CR: Corrosion Rate

Safety
100mV DC maximum on field wiring terminals.
24 VDC maximum on internal card surfaces.

1.1 Installation

Services
The CR driver measures one or two corrosion rates using Linear Polarization Resistance.
Dual CR drivers allow two alloys, copper & steel for example, to be monitored concurrently..
Up to two dual and one single 'CR' drivers may be installed in an Aegis controller.
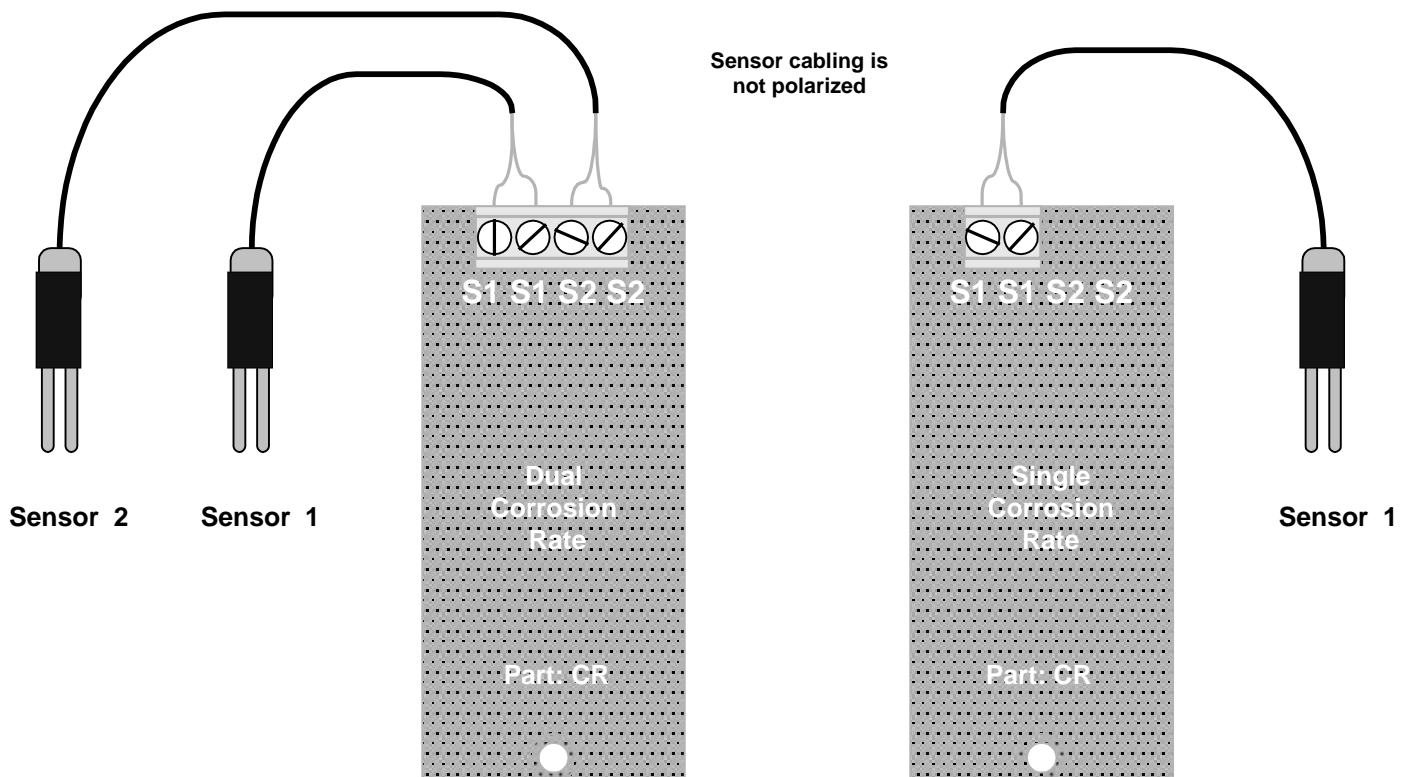
Card Installation
1. Turn OFF the controller AC power
2. The single and dual CR driver cards may be installed in either the Sensors 'C' & 'D' or Sensors 'E' & 'F' slot.
3. Turn ON the controller after installing the CR Driver and the controller will auto-configure, displaying one or both corrosion rates on the LCD display and browser.

Sensor Types
Aquatrac type CRS-SEN corrosion rate sensors.
Alloy sensor sets available in steel, copper, admiralty and cupro-nickel

Sensor Wiring

Sensor cabling is not polarized

S1 S1 S2 S2

Dual Corrosion Rate

Part: CR

Sensor 2   Sensor 1

S1 S1 S2 S2

Single Corrosion Rate

Part: CR

Sensor 1

1.1 Installation cont.

Sensor Wiring

Corrosion rate sensor cabling may be extended up to 200ft / 60m, using single pair AWG22 / 0.25 mm^2, 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 any AC power cabling.

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

1.2 Configuration - Operation

Setup-Calibration

Alloy Number:
The Alloy Number is used to convert the Linear Polarization Current to a rate of metal loss in mils/year.
The default Alloy Number is 1.000, Carbon Steel.
Common alloy numbers are Copper @ 2.00, 90/10 Cupro-Nickel @ 1.80, Zinc @ 1.29, Admiralty @ 1.67

Conductivity Sensor:
If the controller includes a conductivity sensor installed in the same sample stream at the corrosion rate sensor, the corrosion rate measurement may be corrected for conductivity.
Conductivity correction has little effect at 1000uS with correction increasing as conductivity falls.
At low conductivities, LPR faults and alarms.

Calibration:
The CR driver can operate without calibration with nominally 0.05 mpy of static error caused by component offsets in the driver card.
If you disconnect the sensor and calibrate for 0 mpy, the controller will correct the Offset for the static error.
This is a one-time calibration unless you move the CR driver to another controller slot. A new slot, resets the offset calibration.

Diagnostics

Parameter	LCD Display	Browser	Value : Use
Sensor Location		OK	E: Installation slot. LCD displays slot letter on screen.
Input Card Type	OK	OK	Corrosion Rate: verifies driver card type
Current State	OK	OK	Operational / Alarmed:
Displayed Value	OK	OK	1.23 mpy: Current measured corrosion rate, Displayed with user set resolution Updates every 128 seconds
Period Maximum		OK	1.28 mpy: Data from current log interval.
Period Minimum		OK	1.21 mpy:
Period Average		OK	1.22 mpy:
Sample Size		OK	106: Samples in Period Max. Min. & Average
Current Period		OK	26 minutes: Elapsed time in current log period
Log Period		OK	60 minutes: User set log period 5 to 1440 minutes
Compensation	OK	OK	Corrosion Rate: Sequences through six steps, repeating every 128 seconds
Anodic Level	OK	OK	52.1 mV: Anodic & Cathodic levels should be opposite in sign and nominally the same value.
Cathodic Level	OK	OK	-48.6 mV:
Pitting Level	OK	OK	1.2 mV: Pitting should always be less than either Anodic or Cathodic. Pitting alarms are blocked for corrosion rates less than 2mpy. **A Pitting level higher than the Anodic or Cathodic level is an invalid corrosion rate measurement. Replace pitted sensor tips.**
Measured Level	OK	OK	6.8 mV: Raw sensor level in mV Displayed in real time as the CR driver sequences.
Gain Multiplier	OK	OK	1.0000: User set Gain.
Default Gain	OK	OK	1.0000: Factory default Gain. Gain selected by Input Card ID
Offset Adjust	OK	OK	-0.532: Offset. Calibration adjusts Offset for hardware error.
Default Offset	OK	OK	0.0000: Factory default Offset. Offset selected by Input Card ID
Input Card ID	OK	OK	1614 mV: Dual Design level = 1611mV. Single Design level = 1548mV
Drive Level	OK	OK	1209.9 mV: Offset correction allied to measured values. Inserted by driver card optical isolation.

Driver Verification Test:
Connect 10K ohm resistor to 'S1' & 'S1' or 'S2' & 'S2'.
Configure with Alloy Number =1.000 & no conductivity sensor.
Controller will display nominally 0.5mpy.
Anodic & Cathodic Levels will be nominally +/-50mV with pitting level +/-10mV.

1.3 Specifications

Function		Notes
Resolution	0.1mpy	Linear Polarization Resistance, LPR is applicable where general corrosion is the dominant corrosion mode. LPR is useful in measuring relative corrosion rates, process upsets and the immediate effect of changing treatment programs or operating conditions. **LPR is not an applicable technique for processes where pitting is the dominant corrosion mechanism.** Aluminum alloys and Stainless steels in cooling water and waste water stream usually pit.
Sensor Drive	DC Isolated.	Each sensor drive is separately electrically isolated from controller common and electrical ground.
Uncalibrated Error	0.05 mpy Nominal	Calibration with sensor disconnected removes The effect of Uncalibrated Error

Notes:
1. Accuracy with respect to weight loss measurements is typically 50% to 200%.
2. The first valid corrosion rate measurement occurs 4 minutes after Power ON and is updated every 2 minutes thereafter.

CR Driver Revision Log		
01/01/04 Initial release	Version 037 CR Driver cards	16 Second measurement cycle
05/05/05	Version 054 CR Driver cards	128 Second measurement cycle
09/05/05	Rate with 10K test resistor now 0.5mpy was 5mpy. Uncalibrated error reduced from 0.5mpy to 0.05mpy	Requires controller firmware Version T095 and later.
07/02/08	Reformatted for Aegis controllers	