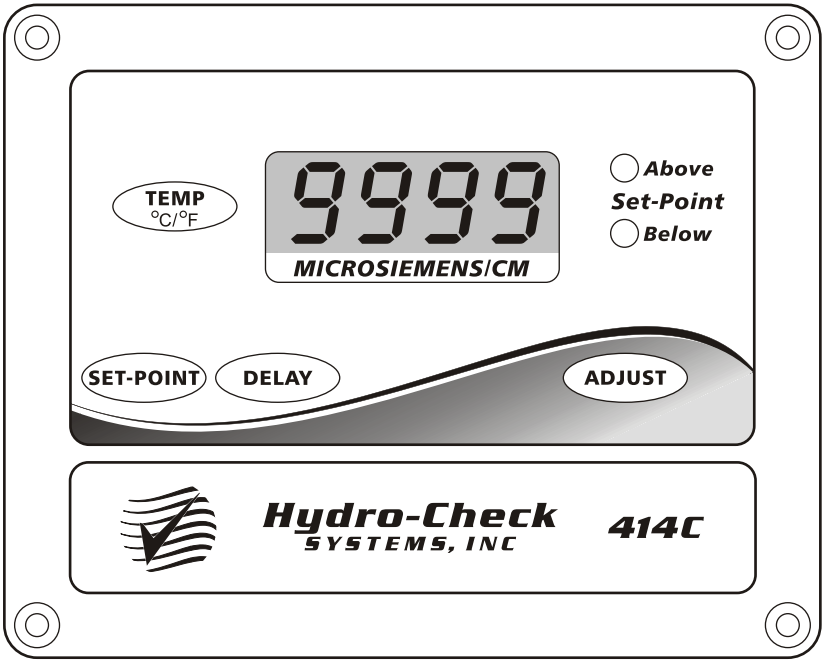
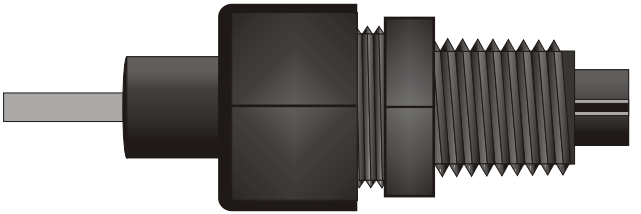
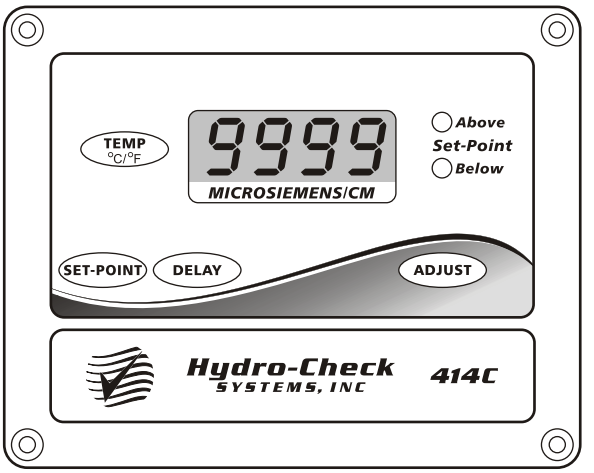
MODELS 414C & 414TDS

CONDUCTIVITY MONITOR-CONTROLLERS





INSTALLATION & OPERATION MANUAL



Front Panel Quick Reference Guide

To Check Temperature

Press and Hold TEMP °C/°F
Repeat to toggle from °C to °F

To Check Set-Point or Time Delay Setting

Press and Release SET-POINT OR DELAY

To Adjust Set-Point or Time Delay Settings

Press and Hold SET-POINT OR DELAY then Press ADJUST
& Release both buttons

Press SET-POINT OR DELAY To Adjust Digit

Press ADJUST To Skip Digit

TABLE OF CONTENTS

I) Instrument Overview

The two 414 models are microprocessor based and feature Automatic Range Selection spanning 4 ranges. Water quality is displayed in the lowest possible range for optimum accuracy and resolution. Unlike other conductivity instrumentation, the 414 utilizes just one conductivity cell for all the ranges. This eliminates the need for different cell constants for low and high ranges resulting in greater versatility and convenience with lower operating costs.

The 414C displays conductivity from 0 to 9.99, 99.9, 999, 9999 microSiemens (μS/cm). The 414TDS converts the measured conductivity and displays Total Dissolved Solids from 0 to 4.99, 49.9, 499, 4999 ppm. Temperature Compensation is automatic and the reading is referenced to 25°C. The measurement is displayed via a 4 digit LCD with large 1/2 inch digits making it easy to read from a distance. Water Temperature may also be momentarily displayed in °C or °F by pressing the TEMP button on the front panel.

The Conductivity Cell/Temperature Sensor, CTS1, is insertion style with MNPT bushing designed for easy installation in standard 1/2 in & 3/4in FNPT tees. Cable can be supplied in 10, 25, 50, & 100 foot lengths, or custom ordered.

The 414's also feature a controller for connection of valves, alarms, etc. The set-point hysteresis may be adjusted to have a high and low threshold. Activation of the SPDT relay can also be delayed 0 to 999 seconds to compensate for expected system "rinse-up" times. All the set-point parameters are easily programmed into the non-volatile memory via 3 front panel pushbuttons. Green and Red LEDs indicate the water quality relative to the set-point.

Isolated Analog Outputs are available as an option. This option provides 0-5VDC, 4-20mA, and 0-20mA outputs which are user selectable by jumpers on the circuit board. The selected output's resolution may be further refined by programming the output to correspond to any of the 4 ranges.

Input power can be either 110VAC or 220VAC @ 50-60Hz. The appropriate input is selected with jumpers on the circuit board during installation.

II) SPECIFICATIONS

MONITOR

Conductivity Ranges, ***MODEL 414C***

Automatic, Zero to

Total Dissolved Solids Ranges, ***MODEL 414TDS***

Automatic, Zero to

conductivity conv. curve, .62 to .83 std factory embedded program

Temperature Display:
0 - 50.0°C or 32 - 122°F

Accuracy:
Conductivity, ±3% of Reading; Repeatability, ±1%
Temperature, ±0.1°C

Temperature Compensation:
Automatic to 25°C from 0 to 50°C

Measurement Update:
3 times per second

Display:
numeric: ½ inch, 4 digit LCD
indicator: Red and Green LEDs for controller status

CONTROLLER

Relay:
1 SPDT rated 1 amp resistive @ 28VDC; 0.5 amp resistive @ 120VAC

Function:
Adjustable High/Low Set-Point

Relay Activation Delay:
Adjustable from 0 - 999 seconds

Memory:
non-volatile EEPROM

OPTIONAL OUTPUTS

Isolated, 0-5 VDC / 4-20 mA / 0-20 mA, Field Selectable

GENERAL

Power Input: Selectable 110 or 220 VAC; 50 - 60 Hz
Power Consumption: 52 milliwatts; 0.43mA @ 110 VAC
Enclosure: ABS, Panel or Wall Mount

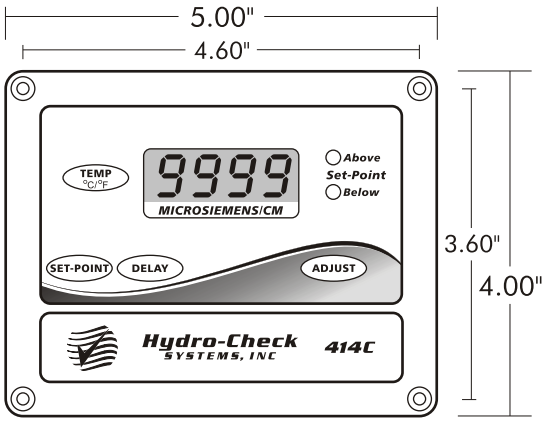
CONDUCTIVITY CELL & TEMPERATURE SENSOR

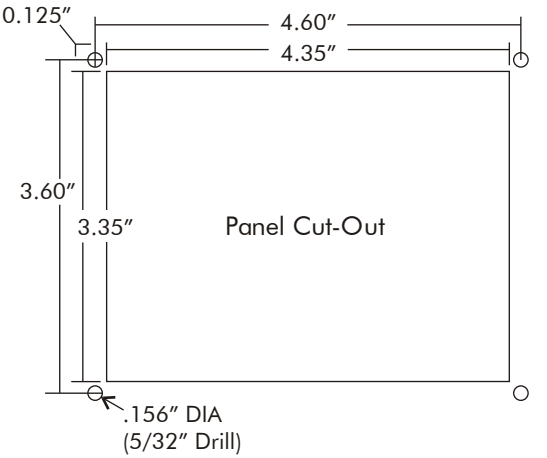
Type: Insertion Style, ½" or ¾" mNPT fitting
Conductivity Cell: 1.06 Cell Constant
Temperature Sensor: Linear Thermistor Network
Maximum Sensor Deployment: 100ft of cable
Wetted Materials: 316SS, Polypropylene, Noryl731®[1] , Viton®[2]

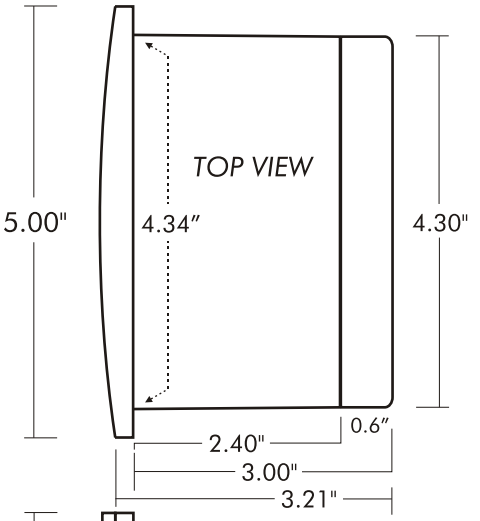
[1]Noryl731® is a registered trademark of the General Electric Company

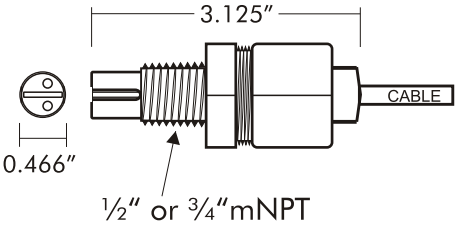
[2]Viton® is a registered trademark of DuPont Dow Elastomers

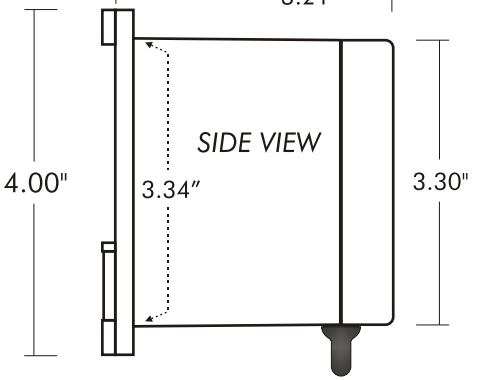
II) DIMENSIONS



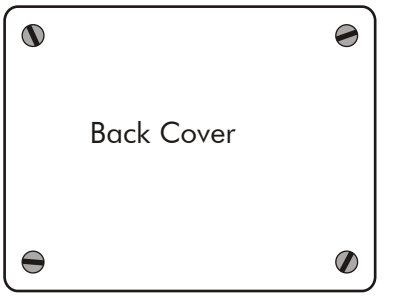








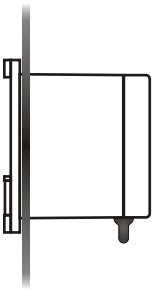
Port Nipple



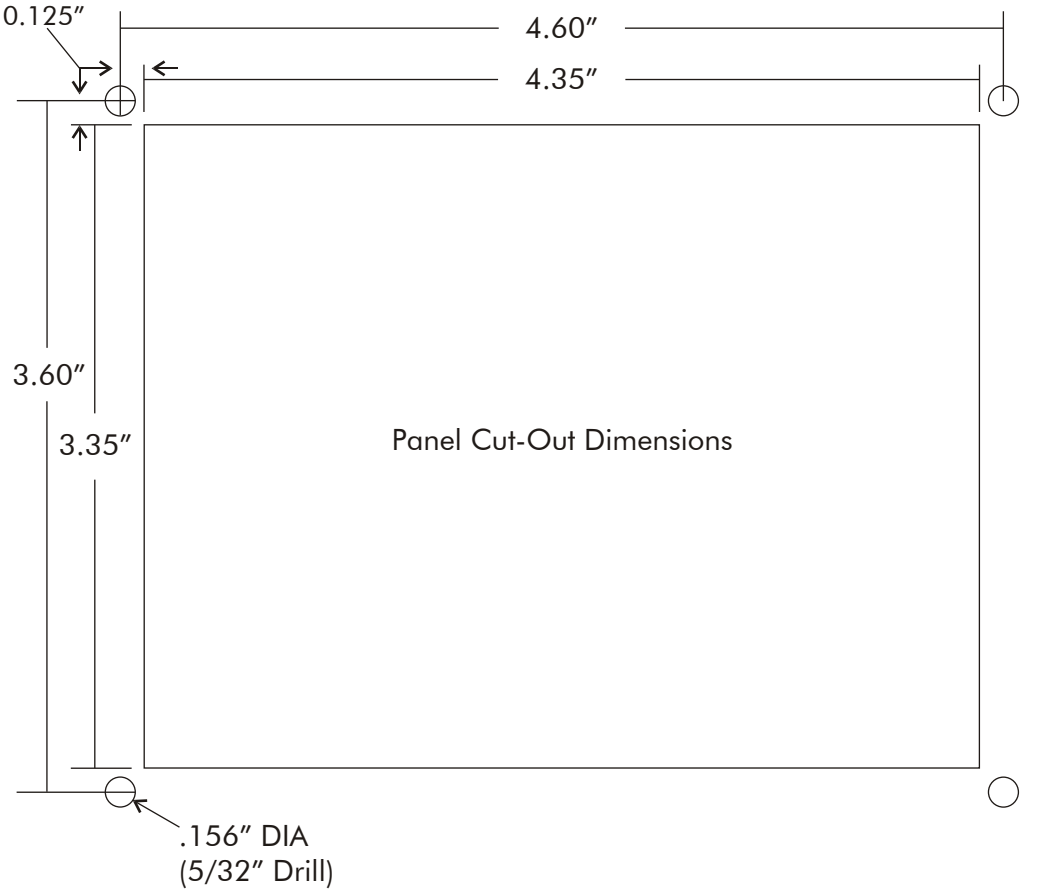
III) Basic Installation

A) Panel Mounting

prior to any electrical wiring



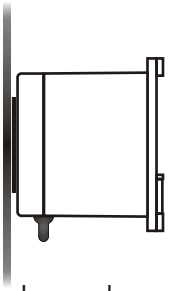
1) Cut out panel per drawing below and Drill 4 mounting holes using a 5/32″ drill bit.



III) Basic Installation

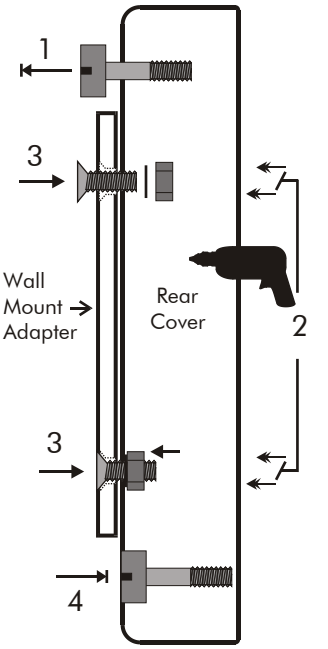
B) Wall Mounting

prior to any electrical wiring



1) Remove the back cover of the enclosure by unscrewing the 4 screws... note, the screws are "captive" and cannot be completely removed from the enclosure's rear cover.

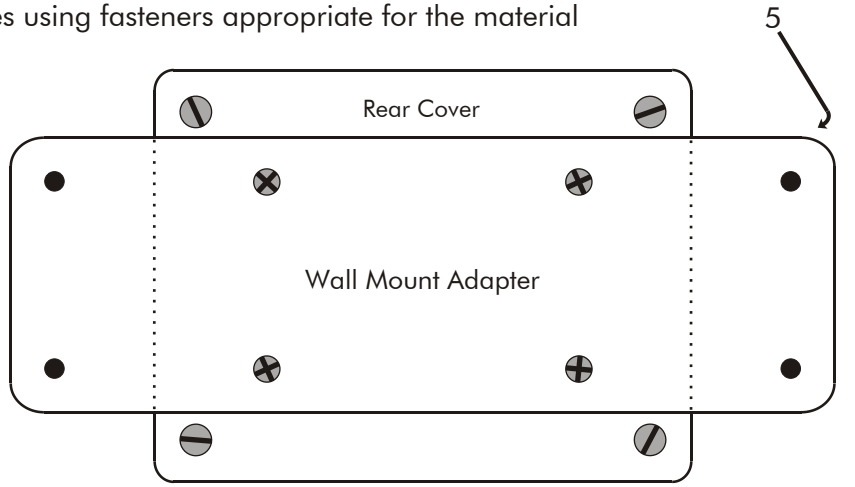
2) Locate the 4 depressions in the plastic on the inside of the back cover. These are drill bit starting guides. Using a 7/64" bit, drill through the back cover at the 4 positions.



3) Assemble the Wall Mount Adapter to the cover as shown using the provided #4-40 screws, nuts, and washers.

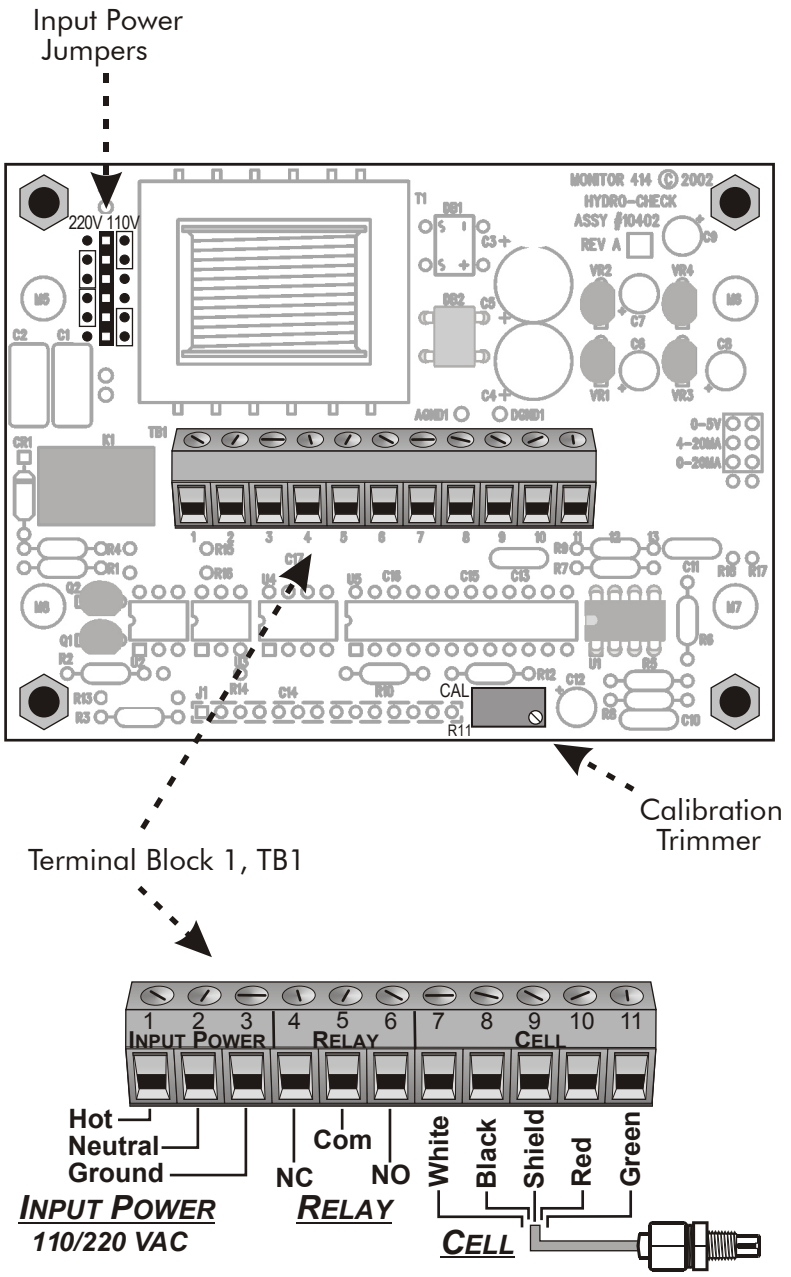
4) Re-Assemble the rear cover to the enclosure after performing any necessary electrical connections, as detailed in this manual.

5) Attach completed assembly to the wall surface by the four holes using fasteners appropriate for the material



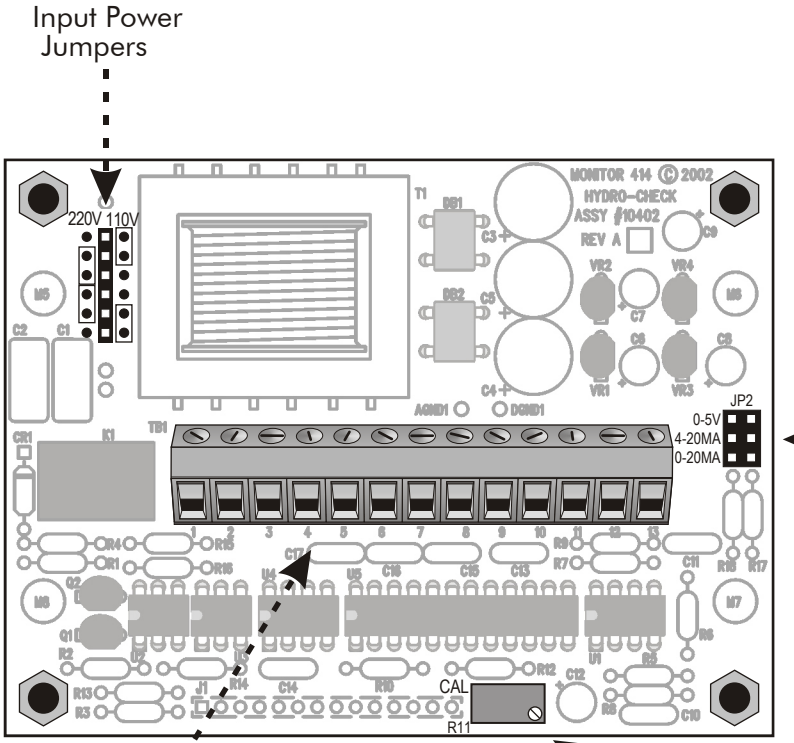
III) Basic Installation

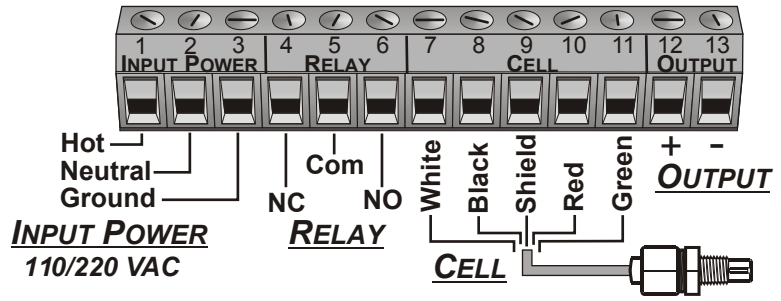
C) Component Identification, Models 414C & 414TDS without Output Option



III) Basic Installation

C) Component Identification, Models 414C & 414TDS with Output Option (-520)





III) Basic Installation

D) Input Power Selection & Connection

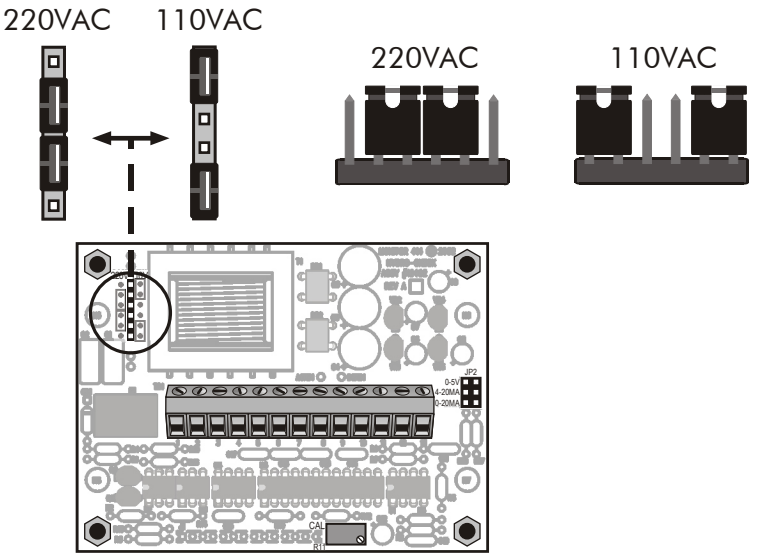
1) The electrical and physical installation of the unit should be performed by professional qualified personnel

2) Do not attempt any wiring with live voltage connection

3) Remove the back cover of the enclosure by unscrewing the 4 screws... note, the screws are "captive" and cannot be completely removed from the enclosure's rear cover.

4) Locate Jumper Block 1 at the top left of the circuit board *(See Illustration Below)*. Confirm the jumper is properly configured for the desired input voltage: 110VAC or 220VAC

5) To change the voltage input, simply pull the jumpers off the pins and reposition to the desired voltage combination as shown.



III) Basic Installation

D) Input Power Selection & Connection, Cont.

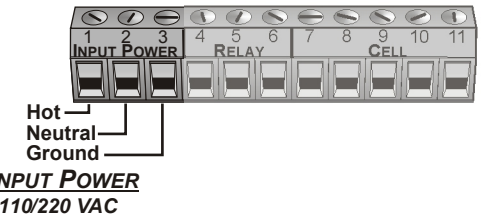
6) Locate Terminal Block 1, TB1, which is near center of the board *(See Illustration Below)*.

7) Cut & Strip 1/4" from the ends of all three power supply wires. Cut the end off an unused port nipple and route the wires thru the nipple such that the nipple will point away from the striped ends.

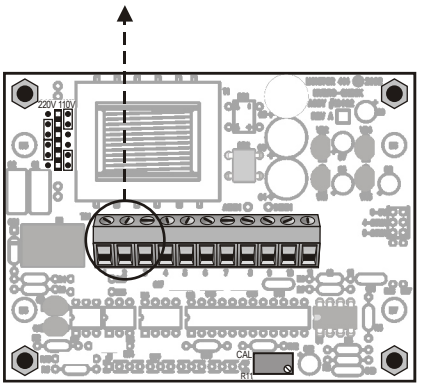
8) Unscrew the screws corresponding with positions shown. Insert wires according to polarity and tighten the screw til secure with some striped wire slightly visible.

9) Slide the groove of the nipple in the edge of the enclosure access hole. Check all other wiring into the enclosure, and replace the back cover.

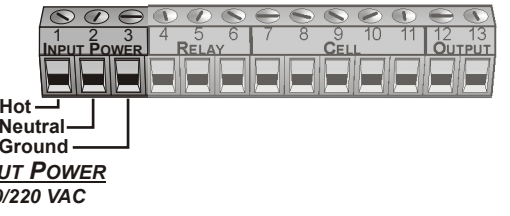
TB1



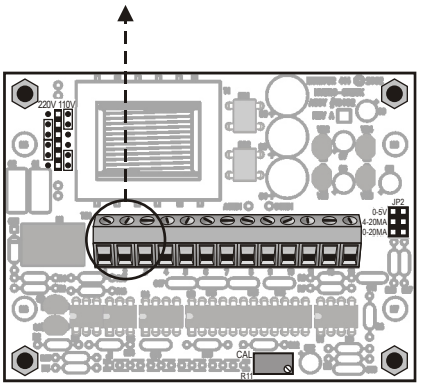
INPUT POWER
110/220 VAC



TB1 WITH OUTPUT OPTION



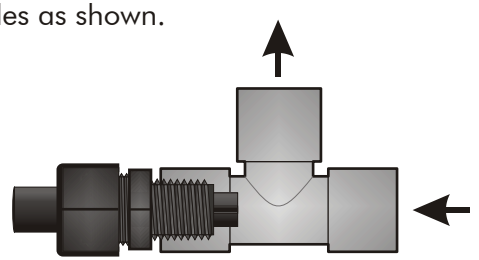
INPUT POWER
110/220 VAC



III) Basic Installation

E) Cell Installation & Wiring

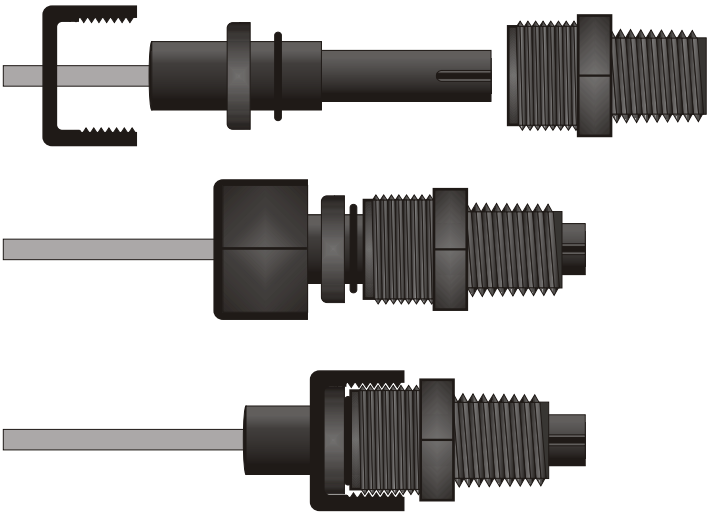
The CTS1 conductivity cell and temperature sensor is designed for insertion in either the branch or run of standard 1/2" & 3/4" FNPT threaded tees. Horizontal orientation is recommended to avoid any system bubble accumulation near the conductivity electrodes as shown.



Select the 1/2" or 3/4" MNPT fitting body appropriate for the Tee. If the correct size is already installed on the sensor, remove by unscrewing the securing nut and sliding the fitting body off the cell.

Apply pipe tape to the pipe threads of the cell fitting. Thread the fitting into the tee hand tight then tighten an additional 1/2 to 1 turn with a 1+1/8" wrench.

Insert the cell into the fitting. Be sure the O-ring and securing nut are present as shown. Tighten the securing nut... hand tight only.



III) Basic Installation

E) Cell Installation & Wiring

1) Be sure voltage to the unit and relay or output is disconnected.

2) Remove the back cover of the enclosure by unscrewing the 4 screws... note, the screws are "captive" and cannot be completely removed from the enclosure's rear cover.

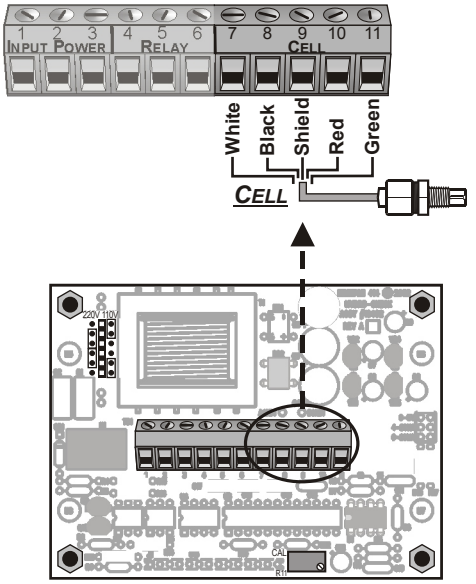
3) Locate Terminal Block 1, TB1, which is near center of the board *(See Illustration Below)*.

4) Cut the end off an unused port nipple and route the cell wires thru the nipple such that the nipple will point away from the striped ends of the 5 wires.

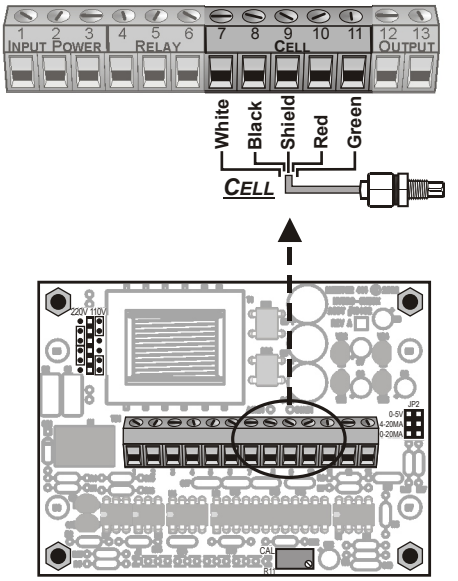
5)Unscrew the screws corresponding with the cell terminal positions shown. Insert wires according to color code and tighten the screw til secure with some striped wire slightly visible.

6) Slide the groove of the nipple in the edge of the enclosure access hole. Check all other wiring into the enclosure, and replace the back cover.

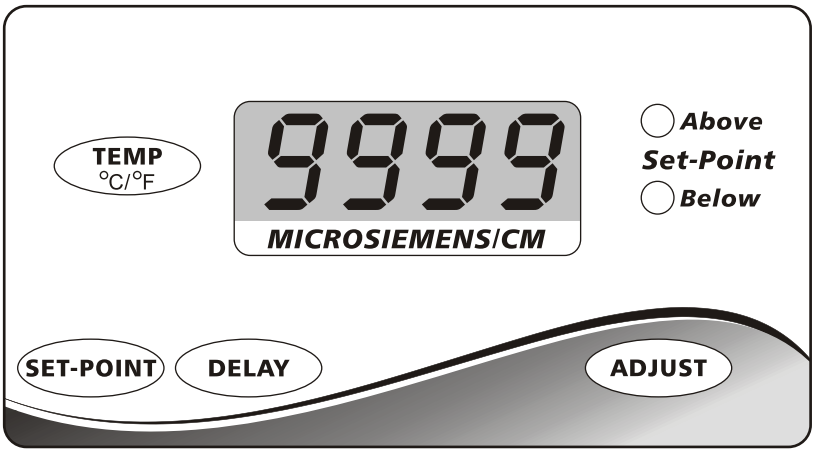
TB1



TB1 WITH OUTPUT OPTION



IV) Front Panel Operation and Programming



To Check Water Temperature:

Press and Hold TEMP °C/°F

The water temperature is displayed while the button is pressed

The monitor returns to normal operation when released.

The displayed temperature can be toggled from °C to °F by repeated pressing of TEMP °C/°F

To Check Set-Point

Press and Release SET-POINT

-HI- will be displayed momentarily, followed by the current stored value.

The High setpoint value is the point where the relay will energize.

-LO- will then be displayed followed by the low set-point value.

The Low set-point value is the point where the relay will de-energize.

The monitor will automatically return to normal operation

To Check Relay Time Delay Setting:

Press and Release DELAY to momentarily display the current delay setting in seconds

TO ADJUST SET-POINT

Press and Hold (SET-POINT) then also Press (ADJUST)

Release both buttons

-HI- will be displayed momentarily, followed by the current high set-point value with the LCD's highest digit flashing

To Skip this digit Press and Release (ADJUST) again

OR, Press (SET-POINT) repeatedly until the desired number is achieved

Then Press and Release (ADJUST)

The next lowest digit will begin flashing

Press (SET-POINT) to adjust the digit / Press (ADJUST) to Skip

Continue this sequence until all the digits are set and press (ADJUST)

-LO- will be displayed momentarily, followed by the current low set-point value with the LCD's highest digit flashing.

Press (SET-POINT) to adjust the digit / Press (ADJUST) to Skip

Continue this sequence until the digits are set

The monitor will automatically return to its normal operating mode

TO ADJUST THE RELAY TIME DELAY

Press and Hold (DELAY) then also Press (ADJUST)

Release both buttons

The display's hundreds digit will flash

To Skip this digit Press and Release (ADJUST) again

OR, Press (DELAY) repeatedly until the desired number is achieved

Then Press and Release (ADJUST)

The tenths digit will flash

Press (DELAY) to adjust a digit / Press (ADJUST) to Skip

Continue this sequence until the digits are set

The monitor will automatically return to its normal operating mode

OUTPUT OPTION RANGE ASSIGNMENT, MODELS 414C-520 & 414TDS-520

Note: The type of output (0-5VDC/4-20mA/0-20mA) is determined by a circuit board jumper position

Press and Hold (ADJUST) to display current output range assignment

To step through the ranges, repeatedly Press and Release (ADJUST)

Stop when the desired range is indicated.

The monitor returns to its normal operation with the output range set.

V) Monitor Operation

Ranges:

Range Selection is automatic and setting a range is unnecessary. The 414's microprocessor will automatically display the measurement in the lowest possible range.

Temperature Display:

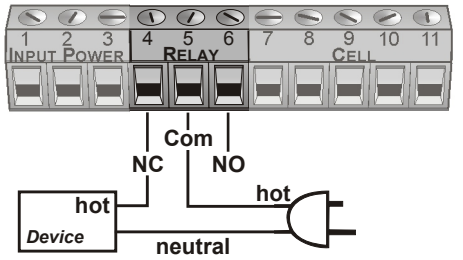
Water Temperature may be checked by pushing the TEMP button on the front panel. The temperature reading may be "toggled" between °C or °F by pushing the button again during the temperature display cycle.

VI) Controller Operation and Wiring

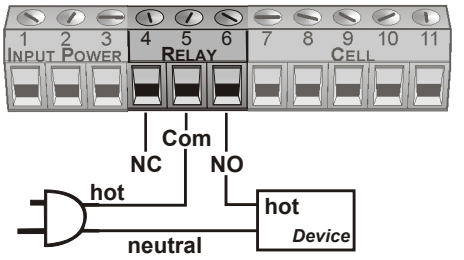
A controller circuit is a standard feature of the 414 models. The single set-point has both a High and Low threshold adjustment (see P. 12-13, Front Panel Operation and Programming). This allows for different activation and deactivation values. The Single-Pole-Double-Throw (SPDT) Relay has Normally Open (NO), Normally Closed (NC), and Common contacts enabling control both above and below the set-point. The circuit relay is undedicated, the user wires in the appropriate voltage for the controlled device. A Time Delay can be programmed (see P. 12-13, Front Panel Operation and Programming) from 0 to 999 seconds to compensate for any anticipated normal equipment rinse-up times.

The relay acts simply as a switch. When the water quality is below the set-point, the relay is in a de-energized state and there is a completed circuit between the COM and NC terminals of the relay. If the water quality is above the set-point, the relay is energized completing the circuit between the COM and NO terminals, while simultaneously disconnecting the COM/NC circuit.

Control
Below Set-Point



Control
Above Set-Point



VI) Controller Operation and Wiring, Cont.

Relay Wiring

1) This procedure should only be performed by qualified personnel

2) Before wiring any device to the relay, disconnect the 414's input power AND be sure the power for the device is also disconnected.

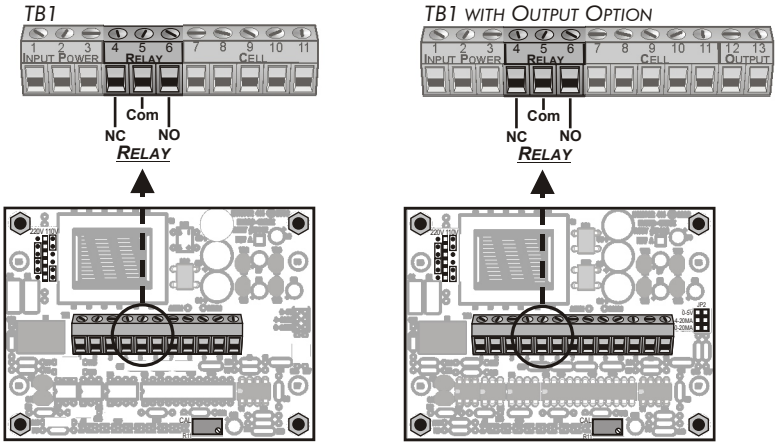
3) Remove the back cover of the enclosure by unscrewing the 4 screws... note, the screws are "captive" and cannot be completely removed from the enclosure's rear cover

4) Locate the green Terminal Block (TB1) in the center of the circuit board. *(See Illustration Below)*

5) The relay is used to open or close only one of the leads supplying power to the controlled device, typically the HOT side of the circuit. Cut & Strip 1/4" of both the "hot" lead from the device and the "hot" lead from the device's power source. Cut the end off an unused port nipple and route the wires thru the nipple such that the nipple will point away from the striped ends.

6) Unscrew the screws corresponding to the COM and NC or NO terminal positions 4, 5, & 6 of TB1 as dictated by requirements of the application *(See Illustration Previous Page)*. Insert the striped end of each wire into the wire well leaving a small amount of wire visible, and tighten the screw until the wire is secure.

7) Slide the groove of nipple in the edge of the enclosure access hole. Check all other wiring into the enclosure, and replace the back cover.



VII) Output Option, PN adder -520

When ordered with the output option, the 414 has three isolated analog outputs of 0-5 VDC, 4-20 milliamp, and 0-20 milliamp. The preferred output is user selectable via the output jumper of JP2 *(See Illustration Below)*

The selected output will correspond to zero to full scale of the instrument. The output can be assigned to any of the lower ranges to further refine the resolution. *(See P. 13, Front Panel Operation and Programming)*

Output Wiring

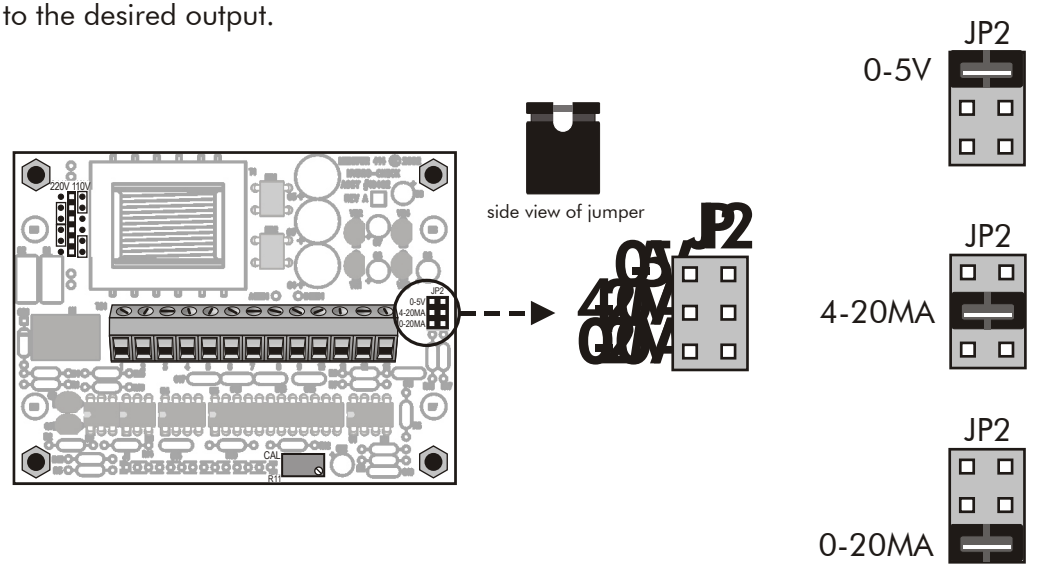
1) This procedure should only be performed by qualified personnel

2) Before wiring any device to the output, disconnect the 414's input power AND be sure the power for any relay controlled devices is also disconnected.

3) Remove the back cover of the enclosure by unscrewing the 4 screws... note, the screws are "captive" and cannot be completely removed from the enclosure's rear cover

4) Locate the jumper block, JP2 *(See Illustration Below)* and confirm the jumper is properly configured for the desired output

5) To change the selected output, simply pull the jumper off the pins and reposition to the desired output.



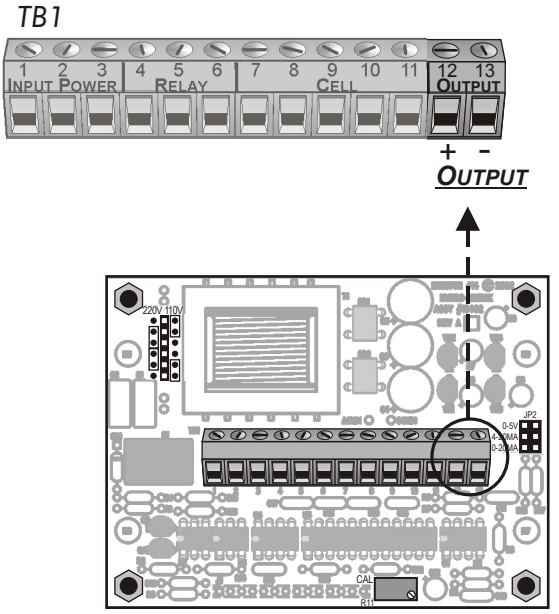
VII) Output Option, PN adder -520

Output Wiring, Cont.

6) Locate the green Terminal Block (TB1) in the center of the circuit board *(See Illustration Below)*. Cut & Strip 1/4" of both the + and - leads to be installed. Cut the end off an unused port nipple and route the wires thru the nipple such that the nipple will point away from the striped ends.

7) Unscrew the TB1 screws corresponding to the terminal positions 12 & 13 of TB1. *(See Illustration Below)*. Insert the striped end of each wire into the wire well with corresponding polarity, leaving a small amount of wire visible, and tighten the screw until the wire is secure.

8) Slide the groove of nipple in the edge of the enclosure access hole. Check all other wiring into the enclosure, and replace the back cover.



VIII) CALIBRATION

The 414 conductivity circuit is very accurate and stable. Calibration is never required under most circumstances. However, calibration may be necessary to comply with QC or certification requirements of the particular application.

CALIBRATION PROCEDURE

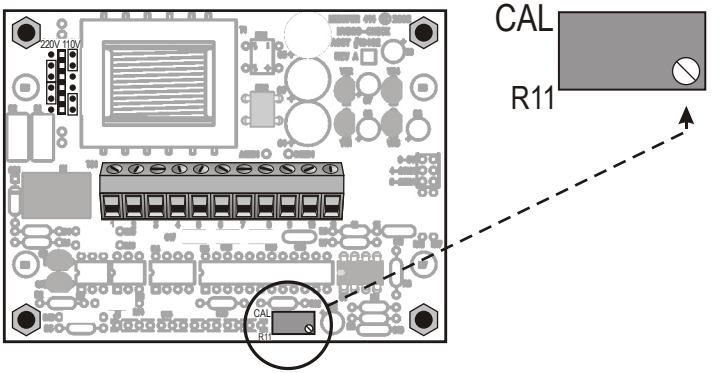
1) Remove the back cover of the enclosure by unscrewing the 4 screws... note, the screws are "captive" and cannot be completely removed from the enclosure's rear cover

2) Locate the calibration trimmer, CAL / R11, on the lower edge of the circuit board. *(See Illustration Below)*

3) Place the conductivity cell in a calibration solution with a known value which is appropriate for the range that requires the utmost accuracy. It is very important to have the cell immersed in an adequate quantity of solution and in a large enough container to have the cell away from the sides or bottom of the container. Vigorously swirl the cell to dislodge any air bubbles that may be entrapped near the electrodes. Allow the temperature to fully stabilize... approximately one minute.

4) Observe the monitor display. If adjustment is necessary turn the calibration trimmer adjustment screw with a small fine screwdriver. Clockwise to increase readings, Counter-Clockwise to decrease readings.

5) Replace the enclosure's rear cover, and install the cell



IX) Conductivity to ppm of TDS Conversion

Conductivity is a convenient tool for indirectly measuring chemical concentrations in water. Although the measurement itself is not specific to a particular ionic constituent, conductivity can be used to: 1) Accurately correlate the concentration of a particular chemical added to water of predetermined conductivity.
2) Estimate the Total Dissolved Solids of common water supplies.

The more ions there are dissolved in water, the more conductive it becomes. Ultrapure water is a not a good electrical conductor as evidenced by the 10 to 18 megohm resistivity. However water begins to become very conductive with just a few ppm of dissolved solids/ions.

Water supplies vary substantially in the types and amounts of dissolved solids present. The overall conductivity of the water is the cumulative effect of the blend of ions. Many water sources have similar conductivity to dissolved solids correlations allowing for conductivity to be used as a quick and economical indicator.

The 414TDS converts conductivity to a ppm TDS reading by way of a factory embedded program in the microprocessor. The relationship of the two parameters is non-linear being both concentration and temperature dependent. The standard 414TDS is programmed for accuracy with typical “fresh” water supplies. This conversion curve varies from approximately .6 at the lower conductivities, to as much as .8 at the high end. The 414TDS may be factory programmed for other applications per customer request. For example, instruments used in seawater desalination should be ordered with a NaCl conversion program (more linear, .55 ratio) for correct accuracy.

X) Contact Us

Hydro-Check Systems, Inc.
5931 Sea Lion Place, Suite 100
Carlsbad, CA 92008

Tel: 760-930-1924, 8-4:30 PM PST
Fax: 760-930-1934
e-mail: schipper@hydrocheck.com
Web: www.hydrocheck.com

XI) Warranty The Hydro-Check Systems 414 Monitor-Controllers and CTS1 Sensors have a warranty against defects in materials and workmanship for a period of 2 years from the date of manufacture. Warranty items returned prepaid will be repaired or replaced by the factory at no charge. Warranty applies only to product defects and Hydro-Check Systems accepts no other liability.