Advanced Sensor Technologies, Inc.
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IMPORTANT NOTES FOR CYANIDE SYSTEM

Calibration and Accuracy of PT91 Cyanide Analyzer

For Non-Gold Leach Low to Mid-Level Cyanide Applications

- All samples, CAL Low, CAL High and Tails Tank Sample should be calibrated at identical temperatures to the process temperature. The actual temperature of the process solution (and thereby the calibrating solutions as well) is not as critical as the fact that they are calibrated at the same temperature. For safety and overall accuracy of interactive total cyanide measurement, however, measurement should be performed as close to 25 degrees Celsius (room temperature process solutions) as possible.

- Cal Low [CN1] and Cal High [CN2] set the slope of CN response into the Analyzer unit. The calibration solutions for [CN1] are 0.5 & 0.2 ppm and for [CN2] they are 5.0 & 2.0 ppm respectively.

- The One Point Re-Calibration Standard is always CN1 - DO NOT TOUCH THE "CN2" VALUE.

- At all times the calibration solutions must be stirred at low speed during stabilization and calibration procedure. Cyanide probe requires flow past the tip. Both probes must be in the liquid and for a minimum of 5 minutes.

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MENU

Menu for DUAL CHANNEL PT 91 Transmitter / Cyanide / pH Meter

PROBE	*Settings*	FUNCTION
	30	**Contrast** Set contrast from 10 to 50 for better LCD visibility
pH	**4 = 7.0** **20 = 14.0**	**4-20mA Output** Signal outputs for pH probe / can be changed to any range
pH	**7.0** **0 mV**	**1 pH CAL** Set start point for pH calibration, Normally at pH 7.0
pH	**10.00** **50 – 59 mV/pH**	**2 pH CAL** Set slope for pH calibration. Normally at pH 10.0
pH	**-155mV** **pH ~ 9.77**	**Input mV** True millivolt reading from pH probe
pH	**10.2** **Tank**	**pH Value/Reading** Displays pH reading and temperature of the probe.
CN	**0.5 ppm** **Tank**	**CN Value/Reading** Displays CN reading and temperature of the probe.
CN	**-61 mV** **~ 0.5 ppm**	**Input mV** True millivolt reading from CN probe
CN	**0.5 ppm** **-61 mV**	**1 CN CAL** Used for **Cal Low** in 2 Point Calibration & CN1 for the 1 Point Calibration.
CN	**5.0 ppm** **-40 to -60 mV**	**2 CN CAL** Cal High calibration point to determine slope. mV / Decade (10X ppm concen.)
	DO NOT ALTER THESE VALUES BELOW	
CN	**20 ppm**	**Maximum Range** Sets maximum range of unit
CN	**4mA= 0.002 ppm** **20mA = 20 ppm**	**4-20mA Output** Signal outputs for CN probe [Can set to any range]
CN	**2 ^5 = 32 sec**	**Average** Time averaging from 2^1 to 2^5 or from 12 to 32 seconds
CN	**9.3** **0.500 ON**	**Dissociation pH 50%** Dissociation value to be set at **ON** position, if pH is less than 12 Can be switched "OFF" Default is then 0.999
CN	**00.30%** **-210 mV**	**TC** Temperature Coefficient to be set at 00.30% / deg. Celsius **ISOPOT** Iso-potential to be set at 90mV
CN	**1.5°C** **TK = 28°C**	**Trim +/- 0.0 C UNIT** Adjustment between probe temp & actual temp

NOTE:

To scroll through the menu use the UP/DOWN arrows on the ***left-hand side*** of the unit. To access the parameters in each menu, simultaneously depress both the LEFT and RIGHT arrows on the ***right hand side*** of the meter. To change the values use the UP/DOWN and LEFT/RIGHT arrows on the ***right hand side*** of the unit.

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Cyanide Probe Calibration

2 Point Calibration

This is the most accurate calibration technique.

Set-up requirements:

- Two (2) plastic buckets.
- Cal Low 0.2 or 0.5 ppm [CN1] CN- standard solution
- Cal High 2.0 0r 5.0 ppm [CN2] CN- standard solution

1. "Standard Cyanide Solutions are provided by ASTI" for CN1 [Cal Low] & CN2 [Cal High] inputs. The pH of these standard solutions is approximately 13.5.

Important:

- Fill both buckets with 2 liters of liquid to ensure the mixer does not introduce too much air into the slurry & both probes are immersed.
- Mixer must only be used at the minimum speed to create an adequate flow past the probes.
- Allow a minimum of 5-10 minutes for the probe to stabilize once it has been removed from the tank, exposed to air and replaced into the samples.
- Once the probe **mV** value is stable exit the calibration mode and this automatically locks in the calibration value.
- Repeat this for each calibration solution during 2-point calibration.

Note:
Immediately after the probe is introduced to air it totally disturbs the surface chemistry on the tip causing erroneous results. Once in solution it takes at 5 minutes to stabilize.

- **SETTING "LO" AND "HIGH" VALUES ESTABLISHES THE SLOPE AND RESPONSE OF THE CYANIDE PROBE FOR AN IDEAL SOLUTION. ***** Slope should be greater than -40mV******
- **TO CHANGE THE SLOPE (SENSOR EFFICIENCY), YOU MUST CAL TO CN1, THEN CN2 AND THEN RECALIBRATE TO CN1 TO VALIDATE THAT YOU CALIBRATION HAS TAKEN EFFECT. YOU SHOULD BE ABLE TO GET REASONABLY GOOD AGREED BETWEEN THE TWO CN1 CALIBRATION VALUES**

PT91 User Manual:

Please consult this book for the basic operation of the key functions to activate the menus for operation & calibration.

- The Left hand Side arrows access the menus
- The Right hand arrows are used for calibration
- The Two "left" & "right" if pushed together at the same time get you into the calibration mode to enter new values.

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Single Point Calibration in Tailings Tank: Entering a new "CN 1" value.

Cyanide Probe Calibration

- ***This procedure can only be performed after a 2 point calibration for determining the "SLOPE" has been "STORED"***
- ***Only use the "CN1" function key, NO OTHER COMMAND.***
- ***Can be performed DAILY if required.***

- When the Cyanide system has been calibrated by the 2-point method it can then be used in the "single point" calibration mode on a daily basis.

Procedure:
- Thoroughly rinse the probes with DI water and blot dry with a clean towel.
- Remove the probes, place them in 2 liters of the Low Cyanide Standard Solution (0.2 or 0.5 ppm), perform a CN1 value in a stirred bucket where there are NO Tank Interferences.
- Enter into the controller/analyzer the "CN1" new value that is the nominal value of the standard solution

Enter this value into the PT91 Analyzer at least TWICE. The PT91 Analyzer uses time averaging of the input signal. *Enter it as CN1 value*.
Last entered value PLUS the previous value / Average It / over a time period.

NOTE:
If the new value is 20-30% away from the original displayed ppm then the process of "punching in" the new value may have to be done 3-4 times over 2-3 minutes.

EXAMPLE: (given in higher ppm values for demonstration of time averaging feature only)
First calibration entry of 260ppm:
Transmitter value 220 ppm, then input 260 ppm (actual from standard solution), the average that is displayed is then 240 ppm.
Second calibration entry of 260ppm:
Transmitter value is now 240ppm, then input 260ppm (actual from standard solution), this brings the average up to 250ppm which is then displayed in the Analyzer.
Third calibration entry of 260 ppm.
Transmitter value is now 250, then punch in 260 ppm, thus the average displayed is now 255 ppm. etc !!!

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Cleaning and Maintenance of ASTI "CN" Probe

Before a major 2-point calibration the cyanide probe may have to be cleaned each time. The frequency of cleaning will depend on the quality of the process water and the build up of lime related products depositing on the probe tip.

Note:

Any noticeable deposits on the tip of the cyanide probe or the pH probe will result in a less accurate calibration. The easiest way to monitor the performance and life of the CN probe is to compare the slope each time it is calibrated in the freshly prepared Cyanide Calibration Solutions. A typical slope for a new probe would be -60 mV. As it deteriorates the slope will drop to -40 mV of less. Calibration may become difficult at -30 mV and the probe ppm values will start to drift.

CLEANING:

1. Thoroughly rinse the sensor tip with ordinary TAP water. Blot the sensor tip dry.

2. First make sure the reference area around the black “CN” semiconductor crystal is scraped clean of excess deposits. Do not scratch the crystal.

3. Scrape the entire Kynar reference area clean with a sharp blade or Stanley knife. This reference is solid Kynar and cannot be damaged.

4. Once this has been achieved the entire tip can be soaked in a weak 10% HCL [Hydrochloric Acid] for approximately 10 minutes. DO NOT LEAVE IN THE ACID FOR EXTENDED PERIODS OF TIME. Wash the tip in “Demin” water for 10 minutes or longer to leach out remaining acid.

5. When the shiny metallic tip becomes dull or scratched, polish ONLY with a non-silicone "Car" polish / sink cleaner or product very similar. Please use a polishing cream, do not use any "wet &dry" paper on it.

6. Thoroughly was the tip and soak in clean water for 10 minutes.

7. Calibration after this procedure will take an additional 15-20minutes for the probe tip to stabilize in the sample slurry or prepared cyanide solutions.

** If the probe tip has a protective cover please replace it and ensure its direction is at right angles to the direction of the slurry flow in the process.

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OVERALL SUMMARY

Probe Calibration – Summary

Please consult the PT91 handbook for the explanation of the transmitter control panel and the calibration of the pH probe / Two Point Calibration.
The manual fully explains pH calibration and the functions of the transmitter as a "single" channel unit.

Cyanide calibration:

For the Cyanide channel the operation of the transmitter is the same.
The functions that should not be altered and are set-up during commissioning and calibration: See Menu table for Typical Values.

** The outputs for the 4-20mA output signals can be changed at any time to suit control room conditions

IMPORTANT CONSIDERATIONS FOR CALIBRATION

* Allow a minimum of 5 minutes for the probe to stabilize.
* Always stir the solution/slurry at a constant speed to ensure the probe is "seeing" fresh representative solution. Both probes to be immersed.

- Always ensure the mV values on the transmitter are steady before entering the calibration confirmation value for CN 1 & CN 2.
- ONLY use **CN 1** when you are doing a ONE - POINT calibration. Ensure the slope is chosen at its **highest** mV value. Do not enter an unrealistic value due to quick variations in the tank.
- Escape and enter the CN 1 value again for a second time. Repeat CN1 to overcome the “time averaging” sequence. [Details given previously].

ACCURATE 2 POINT CALIBRATION

This type of calibration is best used when you have a brand new sensor or an older aging sensor. A 2-point calibration is always the most accurate overall calibration technique:

- Cal Low 0.2 or 0.5 ppm [CN1] CN- standard solution
- Cal High 2.0 0r 5.0 ppm [CN2] CN- standard solution

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