

PROCESS DESCRIPTION

The WTS Neutralization System (NS-030-2) has been custom designed to neutralize acidic and alkaline waste liquid on a continuous basis. This is accomplished by using conventional neutralization chemistry.

The system consists of a single unit divided into the following chambers:

- ▶ Neutralization Chamber One (NT1 or C1)
- ▶ Neutralization Chamber Two (NT2 or C2)
- ▶ Clearwell

The influent arrives, at a maximum rate of 30 GPM, into C1 where the pH of the solution will be maintained at a prescribed level by the addition of sodium hydroxide and hydrochloric acid. The fluid from C1 then flows into C2 where the pH of the solution is further increased through the addition of sodium hydroxide or decreased through the addition of hydrochloric acid.

Ideally, the adjustment of the influent pH should occur in a 'step-wise' fashion. The pH of the liquid in C1 of the system should be at least 90% of the desired effluent pH. Any remaining pH adjustment should occur (if necessary) in C2.

***e.g.:* If the desired pH of the neutralization effluent is between 7 to 9, the pH of the first chamber should be at least 6.5.**

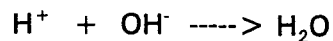
The solution in both chambers is thoroughly mixed by mounted agitators. The pH of the fluid is measured by mounted pH electrodes and then compared to programmed parameters. Addition of the neutralizing agents is regulated by a log-linear timed addition control program which adds a specified amount of reagent based upon the values of pH in the chamber. The reagent addition program is part of the entire control program which runs on the system programmable logic controller (PLC).

The fluid from chamber two then flows through the clearwell into the effluent holding tank where it is pumped out by two self priming centrifugal pumps. The pH is then measured by an in-line pH sensor before flowing to drain. If the pH is not within specified effluent parameters, the effluent is diverted back to the neutralization system through a pneumatic ball valve. If the pH is as specified, then the flow is continuously monitored and totaled by an in-line flow sensor before flowing to drain.

GENERAL CHEMISTRY

The adjustment of pH is accomplished by the combination of hydroxide ions (OH⁻) (alkaline solutions/high pH) with hydrogen ions (H⁺) (acidic solutions/low pH) to form water as a by-product. The pH of the solution in the neutralization system is lowered by the addition of concentrated hydrochloric acid and increased by the addition of concentrated sodium hydroxide.

The neutralization of acidic waste water may be easily summarized by the following equation:



SYSTEM PROCESS CONTROLS

GENERAL:

The neutralization system's process controls are centered around a **Programmable Logic Controller (PLC)** which processes a series of analog and digital signals corresponding to the physical treatment process. The signals, transmitted to the programmable controller (PLC) from various sensors and switches, are processed and outputs are activated or deactivated to control the system components, alarms, and indicators lights.

The PLC provides automatic control of the treatment process and peripheral equipment. It is programmed to meet the particular requirements of the system. The PLC replaces relay logic circuits used in conventional control systems, allowing an easy adaptability not found in a relay based system. This eliminates many of the various hardware failures which plague the relay based systems.

The treatment process control program is stored in the memory of the PLC's CPU and remains resident as long as there is power to the system and/or the back up battery is in place and active. Field experience has shown that the special lithium battery needs to be replaced roughly twice a year, and must only be replaced while there is power to the PLC. This minimizes the danger of losing the program due to a power surge or power failure.

MAIN COMPONENTS:

1. Control Cabinet → This enclosure houses the system control panel, circuit breakers, power relays, protection fuses, and logic controls:
 - a) Allen-Bradley SLC 5/01 equipped with
 - ▶ 1 4K CPU, model # 1747-L514
 - ▶ 1 Analog Input Module, 4 point, 4-20 mA, model # 1746-N14
 - ▶ 1 Digital Input Module, sink, 16 point, model # 1746-IB16
 - ▶ 1 Digital Output Module, 16 point, 24 VDC, model # 1746-OB16
 - ▶ 1 Rack, 7 slot, model # 1746-A7
 - ▶ 1.5 Slot Filter, pair, model # 1746-N2
 - ▶ 1 Power Supply, 5 AMP, model # 1746-P2
 - b) Power Supply, 24 VDC, 4.5 AMP → Used to power all 24 VDC requirements:
 - ▶ PLC
 - ▶ pH Transmitters
 - ▶ Level Sensors
 - ▶ Alarms
 - ▶ Panel Lights
 - ▶ Power Relays/Contactors
 - c) Flowmeter/Totalizer → Panel mounted analog displays used for continuous monitoring and totalling of the influent flow rate to the NS.

- d) Edgewise Panel Meters → Panel mounted analog displays used for continuous monitoring of the pH in C1 and C2 of the NS.
- e) Chart Recorder → Continuous strip recorder used to continuously monitor and record the systems in-line effluent pH, and the system's effluent flow.
- f) Audible/Visual Alarms → A combination of panel lamps and an electronic alarm speaker used to alert the operator when a system failure has occurred.

PH CONTROL LOOPS

The pH electrodes send a millivolt signal to their corresponding transmitters, which in turn send a 4 to 20 mA signal, proportional to a 0 to 14 pH to the analog input module of the PLC. These signals are continuously monitored by the PLC. The system is then programmed to activate peripherals based upon these signals.

SYSTEM COMPONENTS

This is a list of the primary system components supplied by WTS.

TANKS AND FILTERS:

- NS → Dual wall polypropylene tank with two chambers (C1/C2) and a clearwell used for the staged chemical addition of the neutralization process.
- HT1 → Steel reinforced holding tank for the collection and transfer of effluent.

PUMPS AND AGITATORS:

- NT1 NaOH FINE FEED PUMP → Solenoid driven metering pump used for the fine addition of sodium hydroxide into C1 of the NS.
- NT1 NaOH GROSS FEED PUMP → Diaphragm pump used for the gross addition of sodium hydroxide into C1 of the NS.
- NT2 NaOH FEED PUMP → Solenoid driven metering pump used to transfer sodium hydroxide into C2 of the NS.
- NT1 HCl FEED PUMP → Solenoid driven metering pump used to transfer hydrochloric acid into C1 of the NS.
- NT2 HCl FEED PUMP → Solenoid driven metering pump used to transfer hydrochloric acid into C2 of the NS.
- DISCHARGE TRANSFER PUMP 1/2 → Vertical effluent transfer pumps used to transfer effluent from the holding tank to drain.
- SUMP PUMP → Submersible sump pump used to transfer waste from area sump back into the neutralization system.
- AG1/AG2 (NT1/NT2 MIXER) → Mechanical agitators used to mix the influent and reagents in the reaction chambers (C1/C2) of the NS.

CONTROL PANEL

The system control panel is comprised of panel meters, chart recorder, control switches, and indicator lights which are the interface between the operator and the process controller.

CONTROL SWITCHES:

► NOTE ◀

The control panel uses 3-position, 2-position, or push button switches for control of the system component. Each device control switch is paired with a green panel light which indicates that the device should be in operation.

When the switch is placed in the ON/OFF positions the device is controlled manually.

When the switch is placed in the AUTO position, the device is operated based upon instructions from the PLC.

When a push button switch is pressed, a relay is thrown enabling or disabling the desired action.

NT1 NaOH GROSS FEED PUMP	→	3-position switch controlling the operation of the diaphragm pump which transfers sodium hydroxide into C1 of the NS.
NT1 NaOH FINE FEED PUMP	→	3-position switch controlling the operation of the solenoid driven metering pump which transfers sodium hydroxide into C1 of the NS.
NT2 NaOH FEED PUMP	→	3-position switch controlling the operation of the solenoid driven metering pump which transfers sodium hydroxide into C2 of the NS.
NT1 HCl FEED PUMP	→	3-position switch controlling the operation of the solenoid driven metering pump which transfer hydrochloric acid into C1 of the NS.
NT2 HCl FEED PUMP	→	3-position switch controlling the operation of the solenoid driven metering pump which transfer hydrochloric acid into C2 of the NS.
DISCHARGE TRANSFER PUMP 1/2	→	3-position switch controlling the operation of the effluent transfer pumps.

- NT1 MIXER → 2-position switches controlling the operation of the mechanical agitator (AG1) in C1 of the NS.
- NT2 MIXER → 2-position switches controlling the operation of the mechanical agitator (AG2) in C2 of the NS.
- SYSTEM CONTROLLER → 2-position switch enabling the automated operation of the system via the control program in PLC.
- ALARM ACKNOWLEDGE → Push button switch for turning off the audible alarm after a warning condition occurs.
- EFFLUENT BALL VALVE PBV1 → 3-position button to control the operation of the pneumatically actuated valve which controls the effluent from the NS.
- OUT OF SPEC BALL VALVE PBV2 → 3-position button to control the operation of the pneumatically actuated valve which controls the out of spec. effluent from the NS.

PANEL LAMPS:

- NT1 pH FAIL → Red LED panel lamp for indicating that the pH in C1 of the NS is too high or too low.
- NT2 pH FAIL → Red LED panel lamp for indicating that the pH in C2 of the NS is too high or too low.
- FINAL pH FAIL → Red LED panel lamp for indicating that the effluent pH in-line is too high or too low.
- NaOH DRUM LOW LEVEL → Red LED panel lamp for signalling that the supply of sodium hydroxide in the sodium hydroxide holding drum (provided by owner) is low.
- HCl DRUM LOW LEVEL → Red LED panel lamp for signalling that the supply of hydrochloric acid in the hydrochloric acid holding drum (provided by owner) is low.
- EFFL. TANK HIGH LEVEL → Red LED panel lamp for indicating that the liquid level in the effluent holding tank is high.
- SUMP PIT HIGH LEVEL → Red LED panel lamp for indicating that the liquid level in the sump pit is high.

SAFETY

ELECTRICAL:

1. Keep all enclosure doors closed and sealed when left unattended.
2. Do NOT allow water to enter any electrical enclosure!
3. Turn OFF appropriate circuit breakers when servicing any electrically actuated device (motors, mixers, valves...).
4. Do NOT operate any controls with wet hands.

MECHANICAL:

1. Disconnect air prior to servicing any air operated device.
2. Do NOT exceed maximum pressure ratings on any equipment.
3. Turn OFF agitators when adjusting shaft pitch. After adjustment, manually rotate shafts to verify that the props do not contact the chamber walls.
4. Do not operate any agitators when the applicable chamber or tank is empty or the props are not sufficiently submerged.
5. Always wear safety glasses when servicing or operating the equipment.

CHEMICAL:

1. Always wear protective clothing while handling the chemicals. This clothing should include goggles, gloves, boots, and an apron. All designed for the handling of corrosive chemicals.
2. An eyewash and body shower must be present at the site and should be utilized immediately should any chemicals contact the skin or eyes.
3. Do NOT ingest any of the chemicals.
4. Hydrochloric Acid (HCl) and Sodium Hydroxide (NaOH) are extremely corrosive and will dissolve clothing as well as skin. They are extremely harmful to touch, and can cause blindness if it comes in contact with the eyes. Read all chemical warnings supplied by the chemical manufacturer.

SYSTEM INITIALIZATION & OPERATION

The WTS neutralization system controls have been designed to operate automatically with only minimal operator interaction. In order to ensure the process controller's ability to effectively operate the system, it must be initialized as detailed. The initialization criteria have been established to ensure the continuous, effective, automatic operation of the system.

PROCESS CONTROLLER:

The process controller governs the automatic operation of the entire treatment system. If any of the following criteria are not met, the system will not function normally, if at all.

OPERATIONAL CRITERIA:

- The system is receiving adequate, steady power.
- The CPU is on and the RUN lamp is lit.
- The PLC panel control switch (SYSTEM CONTROLLER) is in the ON position.

NEUTRALIZATION TANK:

In order to ensure the effective neutralization of waste in the neutralization tank, the following criteria must be met:

OPERATIONAL CRITERIA:

- The liquid level in each chamber is sufficient to cover the agitator impellers and pH probes.
- The AG1 and AG2 panel control switches (NT1 MIXER/NT2 MIXER) are in the AUTO position and the agitators are operational.

REAGENT ADDITION:

Sodium hydroxide and hydrochloric acid are supplied to the system via one air operated diaphragm pump, and four solenoid driven metering pumps. Reagent addition into the system will occur only when the following conditions are met:

OPERATIONAL CRITERIA:

- All manual ball valves on the transfer lines are open.
- There is an adequate supply of reagents in the supply vessels.
- The chemical suction assemblies are inserted into the appropriate reagent supply vessels.

- The pressure regulators on each point of the air manifold are set to approximately 60 PSIG and the manual valves on each point of the manifold are open.
- The NT1 NaOH GROSS FEED PUMP, NT1 NaOH FINE FEED PUMP, NT2 NaOH FEED PUMP, NT1 HCl FEED PUMP and NT2 HCl FEED PUMP panel control switches are in the AUTO position.

SYSTEM OPERATION:

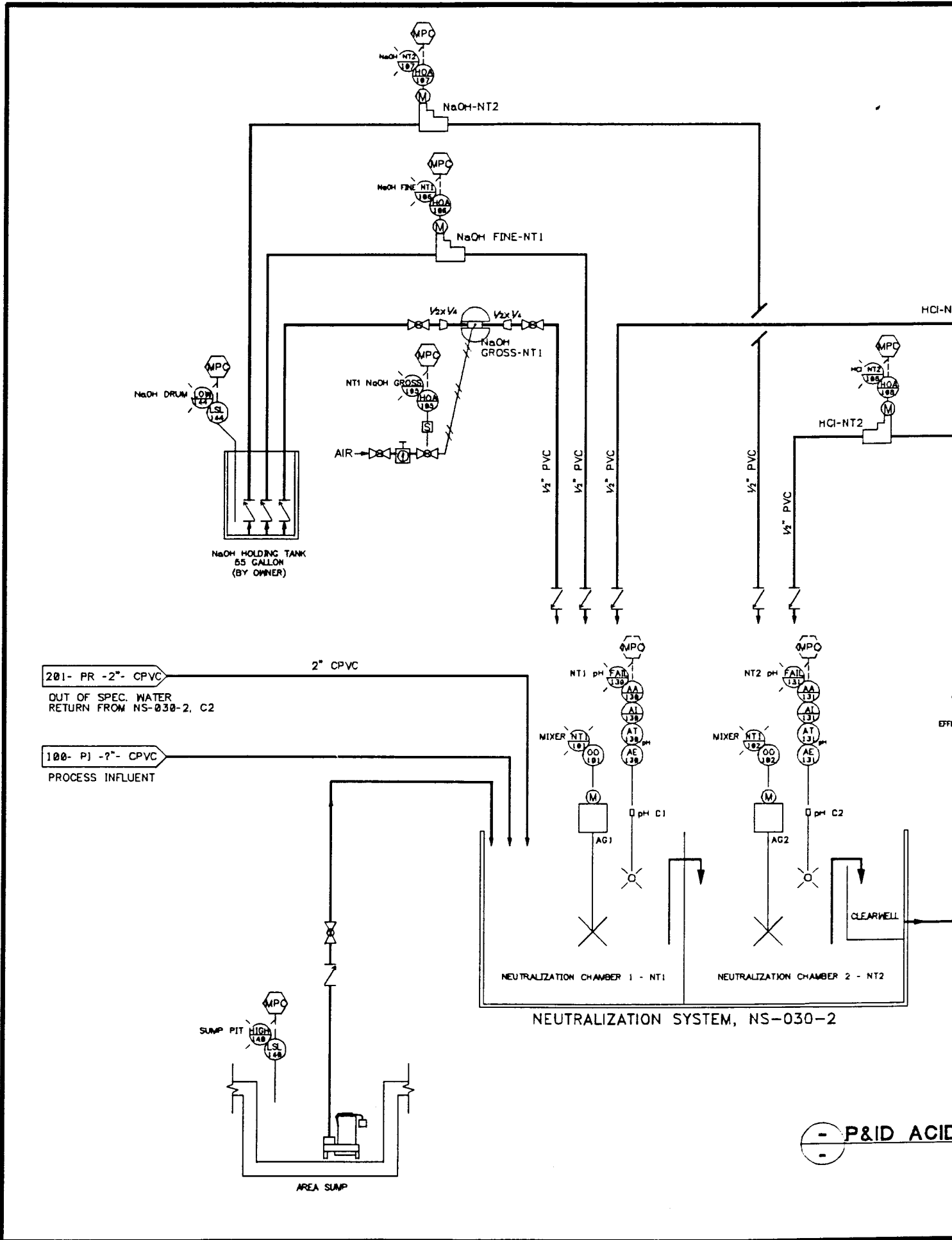
Once the system has been initialized, the following guidelines should be used to ensure the proper operation of the system during routine operation and shutdown. If the system has not been initialized properly, it may not operate in an efficient, effective manner.

ROUTINE OPERATION:

1. Enable the flow of waste to C1 of the NS.
2. Respond to any and all system alarms in a timely fashion.
3. Perform scheduled maintenance and any other maintenance as required.

SHUTDOWN:

1. Stop the transfer of waste to the system.
2. Ensure that there are no alarm conditions.
3. Place all panel control switches into the OFF position.

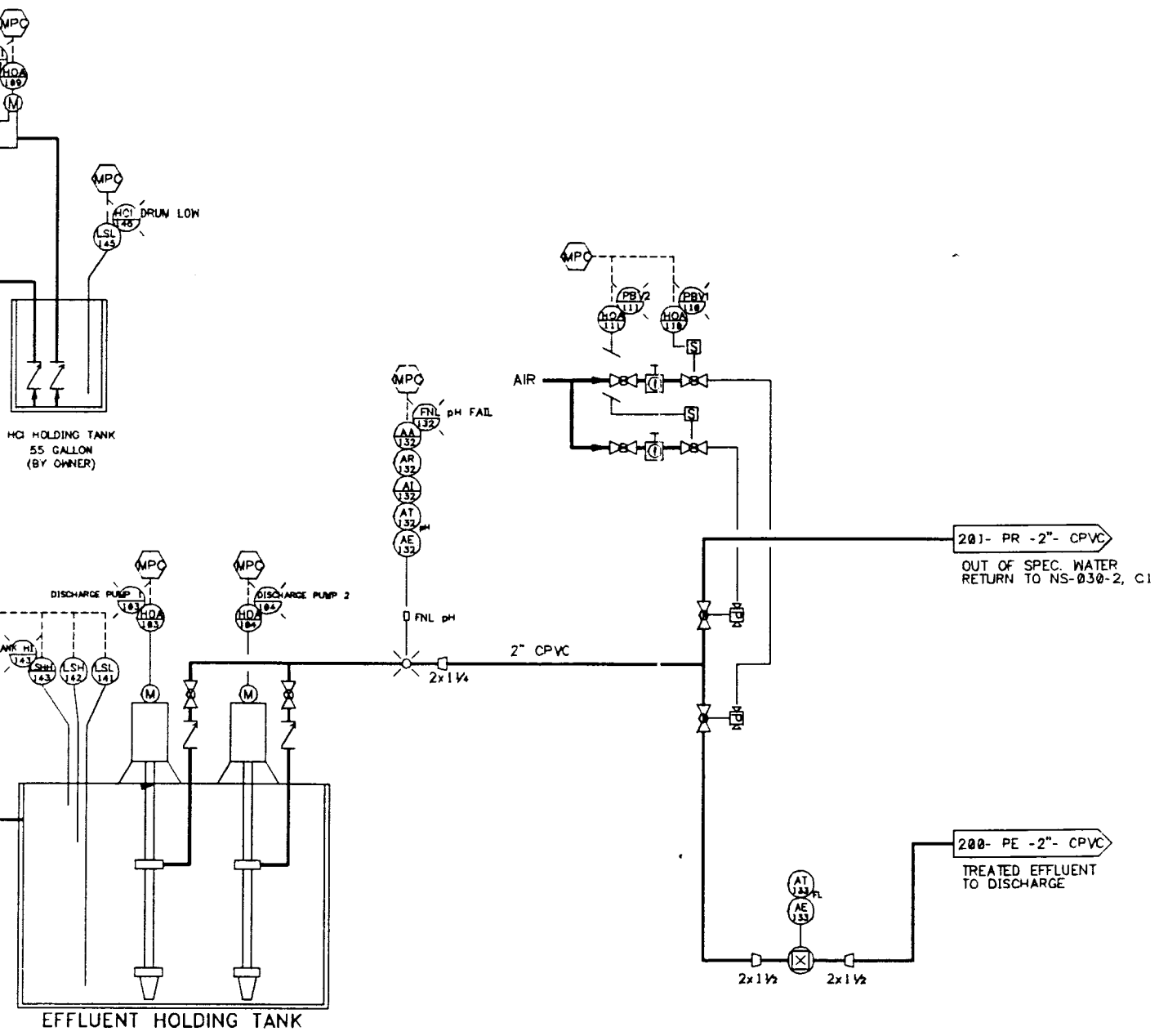


201- PR -2"- CPVC
 OUT OF SPEC. WATER
 RETURN FROM NS-030-2, C2

100- PJ -?"- CPVC
 PROCESS INFLUENT

NEUTRALIZATION CHAMBER 1 - NT1 NEUTRALIZATION CHAMBER 2 - NT2
NEUTRALIZATION SYSTEM, NS-030-2

- P&ID ACID



WASTE NEUTRALIZATION SYSTEM

FILE NAME: 4502984	PROJECT NO.: 2904	DRAWN BY: RDW
DATE: 9/9/93	CHECKED BY:	APPROVED BY:
P&ID, pH NEUTRALIZATION SYTEM, NS-030-2		
UNIVERSITY OF ARIZONA, TUSCON, AZ		
DRAWING NUMBER: 450-2904	NEXT ASSEMBLY:	
SCALE: NONE	REV LEVEL: A	NO. 10 PAGE 1 OF 1
DIMENSIONAL TOLERANCES: Unless otherwise specified, all tolerances shall be held to the following specification:		
X' = +/- 1"	X/4" = +/- 1/16"	
X/2" = +/- 1/8"	X/8" = +/- 1/32"	
X/2" = +/- 1/16"	X/16" = +/- 1/32"	
PROPRIETARY INFORMATION		

WTS
WASTEWATER TREATMENT SYSTEMS

A MEMBER OF THOMAS WATER PRODUCTS & SERVICES GROUP
 235 Elko Dr. Sunnyvale, CA 94089
 Phone (408)541-8000 Facsimile (408)541-0015

TROUBLE SHOOTING & SYSTEM ALARMS

TROUBLE SHOOTING GUIDE:

The following table is provided to help to quickly determine the source of any problems and correct them. To use the table, locate your problem in the left hand column, determine which cause is most likely responsible, and then select the solution that will correct the problem.

PROBLEM	POSSIBLE CAUSE	POTENTIAL SOLUTIONS
pH fluctuates widely	Probe / Transmitter failure	<ul style="list-style-type: none"> • Check probe/transmitter connections • Clean and calibrate pH probe • Replace pH probe • Replace transmitter
	Metering Pump Settings	<ul style="list-style-type: none"> • Check SPEED/STROKE settings against manual • Adjust settings as necessary
	Program errors	<ul style="list-style-type: none"> • Check program logic • Check pH control setpoints • Check reagent addition timer values
	Wastewater fluctuations	<ul style="list-style-type: none"> • Test the incoming waste stream
System does not operate automatically	Panel controls not set properly	<ul style="list-style-type: none"> • Place PLC switch into the ON position • Ensure all 3-position switches in AUTO
	PLC failure	<ul style="list-style-type: none"> • Verify power to the PLC • Make sure PLC is in the RUN mode • Check for program faults
Mixer failure	Mixer is not receiving power	<ul style="list-style-type: none"> • Reset circuit breaker for mixer • Put control switch in the ON position • Check wiring • Replace protection fuses • Repair/replace power relay coil
	Mixer won't turn	<ul style="list-style-type: none"> • Check for obstructions of the mixer prop • Tighten mixer mounting • Adjust shaft pitch
Metering pump failure	Pump is not receiving power	<ul style="list-style-type: none"> • Reset circuit breaker for pump • Put control switch in the AUTO position • Check wiring • Replace protection fuses • Repair/replace power relay coil • Check control program
	Liquid is not transferring adequately	<ul style="list-style-type: none"> • Check for 'weep' holes in the pump head • Clean the injection foot valve • Clear obstructions from suction line • Adjust the SPEED and STROKE dial
No flow	Line obstructed	<ul style="list-style-type: none"> • Clean out line • Open any valves
	Pump failure	(see instruction for centrifugal pump failure)
Solenoid valve failure	Solenoid is not receiving power	<ul style="list-style-type: none"> • Reset circuit breaker for valve • Put control switch in the AUTO position • Check wiring • Replace protection fuse • Repair/replace power relay coil • Check control program
	Mechanical jamming of mechanism	<ul style="list-style-type: none"> • Clean Valve

PROBLEM	POSSIBLE CAUSE	POTENTIAL SOLUTIONS
Centrifugal pump failure	Pump is not receiving power	<ul style="list-style-type: none"> • Reset circuit breaker for pump • Put control switch in the AUTO position • Check wiring • Replace protection fuses • Repair/replace power relay coil • Check control program
	Liquid is not transferring adequately	<ul style="list-style-type: none"> • Clear obstructions from pump head • Open valves on transfer lines • Clear obstructions from suction line • Check for leaks in the pump head
Air operated diaphragm pump failure	Pump is not receiving air	<ul style="list-style-type: none"> • Ensure air supply compressor is operating • Put control switch in the AUTO position • Open manual valves on air line • Verify solenoid valve operation • Ensure regulator set at 80 PSIG • Check control program
	Liquid is not transferring adequately	<ul style="list-style-type: none"> • Check for leakage from the connections • Check lubricator for oil • Clear obstructions from suction line • See equipment literature in MAINTENANCE section

SYSTEM ALARMS:

☀ NT1 pH FAIL

This alarm alerts the operator to a failure in the systems control of the pH in C1 of the NS. This condition will occur when the pH varies from the specified range for more than 60 seconds. The pH failure can be verified by reading the pH signal on the appropriate transmitter and panel meter. If the system is operating automatically, the following steps should be taken:

PROCEDURE: PH IS LOW

- ✓ Press the ALARM ACKNOWLEDGE button to silence the audible alarm.
- ✓ Ensure that NT1 NaOH GROSS FEED PUMP is receiving adequate air pressure and is operational.
 - The pressure regulator on the air manifold point supplying air to the pump is set at 60 PSIG.
 - The manual valve on the air manifold point is open.
 - The solenoid valve on the air manifold point is receiving adequate power and is operational.
- ✓ Ensure that NT1 NaOH FINE FEED PUMP is receiving adequate power and is operational.
- ✓ Ensure that all manual valves on the injection lines are open.
- ✓ The NT1 NaOH GROSS FEED PUMP, NT1 NaOH FINE FEED PUMP and NT1 HCl FEED PUMP panel control switches are in the AUTO position.
- ✓ Verify that NT1 NaOH FINE FEED PUMP and NT1 NaOH GROSS FEED PUMP are cycling on and off.
- ✓ Verify that there is an adequate supply of caustic reagent.
- ✓ Verify that NT1 HCl FEED PUMP, the acid pump, is not cycling on and off.
- ✓ Verify that the pH is actually low, using a portable pH meter.
- ✓ Clean and calibrate the appropriate pH electrode and transmitter.

If all of the above appears normal, the alarm condition may be temporary and will clear itself in a few minutes. If the low pH condition keeps recurring, the caustic feed rate should be slightly increased. Follow only those steps needed to achieve the desired operating efficiency.

- ☞ First, try increasing the NT1 NaOH FINE FEED PUMP's SPEED and STROKE dial settings. This will increase the amount of caustic being injected into the chamber (C1) each time the pump activated.

- ☞ Next, try decreasing the NT1 HCl FEED PUMP's SPEED and STROKE dial settings. This will decrease the amount of acid being injected into the chamber (C1) each time the pump activated.
- ☞ Next, try lengthening the caustic pumps (NT1 NaOH FINE FEED PUMP and NT1 NaOH GROSS FEED PUMP) on cycle duration by increasing the timer values for caustic addition located in the appropriate data block. Use the hand held programmer to make this change.
- ☞ Finally, try shortening the acid pump (NT1 HCl FEED PUMP) on cycle duration by decreasing the timer values for acid addition located in the appropriate data block. Use the hand held programmer to make this change.

Performing any or all of the above changes as needed will allow the operator to establish a feed rate that will prevent a recurring pH low condition.

PROCEDURE: PH IS HIGH

- ✓ Press the ALARM ACKNOWLEDGE button to silence the audible alarm.
- ✓ Ensure that the NT1 NaOH FINE FEED PUMP, NT1 NaOH GROSS FEED PUMP and NT1 HCl FEED PUMP panel control switches are in the AUTO position.
- ✓ Verify that NT1 HCl FEED PUMP is cycling on and off.
- ✓ Verify that there is an adequate supply of acid reagent.
- ✓ Verify that NT1 NaOH FINE FEED PUMP and NT1 NaOH GROSS FEED PUMP are not cycling on and off.
- ✓ Verify that the pH is actually high, using a portable pH meter.
- ✓ Clean and calibrate the appropriate pH electrode and transmitter.

If all of the above appears normal, the alarm condition may be temporary and will clear itself in a few minutes. If the high pH condition keeps recurring, the caustic feed rate should be slightly decreased. Follow only those steps needed to achieve the desired operating efficiency.

- ☞ First, try increasing the NT1 HCl FEED PUMP's SPEED and STROKE dial settings. This will increase the amount of acid being injected into the chamber (C1) each time the pump activated.
- ☞ Next, try decreasing the NT1 NaOH FINE FEED PUMP's SPEED and STROKE dial settings. This will decrease the amount of caustic being injected into the chamber (C1) each time the pump activated.
- ☞ Next, try lengthening the acid pump (NT1 HCl FEED PUMP) on cycle duration by increasing the timer value for acid addition located in the appropriate data block. Use the hand held programmer to make this change.

- ☞ Finally, try shortening the caustic pumps (NT1 NaOH FINE FEED PUMP and NT1 NaOH GROSS FEED PUMP) on cycle duration by increasing the timer values for caustic addition located in the appropriate data block. Use the hand held programmer to make this change.

Performing any or all of the above changes as needed will allow the operator to establish a feed rate that will prevent an under dosing of caustic and a recurring pH low condition.

☼ NT2 pH FAIL

This alarm alerts the operator to a failure in the systems control of the pH in C2 of the NS. This condition will occur when the pH varies from the specified range for more than 60 seconds. The pH failure can be verified by reading the pH signal on the appropriate transmitter and panel meter. If the system is operating automatically, the following steps should be taken:

PROCEDURE: PH IS LOW

- ✓ Press the ALARM ACKNOWLEDGE button to silence the audible alarm.
- ✓ Ensure that NT2 NaOH FEED PUMP is receiving adequate power and is operational.
- ✓ The NT2 NaOH FEED PUMP and NT2 HCl FEED PUMP panel control switches are in the AUTO position.
- ✓ Verify that NT2 NaOH FEED PUMP, the caustic pump, is cycling on and off.
- ✓ Verify that there is an adequate supply of caustic reagent.
- ✓ Verify that NT2 HCl FEED PUMP, the acid pump, is not cycling on and off.
- ✓ Verify that the pH is actually low, using a portable pH meter.
- ✓ Clean and calibrate the appropriate pH electrode and transmitter.

If all of the above appears normal, the alarm condition may be temporary and will clear itself in a few minutes. If the low pH condition keeps recurring, the caustic feed rate should be slightly increased. Follow only those steps needed to achieve the desired operating efficiency.

- ☞ First, try increasing the NT2 NaOH FEED PUMP's SPEED and STROKE dial settings. This will increase the amount of caustic being injected into the chamber (C2) each time the pump activated.
- ☞ Next, try decreasing the NT2 HCl FEED PUMP's SPEED and STROKE dial settings. This will decrease the amount of acid being injected into the chamber (C2) each time the pump activated.
- ☞ Next, try lengthening the caustic pump (NT2 NaOH FEED PUMP) on cycle duration by increasing the timer values for caustic addition located in the appropriate data block. Use the hand held programmer to make this change.

- ☞ Finally, try shortening the acid pump (NT2 HCl FEED PUMP) on cycle duration by decreasing the timer values for acid addition located in the appropriate data block. Use the hand held programmer to make this change.

Performing any or all of the above changes as needed will allow the operator to establish a feed rate that will prevent a recurring pH low condition.

PROCEDURE: pH IS HIGH

- ✓ Press the ALARM ACKNOWLEDGEMENT button to silence the audible alarm.
- ✓ Ensure that NT2 HCl FEED PUMP is receiving adequate power and is operational.
- ✓ The NT2 NaOH FEED PUMP and NT2 HCl FEED PUMP panel control switches are in the AUTO position.
- ✓ Verify that NT2 HCl FEED PUMP, the acid pump, is cycling on and off.
- ✓ Verify that there is an adequate supply of acid reagent.
- ✓ Verify that NT2 NaOH FEED PUMP, the caustic pump, is not cycling on and off.
- ✓ Verify that the pH is actually low, using a portable pH meter.
- ✓ Clean and calibrate the appropriate pH electrode and transmitter.

If all of the above appears normal, the alarm condition may be temporary and will clear itself in a few minutes. If the high pH condition keeps recurring, the caustic feed rate should be slightly decreased. Follow only those steps needed to achieve the desired operating efficiency.

- ☞ First, try increasing the NT2 HCl FEED PUMP's SPEED and STROKE dial settings. This will increase the amount of acid being injected into the chamber (C2) each time the pump activated.
- ☞ Next, try decreasing the NT2 NaOH FEED PUMP's SPEED and STROKE dial settings. This will decrease the amount of caustic being injected into the chamber (C2) each time the pump activated.
- ☞ Next, try lengthening the acid pump (NT2 HCl FEED PUMP) on cycle duration by increasing the timer values for acid addition located in the appropriate data block. Use the hand held programmer to make this change.
- ☞ Finally, try shortening the caustic pump (NT2 NaOH FEED PUMP) on cycle duration by increasing the timer values for caustic addition located in the appropriate data block. Use the hand held programmer to make this change.

Performing any or all of the above changes as needed will allow the operator to establish a feed rate that will prevent an under dosing of caustic and a recurring pH low condition.

☼ FINAL pH FAIL

This alarm alerts the operator that the final pH in-line is high or low. This condition will occur when the pH drops below or rises above the desired parameters for more than 60 seconds. The pH failure can be verified by reading the pH signal on the transmitter and/or pH recorder.

PROCEDURE:

- ✓ Press the ALARM ACKNOWLEDGE button to silence the audible alarm.
- ✓ Using a portable pH meter, verify that the pH is actually out of the allowable range. If not, clean and recalibrate the pH electrode and transmitter.
- ✓ If the pH is out of spec, check to see if the pH in a previous chamber is out of spec as well and take the appropriate corrective measures as needed.
- ✓ If the condition persists, clean and calibrate all pH probes.

☼ HCl DRUM LOW LEVEL/ ☼ NaOH DRUM LOW LEVEL

These panel lamps will be lit when the associated reagent liquid level is low.

PROCEDURE:

- ✓ Press the ALARM ACKNOWLEDGE button to silence the audible portion of the alarm.
- ✓ Verify that the liquid level is actually low.
- ✓ Verify that the liquid level float switches are operational.
- ✓ The operator should replenish the supply as soon as possible to prevent the automatic shutdown of the appropriate recirculation pumps.

☼ EFFL. TANK HIGH LEVEL

This alarm alerts the operator that the liquid level in the effluent holding tank is high.

PROCEDURE:

- ✓ Press the ALARM ACKNOWLEDGE button to silence the audible portion of the alarm.
- ✓ Verify that there is indeed a high liquid level in the clearwell.
- ✓ Check the operation of the level sensor and alarm circuitry.

PH ELECTRODE/TRANSMITTER USE & MAINTENANCE

pH Electrode Cleaning

The following procedure should be followed when cleaning a pH electrode. The probe should only be cleaned when the reagent addition into the chamber in which the probe is located is disabled.

PRECAUTIONS:

1. Handle the pH electrode carefully! It is a delicate device and may break if dropped.
2. Ensure that reagent addition is disabled.

PROCEDURE:

1. Obtain an open container of 15% HCL.
2. Disable the addition of reagents to the chamber the probe to be cleaned is in by placing the appropriate panel control switches into the OFF position.
3. Lift the probe holder from the tank and break the pipe at the union(s) if applicable.
4. Place the electrode into the HCl solution and swirl it around for about 10 seconds.
5. Remove the electrode and visually verify that all scale build up on the glass tip has been removed. If not, repeat step 3 until all the scale is removed.
6. Rinse the electrode thoroughly in the chamber from which it came.
7. Dispose of the HCl used to clean the probe. Exercise extreme caution if you are disposing of the tainted solution by dumping it into any portion of the treatment system.

pH Electrode Calibration

This procedure should be used when calibrating a pH electrode and its corresponding Signet pH transmitter. Calibration should only take place when all reagent addition to the chamber in which the probe is mounted has been disabled.

PRECAUTIONS:

1. Handle the pH electrode carefully! It is a delicate device and may break if dropped.
2. Do not get the transmitter wet!!

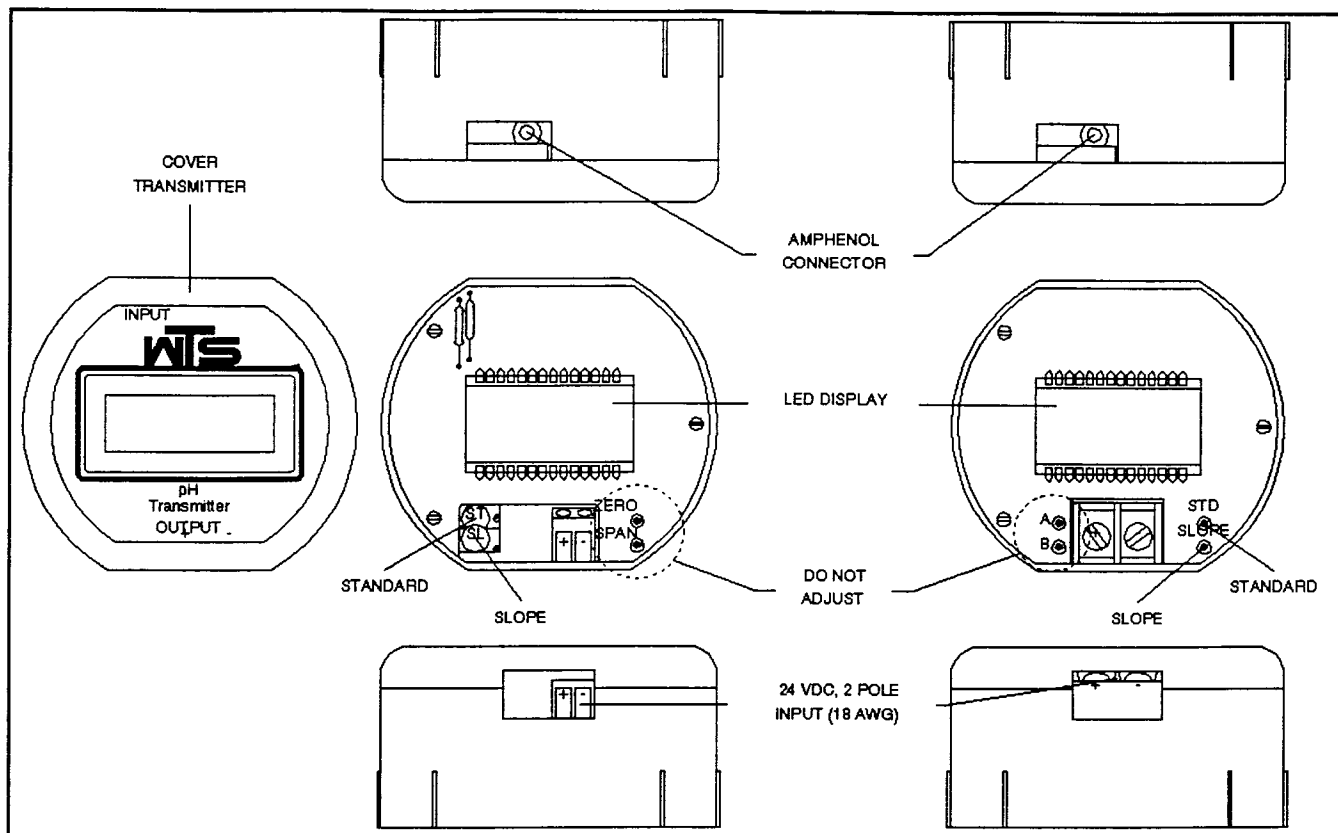


Figure 1

Procedure:

1. Obtain open containers of pH buffer solution 4 and 10.
2. Obtain an open container of tap water.
3. Clean the pH electrode following the preceding procedure.
4. Remove/open the lid from the pH transmitter enclosure and pull the plastic cover off of the transmitter.
5. Lift the probe holder from the tank and break the pipe at the union(s) if applicable.
6. Place the electrode in the pH 4 buffer and swirl it around for 10 seconds.
7. Locate the STANDARD adjustment screw (note transmitter configuration), located on the transmitter as indicated in figure 1, and turn it slowly until the digital display reads 4.0. Turn the screw clockwise to increase the reading and counter clockwise to decrease the reading.
8. Rinse the electrode thoroughly in the tap water.
9. Place the electrode in the pH 10 buffer and swirl it around for 10 seconds.

10. Locate the SLOPE adjustment screw (note transmitter configuration), located on the transmitter as indicated in figure 1, and turn it slowly until the digital display reads 10.0. Turn the screw clockwise to increase the reading and counter clockwise to decrease the reading.
11. Repeat steps 6 through 10 until the transmitter spans from 4.0 to 10.0.
12. Rinse the pH electrode in the chamber that it was taken from.
13. Place the cover back on the transmitter and replace/close the lid on the transmitter enclosure.