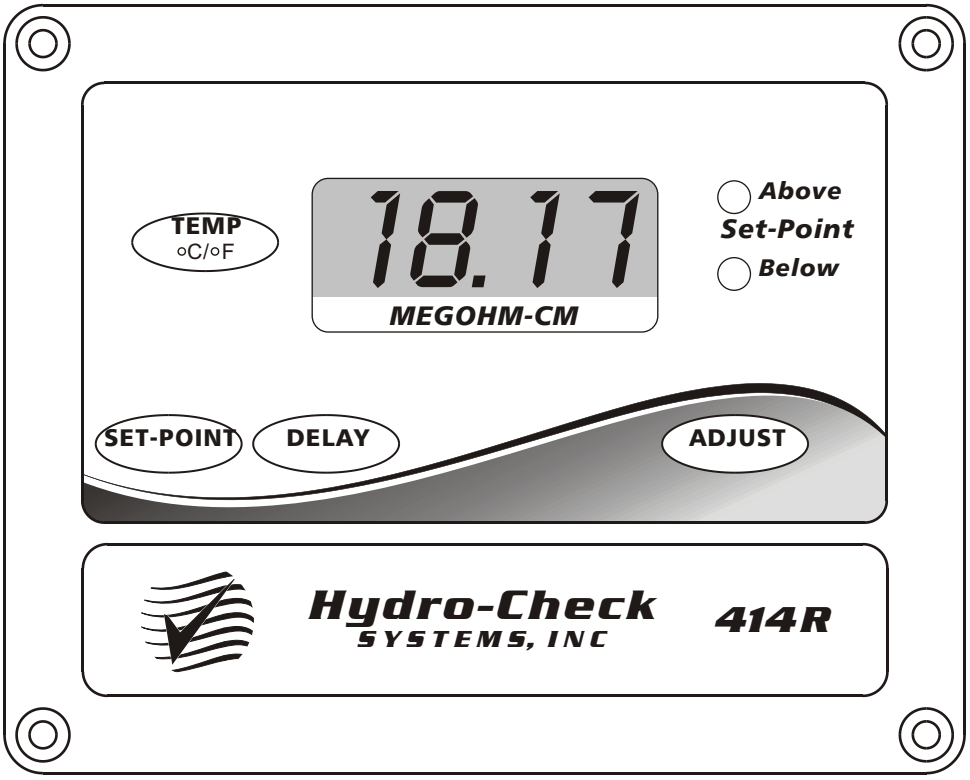
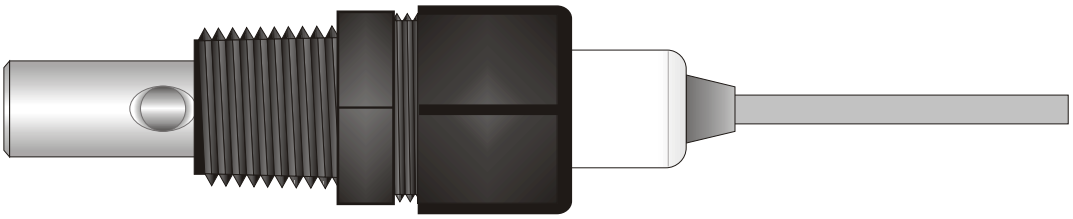
MODELS 414R-HP & 414R-K
RESISTIVITY MONITOR-CONTROLLERS
INSTALLATION & OPERATION MANUAL





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www.hydrocheck.com

Made In The USA

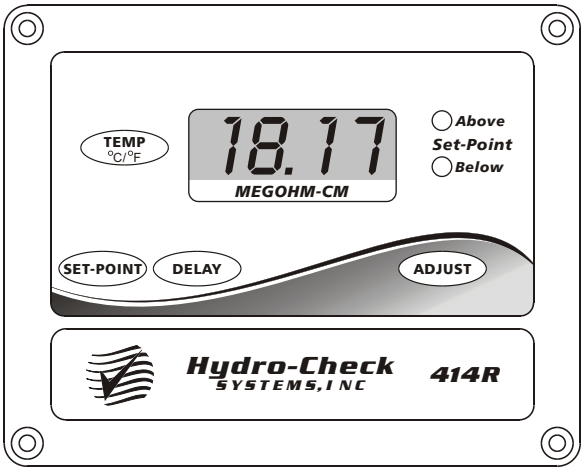
Hydro-Check Systems, Inc

Resistivity Monitor-Controllers

Models 414R-HP & 414R-K

Installation & Operation Manual

0204revB



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

Thank you for choosing the 414R Resistivity Monitor-Controller manufactured by Hydro-Check Systems, Inc.

Application specifications, as well as system service requirements, make water quality monitoring a must for both the end user and service provider. The 414R-HP and 414R-K Resistivity Monitor-Controllers are designed for water systems employing mixed-bed DI, two bed DI, or distillation. They are the ideal specification for the OEM, Engineer, or Service Dealer.

System Application:
Mixed Bed DI
Two Bed Strong Base Anion DI
Two Bed Weak Base Anion DI
Distillation
Double Pass RO

TABLE OF CONTENTS

I) INSTRUMENT OVERVIEW

The *Hydro-Check Systems 414R, Resistivity Monitor-Controller* is designed to accurately indicate the quality of high purity and ultrapure water. Application is typically associated with ion exchange de-ionizer systems.

The 414R utilizes a highly accurate 2-range resistivity measurement circuit, precision cell, and Linear Thermistor Network in combination with a microprocessor programmed with a sophisticated algorithm and TC data. Ultrapure water presents unique measurement challenges due to the extremely broad range of electrical resistance caused by temperature. For example, a water quality of 18 megohm-cm @ 25°C has an actual measured resistance span of 5.8 megohms @ 50°C, to 60 megohms @ 5°C. Therefore, accurate temperature compensation is essential.

The 414R also features 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 120 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.

Input power can be either 110VAC or 220VAC @ 50-60Hz. The appropriate input is selected with jumpers on the circuit board during installation. A low voltage 24VAC input version is also available, consult factory.

II) SPECIFICATIONS & DIMENSIONS

MONITOR

Resistivity Range:

Model 414R-HP: 

To 

Model 414R-K: 

To 

Temperature Display:
0 - 50.0°C or 32 - 122°F
Accuracy:
Resistivity, ±1% of Reading; Repeatability, ±1%
Temperature, ±0.1°C
Temperature Compensation:
Automatic to 25°C from 5 to 50°C
Display:
½ inch, 4 digit LCD

CONTROLLER

Relay:
1 SPDT rated 1 amp resistive @ 28VDC; 0.5 amp resistive @ 120VAC
Function:
Adjustable High/Low Set-Point
Status Indicators:
Green LED / Above Set-Point
Red LED / Below Set-Point
Relay Activation Delay:
Adjustable from 0 - 120 seconds
Memory:
non-volatile EEPROM

OPTIONAL OUTPUTS

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

GENERAL

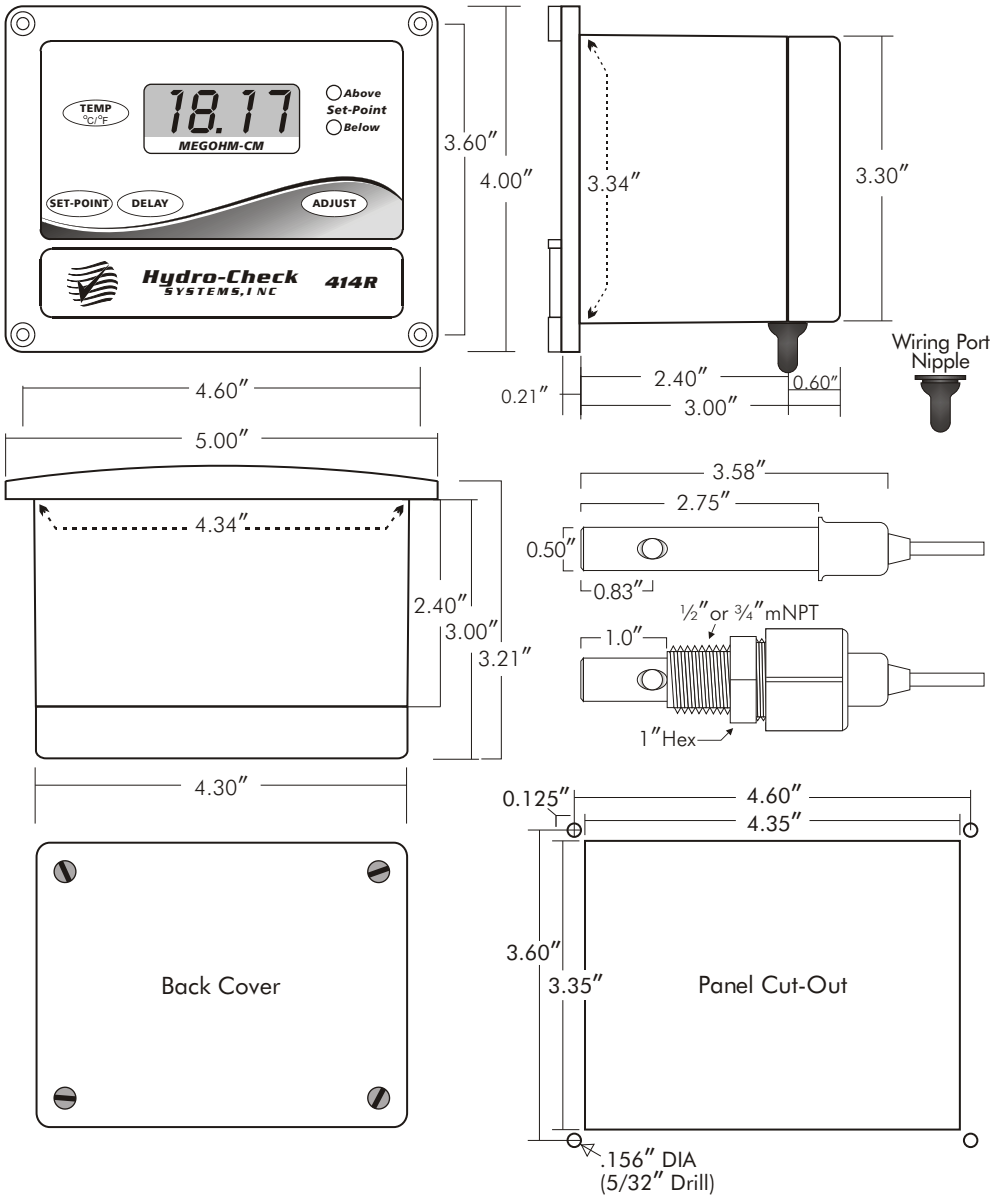
Power Input: Selectable 110 or 220 VAC; 50 - 60 Hz (24VAC available)
Power Consumption: 2.4 watts; 20mA @ 110 VAC
Enclosure: ABS, Panel or Wall Mount

RESISTIVITY CELL, CS10S

Type: Insertion Style, ½" & ¾" mNPT fitting included
Resistivity Cell: 0.05 Cell Constant
Temperature Sensor: Linear Thermistor Network, LTN
Maximum Pres/Temp: 100PSIG @ 100°C
Maximum Sensor Deployment: 100ft of cable
Wetted Materials: 316SS, Polypropylene, Teflon®[1](PTFE) , EPR/EPDM

[1]Teflon® is a registered trademark of DuPont Company

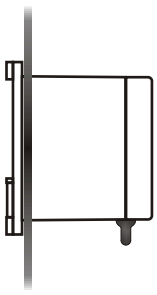
II) Specifications & Dimensions



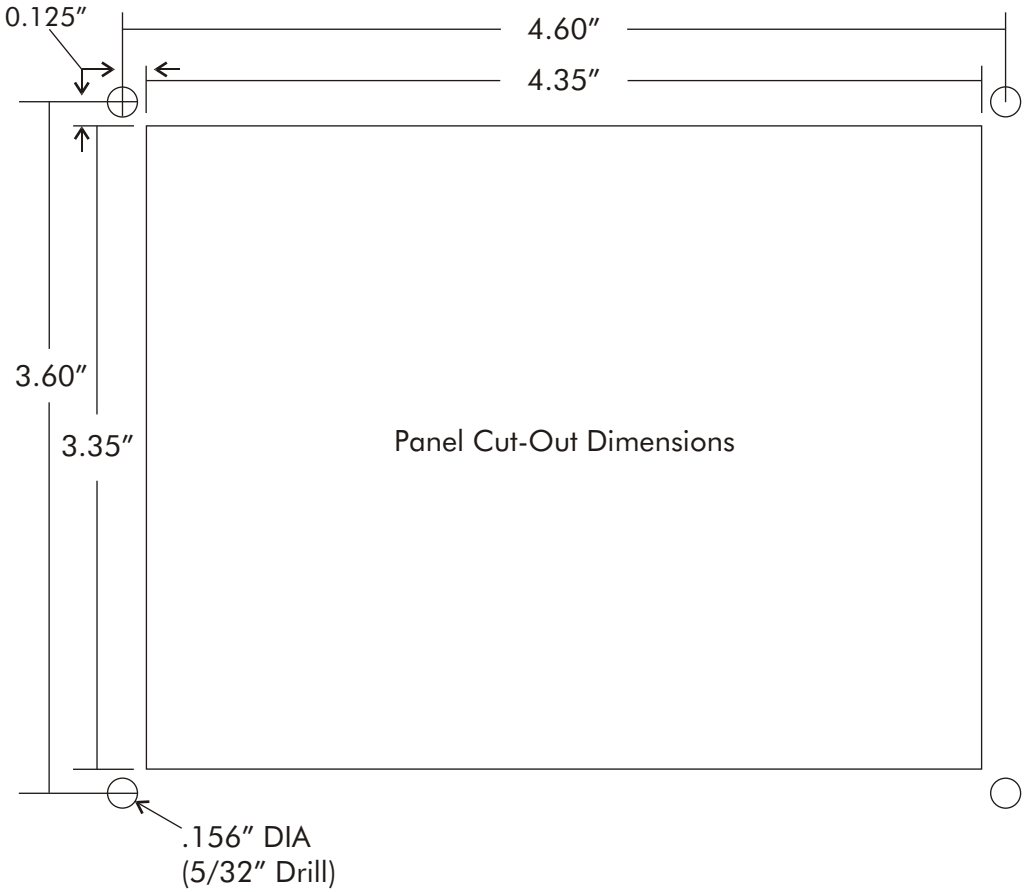
III) BASIC INSTALLATION

A) PANEL MOUNTING

prior to any electrical wiring

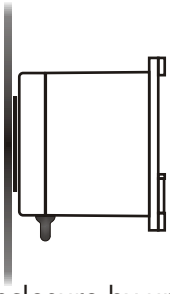


1) Cut out panel per drawing below and Drill 4 mounting holes using a 5/32″ drill bit.



III) BASIC INSTALLATION

B) WALL MOUNTING
prior to any electrical wiring

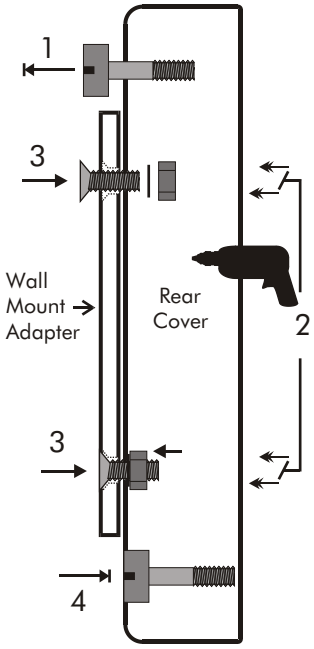


1) Remove the back cover of the enclosure by unscrewing the 4 screws... note, the screws are "captive" and cannot be completely removed from the enclosure's rear cover.

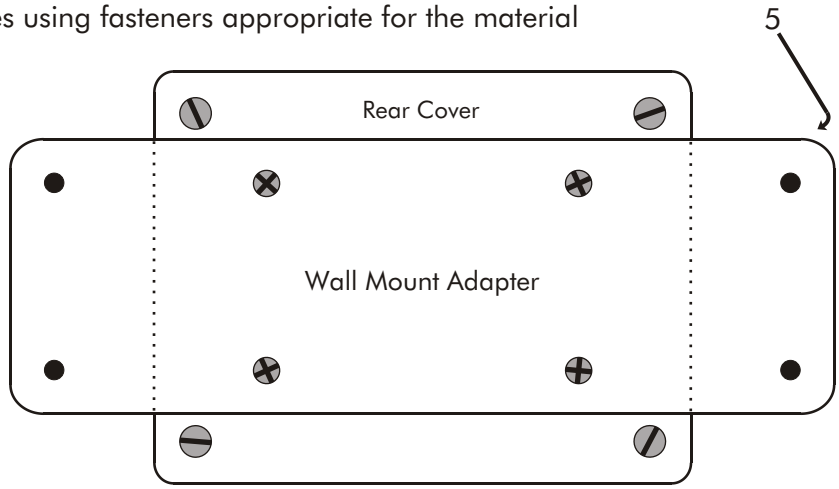
2) Locate the 4 depressions in the plastic on the inside of the back cover. These are drill bit starting guides. Using a 7/64" bit, drill through the back cover at the 4 positions.

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.

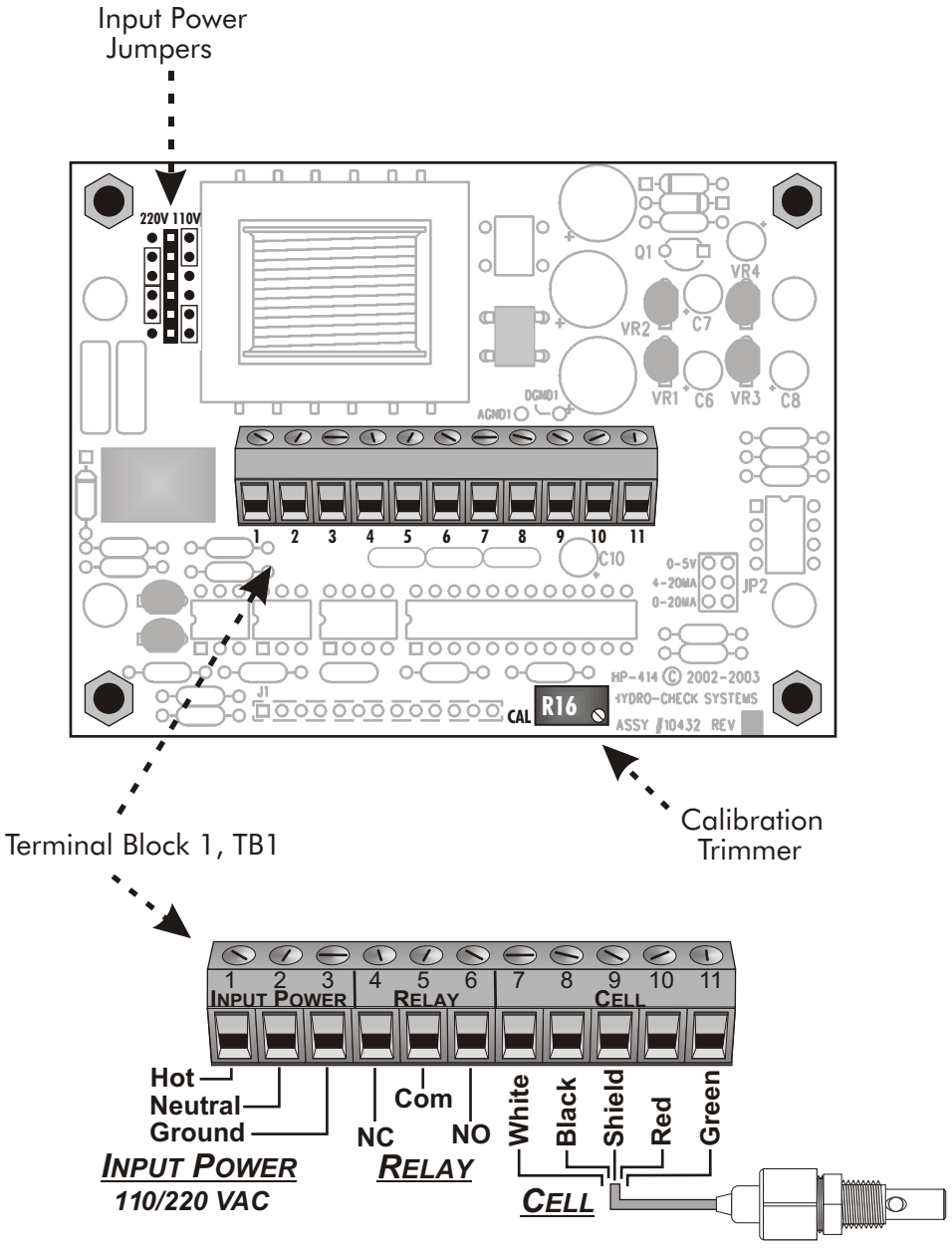


5) Attach completed assembly to the wall surface by the four holes using fasteners appropriate for the material



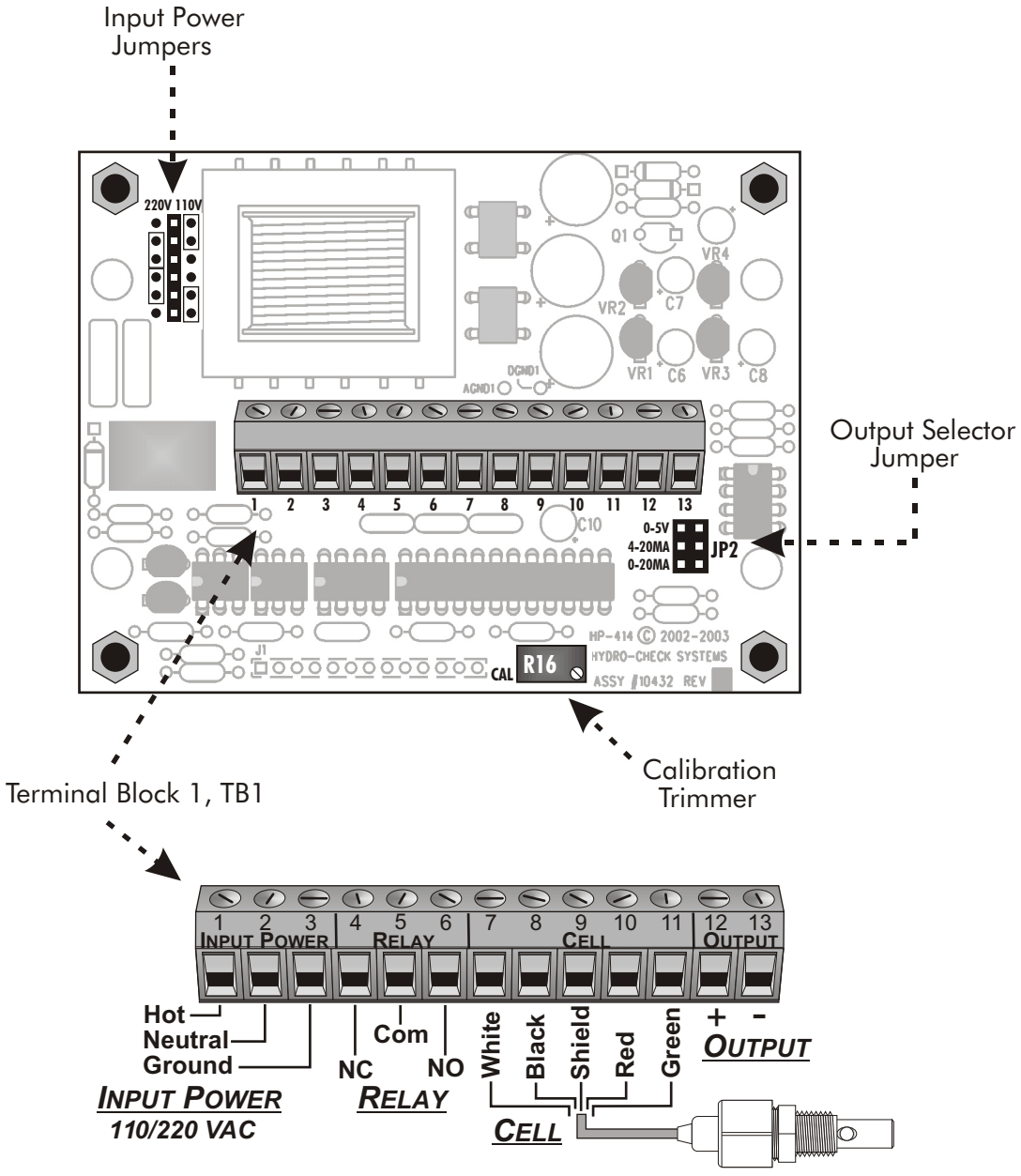
III) Basic Installation

C) Component Identification, Model 414R without Output Option



III) Basic Installation

C) Component Identification, Model 414R with Output Option (-520)



III) BASIC INSTALLATION

D) INPUT POWER SELECTION & CONNECTION

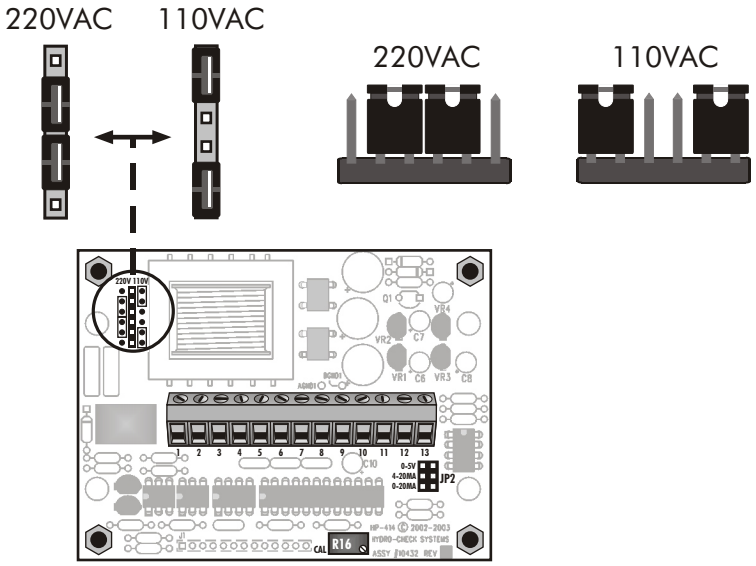
1) The electrical and physical installation of the unit should be performed by professional qualified personnel

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.

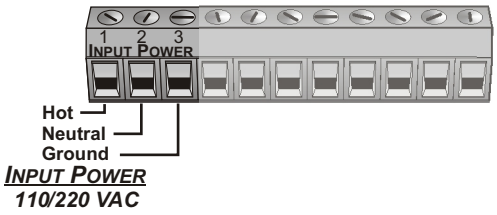
6) Locate Terminal Block 1, TB1, which is near center of the board *(See Illustration Below)*.

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.

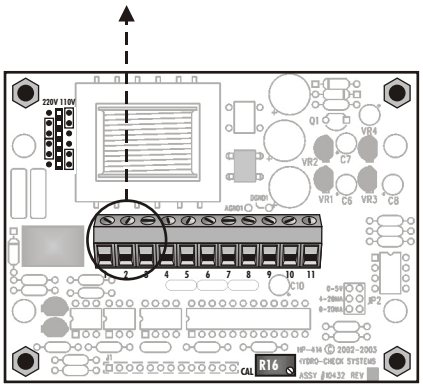
8) Unscrew the screws corresponding with positions shown. Insert wires according to polarity and tighten the screw til secure with some striped wire slightly visible.

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.

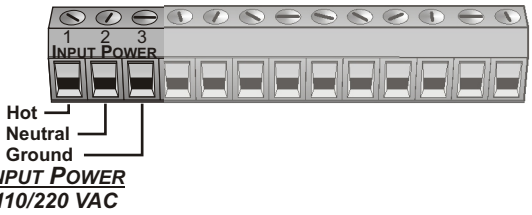
TB1



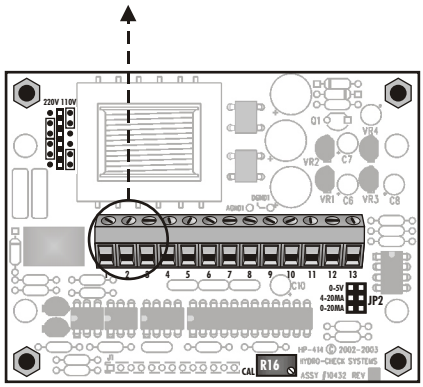
INPUT POWER
110/220 VAC



TB1 WITH OUTPUT OPTION



INPUT POWER
110/220 VAC

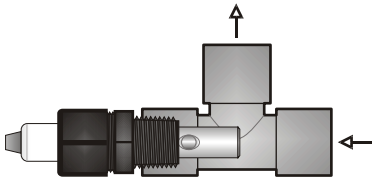


III) Basic Installation

E) Cell Installation & Wiring

IMPORTANT: *ONLY CS-10 Resistivity Cells banded with a YELLOW cable label referencing Hydro-Check Systems and -HCS Part #'s are designed specifically for use with the 414R. No other cells will perform correctly. Confirm proper labeling prior to installation.*

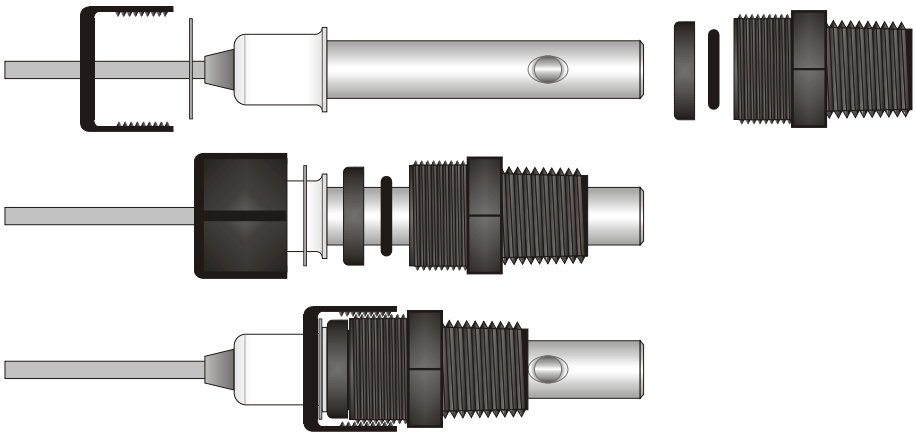
The CS10 resistivity cell and temperature sensor is designed for insertion in either the branch or run of standard ½" & ¾" FNPT threaded tees. The CS-10 is supplied with either a ½" or ¾" mNPT fitting. Horizontal orientation is recommended as shown to avoid any system bubble accumulation near the electrodes.



Confirm the CS-10 has a ½" or ¾" 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 ½ to 1 turn with a wrench.

Insert the cell into the fitting. Be sure the O-ring, spacer, washer, 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.

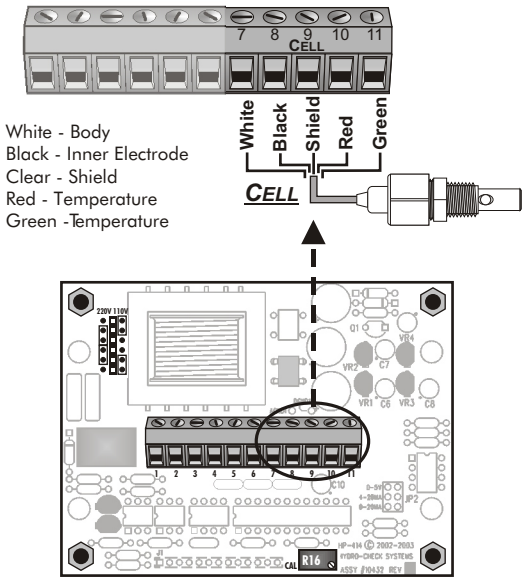
3) Locate Terminal Block 1, TB1, which is near center of the board *(See Illustration Below)*.

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.

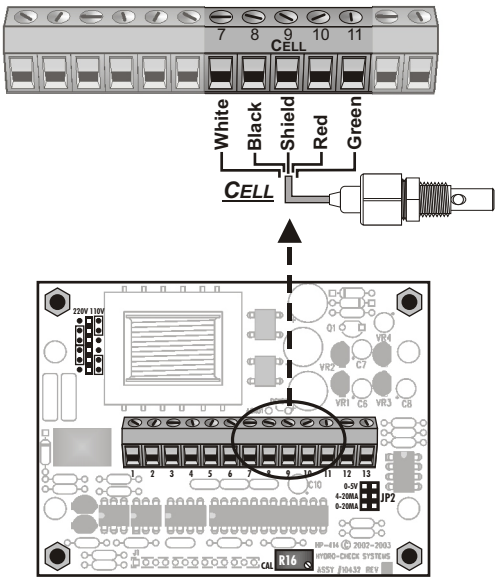
5) Unscrew the screws corresponding with the cell terminal positions shown. Insert wires according to color code and tighten the screw til secure with some striped wire slightly visible.

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.

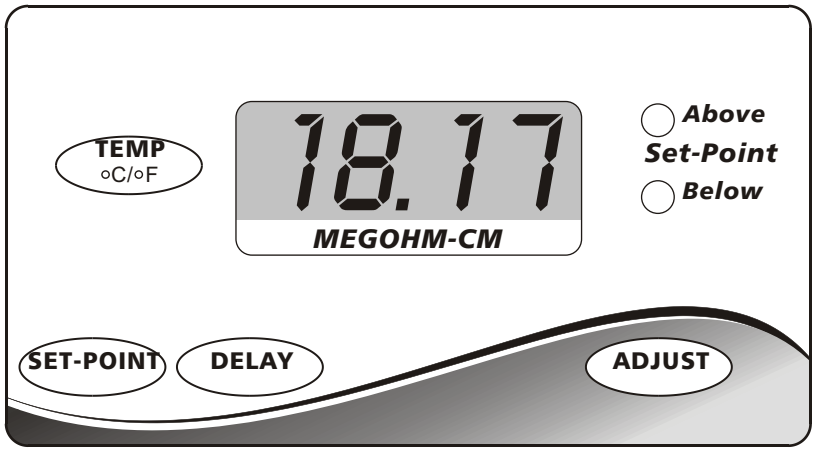
TB1



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

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

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

-HI- will then be displayed followed by the High set-point value.

The High 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

-LO- will be displayed momentarily, followed by the current Low 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)

-HI- will be displayed momentarily, followed by the current High 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

V) Monitor Operation

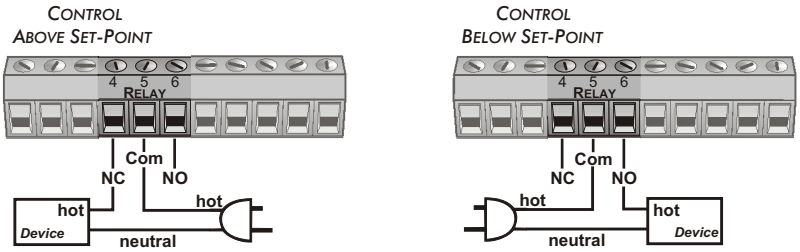
Ranges:

The 414R is a two range instrument for best accuracy. Range selection is automatic and setting a range is unnecessary. The 414's microprocessor will automatically display the measurement to the second decimal place in the high range, and to the third decimal place in the low range. The range shift occurs at slightly different values depending on the temperature of the water. For example, with the model 414R-HP, upon descending readings this range shift occurs at approximately 2.00 megohm-cm. With increasing readings the range shift occurs at approximately 6.000 megohm-cm. If water quality falls to below the range of the instrument, *-UL-* will be displayed representing *Under Limit*. If the unit indicates *-OL-* , *Over Limit,* then there could be air entrapped in the cell which will be dislodged with flow. Contact factory for tech support if the *-OL-* persists.

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 120 seconds to compensate for any anticipated normal equipment rinse-up times.

The relay acts simply as a switch. When the water quality is above the set-point (Green LED), 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 below the set-point (Red LED), the relay is energized completing the circuit between the COM and NO terminals, while simultaneously disconnecting the COM/NC circuit.

VI) Controller Operation and Wiring, continued

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.

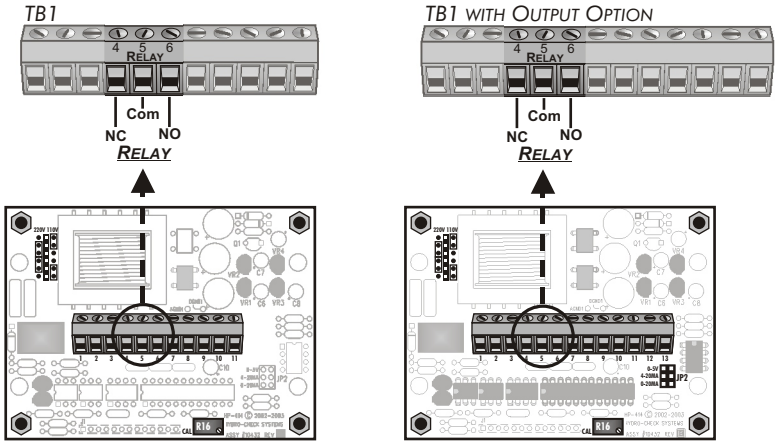
3) Remove the back cover of the enclosure by unscrewing the 4 screws... note, the screws are "captive" and cannot be completely removed from the enclosure's rear cover

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.

Output Wiring

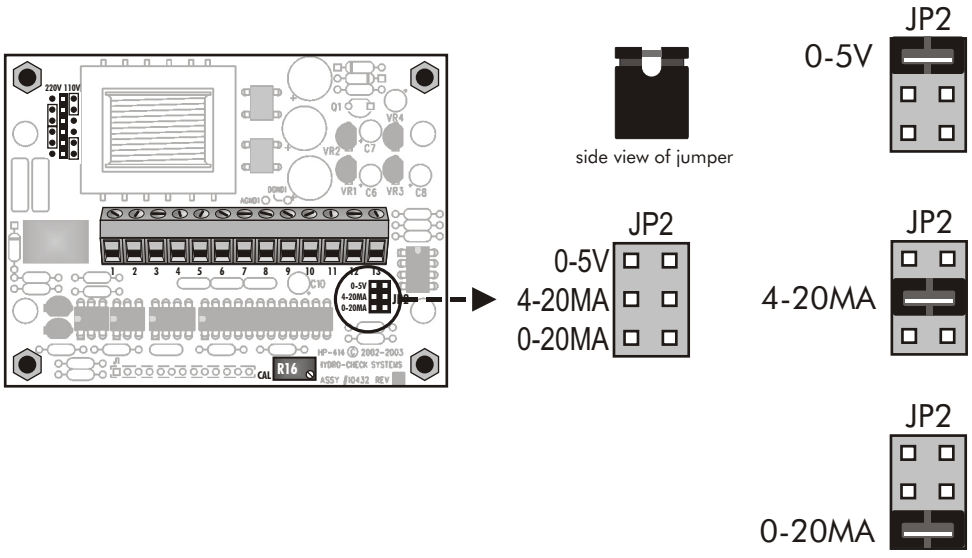
1) This procedure should only be performed by qualified personnel

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.



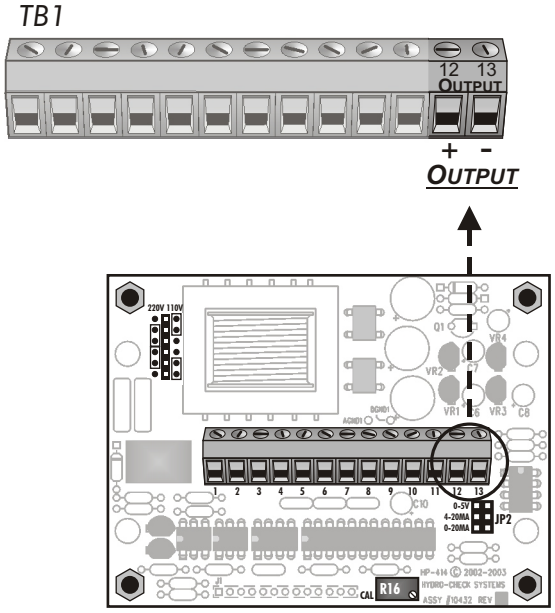
VII) OUTPUT OPTION, PN ADDER -520

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 414R is fully calibrated and wet-tested by the factory. Do not make any adjustments to the factory programmed defaults unless absolutely necessary. Under normal operating conditions involving high purity water, calibration may never be required. If calibration is desired, a basic procedure can be performed with a calibration module as follows below. A more advanced calibration procedure involving microprocessor controlled correction of circuit offset/gain and cell matching can be performed by the factory or by qualified service personnel on-site. Contact Hydro-Check Systems for additional info.

BASIC CALIBRATION PROCEDURE

1) Disconnect power to the unit. 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

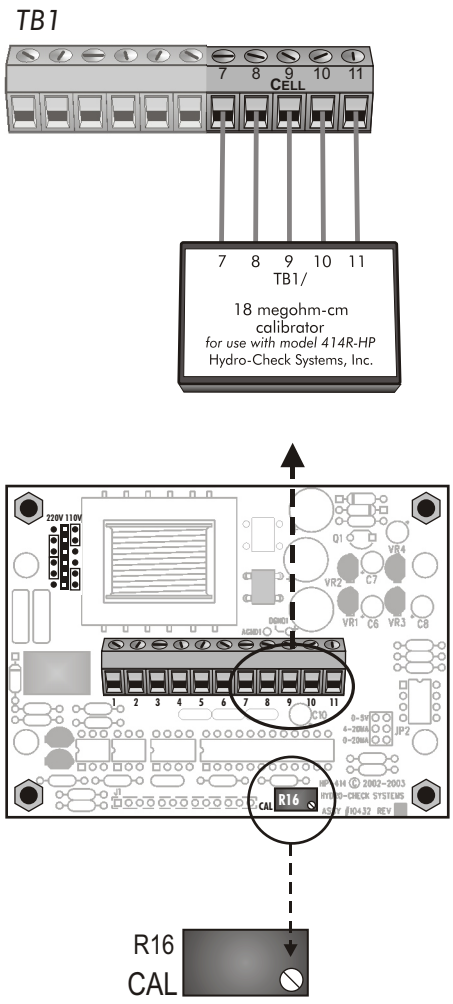
2) Locate the calibration trimmer, CAL / R16, on the lower edge of the circuit board. *(See Illustration Next Page)*

3) LocateTB1 and the 5 cell wires leading to positions 7-11 (see P 11). Unscrew the screws and disconnect all 5 of the cell wires. Insert the pins of the cal module in the same positions as the cell wires such that the label is facing up. Secure the TB screws.

4) Activate power to the unit and let the display stabilize. If the displayed reading differs from the rating of the cal module, turn the cal trimmer, R16, with a small fine screwdriver until the reading agrees.

5) Power off the unit and remove the module, then re-install the cell wires as described in Section III, part E), page 11

6) Replace the enclosure's rear cover, then power up the unit.


TB1
7 8 9 10 11
CELL
7 8 9 10 11
TB1/
18 megohm-cm
calibrator
for use with model 414R-HP
Hydro-Check Systems, Inc.
R16
CAL

X) Contact Us

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

Tel: 760-930-1924
Fax: 760-930-1934
e-mail: schipper@hydrocheck.com
Web: www.hydrocheck.com

XI) Warranty The Hydro-Check Systems 414 Monitor-Controllers and CS-10 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.