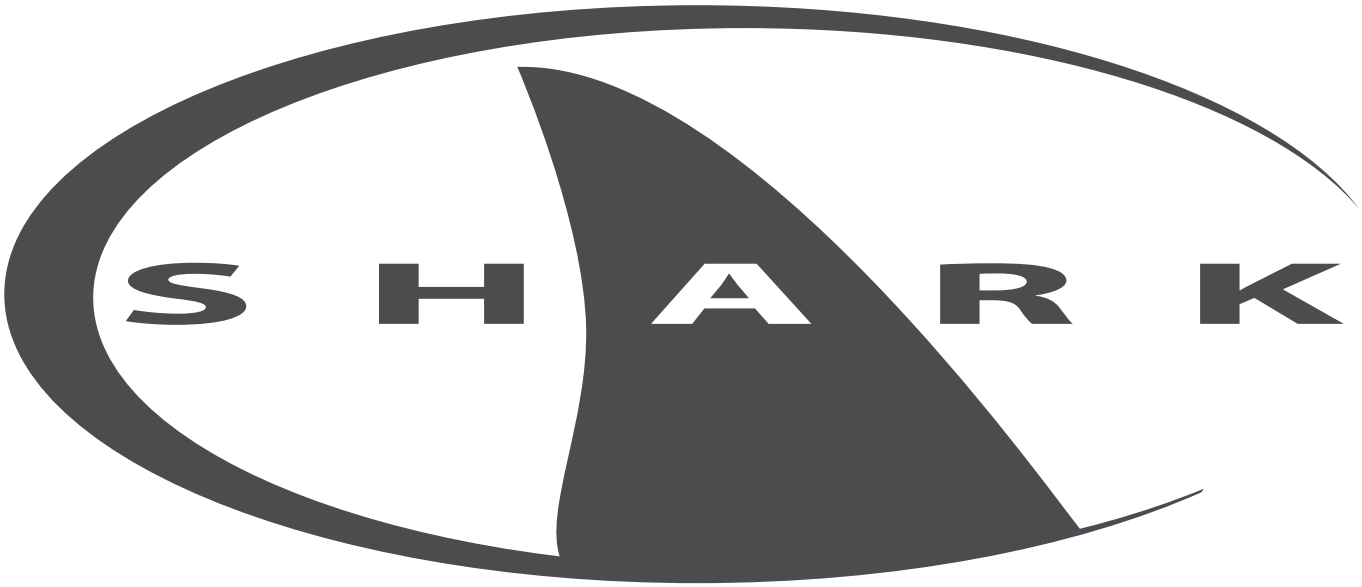


SHARK MULTI-PARAMETER CONTROLLER & ANALYZER USER'S MANUAL

Rev 3

AquaMetrix Inc.
1245 Maple Hill Ct., Unit 7
Newmarket, ON
Canada, L3Y 9E8

Tel: (800) 742-1413
(905) 954-0841
Fax: (905) 954-0415
www.aquametrix.com

Table of Contents

Introduction

The SHARK multi-parameter controller is a microprocessor based controller capable of measuring one of the following parameters, pH, ORP, conductivity or flow.

When shipped from the factory, the SHARK is not set to measure any one parameter. When the SHARK is powered up for the first time, it will display the meter selection screen where the meter type must be selected. (refer to section 4.6 Meter Selection)

This meter selection screen will only be displayed when the SHARK is powered up for the first time.

After the user selects a meter type the SHARK will remain set to that meter type until it is changed with the meter selection menu function in the Utilities menu.

To return the SHARK to its factory settings, the user must re-select the current meter type from the meter selection menu function. This will override all set-points and return all settings back to the factory settings.

The SHARK User's menu has been divided into five main categories

- Calibration, used to calibrate the SHARK with the selected sensor
- Utilities, Used to manually control or override the outputs.
- Setup, used to configure the SHARKs many options
- Diagnostics, used to troubleshoot any problems with the SHARK
- Outputs, used to configure the SHARK's outputs.

There are two displays on the SHARK. A bright LED numeric display with bar graph on the outside front panel, and a 2-line, 16-character LCD display on the inside. The LED readout on the outside panel can be seen several yards away. The distinctive,color-coded bar graph will immediately indicate if you are within the process parameters that you set (green), if the control relays are on (yellow) and if you are in alarm condition (red). This makes diagnosing pump and alarm malfunctions easy. All configuration and control functions are performed on the LCD menu on the inside front panel.

A universal mounting kit is included for surface,panel and pipe-mount applications. The 1/4 DIN enclosure makes panel-mount cutouts and engineering simple.

SHARK is packaged in a rugged NEMA 4X polycarbonate enclosure making it ideally suited for heavy-duty applications such as industrial wastewater neutralization, municipal water and wastewater, pulp and paper, and process control.

Section I - Specifications

	pH	ORP	Conductivity	Flow
Display	Front Panel: 4 x 7 segment 1/2" LED display, 1 LED indicator 0n-line,7 LED Bar Graph Inside Panel: 2 x 16 alpha-numeric LCD display			
Power Requirements	120Vac (±10%) 50/60Hz (less than 12VA) or 240Vac (±10%) 50/60Hz (less than 12VA)			
Measuring Range	pH: 0.01 to 14.00 Temp: 0 to 100°C or 32° to +212°F	ORP: -1999 to +1999mV (Dependent on sensor) Temp: 0 to 100°C or 32° to +212°F	MΩ/cm³: 0 to 19.99 / 0.01 uS/cm³: 0 to 2.000 / 0.01; 0 to 20.00 / 0.1; 0 to 200.0 / 0.1; 0 to 2000 / 1.0 mS/cm³: 0 to 20.00 / 10; 0 to 200.0 / 50 Temp: 0 to 100°C or 32° to +212°F	Flow: 0 to 9999 with selectable flow rate units Volume: 0 to 9999 with Auto Range Flow rate units: Gallons (GP), Cubic Feet (CF), Liters (LP), Cubic Meters (CM), custom by entering factor related to Gallons Time units: Seconds (S), Minutes (M), Hours (H)
Temperature Compensation	Automatic or Manual 0 to 100°C (32° to +212°F)	Not required	Automatic or Manual User selectable temperature compensation slope 0.0 to 10.0%/°C. 0 to 100°C (32° to +212°F)	Not required
Temperature Unit	°C or °F			Not required
Temperature Sensor	User selectable: 300Ω NTC Thermistor, 3000Ω NTC Thermistor or Pt. 1000 RTD			Not required
Calibration Modes	Auto-Calibration Manual Calibration Temperature Calibration	Manual Calibration Temperature Calibration	Dry Calibration Sample Calibration Temperature Calibration	K factor Input
Ambient Conditions	Temperature: -20°C to +60°C or -4°F to +140°F Humidity: 0 to 90% RH (non-condensing)			
Menu Access Front Panel	Auto-Calibration, Manual Calibration, Temperature Display	Manual-Calibration, Temperature Display	Manual Calibration Temperature Display	Not available
Menu Access Inside Panel	Full Access to all parameters of operations menu			
Sensor to SHARK Distance	Differential Sensor: 3000 ft Combination Sensor: 10 ft		300 ft	2000 ft
Relay Outputs	Two Control Relays, 10A / NO, 5A / NC @ 240VAC or 28VDC. Mode: Process control, Adjustable parameters: process direction,(rising or falling) on-set-point, off set-point, (0 to 100% of full scale), cycle timer (on / off, 0 to 600 seconds), failsafe (on / off).			
	One Alarm Relay, 10A / NO, 5A / NC @ 240VAC or 28VDC. Mode: High / Low Alarm, Adjustable parameters: Low on / Low off set-point (0 to 100% of full scale, low on must be less than low off), High On / High Off set-point (0 to 100% of full scale, High on must be greater than High off).			
Analog Outputs	4 to 20mA Channel 1 Isolated Output, Range expand 0 - 100% of full scale (min segment 10% of full scale), max. load 800Ω			
	4 to 20mA Channel 2 Isolated Output, Range expand 0 - 100% of full scale (min segment 10% of full scale), max. load 800Ω Can be set to track temperature if sensor is equipped with a temperature sensor			
Memory Back-up	All user settings are retained indefinitely in memory (EEPROM)			
Mechanical	Enclosure: NEMA 4X, 1/4 DIN, polycarbonate enclosure with four 1/2" conduit holes			
	Mounting: Universal Mounting kit for surface, pipe and panel mount, is included			
Sensor Input	Probe: -600 to +600mV Temp. Sensor: 0 to 9999Ω	Probe: -1999 to +1999mV Temp. Sensor: 0 to 9999Ω	Cell: 0 to 9999Ω Temp. Sensor: 0 to 9999Ω	Paddle: 0 to 2000Hz
Invalid Entries	Invalid entries cannot be stored			
Manual Test Mode	Process value can be simulated with arrow keys to verify correct setup of outputs			
Manual Relay Override	Relays can be set to on / off / auto, to verify correct wiring of auxiliary devices, or to manually adjust process			
Output Hold	All outputs are placed on hold when SHARK is in Menu mode			
Calibration Data	Recall data from last calibration, calibration mode, 1st & 2nd accepted buffer value and probe mV output, calibration temperature, calibration slope, and probe efficiency		Recall data from last calibration, calibration buffer accepted value, and cell resistance, calibration temperature	Recall store K factor.
Auto Return	User selectable auto return if SHARK is left in menu mode or if relays are left in manual override mode for more than 10 min.			
Display Damping	User can select rate at which SHARK updates display. Enables display damping of unstable process			
Net Weight	2.2lbs (1kg)			
Approvals	ULC (pending)			

Section 2 - Installation

2.1 Unpacking

Save the shipping carton and packing material in case the instrument needs to be stored or returned. Inspect the instrument and packing material for shipping damage and report any problems immediately.

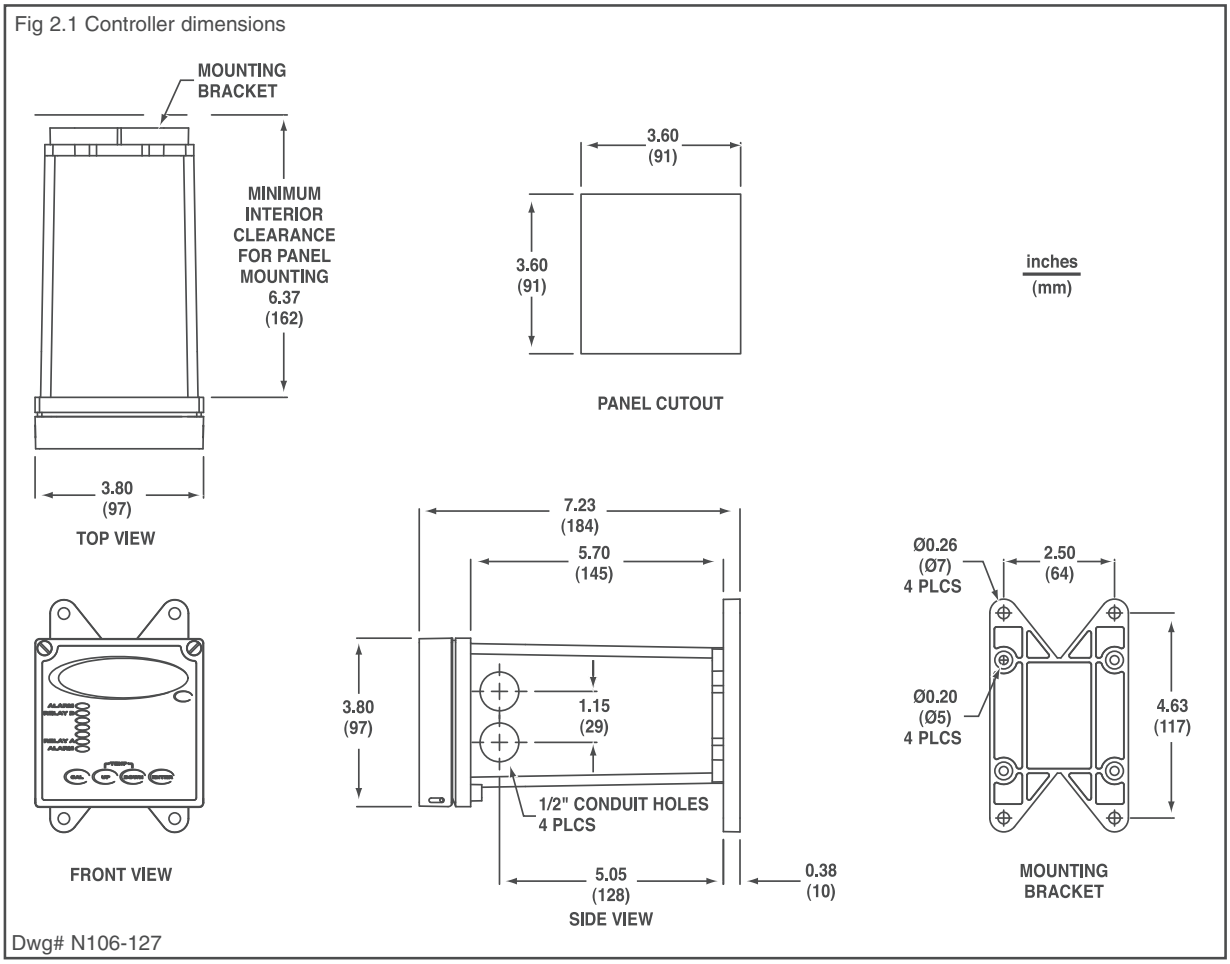
2.2 Location

Locate the controller/analyzer close to the sensor. The list below gives typical maximum distances for various sensors. Refer to the sensor specifications for exact information.

- Aquametrix Differential PH Probe 3000 ft (914 meters)
- Aquametrix Combination PH Probe 10 ft (3 meters)
- Aquametrix Conductivity Probe 300 ft (91 meters)
- Aquametrix Flow sensor 2000 ft (610 meters)

2.3 Mounting

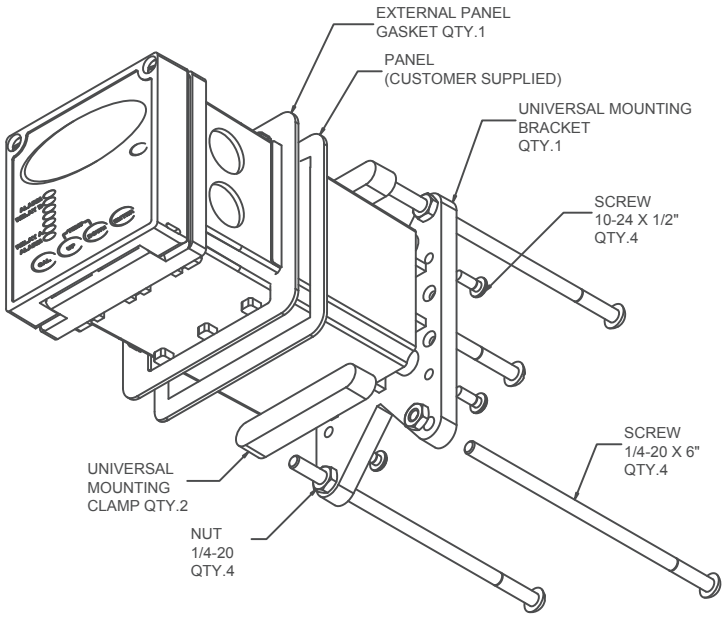
Fig 2.1 Controller dimensions



Section 2 - Installation

Panel Mount – The Shark can be panel mounted to a panel using the hardware kit provided. The panel cutout dimensions are shown in fig. 2.1.

Figure 2.2 Panel Mount

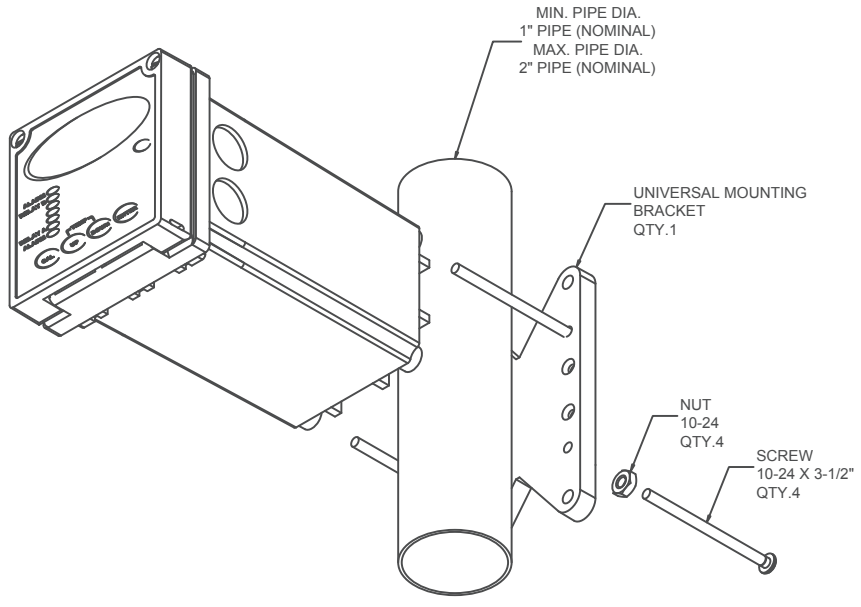


Dwg# N105-100

Pipe Mount – The Shark can also be mounted to a horizontal or vertical pipe with:

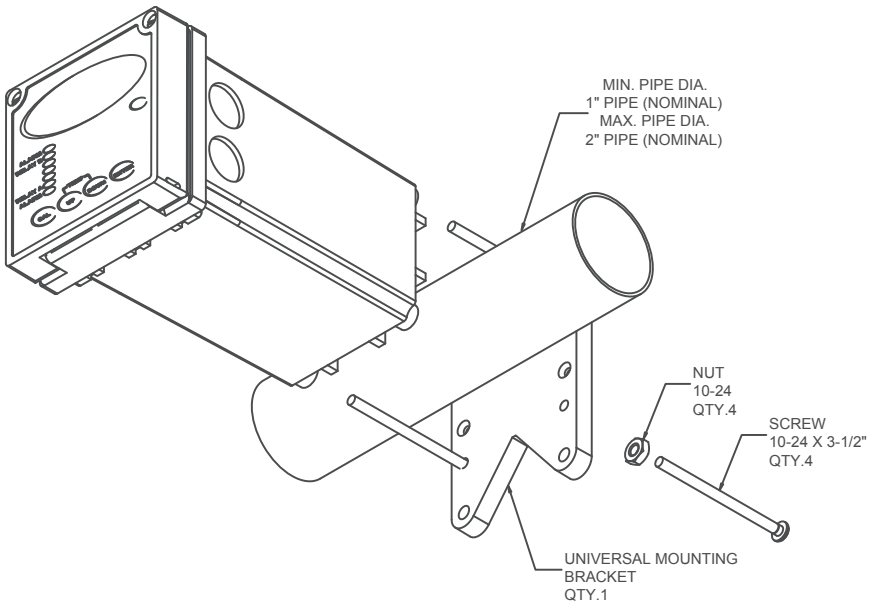
- a minimum outside diameter of 1.30" (33mm) (for example 1" CPVC pipe)
- and a maximum of 2.375" (60mm) (for example 2" CPVC pipe)

Fig. 2.3 Vertical Pipe Mount



Dwg# N105-100

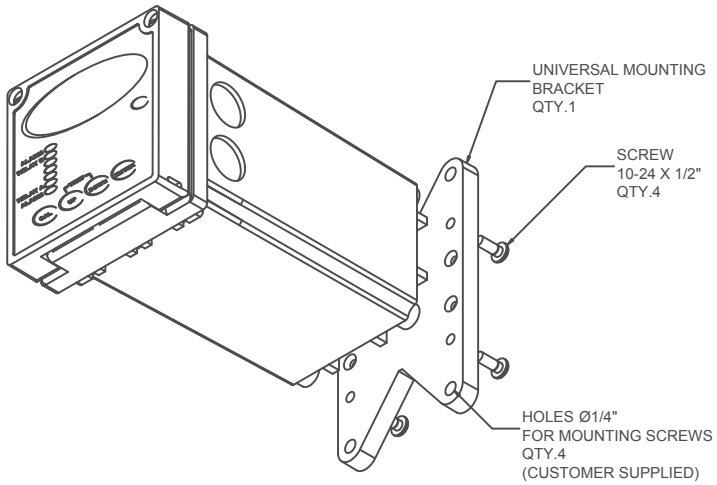
Figure 2.4 Horizontal Pipe Mount



Dwg# N105-100

Surface Mount – The Shark can be surface mounted using the hardware kit provided with the unit.

Figure 2.5 Surface Mount



Dwg# N105-100

Section 3 - Electrical Connections and Setup

3.1 Conduit Connections

The Shark has four 1/2" conduit holes, 2 on each side of the enclosure as shown on fig. 2.1. The unit is shipped with these holes plugged with liquid tight conduit seals. These must be left in unused holes to maintain the NEMA 4X integrity. Use approved conduit hubs to connect the conduit, connect these to the conduit before connecting to the enclosure.

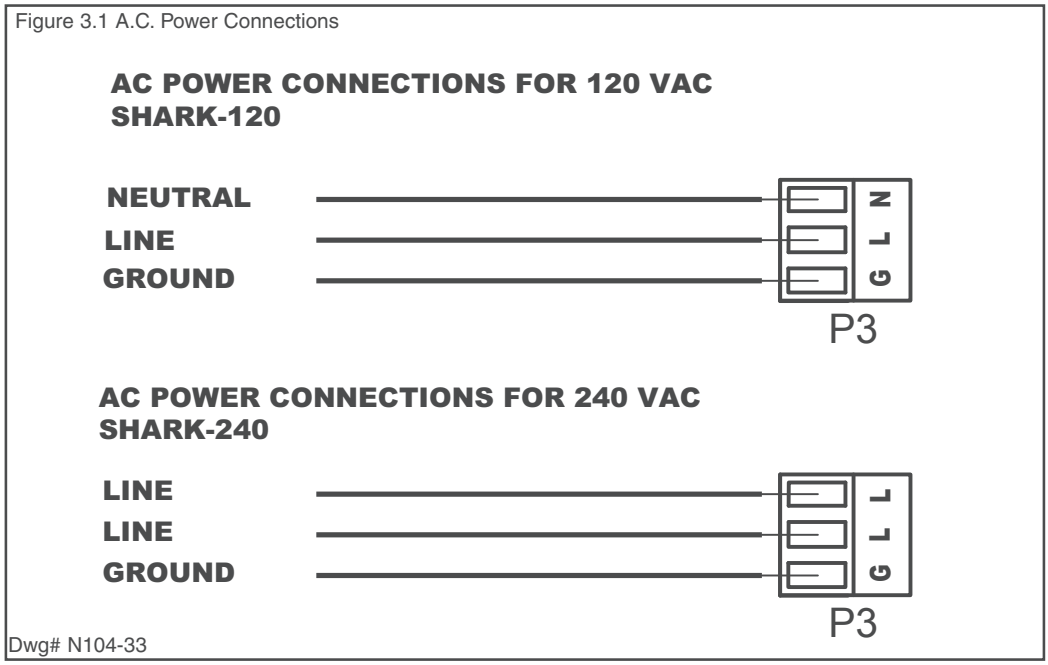
Wire Specification: Size and fuse wire accroding to local electrical code. Maximum current not to exceed 10A when used to power auxillary decvices powered via internal connections.

3.2 A.C. Power Connections

Caution: This instrument uses 120 or 240 50/60 Hz AC power. Opening the enclosure door exposes you to potentially hazardous line power voltage which might be present on the terminals of plug P3 and P4. Always remove line power before working in this area. If the relay contacts on P4 are powered from a seperate source from the line power on P3, be sure to disconnect that power before proceeding. The Shark flip out door contains only low voltage and is safe to handle.

The Shark is available in two power models.
The Shark-240 is designed to operate at 240 VAC.
The Shark-120 is designed to operate at 120 VAC.
To connect power to the Shark, remove the terminal block plug P3 and connect the wiring as shown below.

Figure 3.1 A.C. Power Connections



3.3 pH and ORP Differential Probe connections and setup

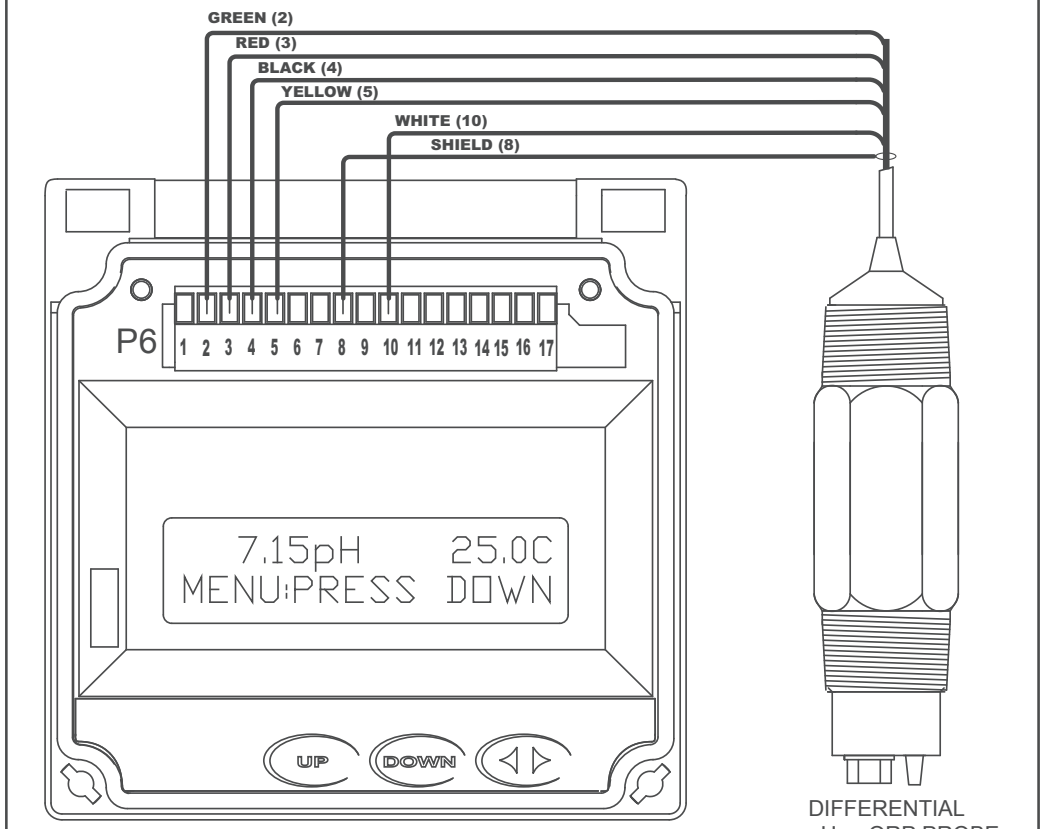
The drawing shows the connections for the Aquametrix Differential (5 wire) probe. The cable should be run in a conduit separate from AC power wires, and via a separate conduit hole.

Note: Leave 4" to 6" slack for all wires connected to the terminals of P6. Slack required so that wires do not interfere with opening or closing of the front door.

If the cable of the differential probe is cut, the blue wire is not used.

CAUTION:
Always remove line power before unplugging or plugging in the P6 connector

Figure 3.2 Connections for Differential (5 wire) pH or ORP probe



Dwg# N104-34

Once connected, step through the LCD menus to select the probe in the order shown. The first two steps may be skipped if the meter is already configured for pH or ORP and a Differential Probe.
When using a pH probe, it is important to ensure that the Shark is reading the probe temperature correctly for accurate temperature compensation. The ORP probe does not require temperature compensation, although the Shark can display process temperature measured by the probe. The factory temperature calibration is usually accurate enough that no adjustments are necessary.

METER SELECTION	SELECT pH SEC. 4.6 or ORP SEC. 5.5 (IF NECESSARY)
PROBE SELECT	SELECT DIFFERENTIAL PROBE pH SEC. 4.7 or ORP SEC. 5.6 (IF NECESSARY)
MANUAL CAL PH	MANUAL CALIBRATE pH PROBE SEC. 4.1 or ORP PROBE SEC. 5.1
7.15pH 25.0C	RUN MODE

Section 3 - Electrical Connections and Setup

3.4 pH or ORP Combination Probe connections and setup

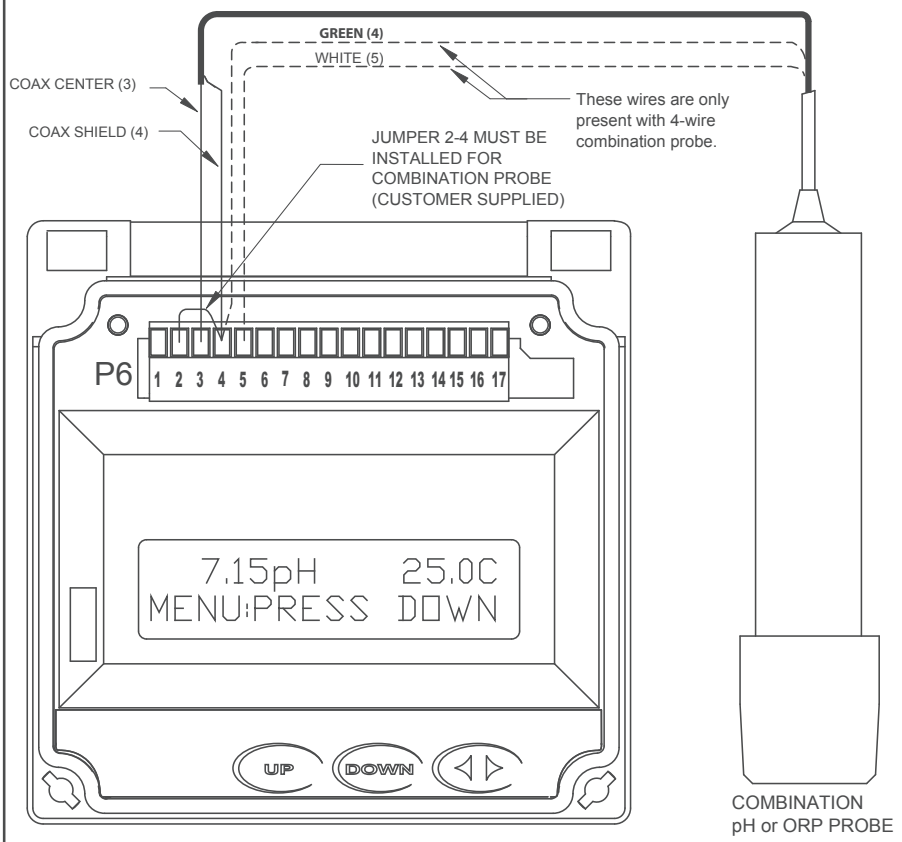
The drawing shows the connections for the Aquametrix Combination probe. The cable should be run in a conduit separate from AC power wires, and via a separate conduit hole. The cable length should not exceed 10 feet (3 meters).

The **2 wire** version has no temperature sensor and is connected via a coaxial wire.
In a pH meter, the user should set the **T COMP OVERRIDE** menu to **ON** (Section 4.11) and adjust the temperature setting to the actual probe temperature.
In an ORP meter, the user should set the **T.DISP OVERRIDE** to **ON** (Section 5.10) to blank the temperature reading on the display.

The **4 wire** version has two additional wires for the probe internal temperature sensor. Ensure that the **T COMP OVERRIDE or T.DISP OVERRIDE** is **OFF.**

Note: Leave 4" to 6" slack for all wires connected to the terminals of P6. Slack required so wires do not interfere with opening/closing of front door.

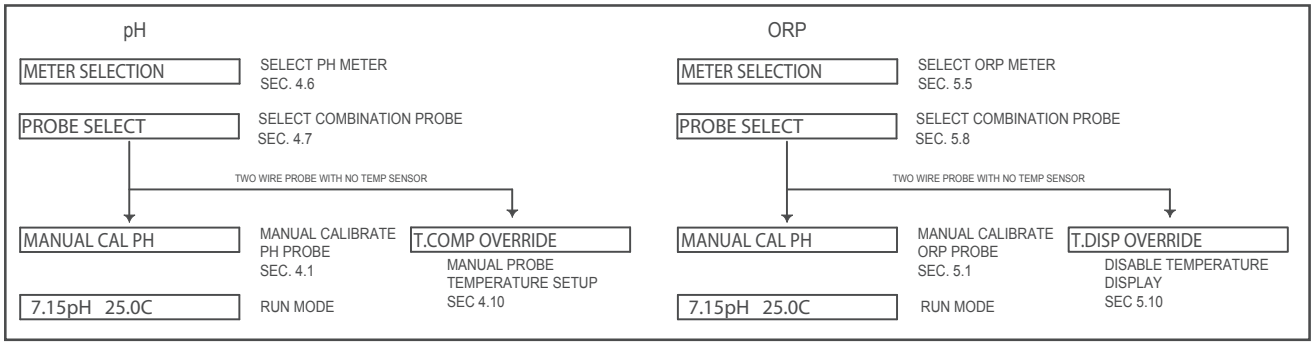
Fig. 3.3 Connections for the 2 and 4 wire Combination Probe



Dwg# N104-35

CAUTION:
Always remove line power before unplugging or plugging in the P6 connector

Once connected, step throught the LCD menus to select the probe in the order shown. The first two steps may be skipped if the meter is already configured for a Combination Probe. If a two wire pH probe is used, which has no temperature sensor, ensure that the Temp. Comp. Override is set to same temperature as the buffer before calibrating. If a two wire ORP probe is used, you can blank the Temp display with the T DISP OVERRIDE menu.



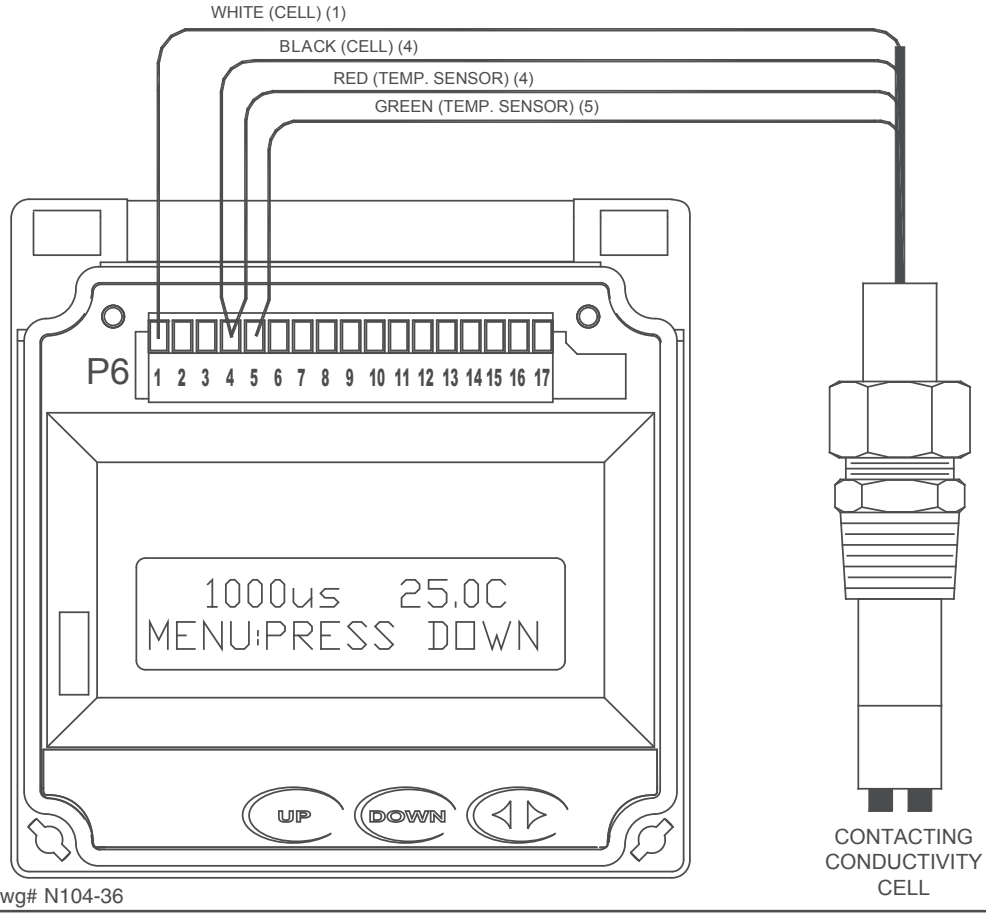
3.5 Conductivity Cell (Contacting style) connections and setup

The drawing shows the connections for the Aquametrix Conductivity Cells (Contacting style). The cable should be run in a conduit seperate from the AC power wires, and via a seperate conduit hole. The cell cable length should not exceed 300ft. (91 meters).

Note: Leave 4" to 6" slack for all wires connected to the terminals of P6. Slack required so that wires do not interfere with opening or closing of the front door.

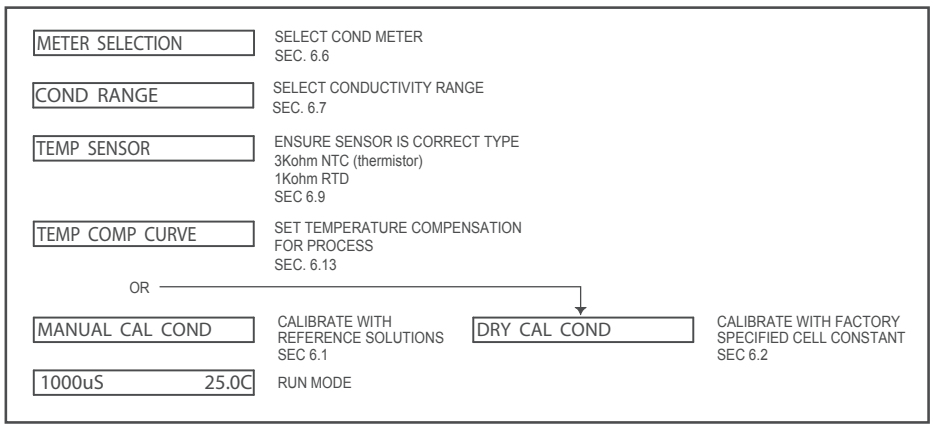
CAUTION:
Always remove line power before unplugging or plugging in the P6 connector

Figure 3.4 Connections for Conductivity Cells



Dwg# N104-36

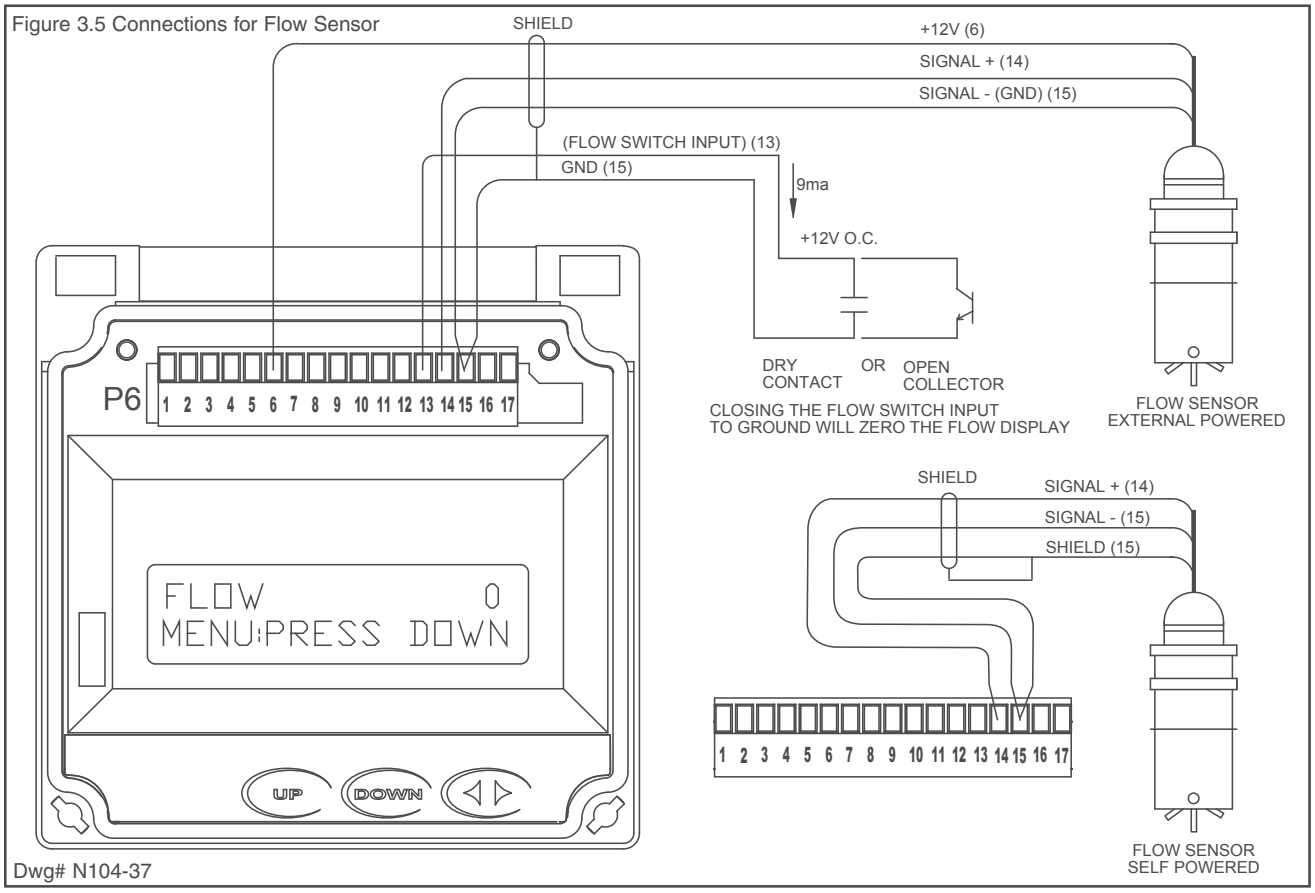
Once connnected, step through the LCD menus to select the cell in the order shown. The TEMP COMP CURVE setup default is 1.8%/deg C. This is acceptable for most process applications. If your process is significantly different from this, change the setting in the TEMP COMP CURVE menu.



3.6 Paddle Wheel Flow Sensor connections and setup

The drawing shows the connnections for a typical paddle wheel flow sensor. The cable to the sensor should not exceed 2000' (600 meters).
The Shark controller also supports the use of an external "flow switch". When the flow switch input is grounded, either through a dry contact or solid state input, the flow display will be held at zero. This is useful to ensure the flow reading remains locked at zero when conditions require it. The flow will start reading again when the input is opened. If the flow switch function is not desired, simply leave it disconnected and the flow meter will read as normal.

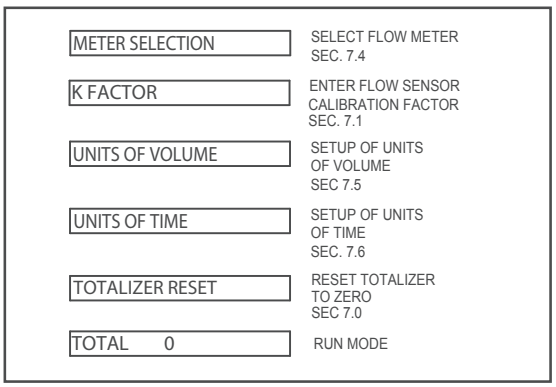
Figure 3.5 Connections for Flow Sensor



Note: Leave 4" to 6" slack for all wires connected to the terminals of P6. Slack required so that wires do not interfere with opening or closing of the front door.

CAUTION:
Always remove line power before unplugging or plugging in the P6 connector

Once connected, step through the LCD menus to select the sensor in the order shown. The Sensor K factor (pulses per U.S. Gallon) is usually printed on the side of the sensor or on a label attached to the sensor cable.



3.7 Relay connections

The Shark controller has three internal relays. Relays A and B are for control, the Alarm Relay can be configured for alarm functions or as an additional control relay.

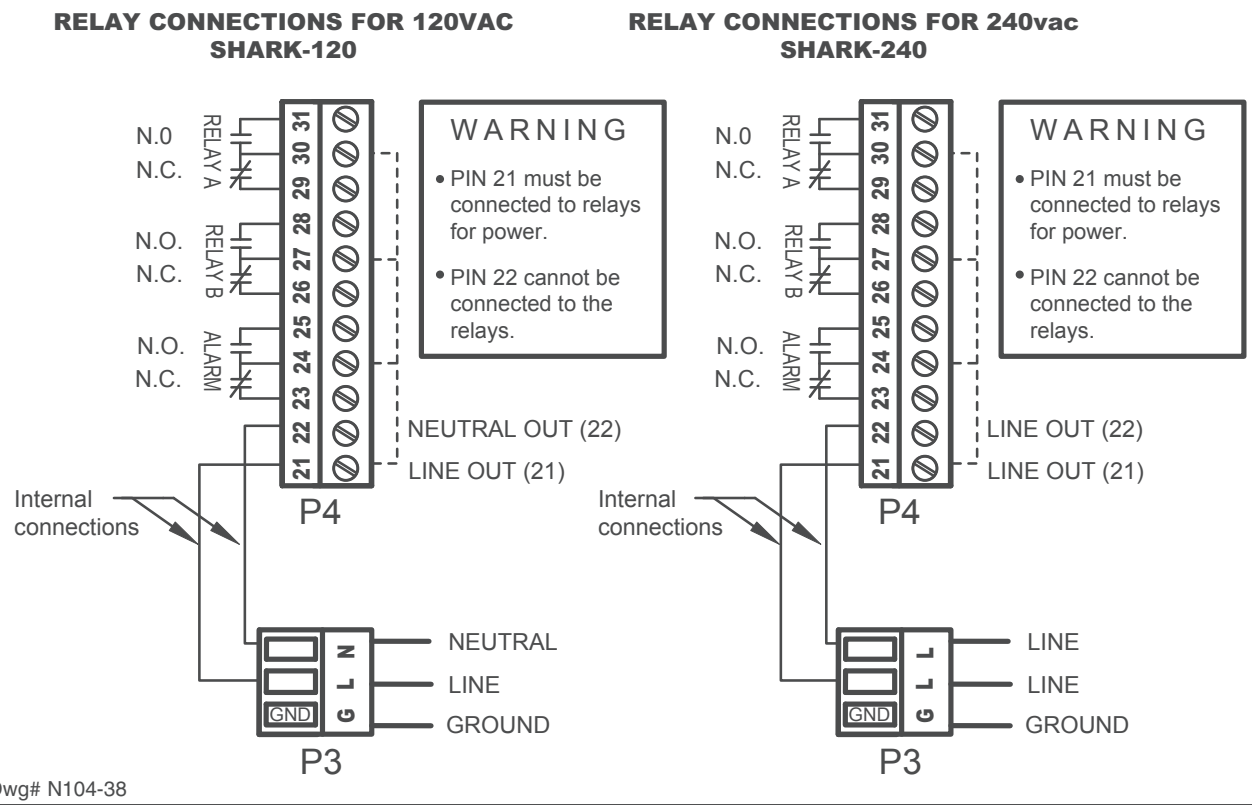
The connections to the relays are shown in the drawing. Note that the AC power is internally connected to the relay terminal plug P4. This is used to provide 120V or 240V AC power for the relay contacts.

Wire Specification: Size and fuse wire accroding to local electrical code. Wire size not to exceed 14 AWG.

WARNING

DISCONNECT POWER FROM CONTROLLER AND LOADS WHILE CONNECTING TO THE RELAY OUTPUT TERMINAL PLUG.

Figure 3.6 Connections for Relay A, B and Alarm



Caution:

The contacts are rated at 10 amp N.O. and 5 amp N.C. Do not exceed this rating. When switching larger currents, use an auxillary relay switched by the controller relay to extend the controller relay life. If the relays are controlling an inductive load, use appropriate transient suppression at the load.

3.8 RELAY A and B Setup

(LCD MENU SECTIONS - pH: 4.18 & 4.19, ORP: 5.17 & 5.18, Conductivity: 6.18 & 6.19, Flow: 7.15 & 7.16)

Relay A & Relay B on the SHARK are SPDT dry contact relays. They are configurable to operate in response to rising or falling process values. Each relay has independently adjustable on and off set-points, cycle times, and fail-safe options.

The operator would use the control relays if the device to be controlled is a simple on/off device. For example a pump, solenoid valve, fan, or an indicating light.

The control relays have 6 user configurable settings:

DIRECTION: The relay can be set to control either a rising or falling process. If for example the relay is set to control a falling process, the ON set-point must be set lower than the OFF set-point. If the relay is set to control a falling process the SHARK will not allow the RELAY OFF set point to be set lower than the RELAY ON set-point. This rule will also apply to a rising process.

RELAY ON set-point: This is the process value at which the relay will energize. This value can be set anywhere between 0-100% of the range.

RELAY OFF set-point: This is the process value at which the relay will de-energize. Depending on the direction for which the relay is configured, the RELAY OFF set-point will only be setable in a limited range.

CYCLE ON time: To obtain a tighter process control, and limit over-shoot, the control relay can be set with the cycling feature. This feature, if enabled, will cause the control relay to cycle when the process is between the RELAY ON set-point and RELAY OFF set-point. The cycle on time is the amount of time in seconds that the relay will be energized. It can be set between 0 and 600 seconds.

CYCLE OFF time: The CYCLE OFF time is the amount of time in seconds that the relay will be de-energized, it can be set between 0 and 600 seconds. To disable the cycling feature set the cycle off time to 0.

OVERFEED TIMER: The overfeed timer is designed to help safeguard against a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

When enabled, the overfeed timer will time out if the control RELAY OFF set point is not reached inside the overfeed time out. The control relays will de-energize, the alarm relay will energize and an LED will flash at the front.

FAILSAFE: The FAILSAFE feature is designed to reverse the normal action of the control relay.

When the relay is set to FAILSAFE OFF the relay will operate as a normal relay. When the relay is de-energized the NO contacts are open and the NC contacts are closed. Thus the device connected via the NO contacts will be off. When the relay becomes energized the device will be on.

When the relay is set to FAILSAFE ON, the normal action of the relay is reversed. Thus the NO contacts act as the NC contact and the NC act as the NO. The device connected to the NC contacts will be energized when the RELAY ON set-point is reached. The relay will be de-energized but because it is acting in reverse the device will be energized. When the RELAY OFF set-point is reached the relay will energize and the device connected to the NC contact will de-energize.

The purpose of the Fail Safe option is to have the device turned on in the event of a power interruption.

The factory default for FAILSAFE is OFF.

3.9 ALARM RELAY Setup

(LCD MENU SECTIONS - pH: 4.20, ORP: 5.19, Conductivity: 6.20, Flow: 7.17)

The third relay (Relay C) is used as an alarm relay. The alarm relay on the SHARK is a SPDT dry contact relay.

This relay will respond to both a rising and falling process. The alarm relay will act as a low alarm (falling process) and a high alarm (rising process). Both relays will have independently adjustable on and off set-points. The ALARM ON set-points will always be set before the ALARM OFF set-points. The shark will not let the user input a value below the ALARM ON set-point. The same rule holds true for the high alarm.

The control relays have 5 user configurable settings:

ALARM LOW ON set-point: This is the low process value that will cause the relay to energize. This value can be set anywhere between 0-100% of the range.

ALARM LOW OFF set-point: This is the value that the process must reach in order to de-energize the alarm relay after it has dropped below the ALARM LOW ON set-point. This value must be higher than the ALARM LOW ON set-point.

ALARM HIGH ON set-point: This is the process value that will cause the relay to energize. This value can be set anywhere between 0-100% of the range.

ALARM HIGH OFF set-point: This is the value that the process must reach in order to de-energize the alarm relay after it has increased over the ALARM HIGH ON set-point. This value must be lower than the ALARM HIGH ON set-point.

FAILSAFE: This option can be turned on or off. It reverses the normal action of the relay. (see description under control relay)

ALARM SET-POINT ERROR: If the ALARM LOW ON set-point is set higher than the factory default ALARM LOW OFF set-point, when the user advances from the ALARM LOW ON set-point to the ALARM LOW OFF set-point the shark will adjust the ALARM LOW OFF set-point to be equal to the ALARM LOW ON set-point. If the user then tries to decrease the ALARM LOW OFF set-point the Shark will display the ALARM LOW ALARM setup error screen.

This screen will be displayed for 10 seconds, then return back to the setup screen that was previously displayed. If the user presses the down key again the error message will be displayed again for 10 seconds. The user must accept the LOW OFF set-point, equal to, or greater than the LOW ON set-point.

The same conditions apply to the ALARM HIGH set-points. Except the ALARM HIGH OFF set-point must be lower than the ALARM HIGH ON set-point. If the user tries to increase the ALARM HIGH OFF set-point higher than the ALARM HIGH ON set-point the High Alarm setup error screen will be displayed.

ALARM RELAY DISABLE: If the user sets the ALARM LOW ON set-point and the ALARM LOW OFF set-point equal to 0% of the range. It will disable the low alarm relay.

If the user sets the ALARM HIGH ON set-point and the ALARM HIGH OFF set-point equal to 100% of the range. It will disable the high alarm relay.

3.10 MANUAL TEST MODE

(LCD MENU SECTIONS - pH: 4.4, ORP: 5.3, Conductivity: 6.4, Flow: 7.2)

Once the relays are configured, the setup can be tested using Manual Test Mode to simulate process changes.

MANUAL TEST MODE is used to simulate a process reading in order to verify the correct response of the outputs. When in the MANUAL TEST MODE, the relays and outputs are no longer placed on hold as they are when in the rest of the menu. The relays and outputs will react to the simulated change in process as if the Shark was in RUN MODE.

Note that when the user exits the MANUAL TEST MODE, the relays and outputs will remain in the MANUAL TEST MODE state until the user enters RUN MODE.

3.11 RELAY OVERRIDE

(LCD MENU SECTION - pH: 4.5, ORP: 5.4, Conductivity: 6.5, Flow: 7.3)

Relay Override is used to manually override the state of the relays. The user is able to set the operating mode of the relay as AUTO/ON/OFF (the default and RUN MODE states are AUTO).

This feature can be used to energize or de-energize the relays to manually correct the process, or to shut down an ancillary device to perform maintenance. When in the RELAY OVERRIDE mode, the relays are no longer placed on hold as they are when in the other menus.

Note that if the RELAY AUTO RETURN is set to "ON", the controller will place all the relay settings back to AUTO 10 minutes after the Shark returns to the run mode..

3.12 4-20 mA Isolated Outputs Channel 1 and Channel 2

(LCD MENU SECTIONS - pH: 4.21 & 4.22, ORP: 5.20 & 5.21, Conductivity: 6.21 & 6.22, Flow: 7.18 & 7.19)

The Shark Controller has two 4 to 20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms.

Channel 1 (the primary output) is located on the flip out door, terminal plug P6. Channel 1 is dedicated to track the process and has fully independent and fully adjustable 4 & 20 mA output setpoints. This will enable the operator to span the output over the desired range.

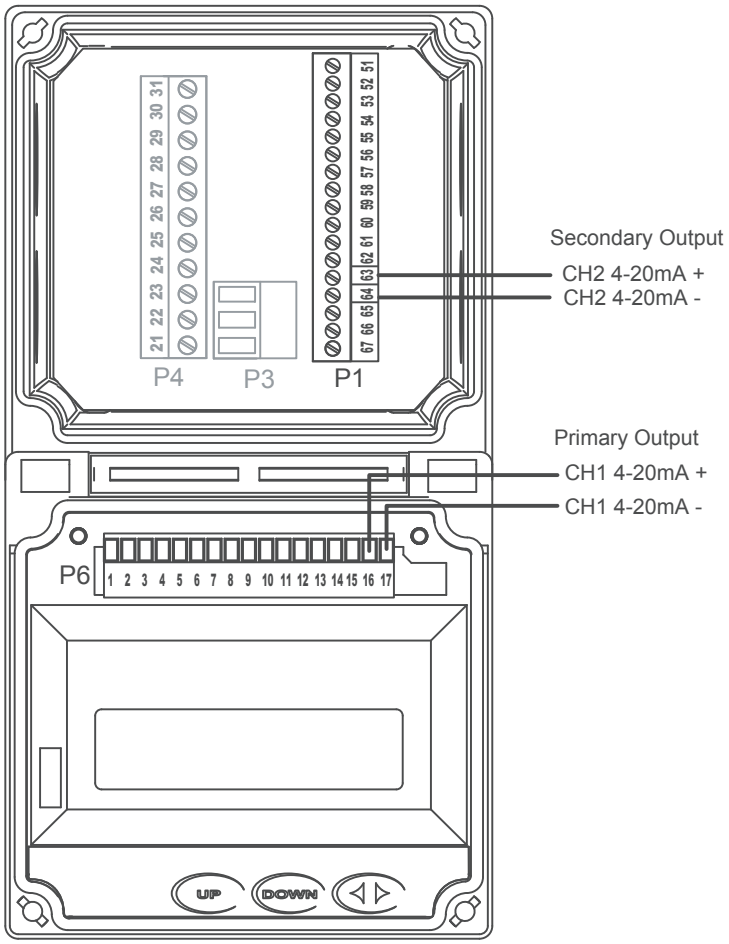
Channel 2 (the secondary output) is located in the enclosure terminal plug P1. Channel 2 can be selected to track the process value or temperature and has fully independent and adjustable 4 & 20 mA output setpoints.

Both Channel 1 and 2 can be precisely trimmed through the LCD menu for precision applications.

The drawing shows the connections for both outputs.

Wire Specification: 22 AWG 7/30, insulation 0.010"

Figure 3.7 Connections for the 4-20mA outputs



Dwg# N104-39

Note: Leave 4" to 6" slack for all wires connected to the terminals of P6. Slack required so that wires do not interfere with opening or closing of the front door.

3.13 Service

SHARK SERVICE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

3.14 Fuse Replacement

WARNING:
DISCONNECT LINE POWER TO THE UNIT TO AVOID THE POSSIBILITY OF ELECTRICAL SHOCK.

1. Proceed **after** disconnecting line power from the instrument.

2. Open the front panel by rotating the quarter-turn fasteners, using a flat blade screwdriver, to expose the relay board.

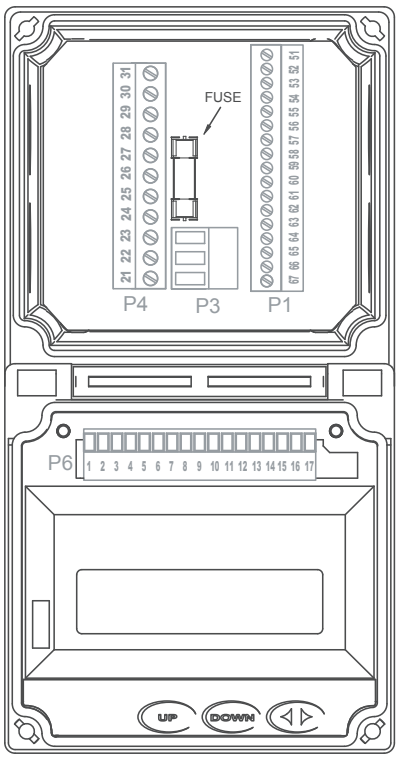
3. The fuse, F1, is located in the middle of the relay board, directly above the three terminal connectors.

4. Remove the open fuse and replace it only with a fuse of the same type and rating. REFER TO THE FUSE RATING TABLES BELOW.

5. Close the front panel and secure using the quarter-turn fasteners.

6. Restore power to the unit.

Figure 3.8 Fuse Location



Dwg# N104-40

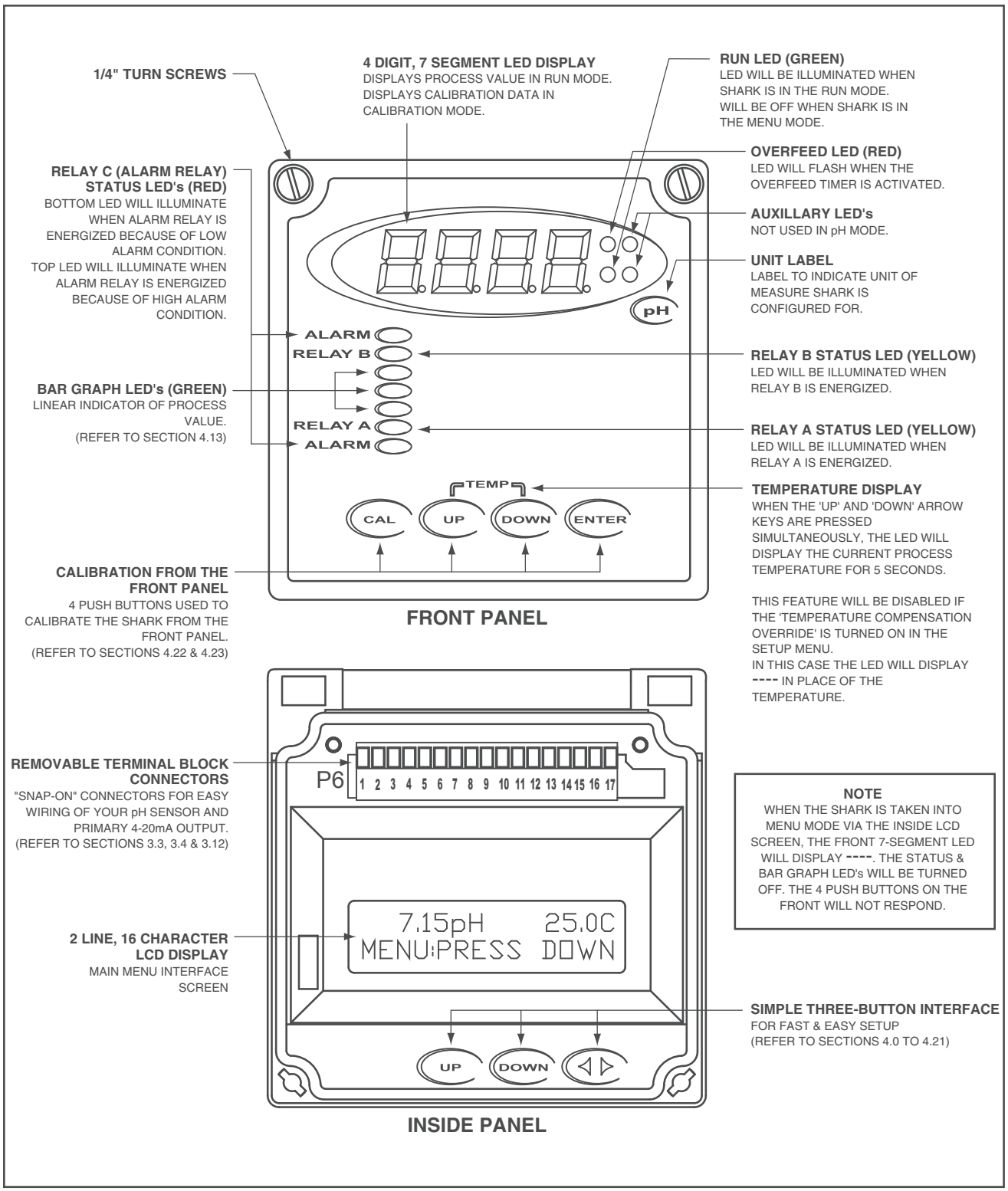
Fuse Rating Table for **120** volt operation

Fuse Type: Slo-Blo fuse 5 x 20mm	Fuse Ratings: 250 VAC, 100mA

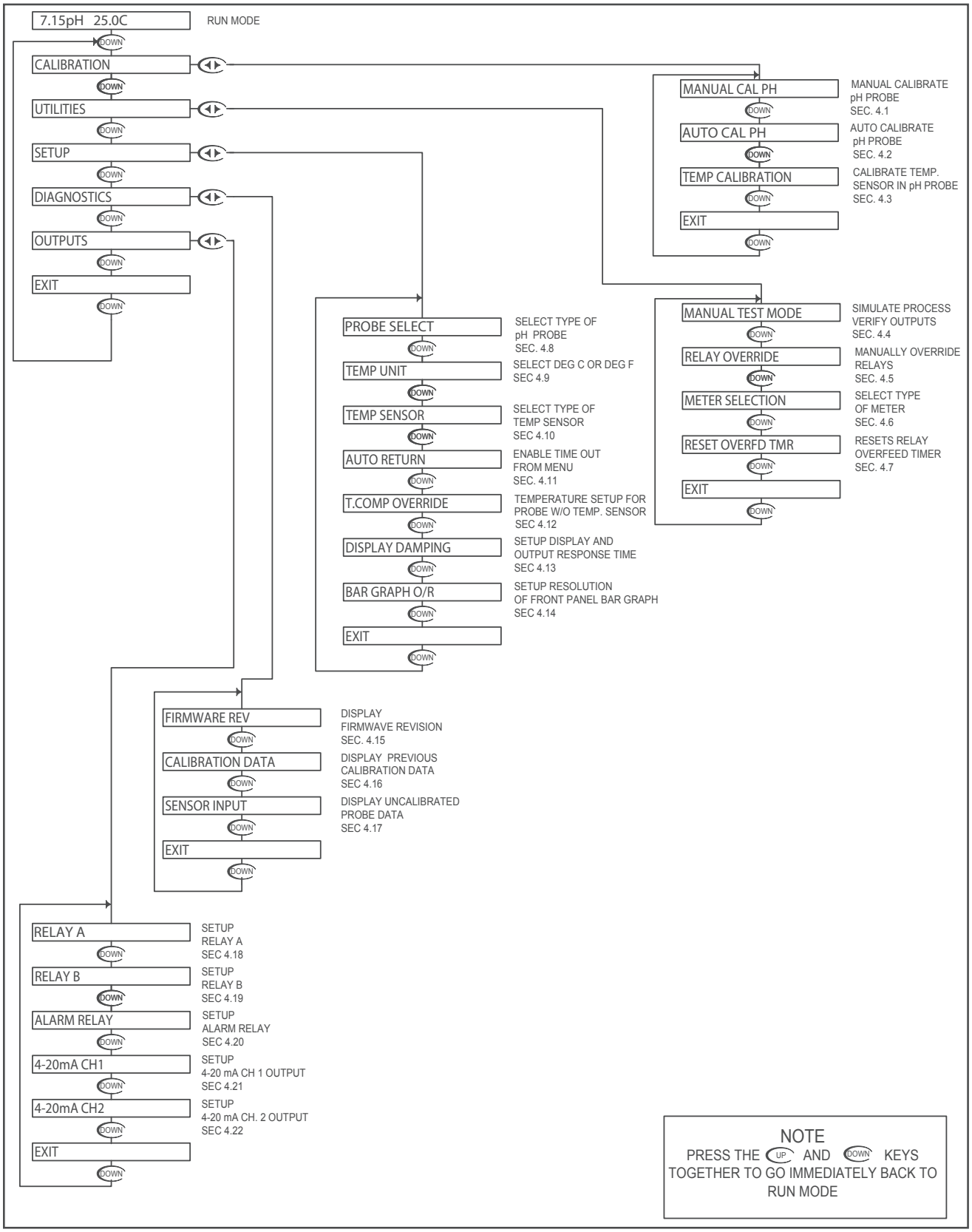
Fuse Rating Table for **240** volt operation

Fuse Type: Slo-Blo fuse 5 x 20mm	Fuse Ratings: 250 VAC, 50mA

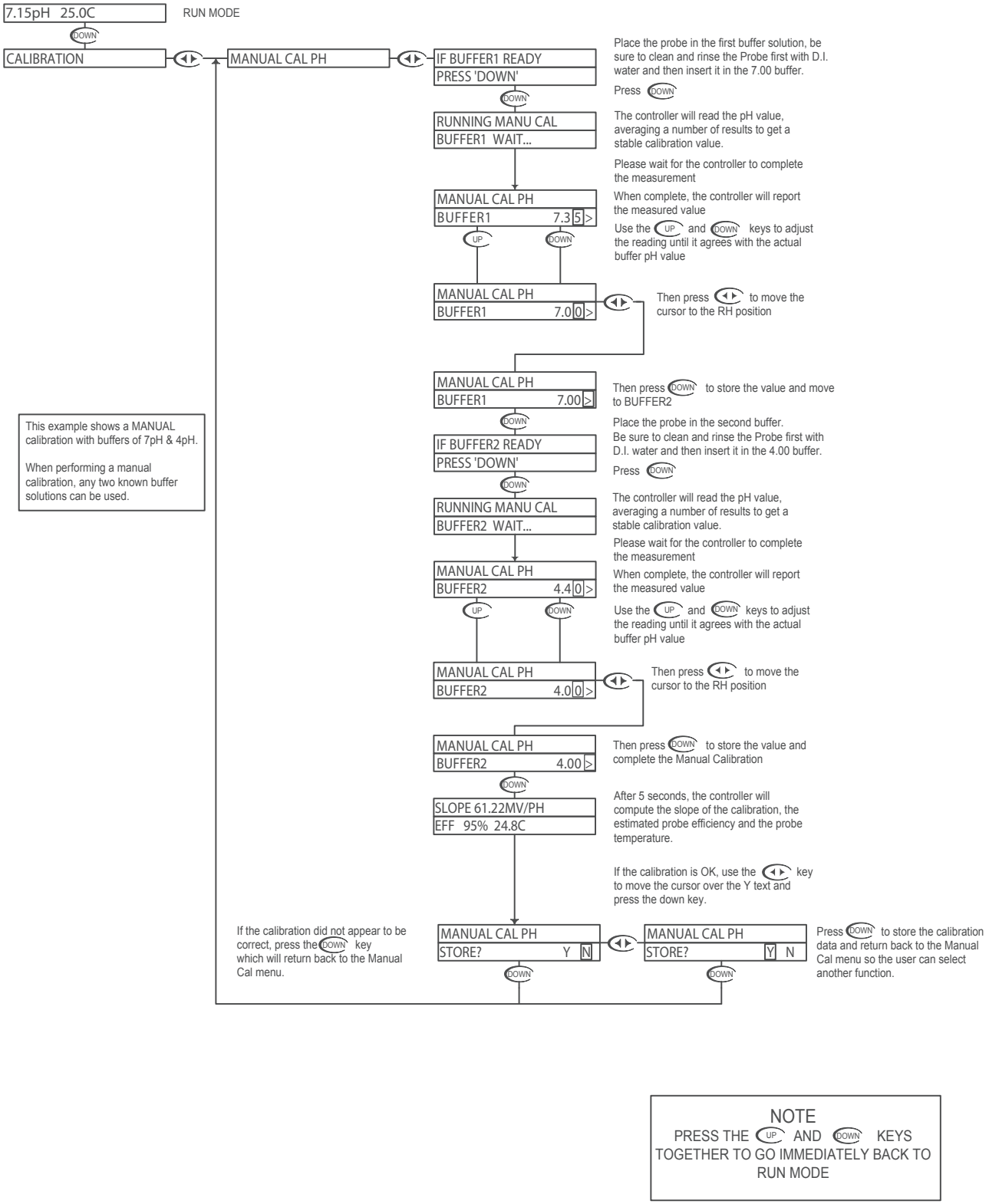
Section 4 - Using the SHARK in pH Mode



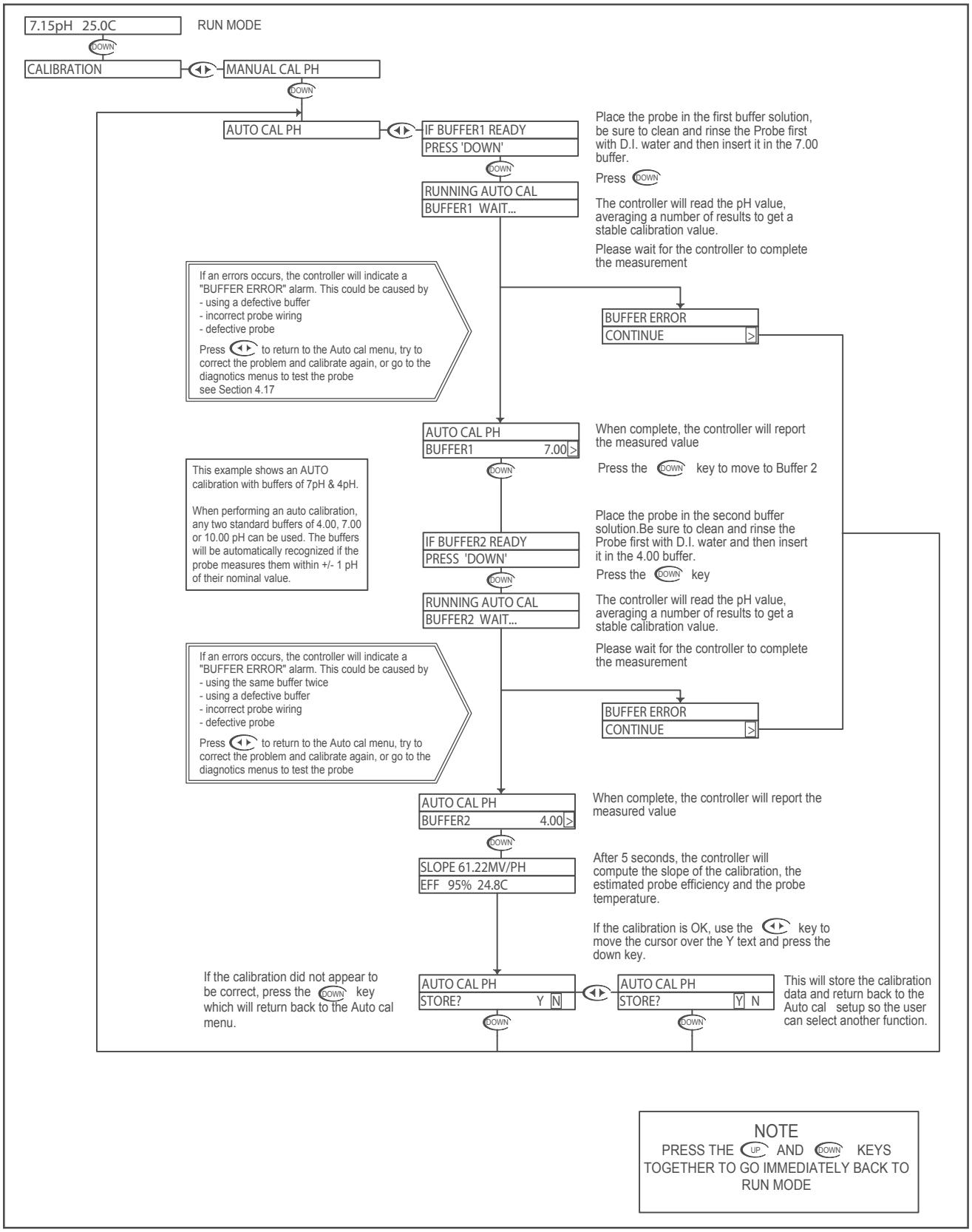
pH - Menu Overview 4.0



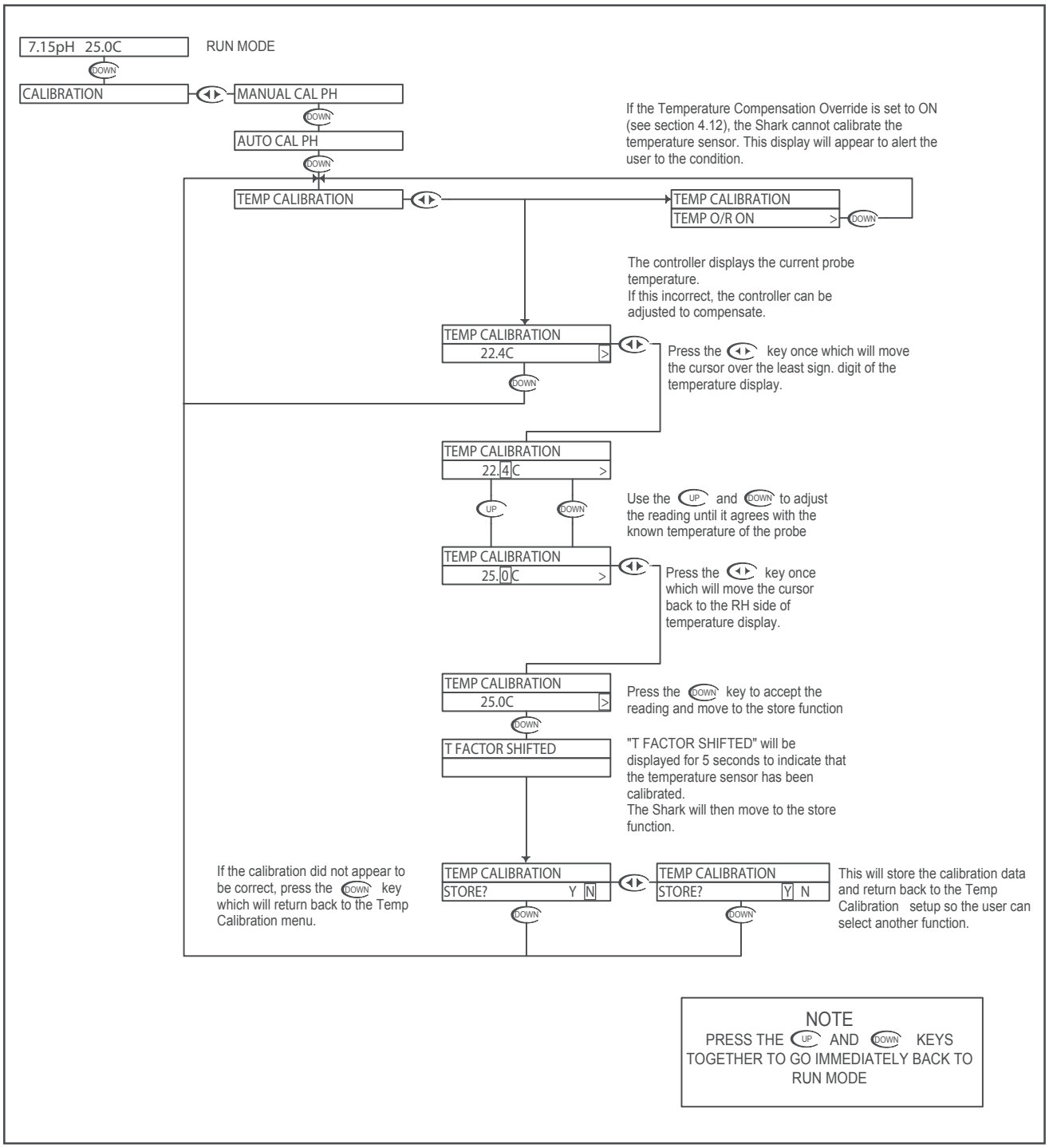
pH - Calibration Menu - Manual Calibrate 4.1



pH - Calibration Menu - Auto Calibrate 4.2

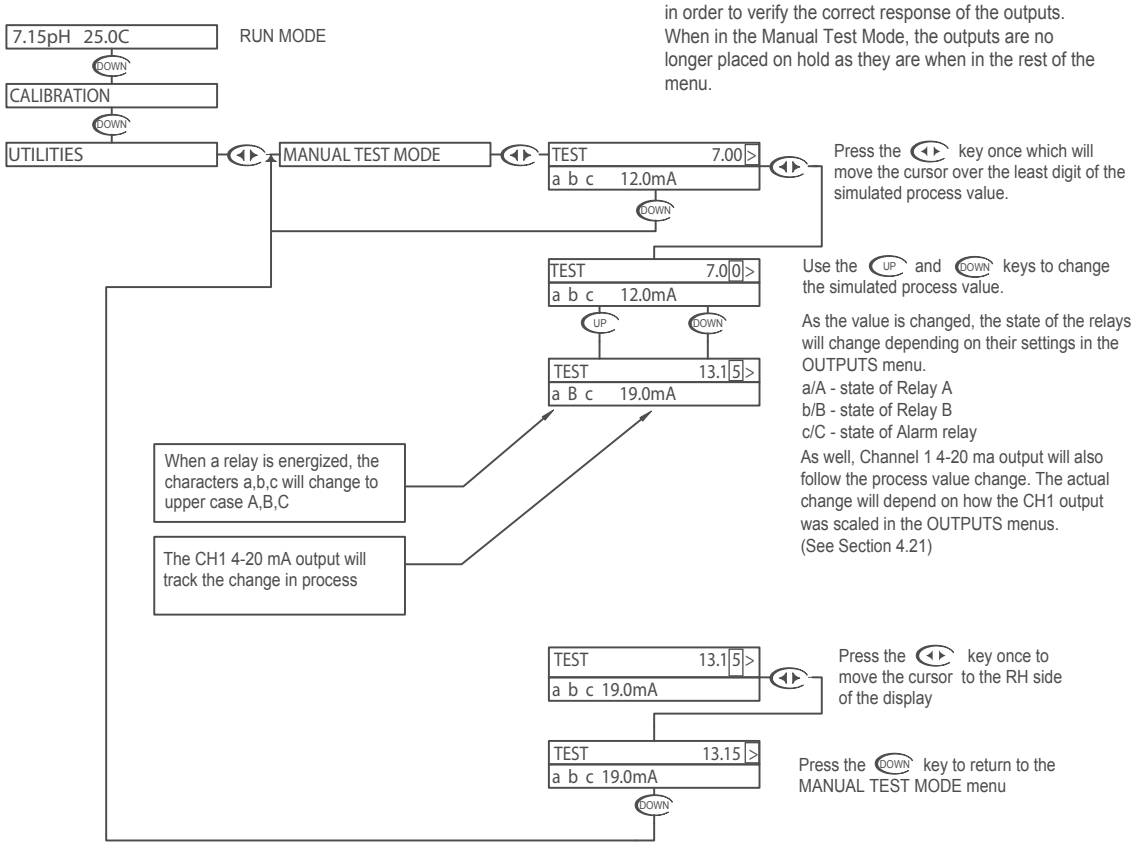


pH - Calibration Menu - Temperature Calibration 4.3



pH - Utilities Menu - Manual Test Mode 4.4

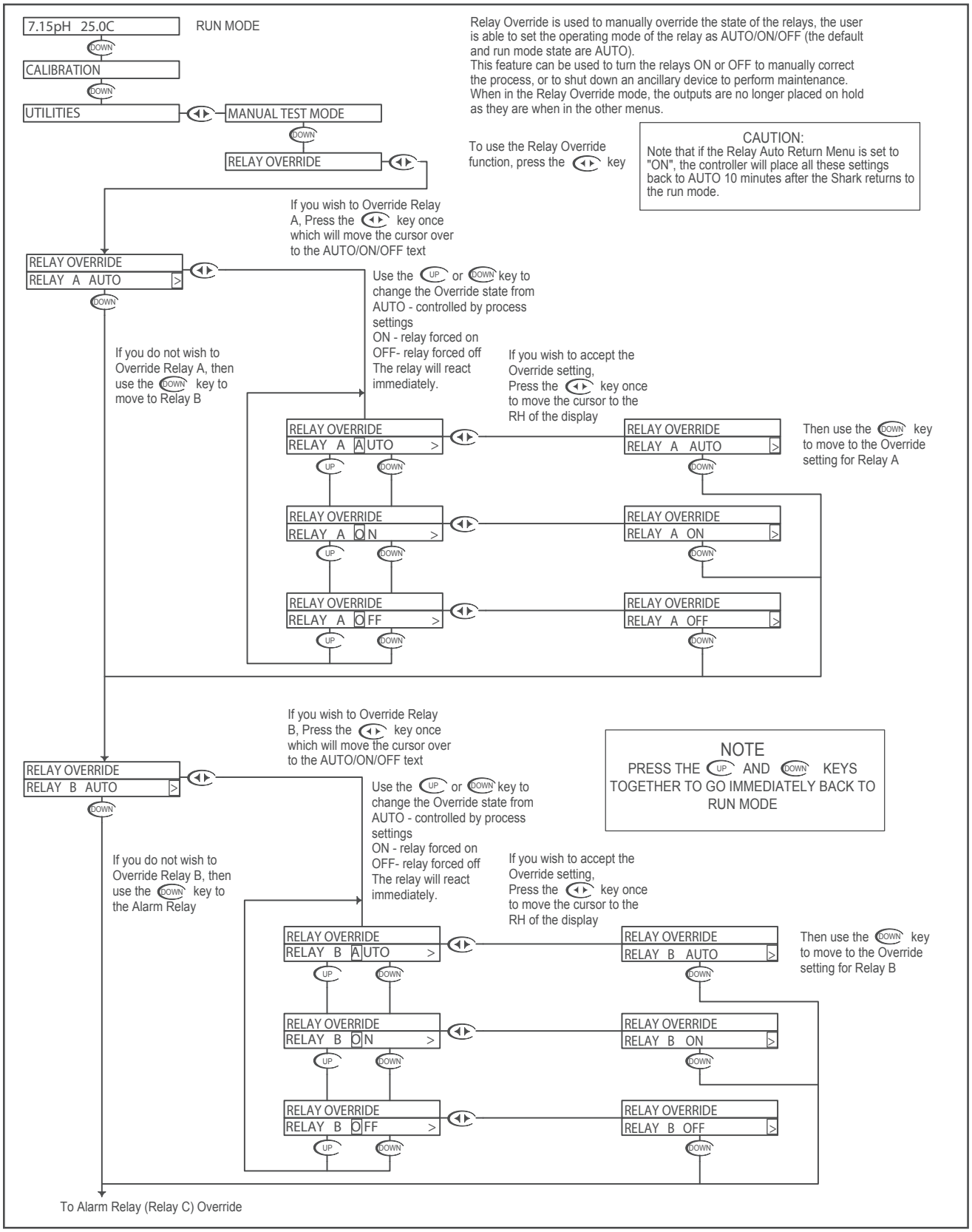
Manual Test Mode is used to simulate a process reading in order to verify the correct response of the outputs. When in the Manual Test Mode, the outputs are no longer placed on hold as they are when in the rest of the menu.



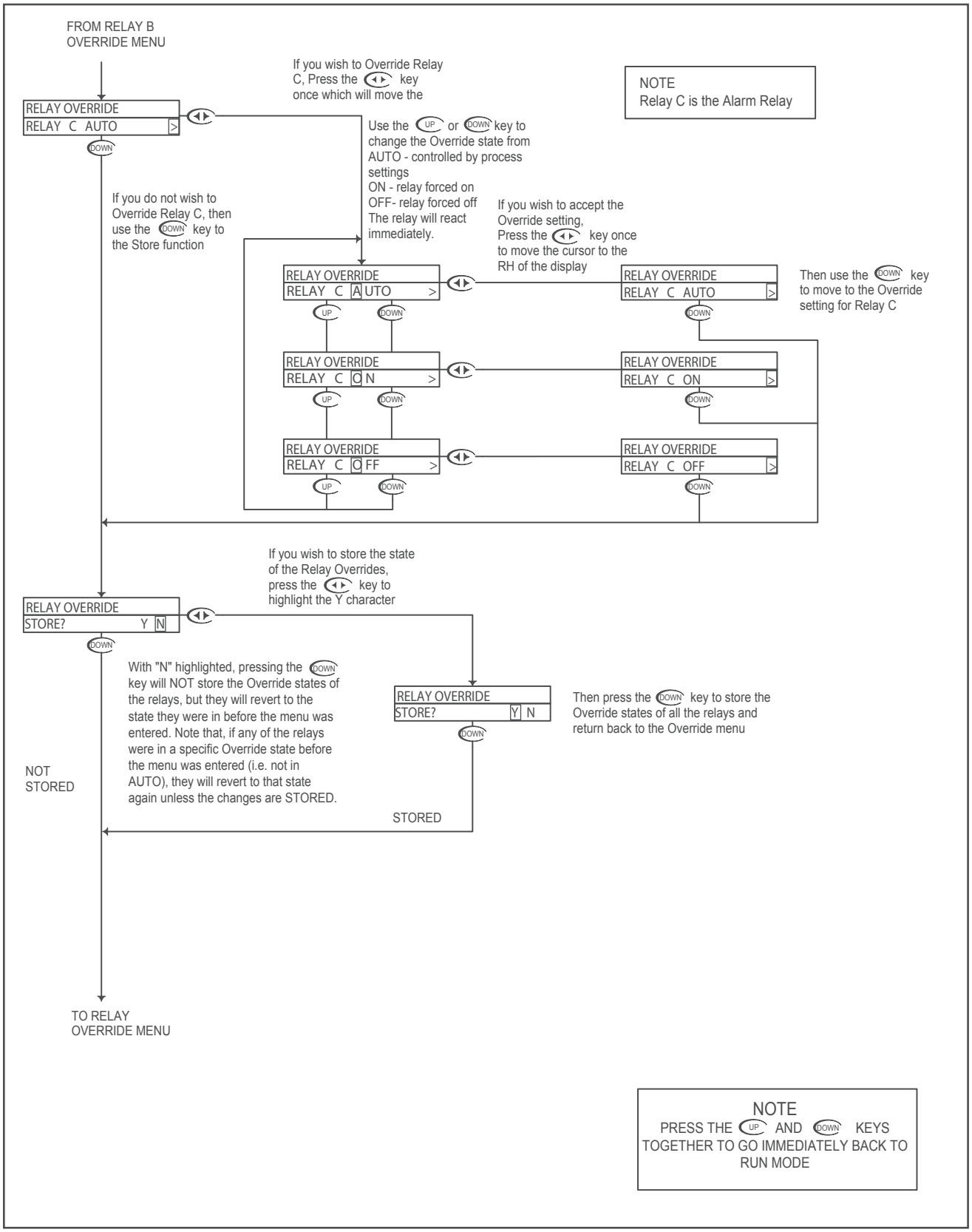
NOTE:
When the user exits the Manual Test Mode, the relays and 4-20mA outputs will remain in the Test Mode state until the operator enters the run mode. The relays and outputs will then revert back to the previous On-line state.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

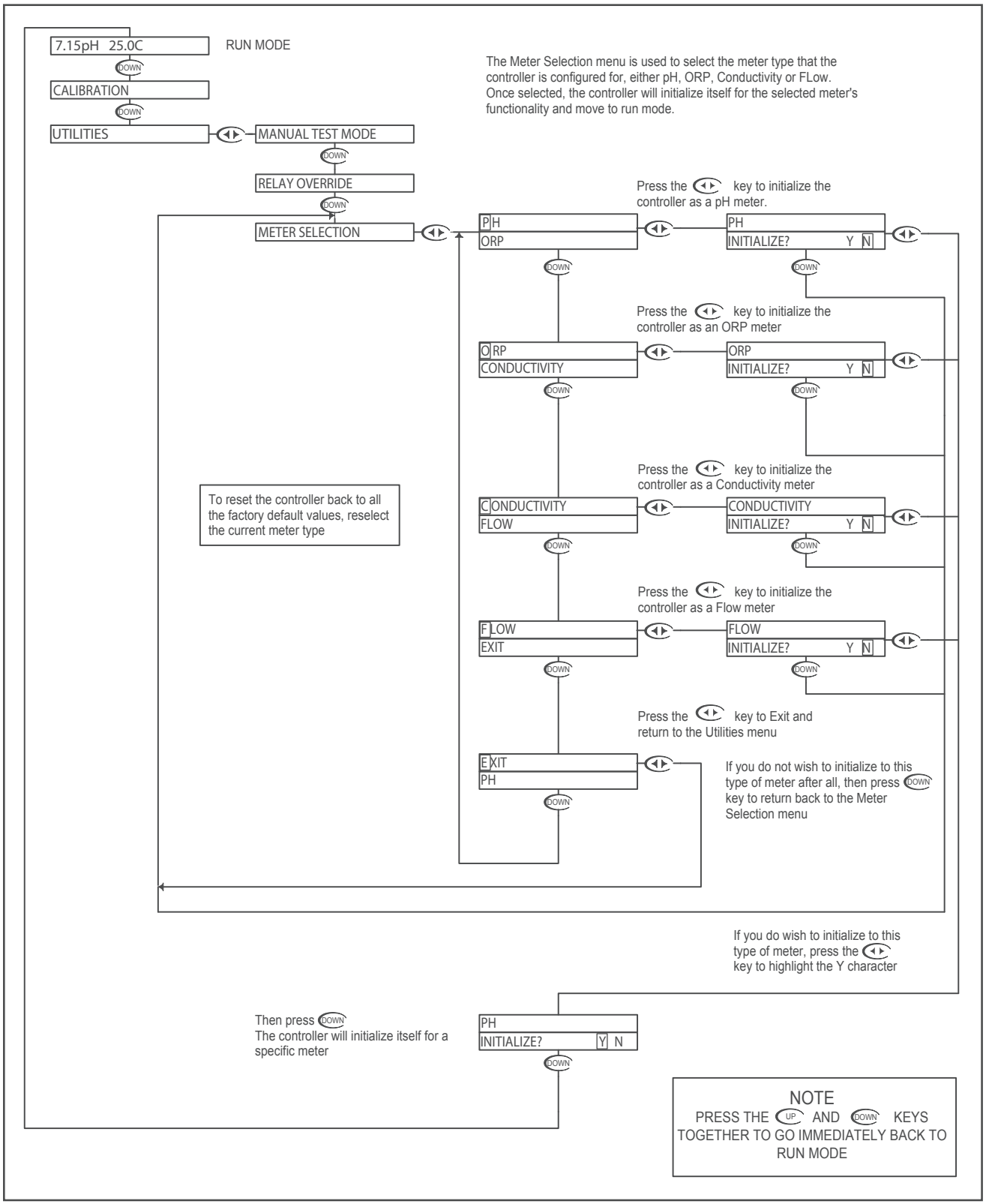
pH - Utilities Menu - Relay Override 4.5



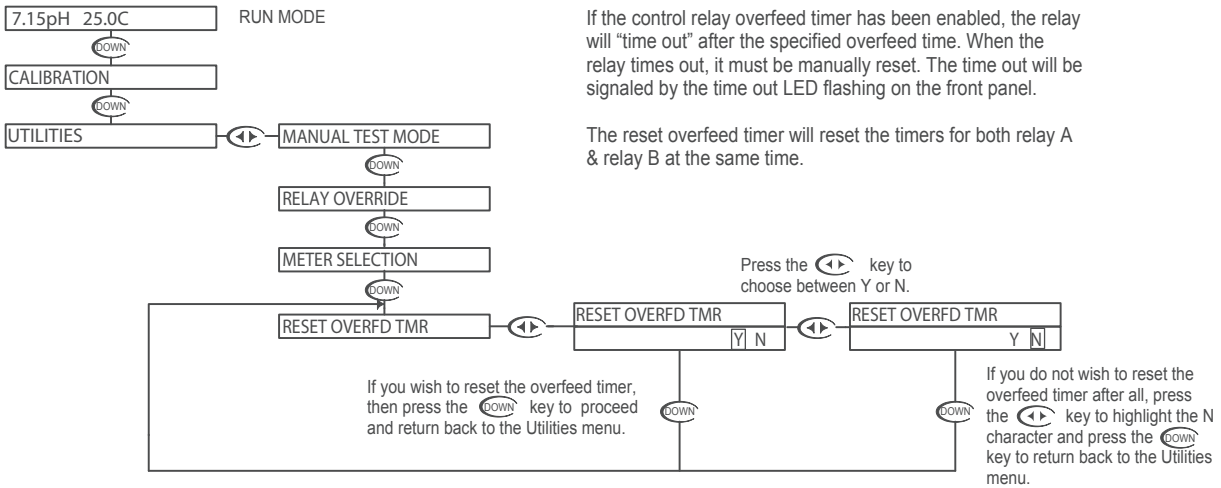
pH - Utilities Menu - Relay Override 4.5



pH - Utilities Menu - Meter Selection 4.6



pH - Utilities Menu - Overfeed Timer Reset 4.7

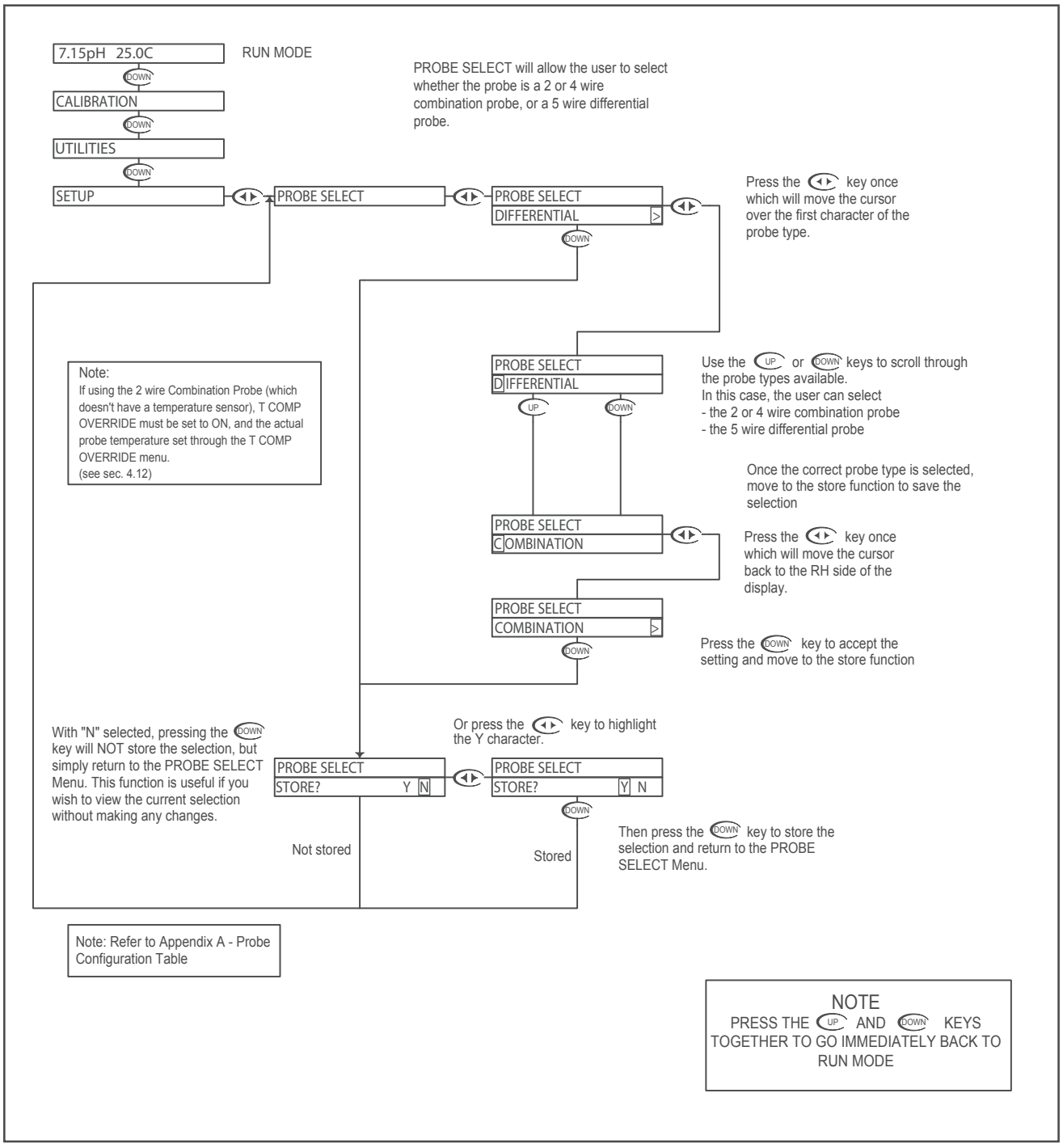


If the control relay overfeed timer has been enabled, the relay will "time out" after the specified overfeed time. When the relay times out, it must be manually reset. The time out will be signaled by the time out LED flashing on the front panel.

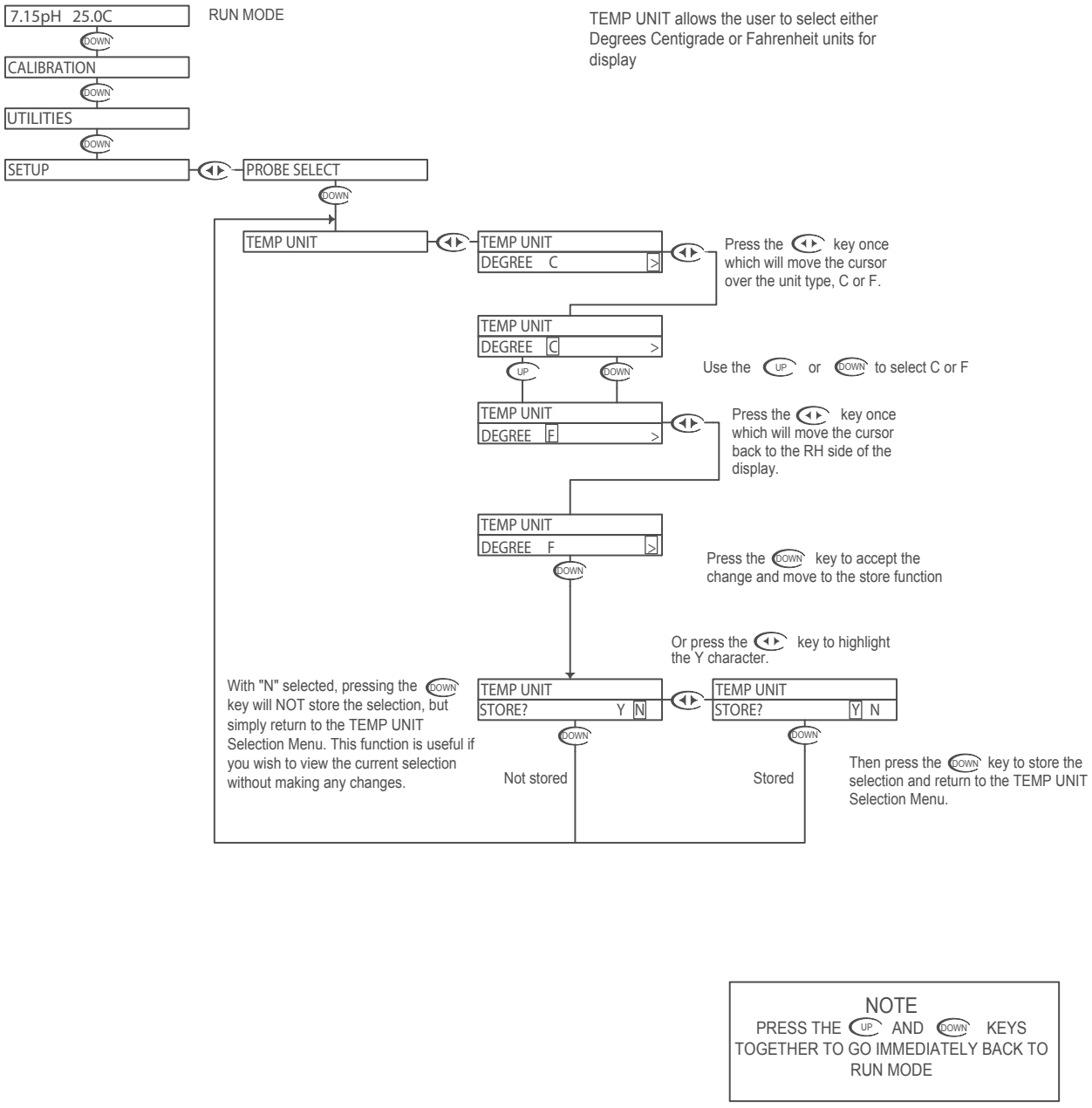
The reset overfeed timer will reset the timers for both relay A & relay B at the same time.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

pH - Setup Menu - Probe Select 4.8



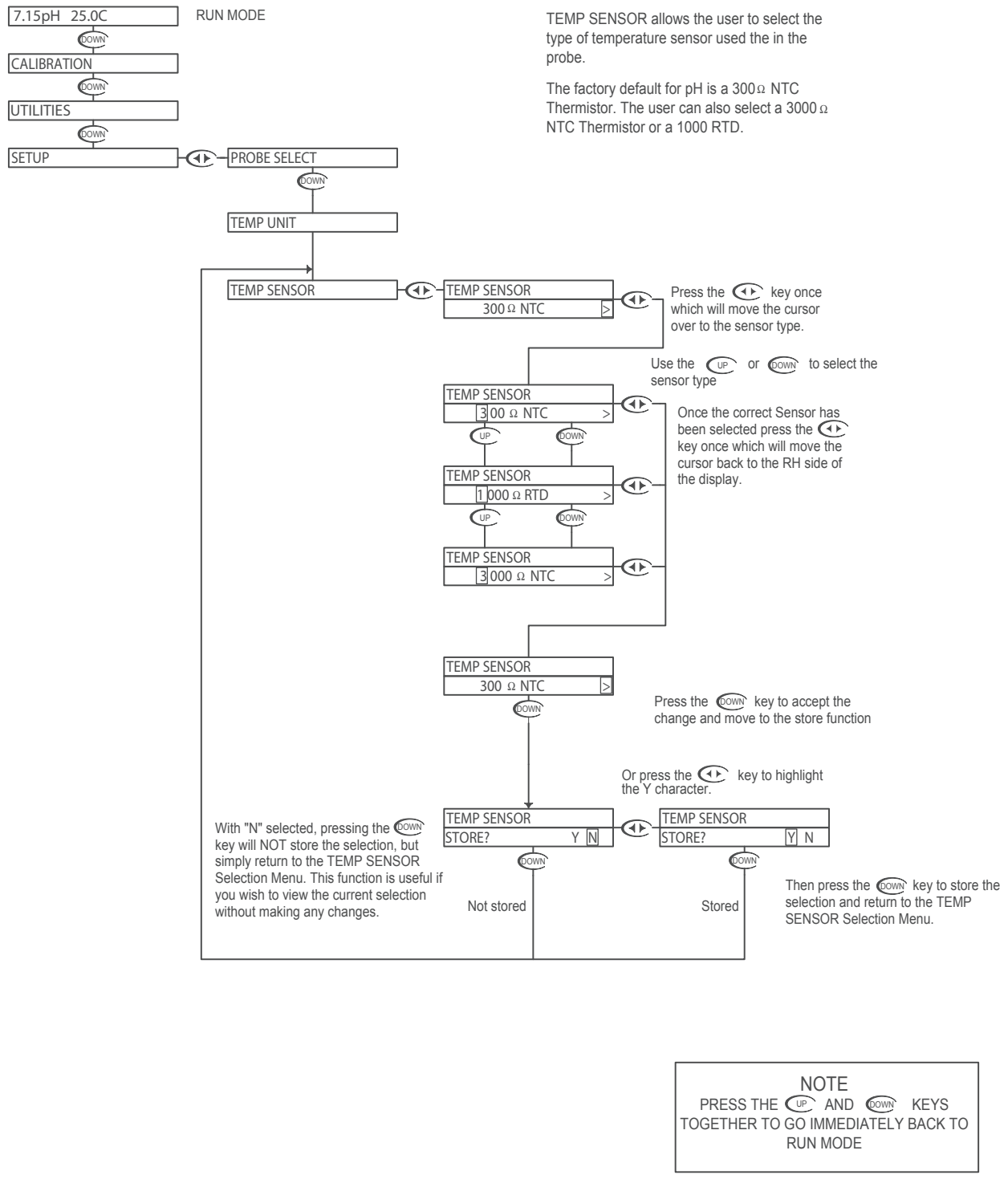
pH - Setup Menu -Temp Unit 4.9



TEMP UNIT allows the user to select either Degrees Centigrade or Fahrenheit units for display

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

pH - Setup Menu - Temp. Sensor 4.10

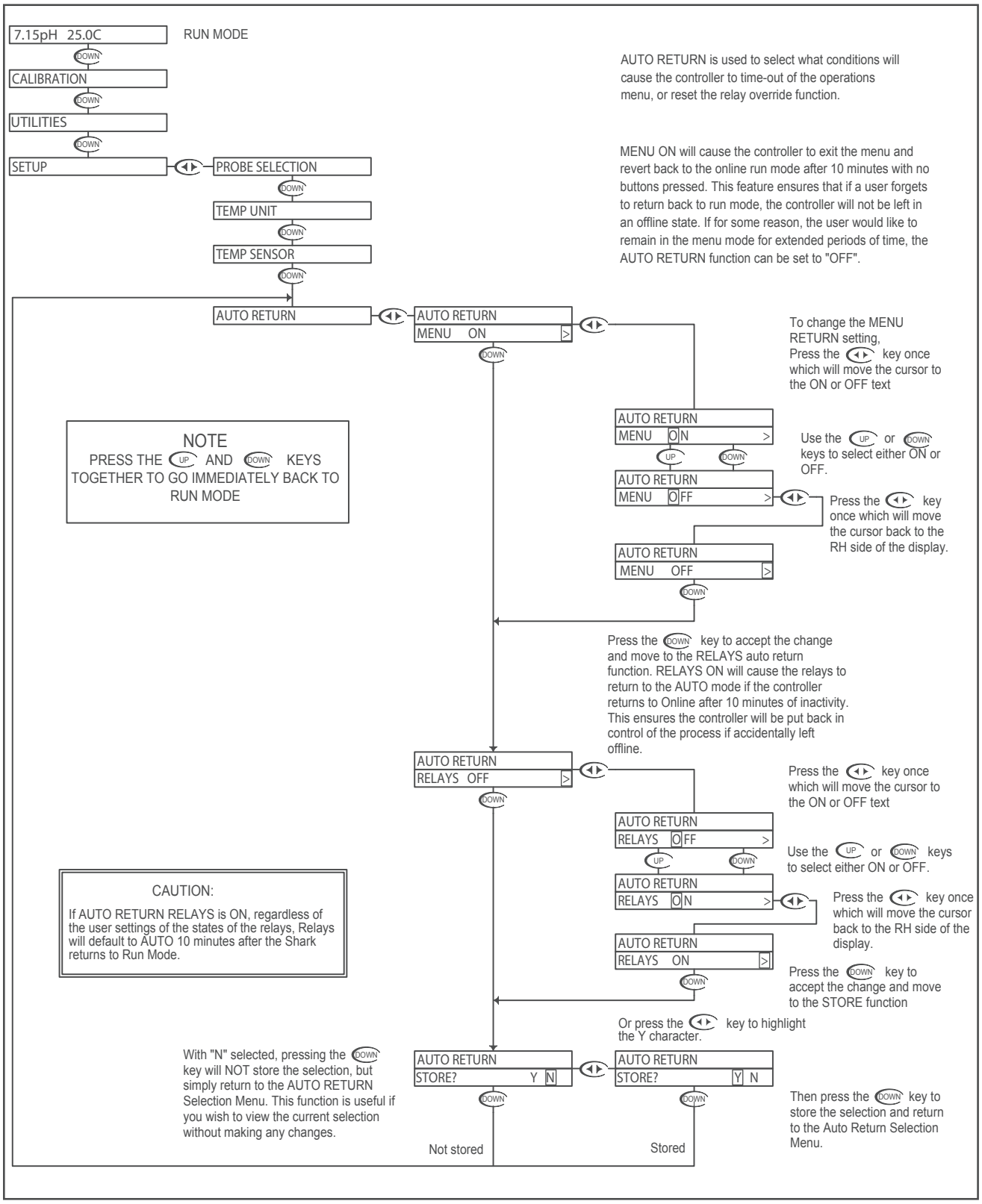


TEMP SENSOR allows the user to select the type of temperature sensor used the in the probe.

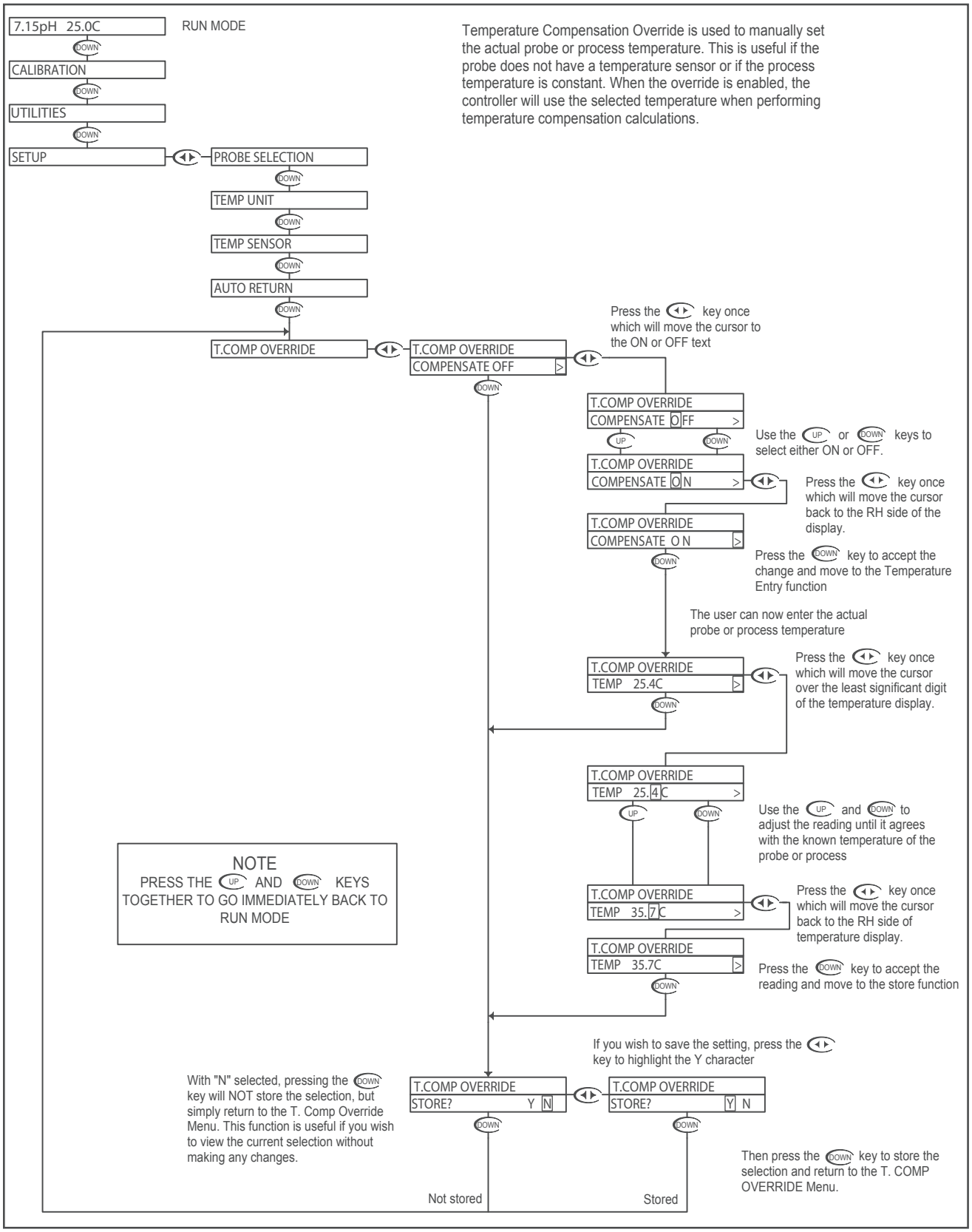
The factory default for pH is a 300Ω NTC Thermistor. The user can also select a 3000Ω NTC Thermistor or a 1000 RTD.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

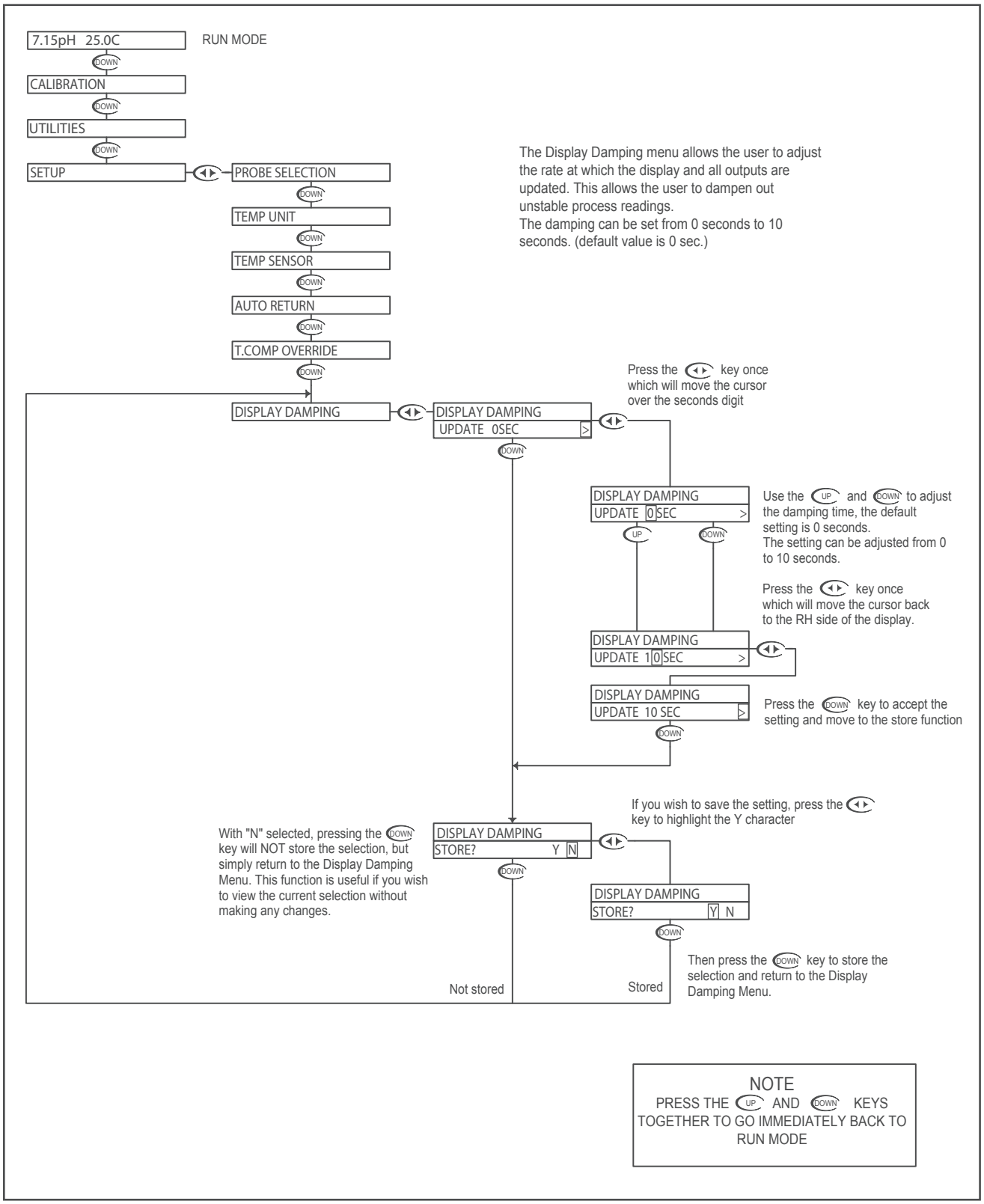
pH - Setup Menu - Auto Return 4.11



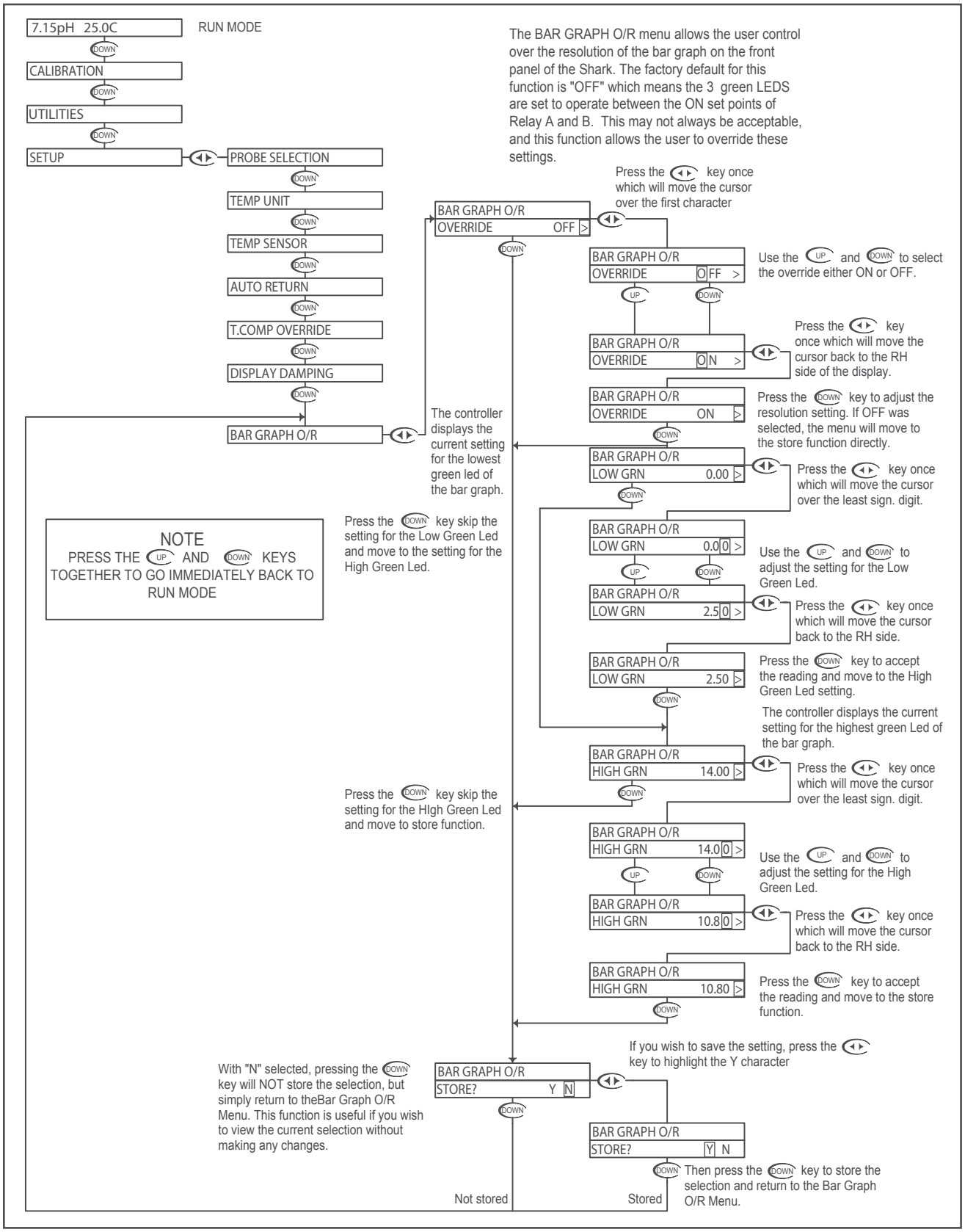
pH - Setup Menu - T.Comp Override 4.12



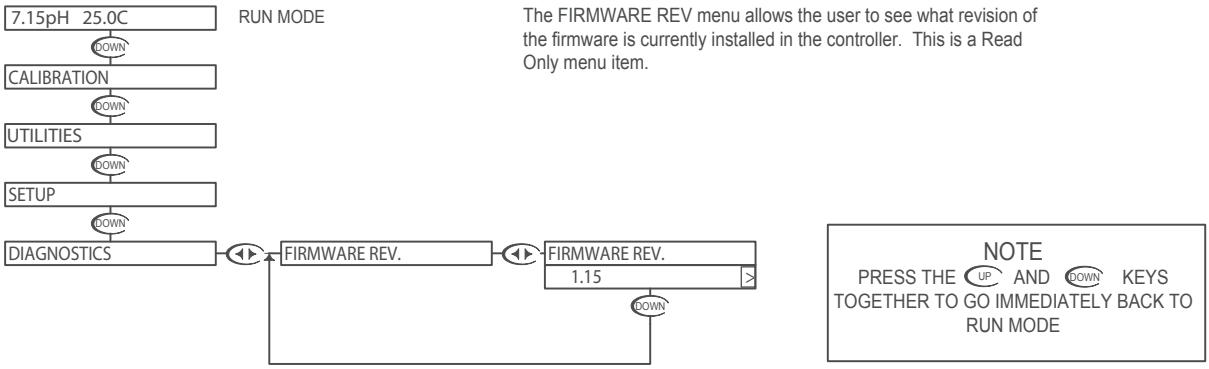
pH - Setup Menu - Display Damping 4.13



pH - Setup Menu - Bar Graph O/R 4.14



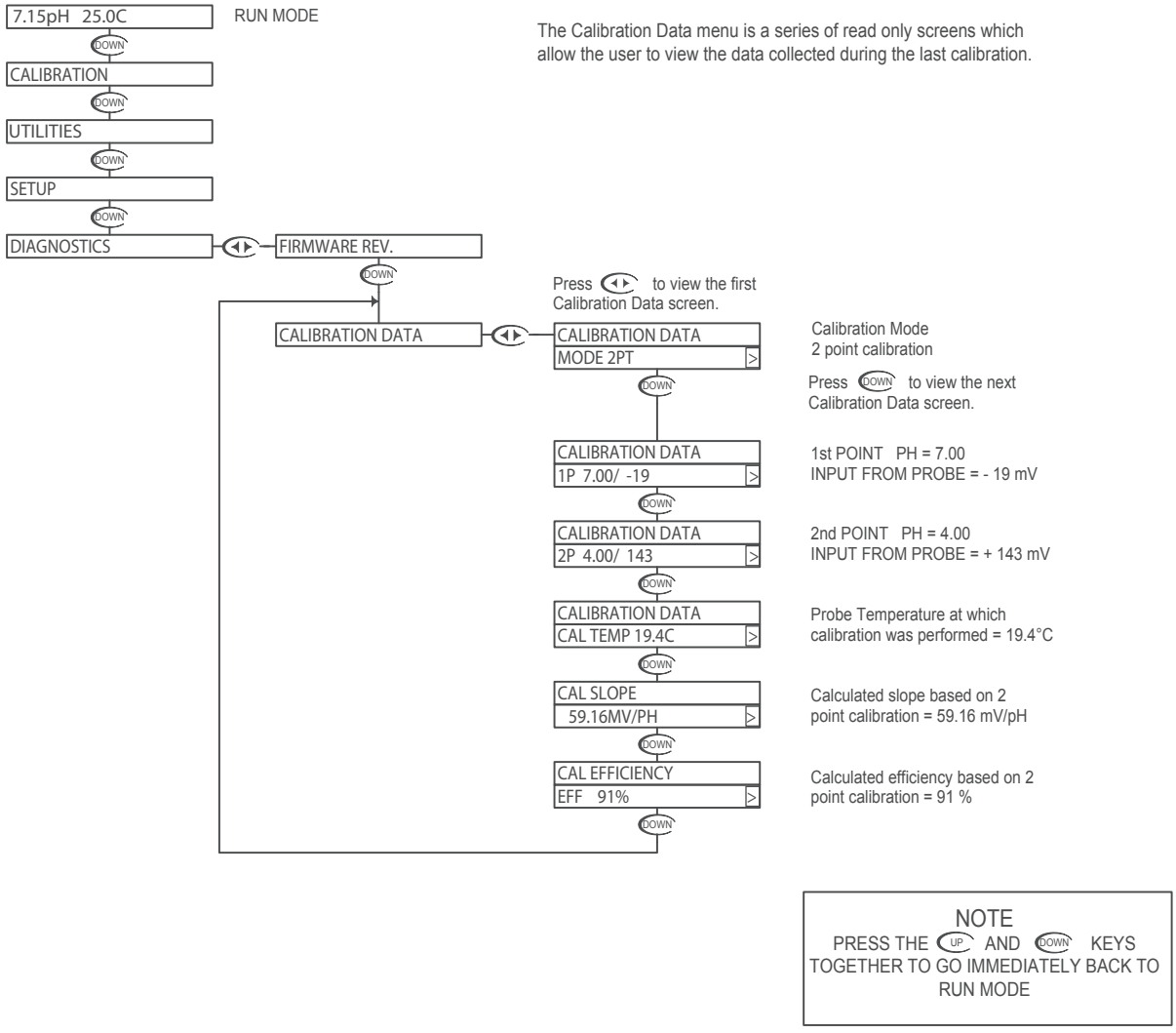
pH - Diagnostics Menu - Firmware Rev 4.15



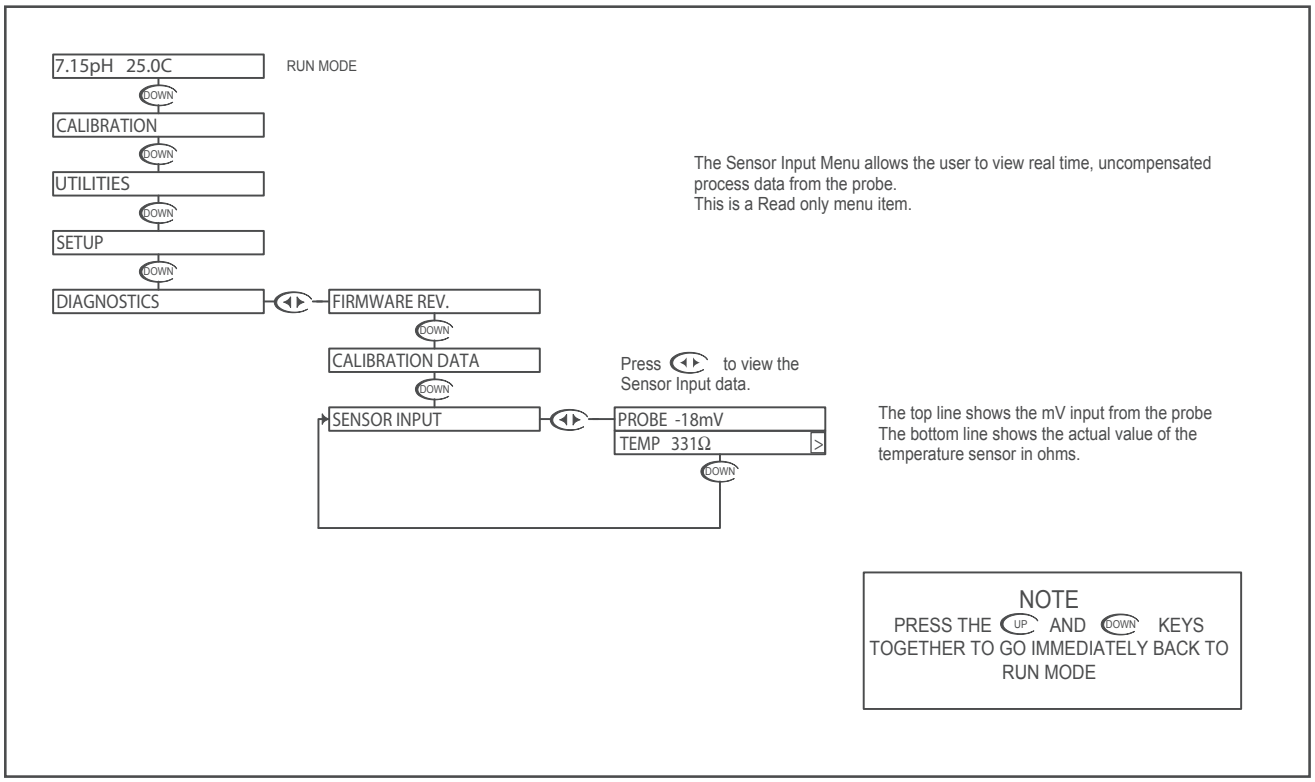
The FIRMWARE REV menu allows the user to see what revision of the firmware is currently installed in the controller. This is a Read Only menu item.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

pH - Diagnostics Menu - Calibration Data 4.16



pH - Diagnostics Menu - Sensor Input 4.17



Troubleshooting a pH probe using the sensor input

Sensor input displays the uncompensated sensor input data. The pH probe values are displayed in mV (millivolts). The temperature sensor value is displayed in Ω (ohm).

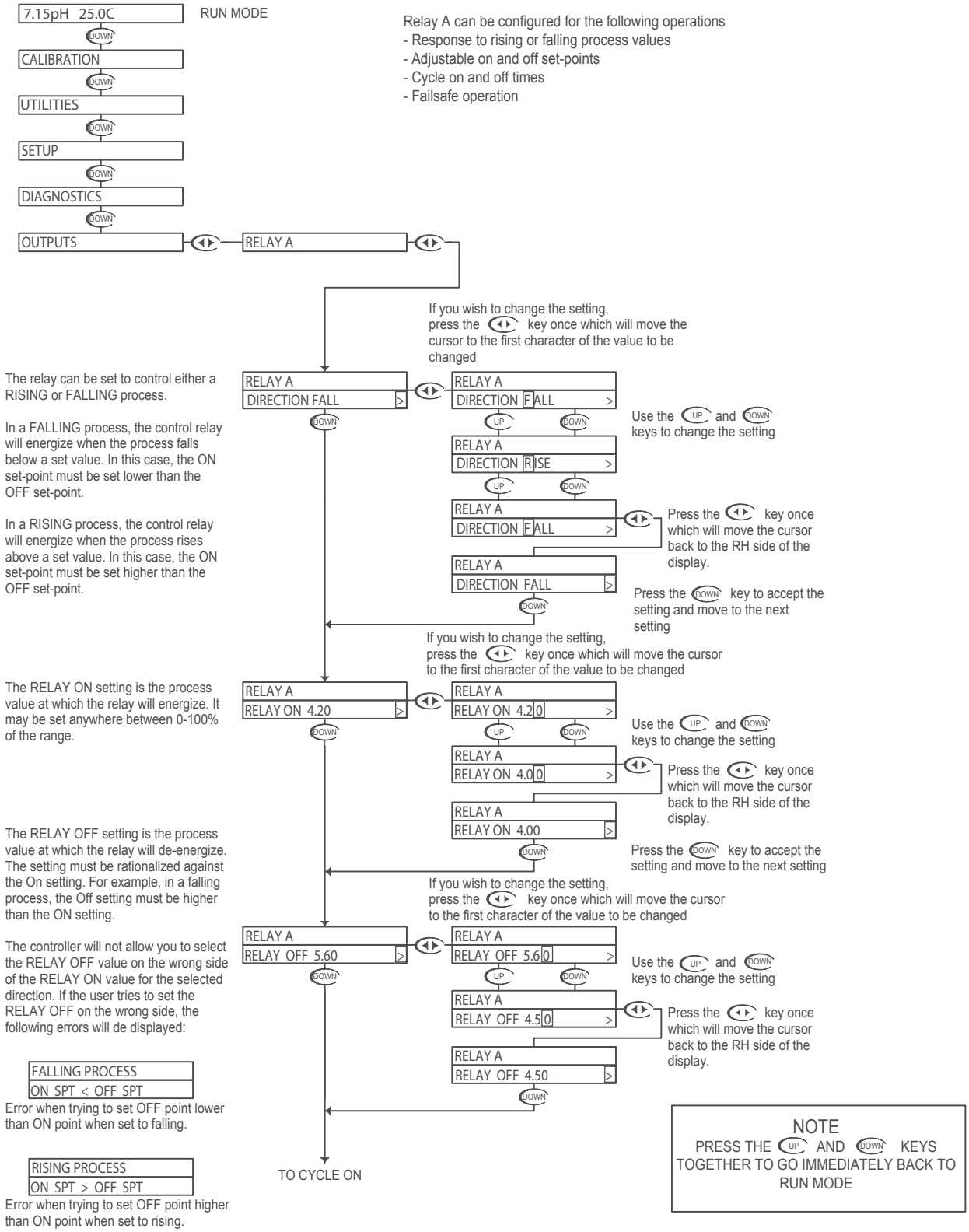
Connect the pH probe as per Probe Configuration Table in Appendix A.

1. Place the probe in buffer 7pH (allow temperature to stabilize)
   - Probe should read 0mV [±50mV]
   - Temperature should read 300Ω [±50Ω] @ 25°C
   - Record both of these numbers.

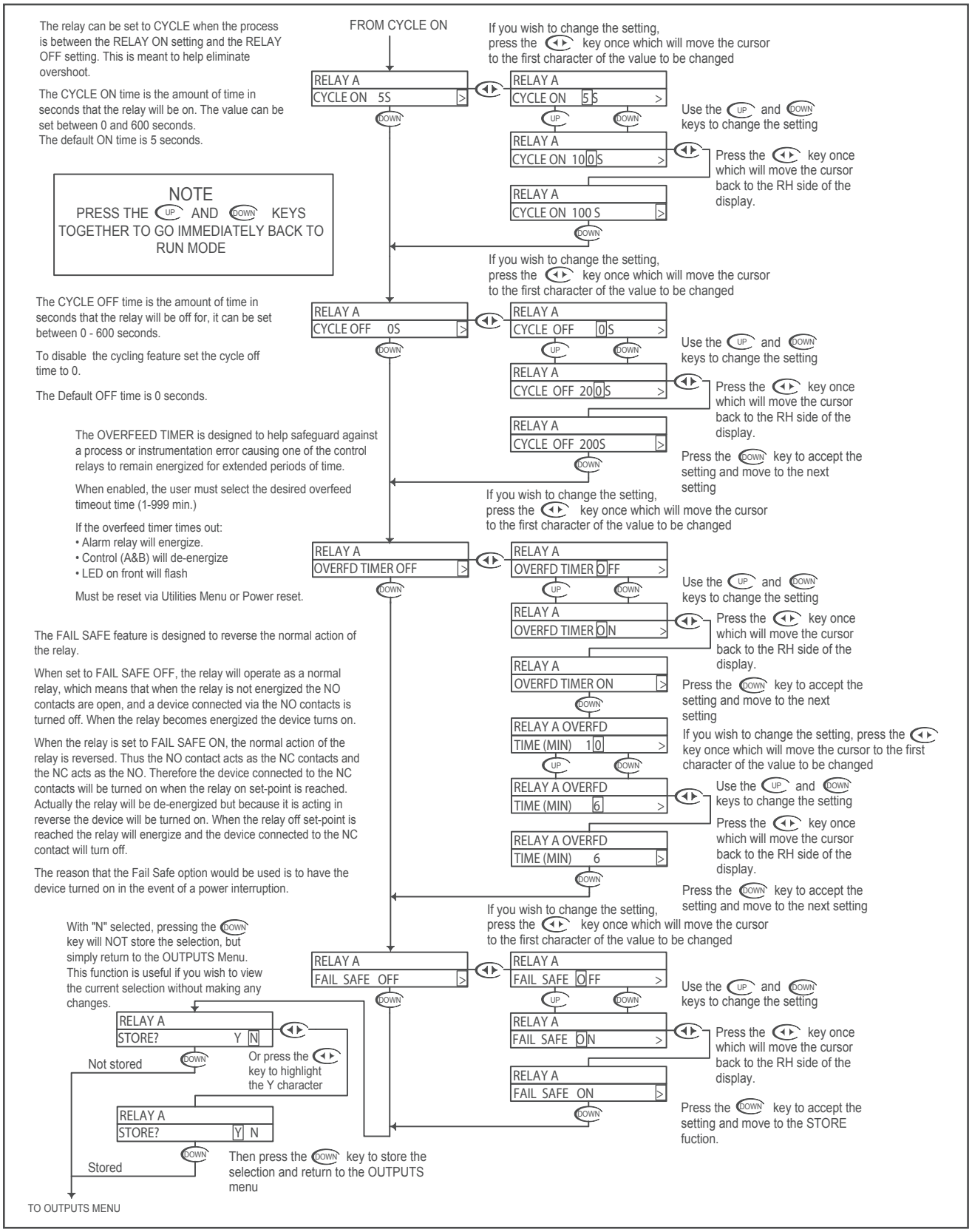
2. Place the probe in buffer 4pH
   - Probe should read +160mV more than probe value at 7pH
   - Temperature should read the same as in 7pH

3. Place the probe in buffer 10pH
   - Probe should read -160mV less then probe value at 7pH
   - Temperature should read the same as in 7pH

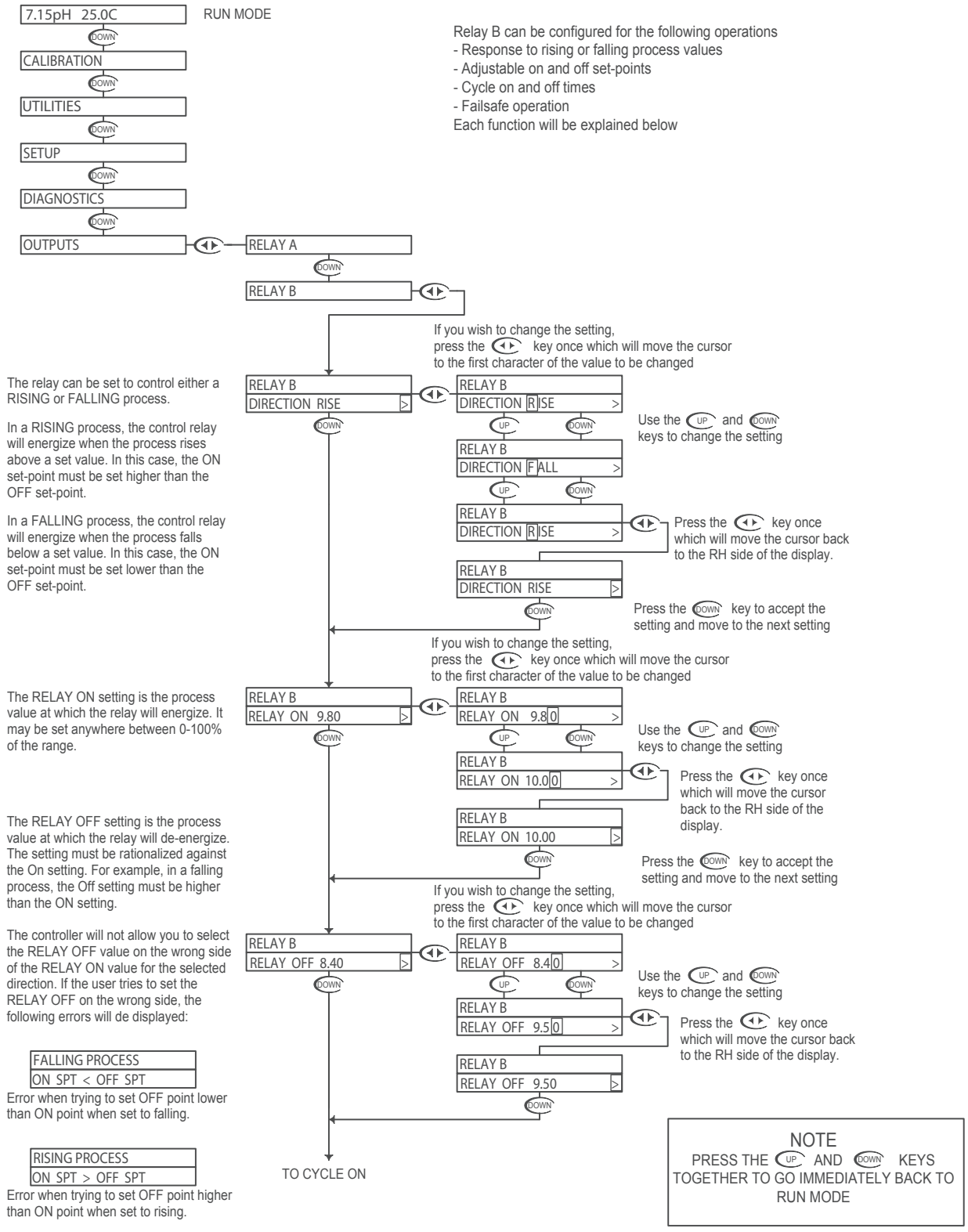
pH - Outputs Menu - Relay A 4.18



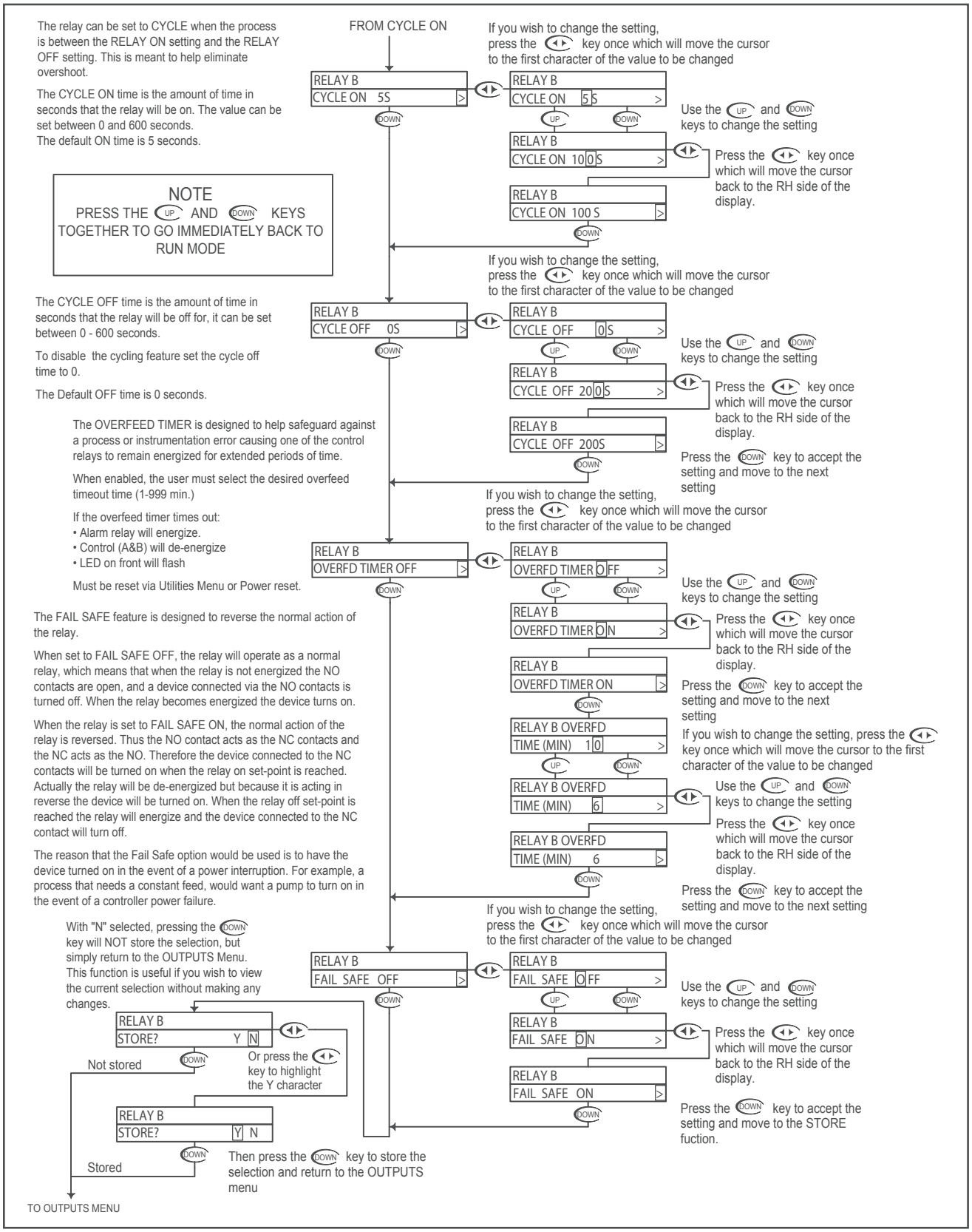
pH - Outputs Menu - Relay A 4.18



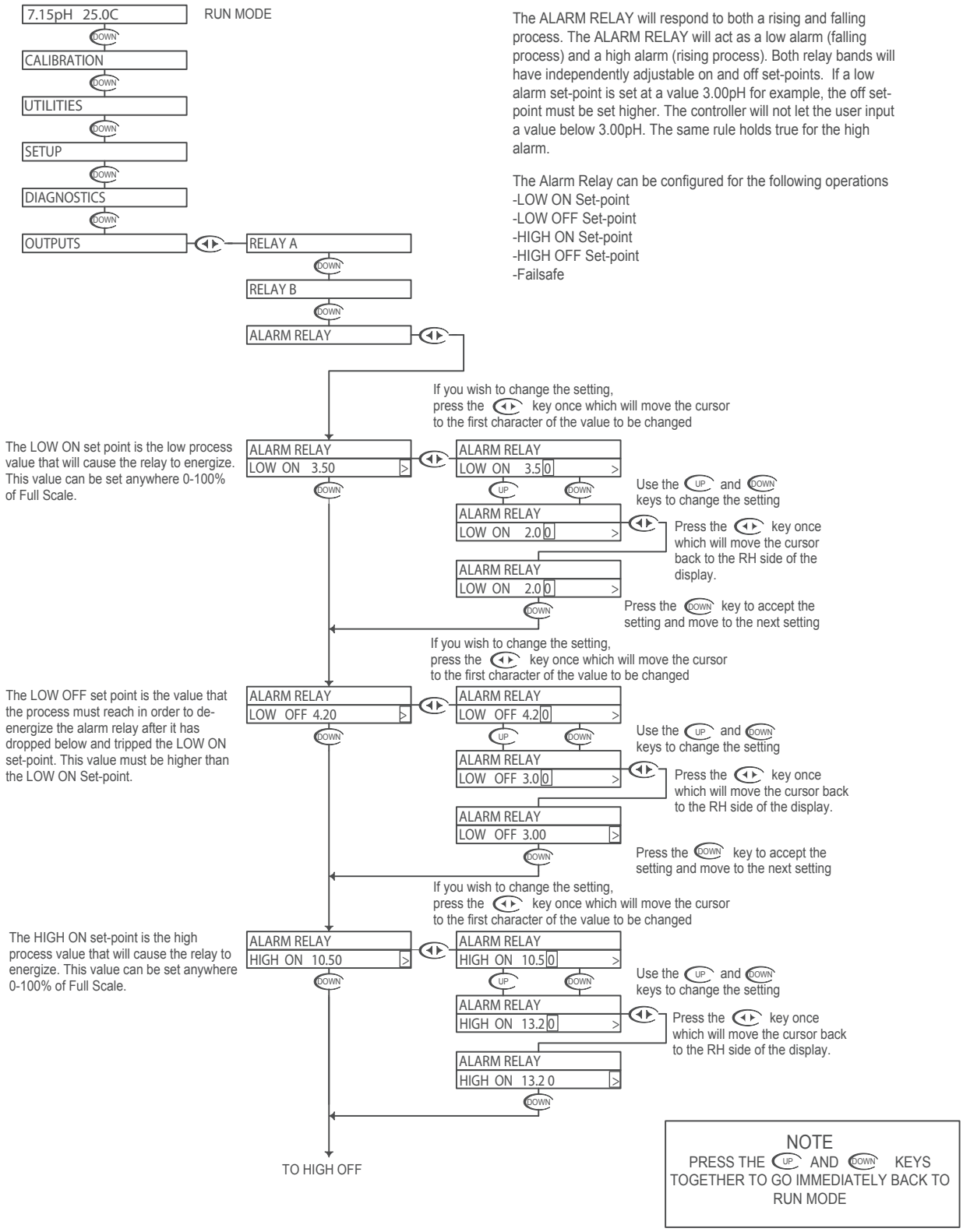
pH - Outputs Menu - Relay B 4.19



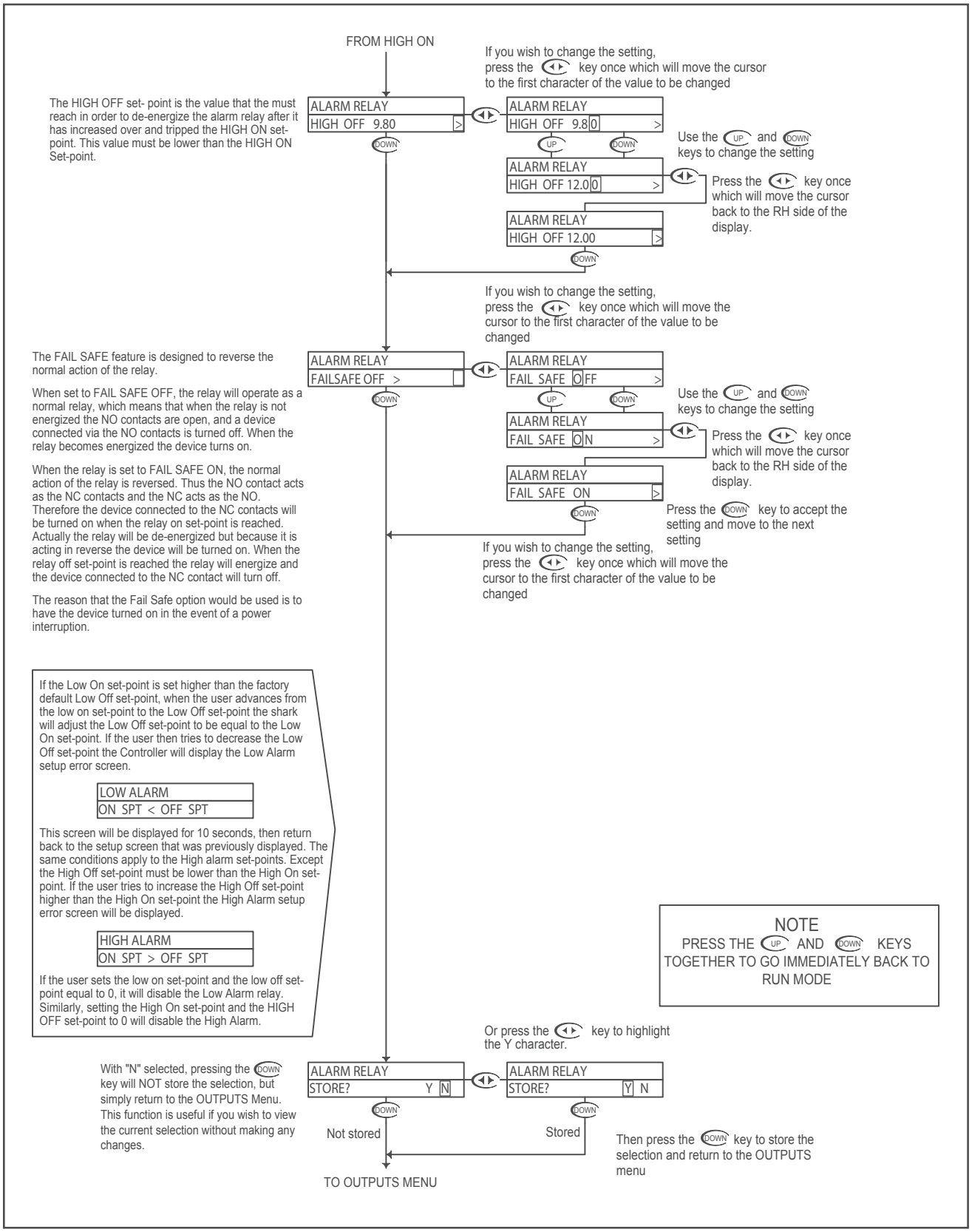
pH - Outputs Menu - Relay B 4.19



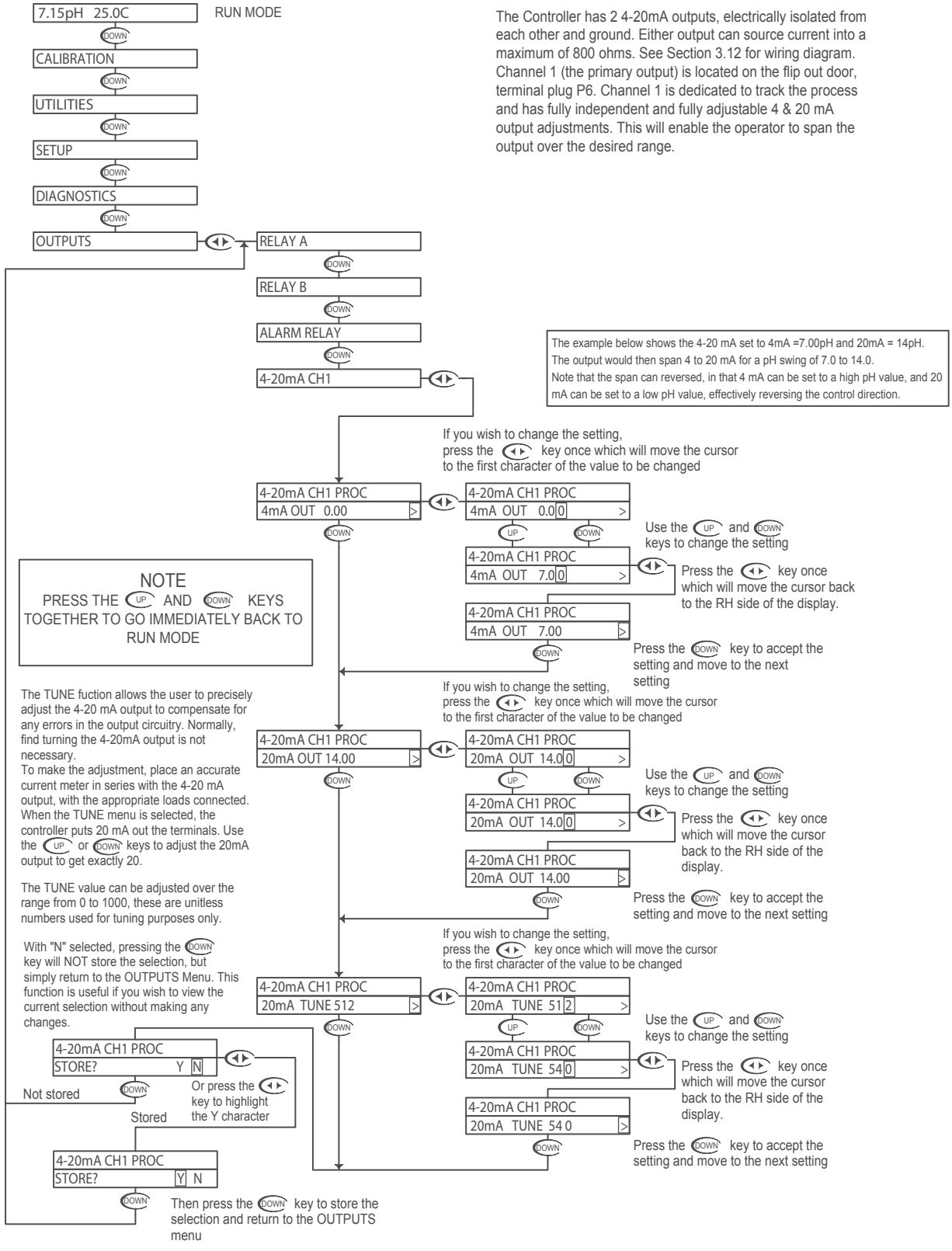
pH - Outputs Menu - Alarm Relay 4.20



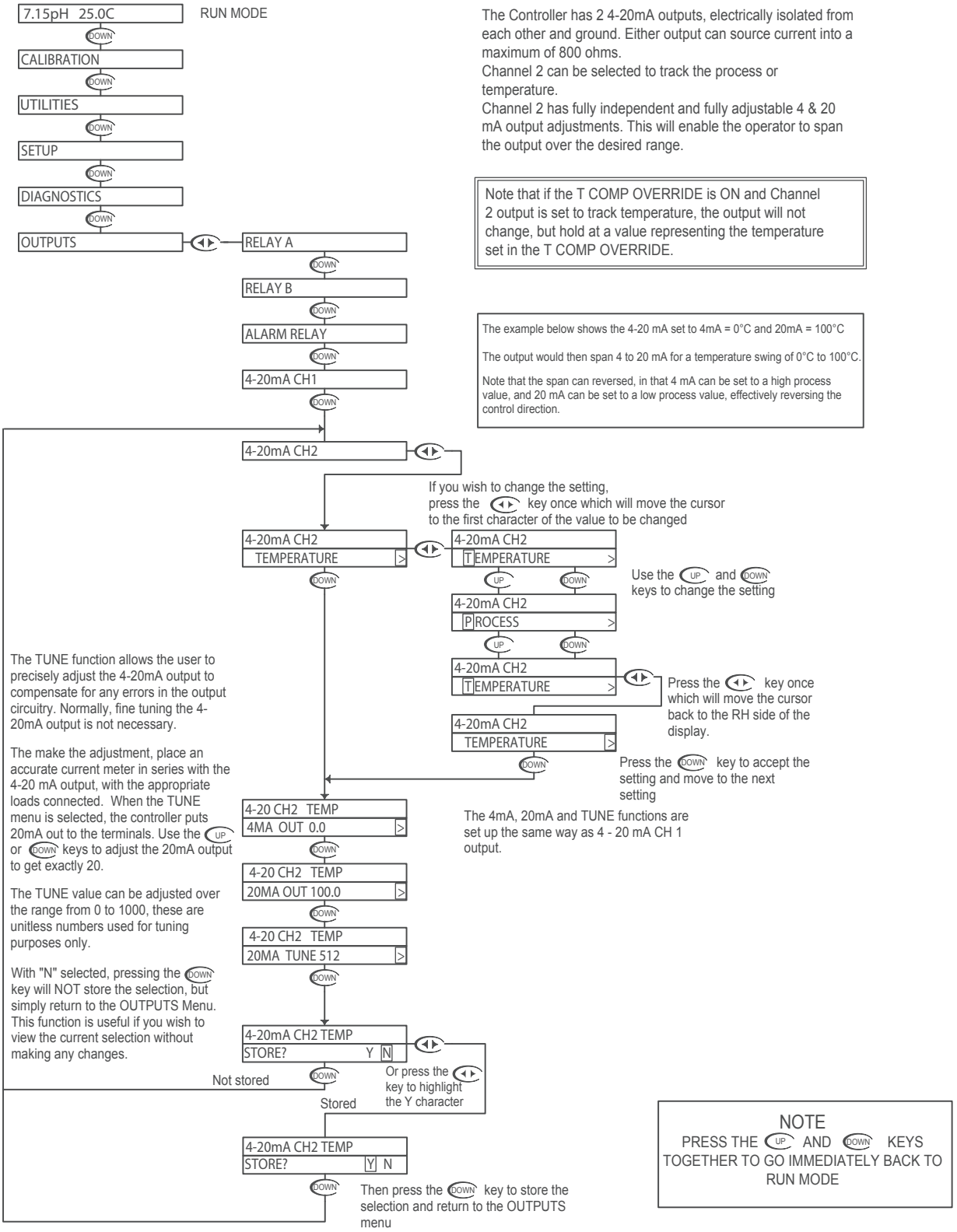
pH - Outputs Menu - Alarm Relay 4.20



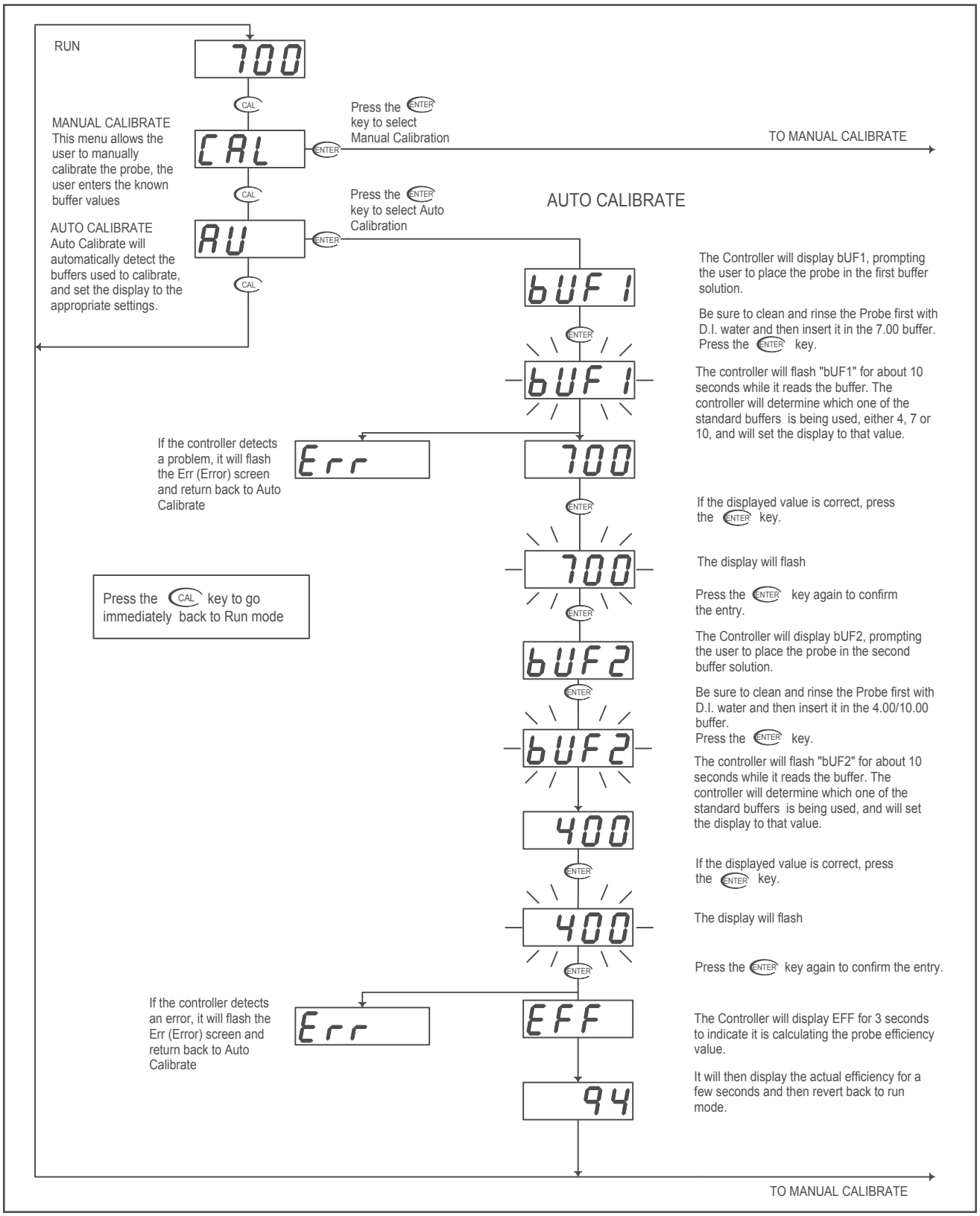
pH - Outputs Menu - 4-20mA CH1 Output 4.21



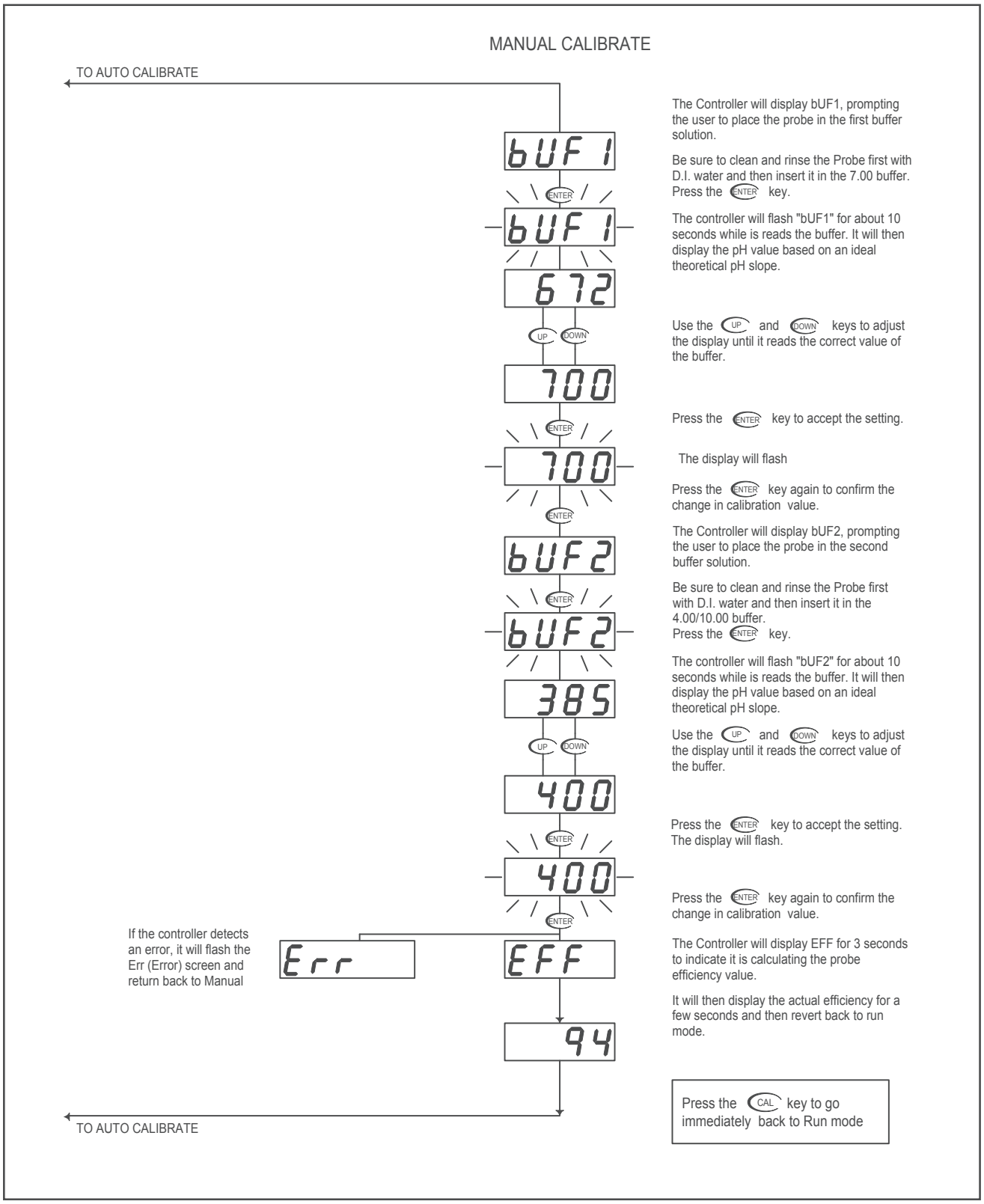
pH - Outputs Menu - 4-20mA CH2 Output 4.22



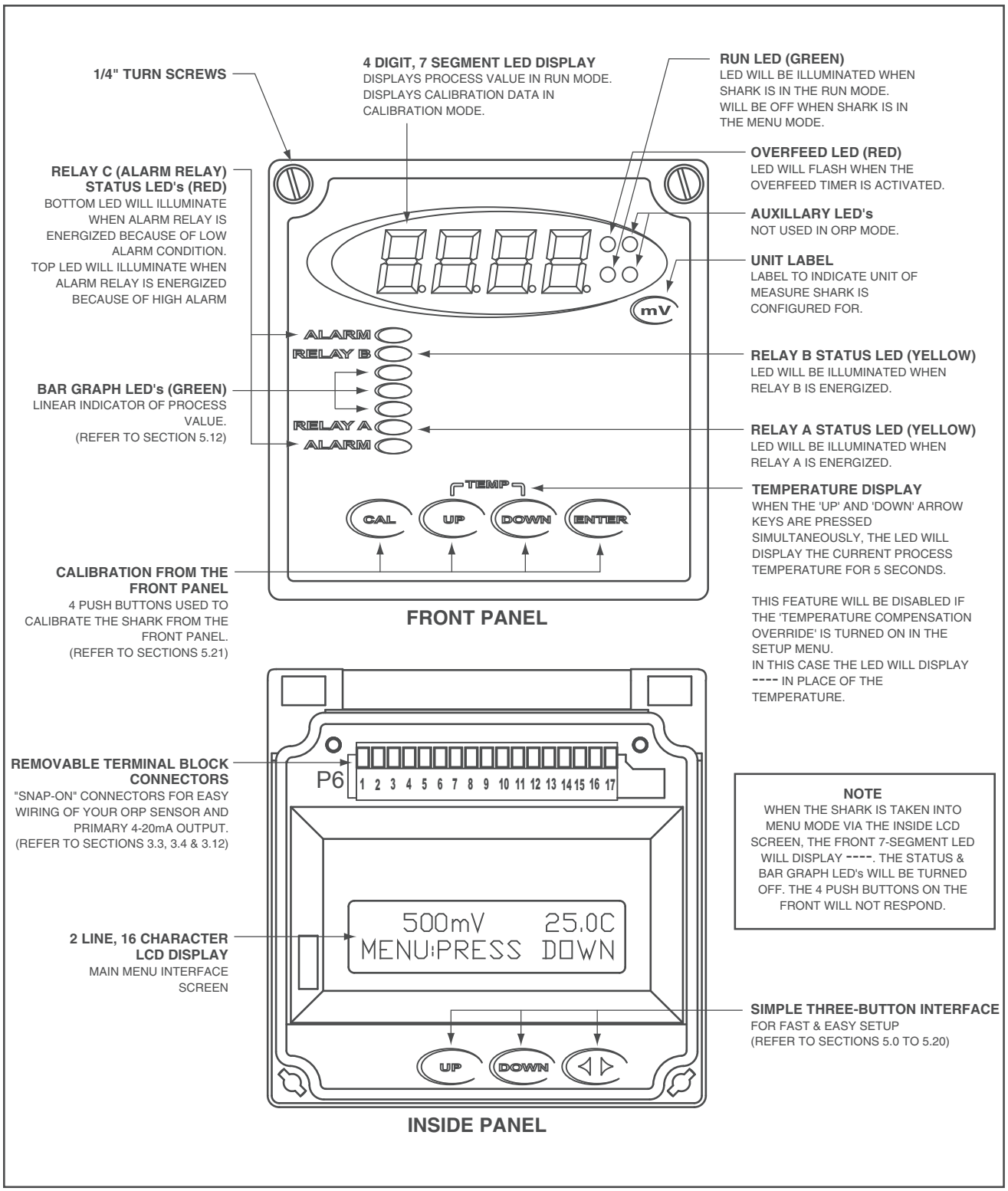
pH - LED Display Menu - pH Auto Calibrate 4.23



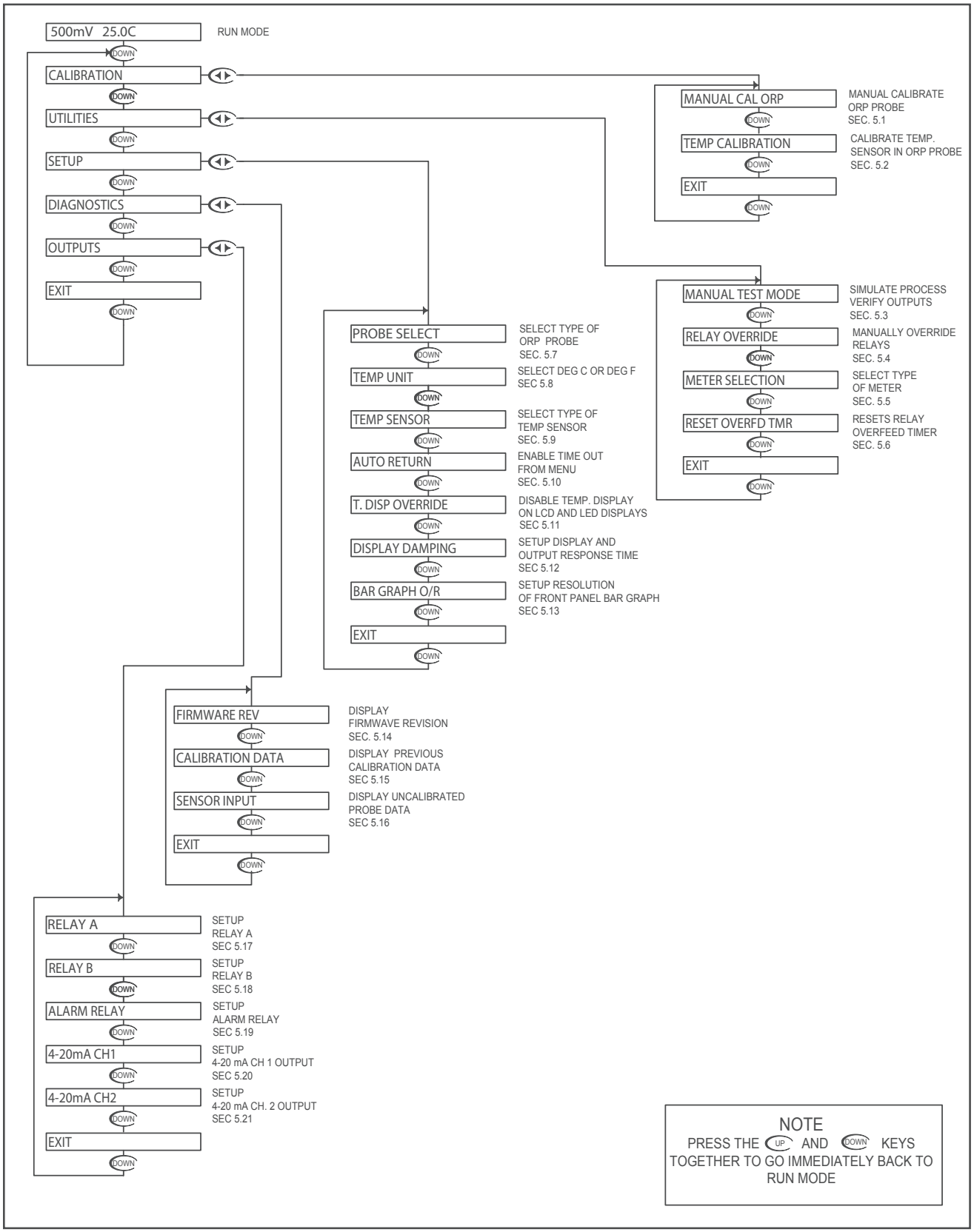
pH - LED Display Menu - pH Manual Calibrate 4.24



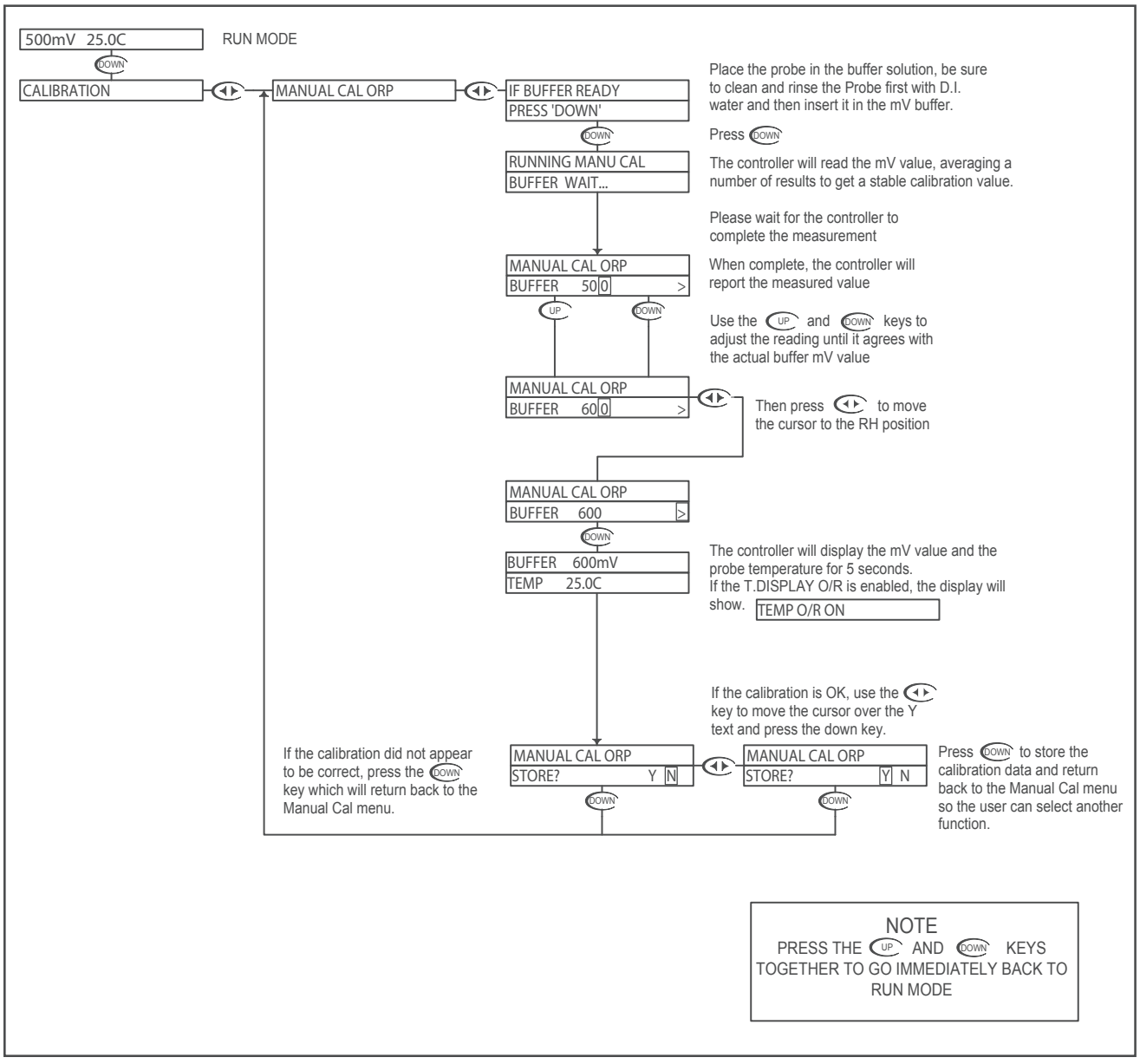
Section 5 - Using the SHARK in ORP Mode



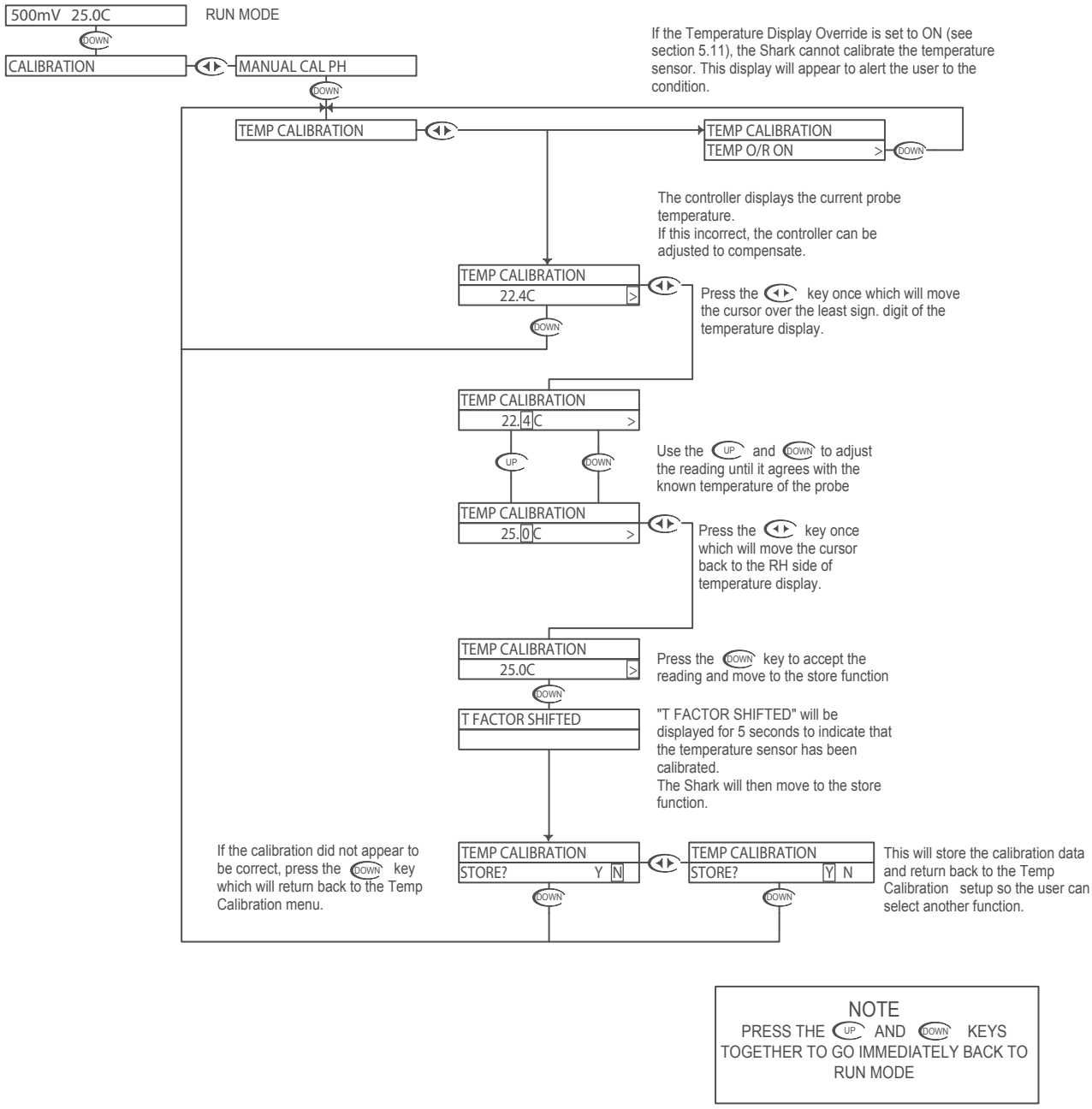
ORP - Menu Overview 5.0



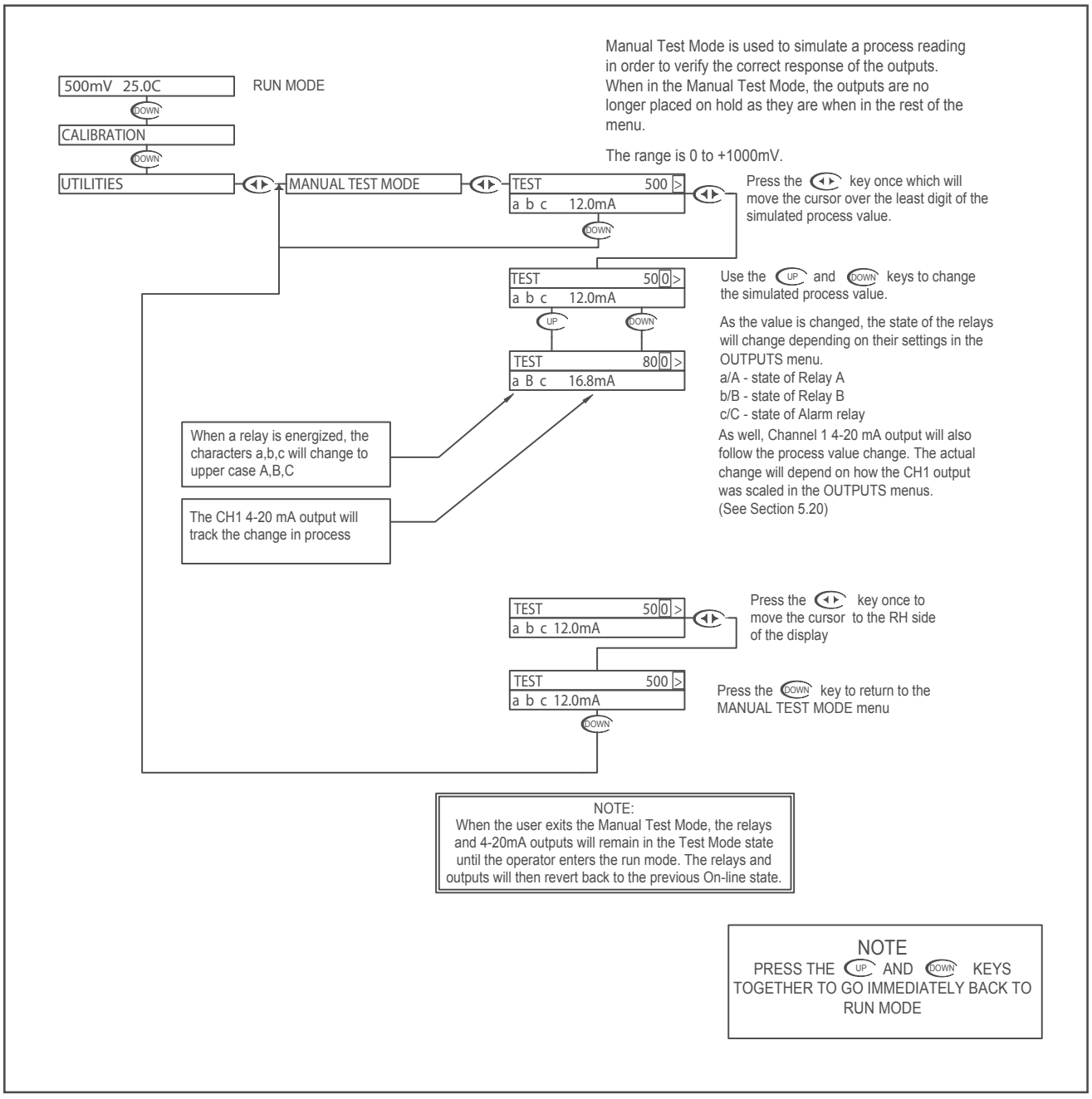
ORP - Calibration Menu - Manual Calibrate 5.1



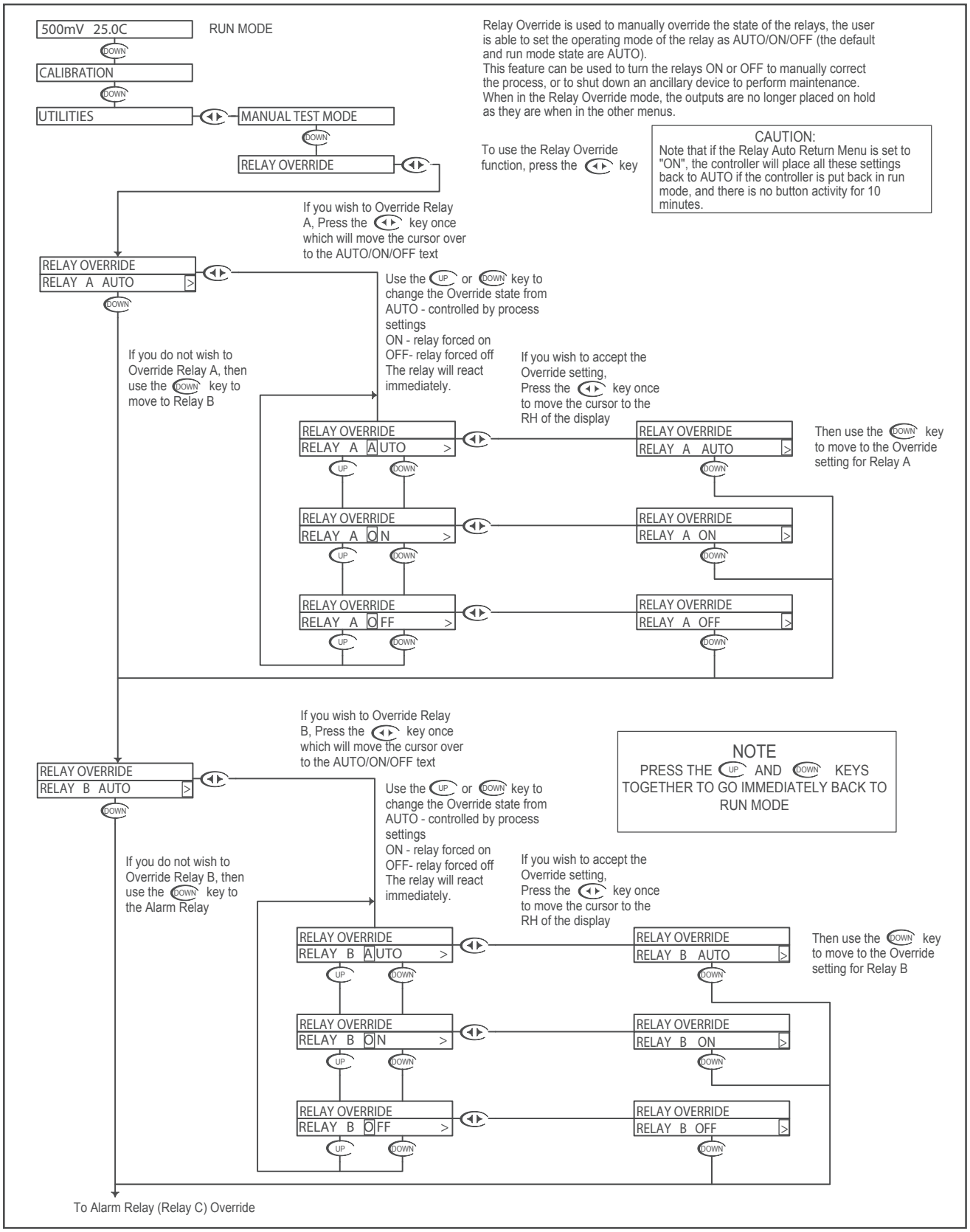
ORP - Calibration Menu - Temp. Calibration 5.2



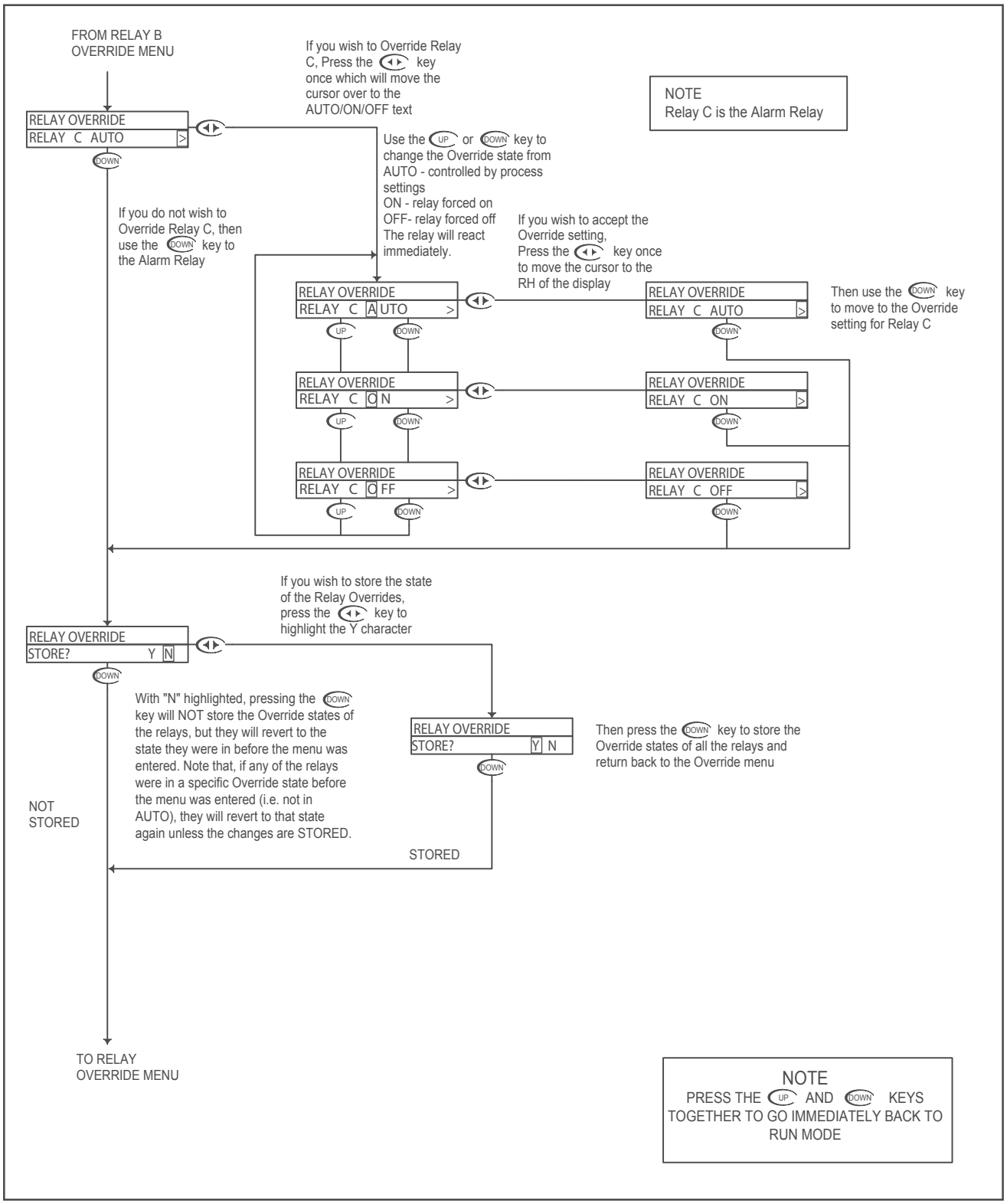
ORP - Utilities Menu - Manual Test Mode 5.3



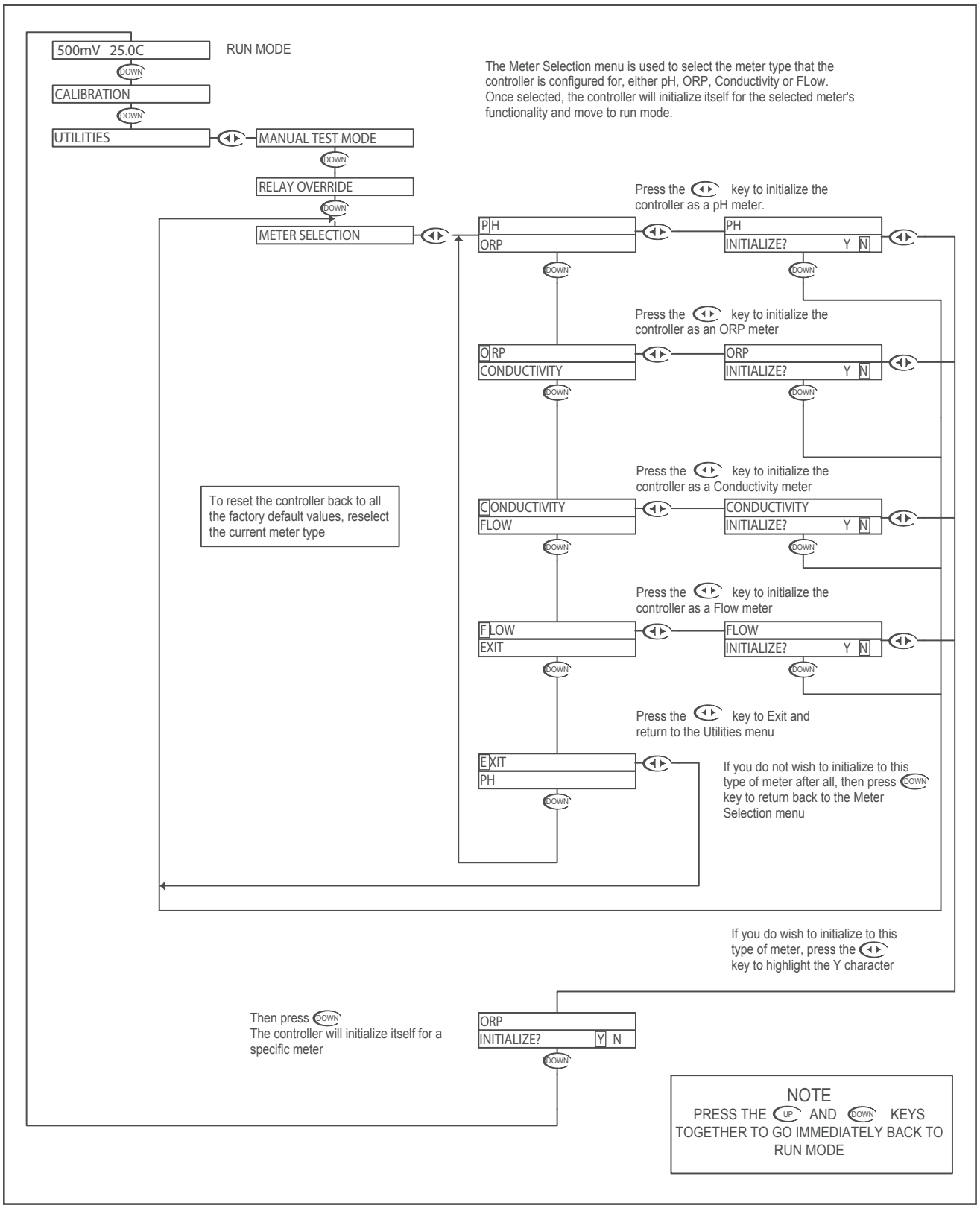
ORP - Utilities Menu - Relay Override 5.4



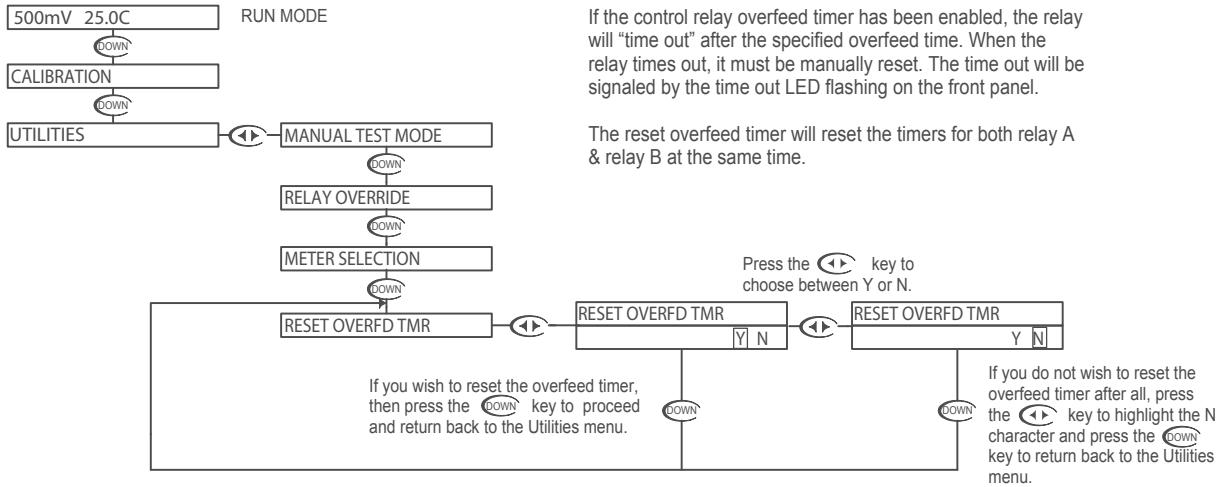
ORP - Utilities Menu - Relay Override 5.4



ORP - Utilities Menu - Meter Selection 5.5



ORP - Utilities Menu - Overfeed Timer Reset 5.6

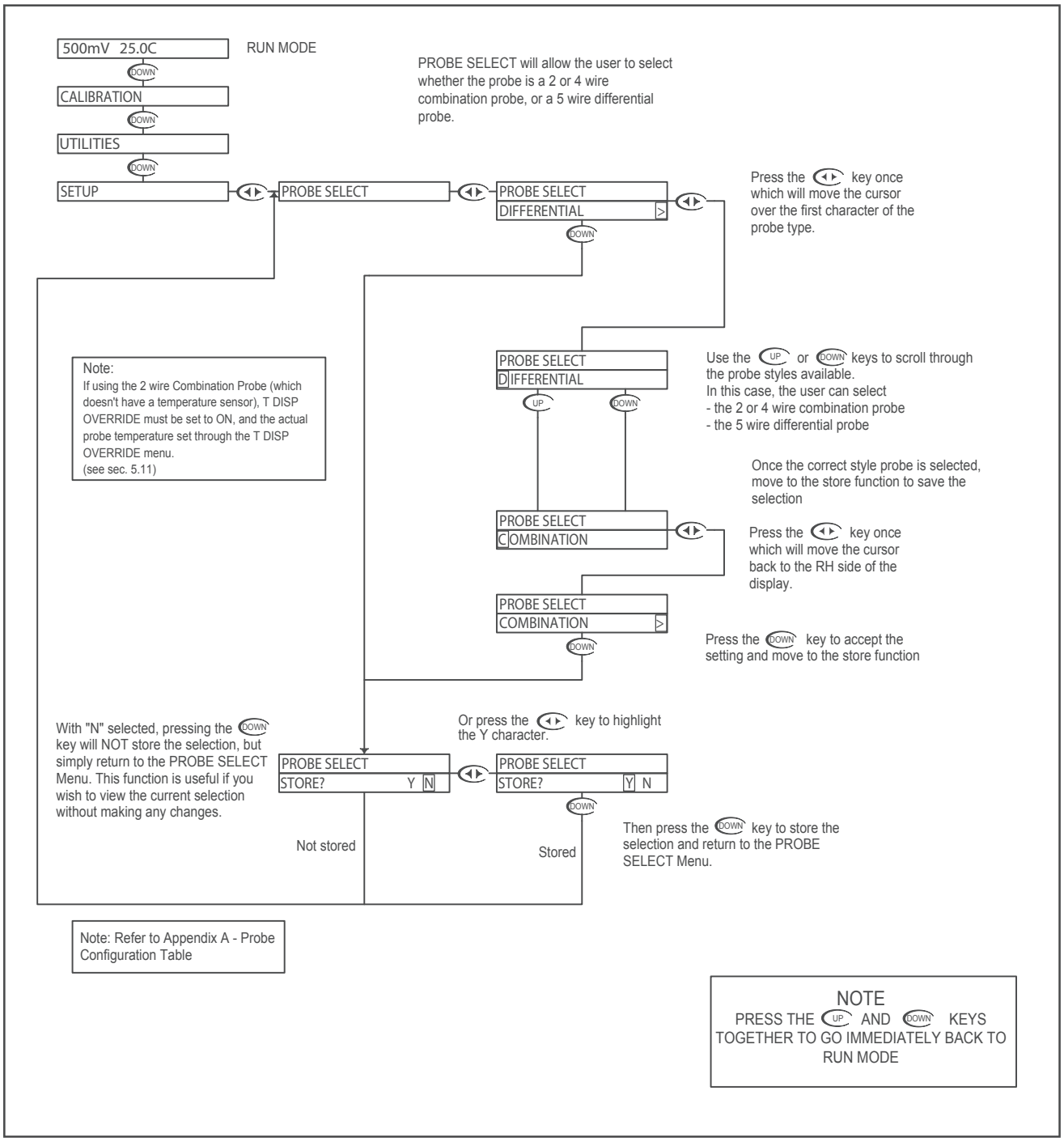


If the control relay overfeed timer has been enabled, the relay will "time out" after the specified overfeed time. When the relay times out, it must be manually reset. The time out will be signaled by the time out LED flashing on the front panel.

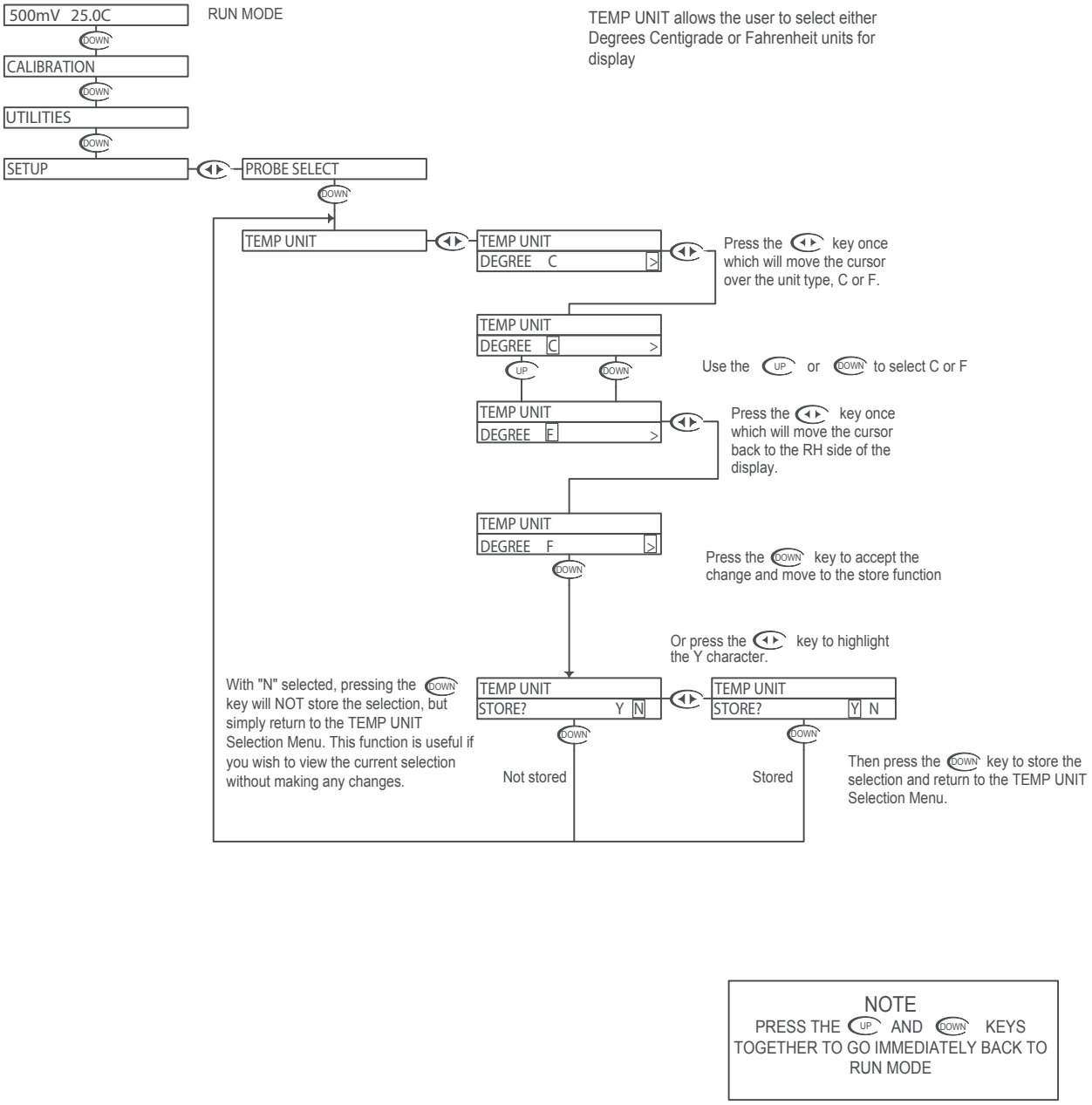
The reset overfeed timer will reset the timers for both relay A & relay B at the same time.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

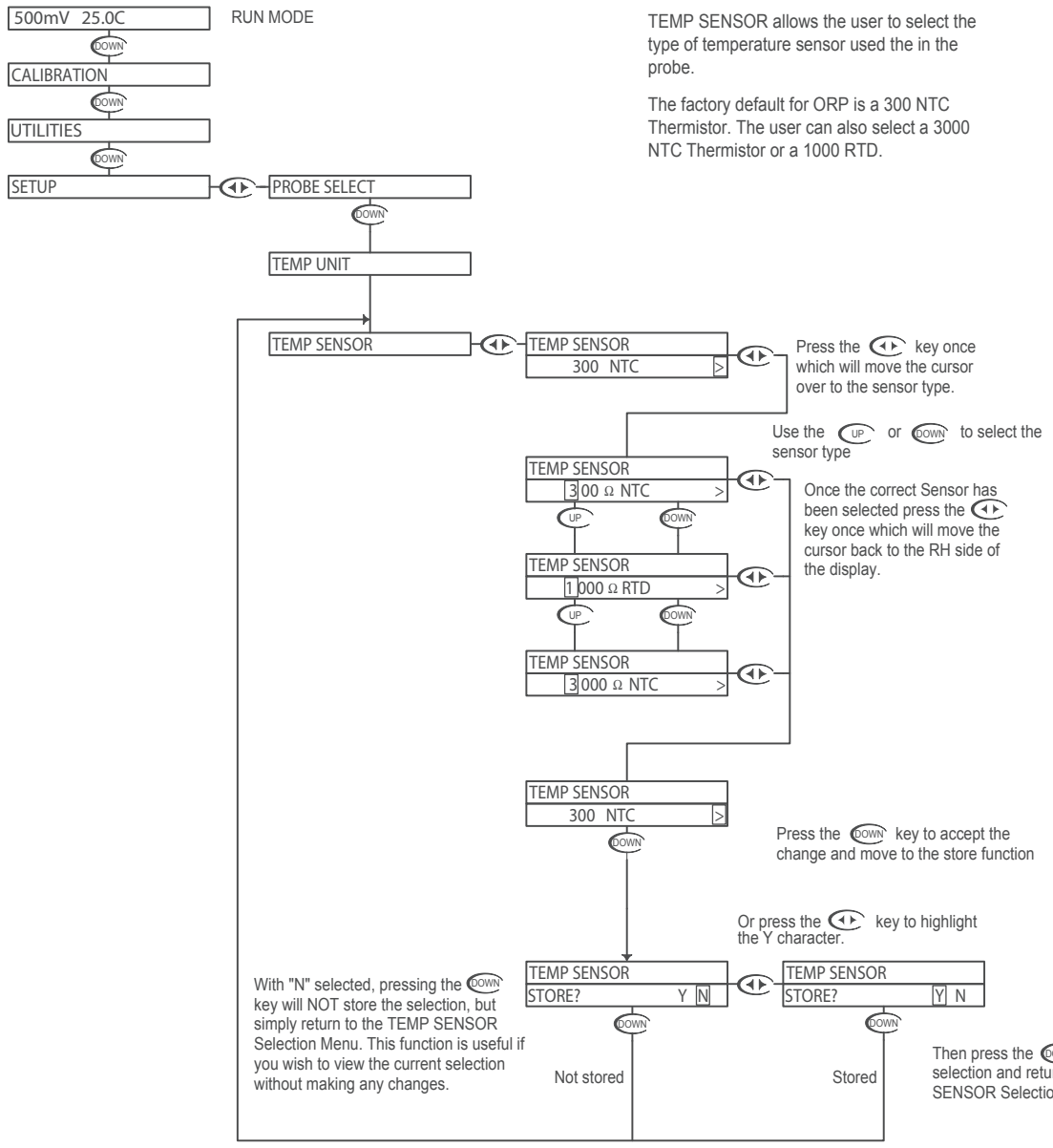
ORP - Setup Menu - Probe Select 5.7



ORP - Setup Menu - Temp. Unit 5.8



ORP - Setup Menu - Temp. Sensor 5.9

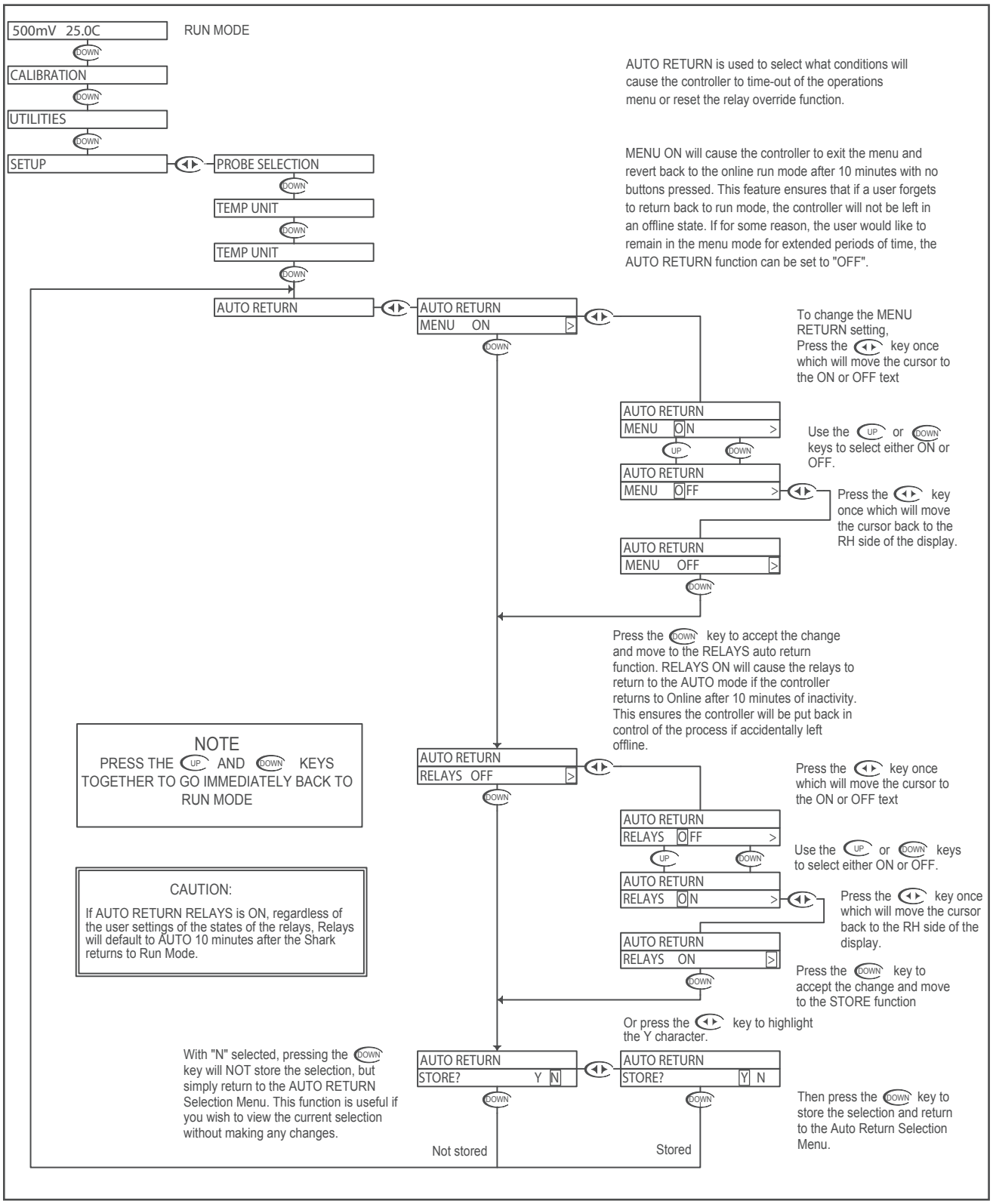


TEMP SENSOR allows the user to select the type of temperature sensor used the in the probe.

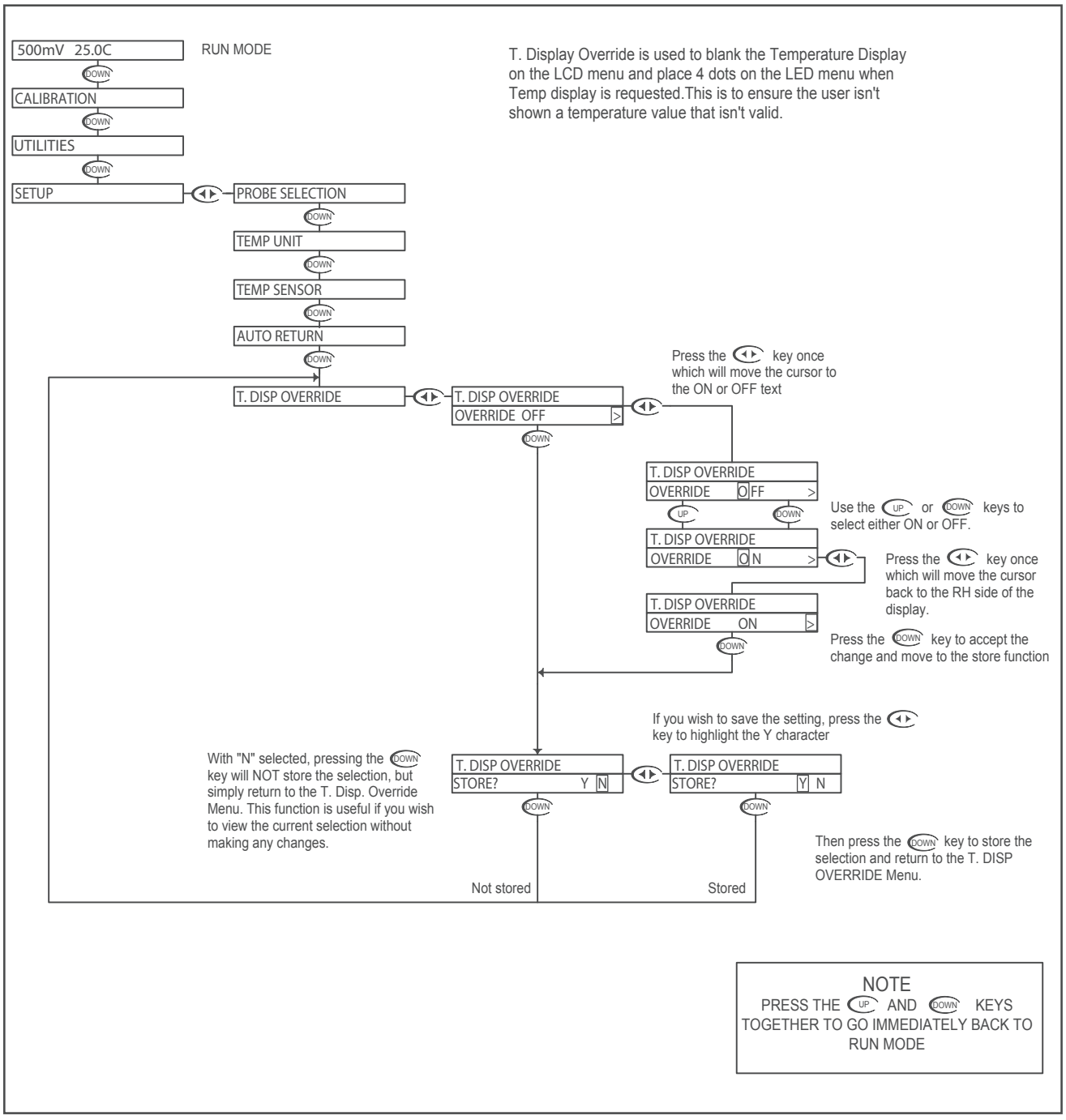
The factory default for ORP is a 300 NTC Thermistor. The user can also select a 3000 NTC Thermistor or a 1000 RTD.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

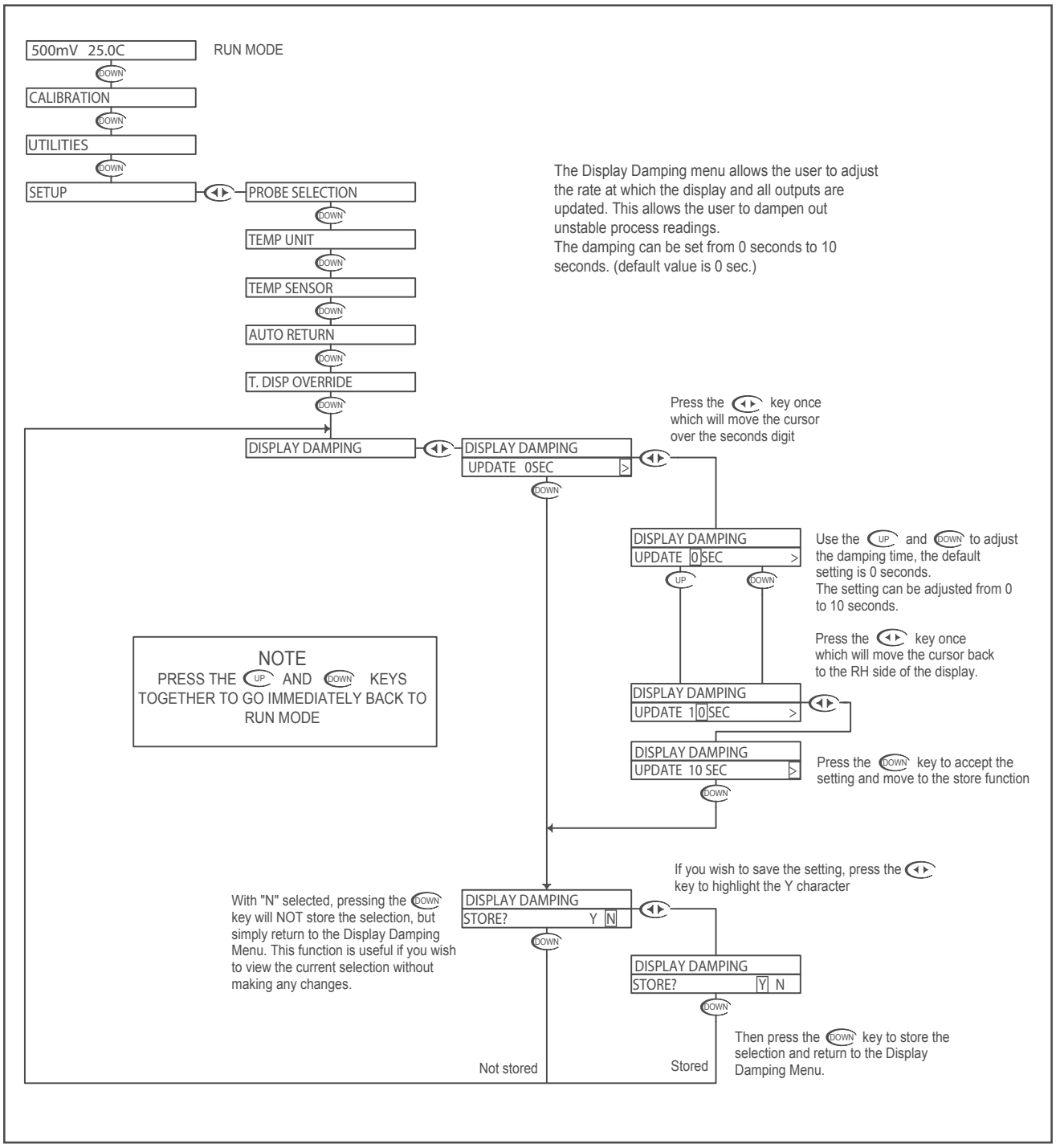
ORP - Setup Menu - Auto Return 5.10



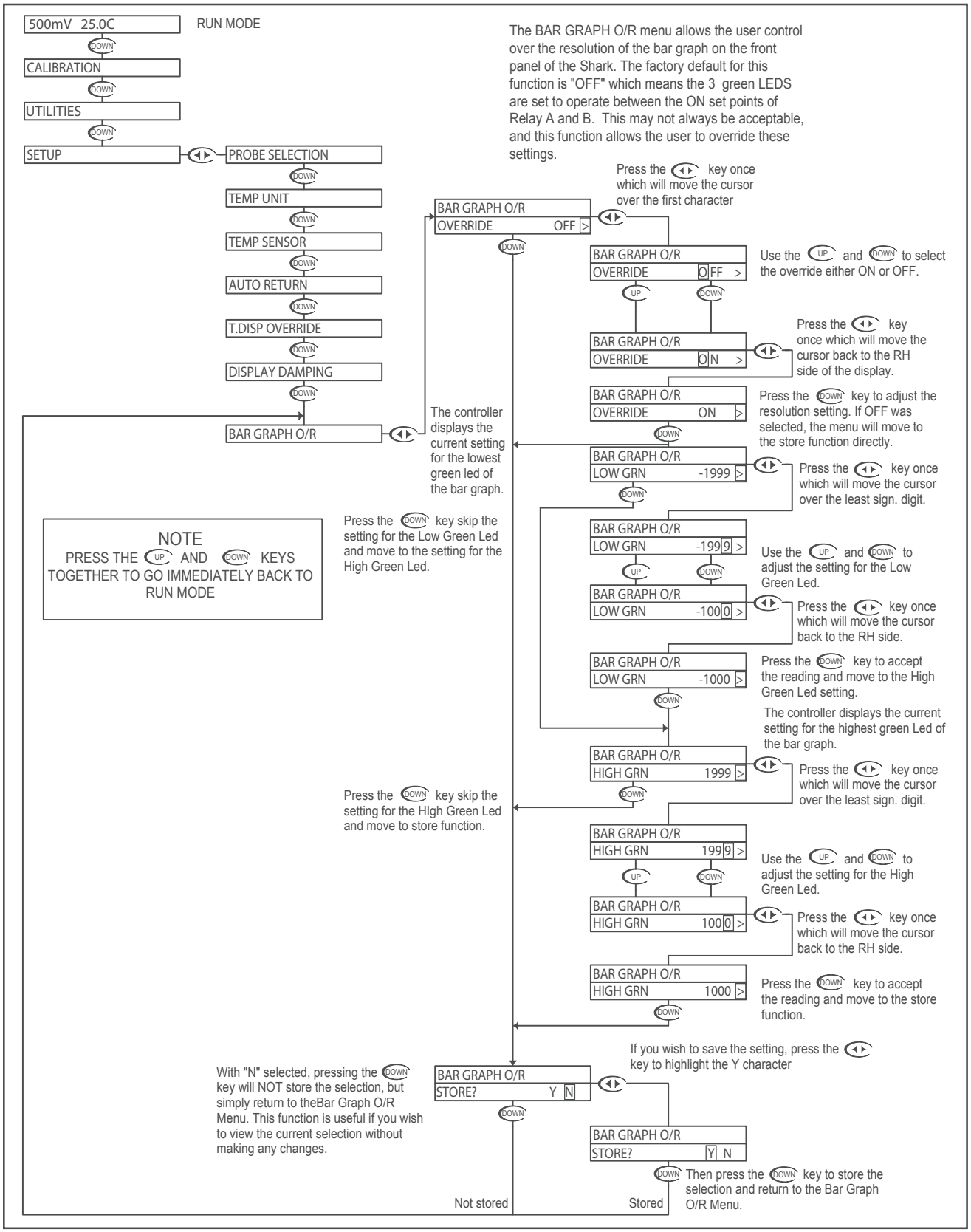
ORP - Setup Menu - Temp. Display Override 5.11



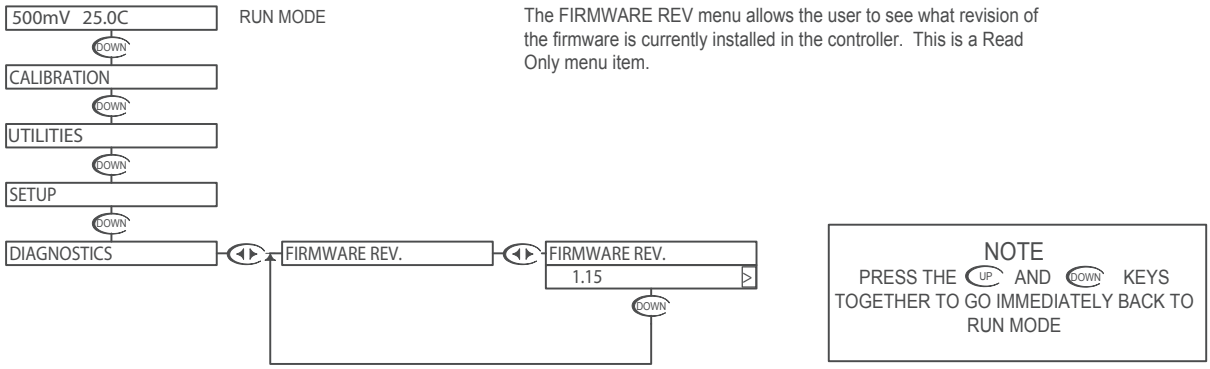
ORP - Setup Menu - Display Damping 5.12



ORP - Setup Menu - Bar Graph O/R 5.13



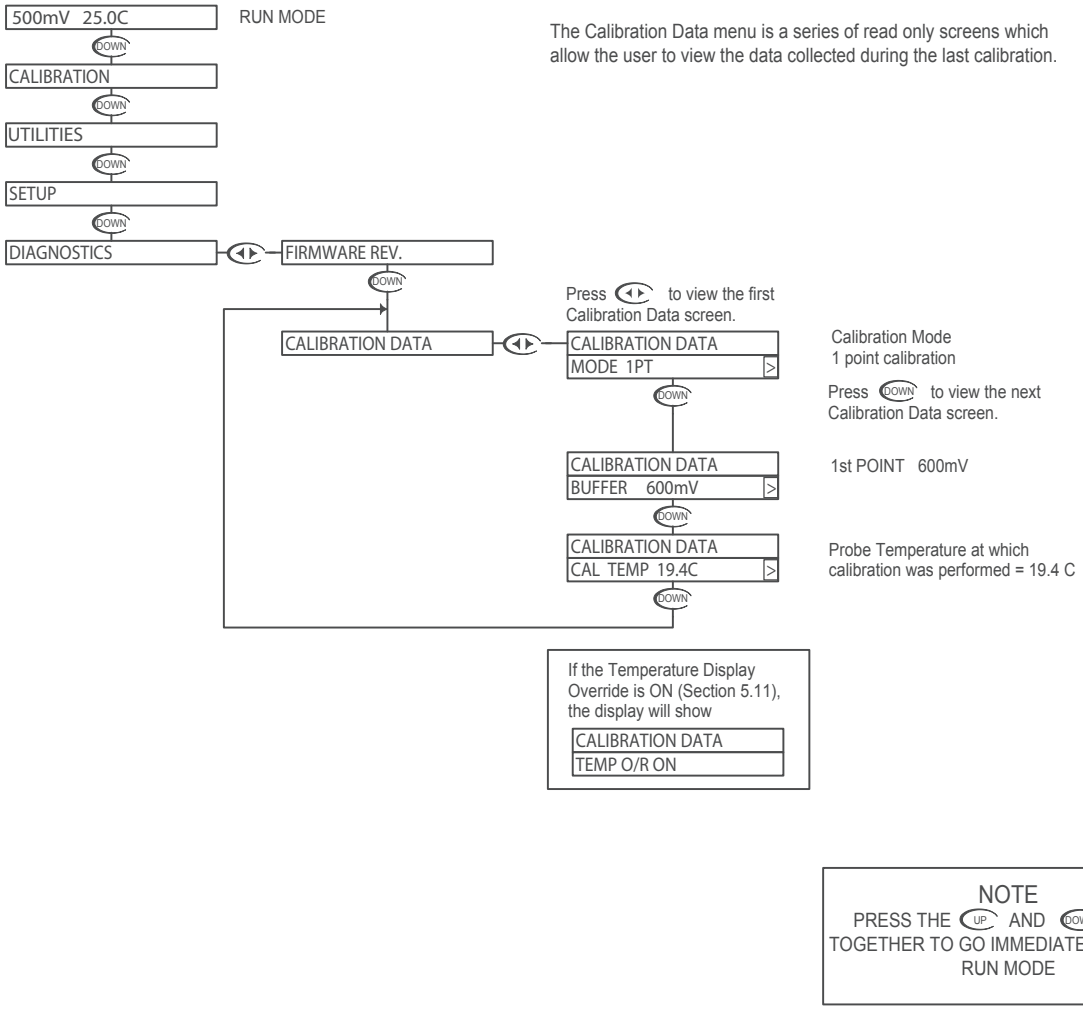
ORP - Diagnostics Menu - Firmware Rev 5.14



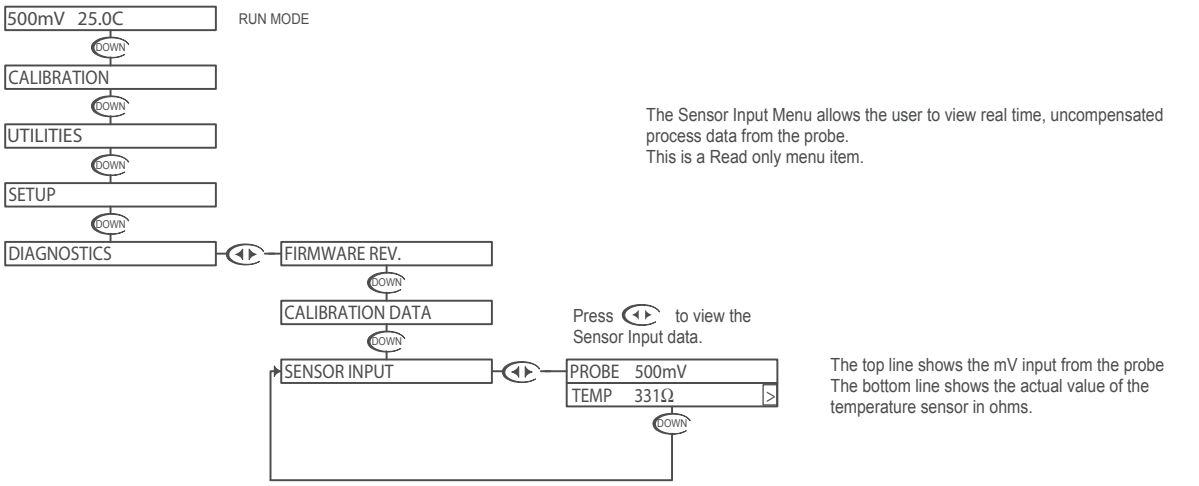
The FIRMWARE REV menu allows the user to see what revision of the firmware is currently installed in the controller. This is a Read Only menu item.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

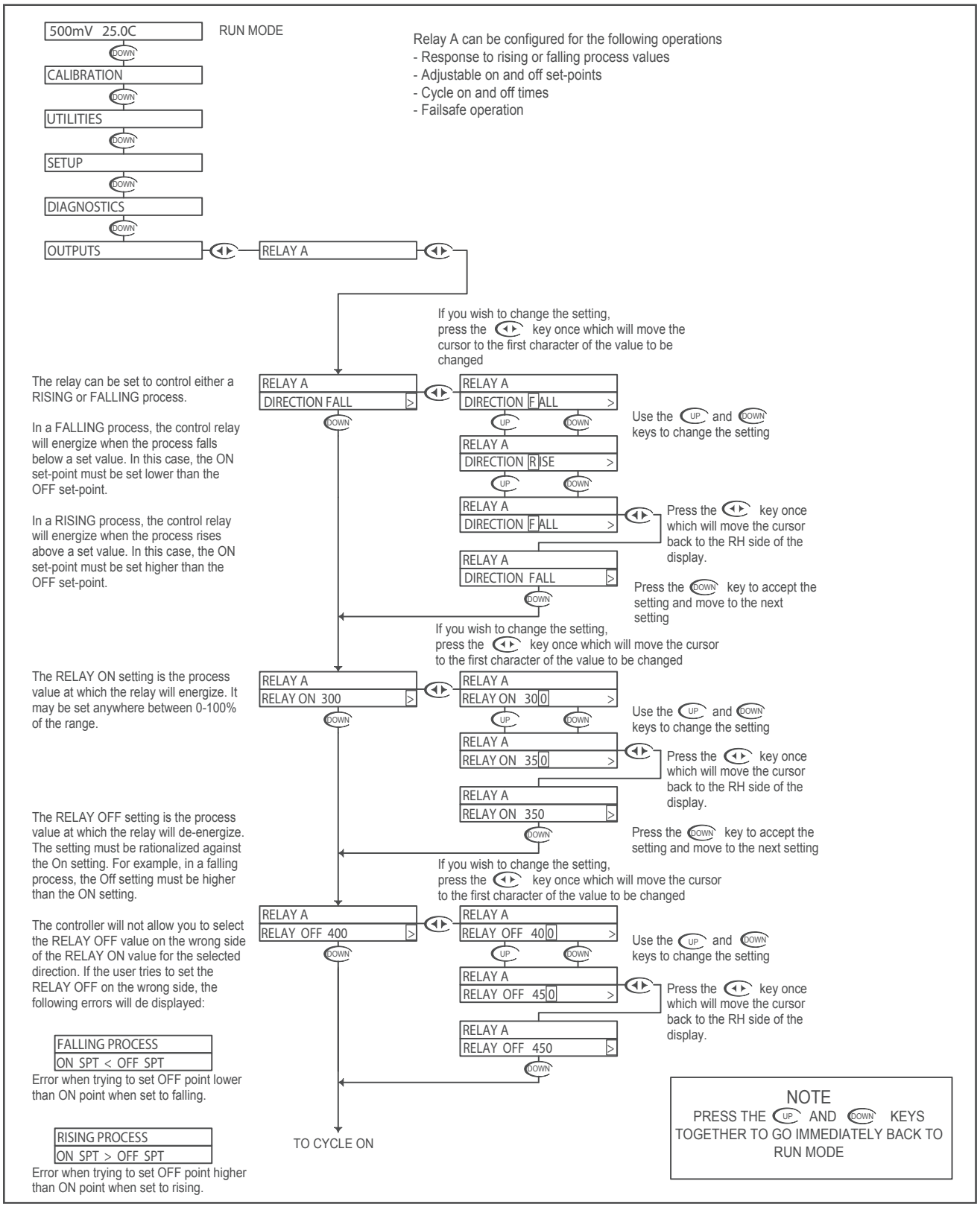
ORP - Diagnostics Menu - Calibration Data 5.15



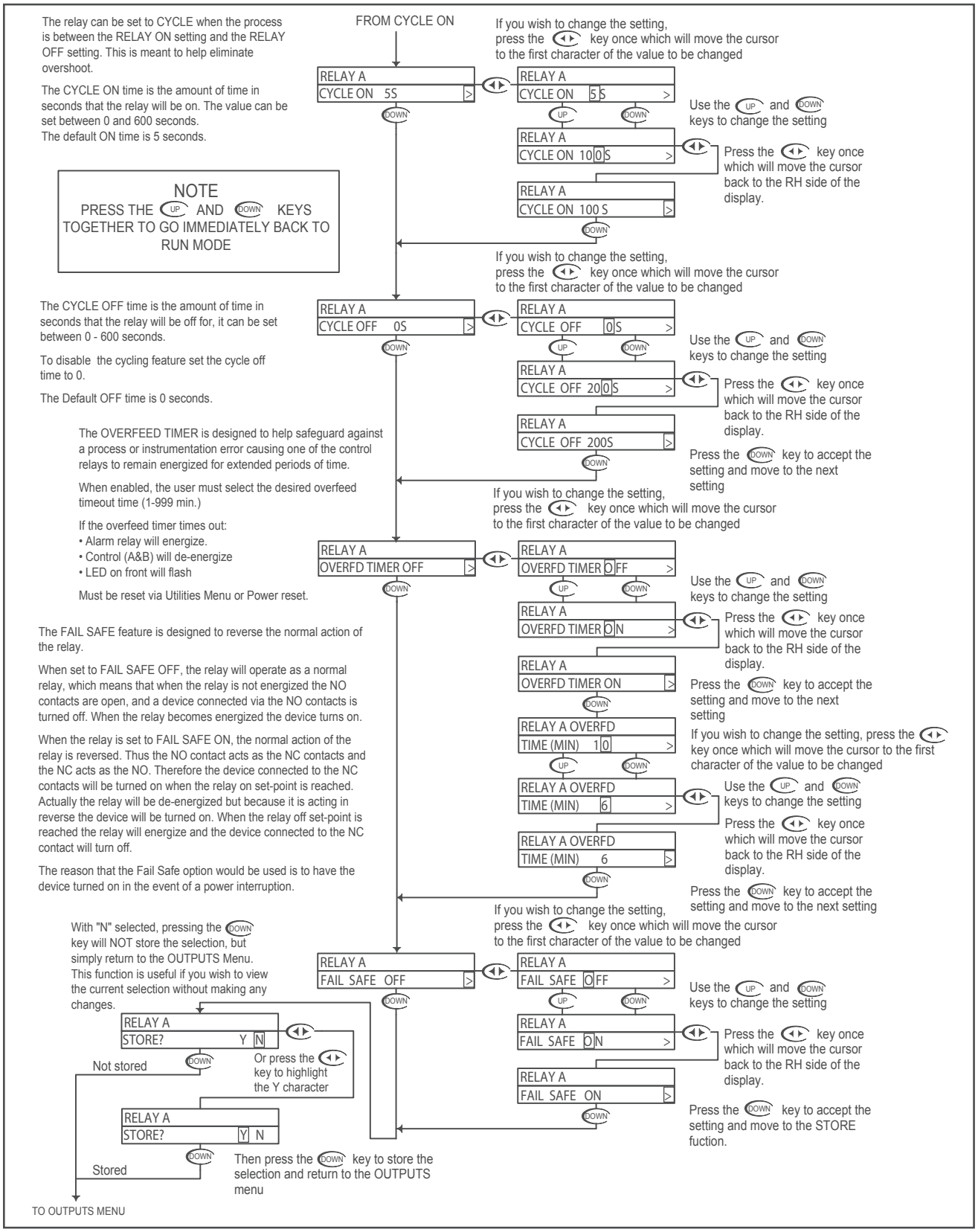
ORP - Diagnostics Menu - Sensor Input 5.16



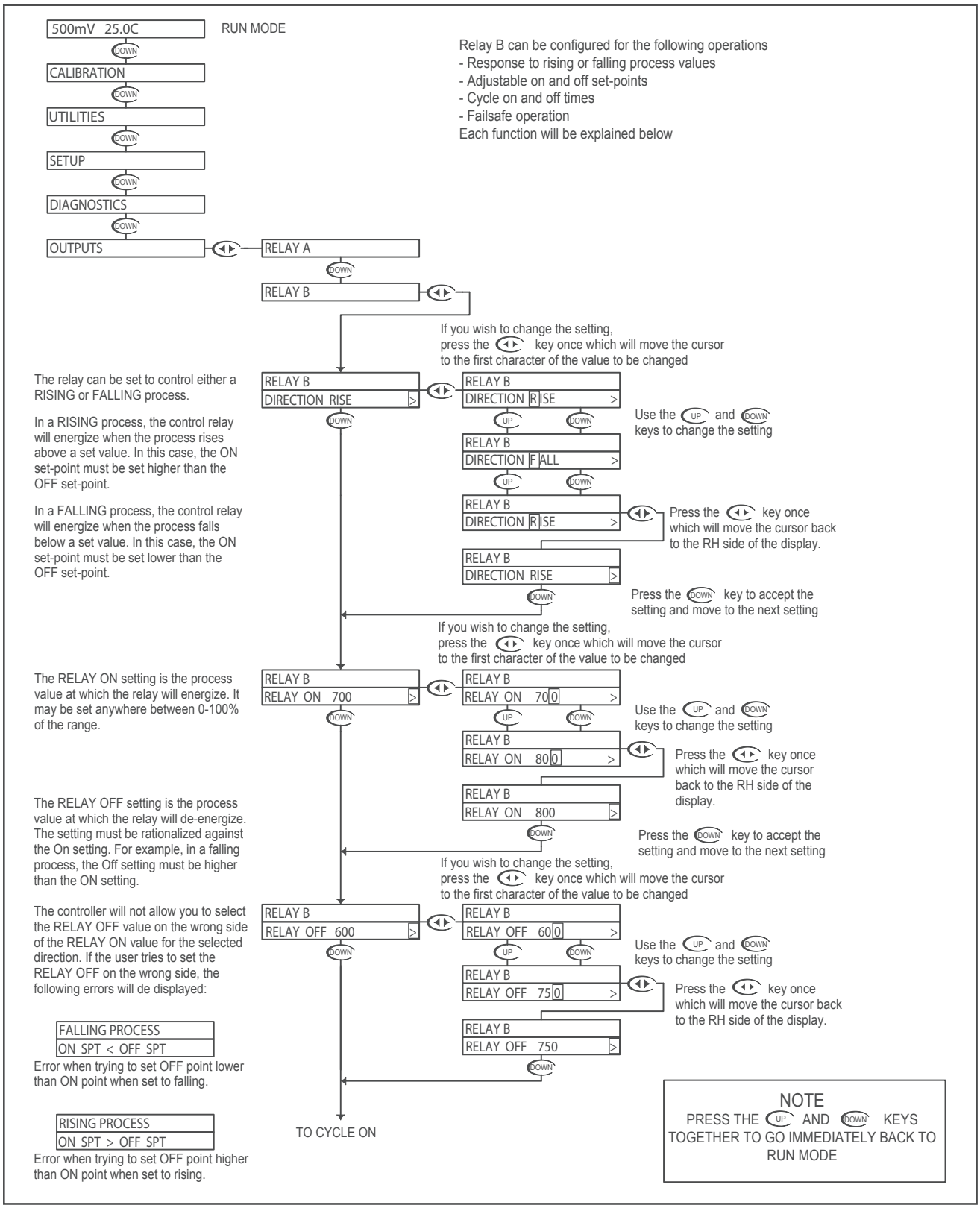
ORP - Outputs Menu - Relay A 5.17



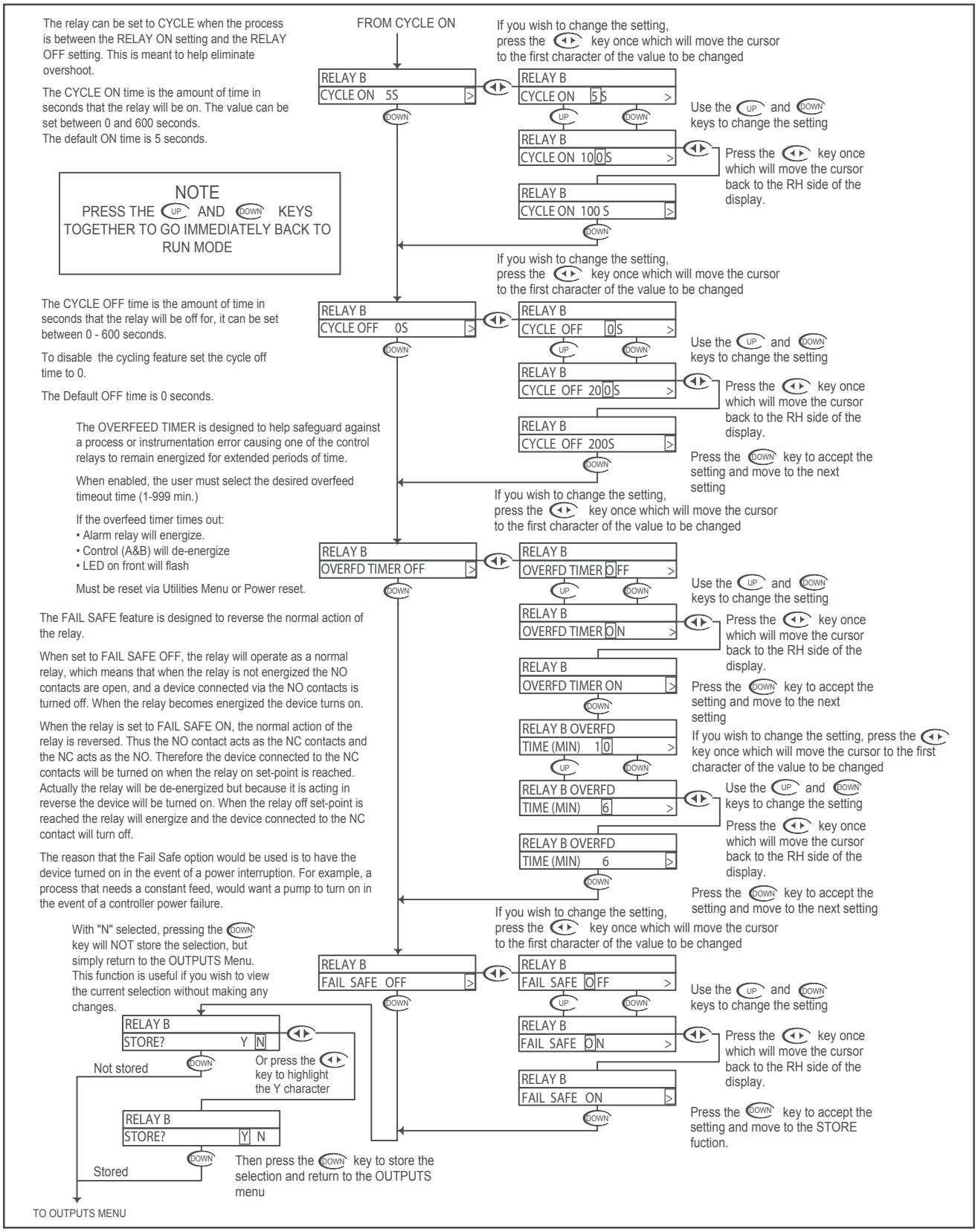
ORP - Outputs Menu - Relay A 5.17



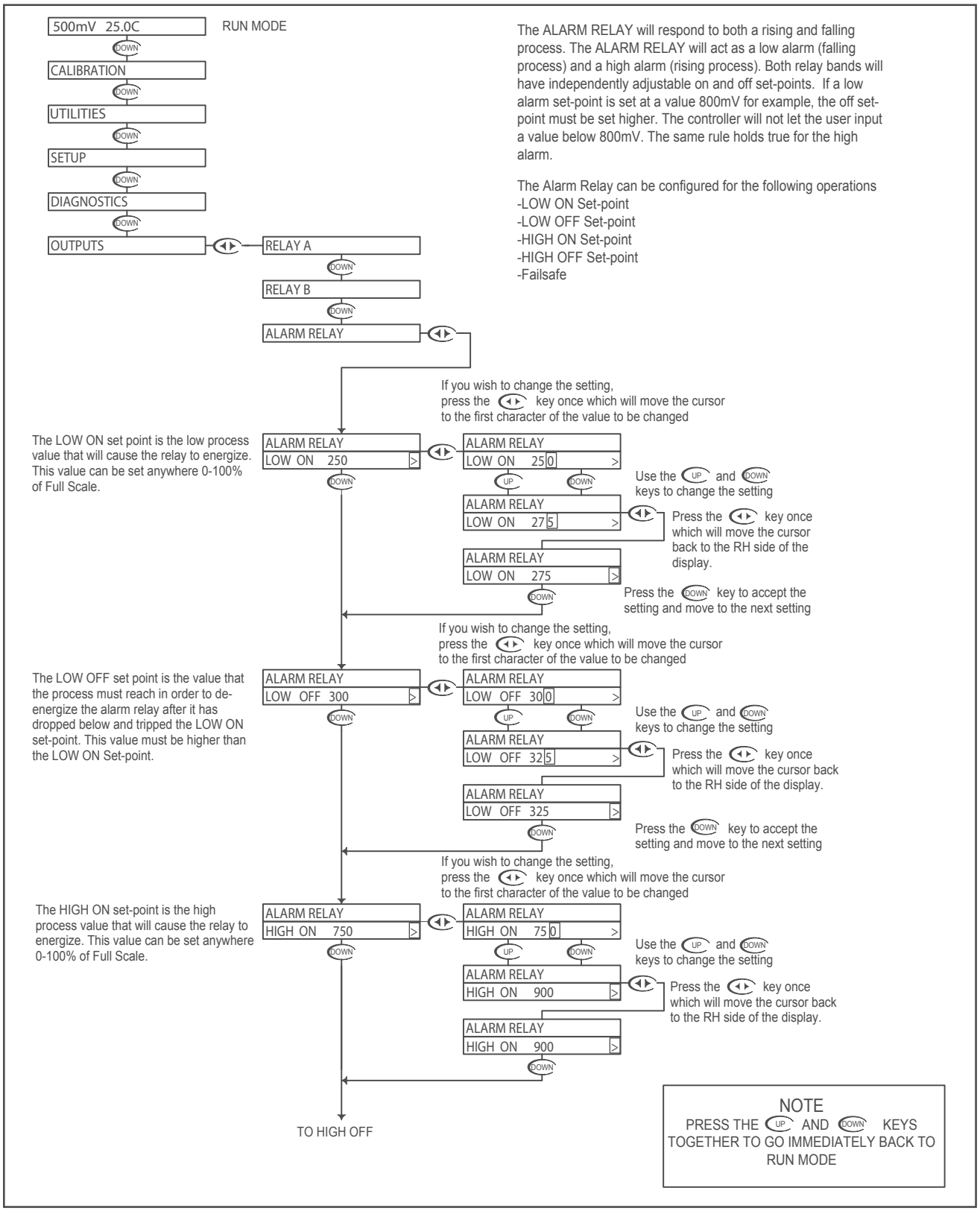
ORP - Outputs Menu - Relay B 5.18



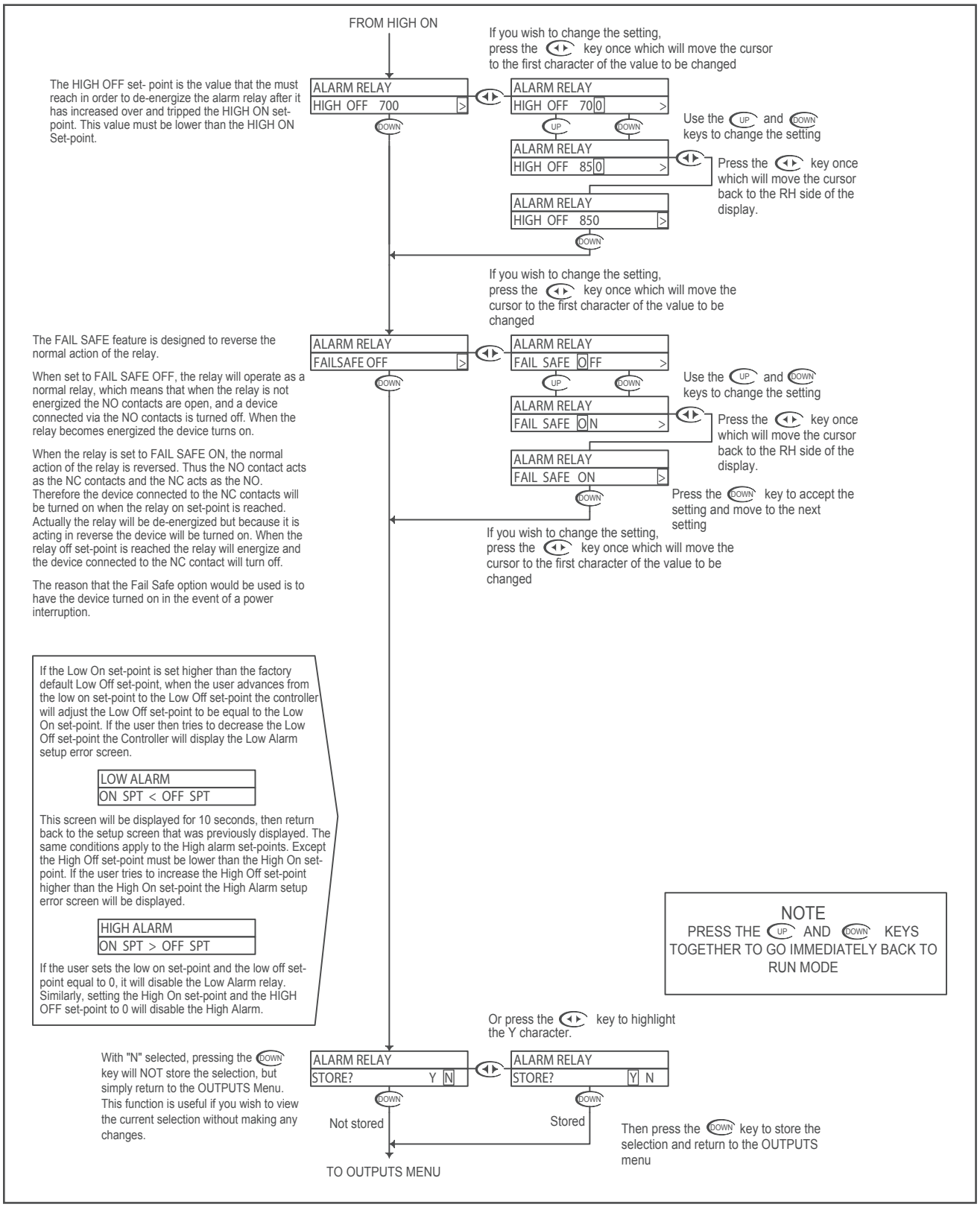
ORP - Outputs Menu - Relay B 5.18



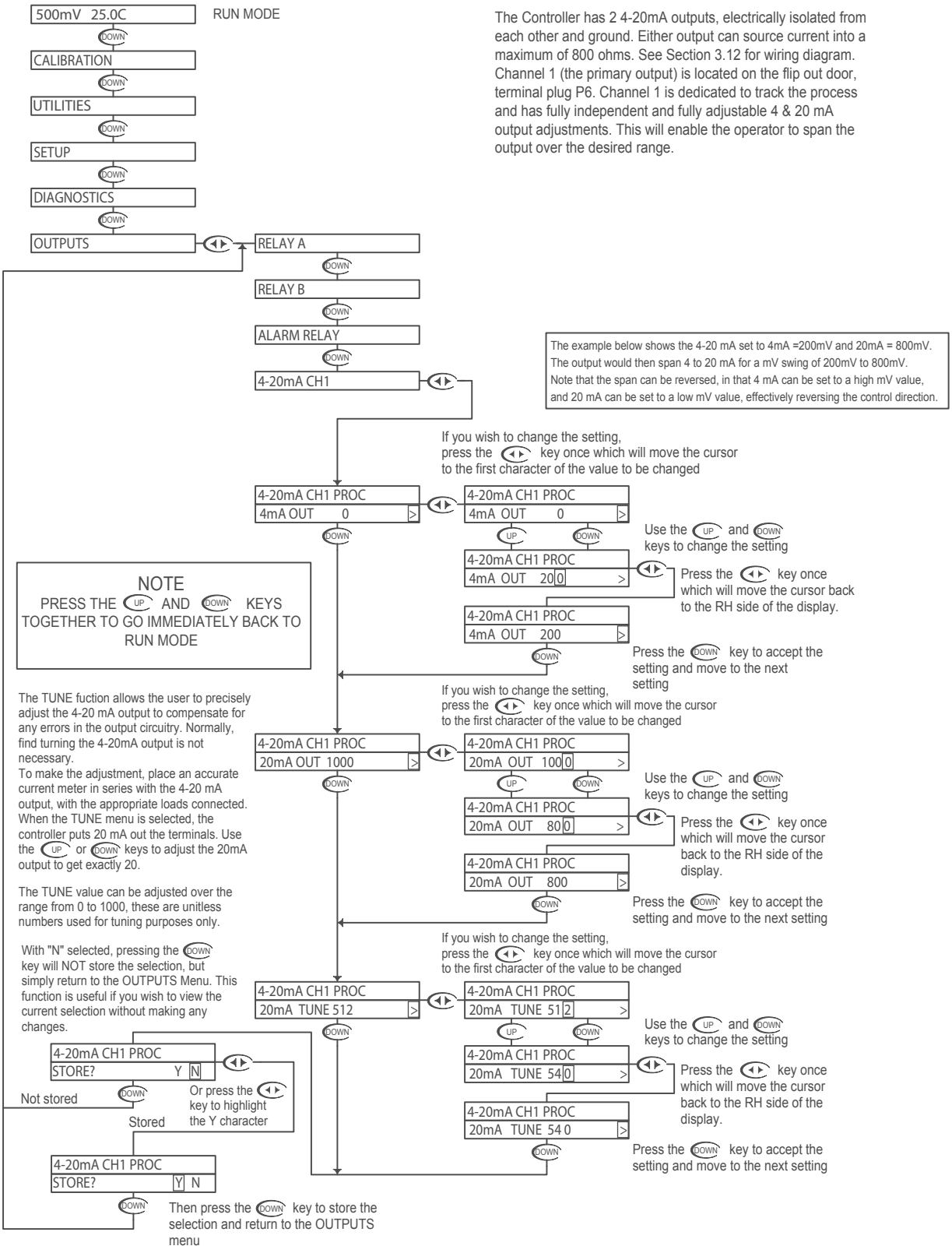
ORP - Outputs Menu - Alarm Relay 5.19



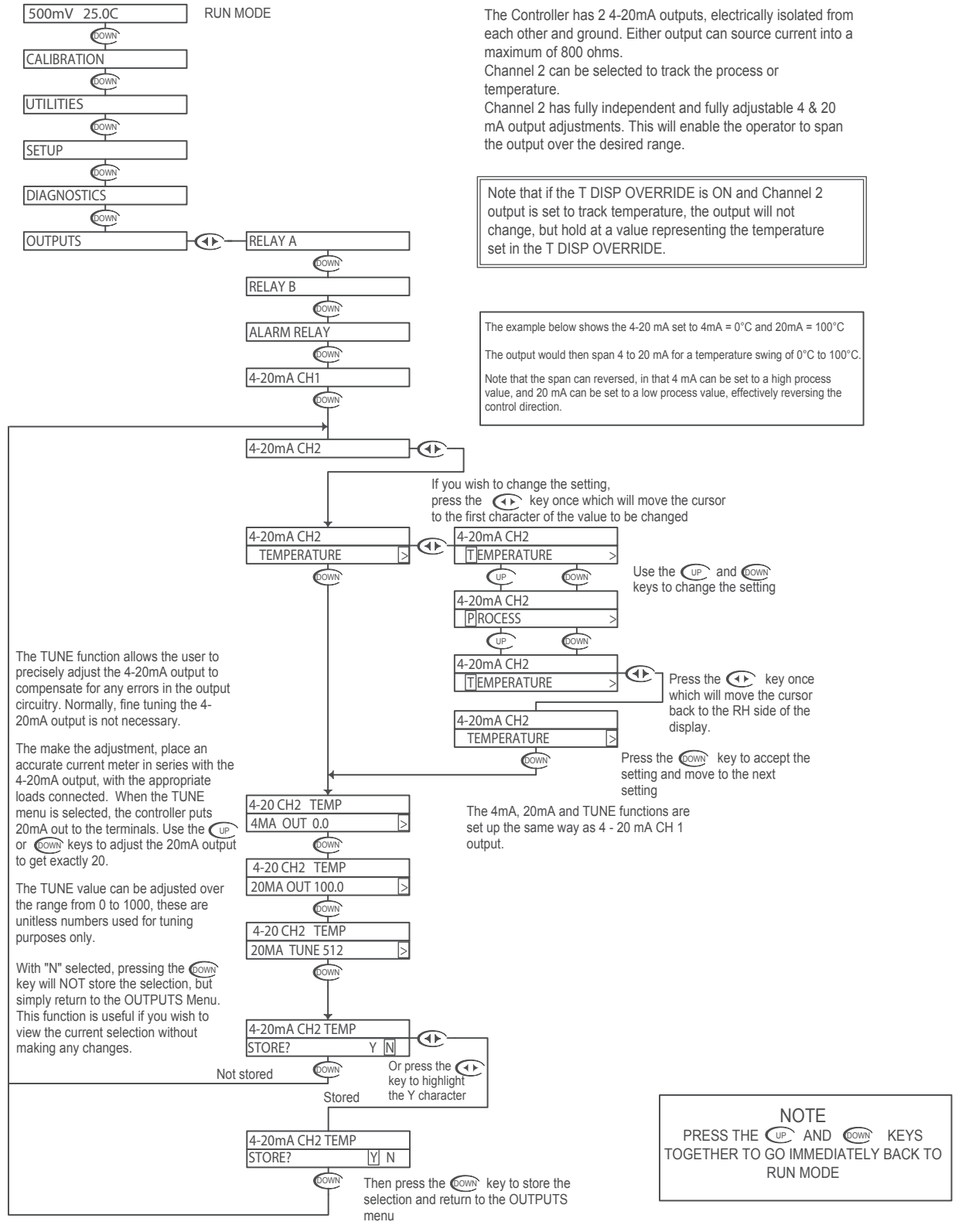
ORP - Outputs Menu - Alarm Relay 5.19



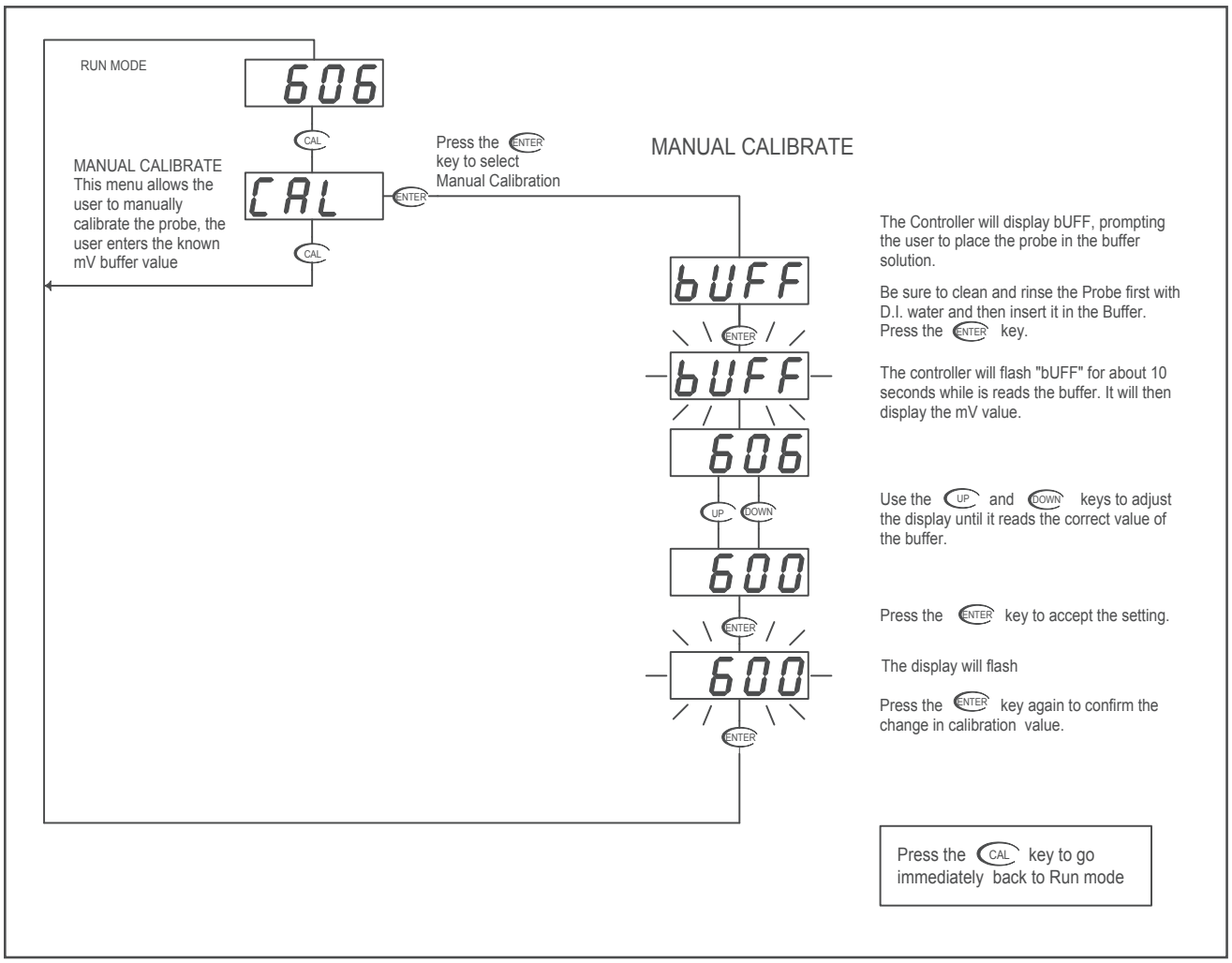
ORP - Outputs Menu - 4-20mA CH1 Output 5.20



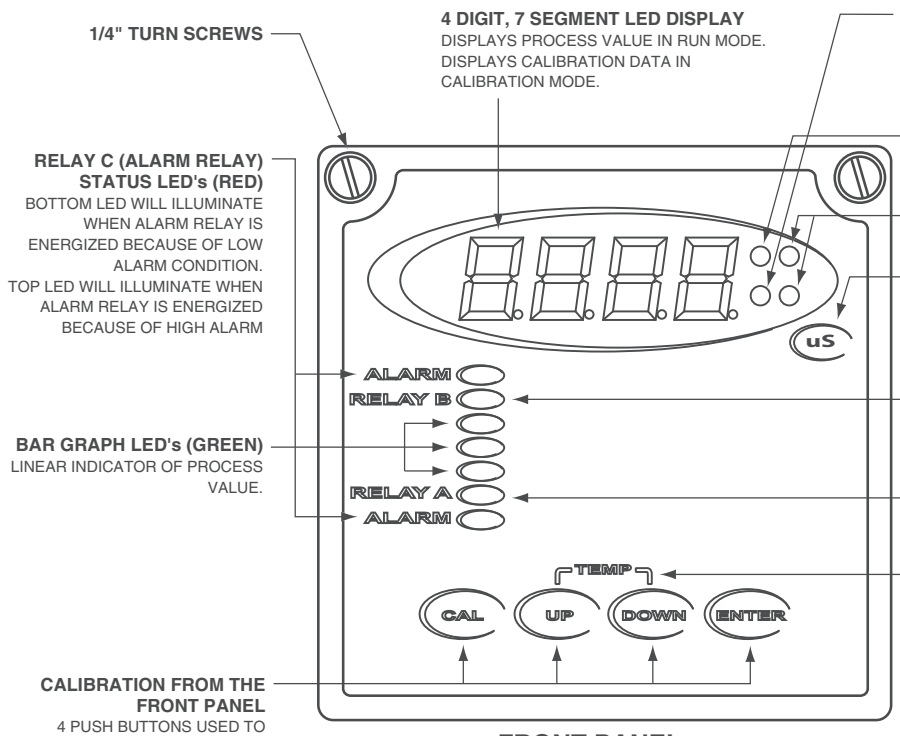
ORP - Outputs Menu - 4-20mA CH2 Output 5.21



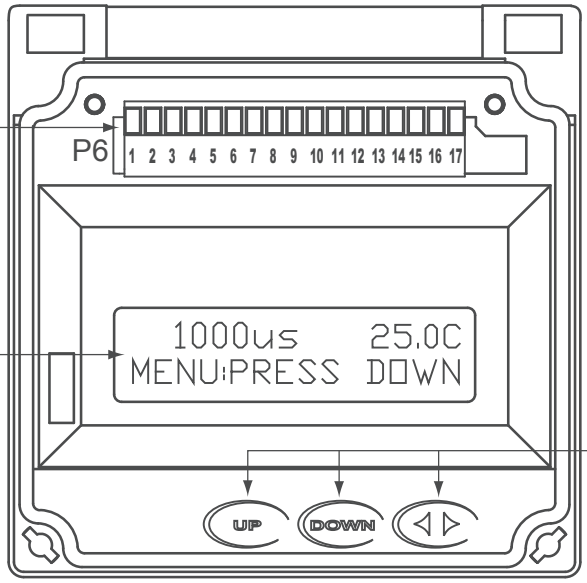
ORP - LED Display Menu - ORP Manual Calibrate 5.22



Section 6 - Using the SHARK in Conductivity Mode



FRONT PANEL



INSIDE PANEL

1/4" TURN SCREWS

4 DIGIT, 7 SEGMENT LED DISPLAY
DISPLAYS PROCESS VALUE IN RUN MODE.
DISPLAYS CALIBRATION DATA IN CALIBRATION MODE.

RUN LED (GREEN)
LED WILL BE ILLUMINATED WHEN SHARK IS IN THE RUN MODE.
WILL BE OFF WHEN SHARK IS IN THE MENU MODE.

OVERFEED LED (RED)
LED WILL FLASH WHEN THE OVERFEED TIMER IS ACTIVATED.

AUXILLARY LED's
NOT USED IN CONDUCTIVITY MODE.

UNIT LABEL
LABEL TO INDICATE UNIT OF MEASURE SHARK IS CONFIGURED FOR.

RELAY C (ALARM RELAY) STATUS LED's (RED)
BOTTOM LED WILL ILLUMINATE WHEN ALARM RELAY IS ENERGIZED BECAUSE OF LOW ALARM CONDITION.
TOP LED WILL ILLUMINATE WHEN ALARM RELAY IS ENERGIZED BECAUSE OF HIGH ALARM

BAR GRAPH LED's (GREEN)
LINEAR INDICATOR OF PROCESS VALUE.

RELAY B STATUS LED (YELLOW)
LED WILL BE ILLUMINATED WHEN RELAY B IS ENERGIZED.

RELAY A STATUS LED (YELLOW)
LED WILL BE ILLUMINATED WHEN RELAY A IS ENERGIZED.

TEMPERATURE DISPLAY
WHEN THE 'UP' AND 'DOWN' ARROW KEYS ARE PRESSED SIMULTANEOUSLY, THE LED WILL DISPLAY THE CURRENT PROCESS TEMPERATURE FOR 5 SECONDS.

THIS FEATURE WILL BE DISABLED IF THE 'TEMPERATURE COMPENSATION OVERRIDE' IS TURNED ON IN THE SETUP MENU.
IN THIS CASE THE LED WILL DISPLAY ---- IN PLACE OF THE TEMPERATURE.

CALIBRATION FROM THE FRONT PANEL
4 PUSH BUTTONS USED TO CALIBRATE THE SHARK FROM THE FRONT PANEL.
(REFER TO SECTIONS 6.22)

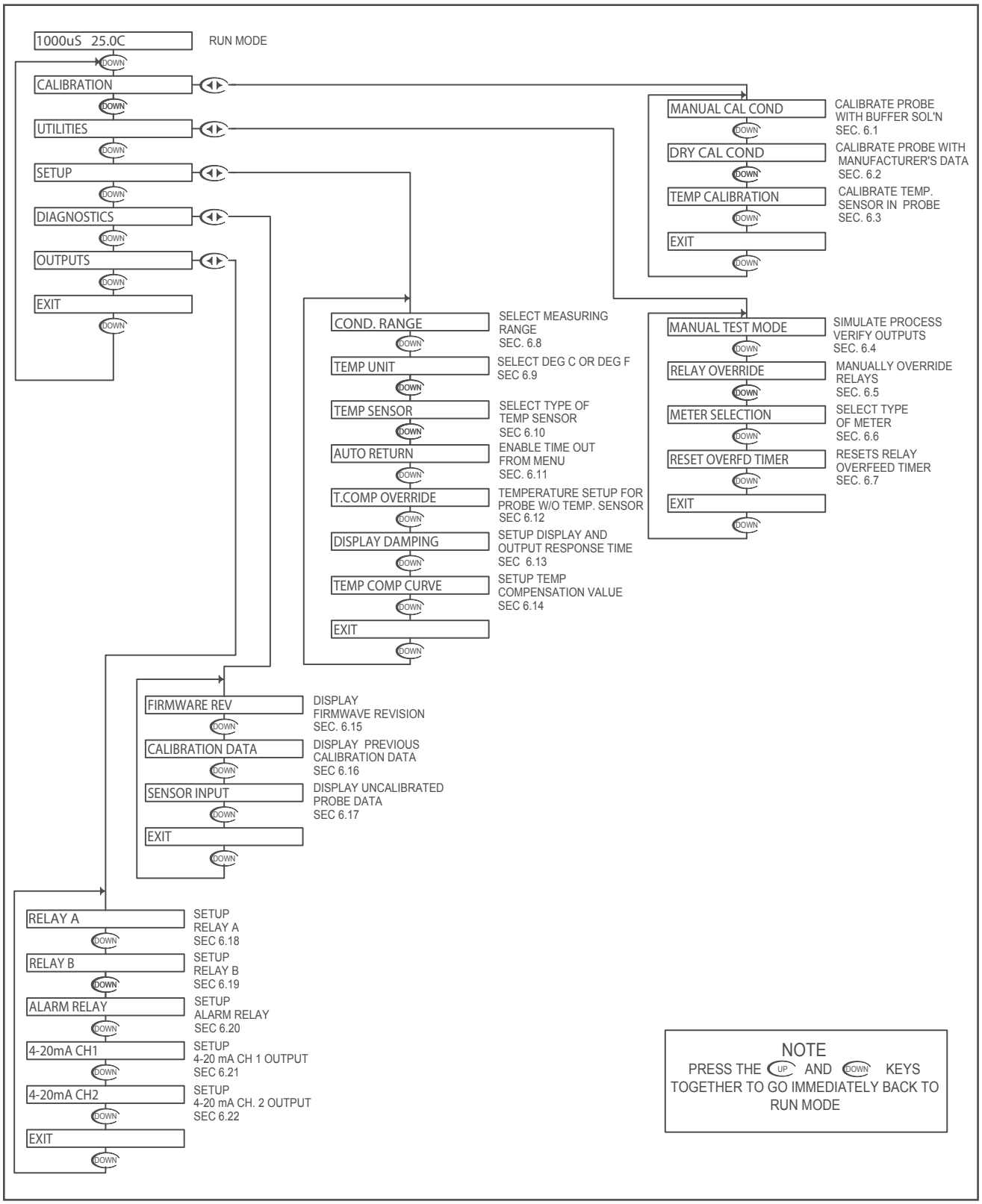
REMOVABLE TERMINAL BLOCK CONNECTORS
"SNAP-ON" CONNECTORS FOR EASY WIRING OF YOUR CONDUCTIVITY SENSORS AND PRIMARY 4-20mA OUTPUT.
(REFER TO SECTIONS 3.5, & 3.12)

2 LINE, 16 CHARACTER LCD DISPLAY
MAIN MENU INTERFACE SCREEN

SIMPLE THREE-BUTTON INTERFACE
FOR FAST & EASY SETUP
(REFER TO SECTIONS 6.0 TO 6.21)

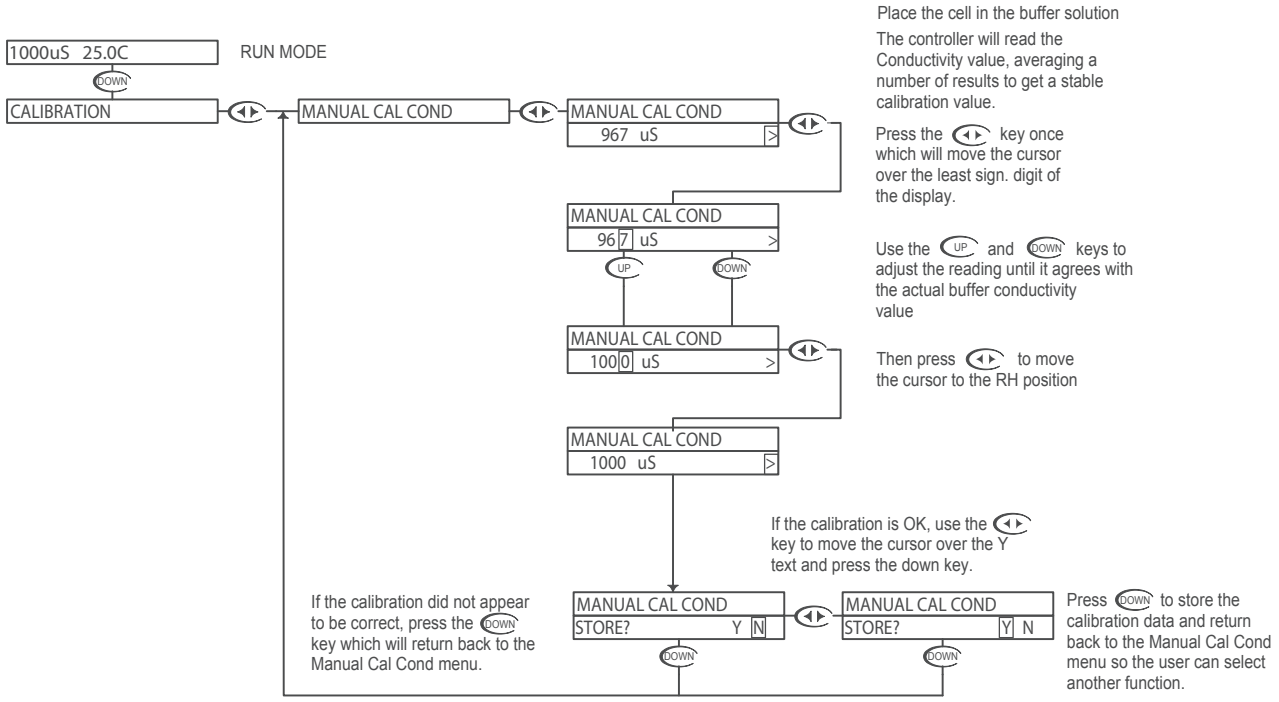
NOTE
WHEN THE SHARK IS TAKEN INTO MENU MODE VIA THE INSIDE LCD SCREEN, THE FRONT 7-SEGMENT LED WILL DISPLAY ----. THE STATUS & BAR GRAPH LED's WILL BE TURNED OFF. THE 4 PUSH BUTTONS ON THE FRONT WILL NOT RESPOND.

Conductivity - Menu Overview 6.0



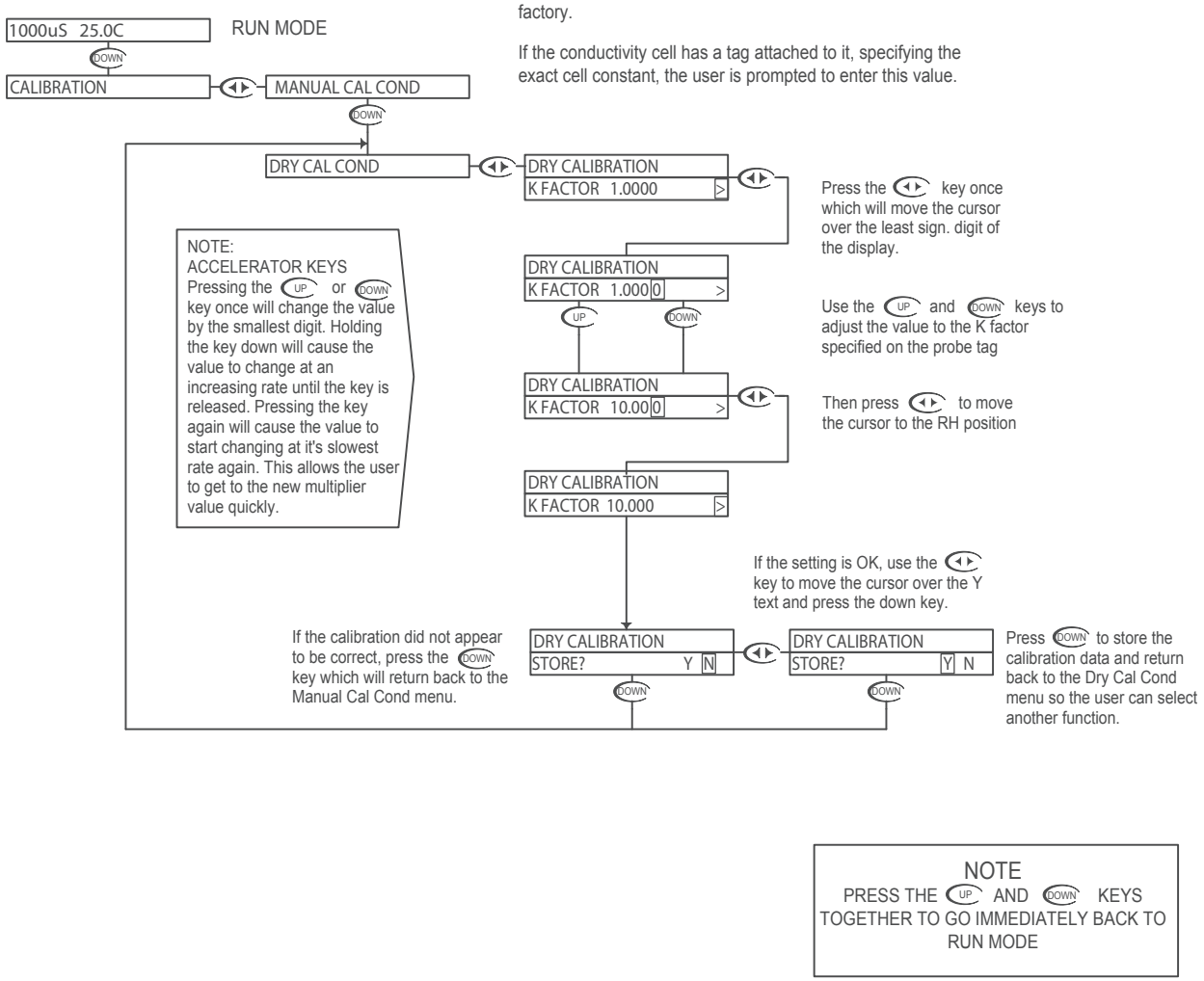
Conductivity - Calibration Menu - Manual Calibrate 6.1

Manual Calibration is used to "wet calibrate the cell". This can be done with the cell installed in the process, or with the cell suspended in a known buffer solution.
When calibrated "In Process", the actual conductivity is determined with a grab sample or a hand held meter, and the value entered in the display.
When calibrated with buffers, the cell is placed in a known buffer solution, and the value of the buffer entered on the display.
In both cases, make sure the cell has time to stabilize both in temperature and conductivity before entering any data.



NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

Conductivity - Calibration Menu - Dry Cal Cond 6.2



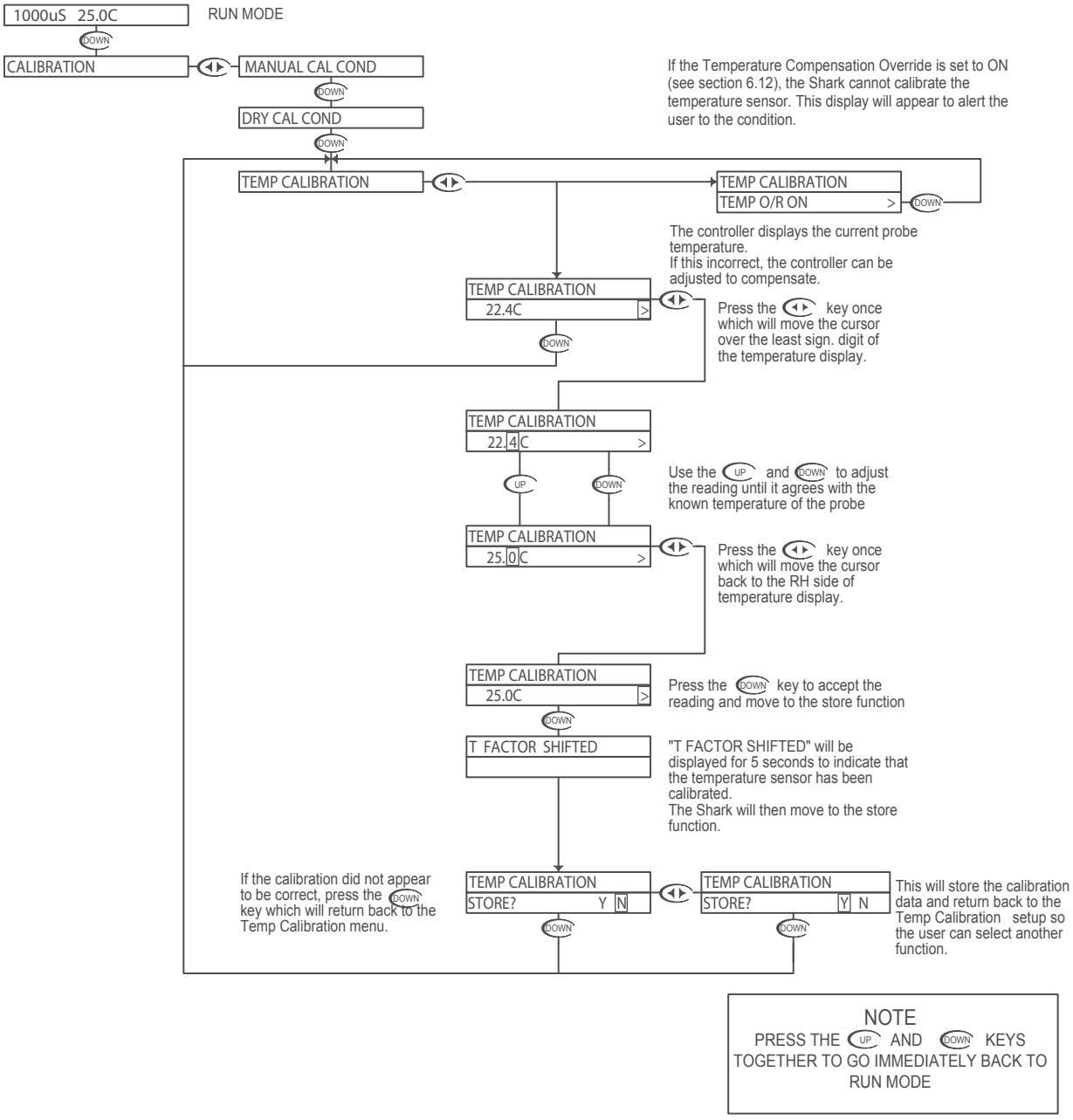
Conductivity - Calibration Menu - Temp. Calibration 6.3

Temperature Calibration

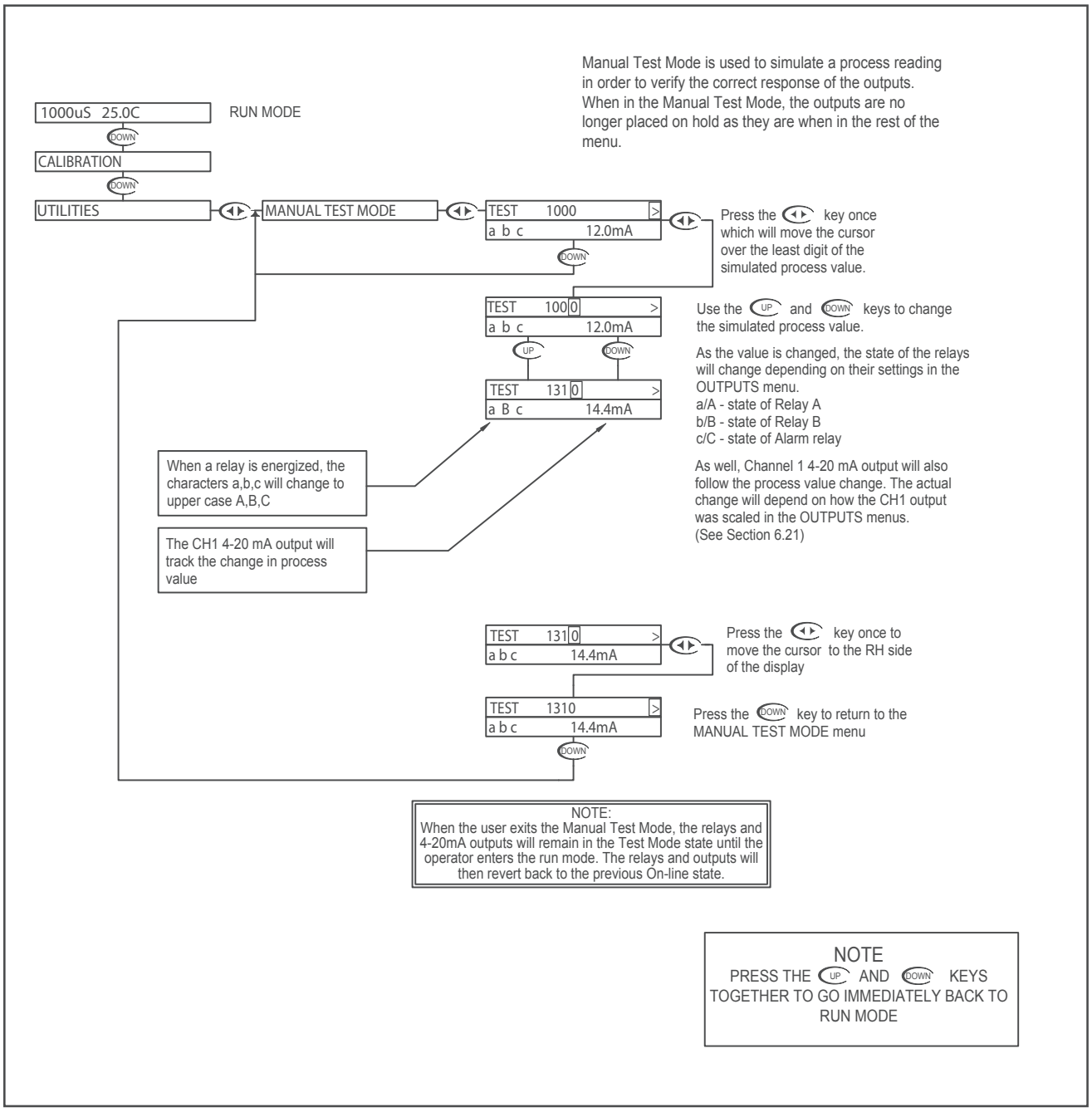
In most cases, the factor temperature calibration is accurate enough to ensure correct temperature readings. However, in some circumstances, the user may wish to ensure the temperature sensor is calibrated accurately, especially when operating at the extreme end of the conductivity cell temperature operating range, or where the temperature compensation is critical to correct process readings.
This menu allows to user to calibrate the temperature anywhere within it's range.

Be aware, that the conductivity reading is affected by the temperature reading (due to the temperature compensation) so accurate temperature calibration is vital to obtaining accurate conductivity readings. If the user is unsure of the calibration test fixture, then it would be best to leave the temperature calibration at it's factory setting.

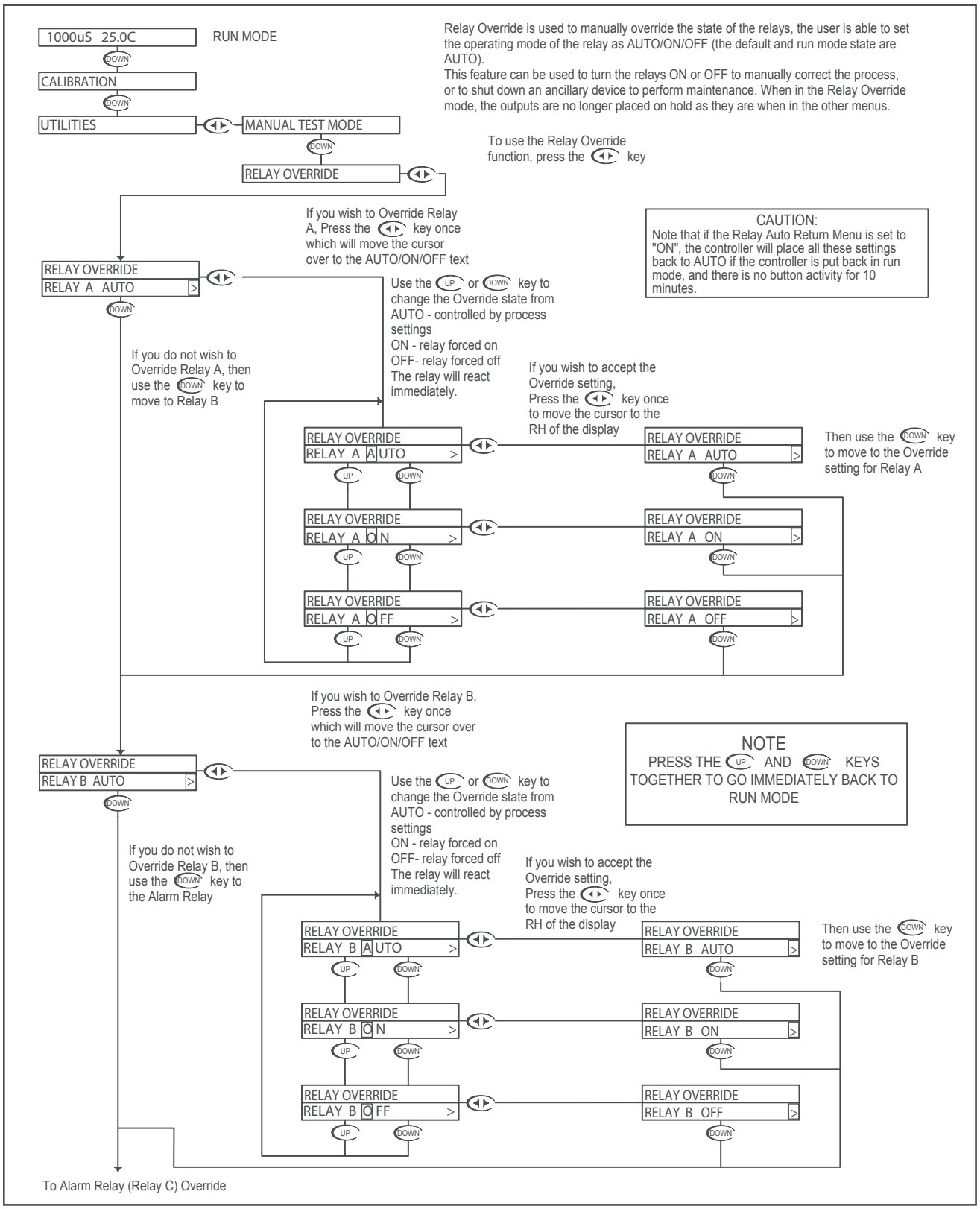
Be sure to allow the temperature of the cell to stabilize before attempting to calibrate the temperature sensor, this may take a significant amount of time as the sensor is buried behind a protective layer of epoxy which will cause some delay.



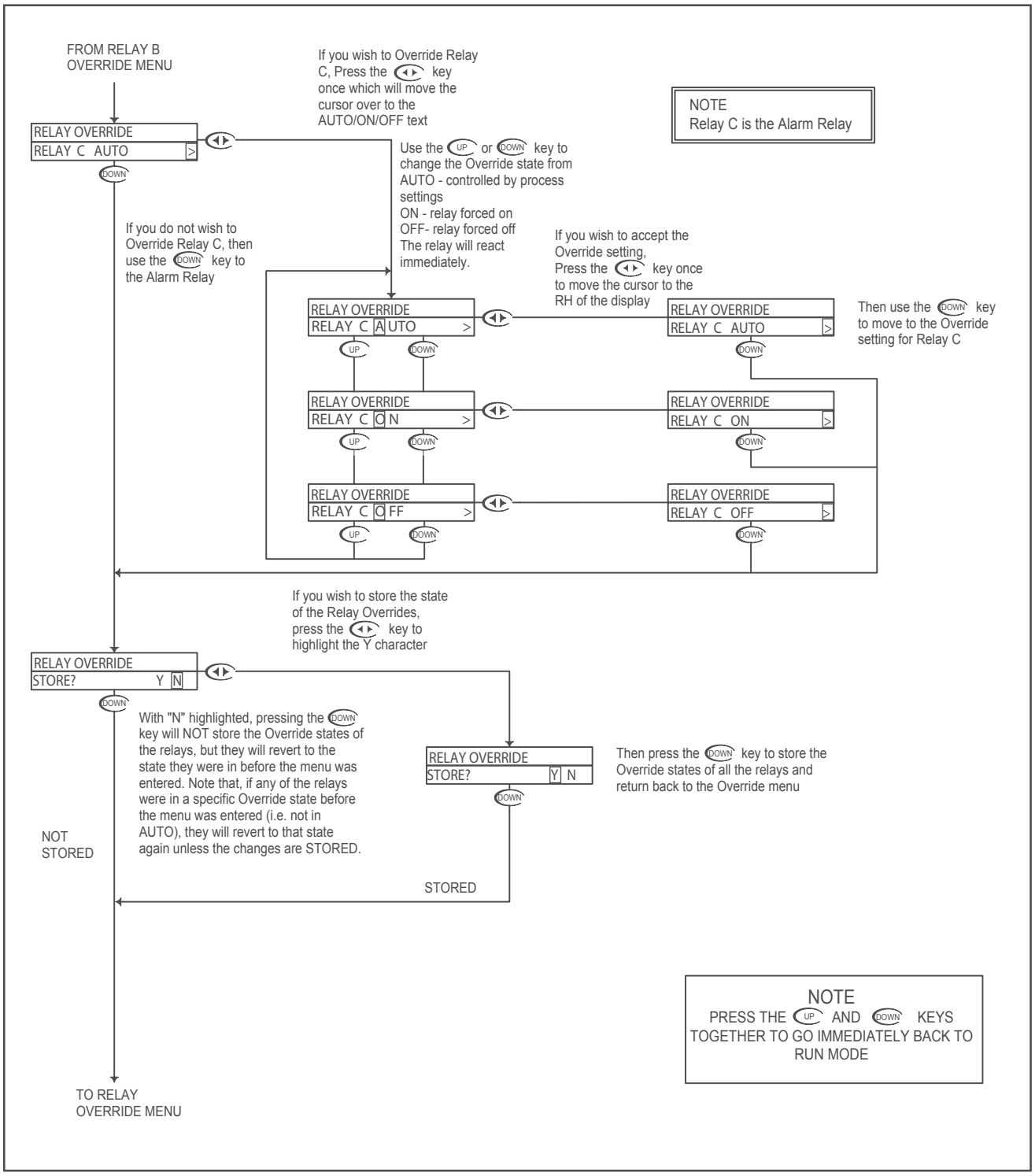
Conductivity - Utilities Menu - Manual Test Mode 6.4



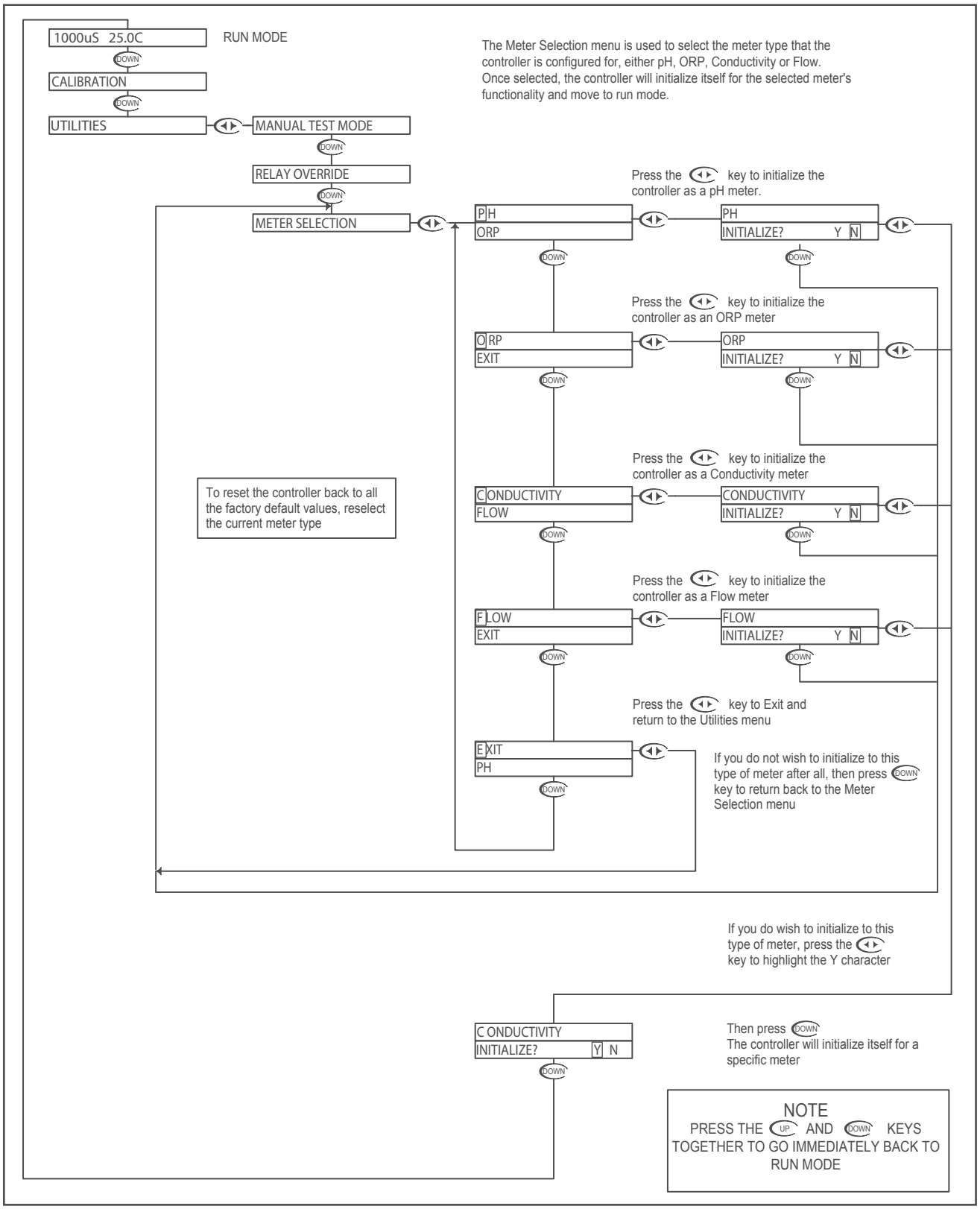
Conductivity - Utilities Menu - Relay Override 6.5



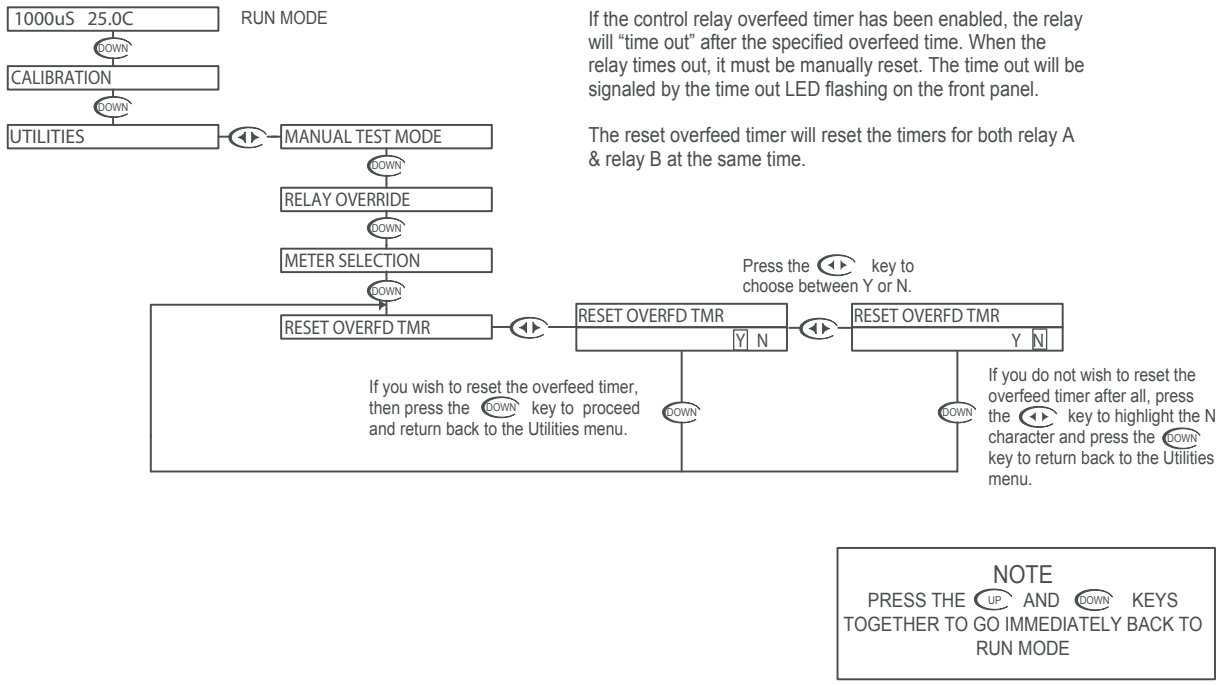
Conductivity - Utilities Menu - Relay Override 6.5



Conductivity - Utilities Menu - Meter Selection 6.6



Conductivity - Utilities Menu - Overfeed Timer Reset 6.7

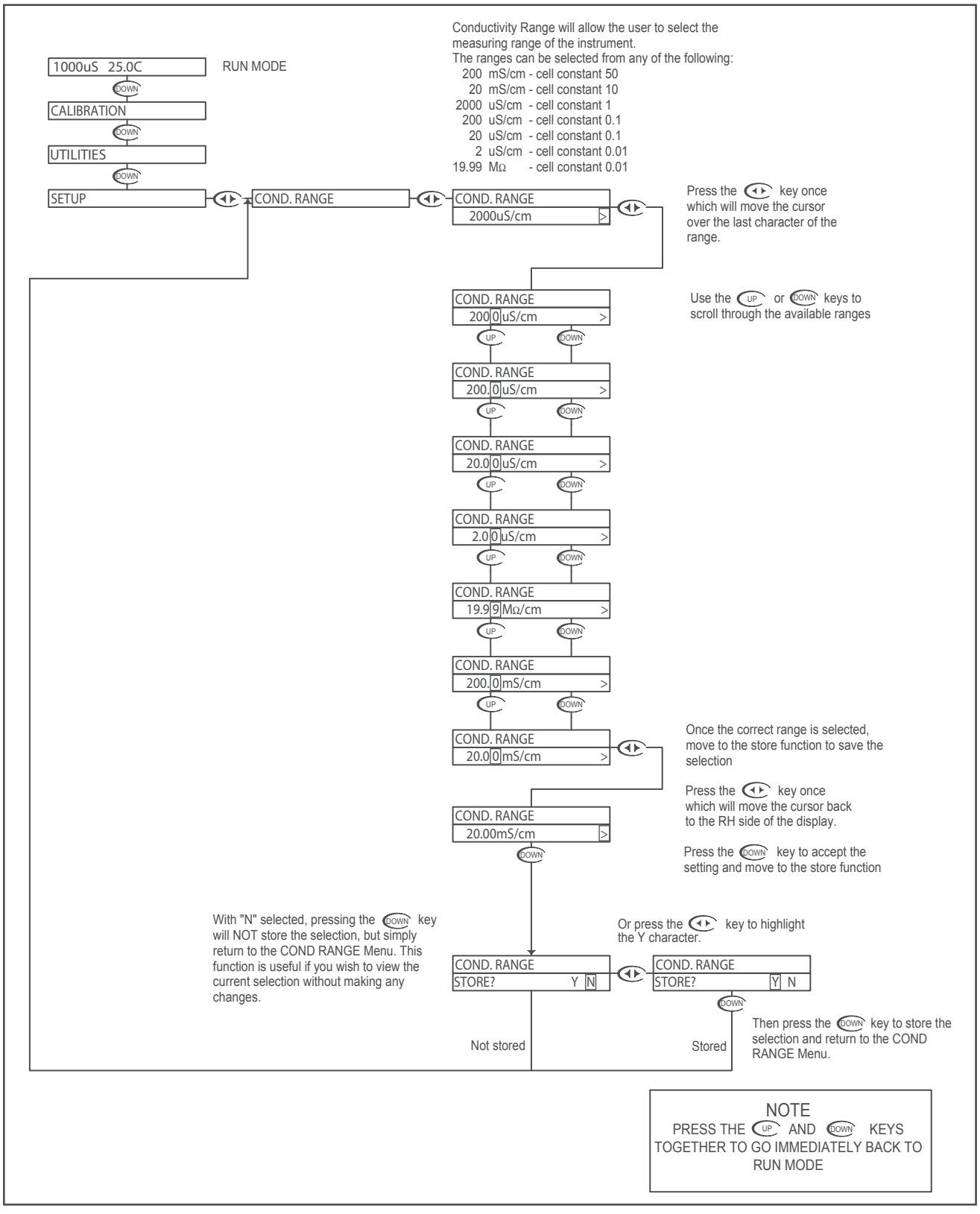


If the control relay overfeed timer has been enabled, the relay will "time out" after the specified overfeed time. When the relay times out, it must be manually reset. The time out will be signaled by the time out LED flashing on the front panel.

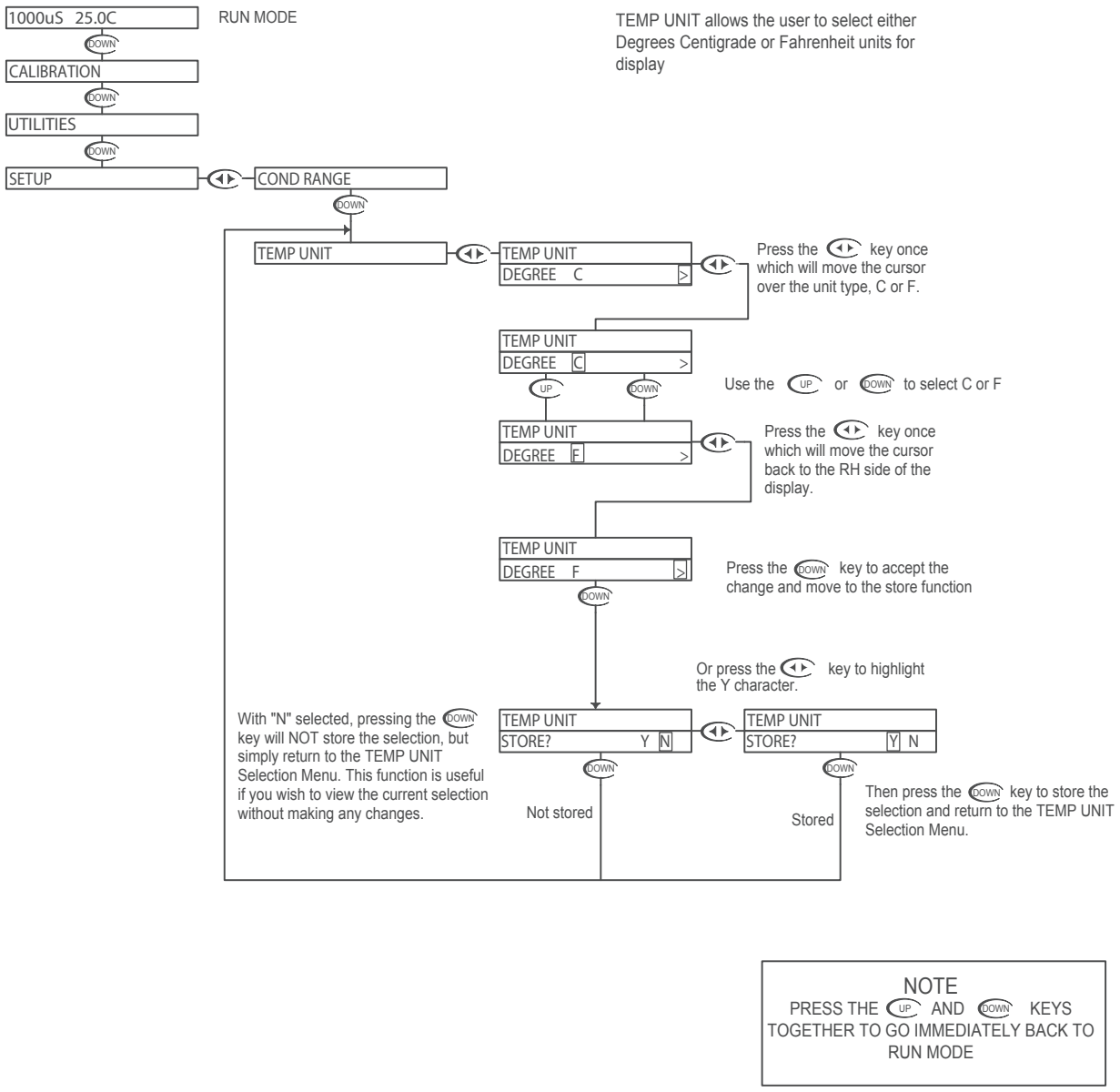
The reset overfeed timer will reset the timers for both relay A & relay B at the same time.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

Conductivity - Setup Menu - Conductivity Range 6.8



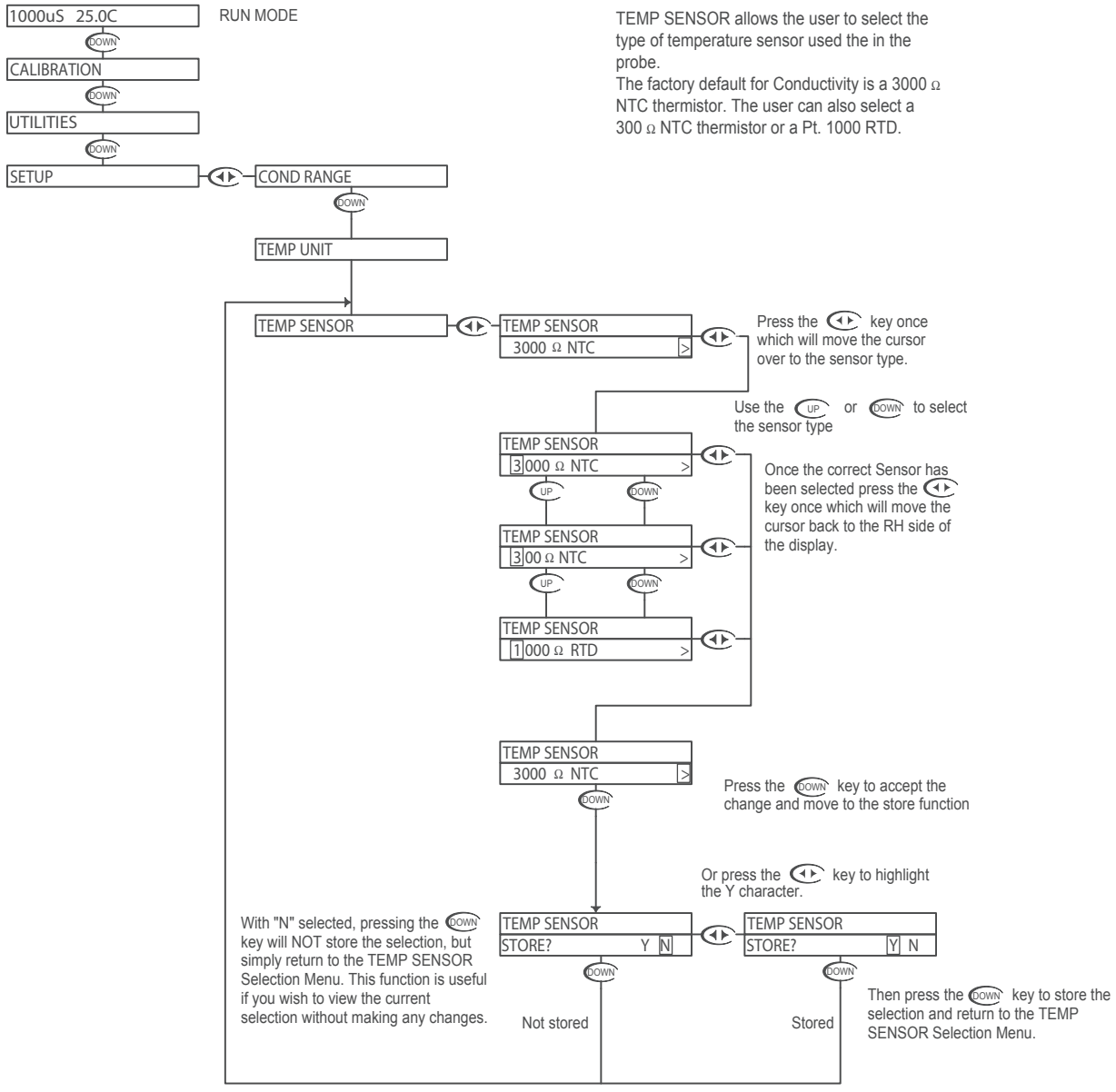
Conductivity - Setup Menu - Temp. Unit 6.9



TEMP UNIT allows the user to select either Degrees Centigrade or Fahrenheit units for display

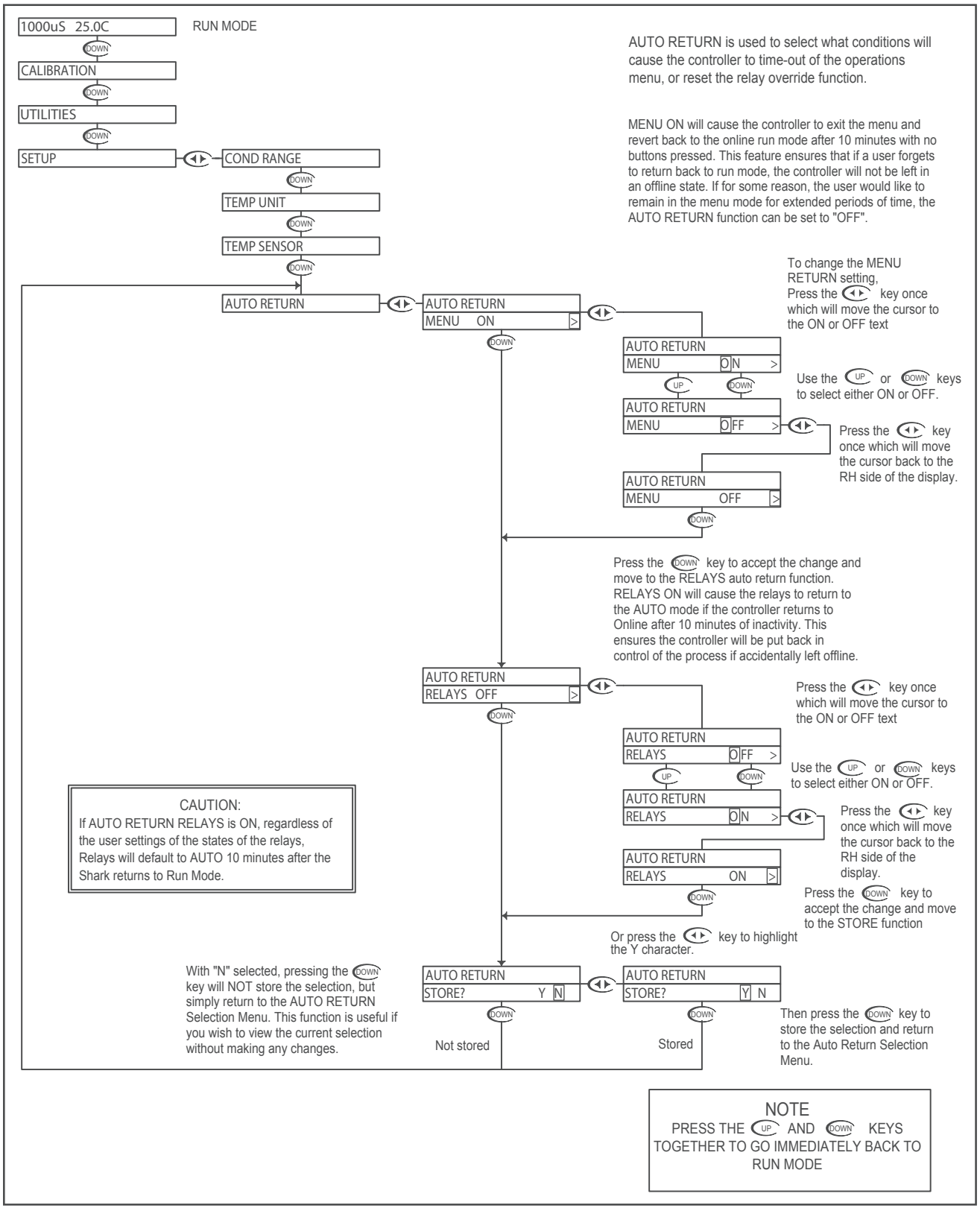
NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

Conductivity - Setup Menu - Temp. Sensor 6.10

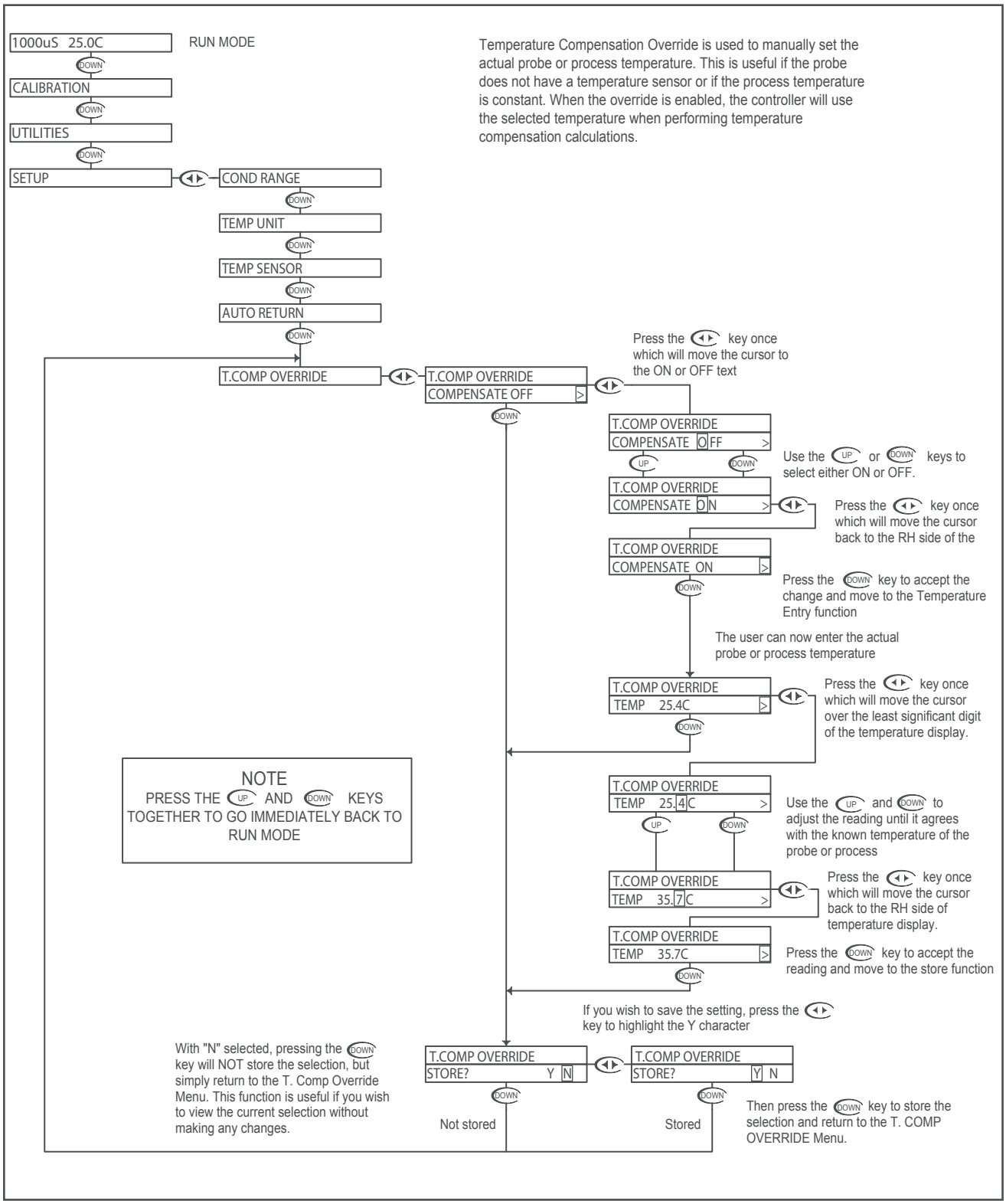


NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

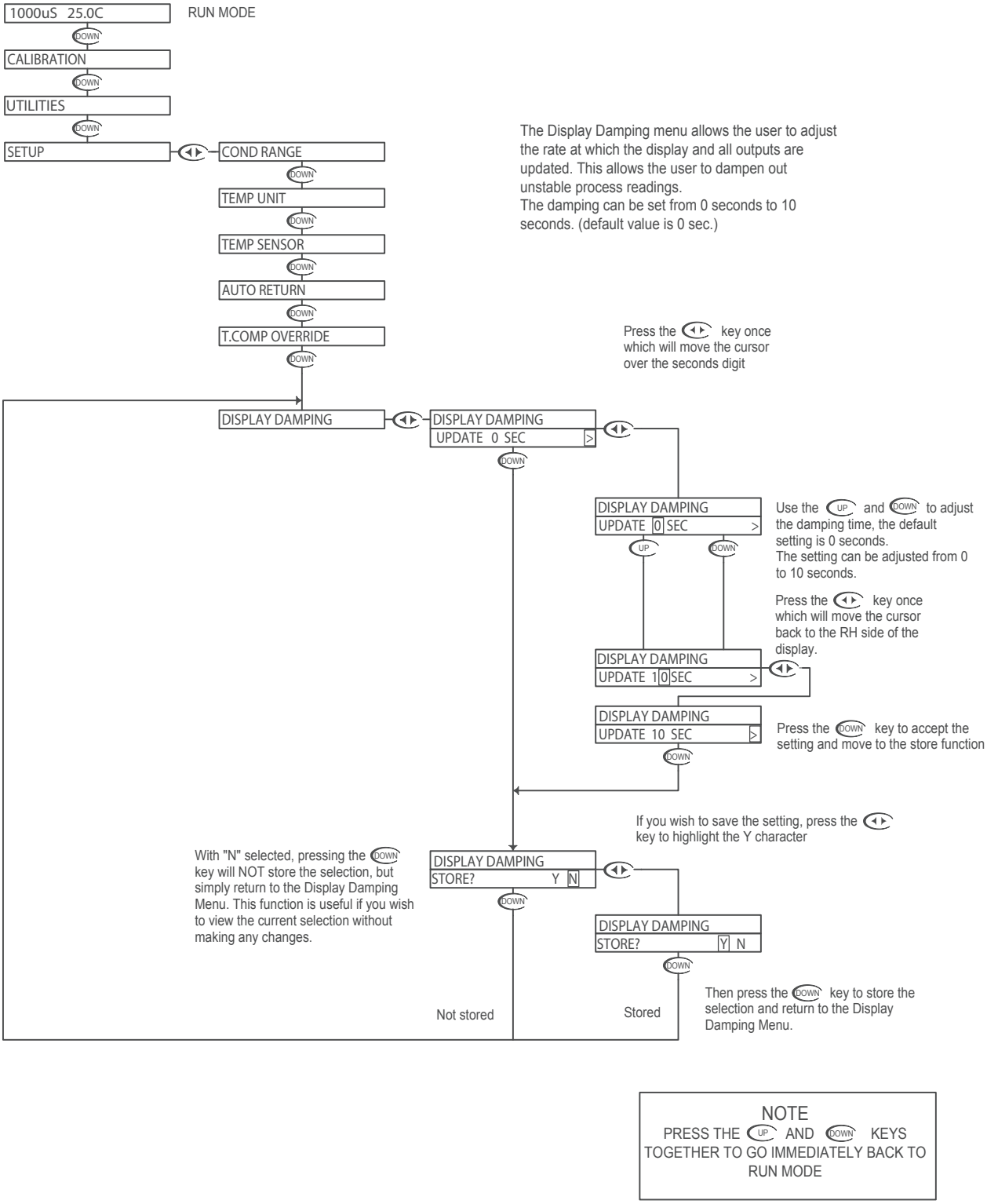
Conductivity - Setup Menu - Auto Return 6.11



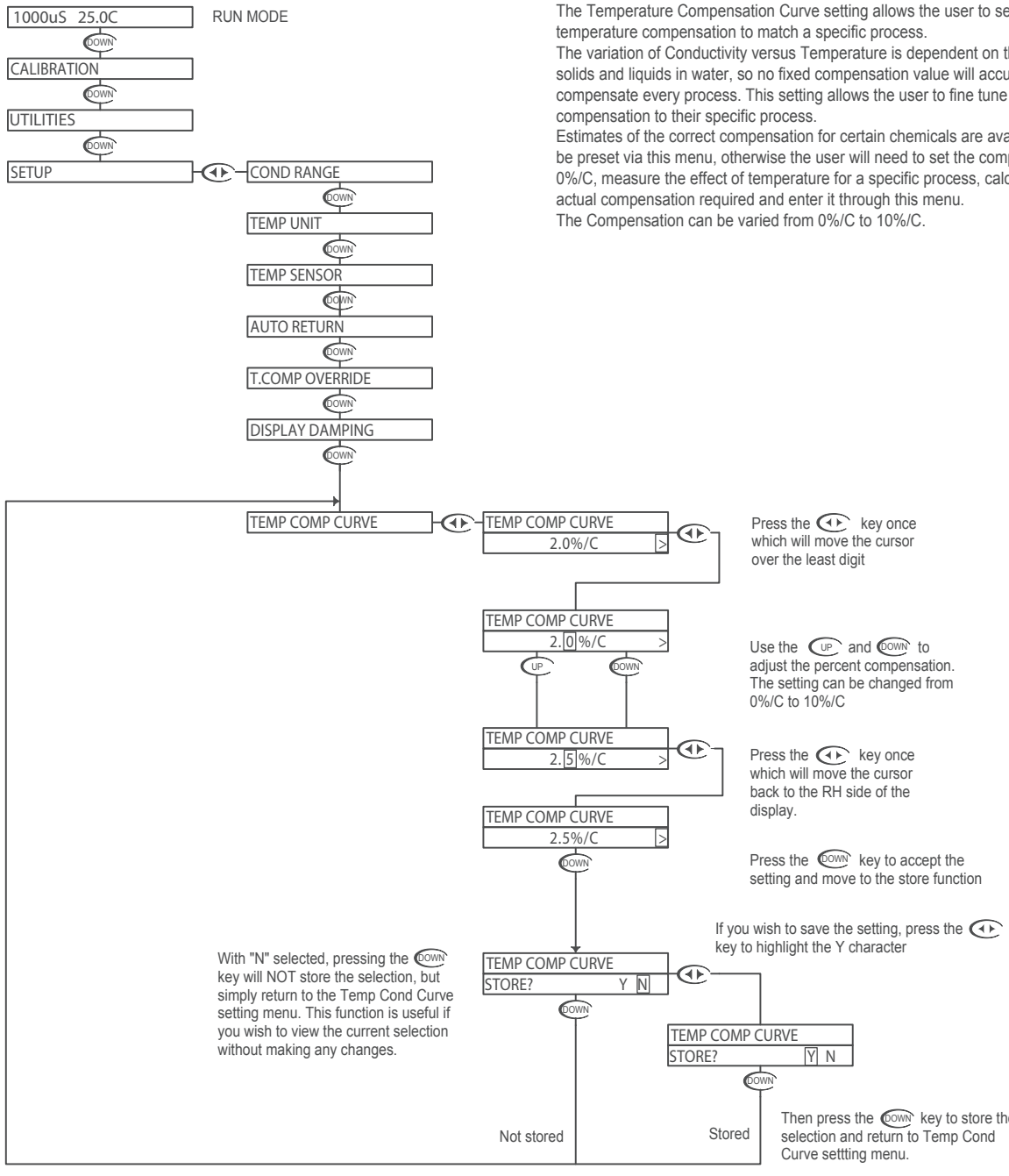
Conductivity - Setup Menu - T. Comp Override 6.12



Conductivity - Setup Menu - Display Damping 6.13



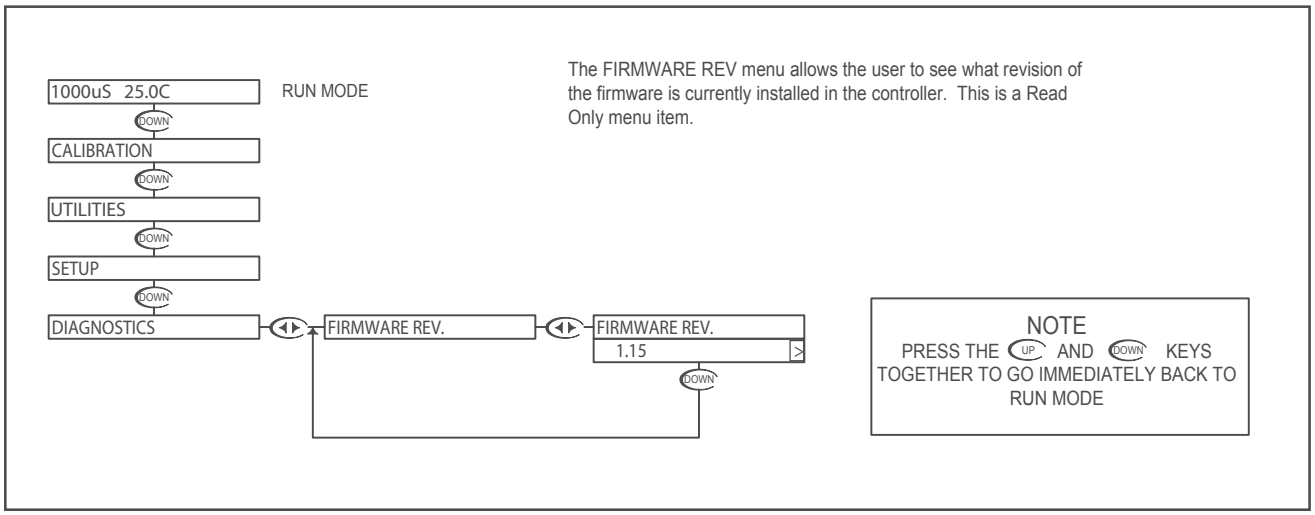
Conductivity - Setup Menu - Temp. Comp. Curve 6.14



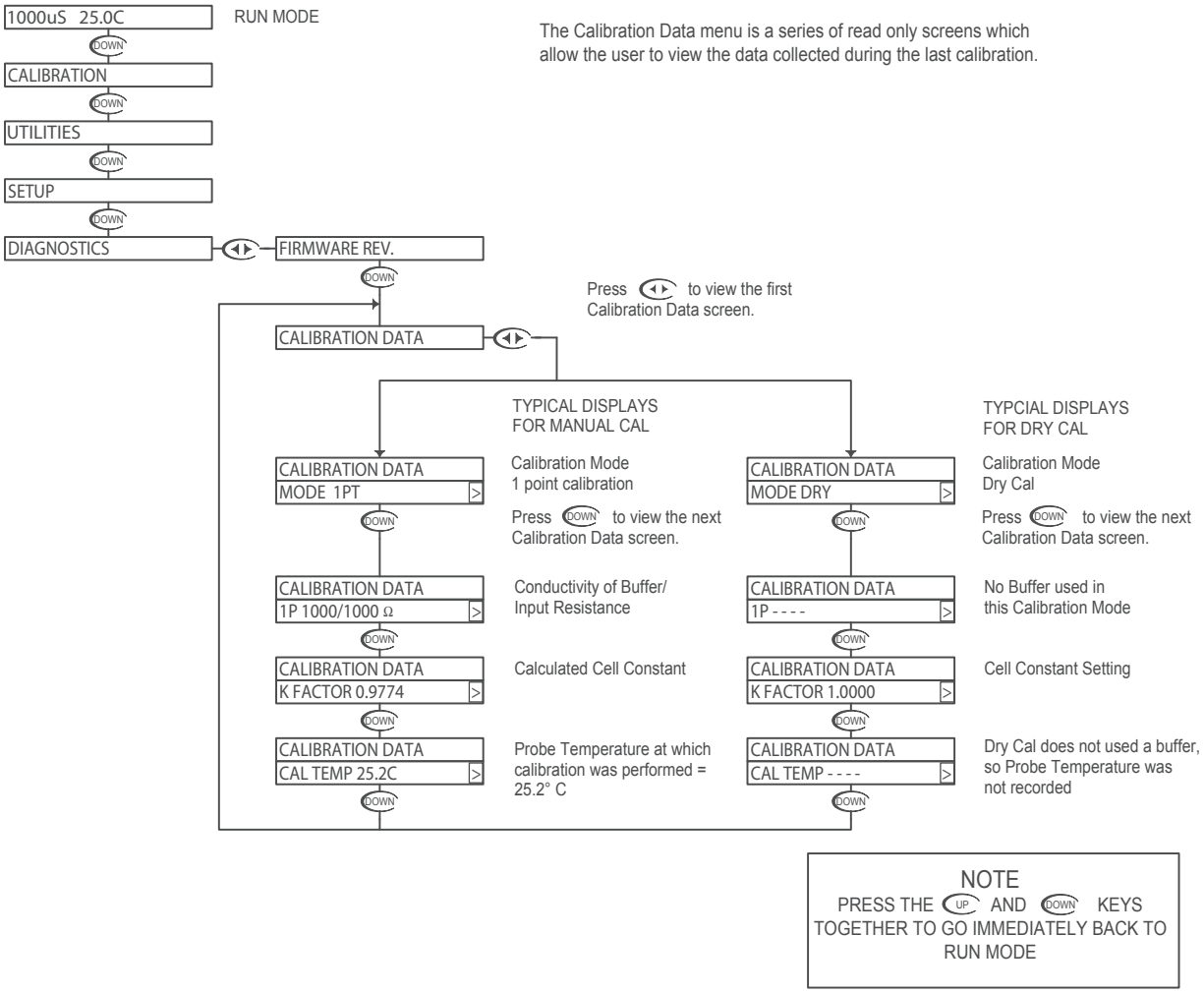
The Temperature Compensation Curve setting allows the user to select the temperature compensation to match a specific process.
The variation of Conductivity versus Temperature is dependent on the type of solids and liquids in water, so no fixed compensation value will accuratly compensate every process. This setting allows the user to fine tune the compensation to their specific process.
Estimates of the correct compensation for certain chemicals are available and can be preset via this menu, otherwise the user will need to set the compensation to 0%/C, measure the effect of temperature for a specific process, calculate the actual compensation required and enter it through this menu.
The Compensation can be varied from 0%/C to 10%/C.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

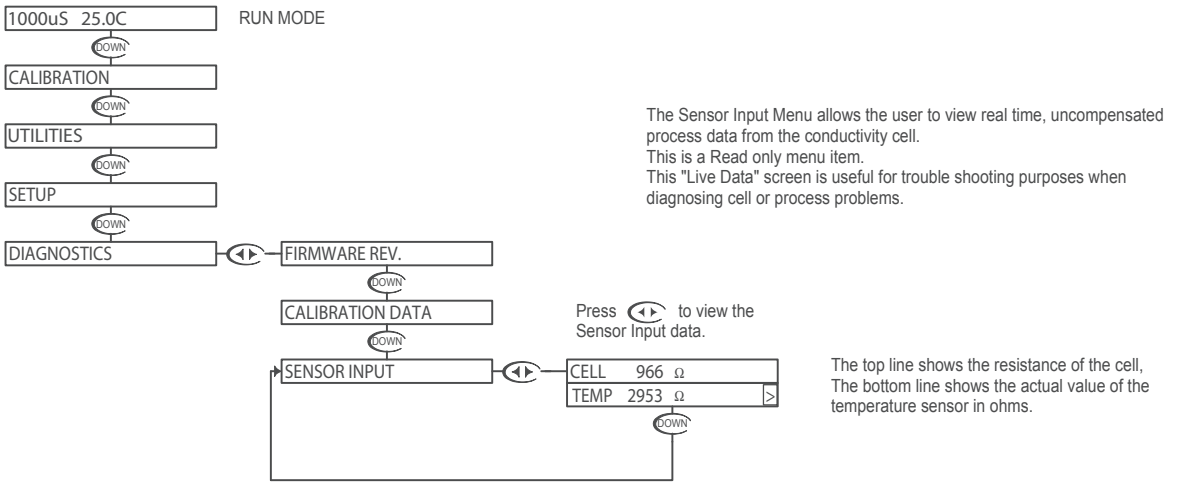
Conductivity - Diagnostics Menu - Firmware Rev. 6.15



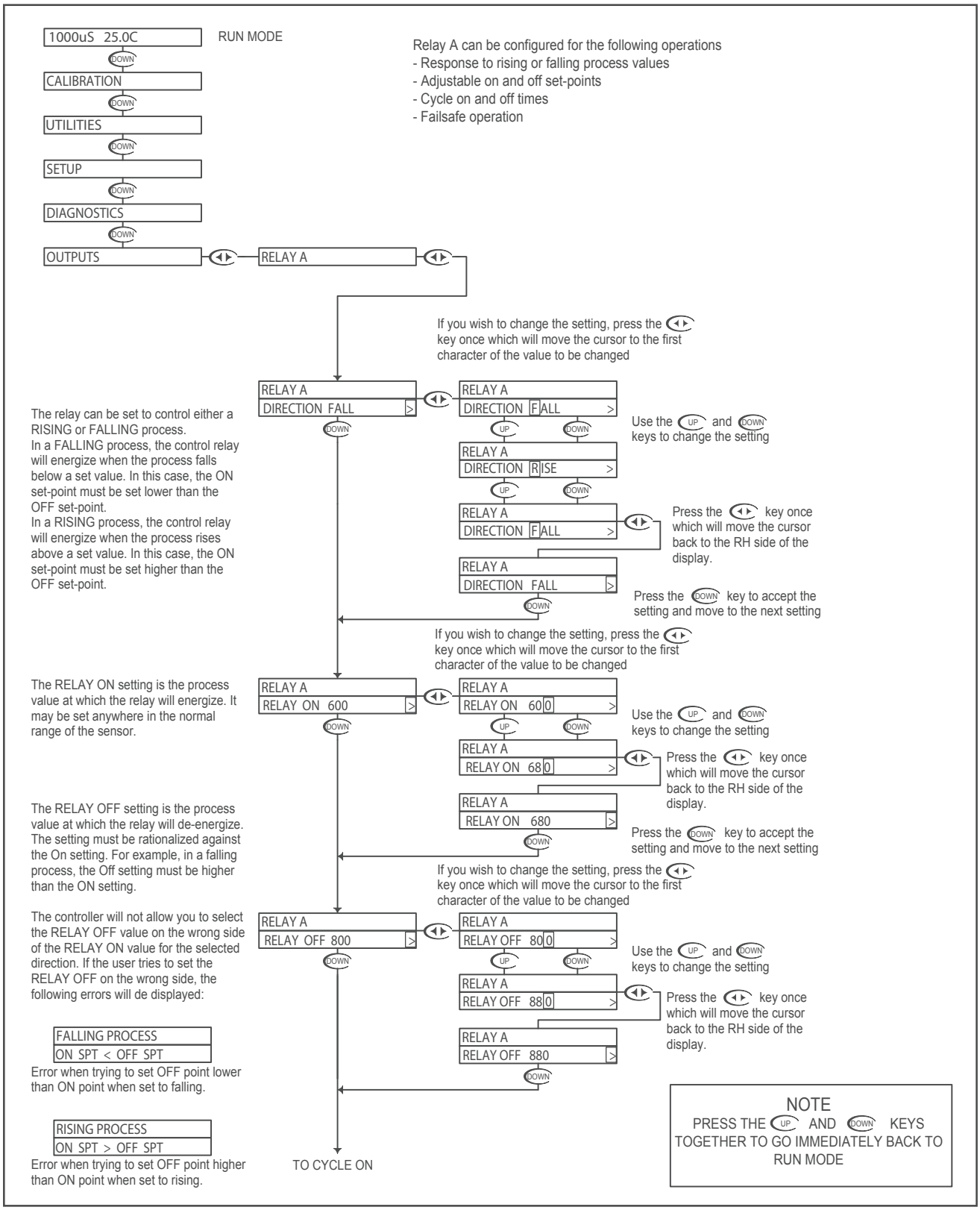
Conductivity - Diagnostics Menu - Calibration Data 6.16



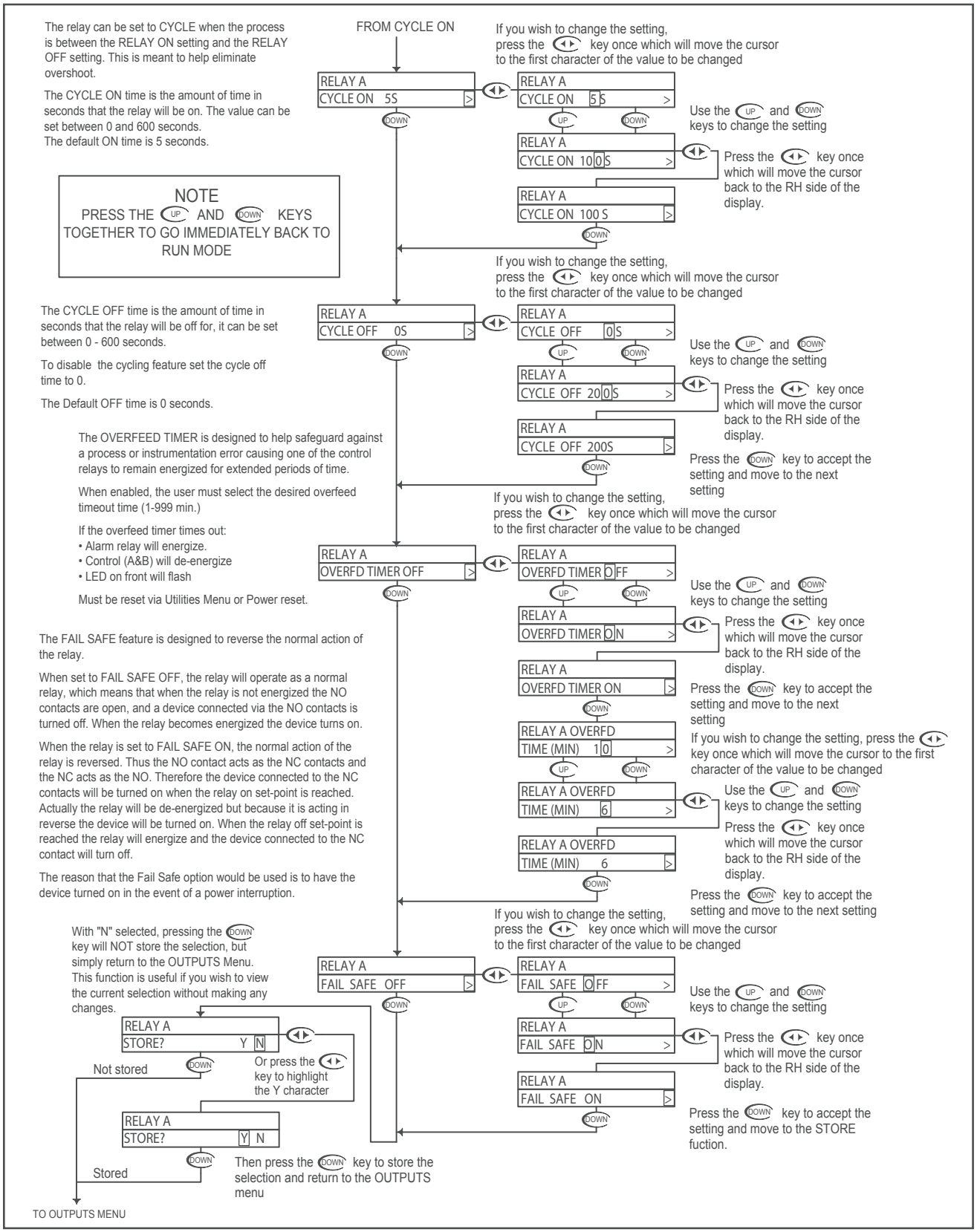
Conductivity - Diagnostics Menu - Sensor Input 6.17



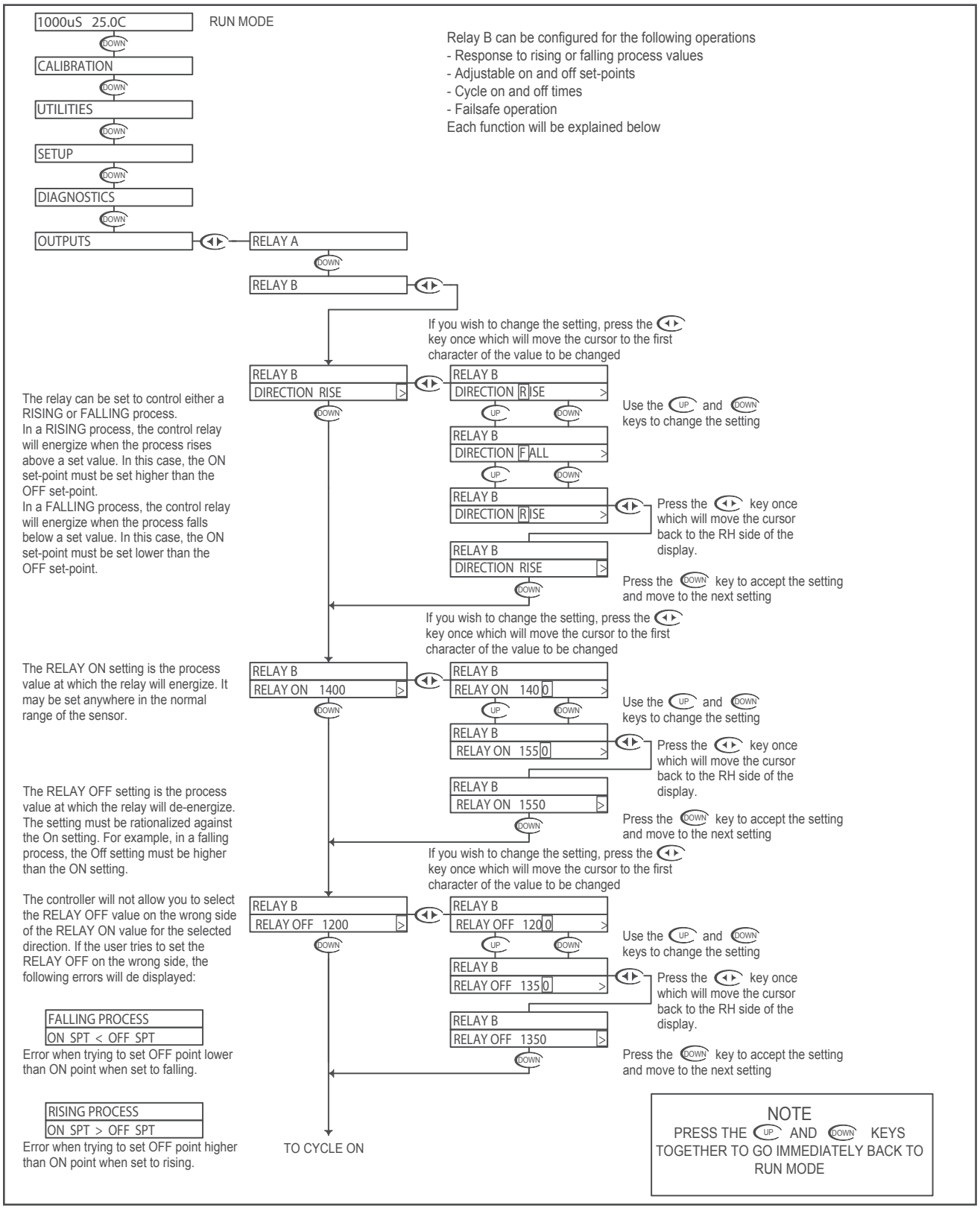
Conductivity - Outputs Menu - Relay A 6.18



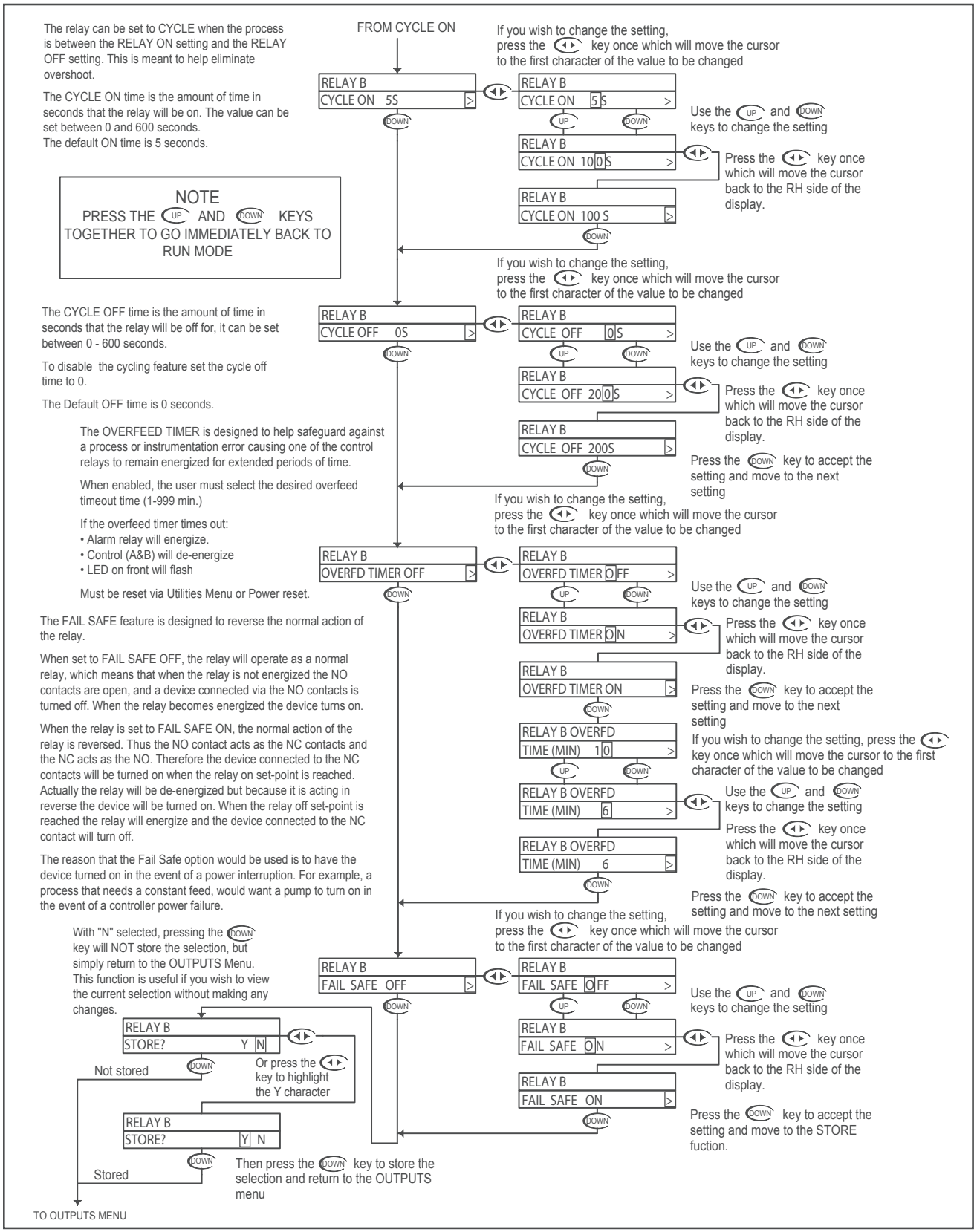
Conductivity - Outputs Menu - Relay A 6.18



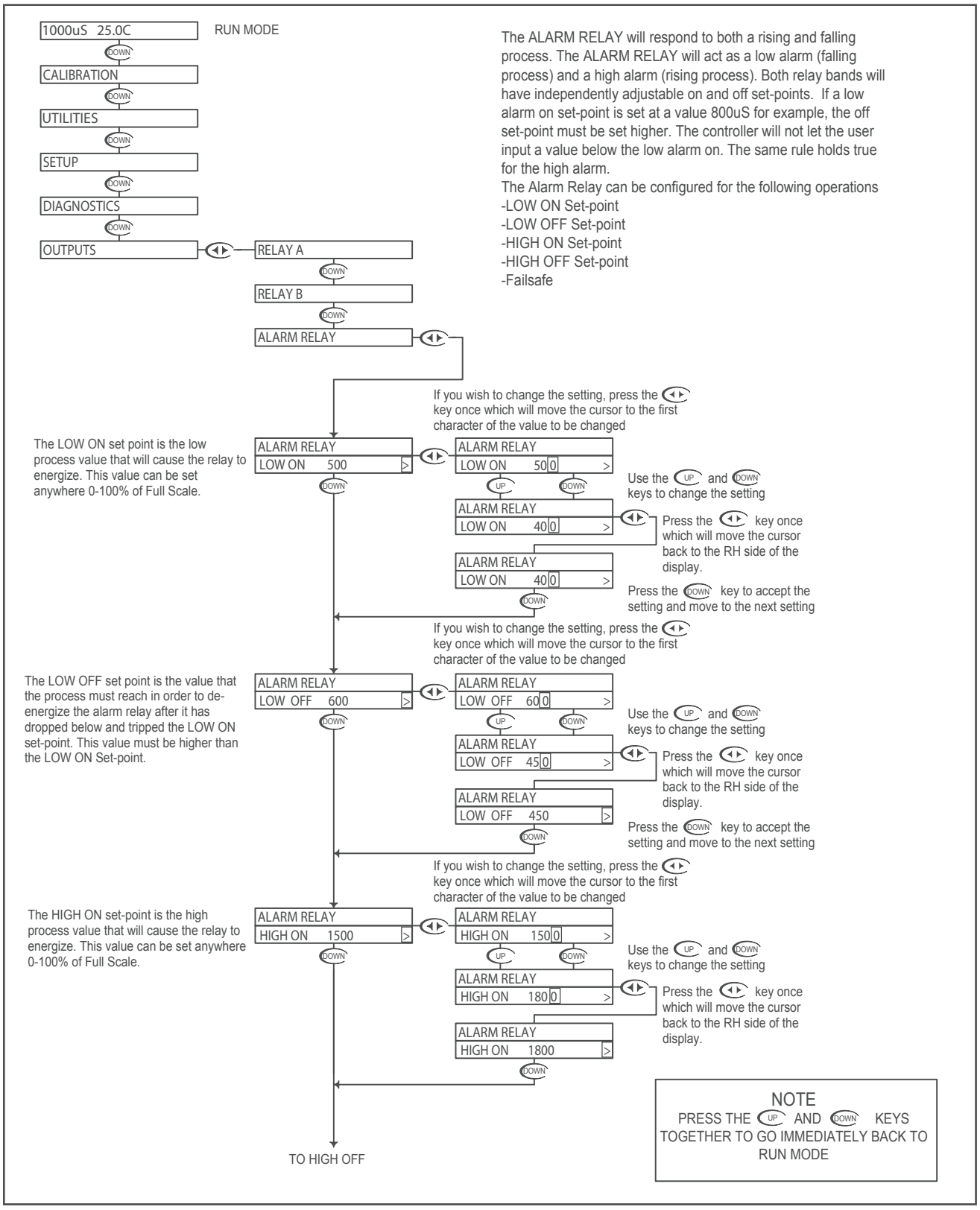
Conductivity - Outputs Menu - Relay B 6.19



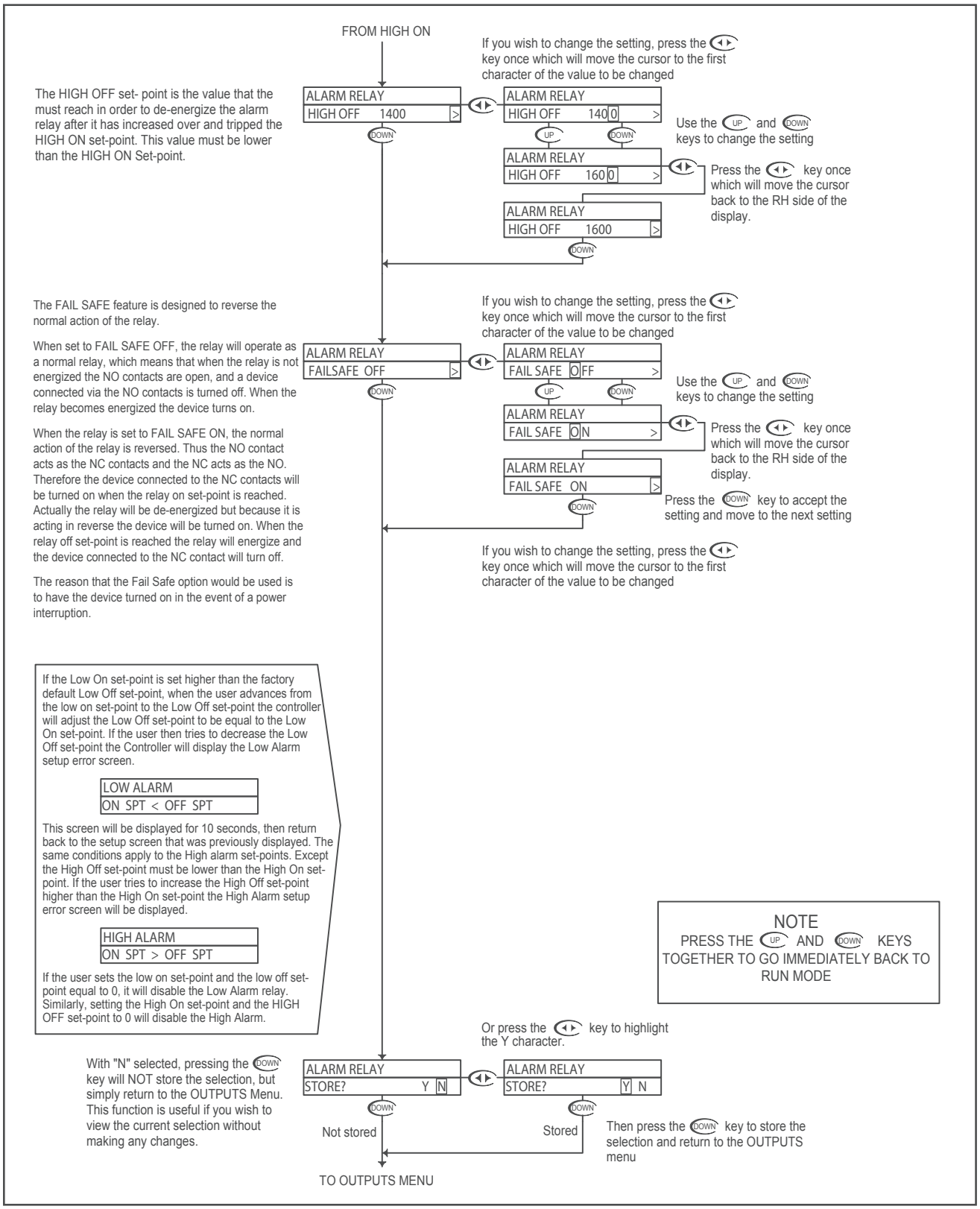
Conductivity - Outputs Menu - Relay B 6.19



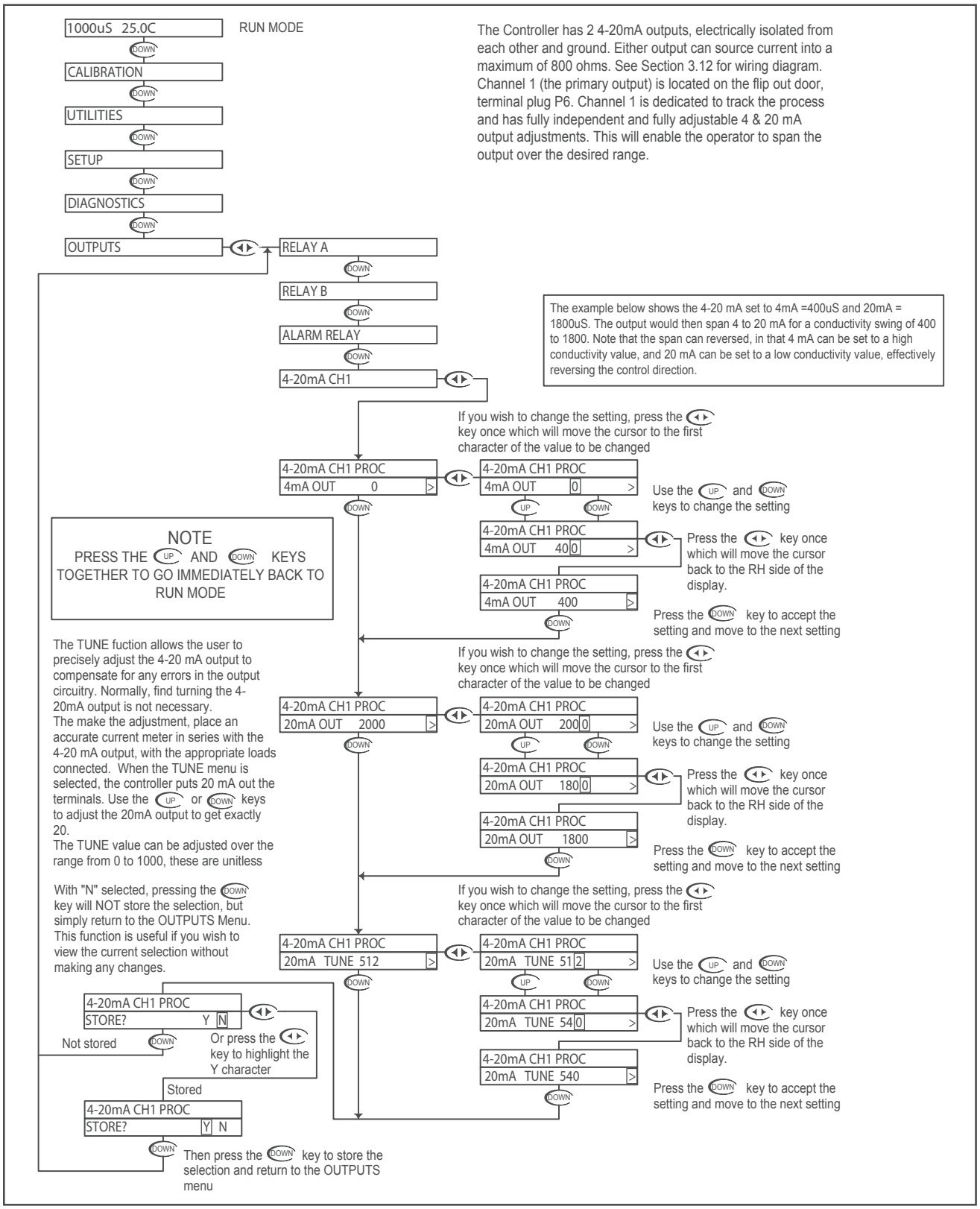
Conductivity - Outputs Menu - Alarm Relay 6.20



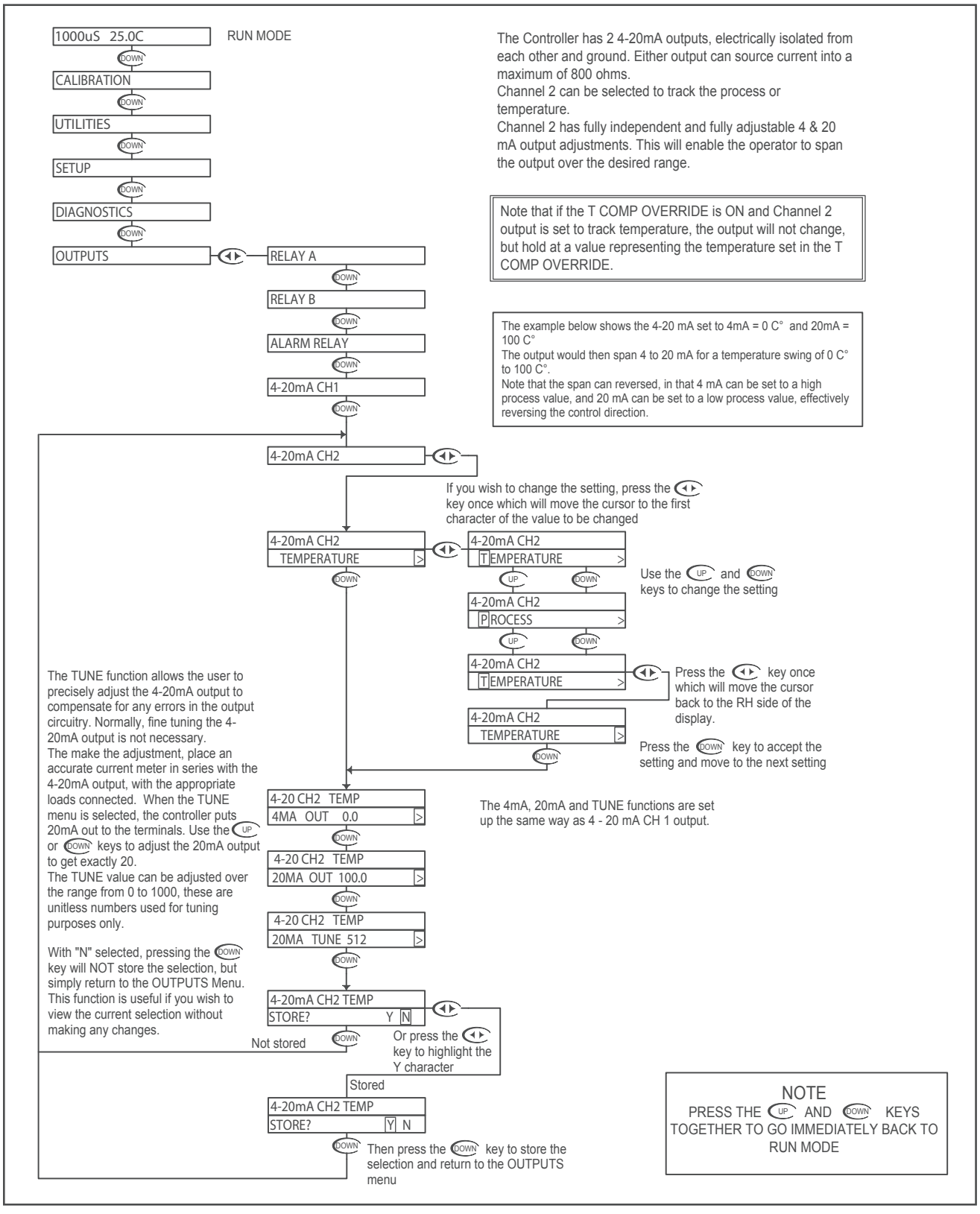
Conductivity - Outputs Menu - Alarm Relay 6.20



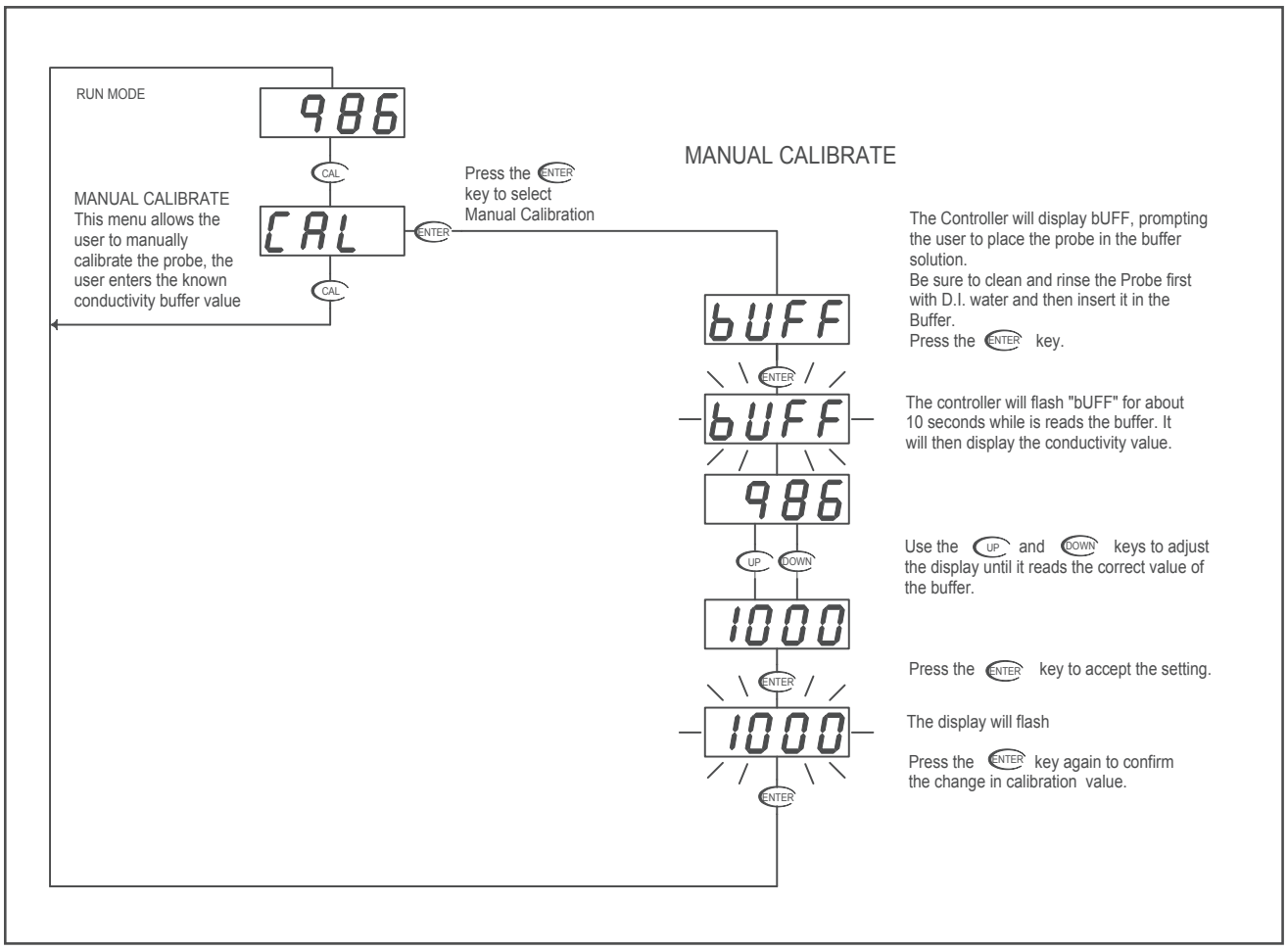
Conductivity - Outputs Menu - 4-20mA CH1 Output 6.21



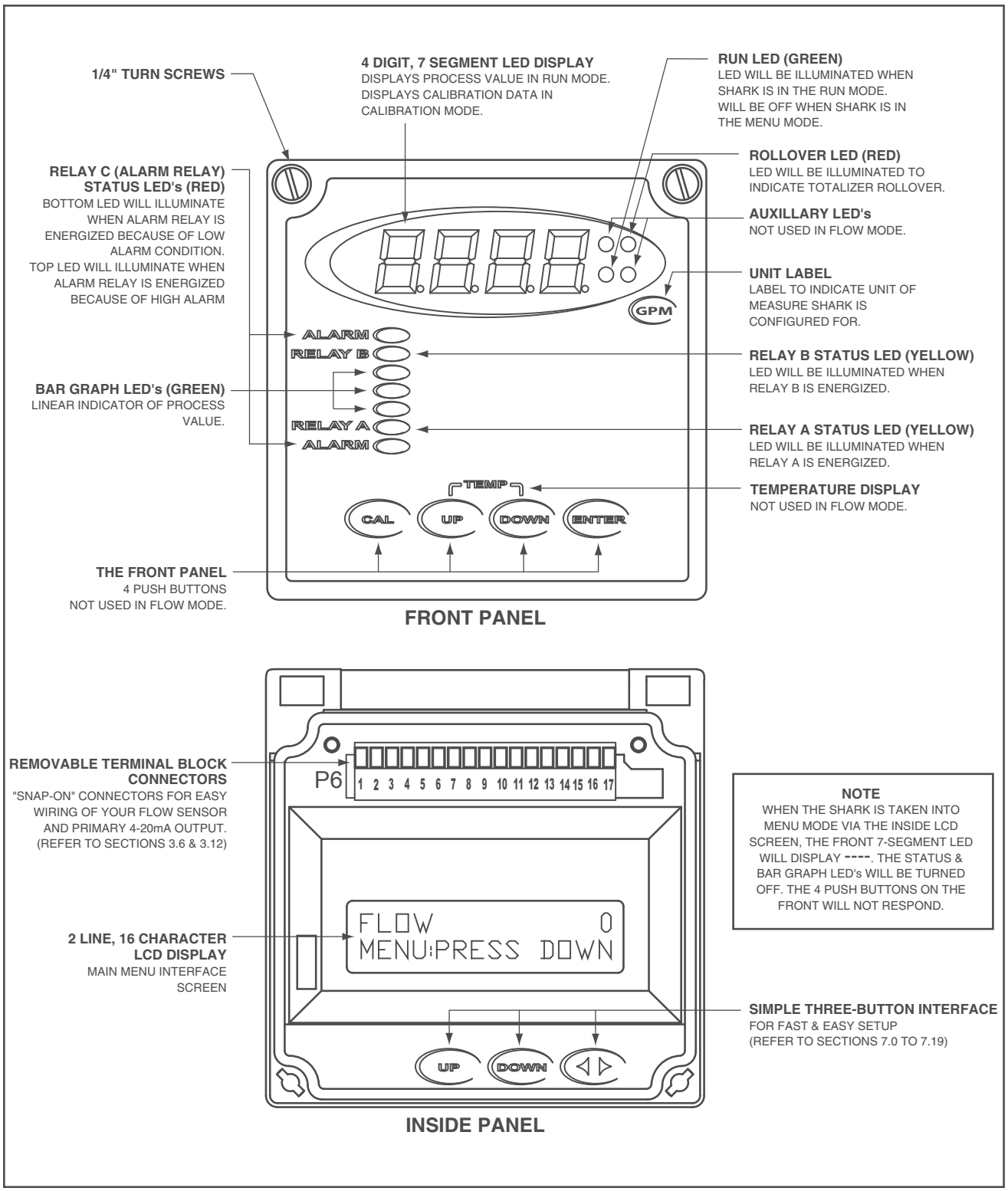
Conductivity - Outputs Menu - 4-20mA CH2 Output 6.22



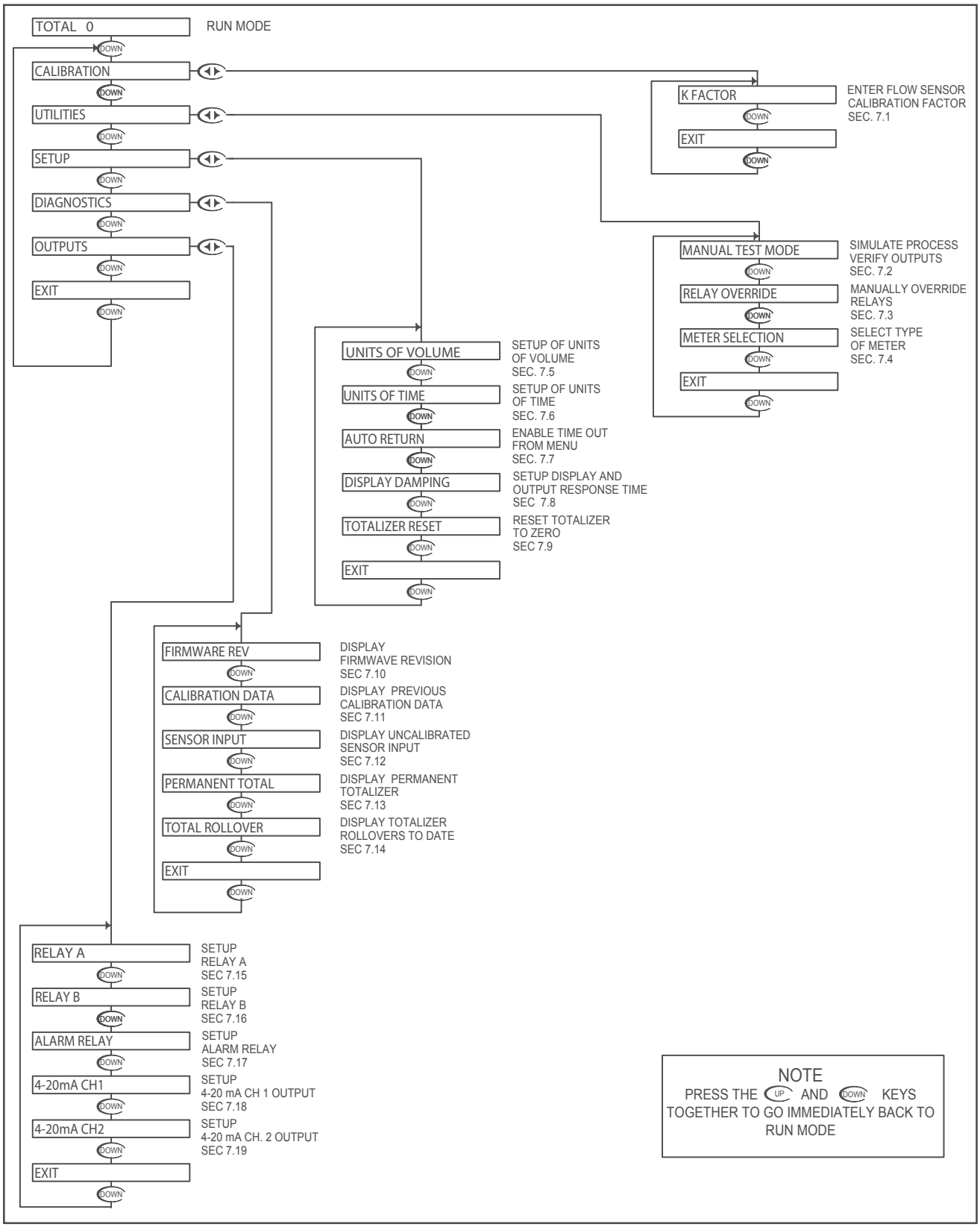
Conductivity - LED Display Menu - Conductivity Manual Calibrate 6.23



Section 7 - Using the SHARK in Flow Mode

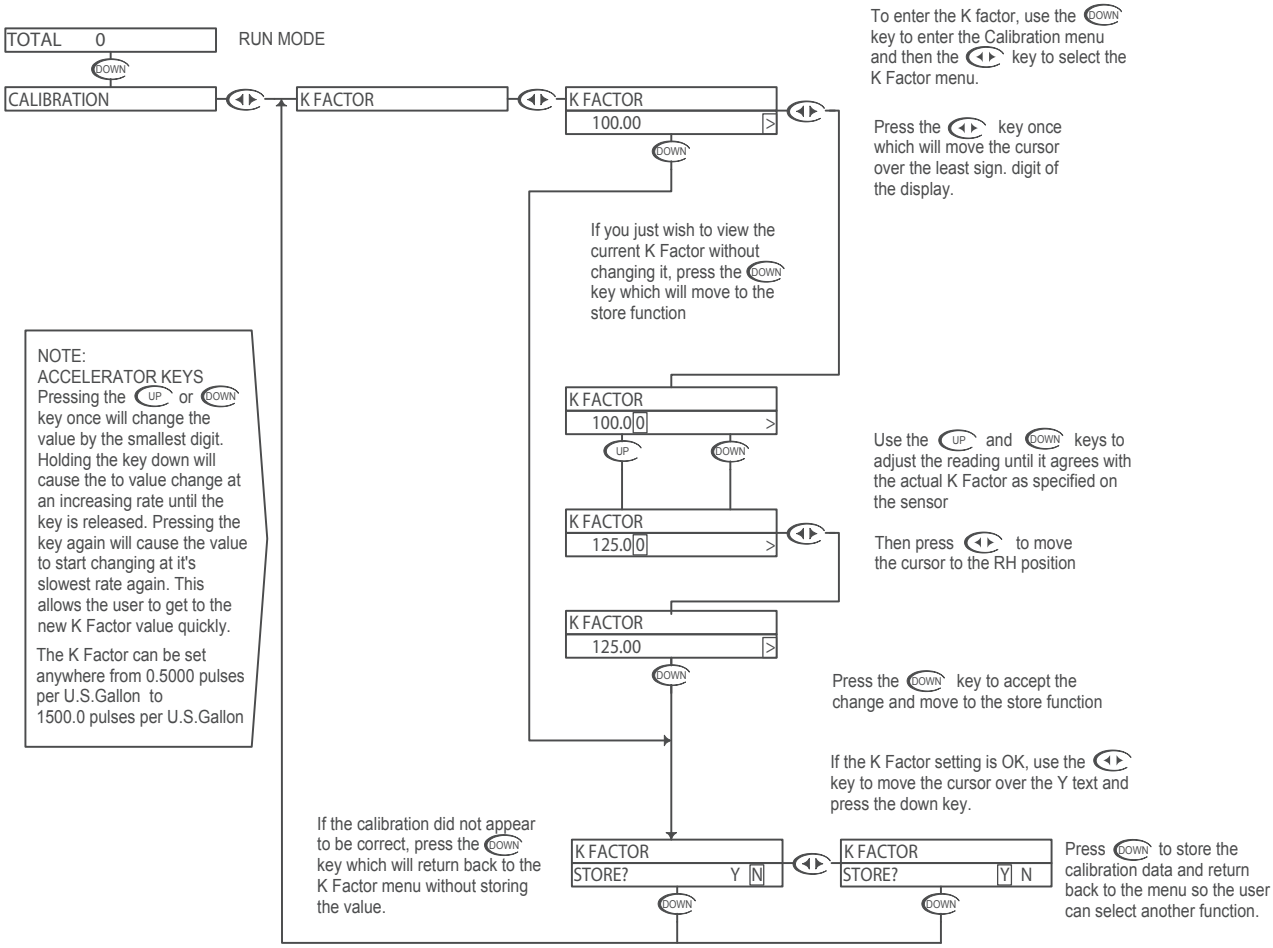


Flow - Menu Overview 7.0



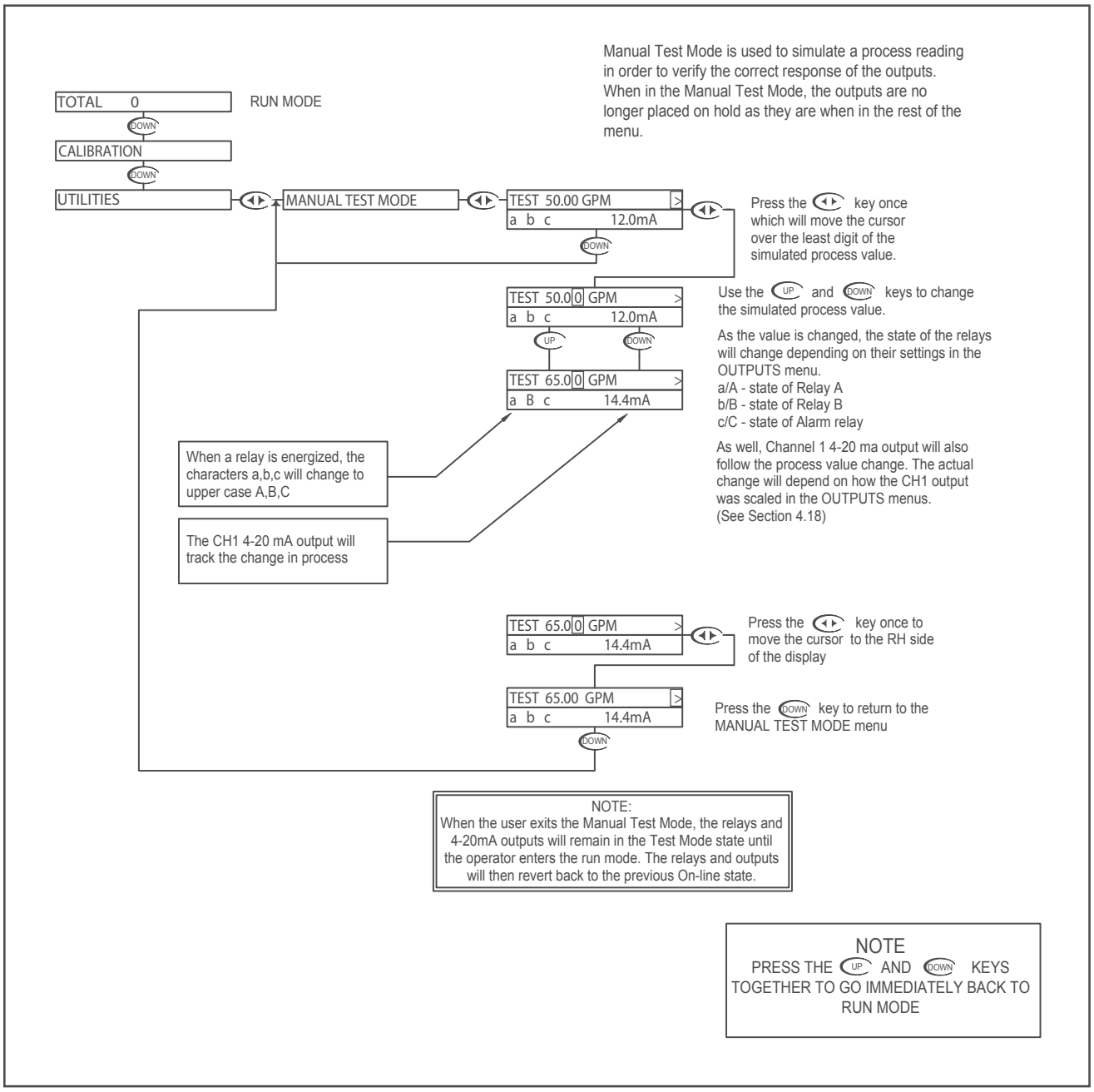
Flow - Calibration Menu - K Factor 7.1

The K Factor menu is used to enter the flow sensor calibration factor. The K Factor represents the number of pulses per U.S. Gallon, generated by the combination of sensor and flow fitting.
It is normally stamped on the flow fitting or attached to a tag on the cable. Typical K factors range between 0.5000 to 1500.0.

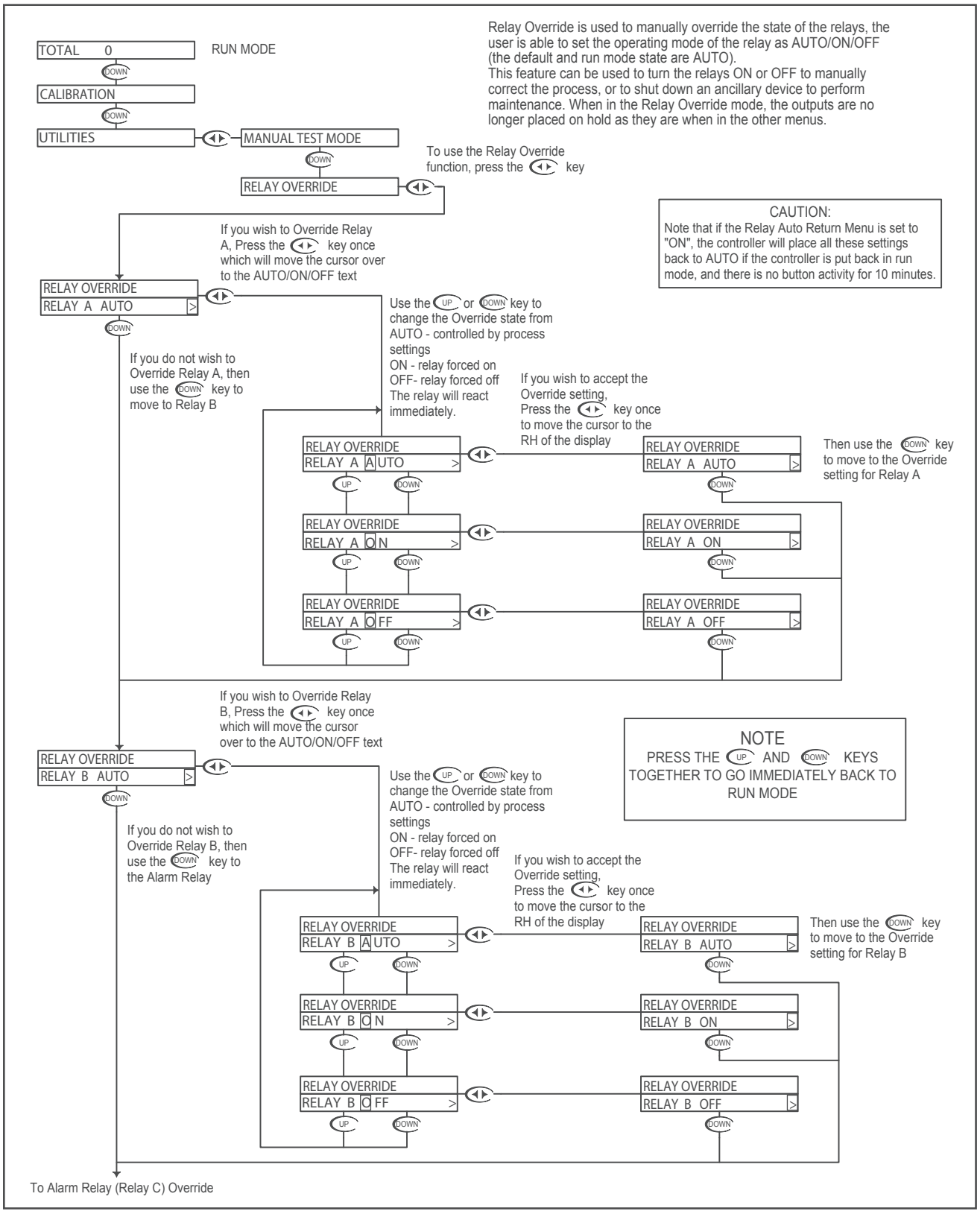


NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

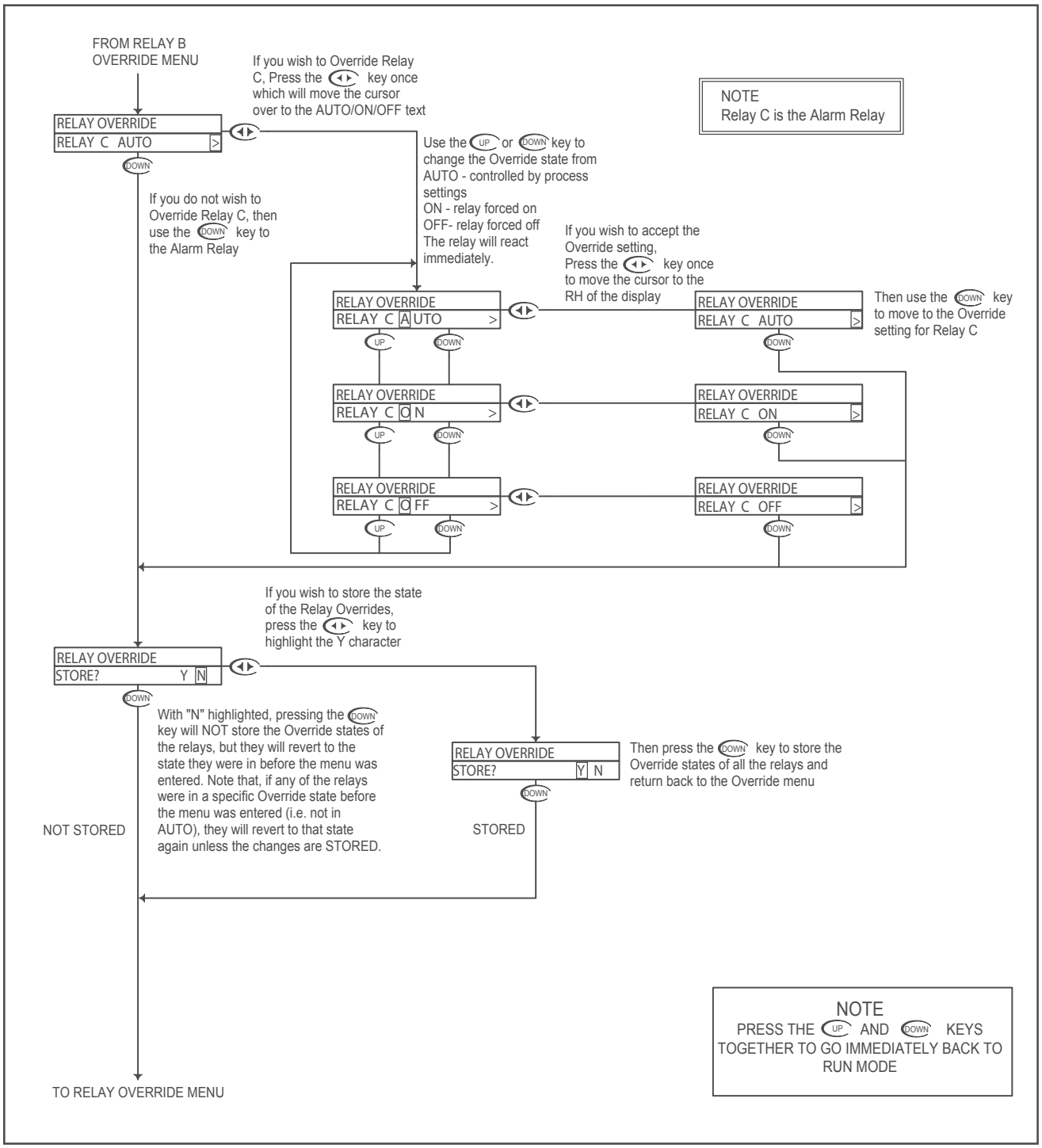
Flow - Utilities Menu - Manual Test Mode 7.2



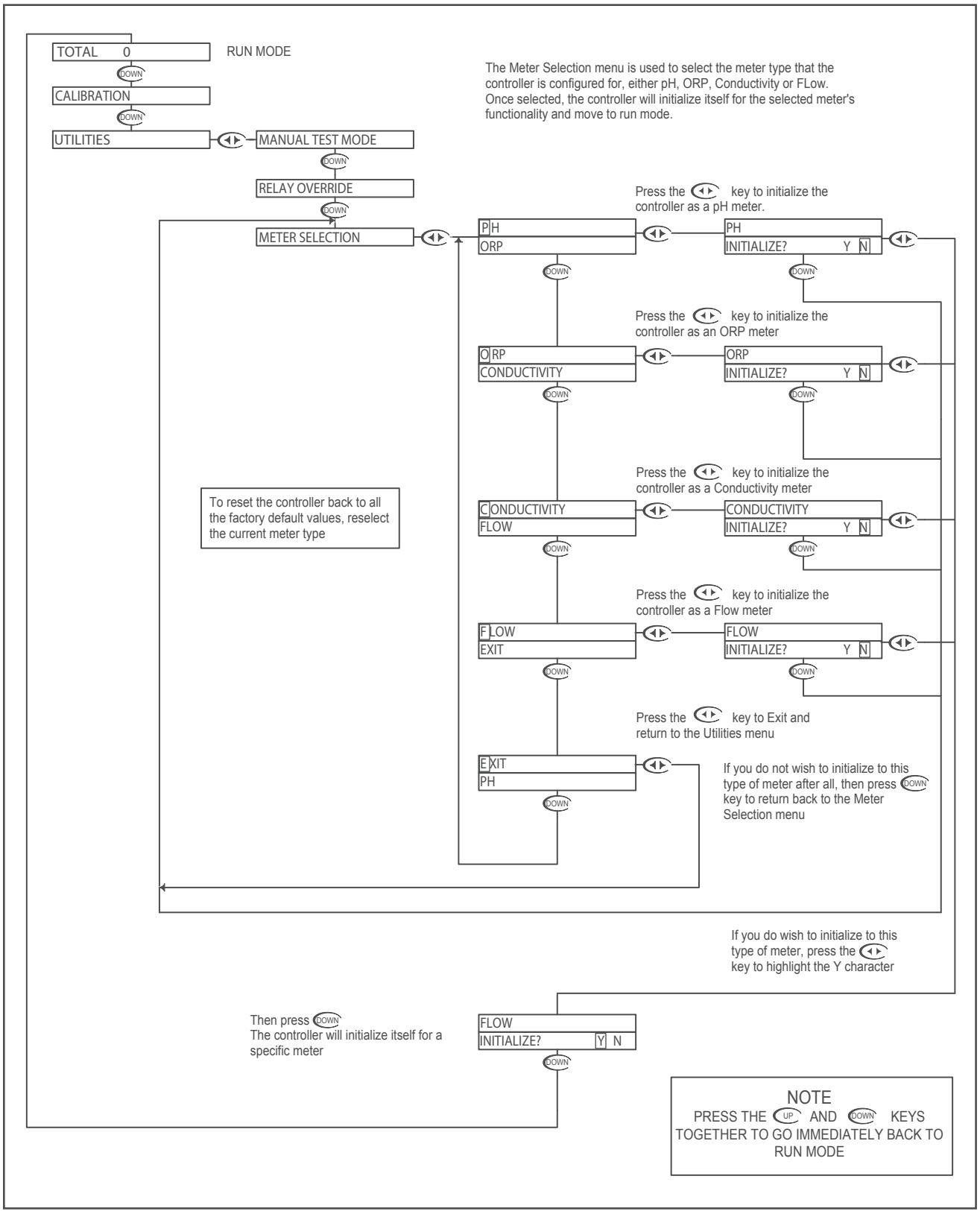
Flow - Utilities Menu - Relay Override 7.3



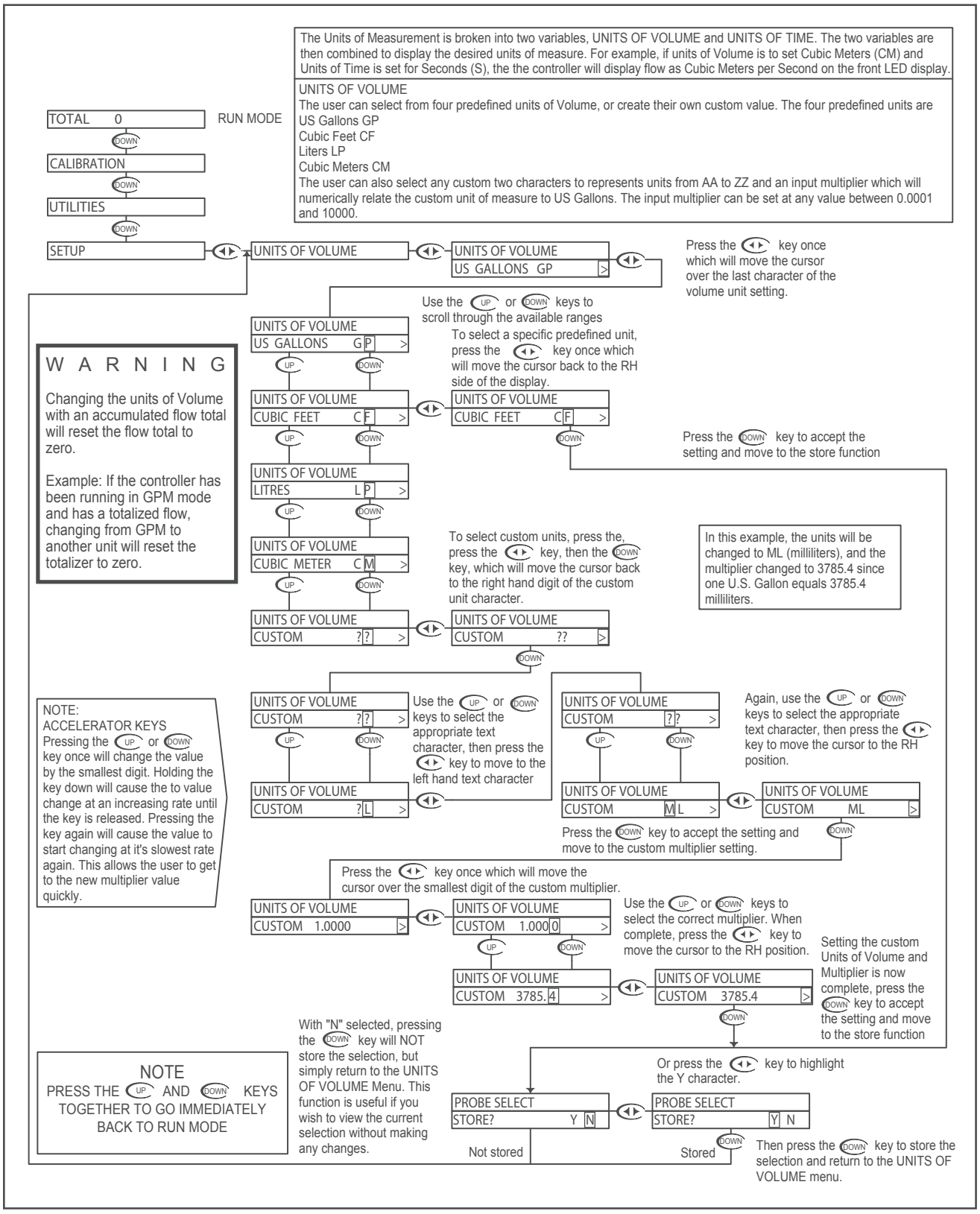
Flow - Utilities Menu - Relay Override 7.3



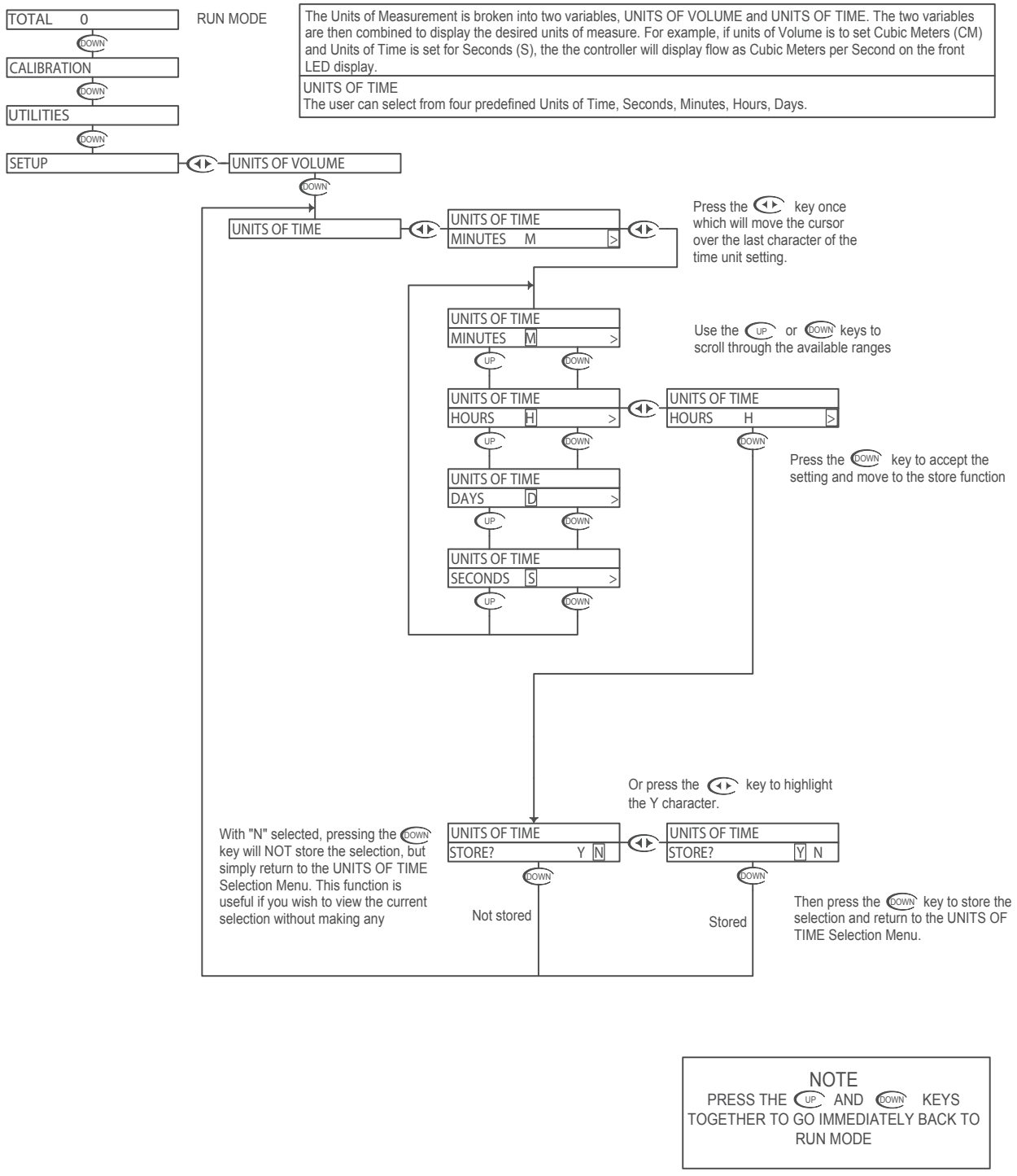
Flow - Utilities Menu - Meter Selection 7.4



Flow - Setup Menu - Units of Volume 7.5



Flow - Setup Menu - Units of Time 7.6

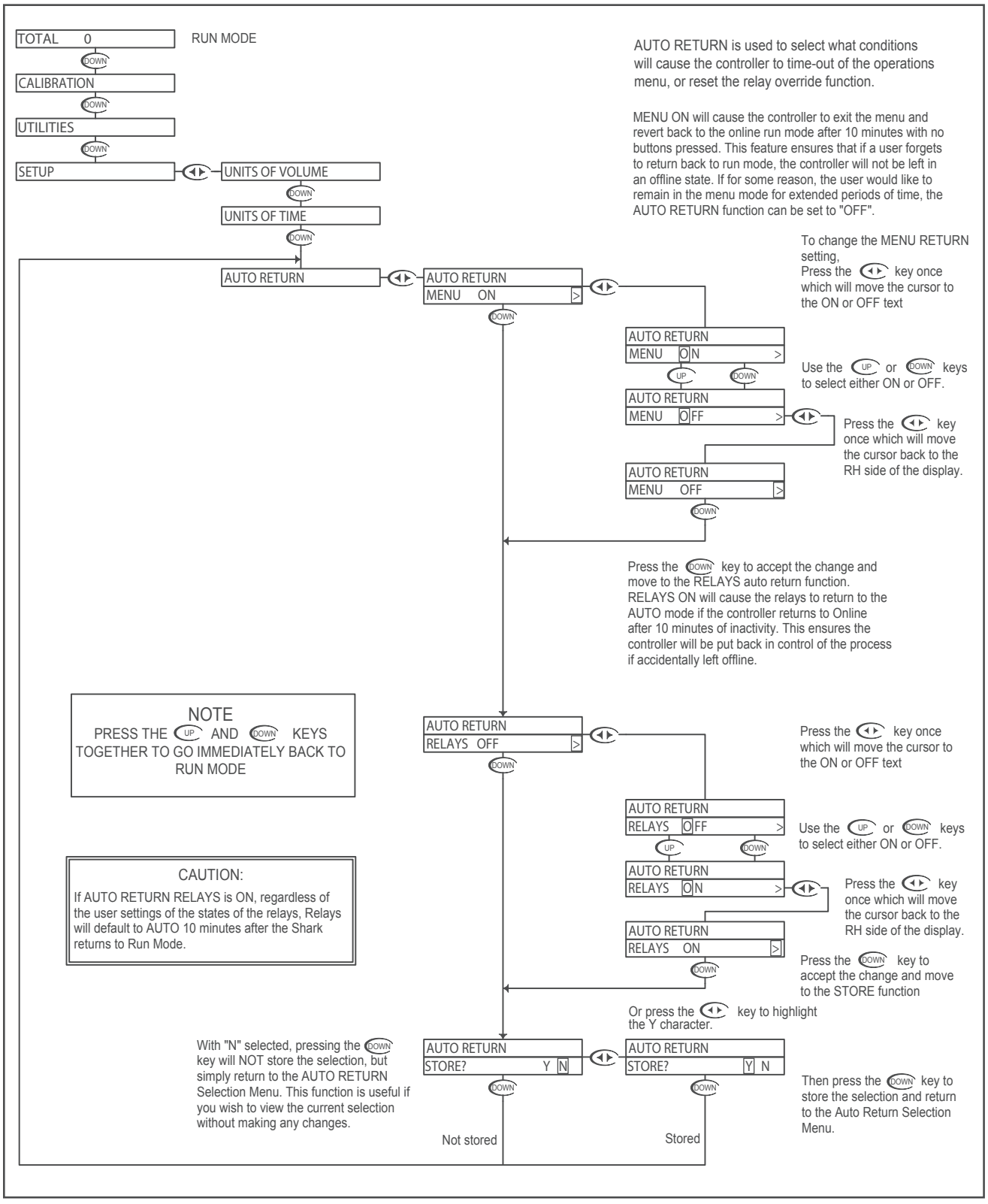


The Units of Measurement is broken into two variables, UNITS OF VOLUME and UNITS OF TIME. The two variables are then combined to display the desired units of measure. For example, if units of Volume is to set Cubic Meters (CM) and Units of Time is set for Seconds (S), the the controller will display flow as Cubic Meters per Second on the front LED display.

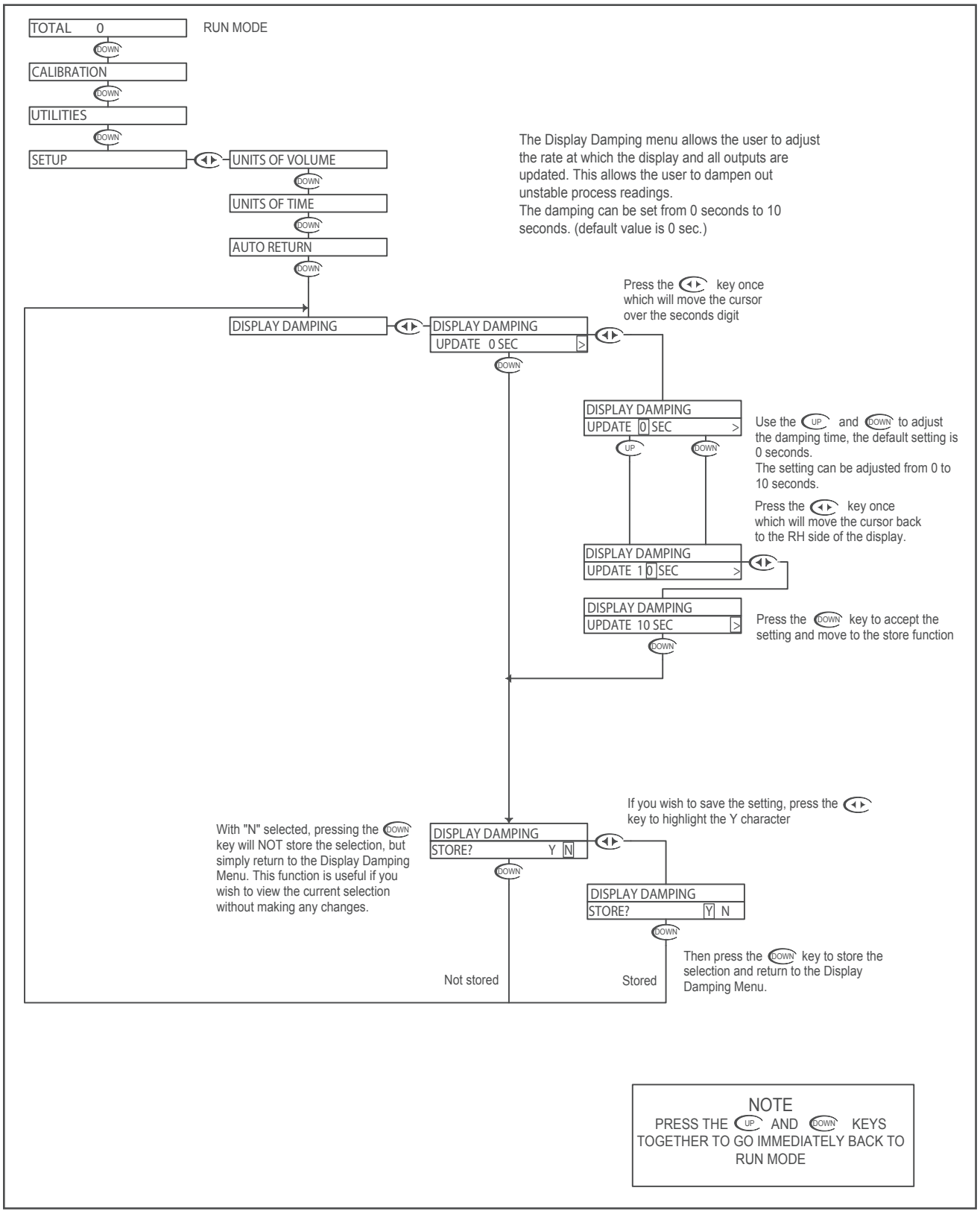
UNITS OF TIME
The user can select from four predefined Units of Time, Seconds, Minutes, Hours, Days.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

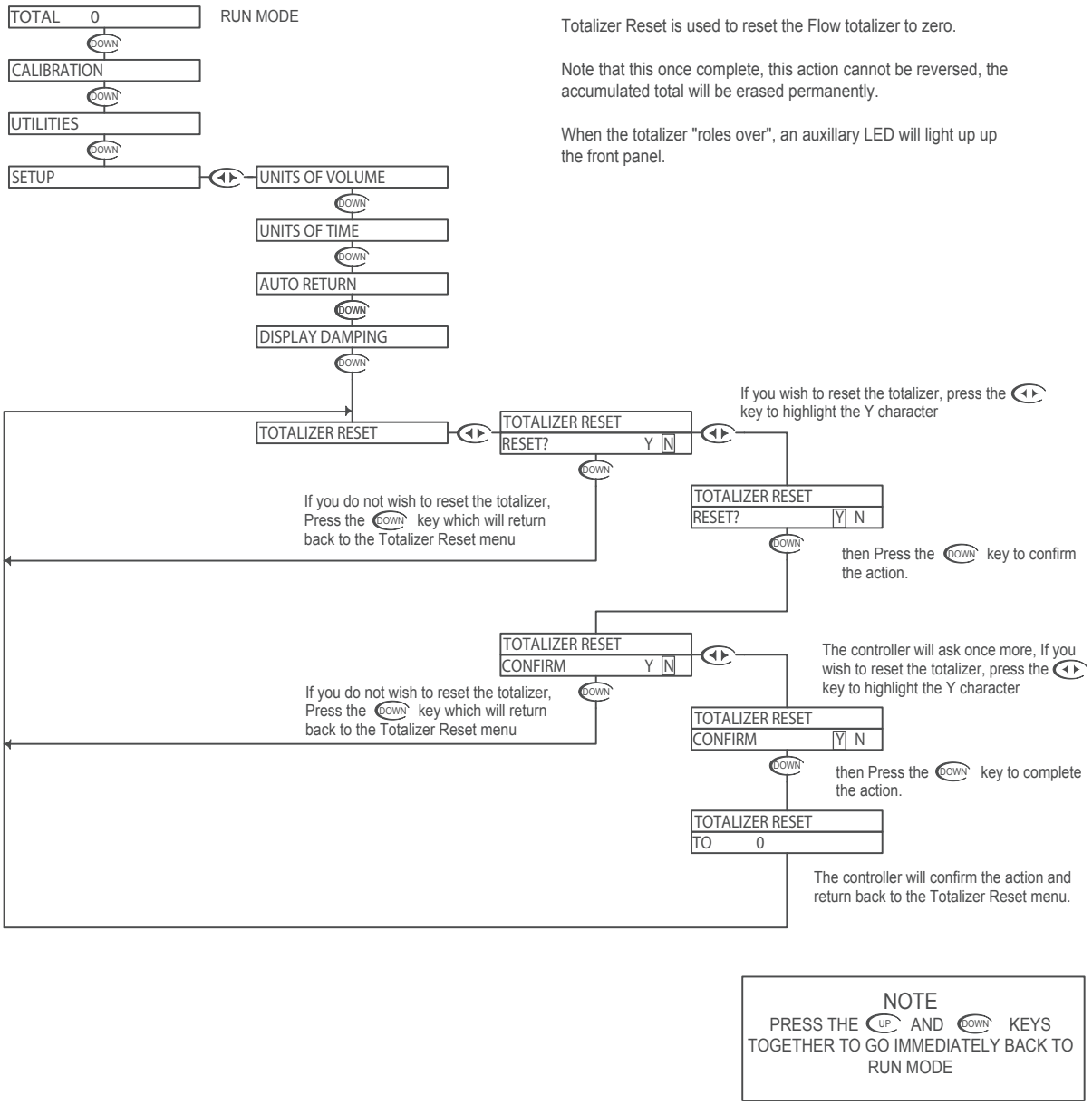
Flow - Setup Menu - Auto Return 7.7



Flow - Setup Menu - Display Damping 7.8



Flow - Setup Menu - Totalizer Reset 7.9



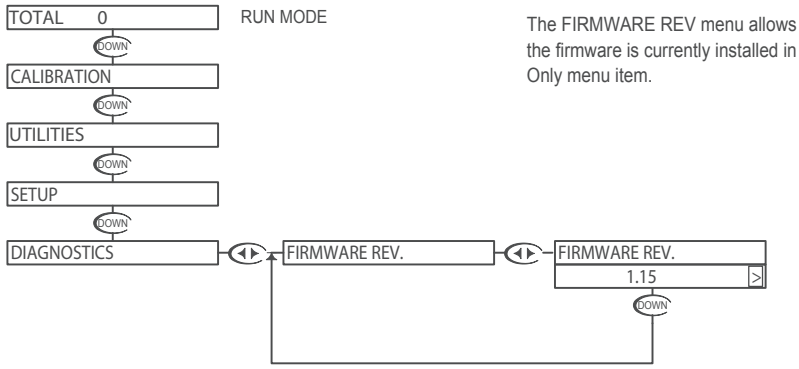
Totalizer Reset is used to reset the Flow totalizer to zero.

Note that this once complete, this action cannot be reversed, the accumulated total will be erased permanently.

When the totalizer "roles over", an auxillary LED will light up up the front panel.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

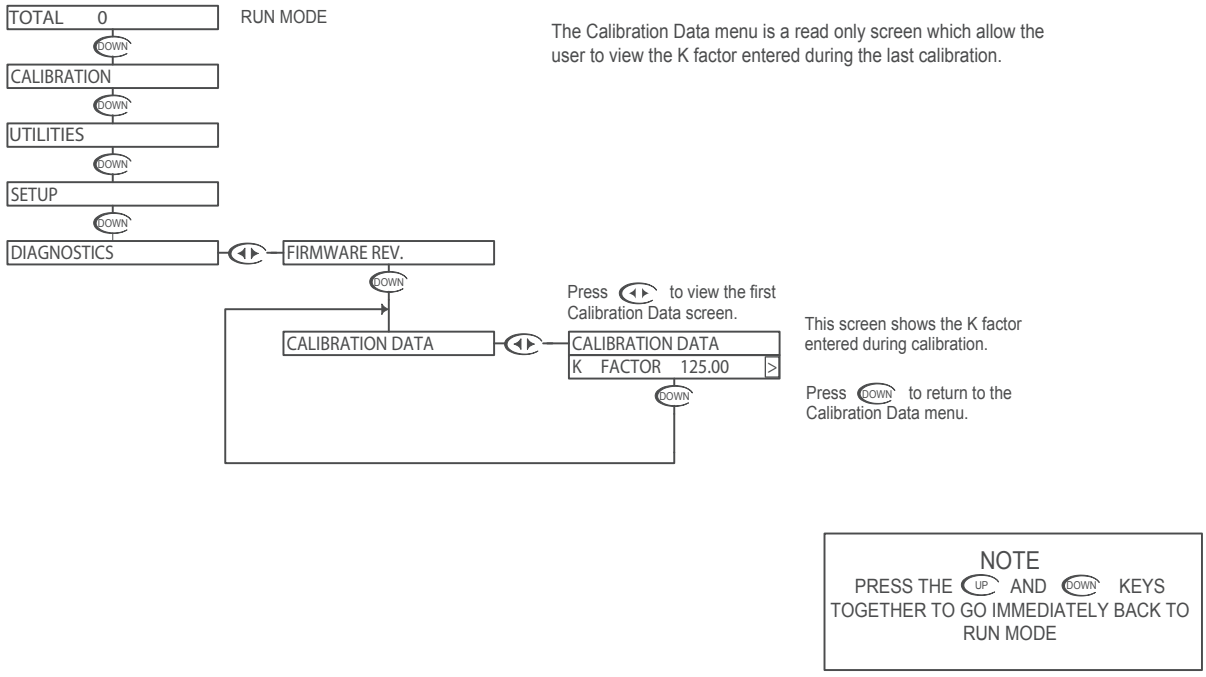
Flow - Diagnostics Menu - Firmware Rev 7.10



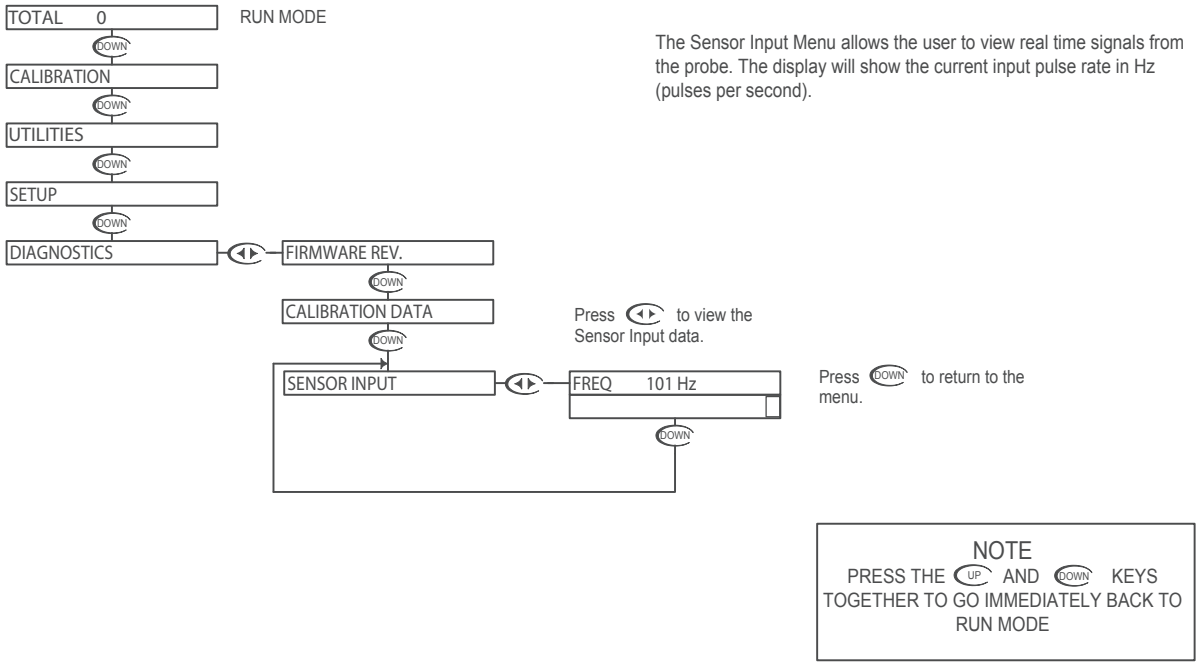
The FIRMWARE REV menu allows the user to see what revision of the firmware is currently installed in the controller. This is a Read Only menu item.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

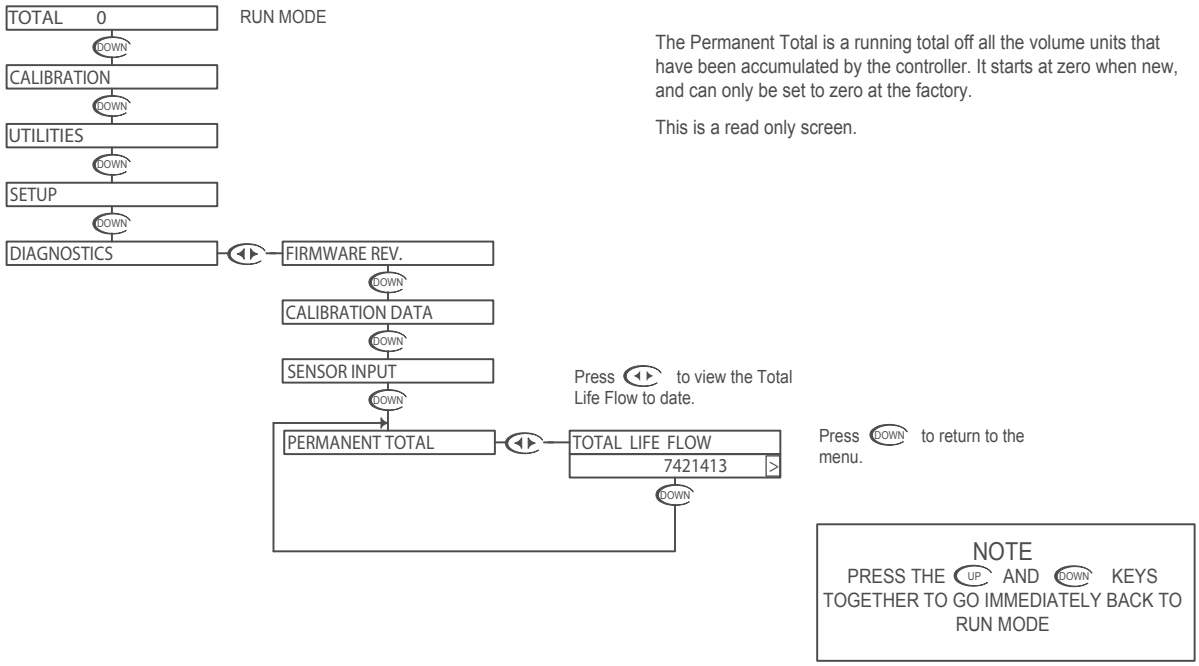
Flow - Diagnostics Menu - Calibration Data 7.11



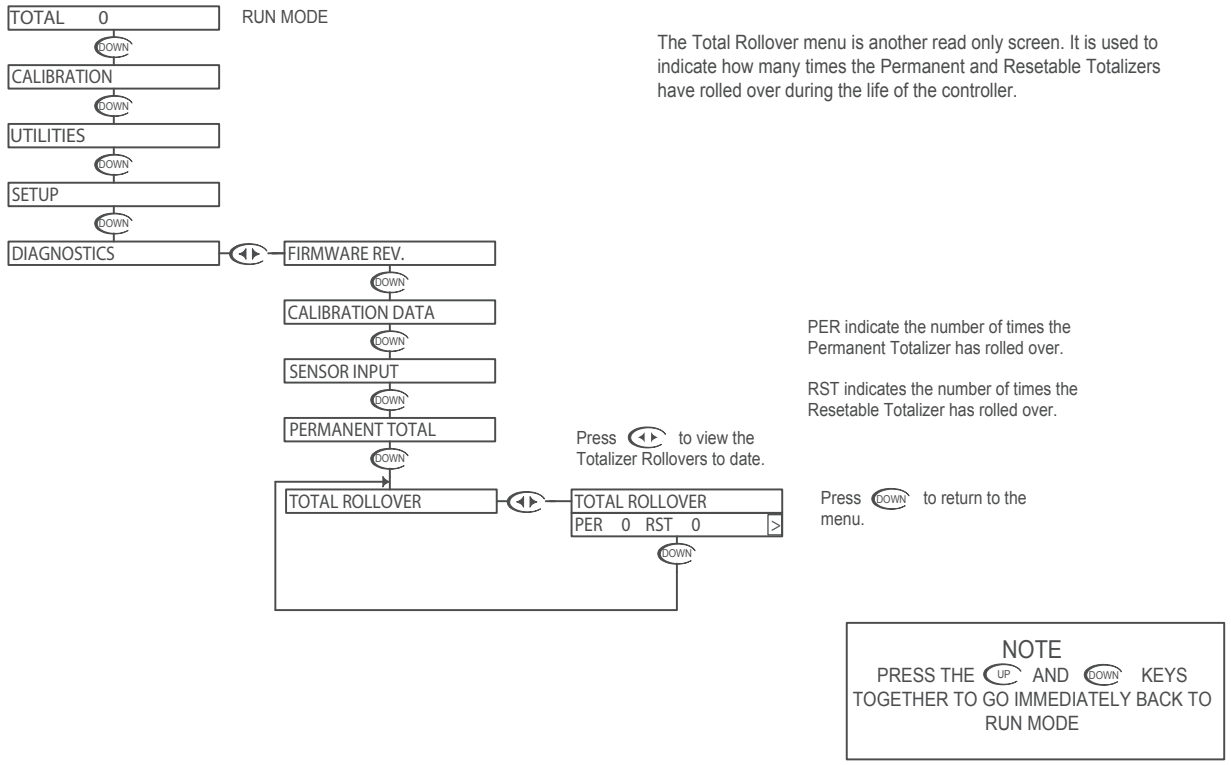
Flow - Diagnostics Menu - Sensor Input 7.12



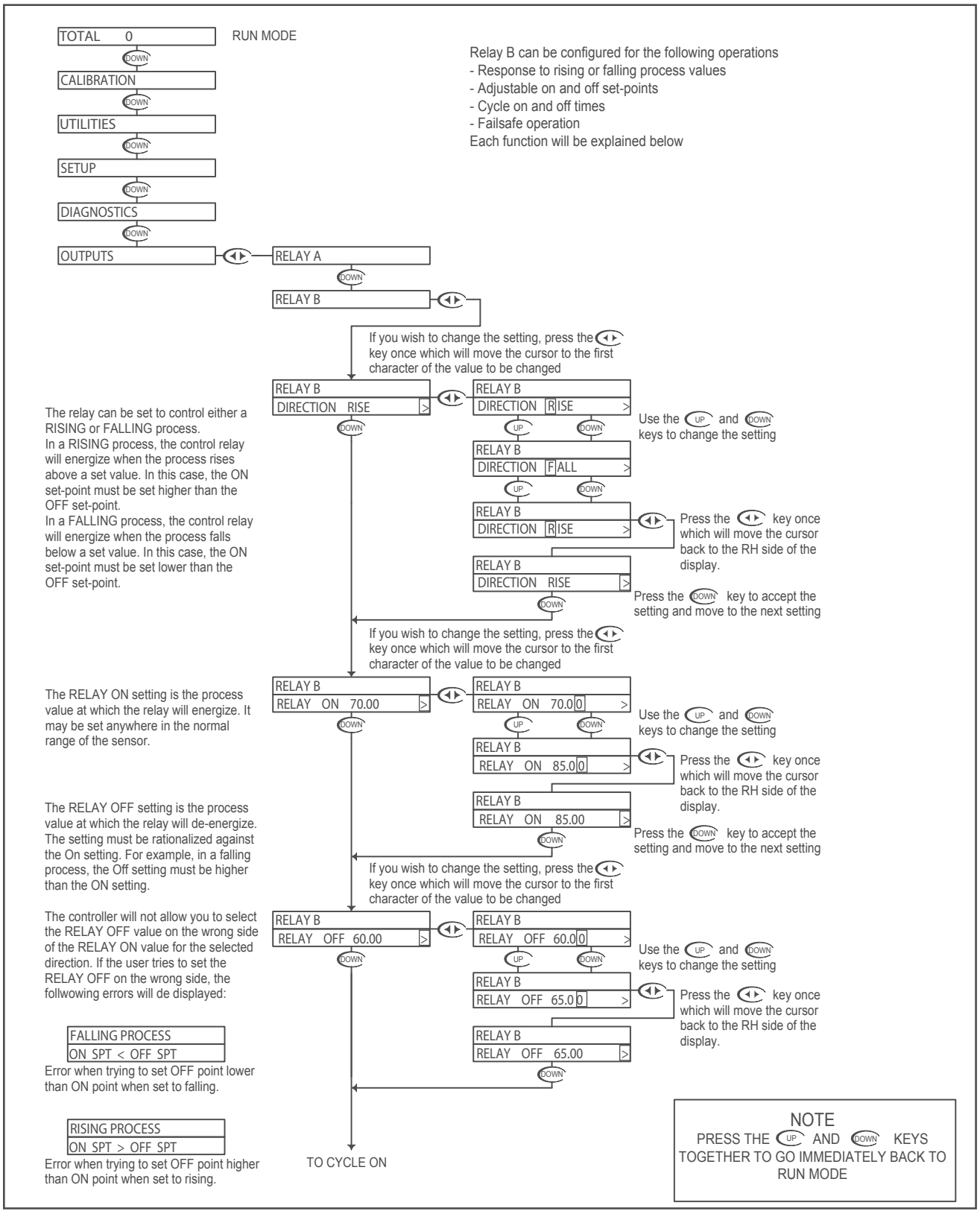
Flow - Diagnostics Menu - Permanent Total 7.13



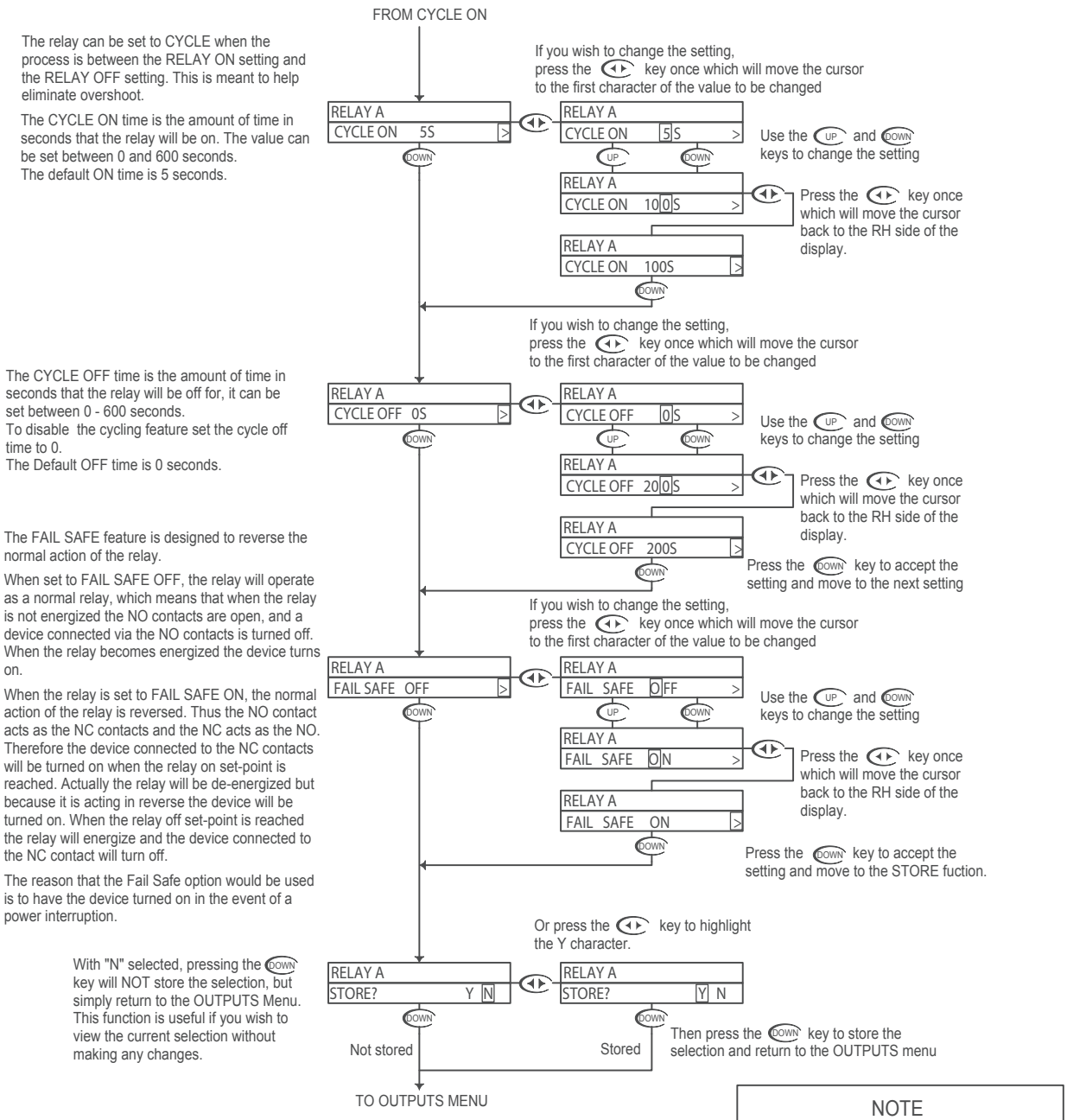
Flow - Diagnostics Menu - Total Rollover 7.14



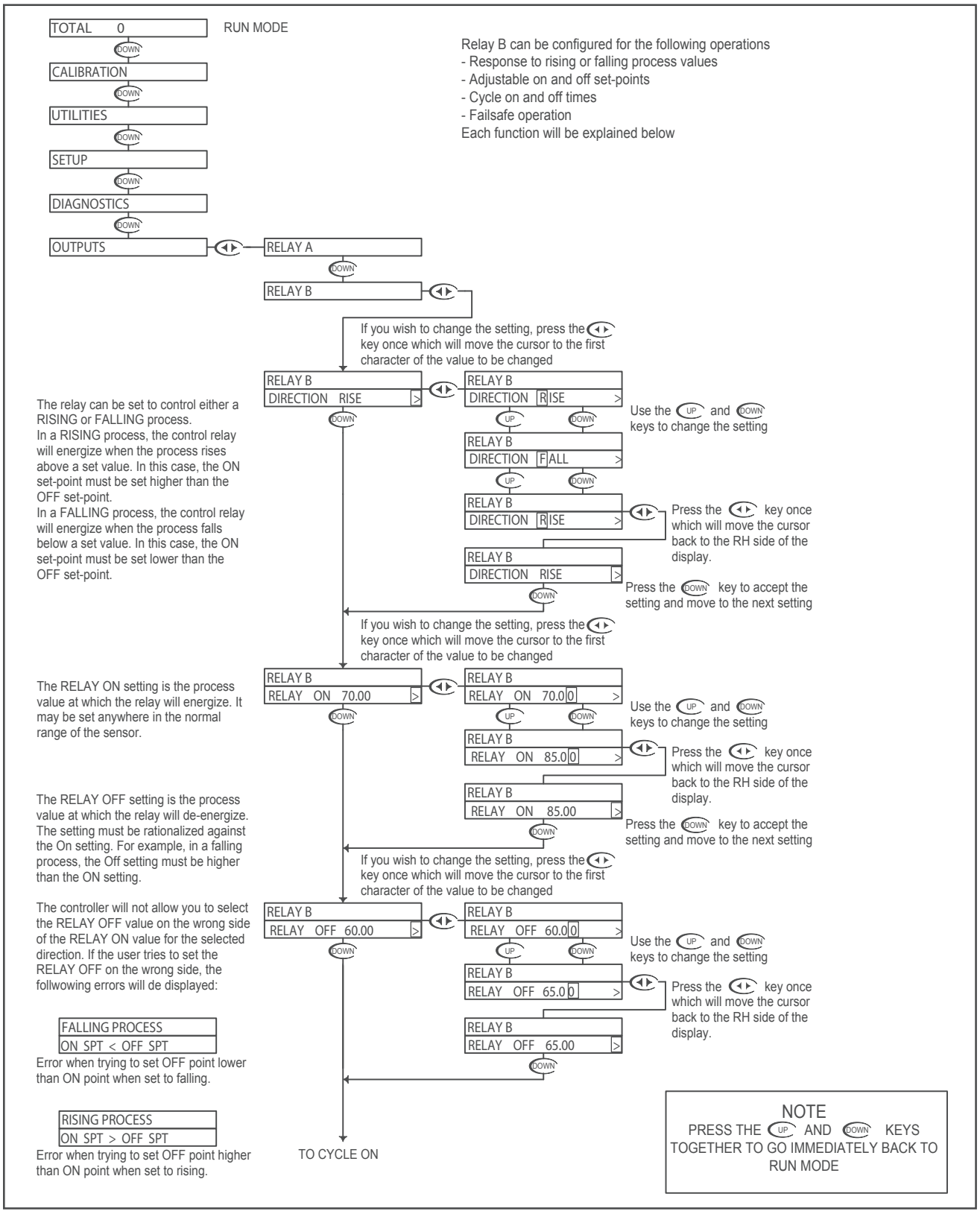
Flow - Outputs Menu - Relay A 7.15



Flow - Outputs Menu - Relay A 7.15



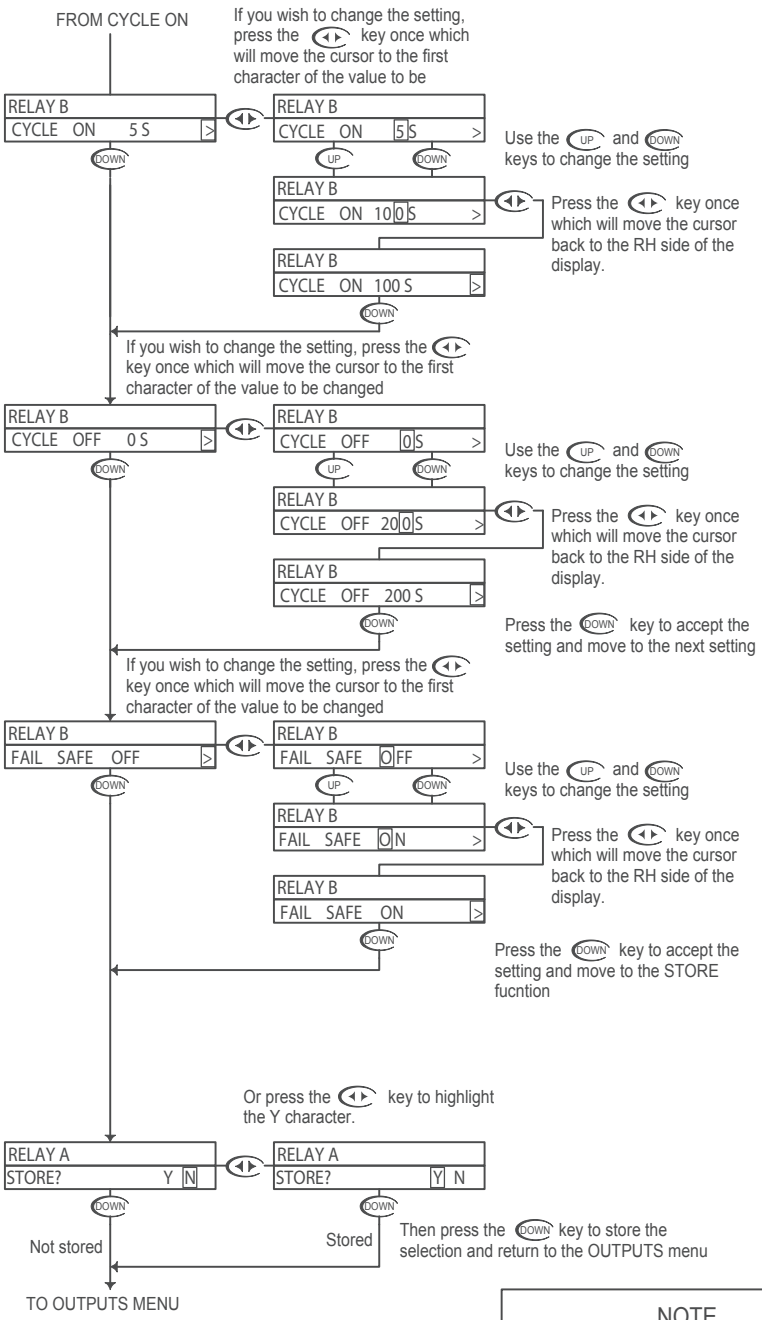
Flow - Outputs Menu - Relay B 7.16



Flow - Outputs Menu - Relay B 7.16

The relay can be set to CYCLE when the process is between the RELAY ON setting and the RELAY OFF setting. This is meant to help eliminate overshoot.

The CYCLE ON time is the amount of time in seconds that the relay will be on. The value can be set between 0 and 600 seconds.
The default ON time is 5 seconds.



The CYCLE OFF time is the amount of time in seconds that the relay will be off for, it can be set between 0 - 600 seconds.
To disable the cycling feature set the cycle off time to 0.
The default OFF time is 0 seconds.

The FAIL SAFE feature is designed to reverse the normal action of the relay.
When set to FAIL SAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

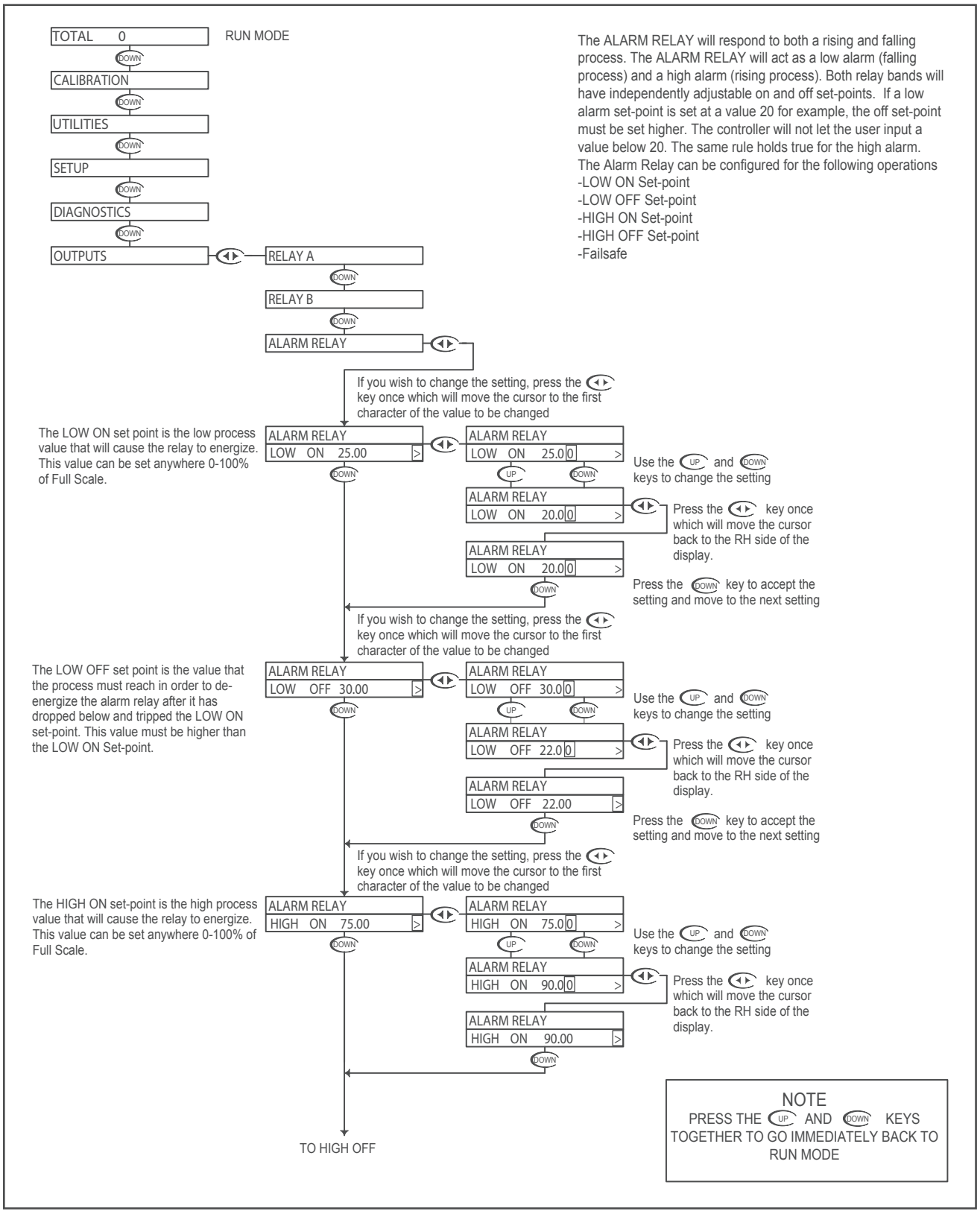
When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption. For example, a process that needs a constant feed, would want a pump to turn on in the event of a controller power failure.

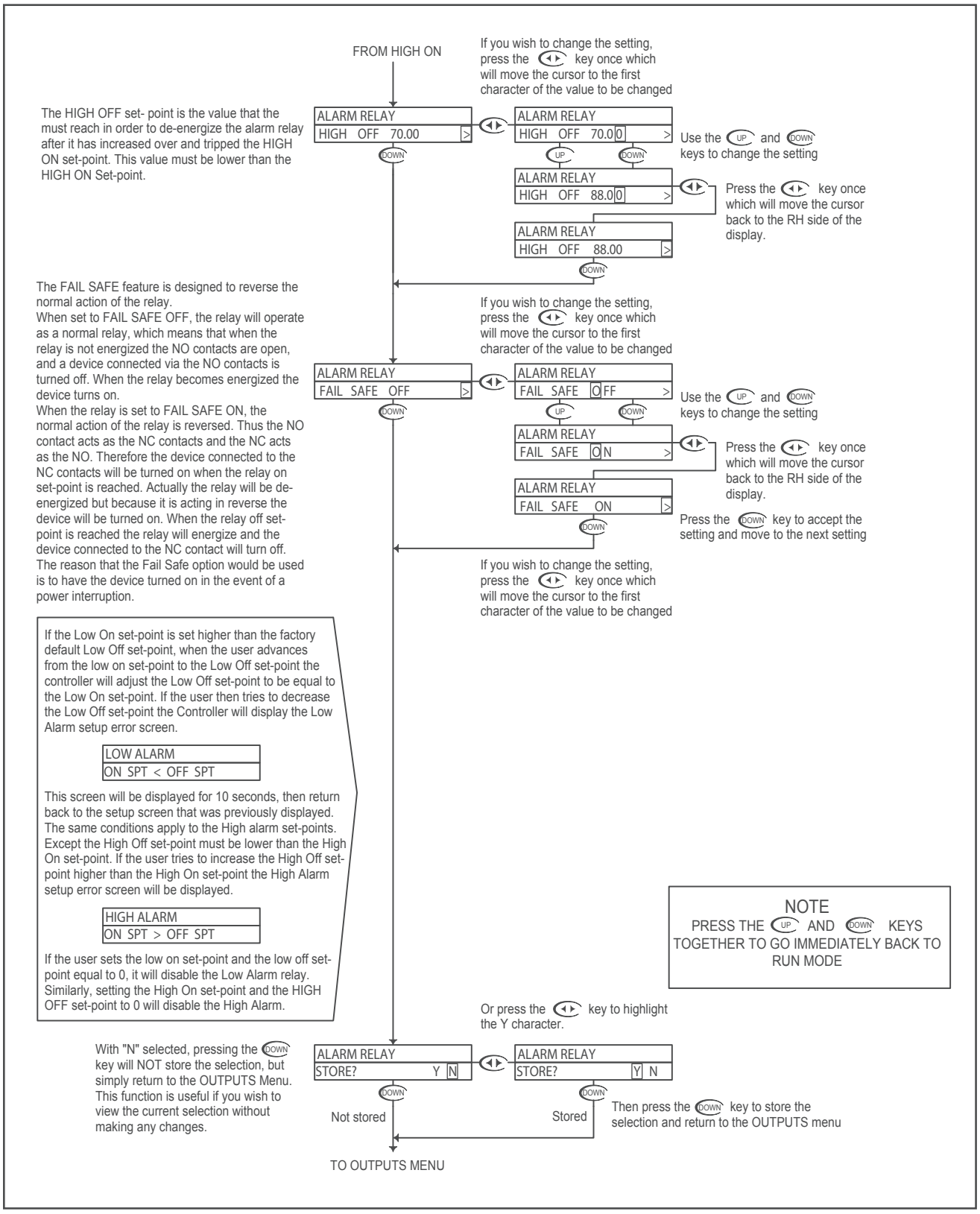
With "N" selected, pressing the DOWN key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

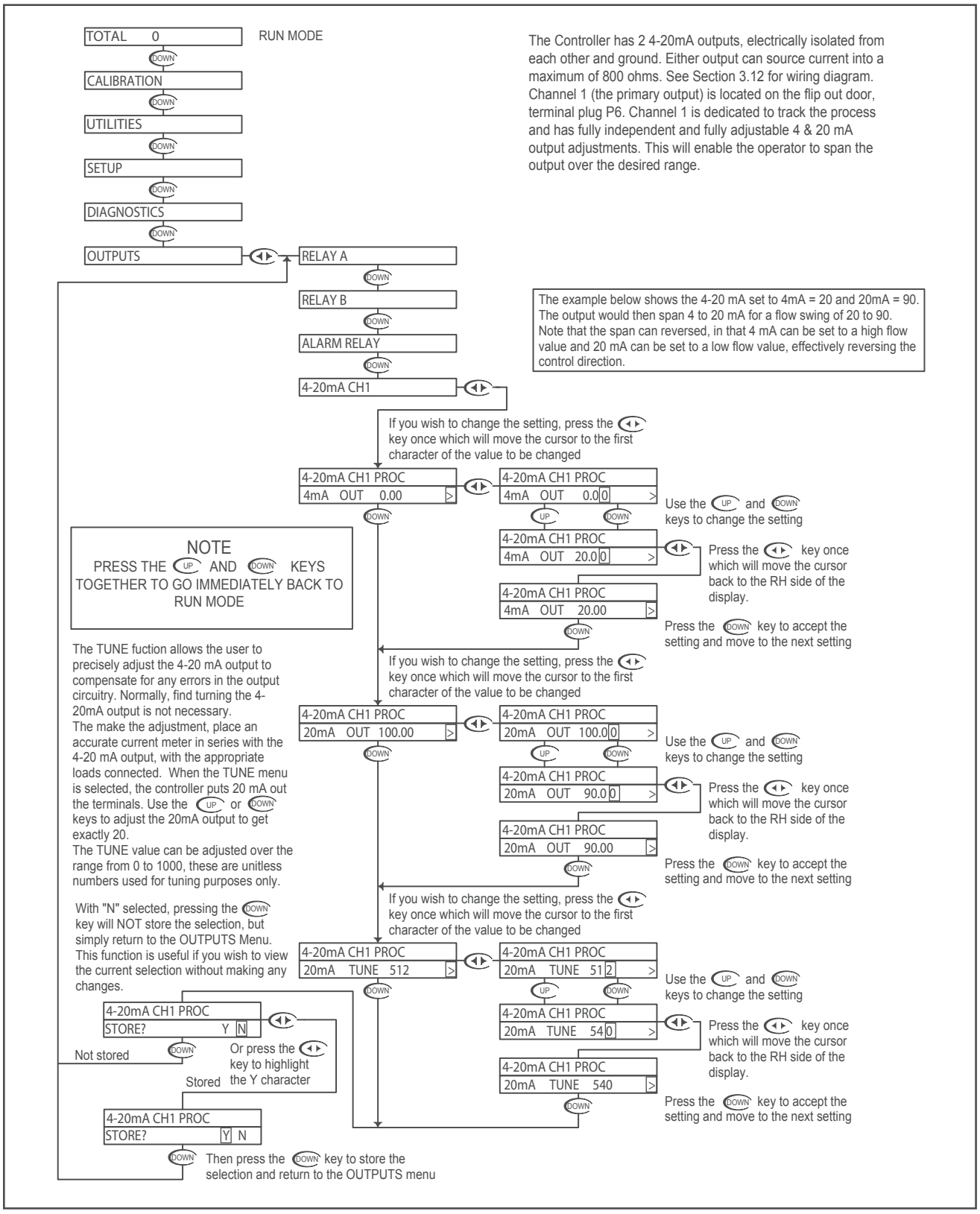
Flow - Outputs Menu - Alarm Relay 7.17



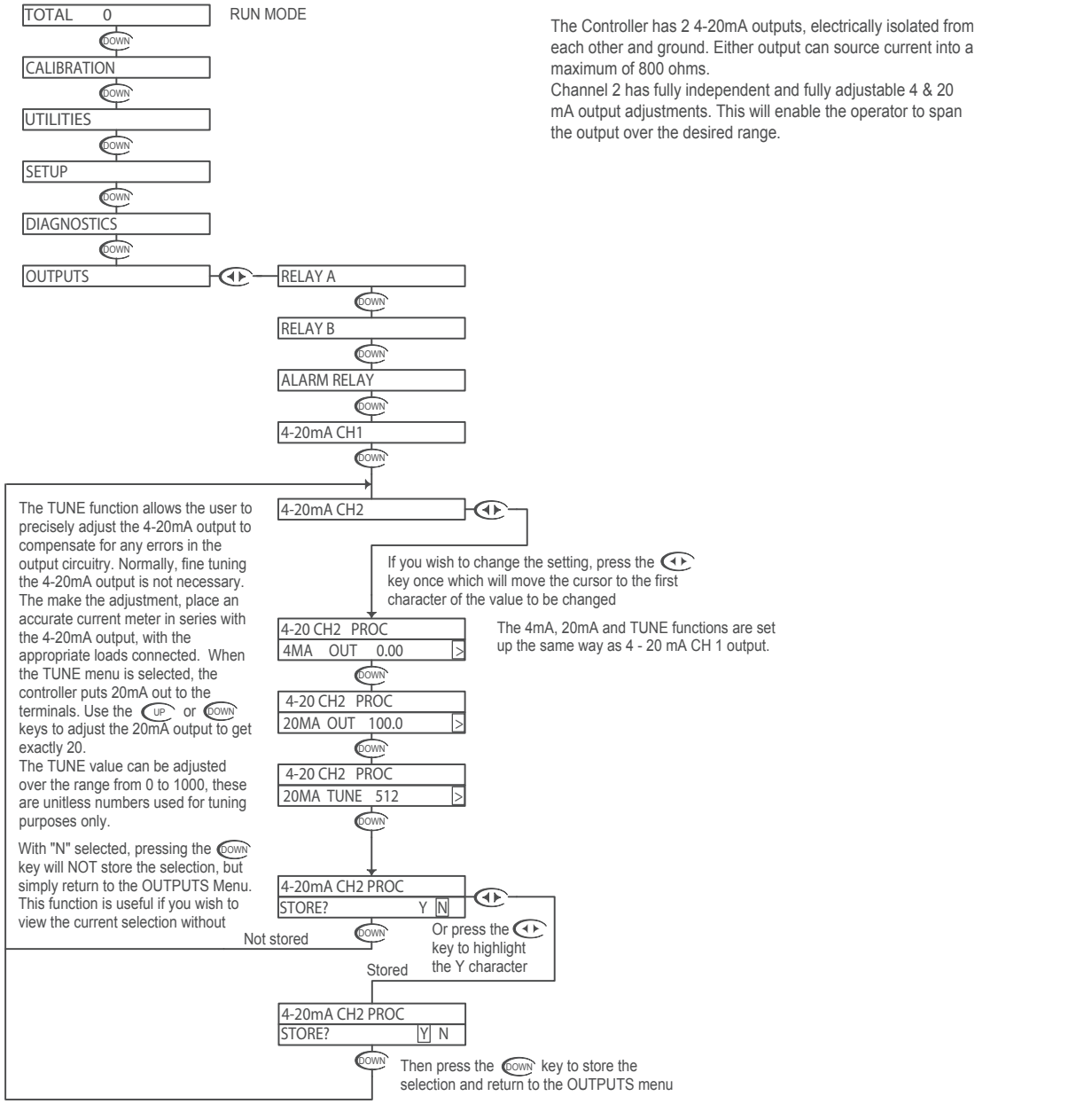
Flow - Outputs Menu - Alarm Relay 7.17



Flow - Outputs Menu - 4-20mA CH1 Output 7.18



Flow - Outputs Menu - 4-20mA CH2 Output 7.19



Appendix A - Probe Configuration Table

Model#	Probe Select	Temp. Sensor
P60C-4	DIFFERENTIAL	300Ω
P60C-4-A	DIFFERENTIAL	300Ω
P60C-4-H	DIFFERENTIAL	300Ω
P60C-6	DIFFERENTIAL	300Ω
P60C-6-H	DIFFERENTIAL	300Ω
P60C-6-F	DIFFERENTIAL	300Ω
P60C-7	DIFFERENTIAL	300Ω
P60C-7-H	DIFFERENTIAL	300Ω
P60C-7-F	DIFFERENTIAL	300Ω
P60C-8	DIFFERENTIAL	300Ω
P60C-8-A	DIFFERENTIAL	300Ω
P60C-8-H	DIFFERENTIAL	300Ω
P60C-S	DIFFERENTIAL	300Ω
P60C-S-F	DIFFERENTIAL	300Ω
AM6010-PO	DIFFERENTIAL	300Ω
AM6070-PO	DIFFERENTIAL	300Ω
P525	COMBINATION	no. temp. sensor
P525-BNC	COMBINATION	no. temp. sensor
P575	COMBINATION	no. temp. sensor
P575K-1	COMBINATION	Pt. 1000 RTD
P575K-2	COMBINATION	300Ω
P575-BNC	COMBINATION	no. temp. sensor
P585	COMBINATION	no. temp. sensor
P585K-1	COMBINATION	Pt. 1000 RTD
P585K-2	COMBINATION	300Ω
P585-BNC	COMBINATION	no. temp. sensor
P565	COMBINATION	no. temp. sensor
P565L	COMBINATION	no. temp. sensor

Model#	Probe Select	Temp. Sensor
R60C-4	DIFFERENTIAL	300Ω
R60C-4-H	DIFFERENTIAL	300Ω
R60C-4-G	DIFFERENTIAL	300Ω
R60C-6	DIFFERENTIAL	300Ω
R60C-6-H	DIFFERENTIAL	300Ω
R60C-6-G	DIFFERENTIAL	300Ω
R60C-7	DIFFERENTIAL	300Ω
R60C-7-H	DIFFERENTIAL	300Ω
R60C-7-G	DIFFERENTIAL	300Ω
R60C-8	DIFFERENTIAL	300Ω
R60C-8-H	DIFFERENTIAL	300Ω
R60C-8-G	DIFFERENTIAL	300Ω
R60C-S	DIFFERENTIAL	300Ω
R60C-S-F	DIFFERENTIAL	300Ω
AM2010-RO	DIFFERENTIAL	300Ω
AM2070-RO	DIFFERENTIAL	300Ω
AM2010-R1	DIFFERENTIAL	300Ω
AM2070-R1	DIFFERENTIAL	300Ω
R525	COMBINATION	no. temp. sensor
R525-BNC	COMBINATION	no. temp. sensor
R575	COMBINATION	no. temp. sensor
R575-BNC	COMBINATION	no. temp. sensor
R585	COMBINATION	no. temp. sensor
R585-BNC	COMBINATION	no. temp. sensor
R565	COMBINATION	no. temp. sensor
R565L	COMBINATION	no. temp. sensor

Return Policy & Warranty Plan

AQUAMETRIX, INC. RETURN POLICY

1. Contact Aquametrix for a "Return Material Authorization" (RMA) form & number. This RMA number is required for all returns or they will not be accepted.
2. The RMA number must be written on the outside of the box for proper identification.
3. A copy of the RMA form along with a description of the problem, model & serial number must be attached with the returning item(s).
4. All C.O.D. & freight collect shipments will be refused unless authorized by AquaMetrix.
5. Shipping documents must indicate "RETURNING FOR REPAIR ONLY, NO COMMERCIAL VALUE".

12-MONTH AQUAMETRIX WARRANTY REPLACEMENT PLAN

AquaMetrix, Inc. will replace or repair any AquaMetrix SHARK controller that fails due to defects in material or workmanship for a period of up to 12 months from the date of shipment from our facility.

A warranty claim will not be honored if defects are not reported within the warranty period, or if AquaMetrix determines that defects or damages are due to normal wear, misapplication, lack of maintenance, abuse, improper installation, alteration, or abnormal conditions. AquaMetrix's obligation under this warranty shall be limited to, at its option, replacement or repair of this product. The product must be returned to AquaMetrix Inc, freight prepaid, for examination. The product must be accompanied with an MSDS for all the process chemicals used, must be thoroughly cleaned and any process chemicals removed before it will be accepted for replacement or repair. AquaMetrix liability shall not exceed the cost of the product. Under no circumstances will AquaMetrix be liable for any incidental or consequential damages, whether to person or property. AquaMetrix will not be liable for any other loss, damage or expense of any kind, including loss of profits, resulting from the installation, use, or inability to use this product.