



Series 3000 System Controller



**PROCON
MODEL 3010
TABLE OF CONTENTS**

PART 1: INTRODUCTION

DESCRIPTION	1.1
MANUAL ORGANIZATION	1.3
FRONT PANEL	1.4
STRUCTURE	1.5
ACCESS CODES	1.10
MANUAL REVISIONS TABLE.....	1.12
LIMITED WARRANTY.....	1.12

PART 2: SYSTEM MENU

SYSTEM MENU	2.1
-------------------	-----

PART 3: RINSE CONTROLLER

QDR – MAIN MENU.....	3.1
QDR – PROCESS MENU	3.3
QDR – RUN RECIPE / RUN PREP CYCLE.....	3.5
QDR – VIEW RECIPES / EDIT RECIPES.....	3.6
QDR – EDIT SETUP	3.13
QDR – MANUAL MODE.....	3.20
QDR – OPERATIONAL EXAMPLE	3.22
QDR – SPECIAL FEATURES	3.24

PART 4: TEMPERATURE CONTROLLER

HTC – MAIN MENU	4.1
HTC – PROCESS MENU	4.3
HTC – RUN DIRECT / RUN RECIPE	4.5
HTC – VIEW RECIPES / EDIT RECIPES	4.7
HTC – EDIT SETUP	4.11
HTC – MANUAL MODE	4.22
HTC – AUTO TUNE	4.24
HTC – SPECIAL FEATURES	4.25

PART 5: SYSTEM CONFIGURATION

SYSTEM CONFIGURATION	5.1
----------------------------	-----

PART 6: ALARMS / UPDATES

ALARMS	6.1
UPDATES	6.9

PART 7: APPENDICIES

APPENDIX A – FLASH PROGRAMMING	7.1
APPENDIX B – TEMPERATURE CONTROL THEORY	7.3
APPENDIX C ON / OFF SWITCH OVERRIDE	7.6

PART 8: SPECIFICATIONS / DRAWINGS

SPECIFICATIONS 8.1

DRAWINGS

 PHYSICAL DIMENSIONS 8.3

 WIRING DIAGRAM 8.4

 SOLENOID PACK DETAILS 8.5

 TEMPERATURE WIRING DIAGRAM 8.6

 ANALOG OUTPUT BOARD WIRING DIAGRAM 8.7

 RTD BOARD WIRING DIAGRAM 8.8

 CONTROLLER SYSTEM DIAGRAM..... 8.9

★★★ NOTICE ★★★

JPC CONTROLS RESERVES THE RIGHT TO MAKE CHANGES TO ITS PRODUCTS OR SPECIFICATIONS AT ANY TIME, WITHOUT NOTICE, IN ORDER TO IMPROVE THE DESIGN OR PERFORMANCE AND TO SUPPLY THE BEST POSSIBLE PRODUCT. THE INFORMATION IN THIS MANUAL HAS BEEN CAREFULLY CHECKED AND IS BELIEVED TO BE ACCURATE. HOWEVER, NO RESPONSIBILITY IS ASSUMED FOR INACCURACIES.

PROCON MODEL 3010 SYSTEM CONTROLLER

The Model 3010 is a Microprocessor based Stand Alone P²LC™ Controller. This new generation of PreProgrammed Logic Controllers offers the latest in ease of operation and use. Ready to go right out of the box...No parts to assemble...No code to write. The P²LC™ program has been written to eliminate the need for the OEM to implement and maintain unique programs for custom applications. Simply by setting a series of parameters hundreds of possible combinations of custom applications are available, and Field changes become as easy as a few key strokes.

The following are highlights of some of the main features of the controller:

- *RINSE CONTROLLER
 - *BUILT IN PNEUMATIC VALVES
 - *SINGLE AND DOUBLE DOOR OPERATION
 - *10 USER PROGRAMMABLE RECIPES
 - *COLOR CODED QUICK DISCONNECT PNEUMATIC PORTS
 - *AUTO CLEAN FUNCTION
 - *MEGASONICS CONTROL
 - *RESISTIVITY INTERFACE
- *TEMPERATURE CONTROLLER
 - *HIGH TEMP/RECIRCULATOR/INLINE FLOW
 - *BUILT IN INDEPENDENT T/C HIGH LIMIT
 - *SNAP SWITCH INTERFACE
 - *TIME/TEMPERATURE DRAIN FUNCTION
 - *TIME/TEMPERATURE INJECTION FUNCTION
 - *MEGASONICS CONTROL
 - *MULTIPLE TIMER FUNCTIONS (UP/DOWN/WITH OVERCOUNT)
 - *10 USER PROGRAMMABLE RECIPES
- *MULTIPLE LEVEL ACCESS CODE PROTECTION
- *BATTERY BACKUP RAM PARAMETER MEMORY (MIN 10 YEAR)
- *AUDIO ANNUNCIATOR
- *WET STATION ENCLOSURE
- *SEALED SMOOTH FACE CONSTRUCTION
- *BRIGHT 5.7" SUPER TWIST LCD DISPLAY
- *24 VAC
- *RS232 STANDARD
- *RS485 STANDARD
- *ASSIGNABLE I/O
- *MANUAL AND AUTO OPERATION
- *HUNDREDS OF POSSIBLE CONTROL COMBINATIONS
- *FLASH UPGRADABLE PROGRAM

The rinse controller contains all of the logic and pneumatics required to interface to dump rinsing systems. Through the large set of parameters, hundreds of combinations of dump configurations can be programmed, from the simplest cascade to the most complex using intricate combinations of fill, dump and cascades logically integrated with both Megasonics and Resistivity.

The Temperature controller can be configured to run numerous types of systems both time proportioning and analog. It will control chillers (thermal electric and compressor types), Megasonics (preconfigured to communicate with most popular models), run 6 different injection techniques, handle time and temperature interlocked drains and much more.

MANUAL ORGANIZATION

This manual is generally organized to follow the screens on the controller. The information about each section is grouped from top to bottom for each screen, proceeding through all available options and then returning to the previous screen.

Since the unit has many combinations of controllers, this manual uses only two of the most common, QDR (Quick Dump Rinser) and HTC (High Temperature Controller). The setting options for all other types are presented and explained, but the headings and examples are shown only with these two types. The other controller types will use the same basic layout with options and displays changed only as required to customize the unit for that specific application.

The Introduction presents an overview of the structure and gives details on access codes. This is done to help with a general understanding and aid in accessing the screens.

Alarms and Updates are handled as separate topics at the end of the manual since they can overlay any of the screens via their special windows.

Several special topics such as Flash Programming and Control Theory are presented in the Appendices.

Note: The following abbreviations are used in the manual and unit for general identification:

RC – Rinse Control
TC – Temperature Control
HTC – High Temperature Controller
RECIRC – Recirculator Temperature Controller
QDR – Quick Dump Rinser
Rinser – Rinse Bath Controller (No Dump)

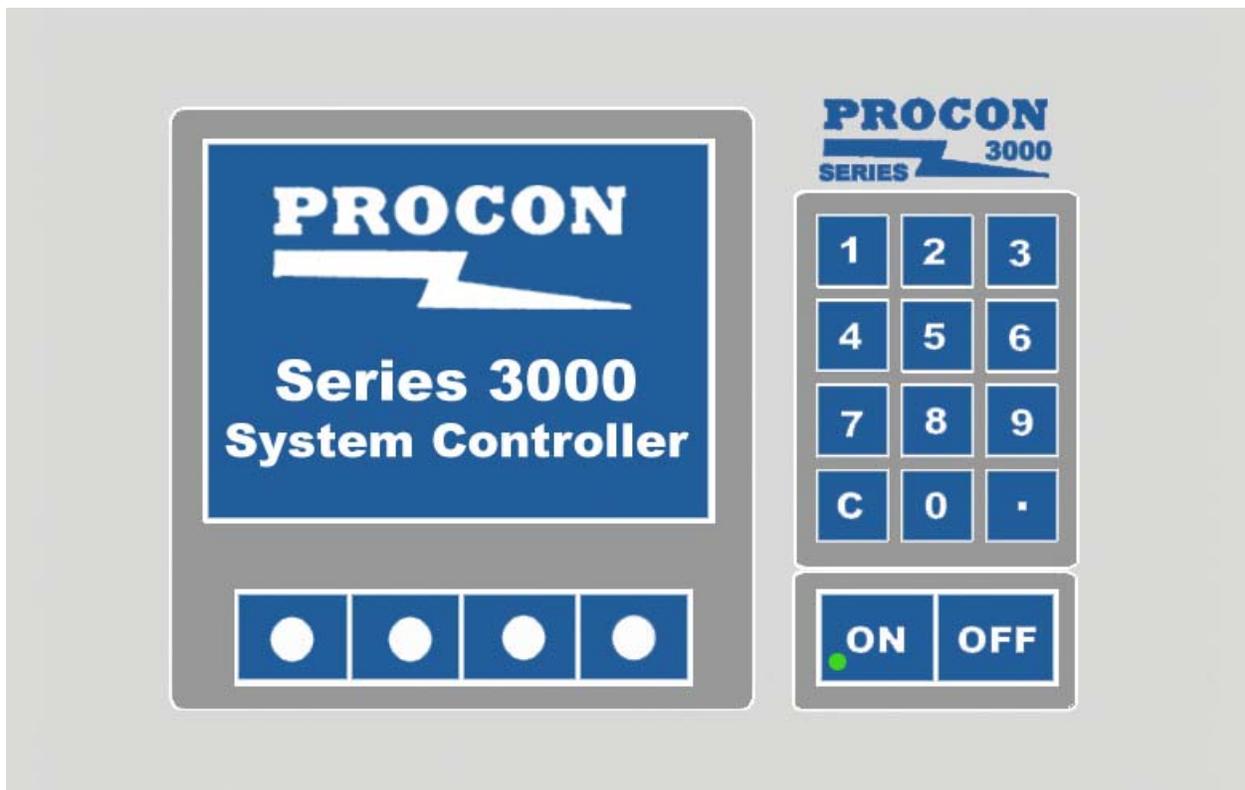
FRONT PANEL

The front of the controller is a smooth Lexan face with no opening. This design is to provide the maximum amount of protection for the unit in wet station environments. The face has a 5.7" diagonal LCD display that provides the user with all of the information necessary to setup and run the system.

There is a 12 key Numeric Keypad to allow for the quick entry of data and rapid selection of certain screens.

There are 4 function keys that are dynamically relabeled to provide the user with only those choices that are applicable at that specific moment.

The ON/OFF keys provide a convenient way to turn the system On and Off. The LED in the ON key indicates that there is line power (24 VAC) applied to the unit.



STRUCTURE

The System is structured based on a series of menus and screens. In general, there are a large number of functions that may be put together. This allows the user to select a great many combinations by simply selecting the functions that apply and setting the parameters that control those functions.

The power of this approach is that while the controller is complex, the user interface can be fairly simple. The program eliminates from the screens and menus all of the items that do not apply to the specific application.

There are multiple levels of setup and configuration, starting with the Factory (OEM) and ending with the user. At each of these levels, selections are made that tailor the controller to the exact application. For example, at the Factory level, the system may be configured to work with an internal or external resistivity monitor. If this option is selected, all of the parameters that are related to it will appear in the menus and logic. If the option is turned off, they are totally removed.

At the customer level this is further refined by having an Administrator function. This allows the further restriction of the options that are available to the user. Thus while the QDR may be capable of ending with the tank empty, the customer can restrict this function so their operators can not see this feature.

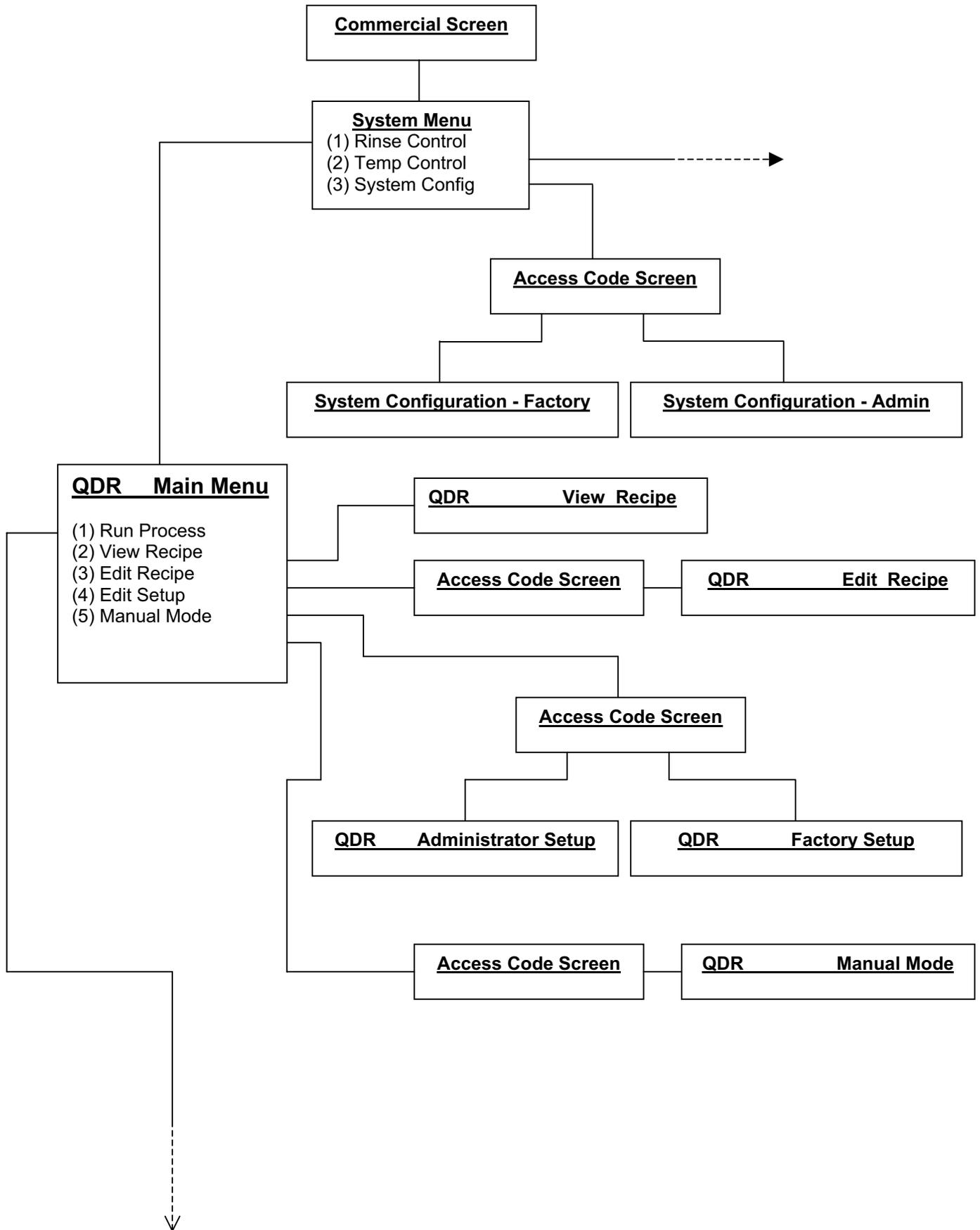
Multiple level access codes are provided that may be used to restrict access to parameters and functions. For example, a separate code can be assigned to editing a recipe and another can even be assigned to restrict the operators ability to change the selected recipe.

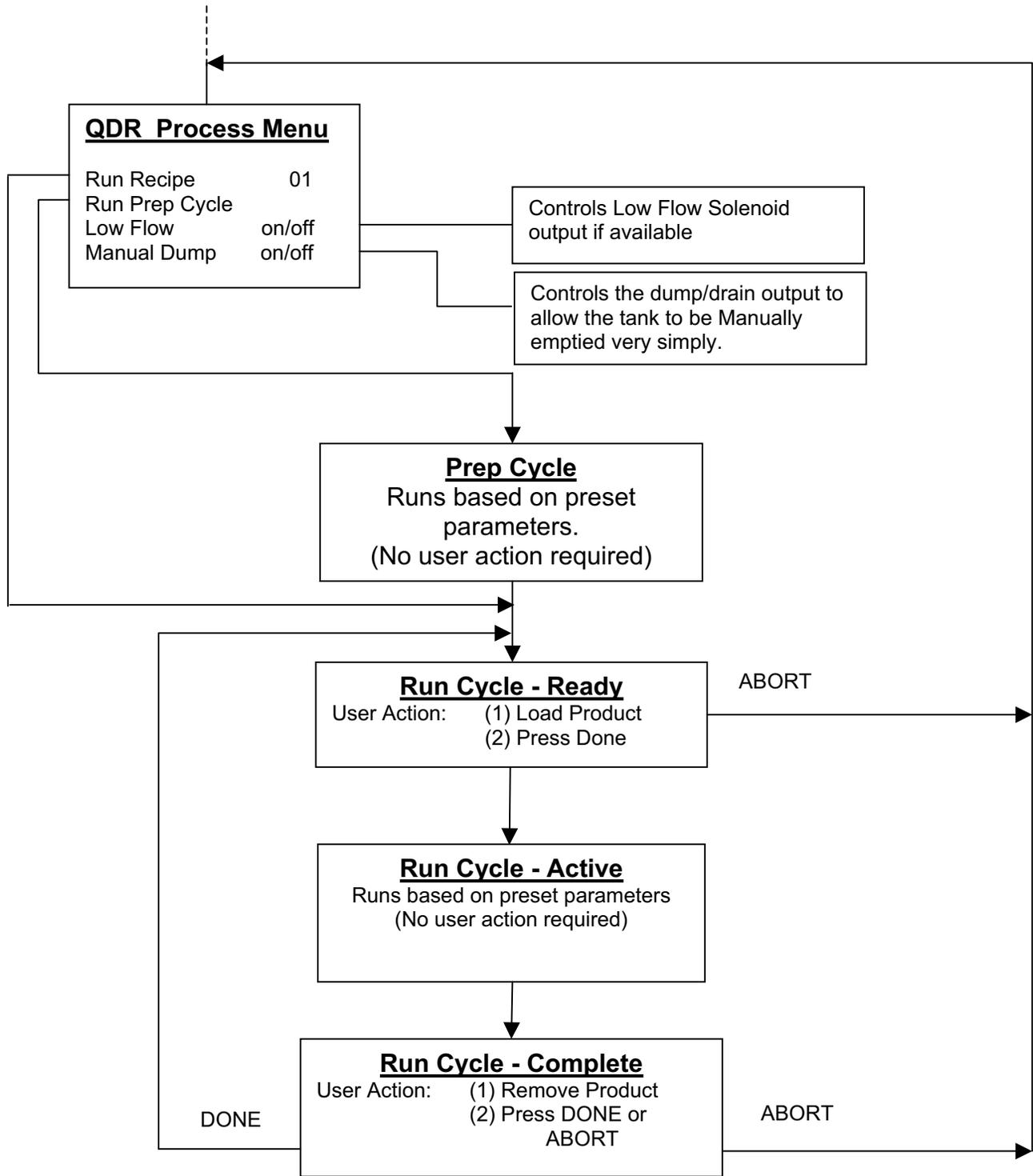
Generally the menus are grouped to allow the user a logical way to step into and out of any screen. The dynamically relabeled function keys offer a specific set of choices that directly apply to the current location rather than a large choice of keys that don't apply. These keys are even relabeled as the highlighted line moves through parameters.

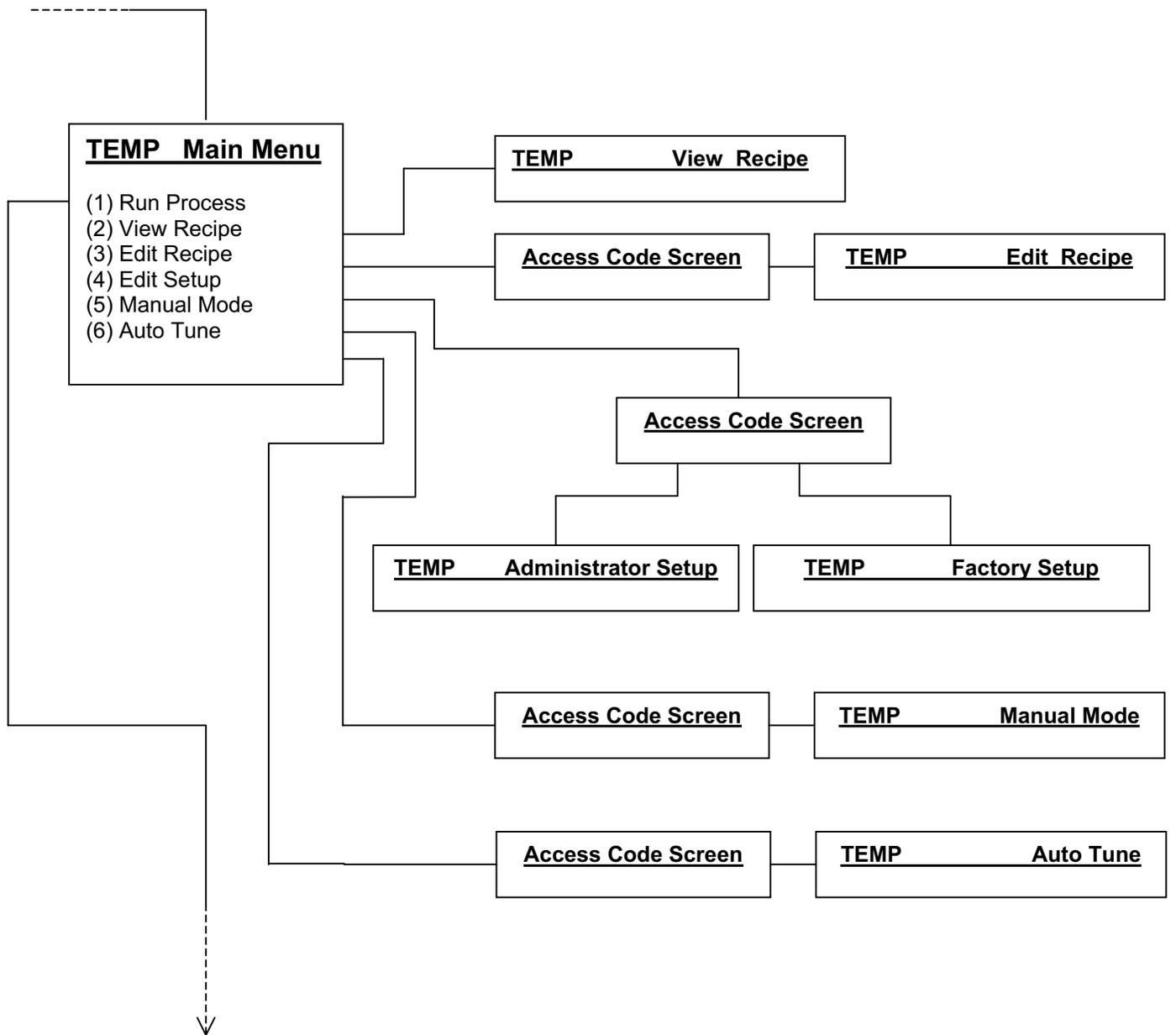
A Navigation key allows the user to move between the separate controller with one key and return to the same location again. Each section (E.G. System, QDR, HTC) operates independently, yet may be accessed almost instantly without affecting the others.

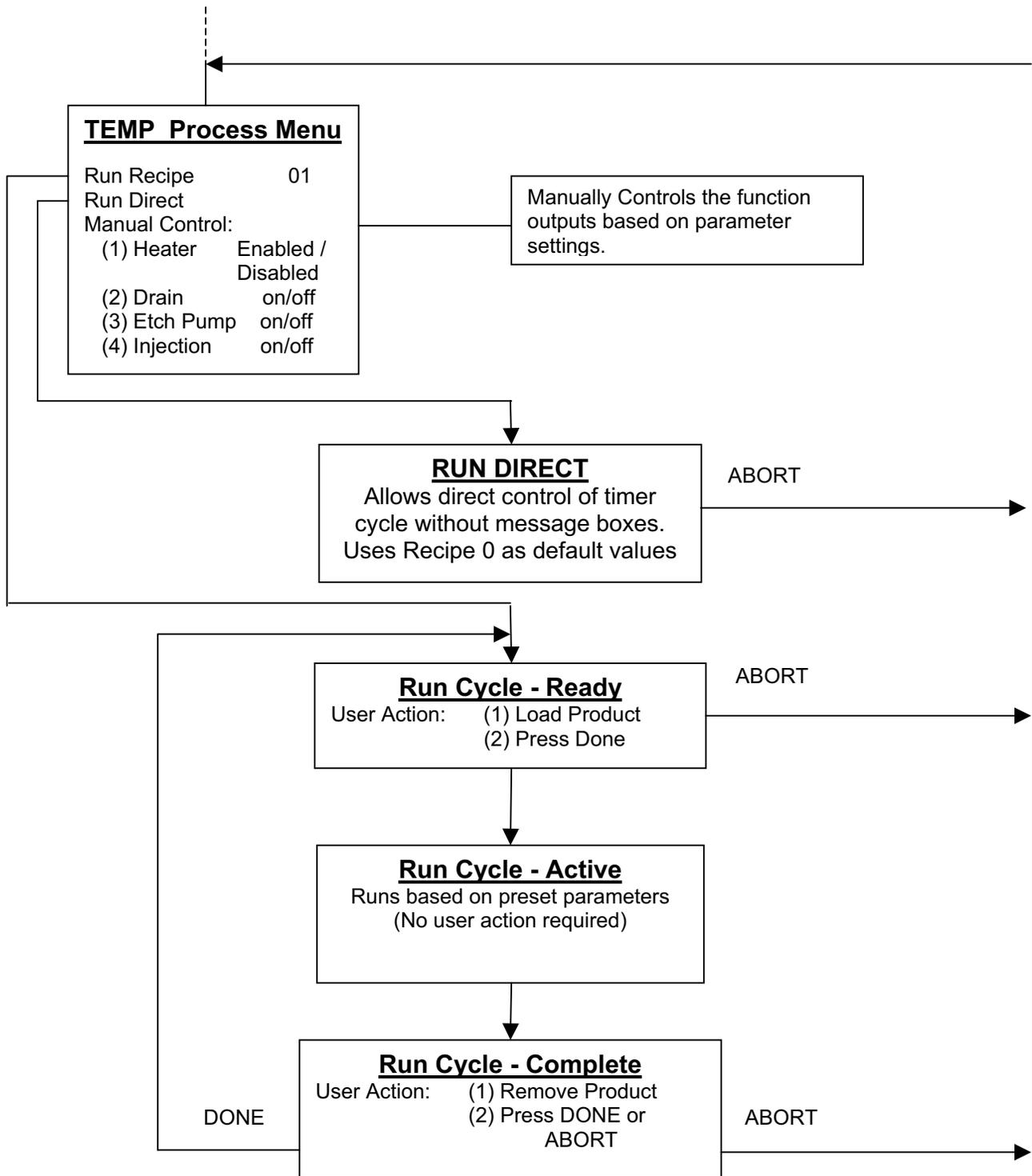
Alarm and message windows keep the operator up to date on actions in all sections no matter what is currently being worked on.

The following chart indicates the general flow of the main screens in a typical system:









ACCESS CODES

There are several levels of access codes in the system:

- (1) Back Door
- (2) Factory
- (3) Administrator
- (4) User

The security for the system can be as simple or as complex as is necessary for the application. If all of the Access Codes are set to 0000 they are all eliminated and the user will have full access to all features. However, in most applications, some level of protection is desirable. Therefore, various levels are provided to allow the system to be tailored to the specific application requirements.

The Back Door Code is a number that is in the main program structure and will allow access into the system no matter what has been set for any of the other Access Codes.

The Factory Access Code is designed so the OEM can take control of the functions that customize the controller to match a specific set of hardware. Since the controller has such a large variety of options, it is unlikely that all of them will be available on a given system. Therefore it is necessary to configure the controller to match the application. Once this is done, the Factory Access Code is used to limit access to this configuration.

The Factory Access Code is settable in the SYSTEM CONFIGURATION - FACTORY screen, but only if that screen is accessed using the Back Door Code.

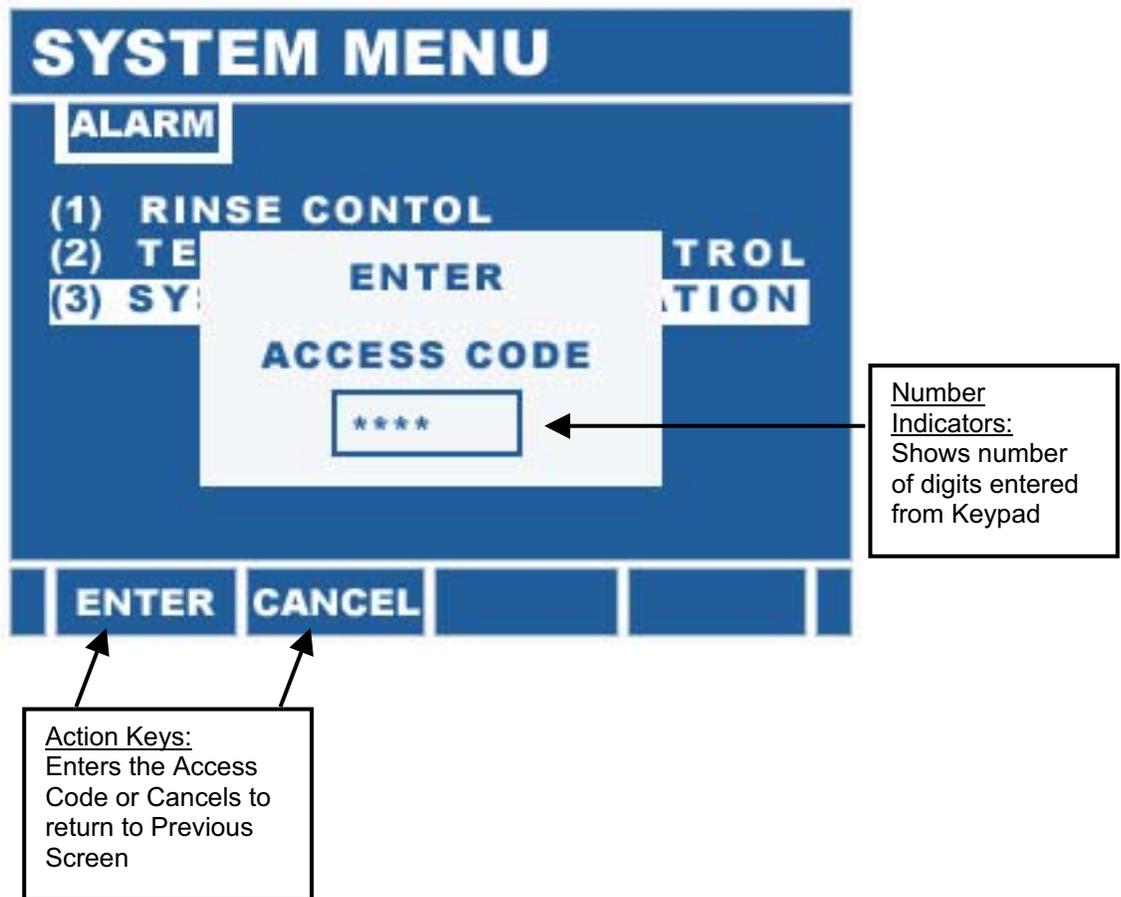
The Administrator Access Code is designed to give the customer the ability to restrict access to certain parameters that control the operation of the system. In this way the customer can differentiate between the user functions and the administration functions if that is desirable.

The Administrator Code is settable in the SYSTEM CONFIGURATION - FACTORY screen.

There is also a special parameter in the SYSTEM CONFIGURATION - FACTORY screen that allows the OEM to set a code that will allow the Administrator to set his own code (Access Code – Admin Set). This is provided for two reasons. The first is that in some applications the OEM wants to turn over full Admin control to the customer. The second is that when this control is not turned over to the customer, it provides a way for the OEM to give a code to the Customer if he is locked out without having to give out the Factory or Back Door Code. In essence it provides for a Customer level back door code that can be changed by the OEM.

There may be several User Access Codes depending on the system. In the QDR for example there are Edit Recipe and Select Recipe codes. Each is settable in the QDR - ADMIN SETUP screen. When set, they allow the customer Administrator to restrict who can setup Recipes and separately who can select which recipe is to be run. In all cases these parameters are set by the Administrator in the Setup menu for the application.

When an Access Code is required, the following window will appear. Use the Numeric Keypad to input the code and then press ENTER.



MANUAL REVISIONS

<u>Revision #</u>	<u>Revisions Made</u>
Rev 15	Upgrades
Rev 16	Pages Renumbered
Rev 17	HTC Parameters and Alarms Updated

LIMITED WARRANTY

WARRANTY: JPC CONTROLS WARRANTS ITS NEW PRODUCTS TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER THE SERVICE FOR WHICH THEY ARE INTENDED. THIS WARRANTY IS EFFECTIVE FOR TWELVE MONTHS FROM THE DATE OF SHIPMENT.

EXCLUSIONS: THIS WARRANTY IS **IN LIEU OF** ANY OTHER WARRANTY EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF **MERCHANTABILITY** OR FITNESS FOR A PARTICULAR PURPOSE.

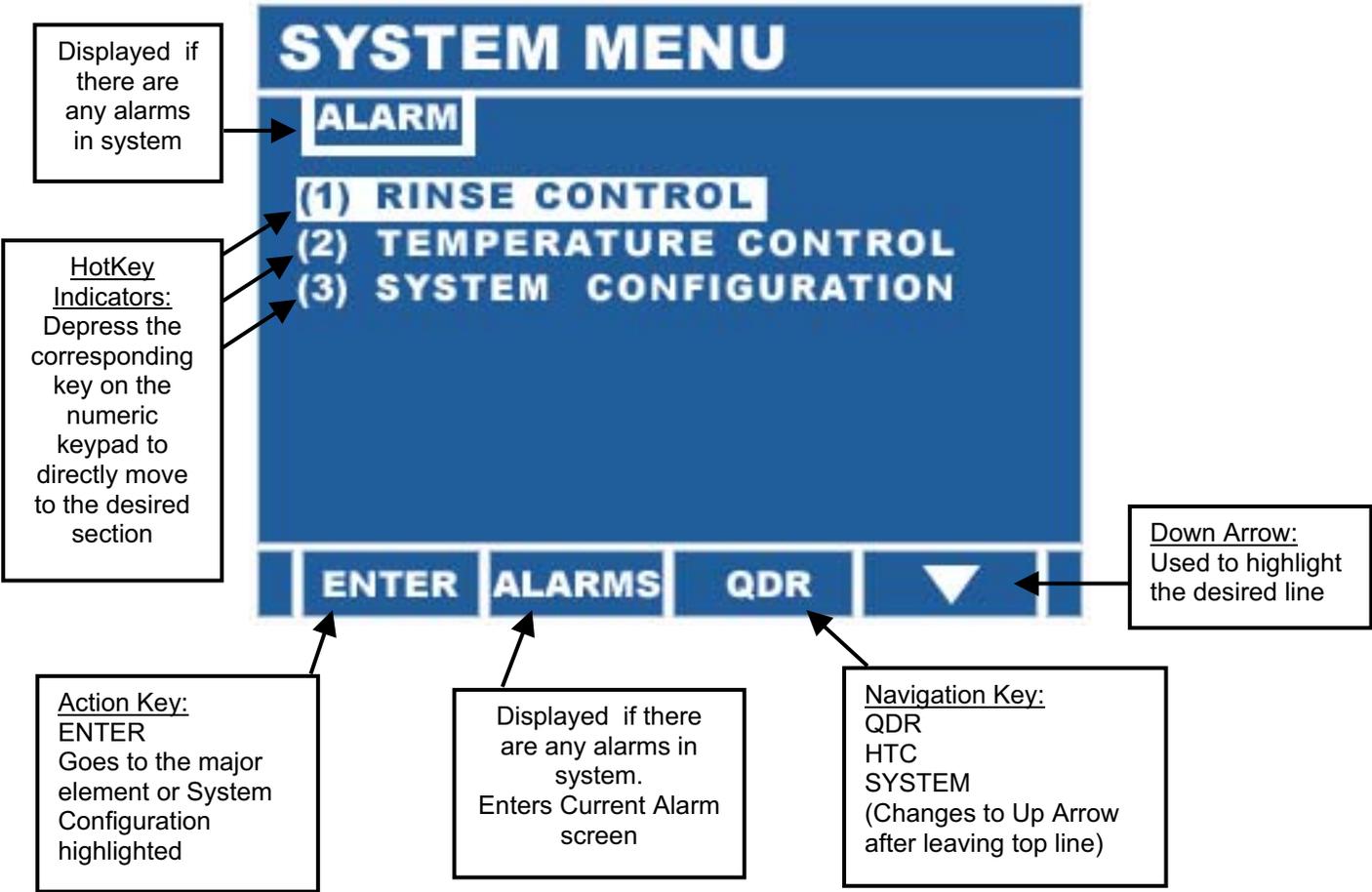
JPC CONTROLS IS NOT LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

NO PERSON OTHER THAN AN OFFICER IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR ASSUME ANY LIABILITY.

REMEDIES: THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY SHALL BE: (1) THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS OR PRODUCTS, WITHOUT CHARGE. (2) AT THE OPTION OF **JPC CONTROLS**, THE REFUND OF THE PURCHASE PRICE.

SYSTEM MENU

The SYSTEM MENU is the main entry point for the unit. It will appear on initial power up after the system diagnostics are complete. Its composition is dependent on the hardware that is present in the unit, but in all cases it contains a line for each major element and the System Configuration.



The sections of the unit are entered from this menu in one of several ways. In the first, the ARROW keys may be used to highlight the desired section and the ENTER key is then used to go to that section.

The second option is to use a HOTKEY. Any line in any menu that has a number in parenthesis to its left indicates a hotkey jump is available for that line. In this menu, all of the lines have hotkey jumps and as such, simply depressing the corresponding key on the Numeric Keypad will directly move to the desired section.

The third option is to use the NAVIGATION key. This is the second key from the right and is available in all menus when the highlight band is at the top line, or if no highlight option is available. It replaces the up arrow on these menus since there is no need to move up. This key then provides a simple way to move between the sections in the unit. It loops through the various sections in the order they appear on the SYSTEM MENU. When moving from section to section, the current view in the sections is not changed. It is like moving between windows on a PC.

The ALARM key is only available if there are active alarms in the system. While the alarm window will appear in the current screen when it occurs, this central location in the SYSTEM MENU allows for the review of the alarm windows at anytime.

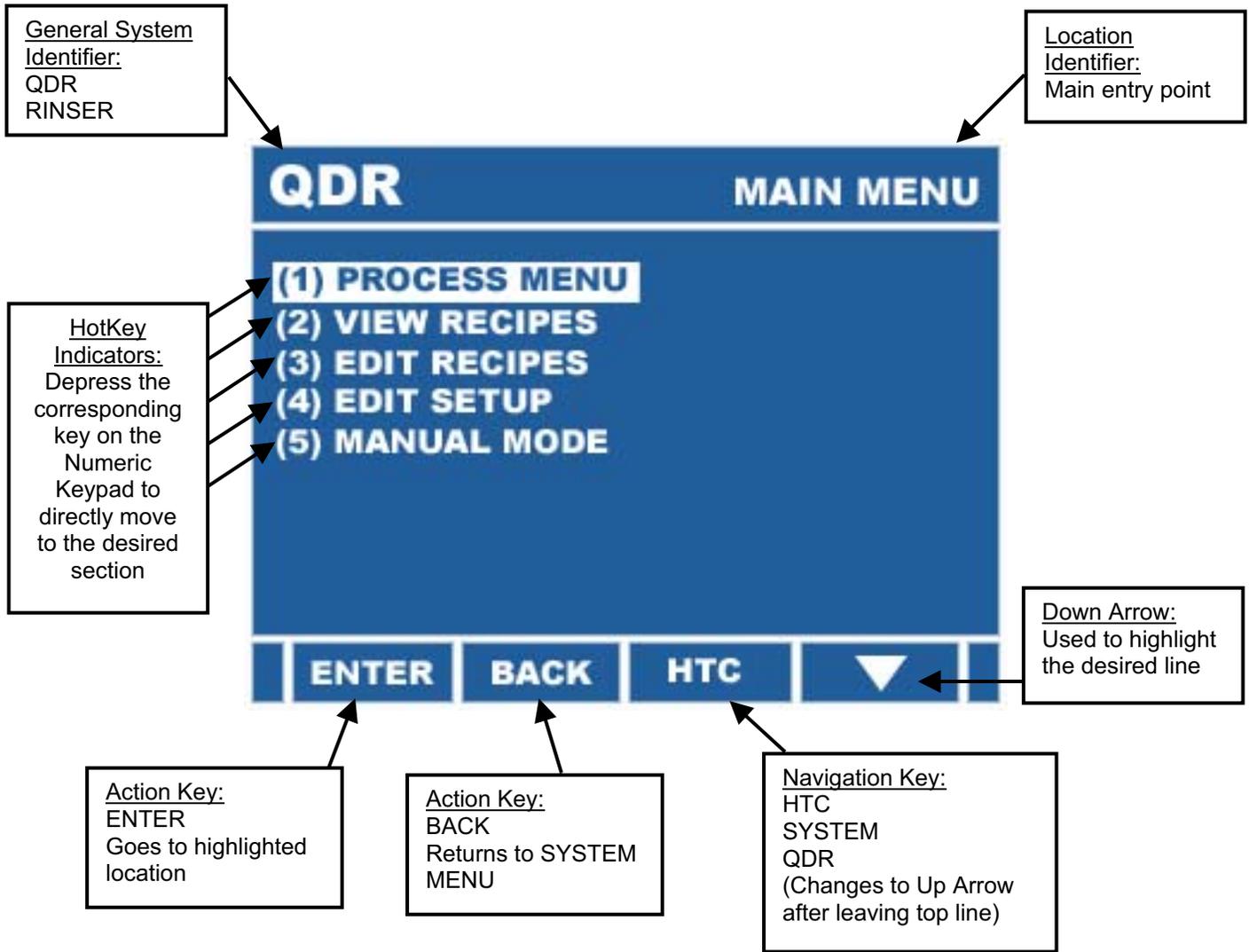
RINSE CONTROL – This line allows the user to select the Rinse Control section of the unit. This section may be setup to run QDR or Rinsers, etc but in all cases it deals with the rinsing function.

TEMPERATURE CONTROL – This line allows the user to select the Temperature Control section of the unit. This section may be setup as an HTC (High Temperature Controller), Recirc (Recirculator Controller), IFTC (Inline Flow Temperature Controller), etc but in all cases it deals with the Temperature Control function.

SYSTEM CONFIGURATION – The configuration of the unit is done in several different menus. They are located in the section MAIN MENUS if they relate to a specific section. If they relate to the entire system, they are configured in the SYSTEM MENU, using this line.

QDR* – MAIN MENU

The QDR - MAIN MENU is the main entry point for control of the QDR. It is entered from the (1) RINSE CONTROL line in the SYSTEM MENU.



* Several types of rinsers are configurable under this section. However, all references and examples will use the most common setting of QDR (Quick Dump Rinsers). The differences between this and the other settings only relates to the labeling of the screens and the specific functions that are available.

PROCESS MENU – This line provides entry into the PROCESS MENU, from which the QDR is actually run.

VIEW RECIPES – This line provides entry into the Recipes for the QDR. In this section, the recipes may be viewed, but not changed.

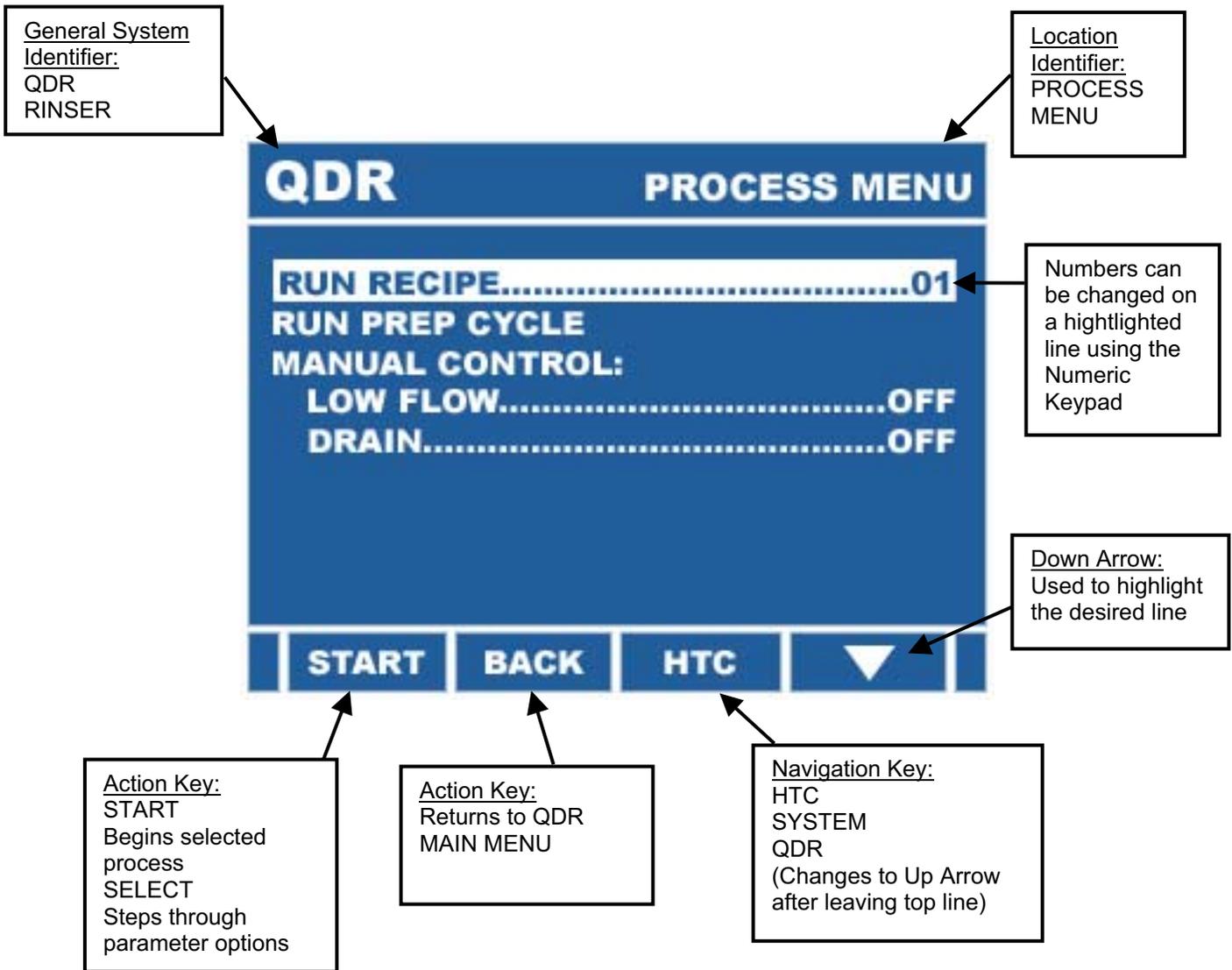
EDIT RECIPES – This line provides entry into the Recipes for the QDR. In this section, the recipes may be viewed and changed.

EDIT SETUP – This line provides entry into the Setup for the QDR. There are two subsections – Administrator and Factory. The Access Code that is used determines which section is entered from this line.

MANUAL MODE – This line provides entry into the Manual Mode. In this mode the outputs may be individually turned on and off and the inputs may be examined. It is used for both testing and fixed manual setup of the system.

QDR – PROCESS MENU

The QDR - PROCESS MENU is the main entry point for operation of the QDR. It is entered from the (1) RUN PROCESS line in the QDR - MAIN MENU.



RUN RECIPE xx – This line allows the user to select the recipe that is to be run using the Numeric Keypad and then begin the run using the START key.

RUN PREP CYCLE – This line allows the user to begin the Prep Cycle by highlighting the line and pressing the START key. The Prep Cycle will run and then proceed to the Recipe that is set in the first line. Note: the RECIPE RUN can be aborted and control returned to this menu after the Prep Cycle without any further action if desired..

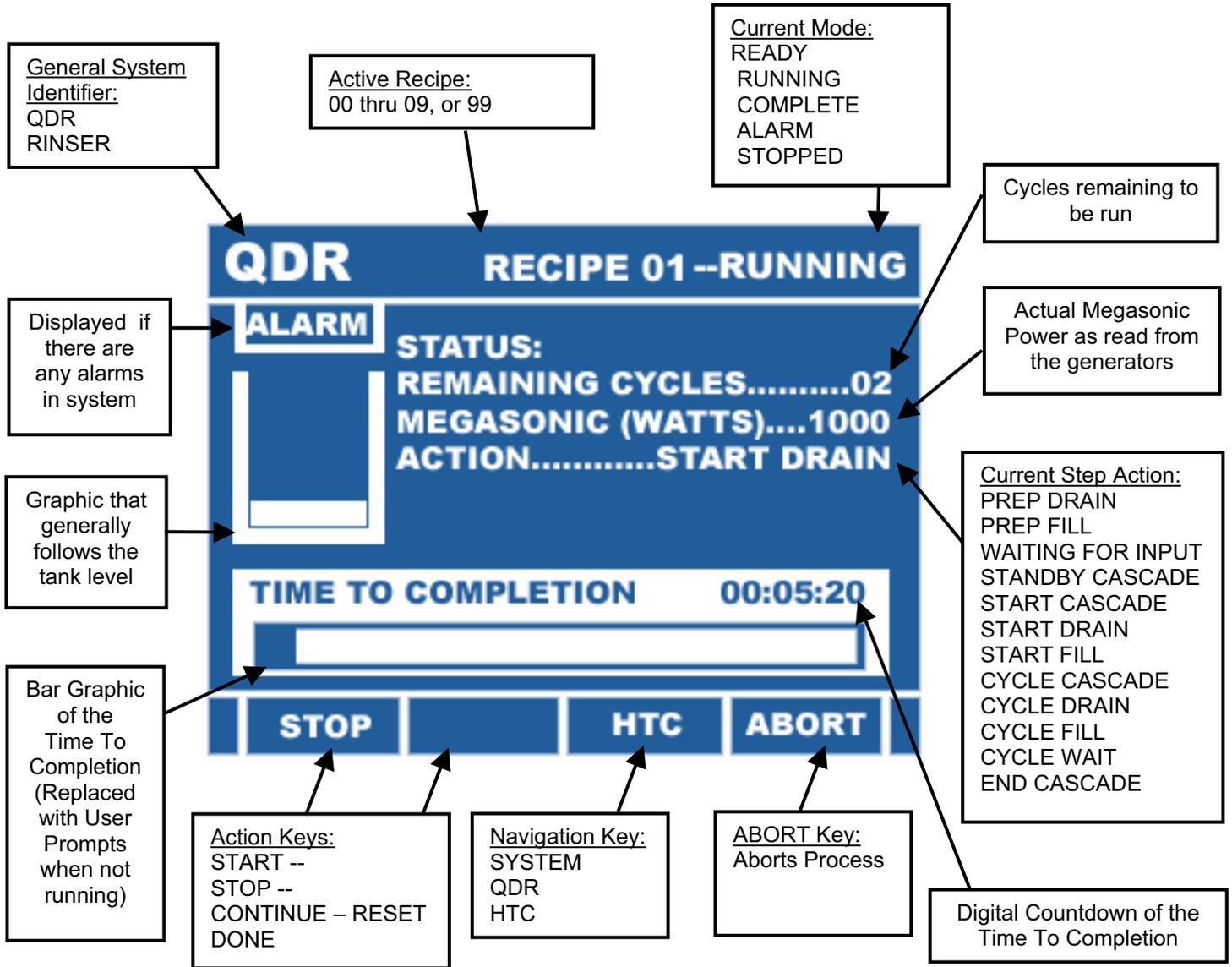
MANUAL CONTROL: – This section provides the user with manual control over a number of features.

LOW FLOW – This line allows the user to toggle the Low Flow Solenoid On and Off. This is a manual operation and the state of the Low Flow Solenoid is strictly controlled by this line.

MANUAL DRAIN – This line allows the user to toggle the Dump/Drain solenoid On and Off when the system is not running a recipe. Its primary usage is to allow a simple way to manually drain the tank. Once a recipe is started, this setting is overwritten and control of the solenoid is taken over by the automatic operations.

QDR – RUN RECIPE/RUN PREP CYCLE

The following screen is typical of the view that is present when a process is running. Some information may be slightly different based on the system configuration, but the basic layout is the same.



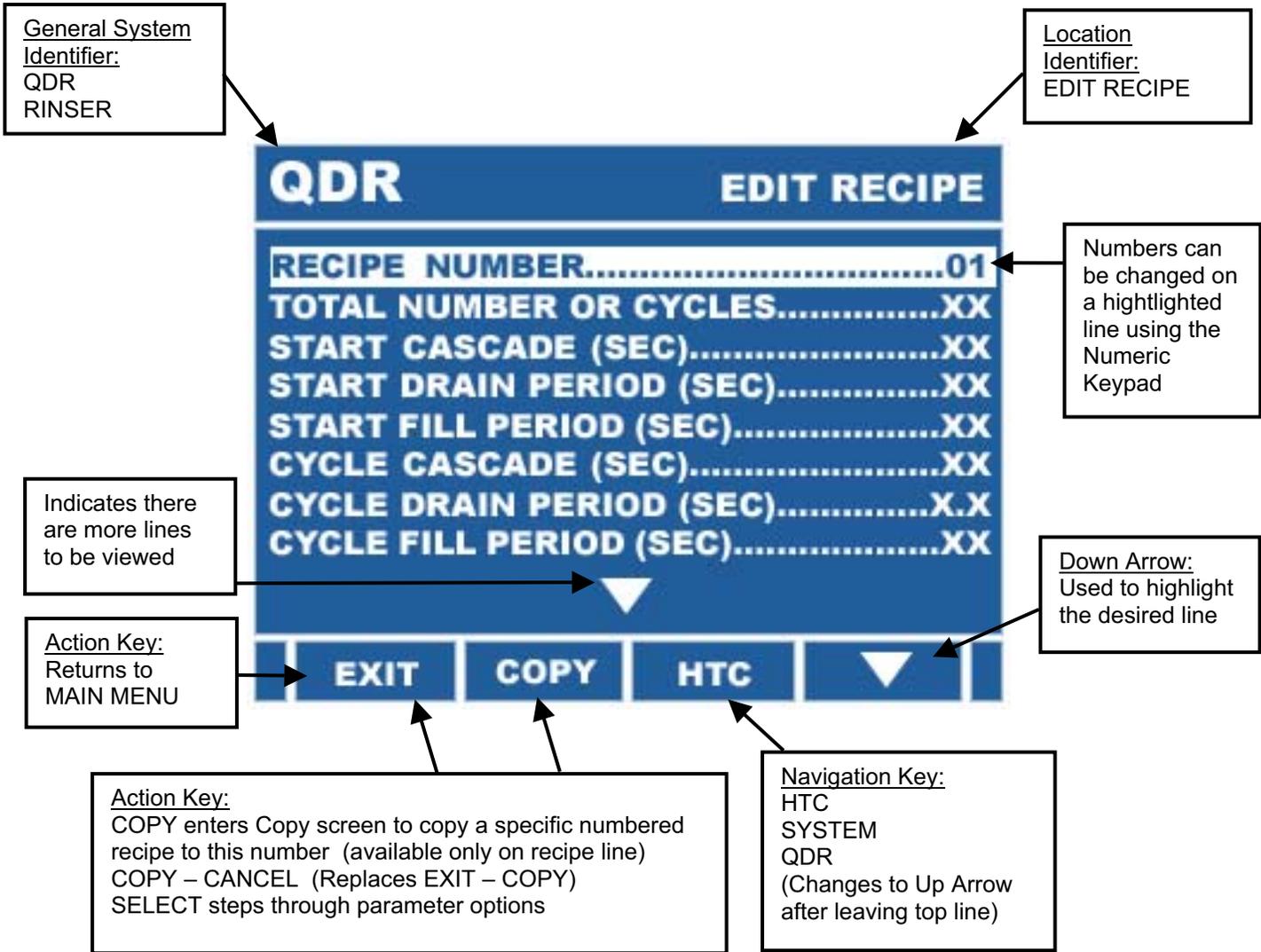
QDR – VIEW RECIPES / EDIT RECIPES

The QDR Recipes allow the user to prestructure a Rinsing application and simply recall the setup for future use. Up to 10 different Recipes may be kept in the system memory. The memory is battery backed up Ram, thus the Recipes are kept even if the power is removed.

In the QDR - MAIN MENU the VIEW RECIPE and EDIT RECIPE line items allow access into the Recipe screens. Use the UP and DOWN ARROWS to move the highlighting to this line and press ENTER.

The VIEW RECIPE item will go directly into the Recipe screen and will allow a complete view of all of the Recipes, but it will not allow any parameters to be changed.

The EDIT RECIPE item opens up an Access Code window. Enter the Access Code to gain access to the QDR – EDIT RECIPE menu.



The following table indicates the parameters, their setting range and when they will be visible in the menu, based on other settings in the system:

QDR – Recipe (0 thru 9)

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Recipe Number	00 to 09	always
Total Number of Cycles	0 to 99	always
Number of Reclaim Cycles	0 to 99	if Reclaim Type not = None (removed in Rinser)
Reclaim Placement	First/Last	if Reclaim Type not = None (removed in Rinser)
Start Cascade (sec)(m:s)	0 to 9999 0:00 to 99:59	always
Start Drain Period (sec)(m:s)	0 to 9999 0:00 to 99:59	always (removed in Rinser)
Start Fill Period (sec)(m:s)	0 to 9999 0:00 to 99:59	if Liquid Level Fill = no (removed in Rinser)
Cycle Cascade (sec)(m:s)	0 to 9999 0:00 to 99:59	always
Cycle Drain Period(sec)	0.0 to 999.9	always (removed in Rinser)
Cycle Fill Period (sec)(m:s)	0 to 9999 0:00 to 99:59	if Liquid Level Fill = no
Cycle Wait Period (sec)(m:s)	0 to 9999 0:00 to 99:59	always
End Cascade (sec)(m:s)	0 to 9999 0:00 to 99:59	always
End Empty	Yes/No	End Empty Option = On
Remove Product Wet	Yes/No	End Empty = Yes
Spray Logic	Off/Fill-Wait-Cascade/All	always (removed in Rinser)
Spray Placement	First/Last/Always	if Spray Logic not=Off (removed in Rinser)
Number of Cycles	0 to 99	if Spray Logic = First or Last (removed in Rinser)

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Resistivity Logic	Off/Short Cycle/ Stop Cascade/Both/ Door Change	if Resistivity not= None
N2 Bubbler Logic	Off/Fill-Wait-Cascade/All	if N2 Bubbler Option = Yes
Megasonic Logic	Off/Fill-Wait-Cascade/All	if Megasonic Type not = none
Megasonic Power (watts)	0 to 9999	if Megasonic Type not = none & Meg Logic not= off
View Mode	Min/Max	always

Recipe Number – This parameter selects the Recipe that is to be Viewed or Edited.

Total Number of Cycles – This parameter sets the total number of cycles for the recipe. It includes the Start Cycle.

Number of Reclaim Cycles – This parameter sets the portion of the Total cycles that are to be Reclaim Cycles.

Reclaim Placement – When Reclaim is active, the cycles will either be at the beginning of the run or at the end. This parameter allows for that choice. (For Example, if Total Cycles = 10, Number of Reclaim Cycles = 3 and Reclaim Placement = First The First 3 drains will go down the Reclaim Drain and the Last 7 will go down the Normal Drain.)

Start Cascade – This parameter sets the time for the Cascade that occurs at the start of the run.

Start Drain Period – This parameter sets the time for the first Drain/Dump.

Start Fill Period – This parameter sets the time for the first Fill in the run, if Liquid Level Fill is not used.

Cycle Cascade – This parameter sets the time for the Cascade that occurs at the start of each cycle after the start cycle.

Cycle Drain Period – This parameter sets the time for all Drain/Dumps after the start cycle.

Cycle Fill Period – This parameter sets the time for all fills after the start cycle, if Liquid Level Fill is not used.

Cycle Wait Period – This parameter sets the time that the run will hold (fill off) before proceeding to the next cycle.

End Cascade – This parameter sets the time for the cascade at the end of the last cycle.

End Empty – This parameter allows for the selection of ending the run with the tank empty. This means that the run will open the drain/dump at the completion of the run. Whether the run is started empty or full or whether the parts are removed wet or dry can be controlled with other parameters if this option is selected.

Note: In double door applications, the doors or diverter valve will revert to the reclaim logic of the first cycle once the DONE key is depressed. The drain will remain open, it will just revert to the recipe preset condition.

Remove Product Wet – If End Empty is selected, this parameter allows the option to remove the parts prior to the last drain/dump, to insure that they are kept wet at all times prior to removal.

Spray Logic – The spray may do many different things dependent on the process. This parameter allows the selection of the logic that controls the Top Spray:

- | | |
|----------------------------|---|
| (0) Off – | The Spray is off during the entire run. |
| (1) Fill – | The Spray is on only during the Fill periods. |
| (2) Drain – | The Spray is on only during the Drain periods |
| (3) Wait – | The Spray is on only during the Wait periods |
| (4) Cascade – | The Spray is on only during the Cascade periods. |
| (5) Fill / Drain – | The Spray is on only during the Fill & Drain periods. |
| (6) Fill / Wait – | The Spray is on only during the Fill & Wait periods |
| (7) Fill / Cascade – | The Spray is on only during the Fill & Cascade periods |
| (8) Drain / Wait – | The Spray is on only during the Drain & Wait periods |
| (9) Drain / Cascade – | The Spray is on only during the Drain & Cascade periods |
| (10) Wait / Cascade – | The Spray is on only during the Wait & Cascade periods |
| (11) Fill / Drain / Wait – | The Spray is on only during the Fill & Drain & Wait periods. |
| (12) Fill / Drain / Cas – | The Spray is on only during the Fill & Drain & Cascade periods |
| (13) Drain / Wait / Cas – | The Spray is on only during the Drain & Wait & Cascade periods. |
| (14) All – | The Spray is on during the entire run. |

Note: For ease of entry, in addition to using the SELECT key to scroll to the selection, the number in parenthesis may be entered from the Numeric Keypad to jump directly to the selection.

Spray Placement – This parameter is used to limit the cycles during which the spray is active. The Spray Logic will be active as selected, but will be further restricted by this parameter.

First – The Spray is on for the First xx Cycles (Subject to Spray Logic Selection).

Last – The Spray is on for the Last xx Cycles (Subject to Spray Logic Selection).

Always – The Spray is always on (Subject to the Spray Logic Selection).

Number of Cycles – If Spray Placement is set to First or Last this parameter sets the number of cycles.

Resistivity Logic #1 – This parameter sets the response that the run will have to meeting a specific Resistivity value on the #1 resistivity input.

Off - Ignore

Short Cycle - Test value at the end of each cycle and jump to End Cascade without running the remaining cycles if the Resistivity is met.

Stop Cascade - Test during End Cascade and jump to Complete if resistivity is met prior to the end of the Cascade.

Both - Use both Short Cycle and Stop Cascade tests.

Door Change - In double door applications, the value is tested at the end of each Cycle Fill and if resistivity is met, the reclaim door change is made if it has not already been done based on the cycle count.

Resistivity Logic #2 – This parameter sets the response that the run will have to meeting a specific Resistivity value on the #2 resistivity input. They are identical to the #1 parameter.

Note: If internal resistivity is used, there are no actual inputs, the internal logic handles the task. The actual setpoints are handled in either the external or internal monitors setup.

N2 Bubblers Logic – The N2 Bubbler may do many different things dependent on the process. This parameter allows the selection of the logic that controls the N2 Bubbler:

- | | |
|----------------------------|---|
| (0) Off – | The Bubbler is off during the entire run. |
| (1) Fill – | The Bubbler is on only during the Fill periods. |
| (2) Drain – | The Bubbler is on only during the Drain periods. |
| (3) Wait – | The Bubbler is on only during the Wait periods |
| (4) Cascade – | The Bubbler is on only during the Cascade periods. |
| (5) Fill / Drain – | The Bubbler is on only during the Fill & Drain periods. |
| (6) Fill / Wait – | The Bubbler is on only during the Fill & Wait periods. |
| (7) Fill / Cascade – | The Bubbler is on only during the Fill & Cascade periods. |
| (8) Drain / Wait – | The Bubbler is on only during the Drain & Wait periods. |
| (9) Drain / Cascade – | The Bubbler is on only during the Drain & Cascade periods. |
| (10) Wait / Cascade – | The Bubbler is on only during the Wait & Cascade periods. |
| (11) Fill / Drain / Wait – | The Bubbler is on only during the Fill & Drain & Wait periods. |
| (12) Fill / Drain / Cas – | The Bubbler is on only during the Fill & Drain & Cascade periods. |
| (13) Drain / Wait / Cas – | The Bubbler is on only during the Drain & Wait & Cascade periods. |
| (14) All – | The Bubbler is on during the entire run. |

Note: For ease of entry, in addition to using the SELECT key to scroll to the selection, the number in parenthesis may be entered from the Numeric Keypad to jump directly to the selection.

Megasonic Logic – The Megasonics may do many different things dependent on the process. This parameter allows the selection of the logic that controls the Megasonic Generators:

- | | |
|----------------------------|--|
| (0) Off – | The Megasonic is off during the entire run. |
| (1) Fill – | The Megasonic is on only during the Fill periods. |
| (2) Drain – | The Megasonic is on only during the Drain periods |
| (3) Wait – | The Megasonic is on only during the Wait periods |
| (4) Cascade – | The Megasonic is on only during the Cascade periods. |
| (5) Fill / Drain – | The Megasonic is on only during the Fill & Drain periods. |
| (6) Fill / Wait – | The Megasonic is on only during the Fill & Wait periods |
| (7) Fill / Cascade – | The Megasonic is on only during the Fill & Cascade periods |
| (8) Drain / Wait – | The Megasonic is on only during the Drain & Wait periods |
| (9) Drain / Cascade – | The Megasonic is on only during the Drain & Cascade periods |
| (10) Wait / Cascade – | The Megasonic is on only during the Wait & Cascade periods |
| (11) Fill / Drain / Wait – | The Megasonic is on only during the Fill & Drain & Wait periods. |
| (12) Fill / Drain / Cas – | The Megasonic is on only during the Fill & Drain & Cas periods |
| (13) Drain / Wait / Cas – | The Megasonic is on only during the Drain & Wait & Cas periods. |
| (14) All – | The Megasonic is on during the entire run. |

Note: For ease of entry, in addition to using the SELECT key to scroll to the selection, the number in parenthesis may be entered from the Numeric Keypad to jump directly to the selection.

Megasonic Power – If Megasonics are active for the system, this parameter allows the setting of the total power that is used.

View Mode – Since the Recipe has a large number of items, many of which may not be used in a given application, this parameter is provided to simplify the display. Obviously, if features are not available or activated in the Configuration and Setup of the system, they will not appear in the menu. However, there may also be a number of items that do not apply to a specific recipe. Therefore, this parameter may be set to MIN to eliminate from the menu any items that are turned off or set to zero. To regain access to these items, the parameter can simply be set back to MAX.

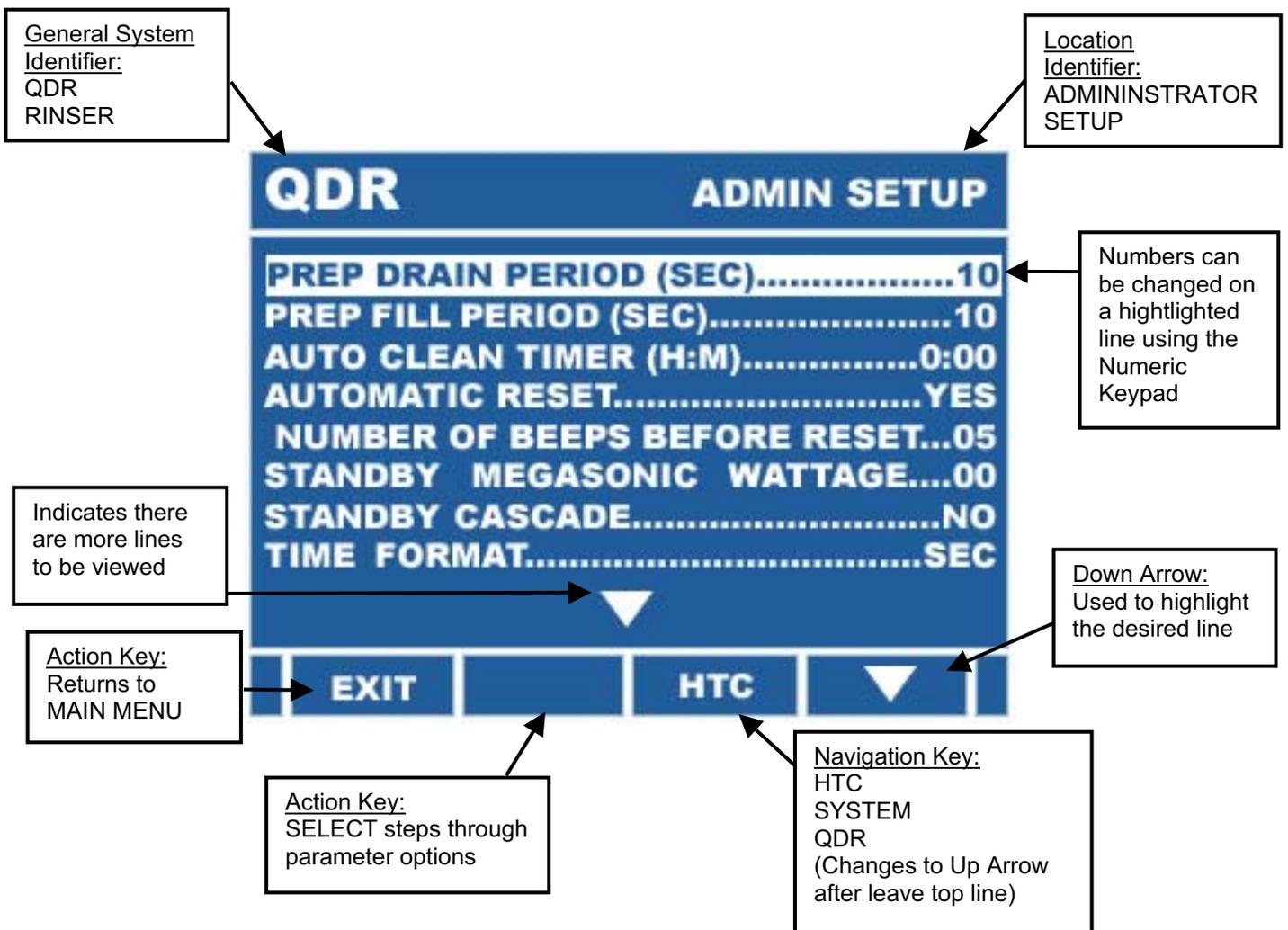
For ease of use, if the parameter is set to MIN, setting a parameter to zero or disabling it, will not immediately remove it from the menu. However, the next time the menu is entered, the line will be removed. If it is desirable to remove the lines while still in the menu, the parameter can be cycled from MIN to MAX and back to MIN and they will immediately be removed.

QDR – EDIT SETUP

The Rinse Control Setup consists of setting those parameters that affect the Rinsers/etc controller section. Since several types of rinsers are configurable under this section, all references and examples will use the most common setting of QDR (Quick Dump Rinsers). However, the same would apply to all other options.

In the QDR - MAIN MENU the second to the last line item is EDIT SETUP. Use the UP and DOWN ARROWS to move the highlighting to this line and press ENTER.

This will open up an Access Code window. Enter the Administrator Access Code to gain access to the QDR - ADMIN SETUP menu, or the Factory Access Code to gain access into the QDR - FACTORY SETUP menu and then press ENTER.



The following table indicates the parameters, their setting range and when they will be visible in the menu, based on other settings in the system:

QDR – Administrator Setup

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Prep Drain Period (sec)(m:s)	0 to 9999 0:00 to 99:59	always
Prep Fill Period (sec)(m:s)	0 to 9999 0:00 to 99:59	if Liquid Level Fill = no
Auto Clean Timer (hr:min)	0:00 to 99:59	always
Auto Clean Drain Time (sec)	0.0 to 999.9	if Auto Clean Timer not =0
Auto Clean Fill Time (sec)(m:s)	0 to 9999 0:00 to 99:59	if Auto Clean Timer not =0 & Liquid Level Fill = No
Automatic Reset	Yes/No	always
Number of Beeps before Reset	0 to 99	if Automatic Reset = Yes
Liquid Level Start Fill Time (sec)	0 to 9999	if Liquid Level Fill = Yes
Liquid Level Cycle Fill Time (sec)	0 to 9999	if Liquid Level Fill = Yes
Auto Adjust Option	Yes/No	if Liquid Level Fill = Yes
Liquid Level Top Off Time (sec)	0 to 9999	if Liquid Level Fill = Yes
Fill Alarm Time (sec)(m:s)	0 to 9999 0:00 to 99:59	if Liquid Level Fill = Yes
Drain Alarm Time (sec)(m:s)	0 to 9999 0:00 to 99:59	if Liquid Level Fill = Yes
Standby Megasonic Wattage	0 to Max	if Megasonic Type not = none
Standby Cascade	Yes/No	always
Time Format	Sec/Min:Sec	always
End Empty Option	Yes/No	always
Access Code – Edit Recipe	0 to 65000	always
Access Code – Select Recipe	0 to 65000	always

The Parameters that are marked (sec)(m:s) are one or the other based on the setting of the Time Format parameter.

Prep Drain Period – This parameter sets the amount of time that the Drain is open during the Prep Cycle.

Prep Fill Period – This parameter sets the amount of time that the Fill is active during the Prep Cycle, if the control is set to Timed Fill as opposed to Liquid Level Fill.

Auto Clean Timer – The Auto Clean Cycle allows the system to be setup to monitor how long it has been inactive and run an automatic drain/fill cycle to keep it clean. The time set in this parameter is counted down whenever the system is inactive. It is reset by any normal cycles. If it reaches zero, the Auto Clean Cycle activates.

Auto Clean Drain Period – This parameter sets the amount of time that the Drain is open during the Auto Clean Cycle.

Auto Clean Fill Period – This parameter sets the amount of time that the Fill is active during the Auto Clean Cycle, if the control is set to Timed Fill as opposed to Liquid Level Fill.

Auto Reset – At the completion of a run, the control may be automatically reset after a fixed number of audio beeps. This parameter activates that feature.

Number of Beeps before Reset – If Auto Reset is active, this parameter is used to set the number of audio Beeps that will sound before the control automatically resets.

Liquid Level Start Fill Time – During a run, the display counts down the time to completion. If the system uses Liquid Level Fill, it uses this setting as the time it takes to fill the tank to the liquid level switch during the Start Fill.

Liquid Level Cycle Fill Time – During a run, the display counts down the time to completion. If the system uses Liquid Level Fill, it uses this setting as the time it takes to fill the tank to the liquid level switch during the Cycle Fill. Note that the Cycle Drain may be set to only do a partial dump and thus the fill will be a different time than the complete fill done in the Start Fill.

Auto Adjust Option – The Liquid Level Fill Time in the previous two parameters can be calculated by the control by taking an average of the fill times. This parameter turns this feature on. NOTE: It is best to give the system an initial value in the Liquid Level Fill Time parameters to allow the averages to more quickly be as accurate as possible. The current average will be displayed in the parameters. When a value is manually changed, the average is reset to the new manual value.

Liquid Level Top Off Time – When Liquid Level Fill is selected, the level in the tank is determined by the placement of a sensor in the tank. Since it may not be possible to place the sensor at the exact top of the tank, this parameter allows for the addition of a fixed timed fill after the level has reached the switch and before the tank is considered full.

Fill Alarm Time – When Liquid Level Fill is selected, the Fill alarm tracks the length of time it takes to fill the tank. If the time it takes to fill the tank exceeds this value, an alarm is sounded. Setting this value to zero eliminates this feature.

Drain Alarm Time – When Liquid Level Fill is selected, the Drain Alarm Timer will sample the liquid level switch after the drain has started to insure that a drain is taking place. If the liquid level switch has not been cleared within this time an alarm is sounded. Setting this value to zero eliminates this feature.

Standby Megasonic Wattage – If Megasonic generators are used with the system, this setting is the wattage output that is used in the Standby Mode. Standby conditions exist while the product is being Loaded and after the run is complete and it is waiting to be Unloaded.

Standby Cascade – This parameter allows the fill solenoid to be active in the Standby Mode. This will provide a continuous cascade. Standby conditions exist while the product is being Loaded and after the run is complete and it is waiting to be Unloaded.

Time Format – Many of the time parameters in the system may be set in seconds or minutes and seconds. This parameter makes that selection. The display for each of these parameters is changed to reflect this setting.

End Empty Option – In some applications it is desirable to end the cycle with the tank empty. This parameter allows the selection of that option. At the end of the run, the door (drain) will remain open. This parameter is used in conjunction with the Remove Product Wet parameter and the Prep Cycle to cover all of the various combinations that might come up with respect to this feature.

Clear Recipes – When set to yes, this parameter will cause all the Recipes except for the Recipe of Record to be cleared when the ADMIN SETUP MENU is exited.

Access Code – Edit Recipe – The Access Code that will allow entry into the EDIT RECIPE menu is set in this parameter.

Access Code – Select Recipe – The Access Code that will allow the selection of the Recipe that is to be run is set in this parameter.

QDR – Factory Setup

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Resistivity Type	None/External /Internal	always
Reclaim Type	None/Double Door/Diverter	always (removed in Rinser)
Liquid Level Fill	Yes/No	always
N2 Bubbler Option	Yes/No	always
Recipe of Record Option	Yes/No	always
Megasonic Type	None/Kokusai /Kaijo	always
Control Via	Logic/RS485	if Meg Type not = None
Baud Rate	2400/4800/9600/19200 38400/5760/115200	if control Via =RS485
Total Power (Watts)	0000 to 9999	if Meg Type not = None
Number of Generators	1 to 4	if Meg Type not = None
Generator #1 ID	00 to 99	if Meg Type not = None
Generator #2 ID	00 to 99	if Meg Type not = None & Number of Gen >= 2
Generator #3 ID	00 to 99	if Meg Type not = None & Number of Gen >= 3
Generator #4 ID	00 to 99	if Meg Type not = None & Number of Gen = 4
Low Flow Option	Yes/No	always

Resistivity Type – If the system uses Resistivity to monitor the water, the feature is selected here. The Resistivity reading may either be taken by an External device and passed to the control as a digital input, or by an Internal Resistivity Module. NOTE: The internal module allows for the setting of exact limits and a screen display of the readings.

Reclaim Type – If the system has two drains to take advantage of the reclaim feature, the type of reclaim is selected here. The reclaim may either be done by the use of a second door/drain in the tank or a diverter valve in the tank drain.

Liquid Level Fill – In systems that have a Liquid Level Sensor (switch) that is used to set the full level for the tank, this parameter allows activation of that feature. If set to No, all fills are done based on the selected fill times.

N2 Bubbler Option – In systems that have an N2 Bubbler Solenoid, this parameter allows activation of that feature.

Recipe of Record Option – The control has the ability to lock in a Recipe at the factory that is considered the baseline for the system. It can be Viewed, Run or Copied by the user, but it may only be changed using the Factory Access Code. This parameter activates that option.

Megasonic Type – The control is designed to work with a variety of different Megasonic Generators. This parameter allows for the selection of the type to be used with the specific system.

Control Via – If a Megasonic Type is selected and there are optional ways to control the unit, this parameter is where that selection is made. If only one method is used, this parameter indicates the control mode and can not be changed.

Baud Rate – If either the RS232 or RS485 options are used to control the Megasonics, the Baud Rate is selected in this parameter.

Total Power – This value is the total Megasonic wattage for the entire system. It is to be the sum of all of the generator wattages.

Number of Generators – The system will control up to 4 generators on a RS485 link. The number of generators present is selected with this parameter.

Generator #1 ID – In a RS485 configuration, each generator must be assigned a *Unique* number (or address) to identify it to the communications link. The ID for generator #1 is set with this parameter.

Generator #2 ID – In a RS485 configuration, each generator must be assigned a *Unique* number (or address) to identify it to the communications link. The ID for generator #2 is set with this parameter.

Generator #3 ID – In a RS485 configuration, each generator must be assigned a *Unique* number (or address) to identify it to the communications link. The ID for generator #3 is set with this parameter.

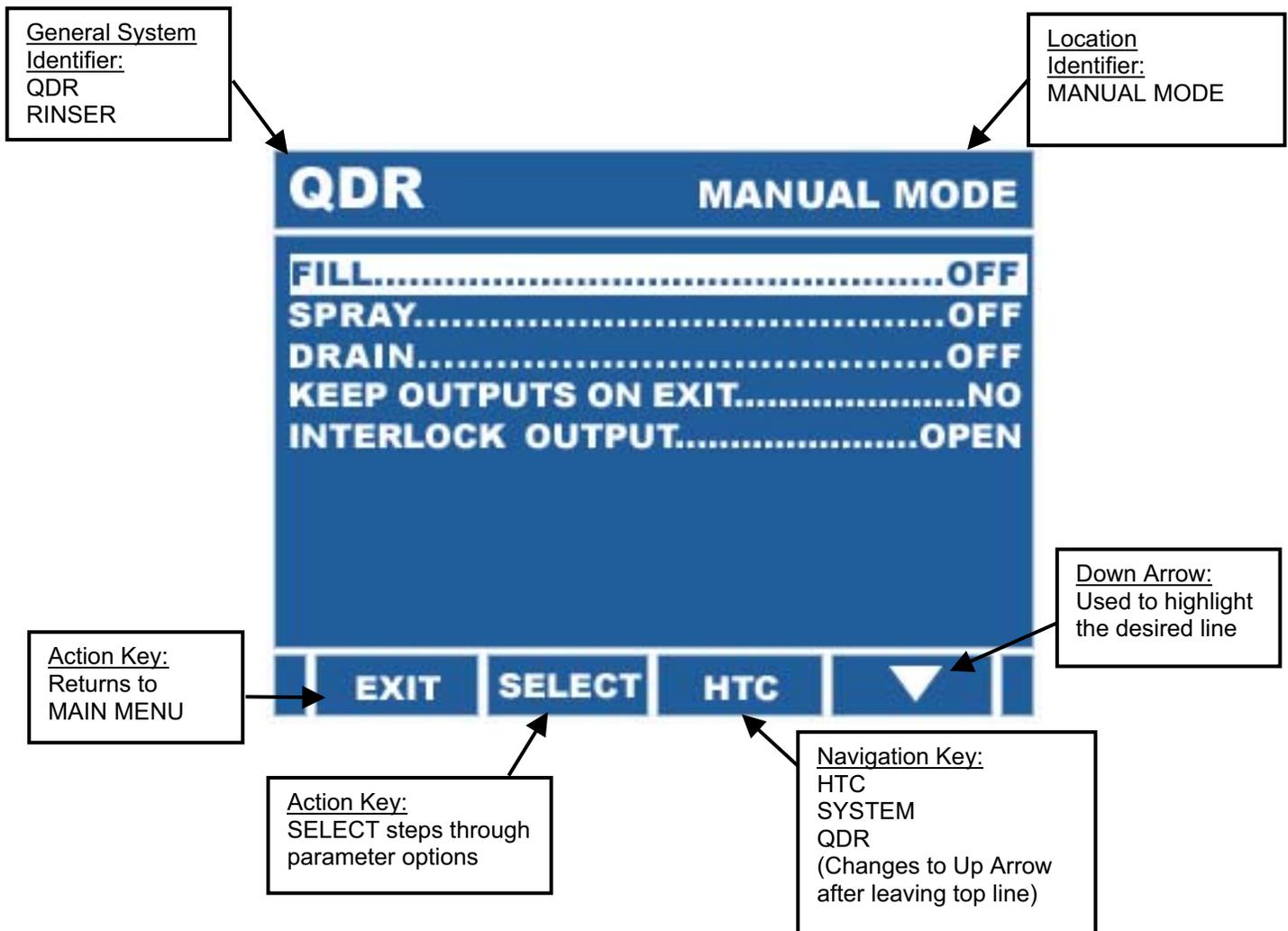
Generator #4 ID – In a RS485 configuration, each generator must be assigned a *Unique* number (or address) to identify it to the communications link. The ID for generator #4 is set with this parameter.

Low Flow Option – In systems that have a Low Flow Solenoid, this parameter allows the activation of that feature.

QDR – MANUAL MODE

The QDR MANUAL MODE allows the user to manually set all of the unit outputs and view all of the inputs. This feature can be used for Maintenance, Trouble Shooting, Setup or Manual Operation.

Note: The Keep Output On Exit allows the operator to set a specific output configuration and keep it on while going to other menus. If this is not set to YES the outputs will all turn off when exiting this Manual Mode.



The following table indicates the parameters, and when they will be visible in the menu, based on other setting in the system:

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Outputs		
Fill	On/Off	always
Spray	On/Off	always (removed in Rinser)
Drain	On/Off	always
Drain 2 or Diverter	On/Off	if Reclaim Type = Double Door or Diverter (removed in Rinser)
N2 Bubbler	On/Off	if N2 Bubbler Option = Yes
Megasonic	On/Off	if Megasonic Type not = none
Megasonic Power	xxxx	if Megasonic Type not = none
Keep Outputs on Exit	Yes/No	always
Inputs		
Liquid Level Input	Open/Closed	if Liquid Level = Yes
Resistivity Input	Open/Closed	if Resistivity Option = Yes
Megasonic Input	Open/Closed	if Megasonic Type not = none
Gas Pressure Input	Open/Closed	if Megasonic Type not = none
Interlock Input	Open/Closed	always

QDR – OPERATIONAL EXAMPLE

This section contains a typical setup, as a way of illustrating the basic function. The system is assumed to be a Single Door QDR with Liquid Level Fill and a Megasonic Generator. We will use Recipe 1:

<u>Parameter</u>	<u>Value</u>
Recipe Number	01
Total Number of Cycles	06
Start Cascade (sec)	90
Start Drain Period (sec)	10
Cycle Cascade (sec)	60
Cycle Drain Period (sec)	10.0
Cycle Wait Period (sec)	30
End Cascade (sec)	120
Spray Logic	Fill
Megasonic Logic	ALL
Megasonic Power (watts)	2000

In this example, we have selected 6 Total cycles. The first will be the Start Cycle that allows us to begin with a Cascade and then a full dump and Refill. Since the system uses a Liquid Level fill, the tank will automatically refill to the Liquid Level switch during the fill cycles.

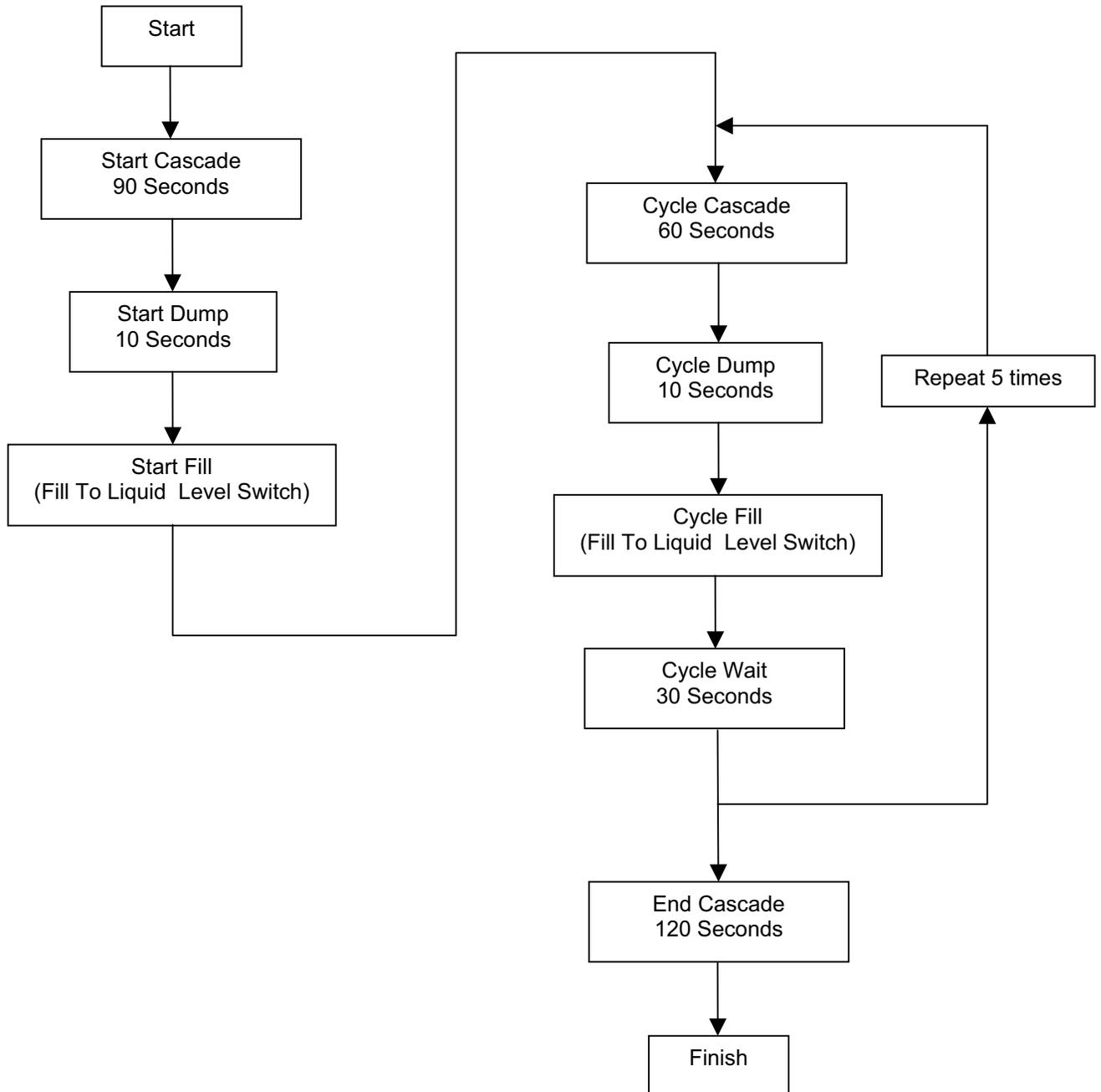
The remaining 5 cycles will use the Cycle Parameter values to control the operation. Each will Cascade for 60 seconds, Drain for 10 Seconds, refill to the Liquid Level switch and then wait for 30 seconds. It will repeat this process five times. Then it will run the End Cascade for 120 seconds. When this is complete it will terminate in the complete mode, waiting for the product to be removed and the DONE key to be depressed.

At the completion of the run, the buzzer will sound to indicate to the operator that the run is complete. The SILENCE key will terminate the audio or it will auto silence when the DONE key is depressed.

The Spray Logic indicates that the Top Spray is to be on during all Fill cycles, but is to be off during all Drain and Cascade Cycles.

The Megasonic power will be on during the entire cycle. Note that prior to the start of the run and while waiting for the Product to be removed, that the Megasonic will be on at it's Standby power level.

The following chart shows a cycle for the rinse controller with the previous configuration:



QDR – SPECIAL FEATURES

RINSER OPTION

In some applications there is no Quick Drain/Dump Function. To simplify the use of the controller in these applications the Rinser Option is provided. It restricts the system to a subset of the QDR functions and provides a system that more closely represents the application. The following actions are taken:

- (1) In all menus that have QDR in the header, the text is changed to RINSER.
- (2) All of the parameters that are marked in the setup and recipe menus are eliminated.
- (3) The values of all marked parameters are reset to values that will insure that they have no affect on the system operation.

RECIPE OF RECORD

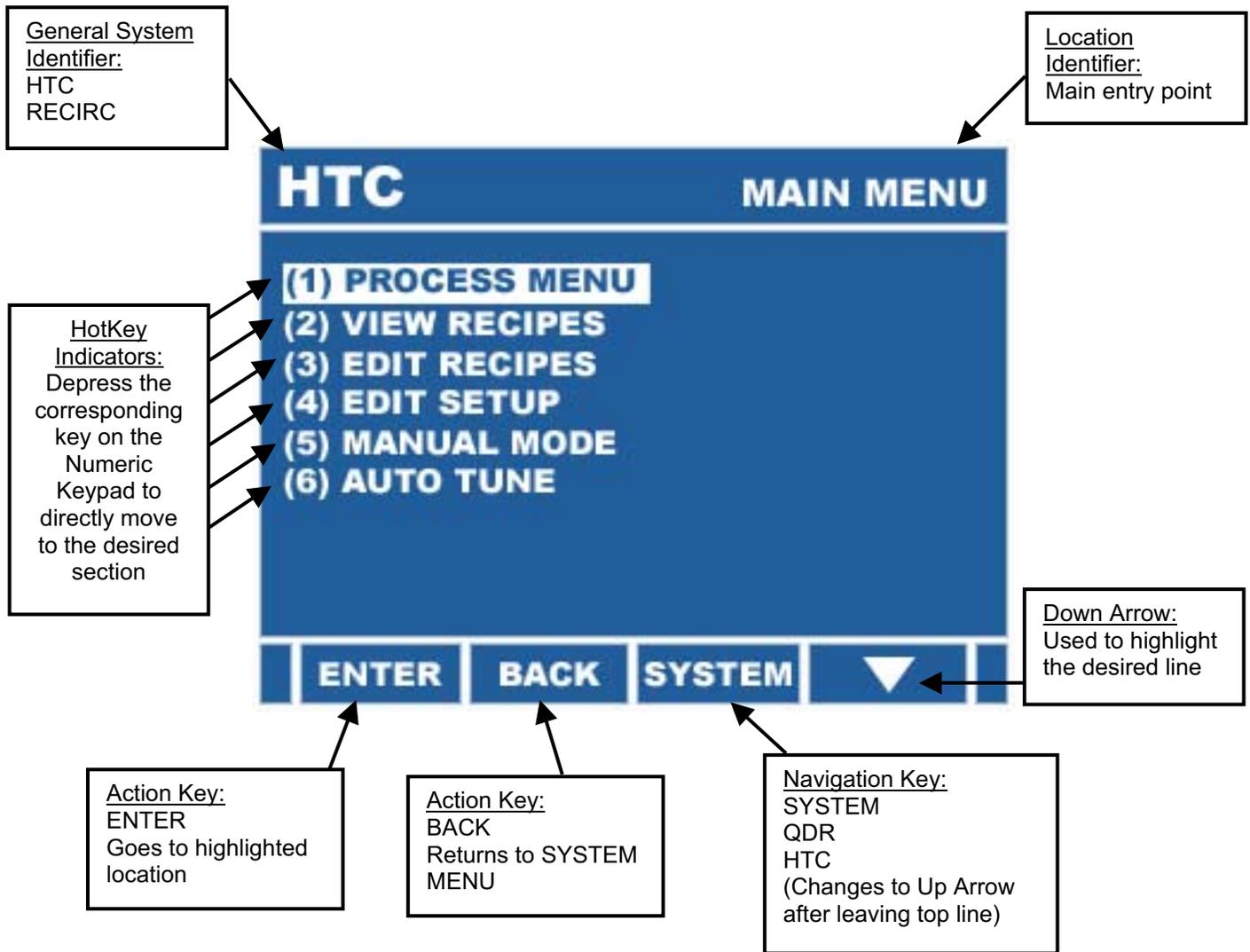
This is a special feature of the system that allows the OEM the ability to lock in a Recipe at the factory that is considered the baseline for the system. It can be Viewed, Run or Copied by the user, but it may only be changed using the Factory Access Code.

There are eleven total Recipes, 0 – 9 and the Recipe of Record. The Recipe of Record is recipe 99. It can be Run and Viewed like all other recipes; however, it can only be Edited if the Factory Access Code is used when entering the EDIT RECIPE screen.

Note: In order to bring up the ACCESS CODE window when entering the EDIT RECIPE screen, the Edit Recipe Code parameter in the QDR – ADMIN SETUP screen must be set to a non-zero value.

HTC* – MAIN MENU

The HTC - MAIN MENU is the main entry point for control of the HTC (High Temperature Controller). It is entered from the (1) TEMPERATURE CONTROL line in the SYSTEM MENU.



* Several types of Temperature Controllers are configurable under this section. However, all references and examples will use the most common setting of HTC (High Temperature Controller). The differences between this and the other settings only relates to the labeling of the screens and the specific functions that are available.

PROCESS MENU – This line provides entry into the Process Menu, from which the HTC is actually run.

VIEW RECIPES – This line provides entry into the Recipes for the HTC. In this section, the recipes may be viewed, but not changed.

EDIT RECIPES – This line provides entry into the Recipes for the HTC. In this section, the recipes may be viewed and changed.

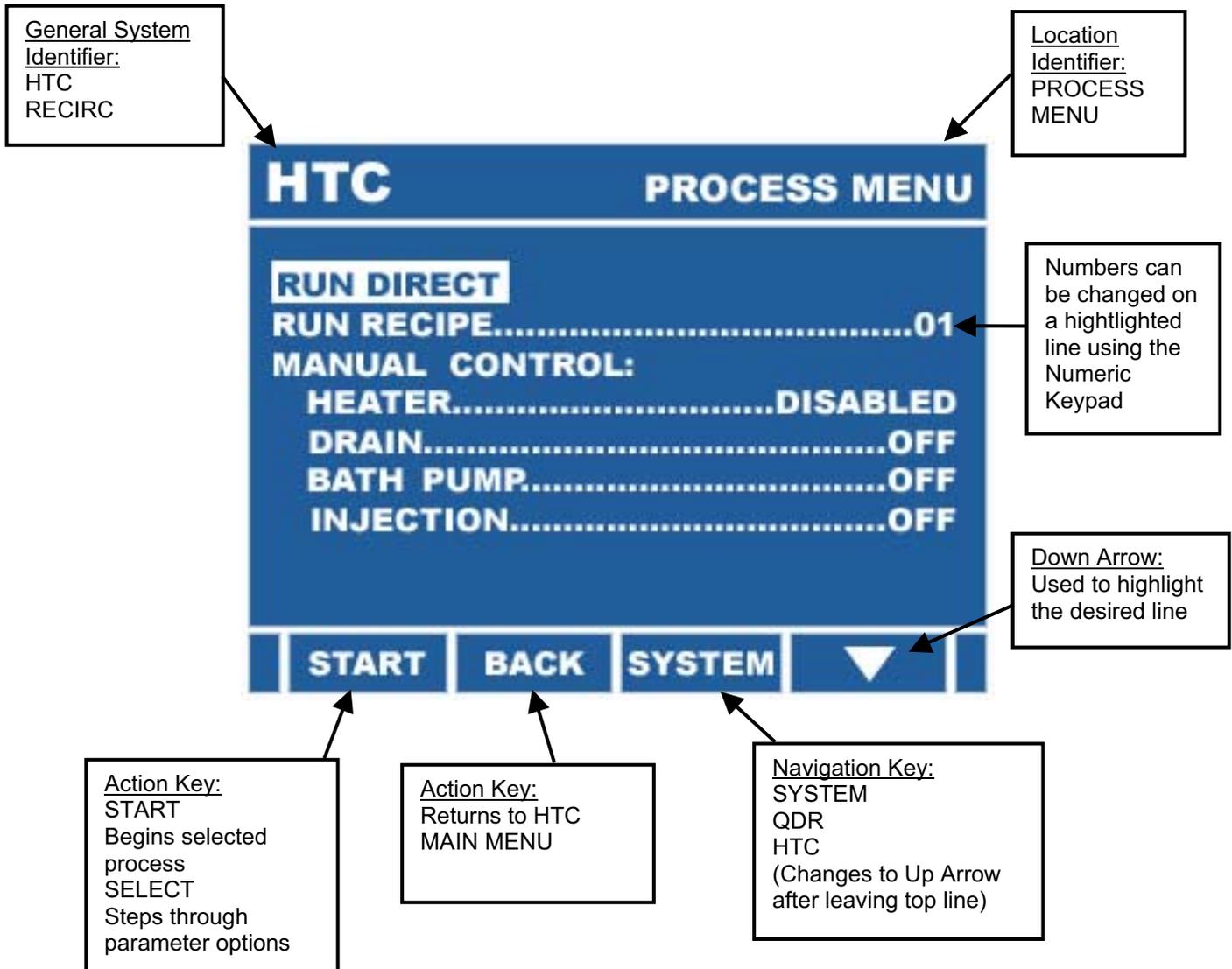
EDIT SETUP – This line provides entry into the Setup for the HTC. There are two subsections – Administrator and Factory. The Access Code that is used determines which section is entered from this line.

MANUAL MODE – This line provides entry into the Manual Mode. In this mode the outputs may be individually turned on and off and the inputs may be examined. It is used for both testing and fixed manual setup of the system.

AUTO TUNE – This line provides entry into the Auto Tune function. Auto Tune is used to automatically configure the PID parameters based on the specific installation.

HTC – PROCESS MENU

The HTC - PROCESS MENU is the main entry point for operation of the HTC. It is entered from the (1) RUN PROCESS line in the HTC - MAIN MENU. Note that only items that are activated in the system will appear in the Manual Control selections.



RUN DIRECT – This line allows the user to enter the run screen for the HTC. In this mode direct and full control is available. The setting in recipe 00 are used. Also, a Quick Set Timer feature allows the timer to be set with the Numeric Keypad without returning to the RECIPE EDIT screen.

RUN RECIPE **xx** – This line allows the user to select the recipe that is to be run using the Numeric Keypad and then begin the run using the START key. This provides full control, but additionally provides process prompt windows and the use of all the recipes.

MANUAL CONTROL: – This section provides the user with manual control over a number of features.

RECIRC – (Recirc Systems Only) This line allows the user to toggle the Recirculator between ENABLE and DISABLE. This is the central setting for the Recirculator and if DISABLED it will override all control items. The ENABLE setting on the other hand allows the output to be on only if system conditions permits.

HEATER – This line allows the user to toggle Heater between Enabled and Disabled. This is the central setting for the heater and if DISABLED it will override all control items. The ENABLE setting on the other hand allows the output to be on only if system conditions permits.

CHILLER – (Recirc Systems Only) This line allows the user to toggle the Chiller between Enabled and Disabled. This is the central setting for the Chiller and if DISABLED it will override all control items. The ENABLE setting on the other hand allows the output to be on only if system conditions permits.

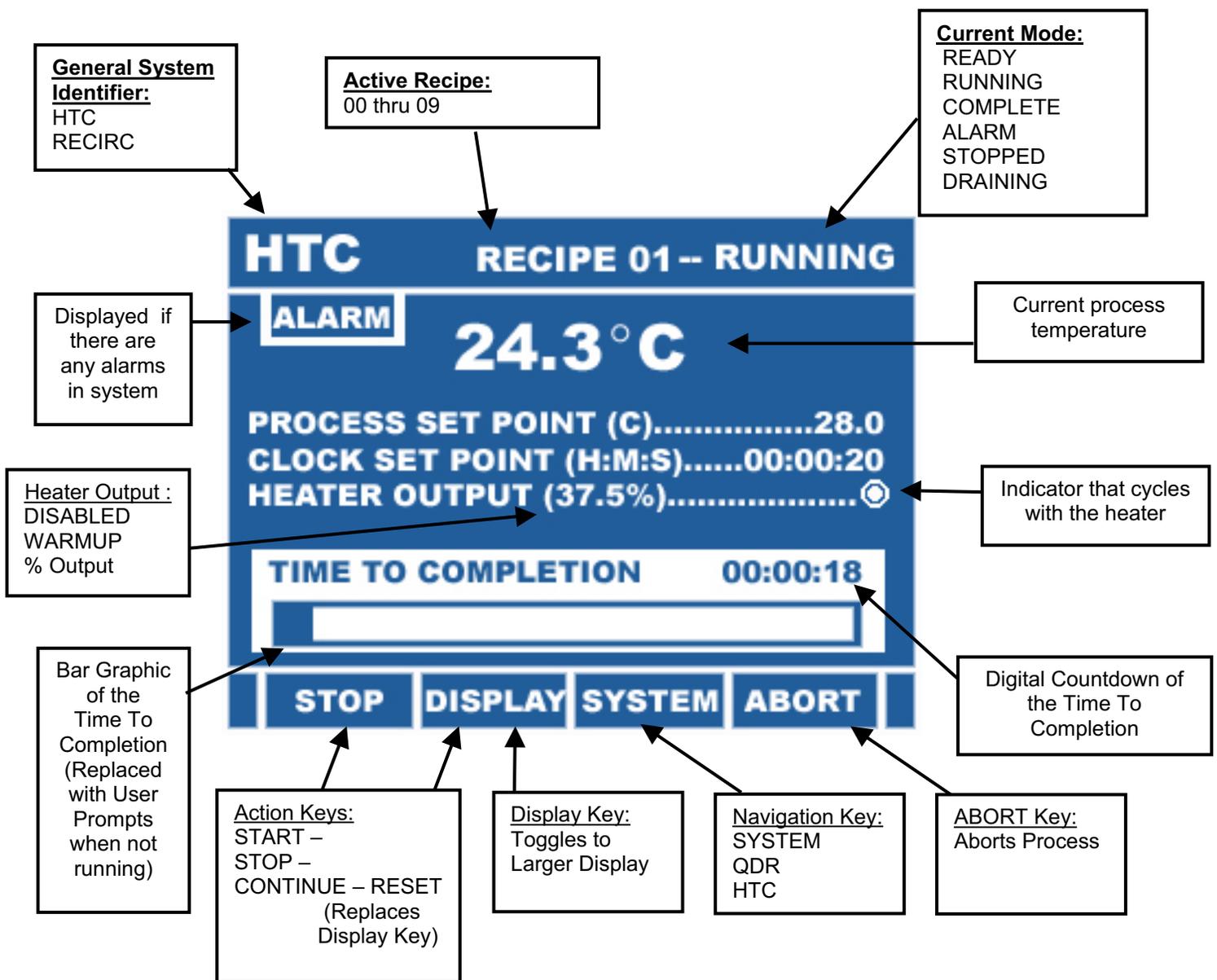
DRAIN/ASPIRATE – This line is used to activate the Drain feature. This is a time and temperature interlocked feature. A detailed explanation may be found in the HTC - SPECIAL FEATURES section.

BATH PUMP – This line allows the user to toggle the optional Bath Pump ON and OFF. This is the central setting for the Bath Pump and if OFF it will override all control items. The ON setting on the other hand is allowed only if system conditions permit and is automatically reset to OFF when necessary.

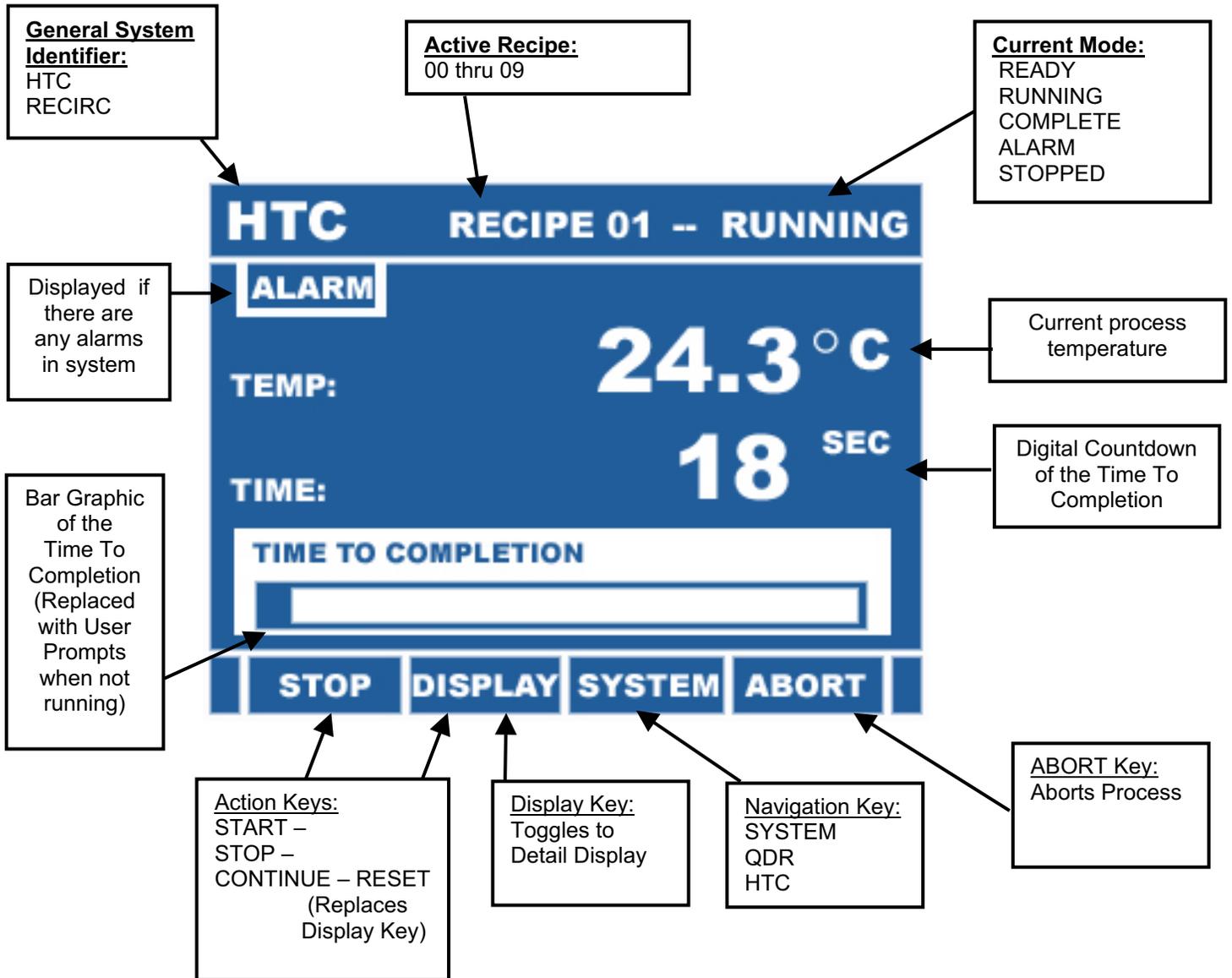
INJECTION – This line is used to activate the manual portion of the injection feature. This is a highly flexible control feature with a wide variety of logic. A detailed explanation may be found in the HTC - SPECIAL FEATURES section.

HTC – RUN DIRECT / RUN RECIPE

The following screens are typical of the view that is present when a process is running. Some information may be slightly different based on the system configuration, but the basic layout is the same. The first screen represents the detailed display that provides more information about the units function. The second provides less information but larger digits. The DISPLAY key is used to toggle between the screens.



The following is an example of the larger number display:



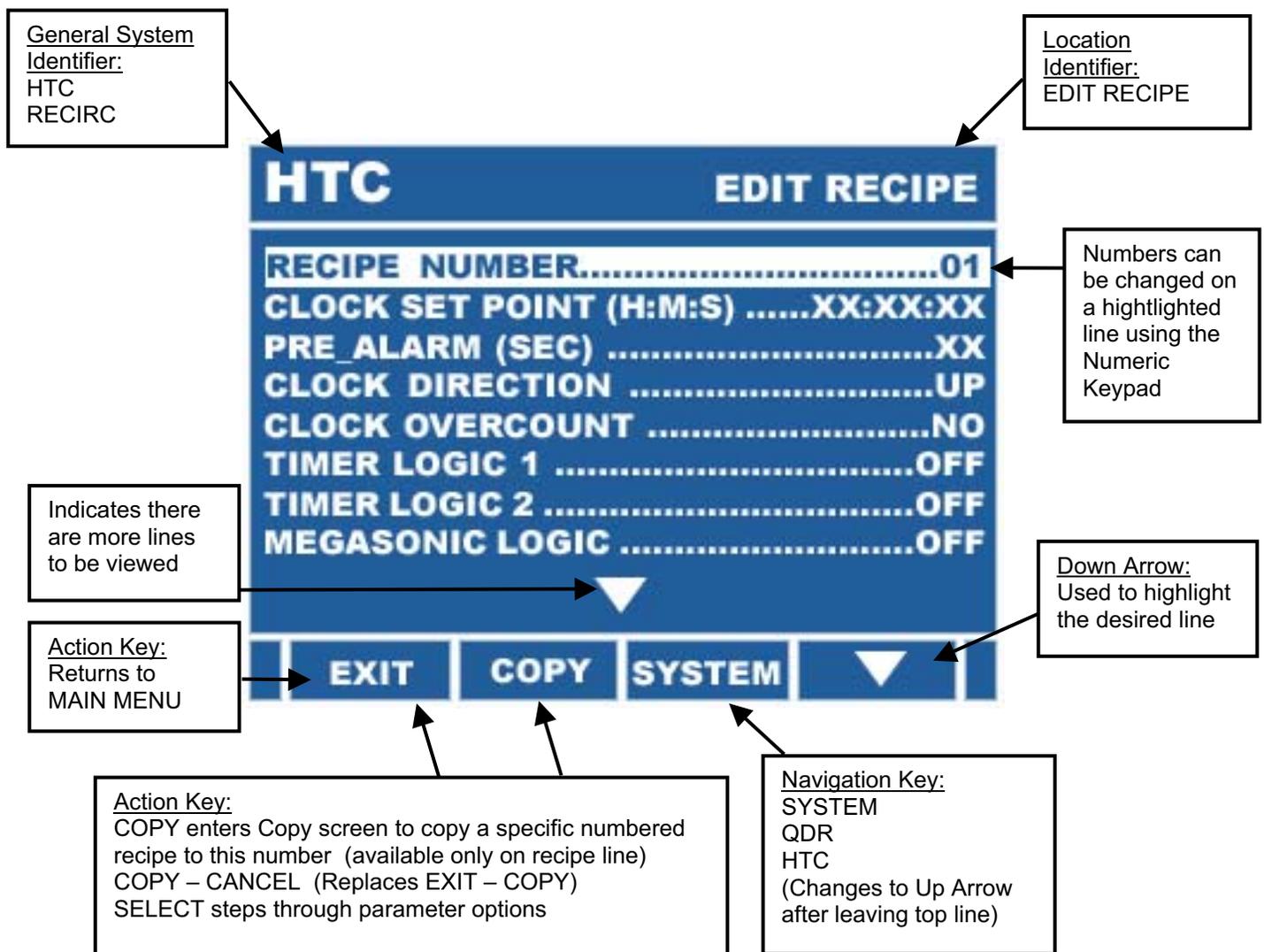
HTC - VIEW RECIPES / EDIT RECIPES

The HTC Recipes allow the user to prestructure a timer application and simply recall the setup for future use. Up to 10 different Recipes may be kept in the system memory. The memory is battery backed up Ram, thus the Recipes are kept even if the power is removed.

In the HTC -MAIN MENU the VIEW RECIPE and EDIT RECIPE line items allow access into the Recipe screens. Use the UP and DOWN ARROWS to move the highlighting to this line and press ENTER.

The VIEW RECIPE item will go directly into the Recipe screen and will allow a complete view of all of the Recipes, but it will not allow any parameters to be changed.

The EDIT RECIPE item opens up an Access Code window. Enter the Access Code to gain access to the TEMP - EDIT RECIPE menu.



The following table indicates the parameters, their setting range and when they will be visible in the menu, based on other setting in the system:

HTC – Recipe (0 thru 9)

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Recipe Number	00 to 09	always
Clock Setpoint (sec)(m:s)	0 to 9999 00:00 to 18:00:00	always
Pre-Alarm (sec)	0 to 999	always
Clock Direction	Up/Down	always
Clock Over Count	Off/On	always
Timer Logic 1	(see Table below)	Always
Timer Logic 2	(see Table below)	Always
Megasonic Logic	(see Table Below)	if Megasonic Type not = none
Megasonic Power (watts)	0 to 9999	if Megasonic Type not = none & Megasonic Logic not = off
View Mode	Min/Max	always

Recipe Number – This parameter selects the Recipe that is to be Viewed or Edited.

Clock Setpoint – The Clock Setpoint determines the duration of the Timer period. Depending on the CD parameter, the Timer will either count up to the desired setting or countdown from the desired setting.

Pre-Alarm – The Pre-Alarm is the time at which an audio warning will begin prior to the Timer period being completed. Its purpose is to alert the operator to the fact that the Timer period has almost elapsed. The audio tone will cycle ON and OFF from the beginning of this period until the end of the Timer period.

Clock Count Direction – The Clock Count Direction allows the user to program the direction in which the Timer will count (Up or Down)

Clock Over Count – This parameter activates the Over Count option for the clock. When active, the clock will count and display the time that has elapsed since the timing cycle has finished.

Timer Logic 1 – There are a number of different logic operators that may be set for an output relative to the timing cycle. To use this feature, a logic operator must be selected in this parameter and Output #1 must be assigned to a physical output (i.e. OCT, Relay or Solenoid) in the SYSTEM CONFIG – FACTORY screen.

- | | |
|-------------------|---|
| (0) Off – | The Output is off during the entire run. |
| (1) Main – | The Output is on only during Main timing period. |
| (2) Pre – | The Output is on only during Pre-Alarm period. |
| (3) Done – | The Output is on only during Done period. |
| (4) Main & Pre – | The Output is on only during Main & Pre Alarm timing periods. |
| (5) Main & Done – | The Output is on only during Main & Done timing periods. |
| (6) Pre & Done – | The Output is on only during Pre-Alarm & Done timing periods. |
| (7) All – | The Output is on only during the entire run. |

Timer Logic 2 – There are a number of different logic operators that may be set for an output relative to the timing cycle. To use this feature, a logic operator must be selected in this parameter and Output #2 must be assigned to a physical output (i.e. OCT, Relay or Solenoid) in the SYSTEM CONFIG – FACTORY screen.

- | | |
|-------------------|---|
| (0) Off – | The Output is off during the entire run. |
| (1) Main – | The Output is on only during Main timing period. |
| (2) Pre – | The Output is on only during Pre-Alarm period. |
| (3) Done – | The Output is on only during Done period. |
| (4) Main & Pre – | The Output is on only during Main & Pre Alarm timing periods. |
| (5) Main & Done – | The Output is on only during Main & Done timing periods. |
| (6) Pre & Done – | The Output is on only during Pre-Alarm & Done timing periods. |
| (7) All – | The Output is on only during the entire run. |

Note: For ease of entry, in addition to using the SELECT key to scroll to the selection, the number in parenthesis may be entered from the Numeric Keypad to jump directly to the selection.

Megasonic Logic – The Megasonics may do many different things dependent on the process. This parameter allows the selection of the logic that controls the Megasonic Generators:

- | | |
|-------------------|--|
| (0) Off – | The Megasonic is off during the entire run. |
| (1) Main – | The Megasonic is on only during Main timing period. |
| (2) Pre – | The Megasonic is on only during Pre-Alarm period. |
| (3) Done – | The Megasonic is on only during Done period. |
| (4) Main & Pre – | The Megasonic is on only during Main & Pre Alarm timing periods. |
| (5) Main & Done – | The Megasonic is on only during Main & Done timing periods. |
| (6) Pre & Done – | The Megasonic is on only during Pre-Alarm & Done timing periods. |
| (7) All – | The Megasonic is on only during the entire run. |

Note: For ease of entry, in addition to using the SELECT key to scroll to the selection, the number in parenthesis may be entered from the Numeric Keypad to jump directly to the selection.

Megasonic Power – If Megasonics are active for the system, this parameter allows the setting of the total power that is used.

View Mode – Since the Recipe has a large number of items, many of which may not be used in a given application, this parameter is provided to simplify the display. Obviously, if features are not available or activated in the Configuration and Setup of the system, they will not appear in the menu. However, there may also be a number of items that do not apply to a specific recipe. Therefore, this parameter may be set to MIN to eliminate from the menu any items that are turned off or set to zero. To regain access to these items, the parameter can simply be set back to MAX.

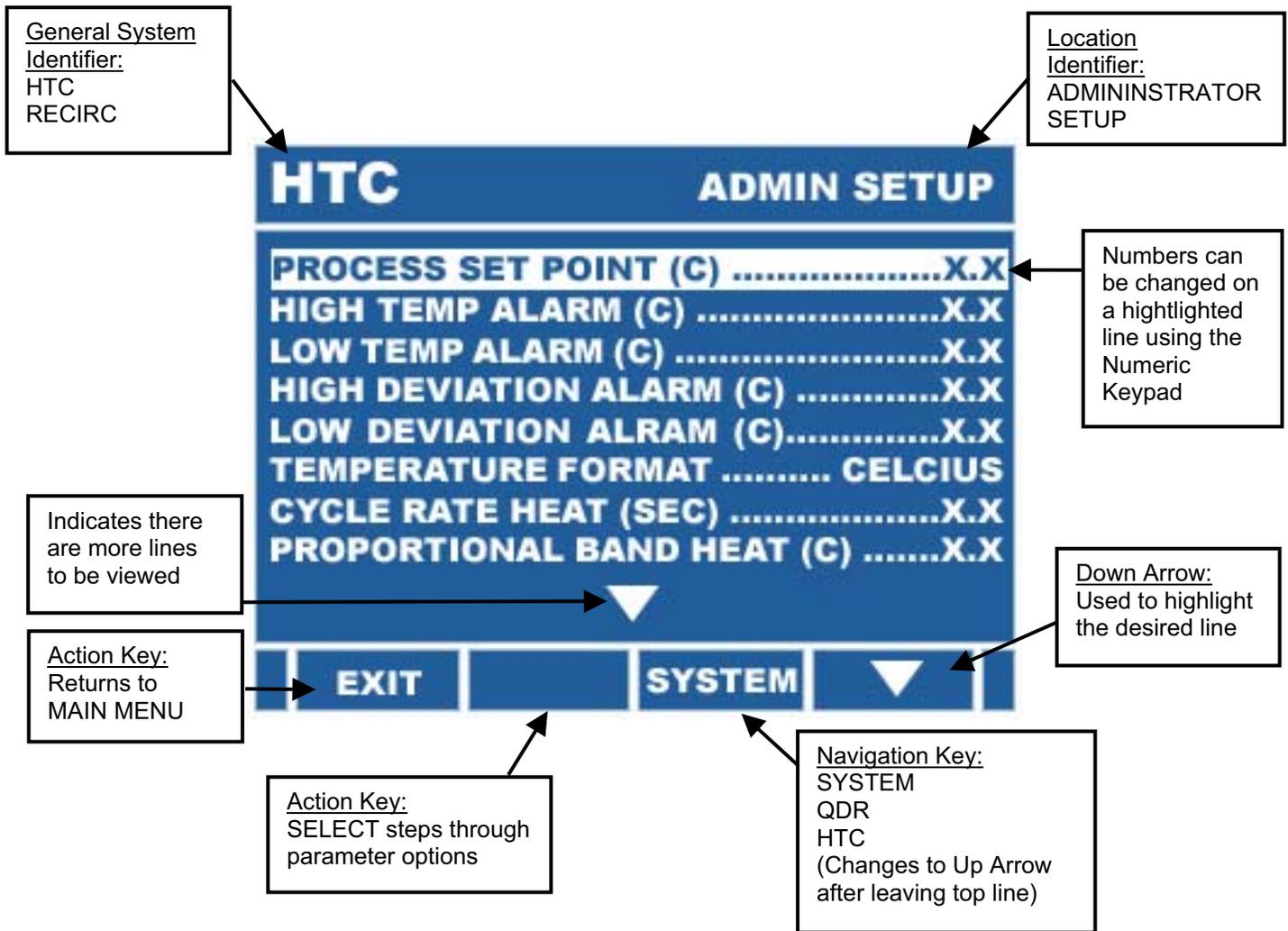
For ease of use, if the parameter is set to MIN, setting a parameter to zero or disabling it, will not immediately remove it from the menu. However, the next time the menu is entered, the line will be removed. If it is desirable to remove the lines while still in the menu, the parameter can be cycled from MIN to MAX and back to MIN and they will immediately be removed.

HTC – EDIT SETUP

The Temperature Control Setup consists of setting those parameters that affect the Temperature Control section. Since several types of temperature controller options are configurable under this section, all references and examples will use the most common setting of HTC (High Temperature Controller). However, the same would apply to all other options.

In the HTC - MAIN MENU the second to the last line item is EDIT SETUP. Use the UP and DOWN ARROWS to move the highlighting to this line and press ENTER.

This will open up an Access Code window. Enter the Administrator Access Code to gain access to the HTC - ADMIN SETUP menu, or the Factory Access Code to gain access into the HTC - FACTORY SETUP menu and then press ENTER.



The following table indicates the parameters, the setting range and when they will be visible in the menu, based on other settings in the system:

HTC – Administrator Setup

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Process Setpoint (C/F)	0.0 to 400.0 C* 32.0 to 752.0 F*	always
Chiller Setpoint	0.0 to 50.0 C* 32.0 to 122.0 F*	if TC Type = RECIRC & Chiller Type = On/Off
Heat Limit	0.0 to 400.0 C* 32.0 to 752.0 F*	if Heat Limit Temp source not = none
High Temp Alarm Setpoint (C/F)	0.0 to 400.0 C* 32.0 to 752.0 F*	always
Low Temp Alarm Setpoint (C/F)	0.0 to 400.0 C* 32.0 to 752.0 F*	always
High Dev Alarm Offset (C/F)	0.0 to 25.0	always
Low Dev Alarm Offset (C/F)	0.0 to 25.0	always
Drain Logic	Off/Drain/Aspirate	always
Drain Setpoint (C/F)	0.0 to 400.0 C* 32.0 to 752.0 F*	if Drain Logic not= Off
Drain Time (sec)	0 to 9999 0:00 to 99:59	if Drain Logic not= Off
Drain Alarm Time (sec)(m:s)	0 to 9999 0:00 to 99:59	if Liquid Level Fill = Yes & Drain Logic not= Off
Injection Logic	(see Table Below)	if Injection Option = On
Injection Setpoint (C/F)	0.0 to 400.0 C* 32.0 to 752.0 F*	if Injection Logic not = Off or Manual or Start
Inject Period (sec)	0 to 999	if Injection Logic not = Off
Inject Delay (sec)	0 to 999	if Injection Logic not = Off
Number of Injections (sec)	0 to 999	if Injection Logic not = Off
Manual Injection	Momentary/ Continuous/Timed	if Injection Logic not = Off

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Temperature Format	Degrees C/Degrees F	always
Cycle Rate Heat (sec)	0.1 to 19.9	always
Proportional Band Heat (C/F)	0.1 to 19.9 C 0.1 to 35.8 F	always
Reset Heat (min)	0.0 to 19.9	always
Rate Heat (min)	0.0 to 19.9	always
Cycle Rate Cool (sec)	0.0 to 19.9	if Chiller Type = PID
Proportional Band Cool (C/F)	0.1 to 19.9 C 0.1 to 35.8 F	if Chiller Type = PID
Reset Cool (min)	0.0 to 19.9	if Chiller Type = PID
Rate Cool (min)	0.0 to 19.9	if Chiller Type = PID
Sensor Offset (C/F)	-9.9 to +9.9 C -17.8 to + 17.8 F	always
Standby Megasonic Wattage	0 to Max	if Megasonic Type not = none
Time Format	Hr:Min:Sec/Sec	always
Clear Recipes	Yes/NO	always
Access Code – Auto Tune	0 to 65000	always
Access Code – Edit Recipe	0 to 65000	always
Access Code – Select Recipe	0 to 65000	always

The Parameters that are marked (sec)(m:s) are one or the other based on the setting of the Time Format parameter.

The Parameters marked (C/F) are either Celsius or Fahrenheit based on the setting of the Temperature Format parameter.

* The temperature range for the parameters may be restricted by the setting of the System Temperature Limit (Factory Parameter).

Process Setpoint – This parameter sets the target temperature for the system. It is used by the 3 Mode PID algorithm to maintain the desired temperature.

Chiller Setpoint – In On/Off recirculator systems, this setpoint controls the Chiller Output. When process temperature is above this setting, Chiller Output is On. When below this setting, the Chiller Output is Off. There is a 0.1° Hysteresis to prevent excess chiller cycling.

Heat Limit Set Point – This parameter is a software lockout of the heater output. If the process temperature rises above this setting, the heat will be locked out. Note that there is not an alarm associated with this function, but the Heater Output power will show (limited) to indicate that the Heat Limit is in effect.

High Temp Alarm Setpoint – If the process temperature reaches or exceeds this value the High Temperature alarm will activate.

Low Temp Alarm Setpoint – If the process temperature falls below this value the Low Temperature alarm will activate. Note that the Warm Up Mode locks out this alarm until the system first comes up to temperature to eliminate nuisance alarms.

High Dev Alarm Offset – This parameter establishes a band above the setpoint plus selected value. If the process temperature exceeds this limit High Deviation Temperature alarm will activate

Low Dev Alarm Offset – This parameter establishes a limit at the setpoint minus selected value. If the process temperature falls below this limit Low Deviation Temperature alarm will activate. Note that the Warm Up Mode locks out this alarm until the system first comes into the band to eliminate nuisance alarms.

Drain/Aspirate Logic – This parameter selects the type of drain function for the system. The difference between Drain and Aspirate is strictly a text feature for the convenience of the user.

Drain/Aspirate Setpoint – This parameter sets temperature that the bath must fall to before the drain/aspirate operation may proceed.

Drain/Aspirate Time – This parameter sets the time that the drain/aspirate output will be active.

Drain/Aspirate Alarm Time – When Liquid Level Monitor is selected, the Drain Alarm Timer will sample the liquid level switch after the drain has started to insure that a drain is taking place. If the liquid level switch has not been cleared within this time an alarm is sounded. Setting this value to zero eliminates this feature.

Injection Logic – The Injection output may do many different things dependent on the process. This parameter allows the selection of the logic that controls the Injection:

- (0) Off – The Injection output is off.
- (1) Manual – The Injection output is only active if manually activated
- (2) On Above – The Injection output is on if the Process Temperature is above the Injection Setpoint.
- (3) On Below – The Injection output is on if the Process Temperature is below the Injection Setpoint.
- (4) Inject Above – The Injection output is on and controlled by the period timer function if the Process Temperature is above the Injection Setpoint.
- (5) Inject Below – The Injection output is on and controlled by the Injection Timer Function if the Process Temperature is Below the Injection Setpoint.
- (6) Inject Start – The Injection output is on and controlled by the Injection Timer Function at the Start of each Process Timer Run.

The Manual injection mode is available in all parameter settings except off.

The Injection Timer Function associated with the injection logic is based on the setting in the Injection Period, Injection Delay and Number Of Injections parameters. Once triggered, the sequence will run injections, being on for the Injection Period and off for the Injection Delay the number of times set in the Number of Injections parameter. Note: This can be as simple as one timed period.

Note: For ease of entry, in addition to using the SELECT key to scroll to the selection, the number in parenthesis may be entered from the Numeric Keypad to jump directly to the selection.

Injection Setpoint – This parameter sets the temperature at which the injection action may take place. The action is based on the Injection logic parameter.

Injection Period – This parameter sets the time that the injection output will be active during each injection cycle.

Injection Delay – This parameter sets time between injections.

Number of Injections – This parameter sets the total number of injections.

Manual Injection – This parameter defines the action of the manual injection operation. This is controlled by the Injection line in the HTC - PROCESS MENU. The line allows the user to manually run an injection based on this parameter choice. The SELECT key will provide a closure on the inject output as long as the key is held down (Momentary), turn on the output and leave it on until manually turned off (Continuous) or turn it on and run the programmed Timed Injection Function (Timed).

Temperature Format – This parameter sets all temperature parameters to either the Centigrade or Fahrenheit scale.

Time Format – Many of the time parameters in the system may be set in seconds or minutes and seconds. This parameter makes that selection. The display for each of these parameters is changed to reflect this setting.

Cycle Rate - Heat – This parameter sets the Cycle Rate for the heating mode. Since the controller is a standard proportional time base unit, the Cycle Rate essentially sets the rate at which the output will cycle ON and OFF. Note that the amount of time that the output is on during each period is controlled to match the heat requirements of the system.

Proportional Band - Heat – The Proportional Band is the parameter that determines the cycling range for the heating mode. This band indicates the range over which the controller will proportion.

Reset - Heat – The Reset parameter for the heating mode sets the Integration time for the second mode in the three mode control scheme. If this parameter is set to 0.0, the Reset function is eliminated.

Rate - Heat – The Rate function for the heating mode sets the Differentiation constant for the third mode of the three mode control scheme. If this parameter is set to 0.0, the Rate function is eliminated.

Cycle Rate - Cool – This parameter sets the Cycle Rate for the cooling mode. Since the controller is a standard proportional time base unit, the Cycle Rate essentially sets the rate at which the output will cycle ON and OFF. Note that the amount of time that the output is on during each period is controlled to match the cooling requirements of the system.

Proportional Band - Cool – The Proportional Band is the parameter that determines the cycling range for the cooling mode. This band indicates the range over which the controller will proportion.

Reset - Cool – The Reset parameter for the cooling mode sets the Integration time for the second mode in the three mode control scheme. If this parameter is set to 0.0, the RESET function is eliminated.

Rate - Cool – The Rate function for the cooling mode sets the Differentiation constant for the third mode of the three mode control scheme. If this parameter is set to 0.0, the Rate function is eliminated.

Sensor Offset – This is the digital calibration for the process sensor. It provides a direct digital offset to the process temperature.

Standby Megasonic Wattage – If Megasonic generators are used with the system, this setting is the wattage output that is used in the Standby Mode. Standby conditions exist while the product is being Loaded and after the run is complete and it is waiting to be Unloaded.

Clear Recipes – When set to yes, this parameter will cause all the Recipes except for the Recipe of Record to be cleared when the ADMIN SETUP MENU is exited.

Access Code – Auto Tune – The access code that will allow activation of the Auto Tune feature.

Access Code – Edit Recipe – The access code that will allow entry into the EDIT RECIPE Menu is set in this parameter.

Access Code – Select Recipe – The access code that will allow the selection of the Recipe that is to be run is set in this parameter.

HTC – Factory Setup

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
System Temp Limit (C/F)	0.0 to 400.0 C* 32.0 to 752.0 F*	always
Process Temp Source	TC B1/TC B2/ TS B1/TS B2	always
Process Sensor Type	T/C-J / T/C-K / RTD-385 / RTD-392	always
Heat Limit Source	None/TCB1/TCB2/ TSB1/TSB2	always
Heat Limit Sensor Type	T/C-J / T/C-K / RTD-385 / RTD-392	if Heat Limit Source not = None
Liquid Level Monitor	Off/Alarm on Open/ Alarm on Close	always
Megasonic Type	None/Kokusai/Kaijo	always
Control Via	Logic/RS485	if Meg Type not = None
Baud Rate	2400/4800/9600/19200 38400/57600/115200	if control Via =RS485
Total Power (Watts)	0000 to 9999	if Meg Type not = None
Number of Generators	1 to 4	if Meg Type not = None
Generator #5 ID	00 to 99	if Meg Type not = None
Generator #6 ID	00 to 99	if Meg Type not = None & Number of Gen >= 2
Generator #7 ID	00 to 99	if Meg Type not = None & Number of Gen >= 3
Generator #8 ID	00 to 99	if Meg Type not = None & Number of Gen = 4
Drain Option	Off/Drain/Aspirate	always
Injection Option	Yes/No	always
Bath Pump Option	Yes/No	always

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Auto Tune Option	Yes/No	always
Auto Enable	Yes/No	always
Chiller Type	None/On/Off PID	if Temp Type = RECIRC
Chiller Output	0-5 VDC 0-10 VDC 4-20 ma 0-20 ma Digital	if Temp Type = RECIRC & Chiller Type = PID
Chiller Fault	Alarm on Open Alarm on Close	If Temp Type = RECIRC and Chiller Type = PID

System Temp Limit – The setting in this parameter limits the maximum setting value that may be entered into the various setpoint parameters.

Process Temp Source – This parameter sets the source for the process temperature reading. TCB1 and TCB2 refer to Temperature Controller Boards 1 and 2. There is no functional difference between boards 1 and 2. TSB1 and TSB2 refer to Temperature Sensor Boards 1 and 2. There is currently no functional difference between boards 1 and 2.

Process Sensor Type – Each temperature source can utilize one of several types of sensors. This parameter selects the proper sensor type that is used for the Process Temperature Input.

Heat Limit Temp Source – This parameter sets the source for the Heat Limit temperature reading. TCB1 and TCB2 refer to Temperature Controller Boards 1 and 2. There is no functional difference between boards 1 and 2. TSB1 and TSB2 refer to Temperature Sensor Boards 1 and 2. There is currently no functional difference between boards 1 and 2. Setting to None will disable the Heat Limit Feature.

Heat Limit Sensor Type – Each temperature source can utilize one of several types of sensors. This parameter selects the proper sensor type that is used for the Process Temperature Input.

Liquid Level Monitor – In systems that have a Liquid Level Sensor (switch) that is used to insure that the tank is full, this parameter activates that feature. This inherently enables the Liquid Level Alarm. It also allows for the definition of the polarity of the alarm. Note: Alarm on Open is preferred, since it allows protection against broken or disconnected wiring.

Recipe of Record Option – The control has the ability to lock in a Recipe at the factory that is considered the baseline for the system. It can be Viewed, Run or Copied by the user, but it may only be changed using the Factory Access Code. This parameter activates that option.

Megasonic Type – The control is designed to work with a variety of different Megasonic Generators. This parameter allows for the selection of the type to be used with the specific system.

Control Via – If a Megasonic Type is selected and there are optional ways to control the unit, this parameter is where that selection is made. If only one method is used, this parameter indicates the control mode and can not be changed.

Baud Rate – If either the RS232 or RS485 options are used to control the Megasonics, the Baud Rate is selected in this parameter.

Total Power – This value is the total Megasonic wattage for the entire system. It is to be the sum of all of the generator wattages.

Number of Generators – The system will control up to 4 generators on a RS485 link. The number of generators present is selected with this parameter.

Generator #5 ID – In a RS485 configuration, each generator must be assigned a *Unique* number (or address) to identify it to the communications link. The ID for generator #5 is set with this parameter.

Generator #6 ID – In a RS485 configuration, each generator must be assigned a *Unique* number (or address) to identify it to the communications link. The ID for generator #6 is set with this parameter.

Generator #7 ID – In a RS485 configuration, each generator must be assigned a *Unique* number (or address) to identify it to the communications link. The ID for generator #7 is set with this parameter.

Generator #8 ID – In a RS485 configuration, each generator must be assigned a *Unique* number (or address) to identify it to the communications link. The ID for generator #8 is set with this parameter.

Drain Option – In systems that use a drain this parameter allows the selection of either Drain or Aspirate. Either setting will activate the feature, and only differ in the displayed text in other parameters (Drain or Aspirate).

Injection Option – In systems that use an Injection output, this parameter allows the activation of that feature.

Bath Pump Option – In a system that uses a bath pump, this parameter allows the activation of that feature.

Auto Tune Option – In systems that have a full Auto Tune feature for tuning the three

mode parameters. This parameter gives the factory the ability to turn this feature off so the user can not retune the system.

Auto Enable – This parameter will determine the state of the Temp controller on system power up. When set to Yes, the Temp Controller outputs will be enabled on power up.

Chiller Type – In RECIRC systems this parameter is used to configure the type of chiller that is used with the system. On/Off indicates a chiller that will be either on or off. PID indicates a chiller that is proportional in nature and is controlled by a three mode PID control signal.

Chiller Setpoint – In RECIRC systems with an On/Off chiller, the chiller will be Enabled anytime the Process Setpoint is below this value. This means that the control will turn the chiller off if the user chooses a setpoint that is high enough that the chiller is not required.

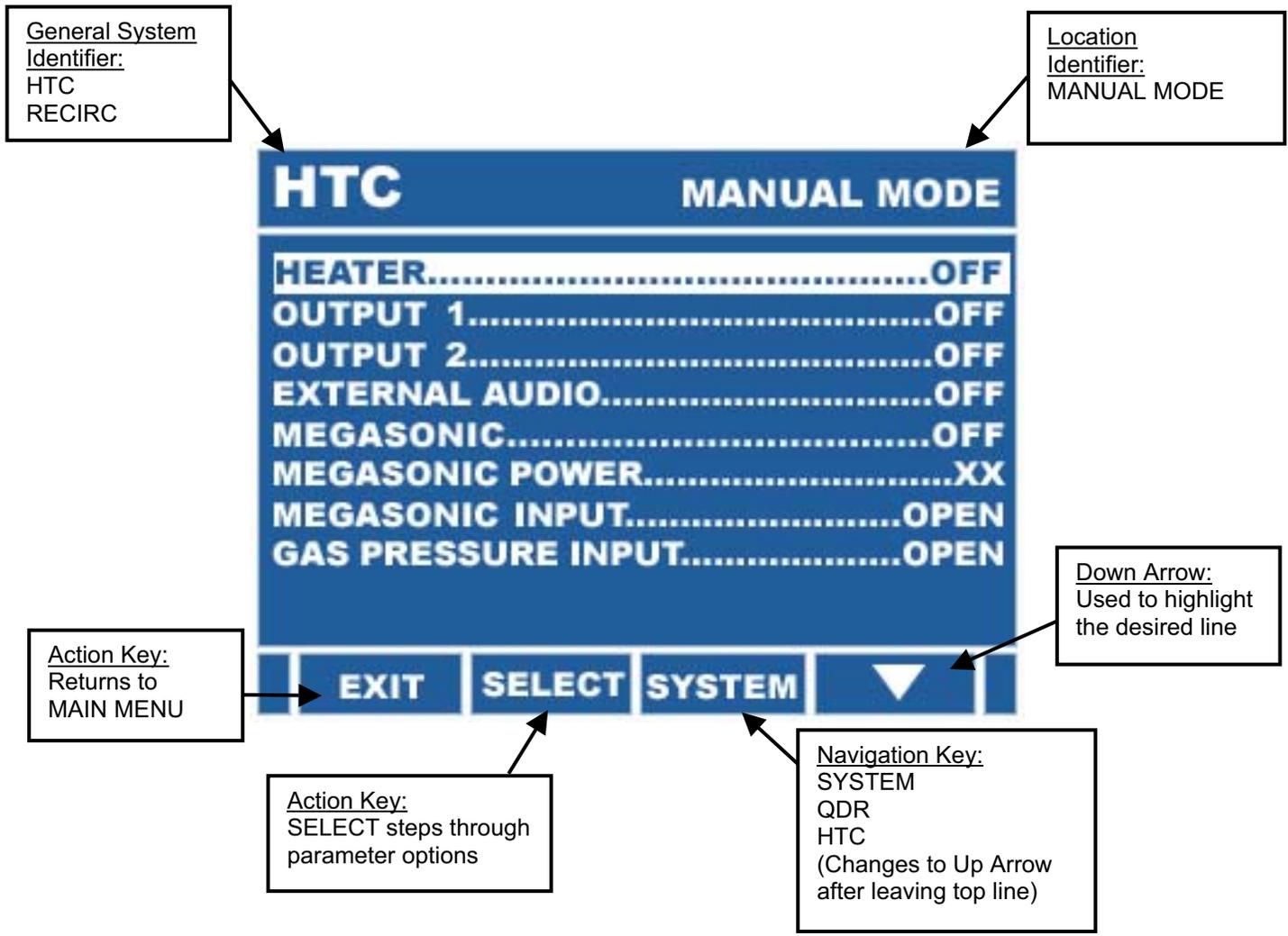
Chiller Output – In RECIRC systems with a PID chiller this parameter is used to configure the interface signal type that is to be used with the chiller. Note that the PID loop will proportion over the entire range of the signal (E.G. 0 to 100% cooling would be 4 to 20 ma).

Chiller Fault – In RECIRC systems this parameter determines when a Chiller Fault alarm will occur.

HTC - MANUAL MODE

The HTC MANUAL MODE allows the user to manually set all of the unit outputs and view all of the inputs. This feature can be used for Maintenance, Trouble Shooting, Setup or Manual Operation.

Note: The Keep Output On Exit allows the operator to set a specific output configuration and keep it on while going to other menus. If this is not set to YES the outputs will all turn off when exiting this Manual Mode.



The following table indicates the parameters, and when they will be visible in the menu, based on other setting in the system:

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Outputs		
Heater *	On/Off	always (5 sec only)
Bath Pump	On/Off	if Bath Pump Option = yes
Recirc Pump	On/Off	if Control Type = Recirc
City Water Valve	On/Off	If TC Type = Recirc
Injection	On/Off	if Injection Option = yes
Drain/Aspirate	On/Off	if Drain Option not= off
Output #1	On/Off	always
Output #2	On/Off	always
External Audio	On/Off	always
Done	On/Off	always
Megasonic	On/Off	if Megasonic Type not = none
Megasonic Power	xxxx	if Megasonic Type not = none
Inputs		
Liquid Level Bath Input *	Open/Closed	always
Liquid Level Recirc Input	Open/Closed	if TC Type = Recirc
City Water Flow Input	Open/Closed	if TC Type = Recirc
Chiller Fault Input	Open/Closed	if TC Type = Recirc and Chiller Type = PID
Megasonic Input	Open/Closed	if Megasonic Type not = none
Megasonic N2 Pressure	Open/Closed	if Megasonic Type not = none
Flow Switch Input	Open/Closed	always
Interlock Input	Open/Closed	always
Heat Limit Temp (C/F)	0.0 to 400.0 C* 32.0 to 752.0 F*	If heat limit source not = none

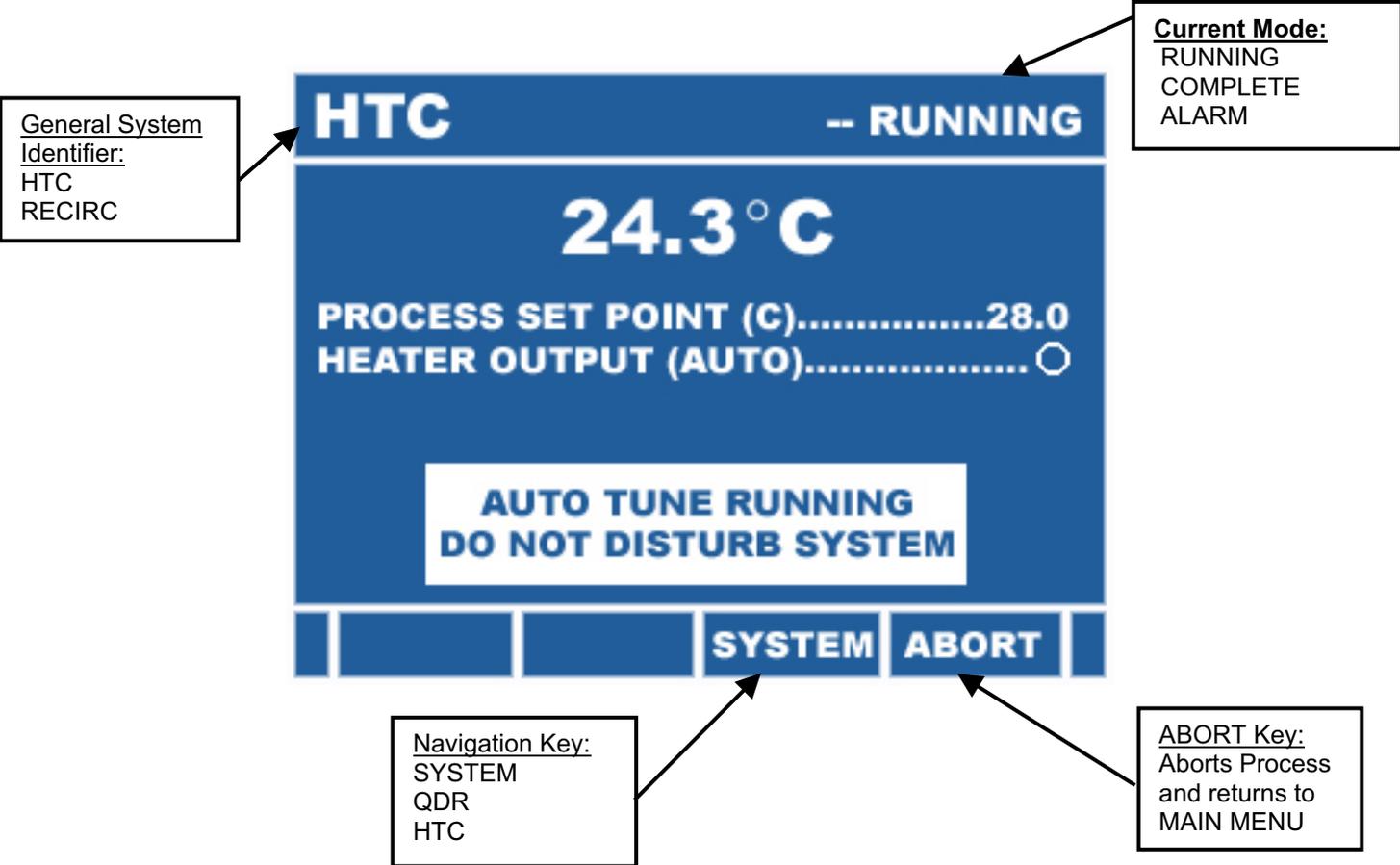
* Indicates I/O that is fixed to the Temperature hardware and does not require software assignment. All other I/O needs to be assigned.

HTC – AUTO TUNE

The unit is capable of automatically tuning the PID parameters to fit the specific requirements of a given system. The procedure can take up to 90 minutes depending on the specific system configuration. The Setpoint and Cycle Rate parameters should be set prior to activating AUTO TUNE.

In the HTC - MAIN MENU the last line item is AUTO TUNE. Use the DOWN ARROW to move the highlighting to this line and press ENTER.

This will open up an Access Code window. Enter the Administrator Access Code to gain access to the Auto Tune Screen.



During this procedure, the system will run a test sequence to determine basic system characteristics. After completing this sequence, the appropriate tuning values will be calculated and automatically inserted into the PROP BAND, RESET and RATE parameters.

It should be noted that MANUAL TUNING is still available in the HTC ADMIN SETUP screen.

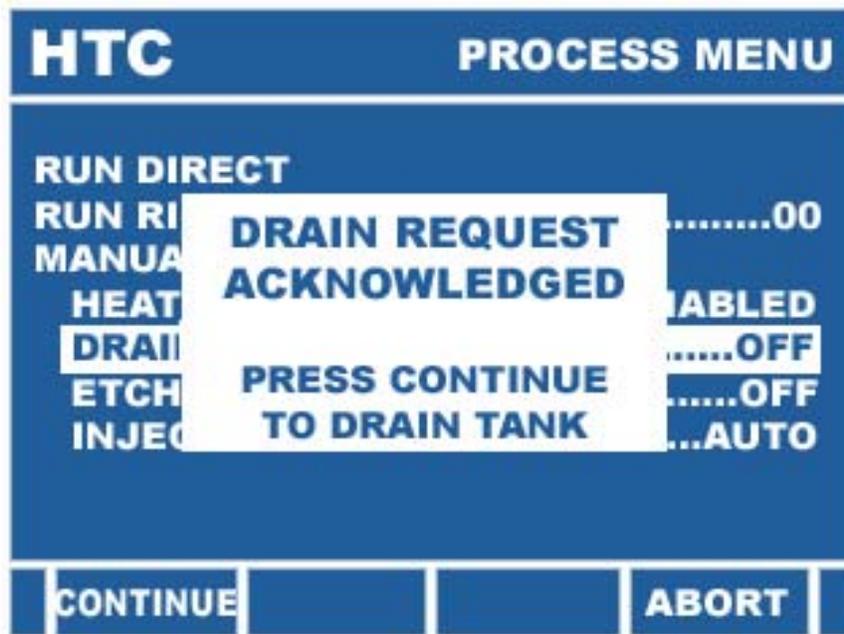
HTC – SPECIAL FEATURES

DRAIN FUNCTION

The unit has a feature that will perform a Timed, Temperature Interlocked automatic drain/aspirate of the bath. The logic for this function is controlled via the Drain Logic Parameters in the HTC ADMIN SETUP Menu.

In the HTC - PROCESS MENU the fifth line item is DRAIN or ASPIRATE. Use the UP and DOWN ARROW keys to move the highlighting to this line and press SELECT.

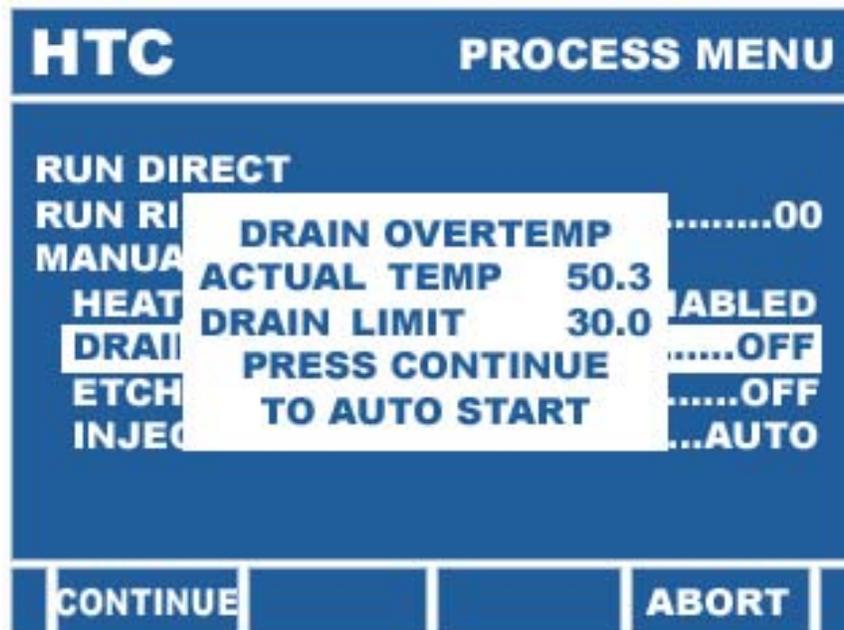
Three beeps will sound and a window asking for confirmation of the drain request will open. This is to help protect against an accidental drain.



Press the CONTINUE key to proceed. At this point the Heater, Etch Pump, Inject feature and process timer are turned off and locked out.

The current process temperature is then compared to the value in the DRAIN SETPOINT parameter. If the temperature is below the preset value, the drain proceeds. The Drain/Aspirate output will remain active for the period programmed into the DRAIN TIME parameter. After this period, the output will turn off and the lockouts released.

If the temperature was not below the setpoint, the following window appears:



Again press the CONTINUE key. This will place the unit in the AUTO START mode. In this mode the function will run in the background, continuously monitoring the process temperature and automatically starting the drain when the temperature falls below the DRAIN SETPOINT.

Once started, the Drain/Aspirate output will remain active for the period programmed into the DRAIN TIME parameter. After this period, the output will turn off and the lockouts released.

INJECTION FUNCTION

There are a wide variety of injection functions that may be used with the unit. These are controlled by the Injection Logic parameters in the HTC - ADMIN SETUP screen.

The possible logic combinations are listed below:

Off –	The Injection output is off.
Manual –	The Injection output is only active if manually activated
On Above –	The Injection output is on if the Process Temperature is above the Injection Setpoint.
On Below –	The Injection output is on if the Process Temperature is below the Injection Setpoint.
Inject Above –	The Injection output is on and controlled by the period timer function if the Process Temperature is above the Injection Setpoint.
Inject Below –	The Injection output is on and controlled by the Injection Timer Function if the Process Temperature is Below the Injection Setpoint.
Inject Start –	The Injection output is on and controlled by the Injection Timer Function at the Start of each Process Timer Run.

The Manual injection mode is also available in all parameter setting except off.

The Injection Timer Function associated with the injection logic is based on the setting in the Injection Period, Injection Delay and Number Of Injections parameters. Once triggered, the sequence will run injections, being on for the Injection Period and off for the Injection Delay the number of times set in the Number of Injections parameter. Note: This can be as simple as one timed period.

Injection Setpoint – This parameter sets temperature at which the injection action may take place. The action is based on the Injection logic parameter.

Injection Period – This parameter sets the time that the injection output will be active during each injection cycle.

Injection Delay – This parameter sets time between injections.

Number of Injections – This parameter sets the total number of injections.

Manual Injection – This parameter defines the action of the manual injection operation. This is controlled by the Injection line in the TEMP PROCESS MENU. The line allows the user to manually run an injection based on this parameter choice. The SELECT key will provide a closure on the inject output as long as the key is held down (Momentary), turn on the output and leave it on until manually turned off (Continuous) or turn it on and run the programmed Timed Injection Function (Timed).

NOTE: The Manual Injection feature is active in addition to the automatic injection functions. Both may be used in the same system.

RECIRC SLEW RATE

For thermal electric systems, the analog output has maximum rate change of 3% per second.

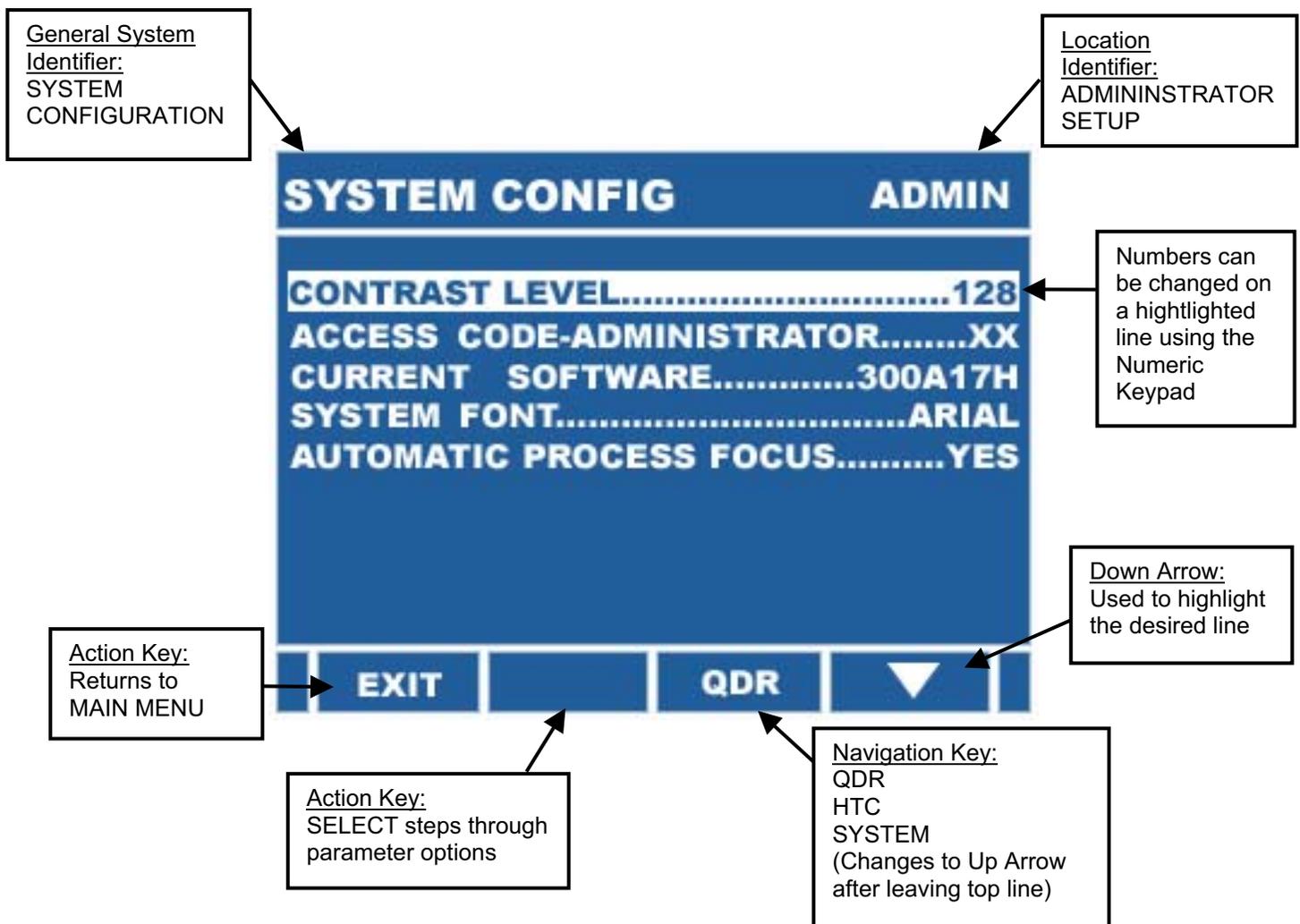
Additionally, the Heat/Cool and enable outputs will only change states if the actual output is less than 3% power.

SYSTEM CONFIGURATION

The Configuration of the system consists of setting those parameters that affect the entire controller. Since the controller is capable of running multiple modules (QDR, Resistivity Monitor, Temperature Controller, etc) there may be many items to setup. If the parameter relates to all of the modules, it is a System Configuration parameter and is handled in this section. If the parameter is unique to the module, it is setup in the individual Module Setup sections.

In the Main Menu the last line item is SYSTEM CONFIGURATION. Use the DOWN ARROW to move the highlighting to this line and press ENTER.

This will open up an Access Code window. Enter the Administrator Access Code to gain access to the SYSTEM CONFIG – ADMIN menu or the Factory Access Code to gain access into the SYSTEM CONFIG – FACTORY menu and then press ENTER.



The following table indicates the parameters, their setting ranges and when they will be visible in the menu, based on other settings in the system:

System Configuration – Admin

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
Contrast Level	0 to 255	always
RS232 Communications	Yes/No	if Admin Access = Yes
Baud Rate	2400/4800/9600/19200/ 38400/57600/115200	if RS232 = Yes
Protocol	JPC	If RS232 = Yes
RS485 Communications	Yes/No	if Admin Access = Yes
Baud Rate	2400/4800/9600/19200 38400/57600/115200	if RS485 = Yes
Protocol	JPC	If RS485 = Yes
Access Code –Administrator	0 to 9999	if entered Code = Admin Set
Current Software	xxxxxx	always
System Font	Arial	always
Load Factory Config	Yes/No	always
Automatic Process Focus	Yes/No	always
Auto Alarm Reset	Yes/No	always

Contrast Level – This parameter sets the contrast for the LCD Display.

RS232 Communications – The RS232 Serial Communications port is activated by setting this parameter to YES.

Baud – The Baud Rate for the RS232 Serial Communications Port is set with this parameter.

Protocol – The Protocol that is to be used with the RS232 Serial Communications Port is selected with this parameter.

RS485 Communications – The RS485 Serial Communications port is activated by setting this parameter to YES.

Baud – The Baud Rate for the RS485 Serial Communications Port is set with this parameter.

Protocol – The Protocol that is to be used with the RS485 Serial Communications Port is selected with this parameter.

Access Code – Administrator – The access code for the administrator is set with this parameter.

Current Software – This parameter lists the current version of the software. It is a read only parameter.

System Font – The Font used for all of the system text may be selected using this parameter.

Load Factory Config – If this parameter is set to Yes when the Admin Setup is exited, all of the Admin and Factory Settings and Recipe of Record will be loaded.

Automatic Process Focus – This parameter allows the selection of the automatic change of the display screen to the Run Screen for any control when an alarm or completion action takes place. For example, the display will automatically change to the QDR Run screen at the completion of a run.

Auto Alarm Reset – This parameter allows the selection of the automatic resetting of any currently listed but cleared alarm when a process is started. Note: Only alarms that are related to the control being started are reset.

System Configuration – Factory

<u>Parameter</u>	<u>Range</u>	<u>Visible</u>
RC Type	None/QDR/RINSER	always
TC Type	None/HTC/RECIRC	always
Admin access to RS232 Settings	Yes/No	always
Admin access to RS485 Settings	Yes/No	if Meg Type = None
Access Code – Factory	0 to 9999	if entered Code = Back Door
Access Code – Administrator	0 to 9999	always
Access Code – Admin Set	0 to 9999	always
Save Factory Config	Yes/No	always
System Input 1	See Table 1	always
·		
·		
System Input 8		
System Output 1	See Table 2	always
·		
·		
System Output 8		
System Relay 1	See Table 2	always
·		
·		
System Relay 4		
Solenoid 1	See Table 2	always
·		
·		
Solenoid 6		

Warning

Alarms are only active if an input has been assigned to them. Failure to correctly configure the inputs will eliminate the feature and may cause property damage, injury or death.

RC (Rinse Control) Type – The rinsers control section may be configured to be either a QDR (Quick Dump Rinser) or a Rinser. This parameter is the primary setting for that selection. It structures the software to perform the unique function indicated and dictates the rinsers section indicator that appears in the upper left corner of all the screens in the section.

QDR – Quick Dump Rinser
RINSER – Rinse Bath

TC (Temp Control) Type – The temperature control section may be configured to operate as several different types of control. This parameter is the primary setting for that selection. It structures the software to perform the unique function indicated and dictates the temperature section indicator that appears in the upper left corner of all the screens in the section.

HTC – High Temperature Controller
RECIR – Recirculator Temperature Controller

Admin access to RS232 Settings – In some cases it may be desirable to restrict access to the RS232 Communication Port setup. If this parameter is set to NO it will require a Factory Level Access Code to set the RS232 setup parameters.

Admin access to RS485 Settings – In some cases it may be desirable to restrict access to the RS485 Communication Port setup. If this parameter is set to NO it will require a Factory Level Access Code to set the RS485 setup parameters. NOTE: If one of the modules (E.G. Megasonics) uses this feature, it is removed from this menu.

Access Code – Factory – The access code for the factory is set with this parameter.

Access Code – Administrator – The access code for the administrator is set with this parameter.

Access Code – Admin Set – The access code that will allow the Access Code – Administrator parameter to be visible in the SYSTEM CONFIGURATION - ADMIN menu is set with this parameter. The Administrator Code may be controlled at the administrator or factory levels. Giving the Administrator this Code allows for administrative control.

Save Factory Config – When exiting the System Configuration, all of the Admin and Factory and Recipe of Record settings will be saved, if this parameter is set to Yes.

System Input x – There are 8 parameters in this set: System Input 1 thru 8. Each is a switch or OCT (Open Collector Transistor) hardware input that comes out on the back panel. Each may be independently linked to one of the software Logical inputs. This allows the Factory to configure the hardware to match the specific application needs. All of the inputs assume a closure is the active state.

The following table indicates the various logical inputs that are available in the software, segmented by controller type. If the type is not selected, these inputs will not appear in the scrolled selections.

#	Logical Input	Description	Used By
SYSTEM			
-	Unused	Unused	
RINSE CONTROLLER			
17	Liq Lev – RC	Liquid Level Input	Liquid Level Logic routines
18	Resist 1 – RC	Resistivity 1 Input	Resistivity Logic Routines
19	Resist 2 – RC	Resistivity 2 Input	Resistivity Logic Routines
20	Interlock – RC	Interlock Input	Alarm Routine – Interlock
21	Meg N2 Pres - RC	Megasonic N2 Pressure Switch Input	Alarm Routine – Meg Low N2 Pres
22	Meg Fault – RC	Megasonic Fault Input	Alarm Routine – Meg Fault
23	Start – RC	Start Rinser	Remote device (E.G. Transfer Arm Controller) to start Rinser.
24	Stop – RC	Stop Rinser	Remote device (E.G. Transfer Arm Controller) to stop Rinser.
TEMPERATURE CONTROLLER			
33	Low Flow CW - TC	Low Flow City Water Input	Alarm Routine – Lo Flo Cty Water
34	Recirc Liq Lev - TC	Liquid Level Input	Alarm Routine – Recirc Liquid Level
35	Meg N2 Pres – TC	Megasonic N2 Pressure Switch Input	Alarm Routine – Meg Low N2 Pres
36	Meg Fault – TC	Megasonic Fault Input	Alarm Routine – Meg Fault
37	Start – TC	Start Temp Controller	Remote device to start Temp Controller.
38	Stop – TC	Stop Temp Controller	Remote device to stop Temp Controller.
39	Recirc Flow – TC	Flow Switch Input	Alarm Routine – Low Flow
40	Interlock – TC	Interlock Input	Alarm Routine – Interlock
41	Add Fluid – TC	Low Fluid Level	Alarm Routine – Add Fluid

Note: System Outputs can be set from the System Configuration Menu in one of two ways. When the desired Output is highlighted, either the Select Key can be used to scroll through the available settings or the desired setting number from the table can be entered on the Number Keypad. If a number is not assigned, the Output will say Unused.

Table 1

System Output x – There are 8 parameters in this set: System Output 1 thru 8. Each is an OCT (Open Collector Transistor) hardware output that comes out on the back panel. Each may be independently linked to one of the software Logical outputs. This allows the Factory to configure the hardware to match the specific application needs. All of the outputs use a low as the active state.

System Relay x – There are 4 parameters in this set: System Relay 1 thru 4. Each is a Form A (N/O – Common) relay that comes out on the back panel. Each may be independently linked to one of the software Logical outputs. This allows the Factory to configure the hardware to match the specific application needs.

Solenoid x – There are 6 parameters in this set: Solenoid 1 thru 6. Each may be a Solenoid Valve with plumbing that comes out on the back panel. Each may be independently linked to one of the software Logical outputs. This allows the Factory to configure the hardware to match the specific application needs. All of the outputs use a closure as the active state.

Since the internal solenoid package comes in a wide variety of configurations, reference the module number that is installed in the system and the chart in the drawing section to determine the plumbing for the solenoids to correctly link the right type of hardware for the system to the internal logic. The valves may be 3 way or 4 way style and there may be up to 6 total, but all six are not provided in some systems.

The following table indicates the various logical outputs that are available in the software, segmented by controller type. If the type is not selected, these inputs will not appear in the scrolled selections.

#	Logical Output	Description	Active When.....
SYSTEM			
0	Off	Unused	Never
1	Ext Audio	External Audio	the internal audio is active except for key clicks.
2	Alarm	Alarm	the unit is in the Alarm mode.
RINSE CONTROLLER			
17	Done - RC	Rinser Done	the rinser is in the Done mode.
18	Drain – RC	Rinser Drain	Based on rinse logic
19	Reclaim – RC	Rinser Reclaim	Based on rinse logic
20	N2 – RC	Rinser N2 Bubbler	Based on rinse logic
21	Low Flow – RC	Rinser Low Flow	Based on rinse logic
22	Fill – RC	Rinser Fill	Based on rinse logic
23	Spray – RC	Rinser Spray	Based on rinse logic
TEMPERATURE CONTROLLER			
33	Done – TC	Temp Timer Done	the Temp controller is in the Done mode.
34	Bath Pump – TC	Bath Pump	Bath Pump logic permits
35	Injection – TC	Injection	Injection logic permits
36	Timer Output 1 – TC	Temp Control Output #1	Based on Recipe Setting
37	Timer Output 2 – TC	Temp Control Output #2	Based on Recipe Setting
38	Recirc Pump – TC	Recirculator Pump	Recirculator Pump logic permits
39	City Water – TC	City Water	Recirculator is On*
40	Drain – TC	Bath Drain	Based on Drain Logic Settings
41	Chiller – TC	Chiller	Based on Recirc Temp Control

Table 2

* This output remains on for 30 seconds after Recirculator has been turned off.

Note: Multiple inputs or outputs can be linked to the same internal logic feature. Thus there may be a relay and an OCT output that both activate on an alarm, or if the drain on a system needs more than one solenoid, they can simply be assigned.

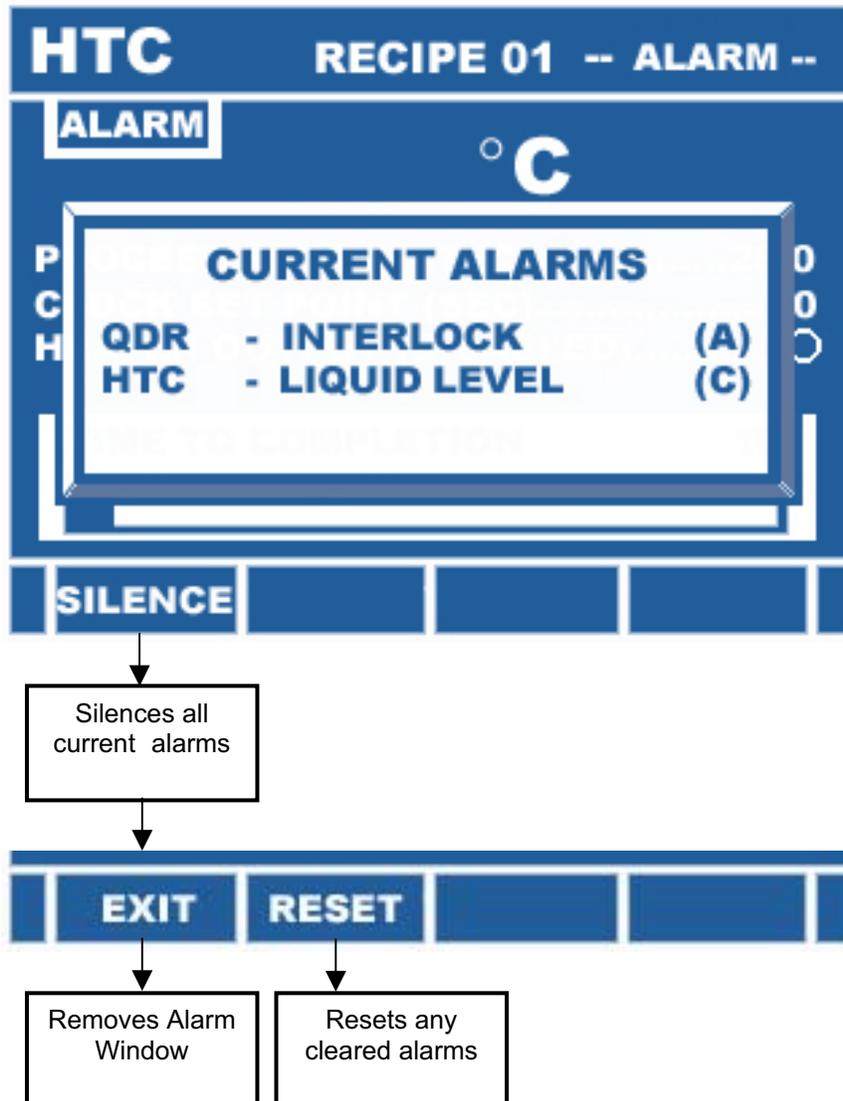
Note: System Inputs can be set from the System Configuration Menu in one of two ways. When the desired Output is highlighted, either the Select Key can be used to scroll through the available settings or the desired setting number from the table can be entered on the Number Keypad. If a number is not assigned, the Output will say Unused.

ALARMS

The system continuously monitors for a wide variety of Alarm conditions. When an Alarm occurs, the status of the system is changed to ALARM and the appropriate Description appears on the display in the ALARM Screen.

Most alarms have a Delay Period of five seconds. The alarm must exist for five consecutive seconds before the unit sounds the alarm. If multiple Alarms occur, they are automatically stacked in the order in which they occurred.

The following screen is a typical example of an ALARM window. It may be overlaid on any screen. In all cases the keys are changed to require that the alarm window be addressed prior to any further action with that screen.



An Alarm will remain on the ALARM window until it is both cleared and reset. The (A) in the right hand margin indicates that the alarm is still ACTIVE. When the Alarm condition has been CLEARED, the designator will change to (C).

If the Alarm has been cleared, depressing the RESET key will remove it from the window. If the Alarm is still present (Active), it cannot be removed until the fault has been cleared.

If an attempt is made to start a Run with active Alarms present, that apply to that portion of the system, the audio portion of the Alarm will RESOUND and the ALARM window will reappear.

If there are cleared Alarms present when a Run is started, they will be auto cleared.

The ALARM window not only indicates the Alarm but also the subsystem that triggered the Alarm. In some cases there may be similar alarms in different subsystems and this indicator provides a clear indication of the location of the Alarm.

If an Alarm(s) is still present when the ALARM window is closed, the ALARM tab remains in the upper left of all screens to remind the user that there is an Alarm(s) present. If the Alarm applies to a specific process screen, the status of that screen is also changed to display ALARM.

The Alarm window may be viewed at any time by proceeding to the SYSTEM MENU screen and depressing the ALARM key. Note that this key is only present if an Alarm is present.

Warning

Alarms are only active if an input has been assigned to them. Failure to correctly configure the inputs will eliminate the feature and may cause property damage, injury or death.

The following pages contain details on the various Alarms. They are grouped based on the system elements that are setup in a given unit.

Rinse Control Alarms

The following is a listing of the possible Rinse Control alarms. Not all Alarms may apply to all systems. If the related hardware is not present or the feature is not selected, the Alarm is locked out by the configuration software.

DRAIN TOO SLOW – In Liquid Level Systems, if the Drain Timer is set to a none zero value this Alarm will be activated. If during a drain/dump cycle the level does not fall below the Liquid Level sensor within this time, the Alarms sounds to indicate that there is something wrong with the drain/dump.

FILL TOO SLOW – In Liquid Level Systems, if the Fill Timer is set to a none zero value this Alarm will be activated. If during a Fill cycle the level does not reach the Liquid Level sensor within this time, the Alarms sounds to indicate that there is something wrong with the fill.

MEG LOW N2 PRES – In systems with Megasonics, a sensor may be used for the N2 that is used in the purge for the transducers. If this sensor detects a lack of N2 pressure, this Alarm will activate.

MEG MALFUNCTION – In systems with Megasonics, the generators are monitored for alarms via a hardware input. If an alarm is detected from the generator, this Alarm is activated.

MEG x COMM – In systems with Megasonics, the generators are monitored for communications alarms. If a communications Alarm is detected from the generator, this Alarm is activated. The x is replaced with a number from the Megasonics unit. Consult the Megasonics manufacturer documentation for details on the meaning of the alarm number.

MEG x SYS – In systems with Megasonics, the generators are monitored for system alarms. If a system alarm is detected from the generator, this Alarm is activated. The x is replaced with a number from the Megasonics unit. Consult the Megasonics manufacturer documentation for details on the meaning of the alarm number.

INTERLOCK OPEN – This Alarm indicates that an open has been detected on the interlock input. This is normally wired to lids or doors as safety interlocks.

The following table provides details on the specific Alarm action that is taken by the system when an Alarm occurs.

Rinse Controller	Inhibit Drain	Inhibit Fill	Inhibit Process Start	Lockout Megasonic Output
DRAIN TOO SLOW				
FILL TOO SLOW				
MEG LOW N2 PRES			X	X
MEG MALFUNCTION			X	X
MEG X COMM			X	X
MEG X SYS			X	X
INTERLOCK OPEN	X	X	X	X

Temperature Control Alarms

The following is a listing of the possible Temperature Control Alarms. Not all Alarms may apply to all systems. If the related hardware is not present or the feature is not selected, the Alarm is locked out by the configuration software.

OPEN HI LIMIT TC – This is the Open High Limit Thermocouple Alarm. The High Limit T/C is continuously monitored for integrity and if it is open, this Alarm is activated.

BAD PROC SENSOR – This is the Bad Process Sensor Alarm. The Process sensor (E.G. T/C, RTD, etc) is continuously monitored for integrity and if it is invalid, this Alarm is activated.

HI ABSOLUTE TEMP - This is the High Absolute Temperature Alarm. It is activated anytime the process temperature exceeds the High Absolute Temperature setpoint.

LO ABSOLUTE TEMP - This is the Low Absolute Temperature Alarm. It is activated anytime the process temperature falls below the Low Absolute Temperature setpoint, after the temperature has first come out of the Warmup mode. The Warmup mode requires that the process temperature exceed the Low AbsoluteTemp setpoint for the first time. This eliminates false Low Alarms on startup.

HI DEVIATION TEMP - This is the High Deviation Temperature Alarm. It is activated anytime the process temperature exceeds the process setpoint Plus the High Alarm deviation offset.

LO DEVIATION TEMP - This is the Low Deviation Temperature Alarm. It is activated anytime the process temperature falls below the process setpoint Minus the Low Alarm deviation offset, after the temperature has first come out of the Warmup mode. The Warmup mode requires that the process temperature exceed the Low DeviationTemp setpoint for the first time. This eliminates false Low Alarms on startup.

LIQ LEVEL – BATH – This is the Bath Liquid Level Alarm. If the liquid level in the bath falls below the sensor, this Alarm will sound.

LIQ LEVEL – RECIR – This is the Recirculator Liquid Level Alarm. If the liquid level in recirculator system falls below the sensor, this Alarm will sound.

LIQ LEVEL – MEG – This is the Megasonics Liquid Level Alarm. If the liquid level in Megasonics system falls below the sensor, this Alarm will sound.

DRAIN TOO SLOW – This Alarm indicates that the Drain/Aspirate function did not clear the bath liquid level sensor in the time programmed into the Drain/Aspirate Alarm Time parameter.

OPEN SNAP SWITCH – This Alarm indicates that the High Temperature Thermal Snap Switch on the bath has opened. Note that this action directly deactivates the safety relay without any controller action. All other actions performed by the system are strictly redundant.

HIGH LIMIT TEMP – This is the Safety High Limit Thermocouple Alarm. If the temperature on the High Limit T/C exceeds the High Limit setpoint, this Alarm is triggered. The setpoint and circuitry for this Alarm are discrete components, separate from the high level circuitry. Note that this action directly deactivates the safety relay with out any controller action. All other actions performed by the system are strictly redundant.

MEG LOW N2 PRES – In systems with Megasonics, a sensor may be used for the N2 that is used in the purge for the transducers. If this sensor detects a lack of N2 pressure, this Alarm will activate.

MEG MALFUNCTION – In systems with Megasonics, the generators are monitored for alarms via a hardware input. If an alarm is detected from the generator, this Alarm is activated.

MEG x COMM – In systems with Megasonics, the generators may be monitored for communications alarms. If a communications alarm is detected from the generator, this Alarm is activated. The x is replaced with a number from the Megasonics unit. Consult the Megasonics manufacturer's documentation for details on the meaning of the alarm number.

MEG x SYS – In systems with Megasonics, the generators may be monitored for system alarms. If a system alarm is detected from the generator, this Alarm is activated. The x is replaced with a number from the Megasonics unit. Consult the Megasonics manufacturer's documentation for details on the meaning of the alarm number.

CHILLER FAULT – In systems with a Chiller, this Alarm indicates that there is a malfunction in that unit. Consult the Chiller manufacturer's documentation for details.

LO FLO CITY WATER – In systems with a Thermal Electric Chiller, there is a flow switch on the incoming city water supply to the T/E module. This Alarm indicates a Low Flow condition in that loop based on an open on this input.

Note: The alarm input is ignored when the City Water Output is OFF and for the first 30 seconds after it is turned ON.

OPEN OUTPUT LOOP – In systems with a 4–20 mA analog outputs (E.G. 4-20 ma) the output loop is continuously monitored and this Alarm is sounded if there is a break in the circuit.

LOW FLOW – This alarm indicates that the low flow input is open.

INTERLOCK – This is a general purpose interlock that will lockout all the temperature controller outputs.

Note: This is a software feature and should not be used for ultimate safety.

ADD FLUID – This is an informational only alarm to indicate that fluid is needed in the system.

The following table provides details on the specific Alarm action that is taken by the system when an Alarm occurs.

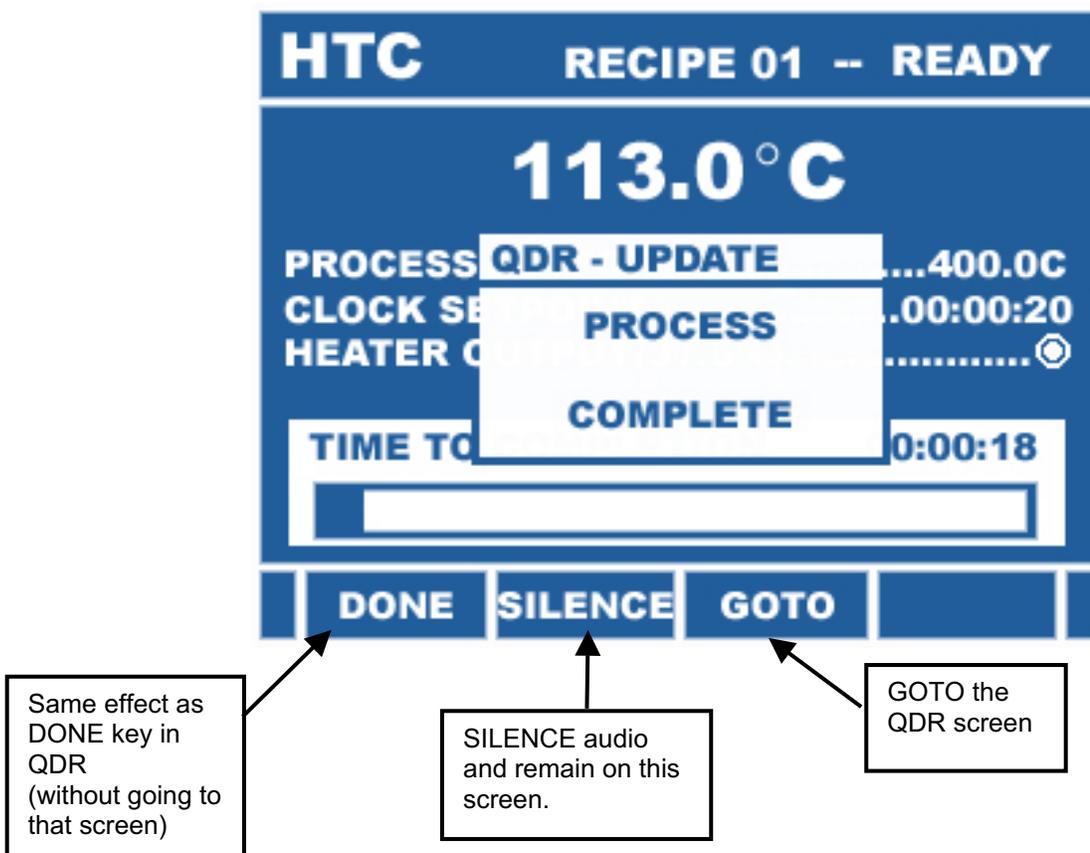
Temperature Controller	Safety Relay Off	Lockout Heater Output	Lockout Chiller Output	Inhibit Process Start	Lockout Drain	Lockout Bath Pump	Lockout Recirc Pump	Lockout Megasonic
OPEN HI LIMIT TC	X	X		X	X			
BAD PROC SENSOR	X	X		X	X			
HI ABSOLUTE TEMP	X	X		X	X			
LO ABSOLUTE TEMP	X		X	X				
HI DEVIATION TEMP		X		X				
LO DEVIATION TEMP			X	X				
LIQ LEVEL - BATH	X	X	X	X		X		X
LIQ LEVEL – RECIRC		X	X	X			X	
LIQ LEVEL – MEG				X				X
DRAIN TOO SLOW				X				
OPEN SNAP SWITCH	X	X		X	X			
HIGH LIMIT TEMP	X	X		X	X			
MEG LOW N2 PRES				X				X
MEG MALFUNCTION				X				X
MEG x COMM				X				X
MEG x SYS				X				X
CHILLER FAULT	X		X	X				
LO FLO CITY WATER	X		X	X				
OPEN OUTPUT LOOP	X	X	X	X				X
LOW FLUID	X	X	X	X			X	X
INTERLOCK	X	X	X	X	X	X	X	X
ADD FLUID								

UPDATES

The system can do many things at the same time. Thus, the end of a QDR cycle might occur while the operator is in an unrelated screen. If the user always wants to have the unit jump to the section that causes an Update, the Automatic Process Focus parameter in the SYSTEM CONFIG – ADMIN menu should be set to YES. In this configuration, the UPDATE window will not be seen and the focus of the display will automatically change to the control section that requires attention.

If the Automatic Process Focus parameter is set to NO, the Update window feature is used to allow the user to be alerted of all system activity and even to control the feature without leaving the current screen. The window will appear on any screen except the run screen that caused the update.

The Update window will appear and the keys will provide the options for the desired action.



APPENDIX A - FLASH PROGRAMMING

The program that runs the unit is stored in Flash memory and can be field upgraded via the RS232 Port. A windows based Flash Downloader can be installed to an on-site PC. Updated programs can be downloaded from the web and Flashed into the unit.

The Downloader program and all of the instructions for its installation and use are available at www.jpcccontrols.com. Also, any program upgrades are also available through the same site.

When using the programmer, the screen on the unit will change to the following.



If for some reason the program in the flash memory becomes invalid the following screen will appear. In this very unlikely event, the current program may be obtained from the web site and Flashed in the unit.



APPENDIX B - TEMPERATURE CONTROL THEORY

The temperature control scheme used in this unit is a standard PID system. This section will briefly review PID control as it relates to this system. It should be noted that this discussion specifically relates to this device and may be somewhat different than other systems.

The control theory and practical implementation will vary depending on whether the unit is using heating, cooling or both. The first section assumes a time proportioned system with heat only. However, the general theory applies to all of the systems and the later sections that deal with other applications will simply refer to how they differ from this basic structure.

HEAT ONLY (Proportional)

The terms PID and Three Mode are interchangeable. These terms describe a control scheme that consists of three distinct modes working together to bring the bath to the desired temperature. The proportional and integral modes work together to eliminate errors in the steady state temperature while the derivative mode works to reduce over-shoot or slow response during rapid changes in temperature.

The first mode of control, proportional, refers to the basic control scheme. The concept is that the controller will determine the percentage of heating required by the bath and adjust the average power to the heater to bring the bath temperature to a stable point. The heater is either fully on or fully off. The proportioning is obtained by adjusting the ratio of the time the heater is on to the time it is off. Adjusting this on-off ratio provides the adjustment to the average heater power needed to control the bath temperature. Proportional control in this application is more correctly termed Time Proportioning.

The cycle rate setting is used to determine the rate at which the heater turns on and off. When heating, the proportioning of the output power is accomplished by varying the percentage of time that the heater is on during the cycle period. For example, if the cycle rate is set to ten seconds then the heater will cycle on and off once every 10 seconds. If the controller has determined that the system requires only half of the full power output of the heater to maintain a specific temperature, the output will be on for five seconds and off for five seconds in a cycle. As the heat requirement increases, this percentage will increase to longer periods on. The opposite is true for decreasing heat load requirements.

To compute the required percentage of on time, the controller utilizes the proportional band parameter value. It is over this band that the output will vary from 0 to 100%. If for example, the setpoint is at 100°C and the proportional band is set at 10°C, the controller will time proportion the heater from 100% to 0% when the process temperature varies from 90°C to 100°C. When the process temperature is at 90°C and less, the heater will be fully on. Between 90°C and 100°C the output will time proportion from 100% down to 0%. At any temperatures above 100°C, the heater will be fully off.

This description of the proportioning control scheme does not include the rate and reset functions. Rate and reset will cause a shifting in the proportional band and vary the percentages just discussed. However, rate and reset do not affect the basic functioning of a proportioning scheme, only the relative position of the proportional band at any moment in time.

By using the preceding example, it can be shown how the proportional band and cycle rate work together. In the example we had a cycle rate of ten seconds with a proportional band of 10°C and a setpoint of 100°C. When the process temperature is 96°, we will note that it is 40 percent into the proportional band. Under these conditions the heater will be on for 40 percent of the time. With the 10-second cycle rate, this means that the heater will be on for four seconds and off for six seconds.

A control with only proportional mode will have an error when at a constant temperature. In the example just given, if only ten percent of the heaters output is required to maintain the desired temperature the heater will cycle one second on and nine seconds off and the temperature will stabilize at 99 degrees. This is not the desired setpoint of 100°C. The difference between the setpoint and the control point is an error inherent in all proportional-only systems.

To remove this error, we need the second control mode working with the proportional mode. This is the integral mode, commonly termed automatic reset mode. The difference between the current process temperature and the desired setpoint is used to adjust (or reset) the proportional band position to compensate for the temperature error. Periodically the integral mode software determines the temperature error and makes an adjustment to the power output by adjusting the setpoint internally. This has the effect of shifting the proportional band. This shift decreases or increases the power to reduce the temperature error. This adjustment to the power output is done at intervals set in the RESET parameter.

The reset action must occur only when the temperature is in the proportional band. If the reset mode adjusted the output duty cycle before the bath temperature were stable, large errors would occur. By preventing the reset action from occurring when the temperature is outside the proportional band such potential errors are eliminated.

The third mode in the PID scheme is the derivative mode, commonly referred to as RATE. The function of the rate mode is to reduce overshoot as the temperature is approaching a new setpoint. Rate reduces overshoot of the temperature when fast ramping rates are used by comparing the rate of temperature change to the programmed rate of change. If the actual rate exceeds the programmed rate the heating duty cycle is temporarily reduced. The interval at which the rate of change is adjusted is set by the RATE parameter. When high ramp rates are used this parameter should be set to shorter intervals to reduce overshoot. At lower ramp rates this interval may be increased to allow better control of temperature while ramping. In situations where overshoot is not a problem, the rate mode may be eliminated by setting the rate interval parameter to zero.

PROPORTIONAL HEATING and FIXED COOLING

In some applications it is necessary to have cooling to provide enough thermal load for the control system to work. If the system can not dissipate enough heat to force the heater to continually be on, the control loop can not control the temperature. This is typical of applications that are near or below room temperature. In these cases it is common to provide a fixed cooling load that is kept on and then control the system by allowing the heater to “buck” the cooling and thus maintain the desired setpoint.

The control is exactly the same as in the HEAT ONLY application, the cooling simply lowers the temperature that the bath will be at if the heater is off.

PROPORTIONAL HEATING and PROPORTIONAL COOLING

With cooling systems that can be proportioned, the control works in a slightly different way. Now instead of operating as a “Buck” control loop, the unit determines whether heating or cooling is to be used and runs a separate 3 mode loop for each. Thus when the setpoint requires heat, the system works just as a heat only system does. However, when the setpoint requires cooling, the heat is off and the cooling is proportioned just as the heat was, except that it uses a separate set of control parameters and works in reverse.

ANALOG HEATING and ANALOG COOLING

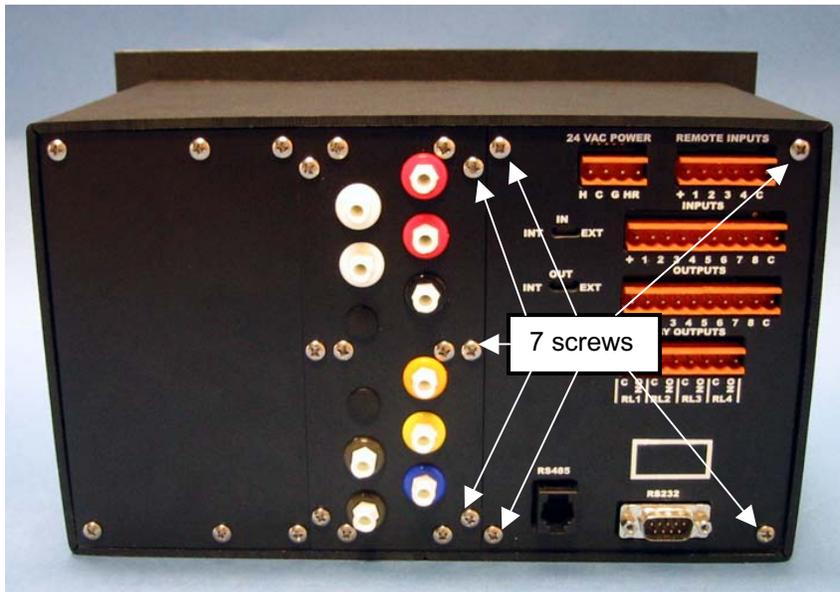
Some systems use an analog signal to proportion the heating and/or cooling. In this case the control is exactly the same, but the output varies. Instead of being on or off, it is a direct ratio of the required power. For example in a 4-20 ma system, 50% heat would be obtained by the control outputting a 12 ma signal.

The theory of control remains the same, except that the user no longer has a Cycle Rate to deal with, since this is only used to determine the percentage on time, which is no longer applicable.

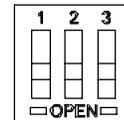
APPENDIX C – ON/OFF SWITCH OVERRIDE

In some applications, it may be desirable for the unit to always Power Up in the On condition. Provisions are made to accommodate this by means of a selector switch behind the right rear access panel.

- (1) Remove Power from the unit.
- (2) Unplug all necessary Connectors.
- (3) Remove the seven Screws.
- (4) Gently pry out the back panel section by lifting from the right edge.
- (5) Set Switch X to Off.
- (6) Reverse steps 4 thru 1.



4. POWER MODE CAN BE SELECTED BY SETTING SWITCH. SWITCH IS LOCATED UNDER BACK PANEL.



ON/OFF KEYS - OPEN SWITCH POSITIONS 1 AND 2 (DEFAULT AS SHIPPED)

LINE POWER - CLOSE SWITCH POSITIONS 1 AND 2
SWITCH POSITION 3 IS RESERVED

Note: If the Heater/Chiller/Recirculator in the Temperature Control section is to come on, automatically upon power up, the Auto Enable On Power Up parameter in the HTC – ADMIN SETUP menu must be set to YES.

SPECIFICATIONS

MODEL 3010 CONTROLLER

DISPLAY	5.7" Diagonal Super Twist LCD with CCF Backlight (Blue & White)
ANNUNCIATOR	Audio Tone, ~ 3200 HZ
SETUP MEMORY	Battery Ram, All Parameters
MEMORY RETENTION	10 Years w/o Power
OPERATING RANGE	0 to 50 Degrees C
STORAGE RANGE	-40 to 60 Degrees C
CONSTRUCTION	Enclosure - Kydex, Black Face - Lexan
SIZE	7.00 x 11.00 x 6.00 inches (HxWxD) 178 x 280 x 152mm
WEIGHT	≤ 10 Lbs. (4.55 kg)
CONNECTIONS	Pneumatic - Rear, Luer Lock Fittings, Color Coded, Internal 1/16" ID Tubing except Open/Close Supply, 1/8" ID Electrical – Rear, Weidmuller Type SL – Controller Type BLZ – Mating Communications – RS232 – DB9 RS485 – 6 Pos Modular T/C – Type J Subminiature

OUTPUTS

Pneumatic Solenoid, Internal,
100 PS1G Max.

Relay – 2 A, 120 VAC

Digital – OCT - 50 MA, 12-30 * VDC

Analog – 0-5 VDC
 0-10 VDC
 0-20 mA
 4-20 mA

12 VDC Supply – 180 MA Total

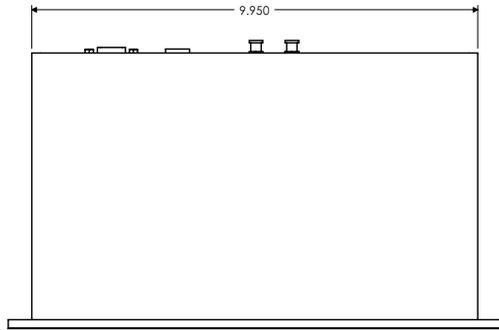
INPUTS

Digital – Switch or OCT
T/C – Type J

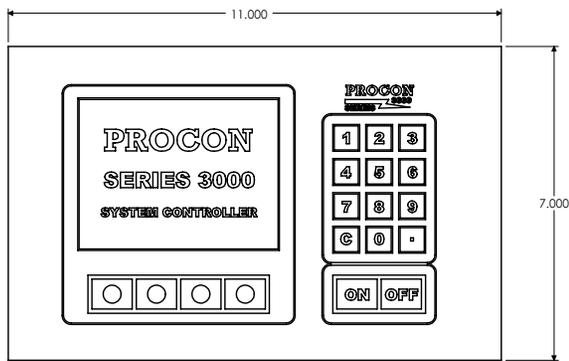
POWER

30 VA, 24 VAC \pm 10%, 50/60 HZ

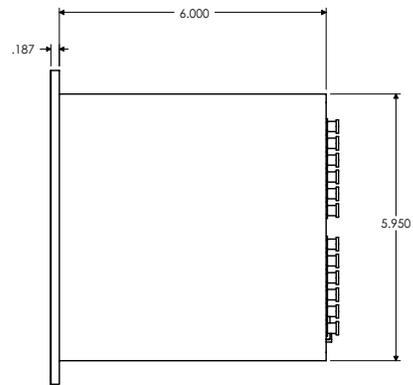
*The unit provides an internal 12 VDC supply for use with the inputs and outputs. This connection may be switched OFF via a rear panel switch and an external supply (e.g. 24 VDC) may be used.



TOP VIEW

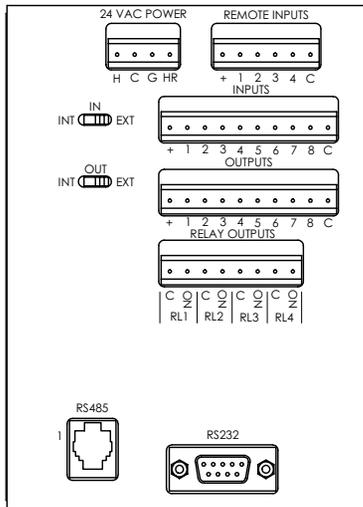


FRONT PANEL



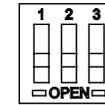
RIGHT SIDE VIEW

TOLERANCES UNLESS OTHERWISE SPECIFIED	JPC CONTROLS		102 COMPASS PT DR. STE. D, ST. CHARLES, MO 63301 (636) 946-3300 Fax (636) 724-2492 www.jpcccontrols.com				
	PROCON SERIES 3000 CONTROLLER PHYSICAL DIMENSIONS						
	APPROVAL		DRN	MPJ	DATE	SCALE	CHKD
ALL DIMENSIONS ARE IN INCHES		ENG	DATE	BY	1	1=2	6330
PATH=E:\CC\DT3000\3000P11.SLDDRW		GA	DATE	1.0/1	44	300000	30 01

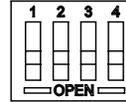


- GENERAL NOTES**
- WE RECOMMEND THE USE OF A QUENCH ARC ON EVERY MECHANICAL RELAY AND SOLENOID IN THE SYSTEM. USE PAKTRON P/N 104M06QC100 OR EQUIVALENT.
 - WEIDMULLER MATING CONNECTORS TYPE BL
 4 PIN - PART NO. 12593.6
 6 PIN - PART NO. 12595.6
 8 PIN - PART NO. 12597.6
 10 PIN - PART NO. 12599.6
 - RS485 CAN BE SETUP FOR USE WITH EITHER A TWISTED SINGLE PAIR OR TWO TWISTED PAIR BY SETTING SWITCH. THE SWITCH IS LOCATED UNDER BACK PANEL.

4. POWER MODE CAN BE SELECTED BY SETTING SWITCH. SWITCH IS LOCATED UNDER BACK PANEL.



ON/OFF KEYS - OPEN SWITCH POSITIONS 1 AND 2 (DEFAULT AS SHIPPED)
 LINE POWER - CLOSE SWITCH POSITIONS 1 AND 2
 SWITCH POSITION 3 IS RESERVED



TWISTED SINGLE PAIR - CLOSE SWITCH POSITIONS 1 AND 3
 OPEN SWITCH POSITIONS 2 AND 4

TWO TWISTED PAIR - CLOSE SWITCH POSITIONS 2 AND 4
 OPEN SWITCH POSITIONS 1 AND 3

- | | |
|---------------------------|------------------------------|
| RS485
TWO TWISTED PAIR | RS485
TWISTED SINGLE PAIR |
| 1 - NO CONNECTION | 1 - NO CONNECTION |
| 2 - TA (+) | 2 - TRA (+) |
| 3 - TB (-) | 3 - TRB (-) |
| 4 - RA (+) | 4 - NO CONNECTION |
| 5 - RB (-) | 5 - NO CONNECTION |
| 6 - GND | 6 - GND |

INPUTS

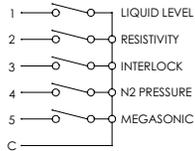
THE IN SWITCH CONTROLS THE POWER FOR BOTH INPUTS AND REMOTE INPUTS. THE INPUTS CAN BE RUN FROM THE INTERNAL POWER SUPPLY OR FROM AN EXTERNAL POWER SUPPLY.
 1. SET THE IN SWITCH TO INT POSITION TO USE INTERNAL POWER SUPPLY.
 2. SET THE IN SWITCH TO EXT POSITION TO USE AN EXTERNAL POWER SUPPLY.

INPUTS

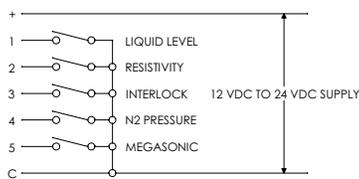
- 1 - LIQUID LEVEL (CLOSED INDICATES WATER IS PRESENT)
- 2 - RESISTIVITY (CLOSED INDICATES RESISTIVITY MET)
- 3 - INTERLOCK (ALARMS ON OPEN)
- 4 - N2 PRESSURE (ALARMS ON OPEN)
- 5 - MEGASONIC (ALARMS ON OPEN)
- 6 - NO CONNECTION
- 7 - NO CONNECTION
- 8 - NO CONNECTION

NOTE: INPUT ASSIGNMENTS ARE PROGRAMMABLE. THIS DRAWING REFERENCES TYPICAL ASSIGNMENTS.

TYPICAL INPUT WIRING FOR USE WITH INTERNAL POWER SUPPLY



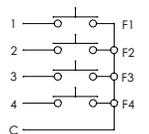
TYPICAL INPUT WIRING FOR USE WITH EXTERNAL POWER SUPPLY



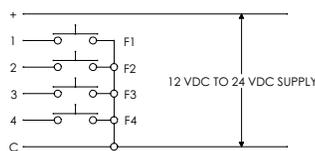
REMOTE INPUTS

- 1 - F1 (MOMENTARY ONLY)
- 2 - F2 (MOMENTARY ONLY)
- 3 - F3 (MOMENTARY ONLY)
- 4 - F4 (MOMENTARY ONLY)

TYPICAL WIRING OF REMOTE INPUTS FOR USE WITH INTERNAL POWER SUPPLY



TYPICAL WIRING OF REMOTE INPUTS FOR USE WITH EXTERNAL SUPPLY



NOTE
 INPUT AND OUTPUT ASSIGNMENTS ARE PROGRAMMABLE. THIS DRAWING REFERENCES TYPICAL ASSIGNMENTS.

OUTPUTS

THE OUT SWITCH CONTROLS THE POWER SUPPLY FOR THE OUTPUTS. THE OUTPUTS CAN BE RUN FROM THE INTERNAL POWER SUPPLY OR RUN FROM AN EXTERNAL POWER SUPPLY.

- SET OUT SWITCH TO INT POSITION TO USE INTERNAL SUPPLY.
- SET OUT SWITCH TO EXT POSITION TO USE AN EXTERNAL POWER SUPPLY

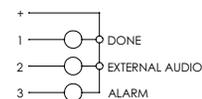
OUTPUTS

- 1 - DONE
- 2 - EXTERNAL AUDIO
- 3 - ALARM
- 4 - NO CONNECTION
- 5 - NO CONNECTION
- 6 - NO CONNECTION
- 7 - NO CONNECTION
- 8 - NO CONNECTION

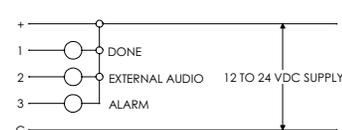
NOTE: OUTPUT ASSIGNMENTS ARE PROGRAMMABLE. THIS DRAWING REFERENCES TYPICAL ASSIGNMENTS.

TYPICAL OUTPUT WIRING FOR USE WITH INTERNAL POWER SUPPLY

(TOTAL OUTPUT POWER IN THIS CONFIGURATION IS 12 VDC @ 180mA. INDIVIDUAL LOADS @ 50mA).



TYPICAL OUTPUT WIRING FOR USE WITH EXTERNAL POWER SUPPLY



DETAIL OF TYPICAL RELAY OUTPUT

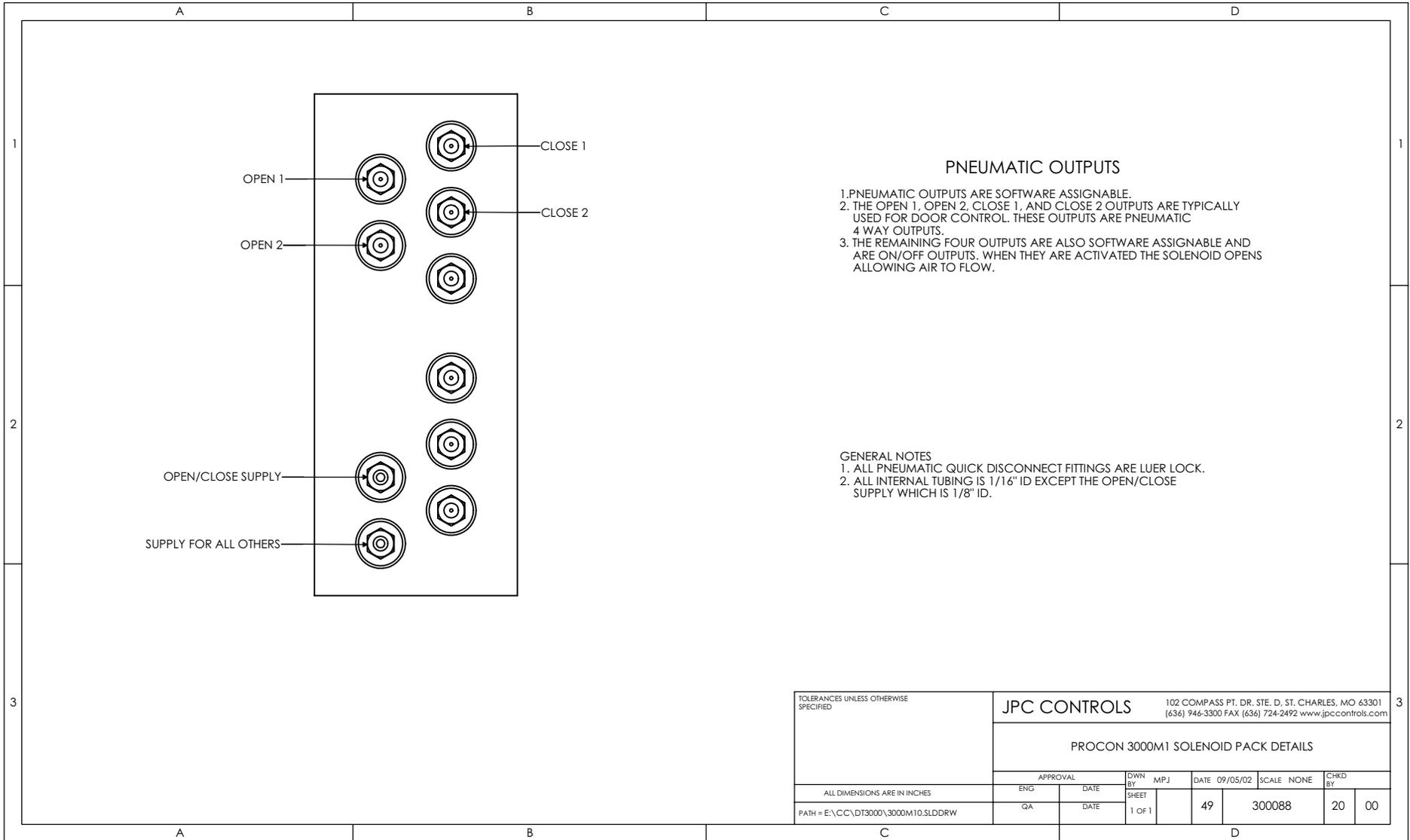


24 VAC POWER
 H - 24 VAC HOT
 C - 24 VAC COMMON
 G - EARTH GROUND
 HR - NO CONNECTION

RS232

- 1 - NO CONNECTION
- 2 - TXD
- 3 - RXD
- 4 - NO CONNECTION
- 5 - COMMON
- 6 - NO CONNECTION
- 7 - NO CONNECTION
- 8 - NO CONNECTION
- 9 - NO CONNECTION

TOLERANCES UNLESS OTHERWISE SPECIFIED		JPC CONTROLS		102 COMPASS PT. DR. STE. D. ST. CHARLES, MO 63301 (636) 946-3300 Fax (636) 724-2492 www.jpccontrols.com	
PROCON SERIES 3000 BASE CONTROLLER WIRING DIAGRAM					
APPROVAL		DRWN	MPJ	DATE	09/05/02
ENG	DATE	SHEET	1 OF 1	SCALE	1=1
ALL DIMENSIONS ARE IN INCHES		GA	DATE	12	300089
PATH = E:\C:\C:\DT3000\3000BASE1\W10.DLDRW				30	00



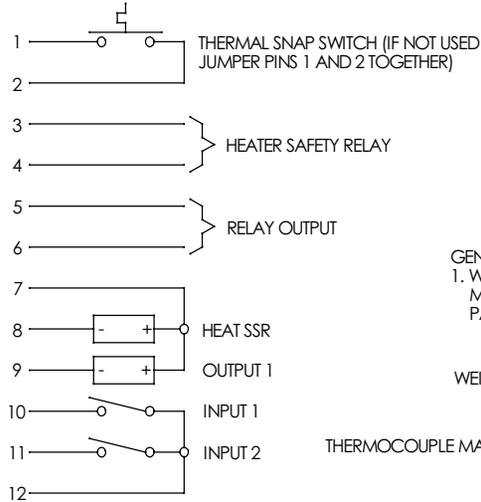
PNEUMATIC OUTPUTS

- 1. PNEUMATIC OUTPUTS ARE SOFTWARE ASSIGNABLE.
- 2. THE OPEN 1, OPEN 2, CLOSE 1, AND CLOSE 2 OUTPUTS ARE TYPICALLY USED FOR DOOR CONTROL. THESE OUTPUTS ARE PNEUMATIC 4 WAY OUTPUTS.
- 3. THE REMAINING FOUR OUTPUTS ARE ALSO SOFTWARE ASSIGNABLE AND ARE ON/OFF OUTPUTS. WHEN THEY ARE ACTIVATED THE SOLENOID OPENS ALLOWING AIR TO FLOW.

- GENERAL NOTES**
- 1. ALL PNEUMATIC QUICK DISCONNECT FITTINGS ARE LUER LOCK.
 - 2. ALL INTERNAL TUBING IS 1/16" ID EXCEPT THE OPEN/CLOSE SUPPLY WHICH IS 1/8" ID.

TOLERANCES UNLESS OTHERWISE SPECIFIED	JPC CONTROLS		102 COMPASS PT. DR. STE. D, ST. CHARLES, MO 63301 (636) 946-3300 FAX (636) 724-2492 www.jpcccontrols.com						
	PROCON 3000M1 SOLENOID PACK DETAILS								
	APPROVAL		DWN BY	MPJ	DATE	09/05/02	SCALE	NONE	CHKD BY
ALL DIMENSIONS ARE IN INCHES	ENG	DATE	SHEET						
PATH = E:\CC\DT3000\3000M10.SLDDRW	GA	DATE	1 OF 1		49	300088	20	00	

TYPICAL WIRING OF TEMPERATURE BLOCK

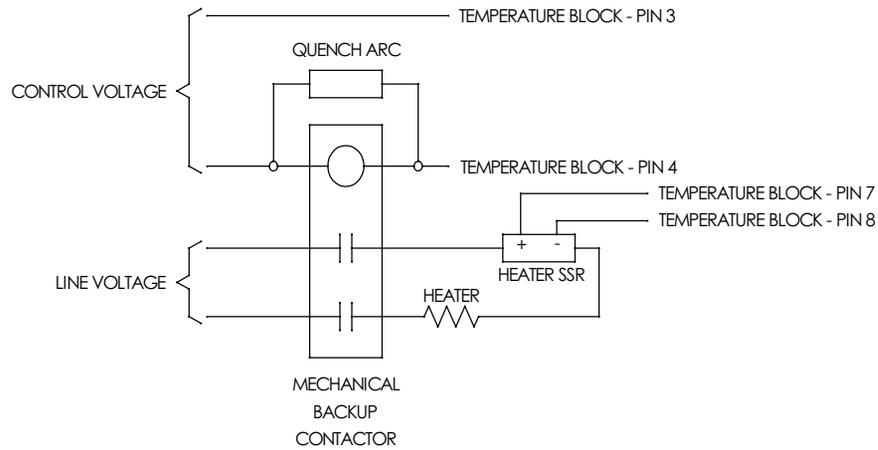
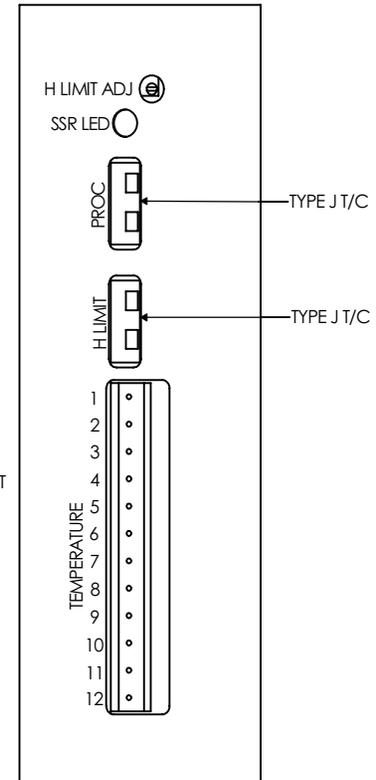


GENERAL NOTES

1. WE RECOMMEND THE USE OF A QUENCH ARC ON EVERY MECHANICAL RELAY AND SOLENOID IN THE SYSTEM. USE PAKTRON P/N 104M06QC100 OR EQUIVALENT.

WEIDMULLER MATING CONNECTOR TYPE BL
12 PIN - PART NO. 12601.6

THERMOCOUPLE MATING CONNECTOR: OMEGA SUBMINATURE TYPE SMP OR EQUIVALENT



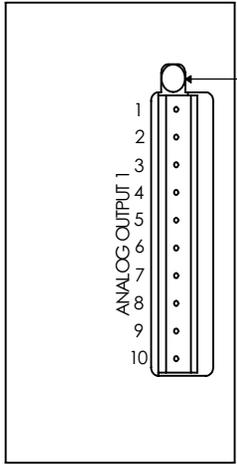
TOLERANCES UNLESS OTHERWISE SPECIFIED

JPC CONTROLS

102 COMPASS PT. DR. STE. D, ST. CHARLES, MO 63301
(636) 946-3300 FAX (636) 724-2492 www.jpcccontrols.com

PROCON 3000T1 TEMPERATURE BOARD WIRING DIAGRAM

APPROVAL		DWN BY	MPJ	DATE	09/06/02	SCALE	NONE	CHKD BY
ENG	DATE							
GA	DATE	SHEET			12	300086		20 00
PATH = E:\CC\DT3000\3000T1 W10.SLDDRW		1 OF 1						



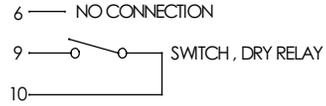
STATUS LED
GREEN = NORMAL OPERATION
RED = ALARM/FAULT

TYPICAL WIRING OF ANALOG OUTPUT 1 BLOCK

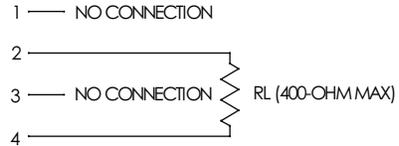
- 1 - V EXTERNAL
- 2 - I+ OUT (ANALOG)
- 3 - V+ OUT (ANALOG)
- 4 - I AND V RETURN
- 5 - EARTH GROUND
- 6 - +12
- 7 - OUTPUT 1
- 8 - OUTPUT 2
- 9 - INPUT 1
- 10 - COM

WEIDMULLER MATING CONNECTOR TYPE BL
10 PIN - PART NO. 12599.6

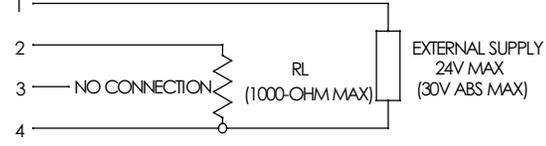
TYPICAL INPUT WIRING (SWITCH, PNP)



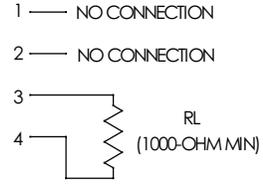
TYPICAL WIRING OF ANALOG CURRENT OUTPUT (STANDARD) 0 - 20mA



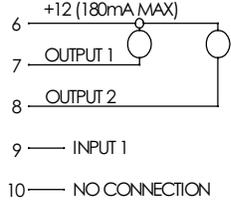
TYPICAL WIRING OF ANALOG CURRENT OUTPUT (BOOST) 0 - 20mA



TYPICAL WIRING OF ANALOG VOLTAGE OUTPUT 0 - 10V



TYPICAL WIRING OF OUTPUTS (OPEN COLLECTOR DRIVER)

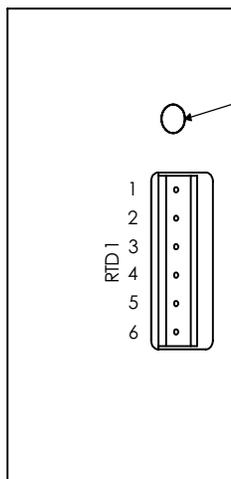


TOLERANCES UNLESS OTHERWISE SPECIFIED

ALL DIMENSIONS ARE IN INCHES

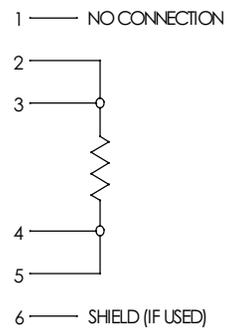
PATH=E:\CC\DT3000\3000A1W11.SLDDRW

JPC CONTROLS		102 COMPASS PT. DR. STE. D, ST. CHARLES, MO 63301 (636) 946-3300 FAX (636) 724-2492 www.jpcccontrols.com							
		PROCON 3000A1 ANALOG OUTPUT BOARD WIRING DIAGRAM							
APPROVAL		OWN BY	MPJ	DATE	11/15/02	SCALE	NONE	CHKD BY	
ENG		DATE							
GA		DATE							
SHEET		1 OF 1		12	300087	10	01		

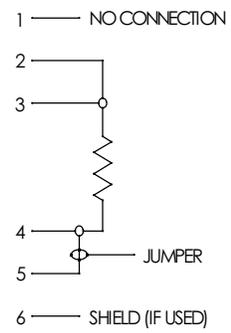


STATUS LED
GREEN = NORMAL OPERATION
RED = ALARM/FAULT

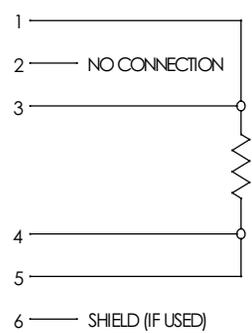
TYPICAL WIRE OF 100-OHM 4 WIRE RTD



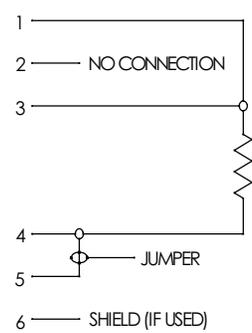
TYPICAL WIRING OF 100-OHM 3 WIRE RTD



TYPICAL WIRING OF 1000-OHM 4 WIRE RTD



TYPICAL WIRING OF 1000-OHM 3 WIRE RTD



TOLERANCES UNLESS OTHERWISE SPECIFIED

ALL DIMENSIONS ARE IN INCHES

PATH=E:\CC\DT\3000\3000T4\W10.SLDDRW

JPC CONTROLS		102 COMPASS PT. DR. STE. D, ST. CHARLES, MO 63301 (636) 946-3300 FAX (636) 724-2492 www.jpccntrls.com				
PROCON 3000T4 RTD BOARD WIRING DIAGRAM						
APPROVAL		DWN BY	MPJ	DATE 04/05/03	SCALE NONE	CHKD BY
ENG	DATE	SHEET		12	3000104	20 00
GA	DATE	1 OF 1				

