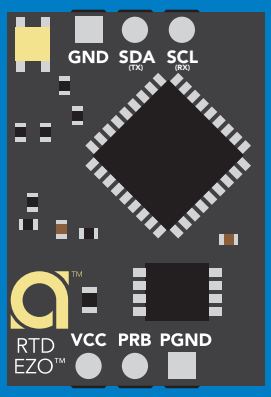
n = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

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

Up to 16 ASCII characters

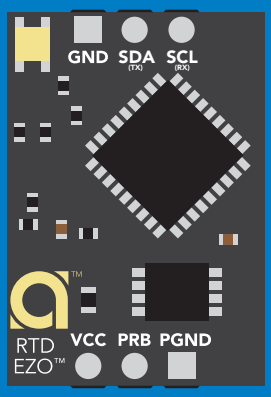
Example	Response
Name,	Wait 300ms — 1 Dec — 0 Null — name has been cleared
Name,zzt	Wait 300ms — 1 Dec — 0 Null
Name,?	Wait 300ms — 1 Dec — ?Name,zzt ASCII — 0 Null

Name,zzt



1 0

Name,?



1 ?Name,zzt 0

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Protocol lock

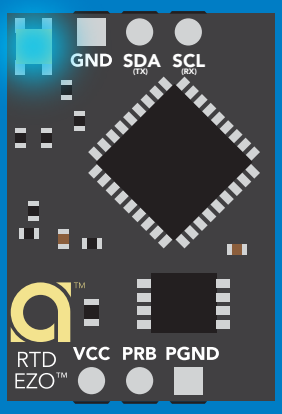
Command syntax

300ms processing delay

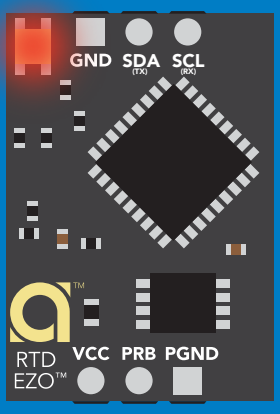
Plock,1	enable Plock	Locks device to I²C mode.
Plock,0	disable Plock	default
Plock,?	Plock on/off?	

Example	Response
Plock,1	Wait 300ms → 1 (Dec) 0 (Null)
Plock,0	Wait 300ms → 1 (Dec) 0 (Null)
Plock,?	Wait 300ms → 1 (Dec) ?Plock,1 (ASCII) 0 (Null)

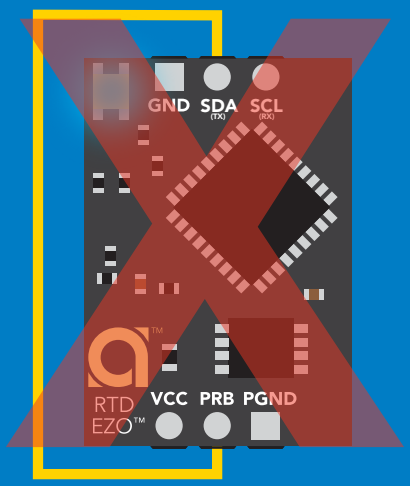
Plock,1



Baud, 9600



cannot change to UART



cannot change to UART

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I²C address change

Command syntax

300ms processing delay

I2C,n sets I²C address and reboots into I²C mode

Example	Response
I2C,100	device reboot (no response given)

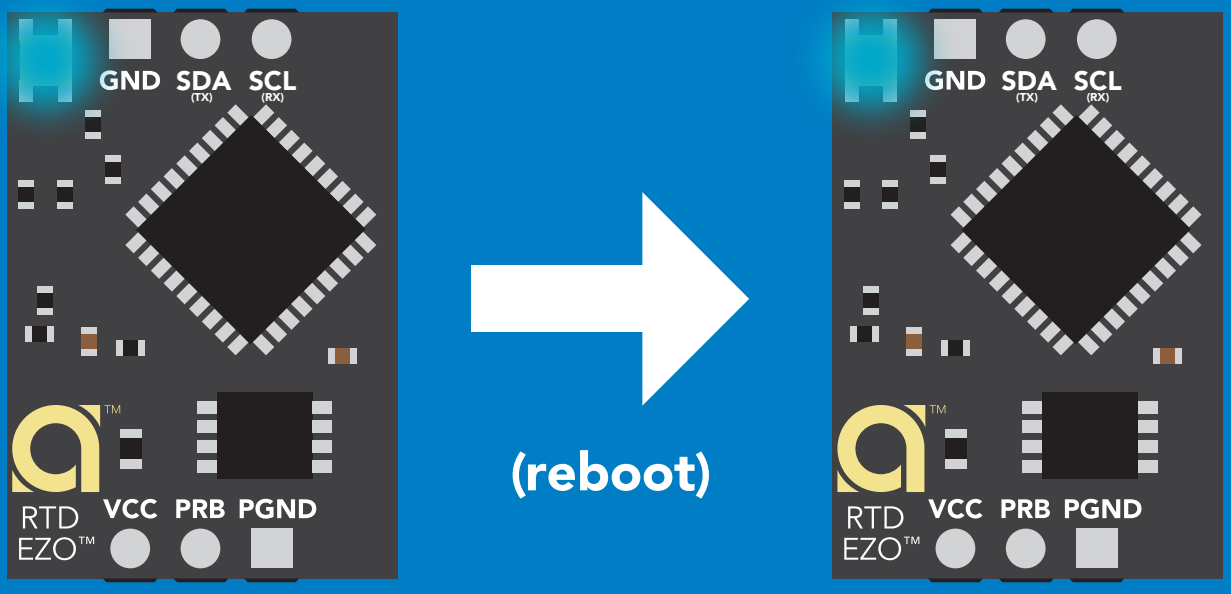
Warning!

Changing the I²C address will prevent communication between the circuit and the CPU until the CPU is updated with the new I²C address.

Default I²C address is 102 (0x66).

n = any number 1 – 127

I2C,100



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Factory reset

Command syntax

Factory reset will not take the device out of I²C mode.

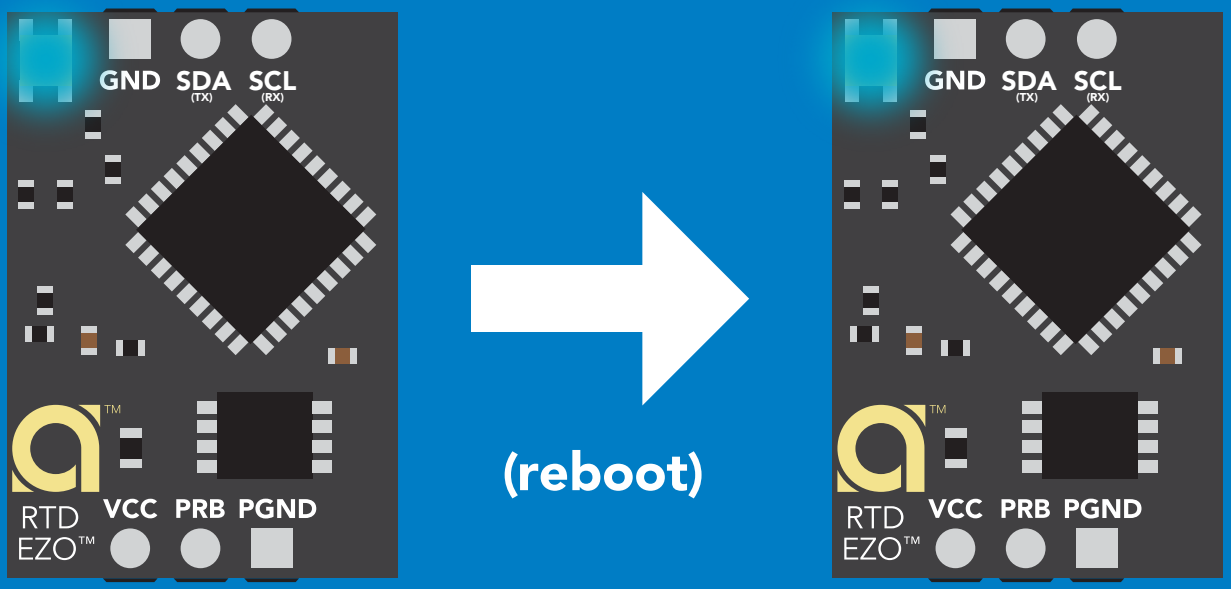
Factory enable factory reset

I²C address will not change

Example	Response
Factory	device reboot (no response given)

Clears calibration
LED on
Response codes enabled
Clears data logger

Factory



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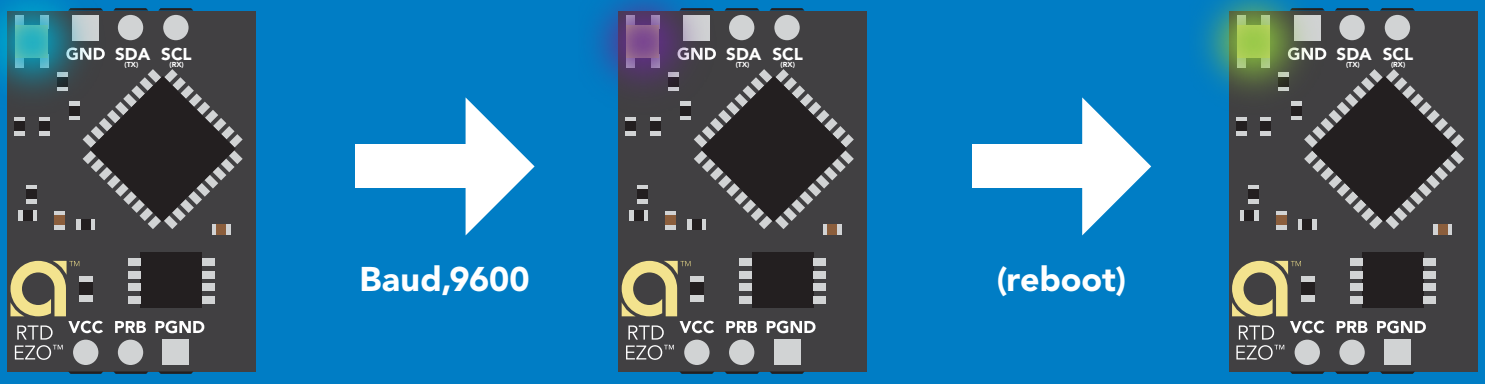
Change to UART mode

Command syntax

Baud,n switch from I²C to UART

Example	Response
Baud,9600	reboot in UART mode (no response given)

n =
- 300
- 1200
- 2400
- 9600
- 19200
- 38400
- 57600
- 115200



Changing to UART mode

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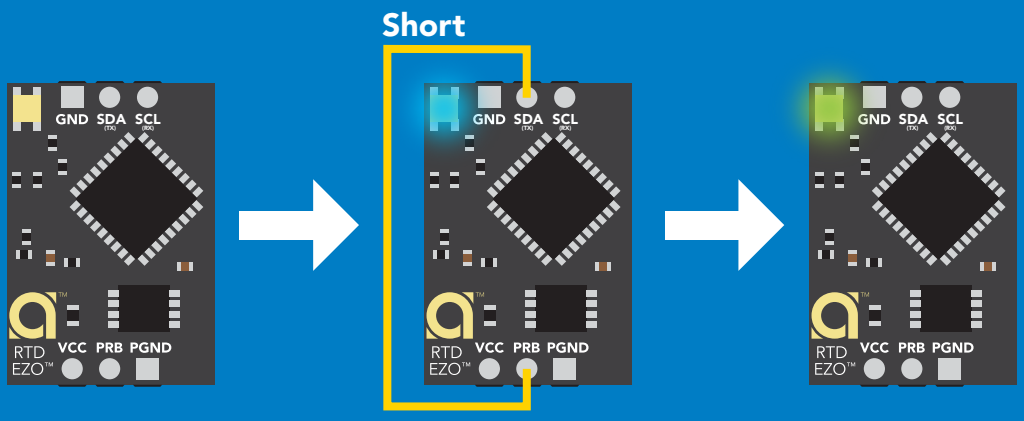
Manual switching to UART

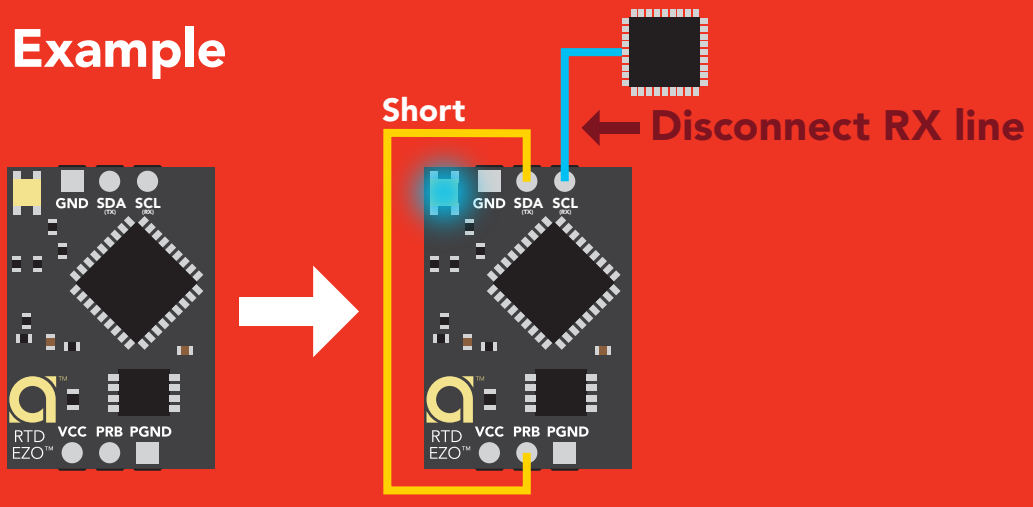
- Disconnect ground (power off)
- Disconnect TX and RX
- Connect TX to PRB
- Confirm RX is disconnected
- Connect ground (power on)
- Wait for LED to change from Blue to Green
- Disconnect ground (power off)
- Reconnect all data and power

Connecting TX to PRB only works for the EZO-RTD™ and the EZO-FLO™ circuits

Example



Wrong Example



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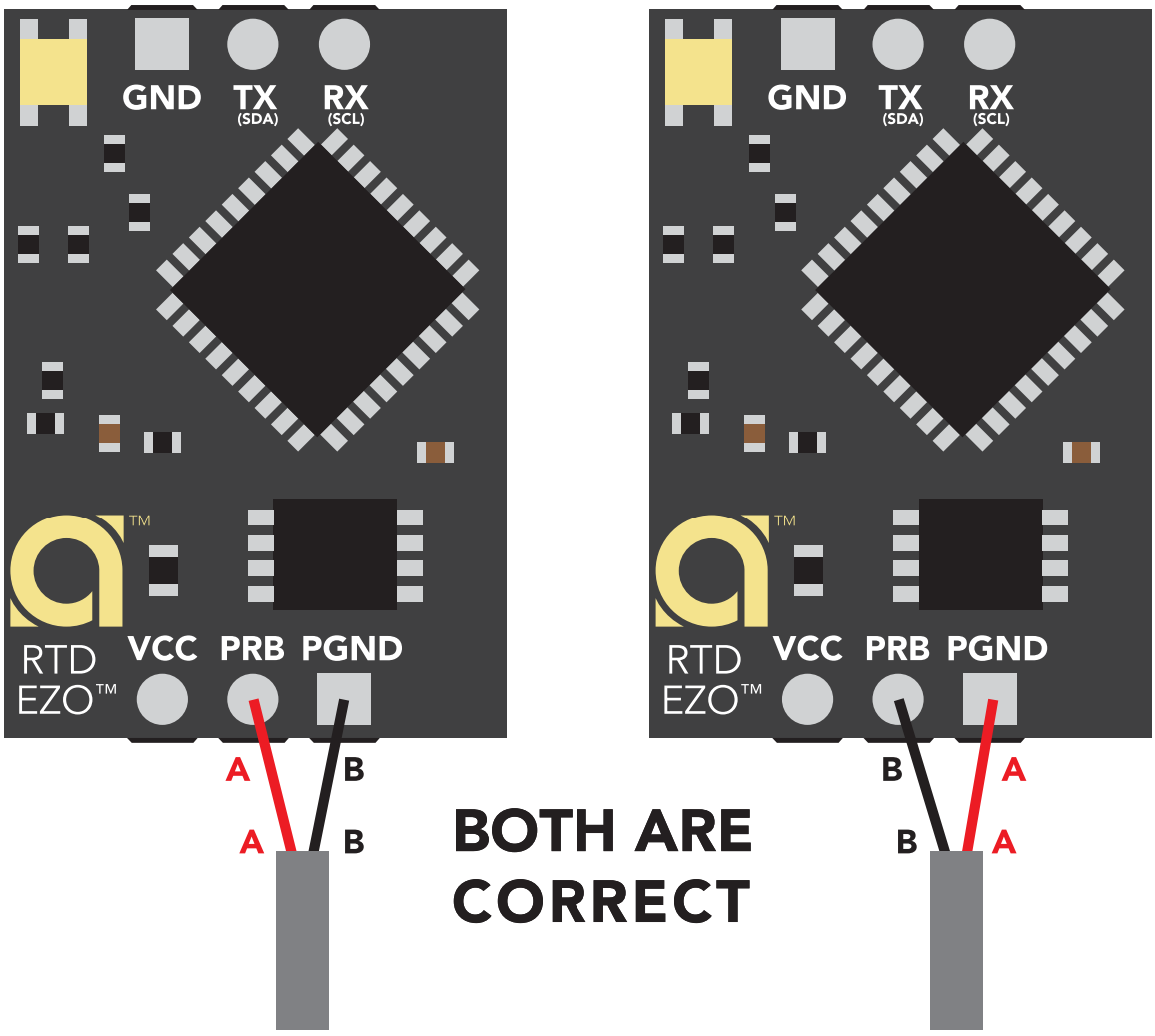
Using other brand PT-100/PT-1000

The EZO™ RTD Temperature circuit will auto-detect if the connected probe is PT-100 or PT-1000.

Probe class	Accuracy
AA	+/- (0.1 + 0.0017 × °C)
A	+/- (0.15 + 0.002 × °C)
B	+/-(0.3 + 0.005 × °C)
C	+/- (0.6 + 0.01 × °C)

It makes no difference which lead of the temperature probe is connected to the two probe pins.



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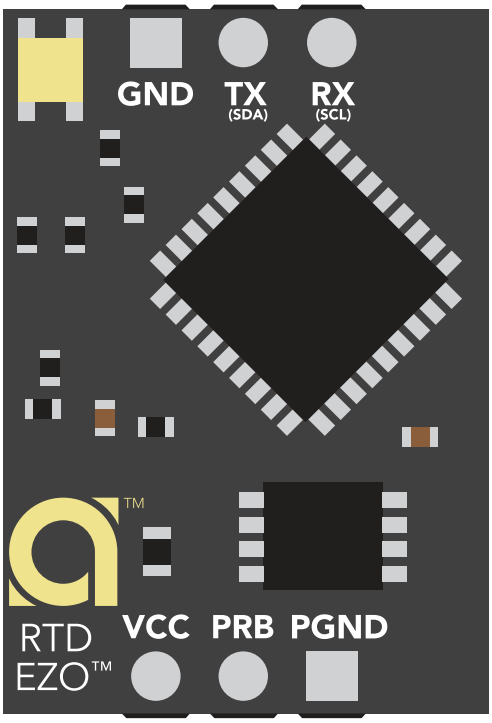
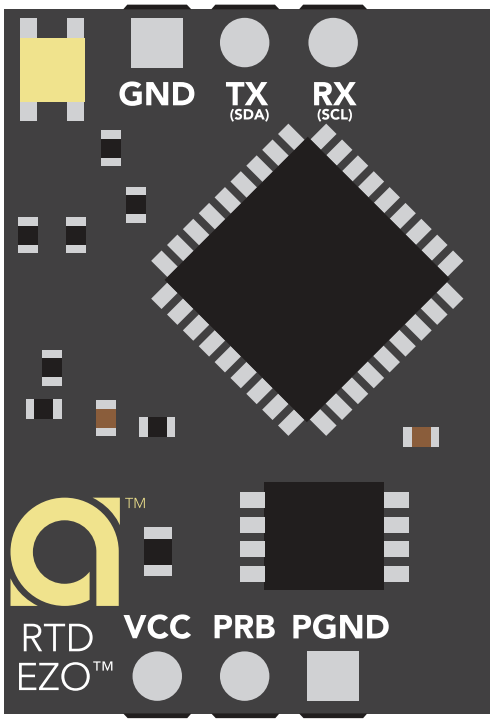
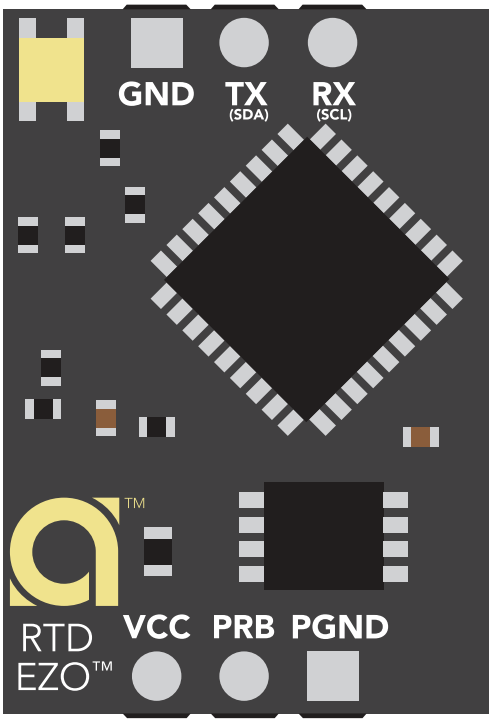
Any off the shelf PT-100 or PT-1000 temperature probe can be used with the Atlas Scientific EZO™ RTD Temperature circuit. The PT-100 or PT-1000 temperature probe can be a 2, 3 or 4 wire probe.



Two wire connection



Three wire connection



Four wire connection

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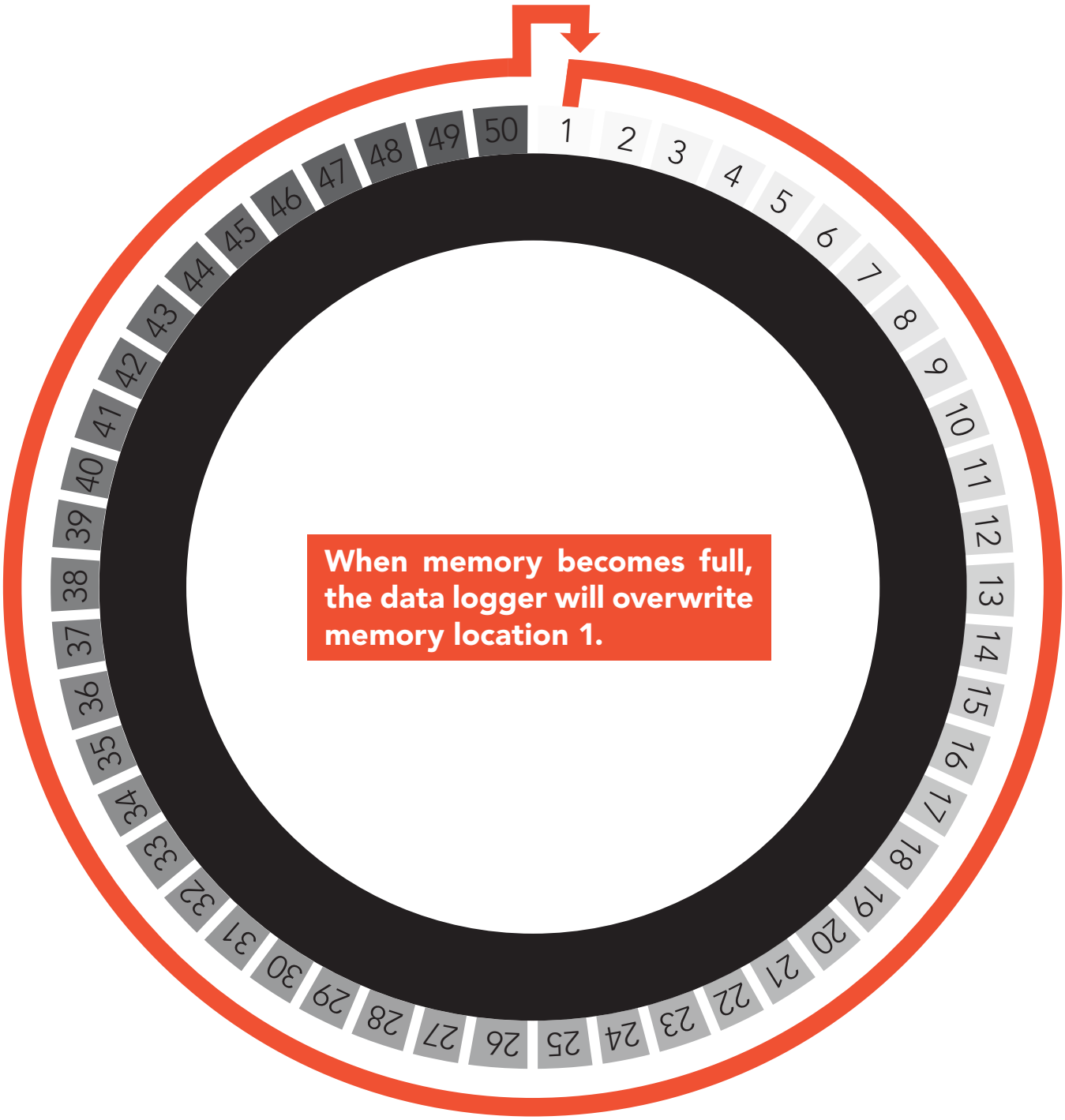
On board data logger

- 50 readings
- Programmable storage interval

Minimum – 10 seconds
Maximum – 320,000 seconds

Temperature readings that are stored to the data logger will be retained even if the power is cut.



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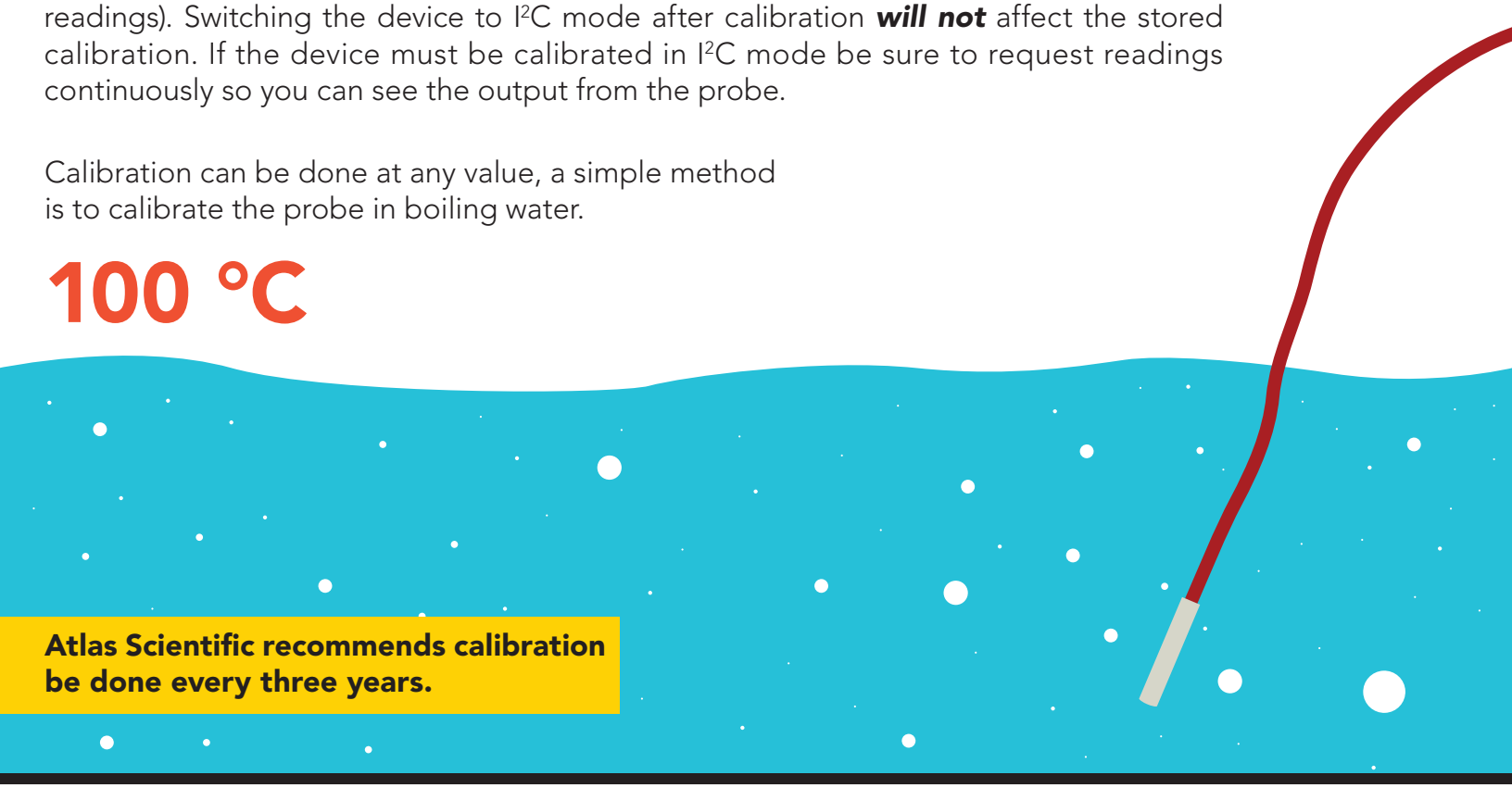
Environmental Robotics

Calibration theory

The most important part of calibration is watching the readings during the calibration process. It's easiest to calibrate the device in its default state (UART mode, continuous readings). Switching the device to I²C mode after calibration ***will not*** affect the stored calibration. If the device must be calibrated in I²C mode be sure to request readings continuously so you can see the output from the probe.

Calibration can be done at any value, a simple method is to calibrate the probe in boiling water.

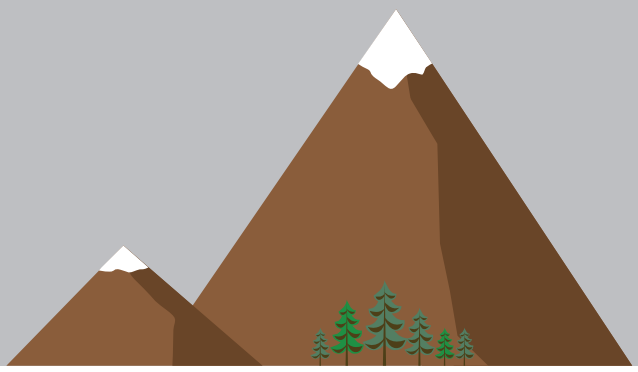
100 °C



Atlas Scientific recommends calibration be done every three years.

Elevation and boiling point table

Elevation in meters	Boiling point
305	98.9 °C
229	99.2 °C
152	99.5 °C
76	99.7 °C
0	100 °C
-76	100.3 °C
-152	100.5 °C



Use purified/distilled water

For accurate calibration using different temperature vaules, you must use a tool called a *"dry block calibrator."*

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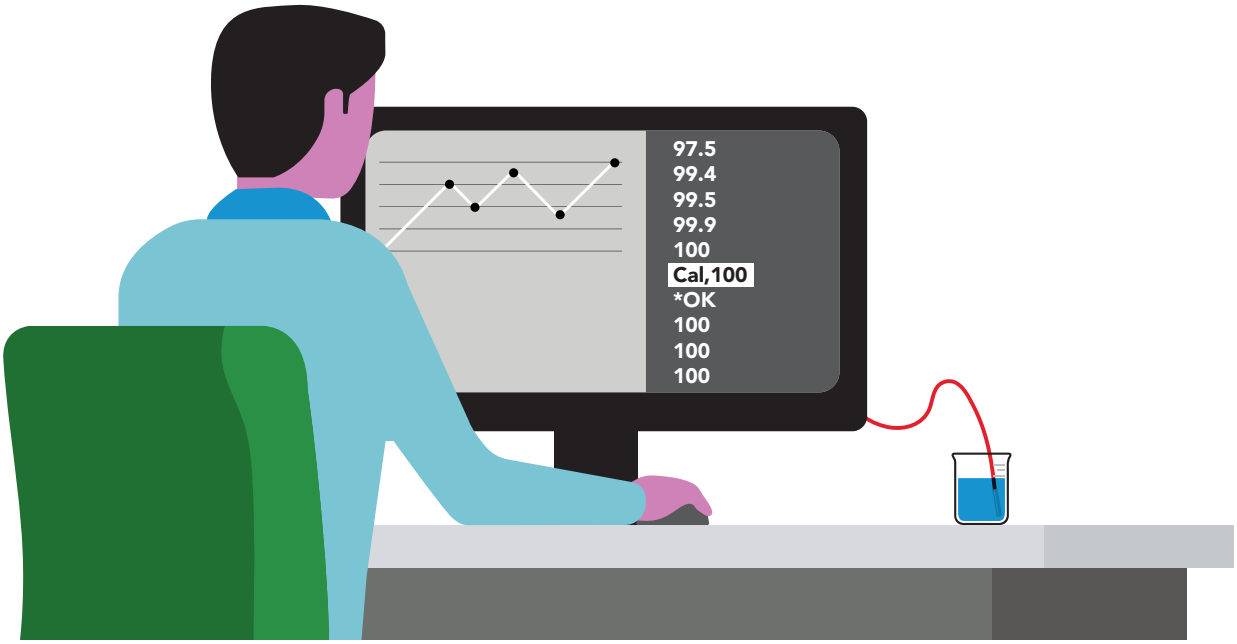
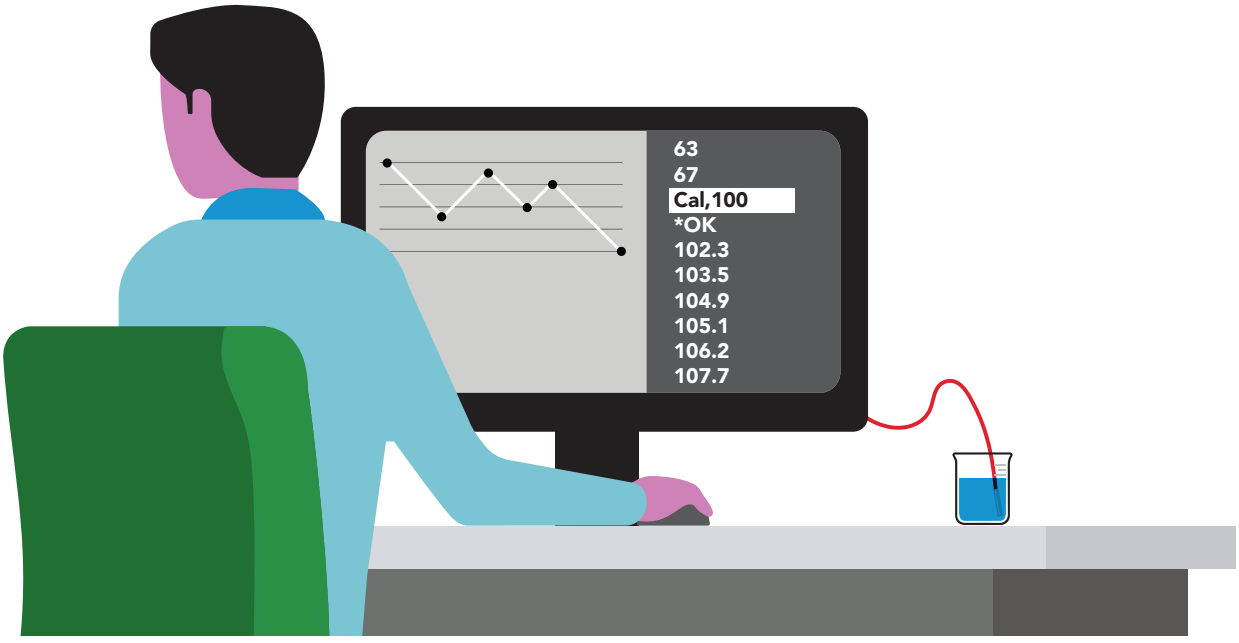
Best practices for calibration

Always watch the readings throughout the calibration process.
Issue calibration commands once the readings have stabilized.



⚠ Never do a blind calibration! ⚠

Issuing a calibration command before the readings stabilize will result in drifting readings.



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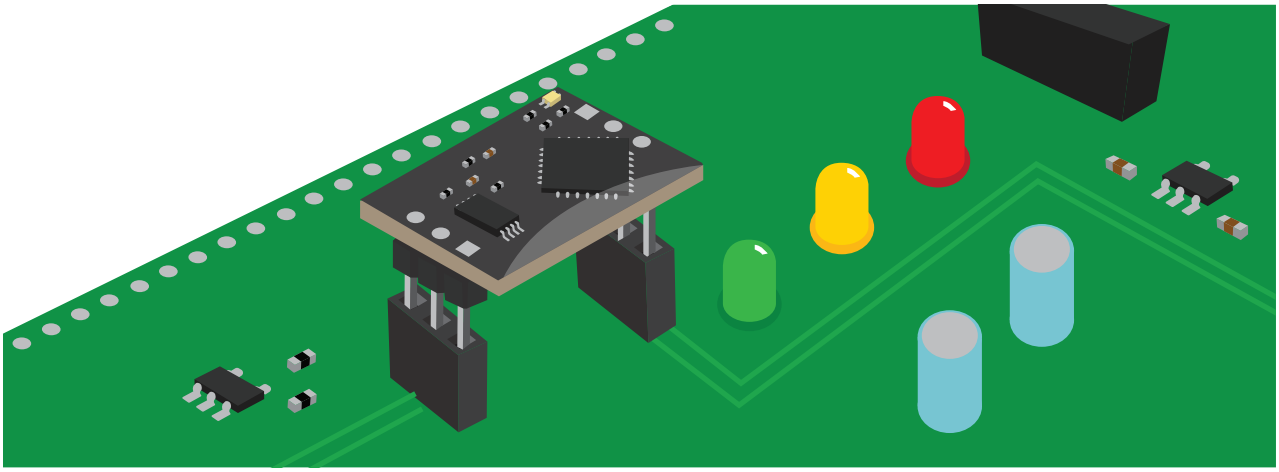
Soldering

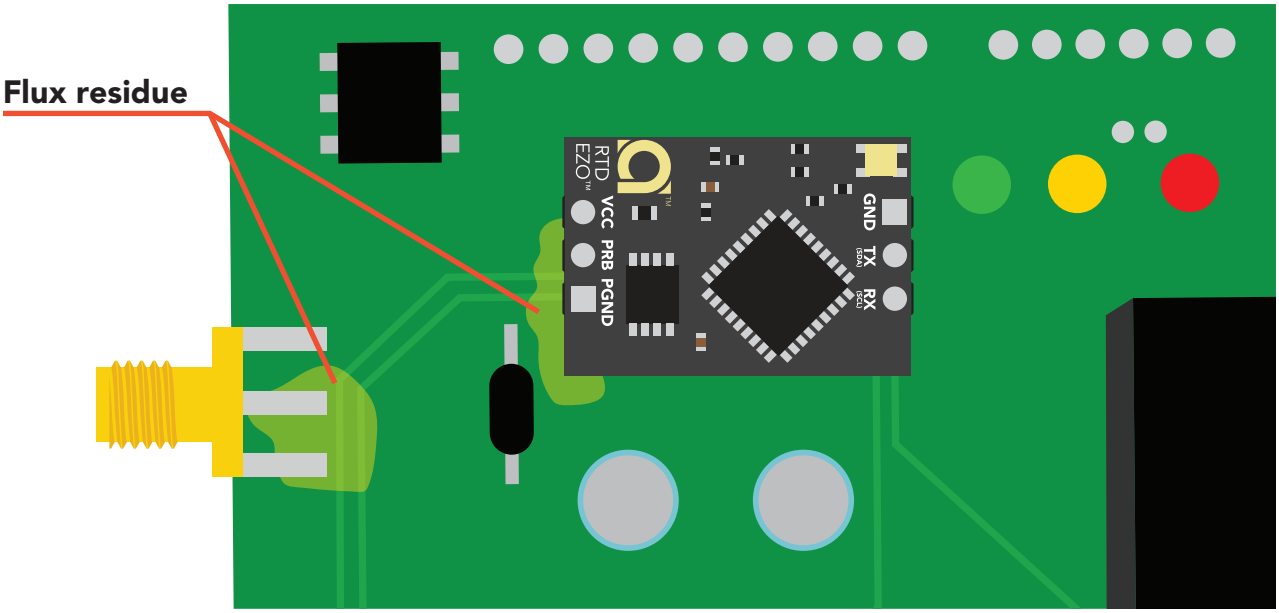
Do not directly solder an EZO circuit to your PCB. If something goes wrong during the soldering process it may become impossible to correct the problem. It is simply not worth the risk.

Instead, solder female header pins to your PCB and place the EZO device in the female headers.



Avoid using rosin core solder.
Use as little flux as possible.

Flux residue will severely affect your readings. Any Flux residue that comes in contact with the PRB pins or your probes connector will cause a "flux short".



You ***MUST*** remove all the flux residue from your PCB after soldering.

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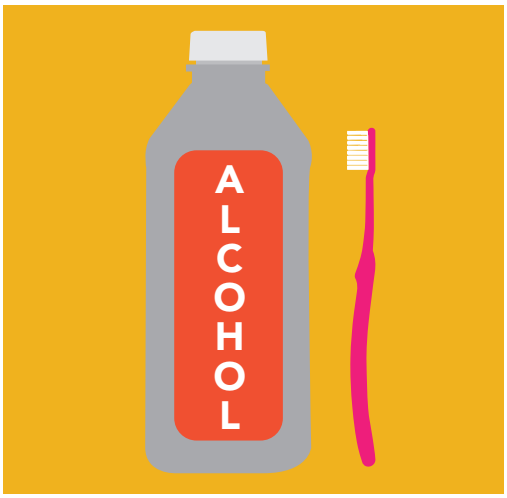
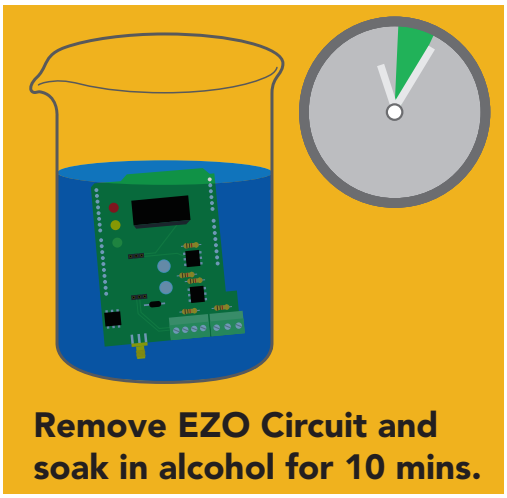
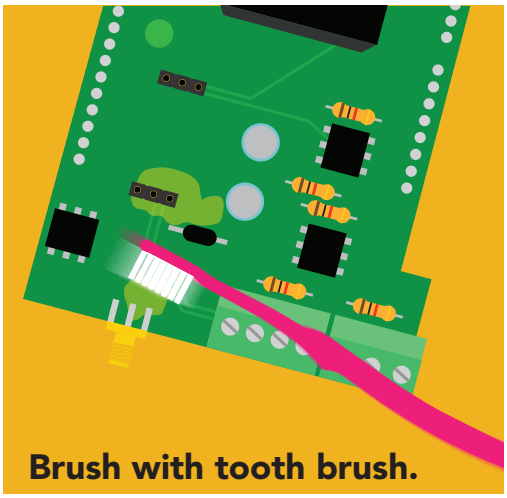
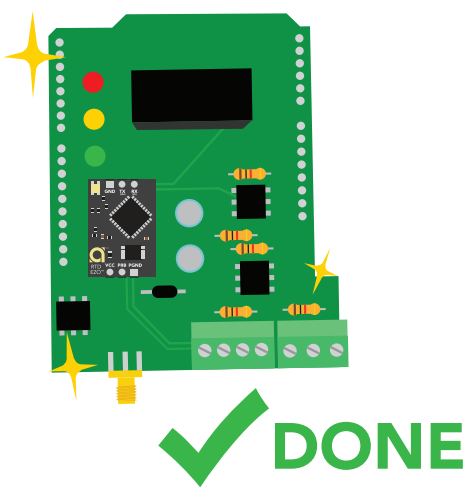
Soldering

Removing flux residue can be done with commercially available products such as flux off or you can use alcohol and a tooth brush.









What does a flux short look like?

Readings move slowly and take serval minutes to reach the correct value.

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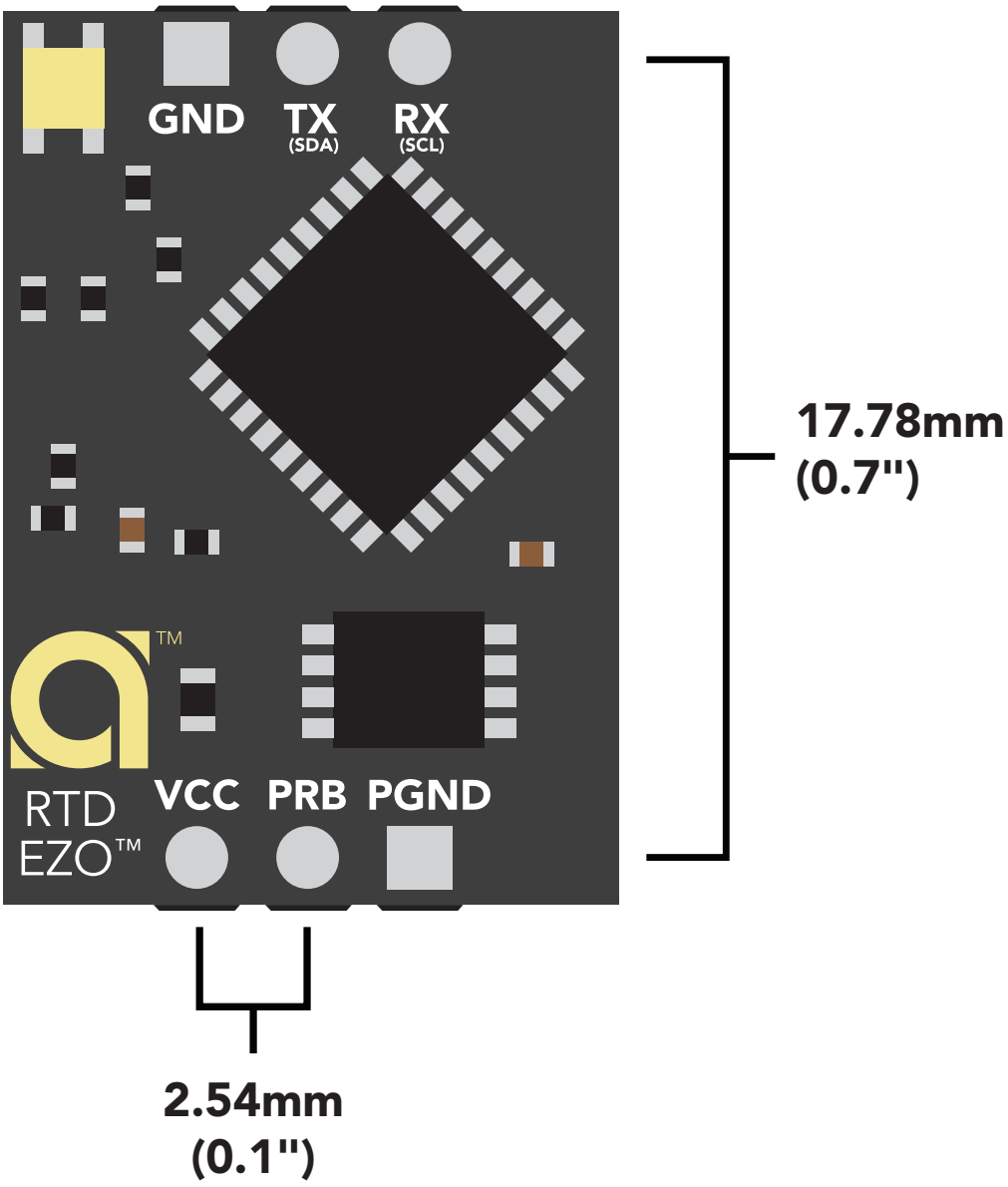
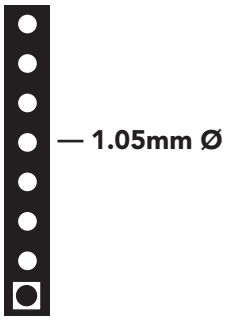
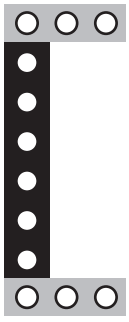
EZO™ circuit footprint



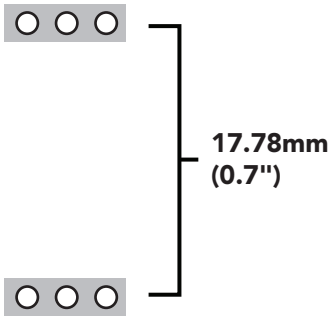
1 In your CAD software place a 8 position header.



2 Place a 3 position header at both top and bottom of the 8 position.



3 Delete the 8 position header. The two 3 position headers are now 17.78mm (0.7") apart from each other.



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Datasheet change log

Datasheet V 3.7

Revised artwork throughout datasheet.

Datasheet V 3.6

Revised naming device info on pages 33 & 60.

Datasheet V 3.5

Added 2 wire, 3 wire, or 4 wire, wiring diagram on pg 7.

Datasheet V 3.4

Revised accuracy equation on pg 7.

Datasheet V 3.3

Moved Default state to pg 13.

Datasheet V 3.2

Revised response for the sleep command in UART mode on pg 36.

Datasheet V 3.1

Added more information on the Export calibration and Import calibration commands.

Datasheet V 3.0

Changed "Max rate" to "Response time" on cover page.

Datasheet V 2.9

Removed note from certain commands about firmware version.

Datasheet V 2.8

Added information to calibration theory on pg 9.

Datasheet V 2.7

Revised definition of response codes on pg 45.

Datasheet V 2.6

Updated calibration processing delay time on pg.51.

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Datasheet change log

Datasheet V 2.5

Revised Plock pages to show default value.

Datasheet V 2.4

Added new commands:
"Find" pages 22 & 49.
"Export/Import calibration" pages 26 & 52.
Added new feature to continous mode "C,n" pg 23.

Datasheet V 2.3

Added manual switching to UART information on pg. 59.

Datasheet V 2.2

Revised Baud command information on pg. 33.

Datasheet V 2.1

Revised entire datasheet.

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Firmware updates

V1.02 – Plock (March 31, 2016)
- Added protocol lock feature "Plock"

V1.03 – EEPROM (April 26, 2016)
- Fixed bug where EEPROM would get erased if the circuit lost power 900ms into startup

V1.11 – Bug Fix (June 9, 2016)
- Fixed bug where a blank name would result in garbage ouput

V2.01 – Update (January 1, 2017)
- Replaced command "response" with "*OK"
- Replaced command "Serial" with "Baud"

V2.02 – Bug Fix (February 16, 2017)
- Fixed bug where calibration would not accept floating point numbers.

V2.10 – (May 9, 2017)
- Added "Find" command.
- Added "Export/import" command.
- Modified continuous mode to be able to send readings every "n" seconds.
- Sleep current is lowered.

V2.11 - Bug Fix (November 19, 2020)
- Fixed bug where the first reading after boot up could be -1024

V2.12 - (June 9, 2022)
- Internal update for new part compatibility.

V2.13 - (August 10, 2022)
- Internal update for new part compatibility.

V2.14 - (Janurary 11, 2023)
- Internal update for new part compatibility.

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Warranty

Atlas Scientific™ Warranties the EZO™ class RTD circuit to be free of defect during the debugging phase of device implementation, or 30 days after receiving the EZO™class RTD circuit (which ever comes first).

The debugging phase

The debugging phase as defined by Atlas Scientific™ is the time period when the EZO™ class RTD circuit is inserted into a bread board, or shield. If the EZO™ class RTD circuit is being debugged in a bread board, the bread board must be devoid of other components. If the EZO™ class RTD circuit is being connected to a microcontroller, the microcontroller must be running code that has been designed to drive the EZO™ class RTD circuit exclusively and output the EZO™ class RTD circuit data as a serial string.

It is important for the embedded systems engineer to keep in mind that the following activities will void the EZO™ class RTD circuit warranty:

- **Soldering any part of the EZO™ class RTD circuit.**
- **Running any code, that does not exclusively drive the EZO™ class RTD circuit and output its data in a serial string.**
- **Embedding the EZO™ class RTD circuit into a custom made device.**
- **Removing any potting compound.**

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Reasoning behind this warranty

Because Atlas Scientific™ does not sell consumer electronics; once the device has been embedded into a custom made system, Atlas Scientific™ cannot possibly warranty the EZO™ class RTD circuit, against the thousands of possible variables that may cause the EZO™ class RTD circuit to no longer function properly.

Please keep this in mind:

1. **All Atlas Scientific™ devices have been designed to be embedded into a custom made system by you, the embedded systems engineer.**

2. **All Atlas Scientific™ devices have been designed to run indefinitely without failure in the field.**

3. **All Atlas Scientific™ devices can be soldered into place, however you do so at your own risk.**

Atlas Scientific™ is simply stating that once the device is being used in your application, Atlas Scientific™ can no longer take responsibility for the EZO™ class RTD circuits continued operation. This is because that would be equivalent to Atlas Scientific™ taking responsibility over the correct operation of your entire device.

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