

**Safety**

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**Safety**

5 VDC, 1V AC maximum on field wiring terminals.

24 VDC maximum on internal card surfaces.

2. Installation

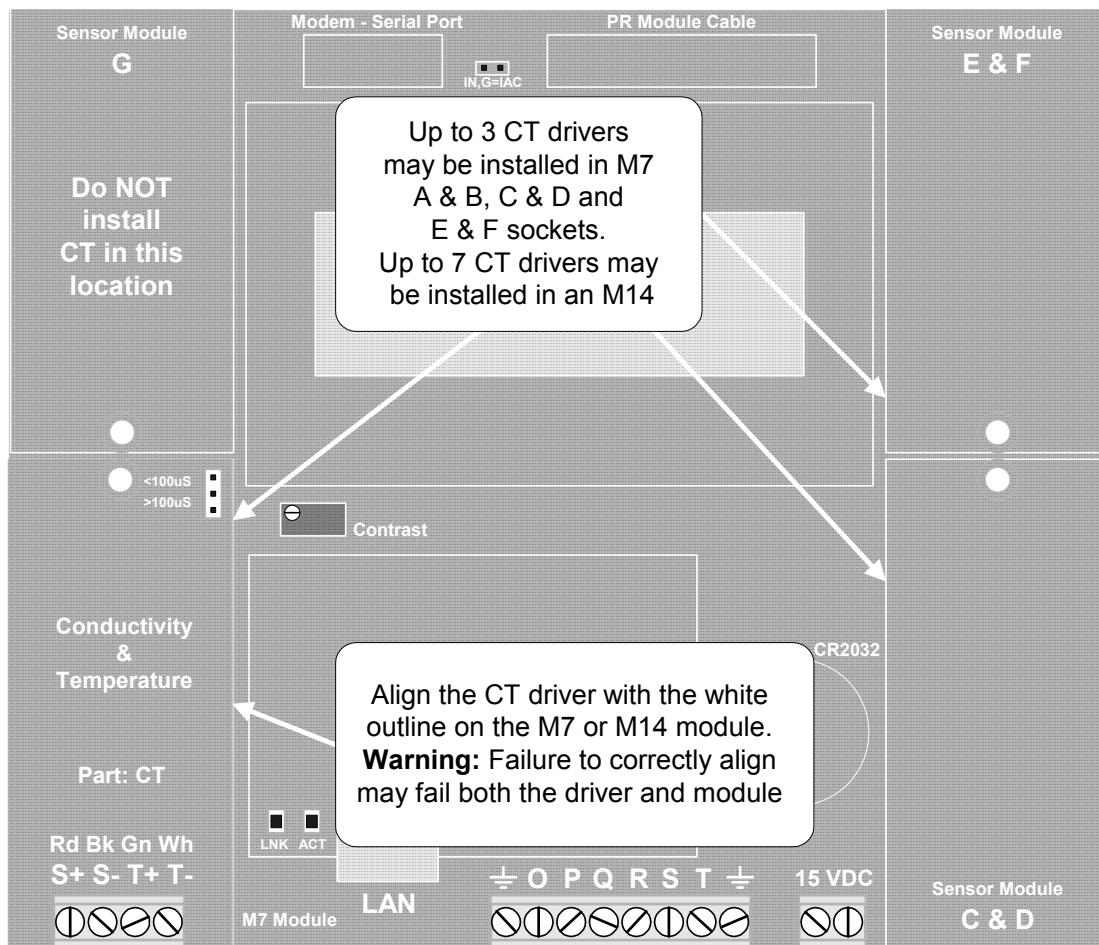
2.1 CT:Services

The CT driver measures conductivity and temperature, connecting to a single immersed sensor. Usually the sensor is installed in a cooling tower recirculating loop, although thermally compensated sensors may be installed in condensate streams, RO piping, downstream of sample coolers on boiler blowdowns...

Up to three CT's may be installed in an M7 controller and up to seven in an M14 controller. Thermal compensation of conductivity is provided by the controller software.

2.2 Driver Card Installation

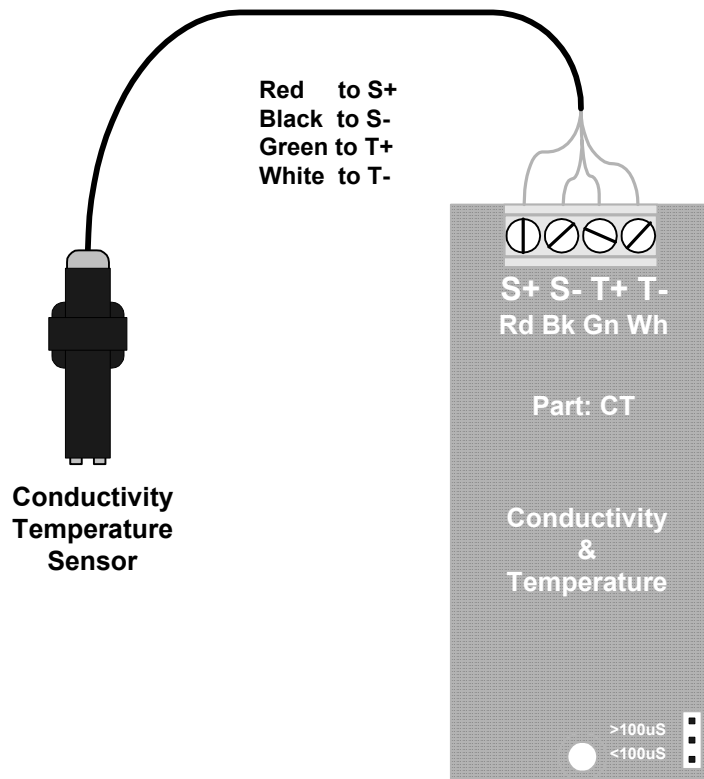
1. Enable both of the analog inputs at the driver socket location.
2. Turn OFF the controller AC power
3. CT drivers may be installed in any of the seven M14 controller slots and in any of the M7 slots with the exception of 'G'.
4. Turn ON the controller after installing the CT Driver and the controller will auto-configure, displaying both conductivity and temperature on the LCD display and browser.



## 2.3 Sensor Types

Aquatrac type A261200 cooling tower and A261016 hot water, boiler-condensate sensors  
Both of these sensors contain a 10mV/K type sensor rated up 125C.

## 2.4 Sensor Wiring



Conductivity sensor cabling may be extended up to 200ft / 60m, using two pair AWG22 / 0.25 mm<sup>2</sup>, cable spliced to the sensor cable using wire nuts or crimped connectors located in an electrical fitting or enclosure.

Do not install sensor cabling in the same conduit as AC power cabling.

Conductivity sensor cabling may share a common conduit with other sensors, water meter and contact set cabling.

## 2. Configuration - Operation

### 2.1 Range Selection

#### Cooling towers – Waste Water – RO Streams:

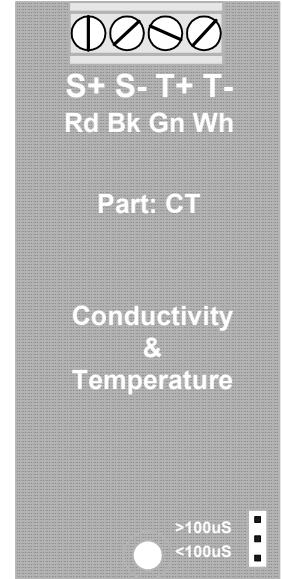
The default range for the CT driver is >100uS. Installing a jumper on the >100uS pins does not change the default range. Use this range for conductivities from 100uS to 20,000uS.

#### Condensate – Low Conductivity:

Jumper the <100uS pins for conductivities in the 1 to 100uS range. Constant pressure condensate conductivities may also be measured with the single or dual **B** driver using sensors without thermal compensation.

#### Changing Ranges:

*Turn controller OFF before changing ranges*  
Controllers check range on power up, loading default Offset and Gain on range change.



Conductivities greater than 100uS	>100uS	<input type="checkbox"/>
	<100uS	<input type="checkbox"/>
Conductivities less than 100uS ( Install jumper )	>100uS	<input type="checkbox"/>
	<100uS	<input checked="" type="checkbox"/>

# CT: Conductivity-Temperature

## 2.2 Diagnostics

# Technical

### 2.2.1 Conductivity Input

Parameter	LCD Display	Browser	Value : Use
Sensor Location		OK	C: Installation slot. LCD displays slot letter on screen.
Input Card Type	OK	OK	Conductivity: verifies driver card type
Current State	OK	OK	Operational / Alarmed:
Displayed Value	OK	OK	1088 uS: Current measured conductivity, display user set units, 'uS' default. Displayed with user set resolution
Period Maximum		OK	1094 uS: Data from current log interval. Used to assess controls.
Period Minimum		OK	1082 uS:
Period Average		OK	1086 uS:
Sample Size		OK	426: Samples in Period Max. Min. & Average
Current Period		OK	36 minutes: Elapsed time in current log period
Log Period		OK	60 minutes: User set log period 5 to 1440 minutes
Compensation	OK	OK	Thermal Compen. / None:
Measured Level	OK	OK	184.9 mV: Raw sensor level in mV, before Gain & Offset after ID Level correction.
Gain Multiplier	OK	OK	5.6420: Calibration adjusts Gain. Displayed Value = Measured Level x Gain Multiplier + Offset Adjust Thermal Compensation is applied after Gain & Offset if selected
Default Gain	OK	OK	5.6000: Factory default Gain. Gain selected by Input Card ID
Offset Adjust	OK	OK	-35.0000: Offset. May be user adjusted.
Default Offset	OK	OK	-35.0000: Factory default Offset. Offset selected by Input Card ID
Input Card ID	OK	OK	77 mV: Drive level at >100uS range. Design level = 75mV. 1007 mV: Drive level at <100uS range. Design level = 1005mV.
Drive Level	OK		0.0 mV: Unused in CT driver.

Range	Default Gain	Calibration Gain Span	Default Offset
>100uS	5.6	2.5 to 10	-35
<100uS	0.4	.25 to .55	-10

**Calibration:** A calculated gain outside of the Calibration Gain Span requires a user selected Override to complete calibration.

**Driver Verification Test:**

Connect 1K ohm resistor to 'S+' & 'S-'. Set Range to '>100uS'. Measured Level = 187.5mV +/-5mV

2.2.2 Temperature Input

Parameter	LCD Display	Browser	Value : Use
Sensor Location		OK	D: Installation slot. LCD displays slot letter on screen.
Input Card Type	OK	OK	Temperature: verifies driver card type
Current State	OK	OK	Operational / Alarmed:
Displayed Value	OK	OK	78.47 F: Current measured conductivity, display user set units, 'F'/'C' are defaults. Displayed with user set resolution. 'Metric' switch selects 'C' as default.
Period Maximum		OK	78.55 F: Data from current log interval.
Period Minimum		OK	78.30 F:
Period Average		OK	78.45 F:
Sample Size		OK	1320: Samples in Period Max. Min. & Average
Current Period		OK	37 minutes: Elapsed time in current log period
Log Period		OK	60 minutes: User set log period 5 to 1440 minutes
Compensation	OK	OK	None:
Measured Level	OK	OK	2988.1 mV: Raw sensor level in mV, before Gain & Offset. 10mV/K = 298.8K, 25.8C
Gain Multiplier	OK	OK	0.18: Gain. May be user adjusted.
Default Gain	OK	OK	0.18: Factory default Gain. Gain selected Metric switch. Metric Default Gain = 0.1
Offset Adjust	OK	OK	-461.4: Calibration adjusts Offset. Displayed Value = Measured Level x Gain Multiplier + Offset Adjust. .
Default Offset	OK	OK	-459.4: Factory default Offset. Offset selected by Input Card ID Metric Default Offset = -273
Input Card ID	OK	OK	3003 mV: Ignored by controller, card ID set by conductivity input.
Drive Level	OK		0.0 mV: Unused in CT driver.

Units	Default Gain	Calibration Offset Span	Default Offset
F	0.18	-430 to -590	-459.4
C / Metric Option Set	0.10	-253 to -293	-273.0

**Calibration:** A calculated offset outside of the Calibration Offset Span requires a user selected Override to complete calibration.

**Driver Verification Test:**

Connect 1K ohm resistor to 'T+' & 'T-'. Measured Level = 680 +/-5mV  
 Measured Level = 680uA thermal sensor drive x 1K ohm

3. Specifications

Range / Function		Drive
<b>&gt;100uS</b> 100 – 10,000uS	Resolution: 1uS Accuracy: +/-5uS	75mV AC
<b>&gt;100uS</b> 10,000 - 20,000uS	Tracks reduced resolution & accuracy	75mV AC
<b>&lt;100uS</b> 1-100 uS	Resolution: 1uS Accuracy: +/-1uS	1005mV AC
<b>Temperature</b> 32 – 250F 0 – 125C	Resolution: 0.1F / 0.1C Accuracy: 1 F/C  Temperature compensation of conductivity is %/Degree from 70F or 20C	680uA Constant current. 5 VDC MAX.

Notes:

1. Accuracy stated after sensor calibration.
2. Exclude errors due to extending sensor cabling.