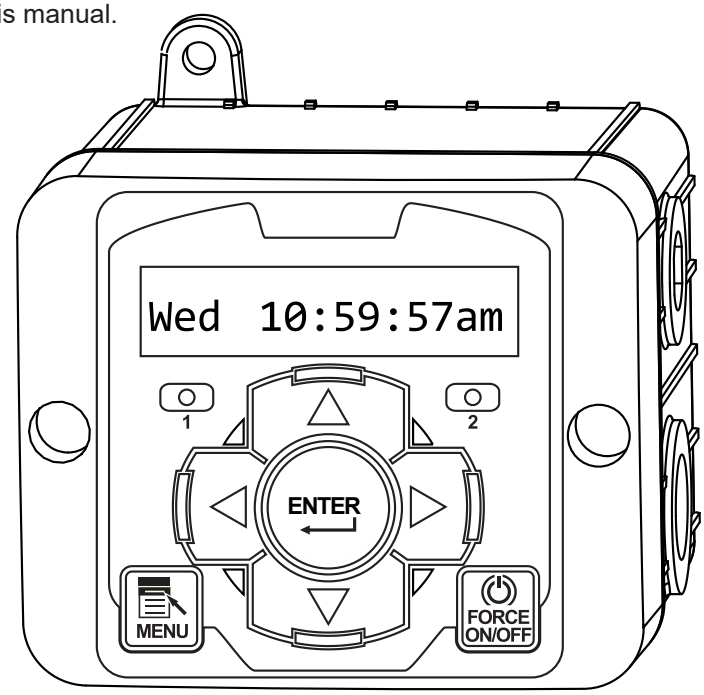
0960.NANOC

Conductivity Controller

Product Manual

Important Safety Instructions
Read all warnings and instructions in this manual.
Save all instructions.

Intertek



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I. Introduction

The 0960.NANOC microprocessor based controller is designed to provide a wide range of control functions for irrigation water systems. The controller is programmed through a front panel keypad and can be configured to provide a customized control system for your application. Your particular unit's functions can be determined by comparing the units model number to the Model Numbering table listed below.

Model Numbering

0960.NANOC units have several base system control functions and unit optional features. Your unit may be supplied with one or more of the features described in this manual. To determine what features apply to your unit check the model number label located on the controller enclosure.

Base Control Function

C - Conductivity and 1 Feed Timer

II. Description

0960.NANOC units are designed to automate conductivity control and / or the addition of various chemicals or activate other devices via a relay output. Relay 1 is activated by the sensor setpoint and Relay 2 can be activated by user-defined timer or alarm.

0960.NANOC units include:

- One totalizing water meter input that can be configured for contacting head or hall effect meter inputs.
- One drum level input that can be set to disable the feed relay output.
- Two mechanical relay outputs with normally open and normally closed contacts that can be configured for powered or dry contact relay operation (see page 5 diagram).
- A "force on" timer that allows for manual activation of the relays for a user defined amount of time.
- One conductivity sensor 0960.E.4.A.10 with 3/4" MNPT threads.

Conductivity Control (C) - Conductivity monitoring and control of Total Dissolved Solids (TDS) in irrigation water systems in terms of electrical conductivity measured in MicroSiemens/cm. The conductivity scale can be selected from three ranges (low, mid and high) in the Configure menu (see page 8). One selectable feed timer is also included (see timer description below).

Feed Timer - One user selectable timer that can be individually programmed as one of the following types:

1. **Pulse Timer** – Accepts dry contact pulses from a water meter (supplied separately). It can accumulate 1-9999 pulses to activate the timer to run from 0-99 minutes, 59 seconds in minutes and seconds. Timer will store up to 5 additional activations during an individual run time.
2. **Recycle Timer** – Provides a user defined "off" cycle in HH:MM and a user defined "on" cycle in MM:SS that is repeated constantly.
3. **28-Day Timer -** 28-day feed timers, typically used for biocide feed are based on a 28-day cycle with two independent programmable feed cycles allowing for feed on selectable days and weeks.
4. **Batch Timer -** Timer activated by the Force On/Off key for a user defined run time.
5. **Reminder Timer -** Provides a 1-99 day cycle reminder alarm.
6. **Post Bleed Timer -** The relay is activated after a bleed cycle and runs for the set percentage of that bleed cycle.
7. **With Bleed Timer -** Activates the relay output simultaneously with the bleed and limits the amount of time the relay output will be on during the bleed cycle.

III. Installation

Electrical Wiring

The controller has an internal regulated power supply that will operate in the range of approximately 100 to 240 VAC on the incoming wiring. Output relay(s) are protected with a replaceable fuse. Relay output voltage will equal the incoming line voltage.

Prewired units are supplied with a 16 AWG cable with a 3-wire grounded USA 120 volt plug for incoming power and 18 AWG 3-wire grounded receptacle cords for all control relay outputs. Conduit units are supplied with liquid tights and adaptors for easy hard wiring to supplied connector.

⚠ CAUTION ⚠
1. There are live circuits inside the controller even when the power switch on the front panel is in the OFF position. Never open the front panel without first disconnecting power from the outlet. Prewired controllers are supplied with an 8 foot, 18 AWG power cord with USA style plug. A #1 Phillips driver is required to open the front panel.
2. Low voltage signal wires (probes, flow switch, water meter, etc.) should never be run in conduit with high voltage (like 115VAC) wires.
3. Never attempt to land connections to the controller without first disconnecting power from the outlet.
4. Do not block access to disconnect power during mounting and installation.
5. The controller should be connected to its own isolated circuit breaker, and for best results, the ground should be a true earth ground, not shared. Any attempt to bypass the grounding will compromise the safety of users and property.
6. The electrical installation of the controller must be performed by trained personnel only and conform to all applicable National, State and Local codes.
7. Operation of this product in a manner not specified by the manufacturer may result in damage to equipment or persons.
8. Avoid mounting in locations that expose the controller to direct sunlight, vapors, vibration, liquid spills or extreme temperatures; less than 0°F (-17.8°C) or greater than 120°F (50°C). EMI(electromagnetic interference) from radio transmissions and electric motors can also cause damage or interference and should be avoided.

NOTES:

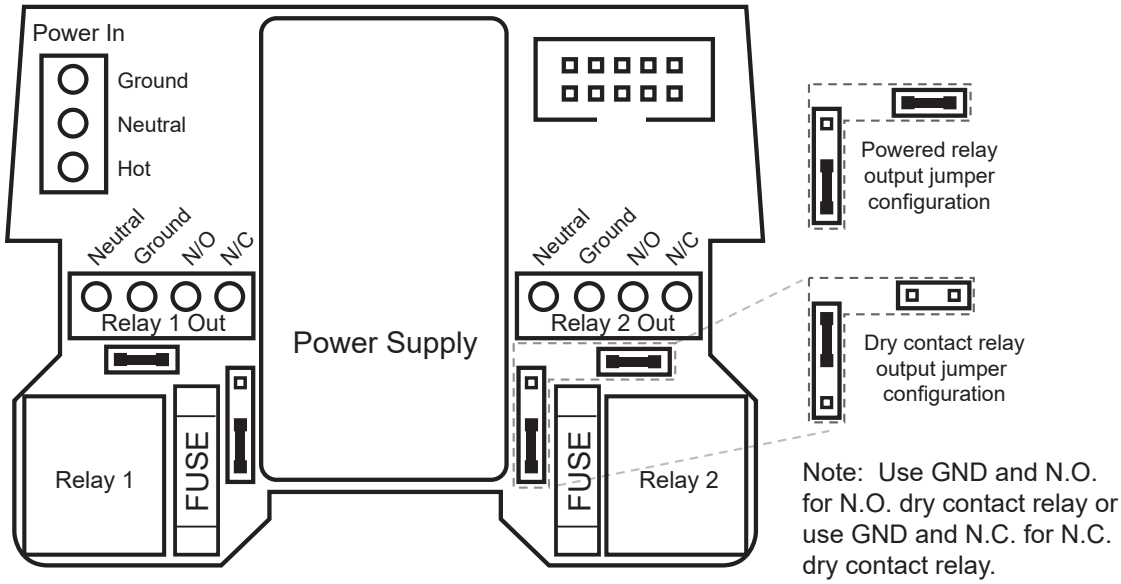
1. **Liquid tight fittings and some labeled signal leads are provided for signal (low voltage) connections, such as water meter inputs.**
2. **Hall effect meters that require +12 VDC must use an external power supply (TFS-PWR).**
3. **Optional 4-20mA ouput is produced with 12 VDC on the loop. Do not connect output to devices that are trying to power the loop.**
4. **When installing a Flow Switch (part number 0960.FS.SHORT or 0960.FS.long) connect the flow switch wires to the RED and the BLACK wires coming from the NANOC.**
5. **When using the NANOC with DEMA's Flex Flow Model L pump (GREEN), connect the pump wire leads thorough the compression nut on the NANOC Controller, into the bus board (mA Output), GREEN wire to (+) mA Out port and the WHITE wire to the (-) mA Out port.**

Mounting Instructions

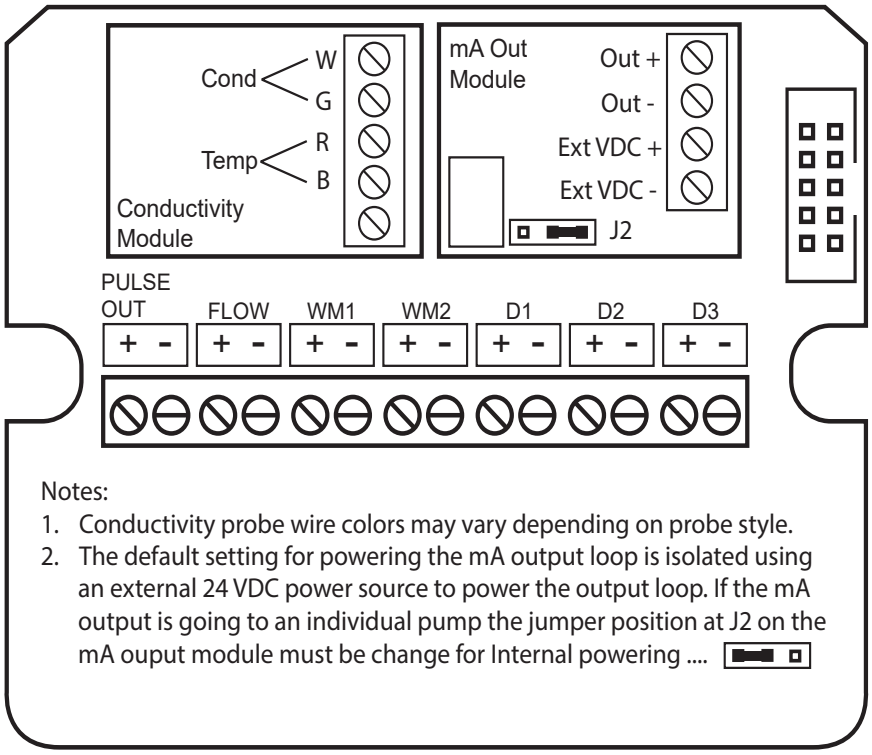
Select a mounting location that provides the operator easy access to the unit and a clear view of the controls through the cover of the controller. The location should be convenient to grounded electrical connections, the needed sample line plumbing and is on a stable vertical surface.

Logic and Relay Cards

Relay Card



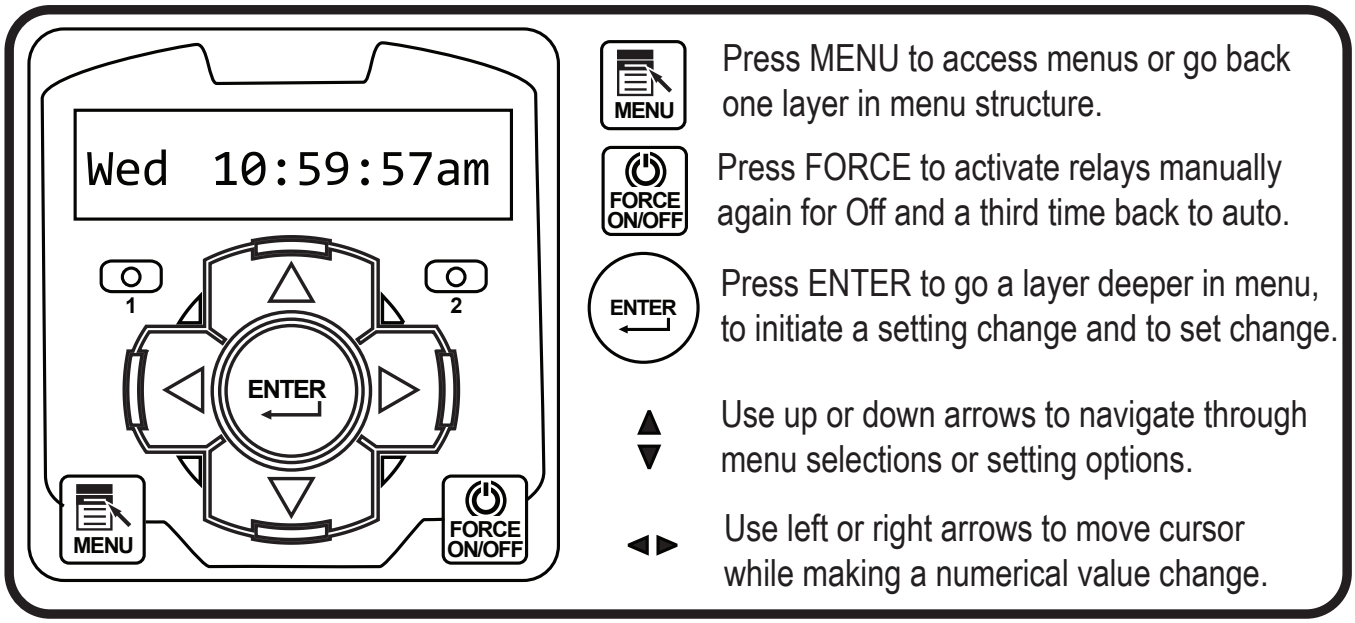
Nano XC Logic Card



Notes:

1. Conductivity probe wire colors may vary depending on probe style.
2. The default setting for powering the mA output loop is isolated using an external 24 VDC power source to power the output loop. If the mA output is going to an individual pump the jumper position at J2 on the mA ouput module must be change for Internal powering ....

IV. Front Panel Description



V. System Operation Overview

Description of Menus

0960.NANOC controllers have three modes of operation, Run, Menu and Force. All menus are circular. Pressing the DOWN key will display the next line of information on the display.

Run - This mode is for normal operation. The control relays will only be automatically active in this mode. In the Run mode, the display will read system values. If an alarm is present, the display flashes with the alarm status.

The Run menu will display values such as day, time, date and other values depending upon the features present on the unit. The unit will automatically return to the Run mode if no keys are pressed for three minutes.

Menu - This mode is used to make adjustments to settings and readings on the controller. To access the Menu mode from the run screen, press the Menu key. Use the up or down arrow to scroll through the various menus. When you want to access a specific menu, press the Enter key. Once you have entered a sub-menu you will be able to step through that menu's options with the up or down arrow key.

Conductivity Sampling Methods

A. **Continuous** - Typical for most irrigation water systems. The controller is constantly reading the sensor and activating the relay based on readings relationship to the set point, set point direction and differential. Example: A falling set point of 1500 and differential of 50 the relay would activate when the conductivity falls below 1500 and stays on until the reading rises to 1550.

B. **Timed Sampling** - A sample timer allows the conductivity to be sampled at periodic intervals. Sample intervals are adjustable from 1 minute to 9 hours, 59 min. Sample duration (on-time) is adjustable from 1 second to 99 minutes, 59 seconds. If the reading is below the set point by the differential amount the pump relay will be turned off at the end of the sample duration and the sample interval countdown reinitiated. If the reading is above the set point at the end of the sample method the pump relay stays on until the reading drops by the differential amount.

C. **Sample and Hold** - Also uses a sample timer for periodic sampling intervals. The unit will sample for its duration then hold the blowdown valve closed for a settable period (hold time). The conductivity is checked at the end of the hold period, if additional blowdown is required the blowdown valve is held open for a preset amount of time (blowdown time). Then sample cycle is repeated until the reading is below the set point at the end of a hold cycle and the sample interval countdown reinitiated.

Note: Continuous sampling is the recommended method.

Calibration Overview

The 0960.NANOC controllers update the conductivity reading every two seconds with a running average. 0960.NANOC controller's conductivity scale should be selected so that the conductivity setpoint is as close as possible to the middle of the scale. (See page 8 menu for setting scale).

Note: If a controller is using Timed Sampling or Sampling and Hold methods of control the conductivity reading shown in the RUN mode may not be a current reading. The controller will hold and display the conductivity value seen at the end of the last sample or hold duration. To see a current reading force on the pump relay with either the Force button or via the Calibration menu.

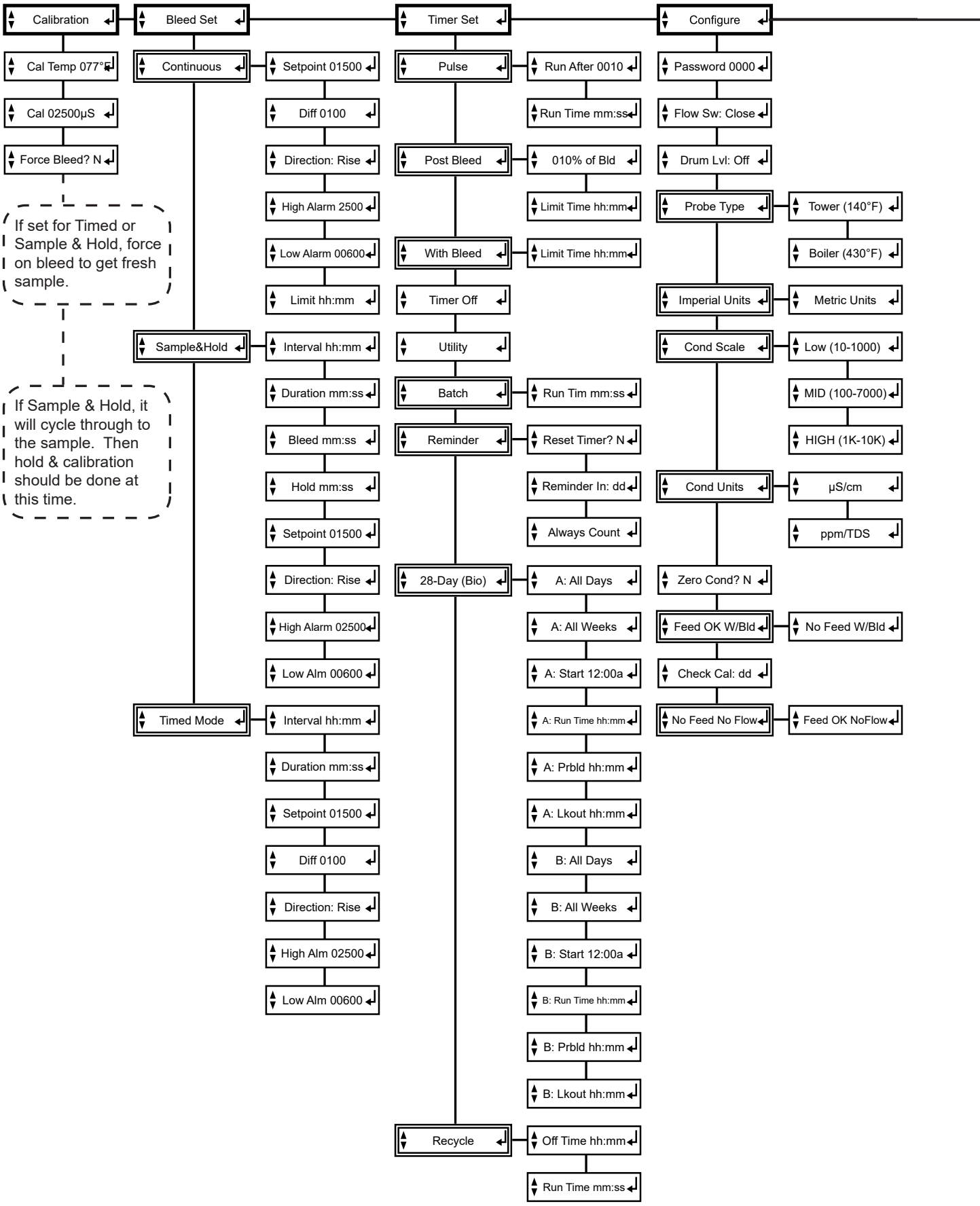
A. **Continuous** - Calibrating continuous sampling units can be done at any time with the probe in a steady stream of water with no air present.

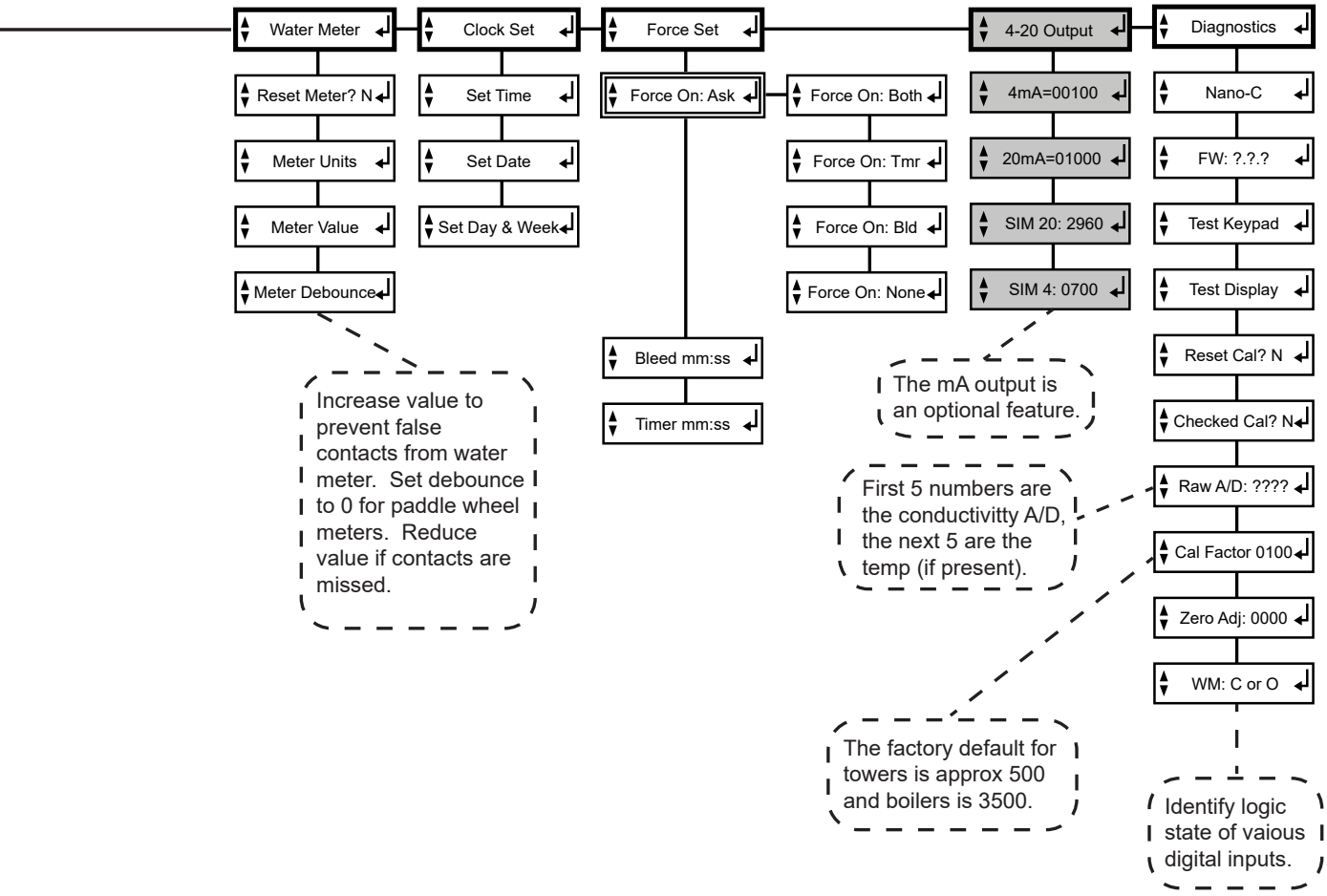
B. **Timed Sampling** - While in the calibration menu there is a selection to force on the pump relay. It will force it into the sample period. After 1-2 minutes verify that the reading is stable then enter the desired calibration value.

C. **Sample and Hold** - While in the calibration menu there is a selection to force on the pump relay. It will force the unit into its sample and hold periods and calibration should be done during the hold after a fresh sample.

Notes:

1. **If you change the conductivity scale in the Configure menu you MUST then go to Diagnostics and Reset the Cal then go to the Calibration menu and calibrate accordingly.**


Calibration
Cal Temp 077°F
Cal 02500µS
Force Bleed? N
If set for Timed or Sample & Hold, force on bleed to get fresh sample.
If Sample & Hold, it will cycle through to the sample. Then hold & calibration should be done at this time.
Bleed Set
Continuous
Setpoint 01500
Diff 0100
Direction: Rise
High Alarm 2500
Low Alarm 00600
Limit hh:mm
Sample&Hold
Interval hh:mm
Duration mm:ss
Bleed mm:ss
Hold mm:ss
Setpoint 01500
Direction: Rise
High Alarm 02500
Low Alm 00600
Timed Mode
Interval hh:mm
Duration mm:ss
Setpoint 01500
Diff 0100
Direction: Rise
High Alm 02500
Low Alm 00600
Timer Set
Pulse
Run After 0010
Run Time mm:ss
Post Bleed
010% of Bld
Limit Time hh:mm
With Bleed
Limit Time hh:mm
Timer Off
Utility
Batch
Run Tim mm:ss
Reminder
Reset Timer? N
Reminder In: dd
Always Count
28-Day (Bio)
A: All Days
A: All Weeks
A: Start 12:00a
A: Run Time hh:mm
A: Prbld hh:mm
A: Lkout hh:mm
B: All Days
B: All Weeks
B: Start 12:00a
B: Run Time hh:mm
B: Prbld hh:mm
B: Lkout hh:mm
Recycle
Off Time hh:mm
Run Time mm:ss
Configure
Password 0000
Flow Sw: Close
Drum Lvl: Off
Probe Type
Tower (140°F)
Boiler (430°F)
Imperial Units
Metric Units
Cond Scale
Low (10-1000)
MID (100-7000)
HIGH (1K-10K)
Cond Units
µS/cm
ppm/TDS
Zero Cond? N
Feed OK W/Bld
No Feed W/Bld
Check Cal: dd
No Feed No Flow
Feed OK NoFlow


Water Meter
Clock Set
Force Set
4-20 Output
Diagnostics
Reset Meter? N
Meter Units
Meter Value
Meter Debounce
Set Time
Set Date
Set Day & Week
Force On: Ask
Bleed mm:ss
Timer mm:ss
Force On: Both
Force On: Tmr
Force On: Bld
Force On: None
4mA=00100
20mA=01000
SIM 20: 2960
SIM 4: 0700
Nano-C
FW: ?.?.?
Test Keypad
Test Display
Reset Cal? N
Checked Cal? N
Raw A/D: ????
Cal Factor 0100
Zero Adj: 0000
WM: C or O
Increase value to prevent false contacts from water meter. Set debounce to 0 for paddle wheel meters. Reduce value if contacts are missed.
The mA output is an optional feature.
First 5 numbers are the conductivitty A/D, the next 5 are the temp (if present).
The factory default for towers is approx 500 and boilers is 3500.
Identify logic state of vaious digital inputs.

VI. Maintenance

The only required maintenance for normal uninterrupted operation of your controller is cleaning of the electrode(s). After initial start up, it is a good idea to clean the electrode frequently until a schedule based on need has been developed. Since each application is unique, it is difficult to estimate the required frequency of cleaning. The first cleaning should take place after about one week of the system being on line.

To determine the required cleaning frequency, record the reading on the controller before the electrode is removed for cleaning. After cleaning, record the new reading. If a change is observed in the two readings, the electrode was dirty. The more significant the change, the dirtier the electrode. If no change occurs, cleaning needs to be done less often.

Conductivity Electrode Cleaning Procedure

1. Record the current conductivity reading.
2. Turn off water flow through the electrode loop, bleed pressure from the line and remove electrode.
3. Use a clean cloth and a mild cleaning solution to remove loose dirt etc., from the metal tips of the electrode.
4. If the electrode has deposits such as scale attached to the electrode surface a more aggressive cleaning approach will be needed. There are several ways to do this, the preferred method being the one that is easiest for the user.
   a. Use a mild acid solution to dissolve deposits.
5. Reinstall the electrode in the system. After the reading stabilizes, calibrate the unit to a reliable test reading.

Many times an electrode can appear to be clean, but the unit still cannot be calibrated. If this is the case, use one of the more aggressive electrode cleaning procedures listed in step 4 above. Recheck the calibration after completion of this procedure. If no change was observed in the reading, replace the electrode. If a change occurred but the unit still will not calibrate, repeat procedure as many times as necessary.

VII. Troubleshooting

The Advantage 0960.NANOTC controller is designed for many years of trouble free operation. Should a problem occur, refer to the following chart to help identify the problem. If replacement is required, follow the procedures listed in the Warranty and Factory Service portion of this manual.

SYMPTOM	POSSIBLE CAUSE	SOLUTION
False reading	Bad or dirty electrode	Clean, as needed
	Out of calibration	Calibrate unit
Will not calibrate	Dirty electrode	Clean electrode
	Faulty electrode	Replace electrode if needed
	Faulty wiring to electrode	Replace wiring if needed
No system power	Check power source	Plug into different receptacle
	Check fuse	Replace as needed
	Check connections	Make sure ribbon cables are secure
Pulse timer not activating	Check wiring	Repair as needed
	Check external device	Repair/replace as needed
Outputs not energized	No flow	Check sample line for clogged pipes or strainers
	Check fuse	Replace as needed

VIII. Manufacturer's Product Warranty

Merchandise Returns
No merchandise will be returned for credit without DEMA'S written permission. Returned merchandise authorization number is required in advance of return.

Product Warranty
DEMA products are warranted against defective material and workmanship under normal use and service for one year from the date of manufacture. This limited warranty does not apply to any products that have a normal life shorter than one year or failure and damage caused by chemicals, corrosion, physical abuse, or misapplication. Rubber and synthetic rubber parts such as "O"-rings, diaphragms, PVC tubing, and gaskets are considered expendable and are not covered under warranty. This warranty is extended only to the original buyer of DEMA products. If products are altered or repaired without prior approval of DEMA, this warranty is void.

Defective units or parts should be returned to the factory with transportation prepaid. If inspection shows them to be defective, they will be repaired or replaced without charge, F.O.B. factory. DEMA assumes no liability for damages. Return merchandise authorization number must be granted in advance of returned units for repair or replacement (See "Merchandise Returns" above).