MS40E Tech Sheet

Customer: **Master Spas**

Part Number: 56352-01   3kW 800 Incoloy Heater

Custom Box Overlay   ☐

Box Overlay Part Number   N/A

UL System Model: BP21-MS40E-RCA3.0K

Software Version ID: M100_225 V9

Software Version: 9.0

File Name: BP2100_9.0_MS40E_NP1.hex

Configuration Signature: D51A6001

Eng. Project Number: 4231

Base PCBA: 56353-01

Control Panels:

TP800   50205 and later

Software Version   1.2 and later

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System Revision History

Part #	EPN	Date	Originator	Changes Made
56352	3914	11-29-12	Customer	New system release
56352-01	4231	04-03-14	Customer	Disable pump1 in filter cycle setting, update reminder settings, and correct various settings on Tech Sheet

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Basic Functions Setups 1 - 5

Power Requirements:

Single Service [3 wires (line, neutral, ground)]
230VAC, 50Hz, 1þ, 32A, (Circuit Breaker rating = 40A max.)

3-Service [5 wires (line 1, line 2, line 3, neutral, ground)]
400VAC, 50Hz, 3Nþ, 16A, (Circuit Breaker rating = 20A max each phase line.)

IMPORTANT - Service must include a neutral wire, with a line to neutral voltage of 230VAC.
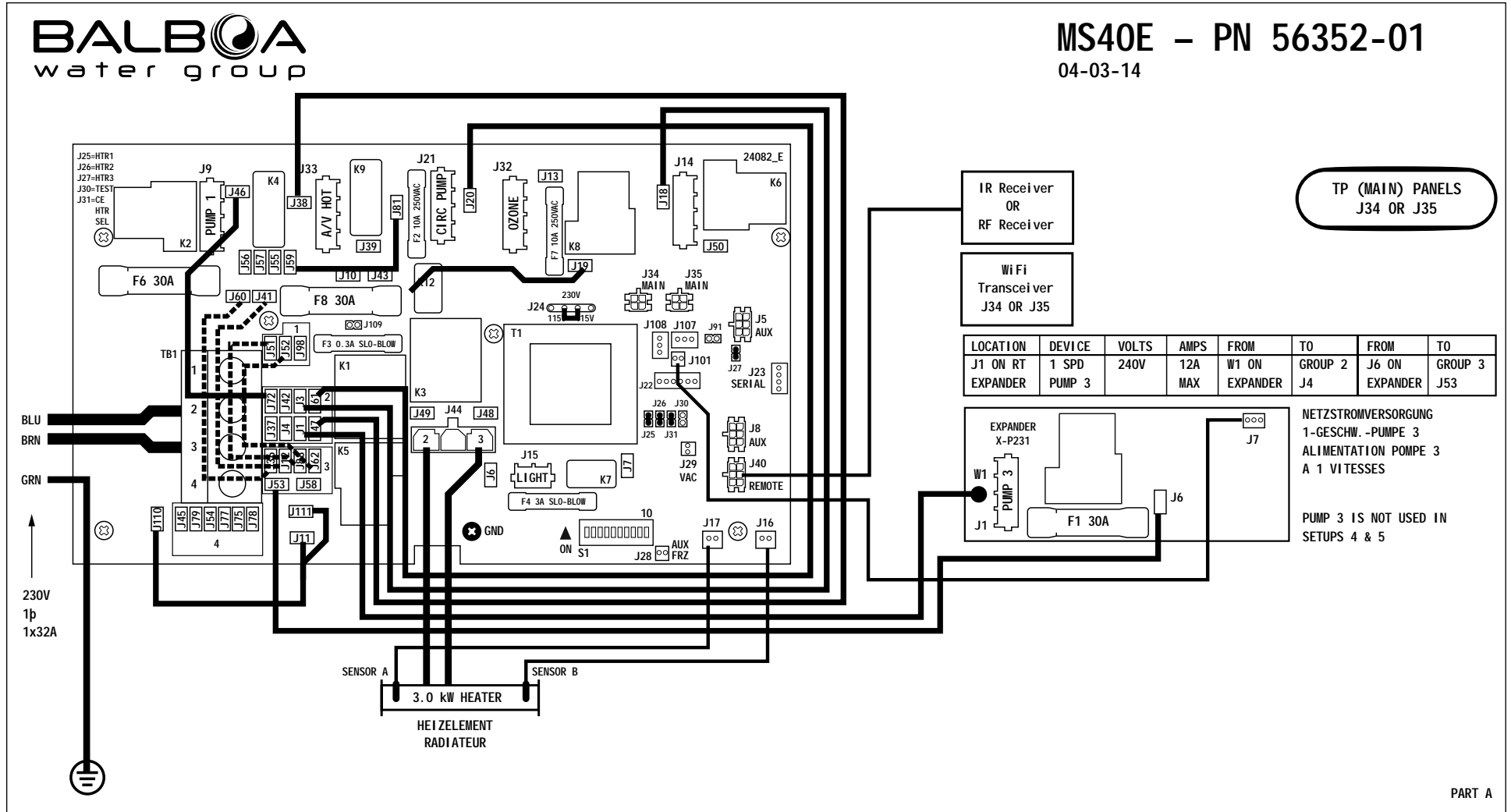
System Ouputs:

Pump 1	230VAC	2-Speed	9.3A* max	15-minute timer for High Speed, 120-Minute timer for Low Speed
	This is the heater pump in Setups 3 & 5 only			
	Must deliver 20 GPM through heater			
Pump 2	230VAC	2-Speed	9A* max	15-minute timer
	1-Speed in Setups 2, 3, 4 & 5			
Pump 3	230VAC	1-Speed	9A* max	15-minute timer - NOT used in Setups 4 & 5
Circ Pump	230VAC	1-Speed	2A max	Programmable Filtration Cycles + Polling - Setups 1, 2 & 4 only
	This is the heater pump in Setups 1, 2 & 4 only			
	Must deliver 20 GPM through heater			
Ozone	230VAC		.5A max	Slaved to Circ Pump in Setup 1, 2 & 4, independent in Setups 3 & 5
Spa Light	10VAC	On/Off	1A max	240-minute timer.
A/V (Stereo)	230VAC	Hot	5A max	Always on
Heater	3.0kW @ 240VAC max			

* 10.3A max pumps could be used with 3-service (3þ) power input, or 1þ x 40A, which is only available is some locations, with DIP switch 5 is OFF.

   10.3A max pumps are likely to require DIP switch 5 to be ON with 1þ x 32A services.

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Hardware Setup

Wiring Diagram

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MS40E – PN 56352-01
04-03-14

J25=HTR1
J26=HTR2
J27=HTR3
J30=TEST
J31=CE
HTR
SEL

J9
K4
J33
K9
J21
J32
J13
J14
24082_E
K6

J46
PUMP 1
J38
A/V HOT
K8
J81
F2 10A 250VAC
CIRC PUMP
J20
OZONE
F7 10A 250VAC
J18
K6
J50

K2
J56 J57 J55 J59
J39
J10 J43
J19

F6 30A
J60 J41
F8 30A
J2

J51 J52 J98
F3 0.3A SLO-BLOW
J109
J24
230V
115V 15V
J34 MAIN
J35 MAIN
J108 J107 J91
J5 AUX

TB1
K1
T1
J27
J23 SERIAL

K3
J72 J42
J22
J26 J30
J25 J31
J8 AUX

J37 J4
J49 J44 J48
2 3
J15 LIGHT
K7
J29 VAC
J40 REMOTE

J53 J58
K5
J6
F4 3A SLO-BLOW

J110
J45 J79 J54 J77 J75 J78
J111
J11
GND
10
ON S1
J28 AUX FRZ
J17 J16

BLU
BRN
GRN

230V
1ϕ
1x32A

SENSOR A
SENSOR B
3.0 kW HEATER
HEIZELEMENT
RADIATEUR

IR Receiver
OR
RF Receiver

WiFi
Transceiver
J34 OR J35

TP (MAIN) PANELS
J34 OR J35

LOCATION	DEVICE	VOLTS	AMPS	FROM	TO	FROM	TO
J1 ON RT EXPANDER	1 SPD PUMP 3	240V	12A MAX	W1 ON EXPANDER	GROUP 2 J4	J6 ON EXPANDER	GROUP 3 J53

EXPANDER
X-P231
W1
PUMP 3
J1
F1 30A
J6
J7

NETZSTROMVERSORGUNG
1-GESCHW.-PUMPE 3
ALIMENTATION POMPE 3
A 1 VITESSES

PUMP 3 IS NOT USED IN
SETUPS 4 & 5

PART A

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Hardware Setup

Settings

SINGLE SERVICE 230V 1þ / 1x32A, THREE-SERVICE 230V 1þ / 3x16A

LOCATION	DEVICE		
J9	NETZSTROMVERSORGUNG 2-GESCHW.-PUMPE 1 ALIMENTATION POMPE 1 A 2 VITESSES 2-SPEED PUMP 1		
J14	NETZSTROMVERSORGUNG 2-GESCHW.-PUMPE 2 ALIMENTATION POMPE 2 A 2 VITESSES 2-SPEED PUMP 2		
	PUMP 2 LINE 1 CONNECTION	J19 to J57	
J15	10V BELEUCHTUNG ECLAIRAGE BAIN HYDRO SPA LIGHT		
J21	KREISLAUF PUMPE POMPE DE CIRCULATION CIRC PUMP		
J32	OZONGENERATOR GENERATOROZONE OZONE GENERATOR		
	CIRC AND OZONE LINE 1 CONNECTION	J81 to J55	
J33	TV / AV		
J40	IR RECIEVER		
J5, J8	AUX PANEL(S) - AX10, AX20, AX30, AX40		

PUMP 2 IS 1-SPEED IN SETUPS 2, 3, 4 & 5

CIRC PUMP OPTION
PROGRAMMABLE FILTRATION CYCLES + POLLING
USED IN SETUPS 1, 2 & 4

230V 1þ
1x32A

* NO CIRC PUMP IN SETUPS 3 & 5

SETUP #	CIRC PUMP	PUMP 1	PUMP 2	PUMP 3	TEMP SCALE
1	24 HOUR WITH 3°F SHUTOFF	2-SPEED	2-SPEED	1-SPEED	°C
2	24 HOUR WITH 3°F SHUTOFF	2-SPEED	1-SPEED	1-SPEED	°C
3	N/A	2-SPEED	1-SPEED	1-SPEED	°C
4	24 HOUR WITH 3°F SHUTOFF	2-SPEED	1-SPEED	N/A	°C
5	N/A	2-SPEED	1-SPEED	N/A	°C

PUMP 1 LOW TIMEOUT IS 120 MINUTES.

SWITCHBANK S1 OFF / SWITCHBANK S1 ON

SWITCHBANK S1 OFF		SWITCHBANK S1 ON
TEST MODE OFF	◄ A1	TEST MODE ON
DON'T ADD 1 HS PUMP W/HTR	A2 ►	ADD 1 HS PUMP WITH HEAT
DON'T ADD 2 HS PUMPS W/HTR	◄ A3	ADD 2 HS PUMPS WITH HEAT
DON'T ADD 4 HS PUMPS W/HTR	◄ A4	ADD 4 HS PUMPS WITH HEAT
SPECIAL AMPERAGE RULE A*	◄ A5*	SPECIAL AMPERAGE RULE B*
STORE SETTINGS**	◄ A6	MEMORY RESET**
NOT ASSIGNED	◄ A7	NOT ASSIGNED
NOT ASSIGNED	◄ A8	NOT ASSIGNED
NOT ASSIGNED	◄ A9	NOT ASSIGNED
NOT ASSIGNED	◄ A10	NOT ASSIGNED

**SWITCH # 6 SHOULD BE SET TO OFF UPON FINAL INSTALLATION.

230V 3þ
3x16A

SWITCHBANK S1 OFF		SWITCHBANK S1 ON
TEST MODE OFF	◄ A1	TEST MODE ON
DON'T ADD 1 HS PUMP W/HTR	◄ A2	ADD 1 HS PUMP WITH HEAT
DON'T ADD 2 HS PUMPS W/HTR	◄ A3	ADD 2 HS PUMPS WITH HEAT
DON'T ADD 4 HS PUMPS W/HTR	◄ A4	ADD 4 HS PUMPS WITH HEAT
SPECIAL AMPERAGE RULE A*	◄ A5*	SPECIAL AMPERAGE RULE B*
STORE SETTINGS**	◄ A6	MEMORY RESET**
NOT ASSIGNED	◄ A7	NOT ASSIGNED
NOT ASSIGNED	◄ A8	NOT ASSIGNED
NOT ASSIGNED	◄ A9	NOT ASSIGNED
NOT ASSIGNED	◄ A10	NOT ASSIGNED

**SWITCH # 6 SHOULD BE SET TO OFF UPON FINAL INSTALLATION.

230V 3þ / 3x16A
1 BRN
BLU
2 BRN
3 BRN
GRN

TB1

J60 J41
J51 J52 J98
J46
J72 J42 J3 J61 J20
J37 J4 J11 J38 J18
J36 J12 J88 J62
J53 J58
J78 J45 J79 J54 J77 J75

W1-XP332
J6   XP332

XP332 OPERATES IN SETUPS 1, 2, & 3 ONLY

* 10.3A MAX PUMPS COULD BE USED WITH
3Þ X 16A POWER INPUT OR 1Þ X 40A POWER INPUT WITH DIP SWITCH 5 OFF.
10.3A MAX PUMPS ARE LIKELY TO REQUIRE DIP SWITCH 5 TO BE ON WITH 1Þ X 32A SERVICES.

INSTEAD OF SETUP #1,
THIS SYSTEM IS CONFIGURED IN SETUP #:

SYSTEM WILL BE IN SETUP #1 UNLESS MARKED OTHERWISE

FOR SUPPLY CONNECTIONS,
USE CONDUCTORS SIZED ON THE BASIS OF 60°C AMPACITY BUT RATED MINIMUM OF 90°C.

USE COPPER CONDUCTORS ONLY.
EMPLOYER UNIQUEMENT DES CONDUCTEURS DE CUIVRE.

TORQUE RANGE FOR MAIN TERMINAL BLOCK (TB1):
27-30 IN. LBS.
(31.1-34.5 kg cm)

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PART B

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Balboa water group

Setup Reference Table

Setup #	Circ Pump	Pump 1	Pump 2	Pump 3	Temp Scale
1	24 Hour with 3°F Shutoff	2-Speed	2-Speed	1-Speed	°C
2	24 Hour with 3°F Shutoff	2-Speed	1-Speed	1-Speed	°C
3	N/A	2-Speed	1-Speed	1-Speed	°C
4	24 Hour with 3°F Shutoff	2-Speed	1-Speed	N/A	°C
5	N/A	2-Speed	1-Speed	N/A	°C

System is shipped in Setup 1

Pump 1 Low timeout is 120 minutes.

Pump 1 High timeout is 15 minutes.

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Changing Software Setups

Test Menu Access (S1, Switch 1 ON) *Service Technician ONLY.*

DANGER! HIGH VOLTAGE WILL BE ACCESSIBLE! SERVICE TECHNICIAN ONLY!

While the system is running, move DIP Switch 1 (on S1 on the Main circuit board) to ON.
The system will enter Test Mode.
Moving DIP Switch 1 to OFF will exit Test Mode.

ON ▶

1

10

S1
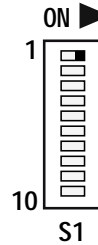
Software Setups

Under the TEST Menu, the Setup screen will allow changing the
Setup from 1 to any number established by the Manufacturer.
Changing the Setup may require wiring changes as well.

102°F   High Range

Set: **104°F**   **Spa**
8:32 PM   **Shortcuts**
Ozone   **Settings**
Filter 1   **Test**   ▶

Ready in Rest Mode
Heating

↺
Back

Test

Setup   **1** ▶
A/B Temps   Off
Fault Log   ▶
Timeouts   Normal
Temp Limit   Yes

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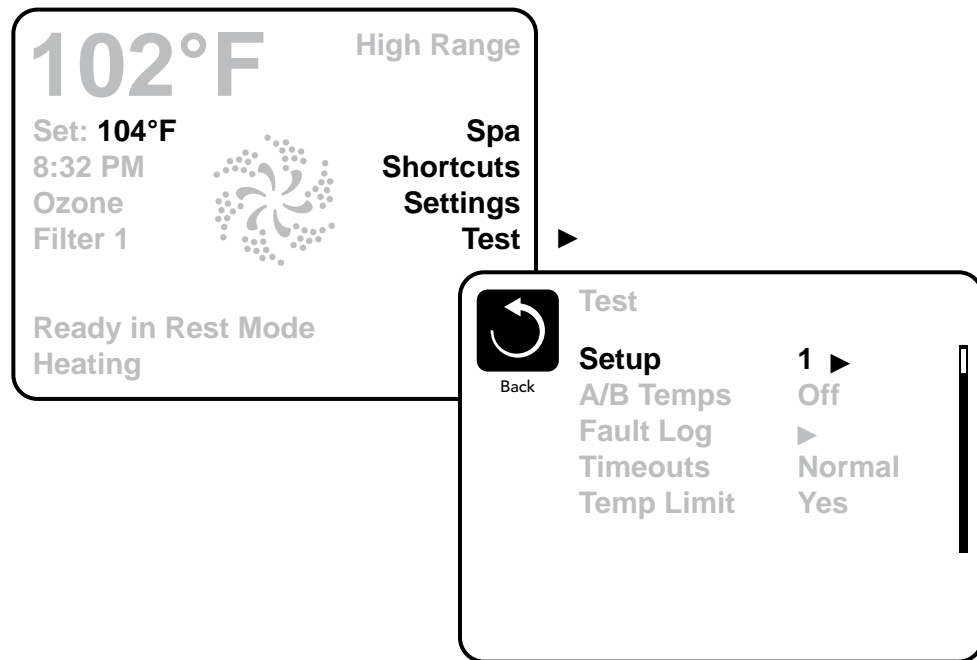
Equipment Expansion

Expansion Features

Control Connection	Default	Fuse
Relay 1 (J101)	Pump 3	30A
Relay 7/8 (J107)	Undefined	None
Relay 9/10 (J108)	Undefined	None

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DIP Switch Functions

Fixed-fuction DIP Switches

ON ▶

1

10
S1

A1   Test Mode (normally Off).

A2   In "ON" position, add one high-speed pump (or blower) with Heater.

A3   In "ON" position, add two high-speed pumps (or 1 HS Pump and Blower) with Heater.

A4   In "ON" position, add four high-speed pumps (or 3 HS Pumps and Blower) with Heater.

A5   In "ON" position, enables Special Amperage Rule B. See Special Features section under Configuration Options for functionality with your system.
                     In "OFF" position, enables Special Amperage Rule A.

A6   Persistent memory reset (Used when the spa is powering up to restore factory settings as determined by software configuration).
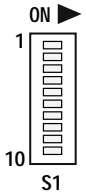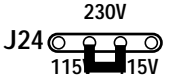

A2, A3, and A4 work in combination to determine the number of high-speed devices and blowers that can run before the heat is disabled. i.e. A2 and A3 in the ON position and A4 in the OFF position will allow the heater to operate with up to 3 high-speed pumps (or two HS Pumps and Blower) running at the same time. Heat is disabled when the fourth high-speed pump or blower is turned on.

Note: *A2/A3/A4 all off = No heat with any high-speed pump or blower.*

Undesignated switches are not assigned a function.

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Jumper Definitions

J109	GFCI Test/Trip Enable	J109
	Note: *This feature must be enabled in software as well.*	
J91	Real Time Clock Enable/Disable	J91
	Note: *This Jumper should NOT be shorted when the Control Panel can display time of day.*	
J30	Do Not Use	
J31	Jumper on 1 pin with 2.0kW or smaller heater	J31
	Jumper on 2 pins with a 3.0kW or higher heater	
J29	Do Not Use	J29
J25, J26, J27	Heater Type Settings.	J27
	Note: *Factory Configured do not change.*	J25 J26
J24	Jumper on center two pins (230V) when heater is running at 240V.	230V
	Two Jumpers installed; one on left 2 pins and one on right 2 pins (115V) when heater is running at 120V (N/A in CE).	J24 115V 115V

Warning!

Setting DIP switches or jumpers incorrectly may cause abnormal system behavior and/or damage to system components.

Refer to Switchbank illustration on Wiring Configuration page for correct settings for this system.

Contact Balboa if you require additional configuration pages added to this tech sheet.

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BP2100 Configuration Options

General Features

Feature	Default
Pump 1 in Filter Cycle (Circ Only)	No
Pump 1 Low Timer*	*120 Minutes*
General Pump Timer	15 Minutes
Blower Timer	15 Minutes
Mister Timer	15 Minutes
Light Timer	*60 Minutes*
Circ (when enabled)	*24 hr w/3°F shutoff*
Cleanup Cycle	*60 Minutes*
Cleaup as Preference setting	*Yes*
Ozone	With Heater Pump**
Ozone Suppression	*60 Minutes*
Pump Purge	60 Seconds
Blower Purge	30 Seconds
Mister Purge	5 Seconds

* The Pump 1 Low Timer applies to Circ Setups (3 & 5) only. In Circ Setups, Pump 1 Low uses the General Pump Timer.

* The heater Pump can be either a Circ Pump or Pump 1 Low.

Blue Indicates New Custom Configuration Default (Setup 1)

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BP2100 Configuration Options

Temperature Features

Feature	Default
Temperature Display	°C

All temperatures must be specified in °F. The system converts °F to °C dynamically. If Celsius is required for default settings, choose a desired °C value that (after rounding) corresponds to a Fahrenheit value.

°C	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
°F	39	41	43	45	46	48	50	52	54	55	57	59	61	63	64	66	68	70	72

°C	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
°F	73	75	77	79	81	82	84	86	88	90	91	93	95	97	99	100	102	104

Hi-Range Min. Set Temp	80°F
Hi-Range Max. Set Temp	104°F
Hi-Range Default Temp*	100°F
Lo-Range Min. Set Temp	50°F
Lo-Range Max. Set Temp	99°F
Lo-Range Default Temp*	70°F
Freeze Threshold	44°F
Temp Lock Type	Temp + Settings

May be changed by end-user (if enabled)

Blue Indicates New Custom Configuration Default (Setup 1)

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BP2100 Configuration Options

Time Features

Feature	Default
Time Format*	24 Hour
Filter 1 Start Hour*	20:00 (8:00 PM)
Filter 1 Duration*	*4 Hours*
Filter Cycle 2 Default*	OFF
Filter 2 Start Hour*	08:00 (8:00 AM)
Filter 2 Duration*	15 Minutes
Light Cycle	Disabled
Light Cycle Default*	OFF
Light Cycle Start Hour*	21:00 (9:00 PM)
Light Cycle Duration*	15 Minutes

May be changed by end-user (if enabled)

Blue Indicates New Custom Configuration Default (Setup 1)

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BP2100 Configuration Options

Reminder Features

Feature	Default
Reminders Shown*	*Yes*
Check pH	*OFF*
Check Sanitizer	*OFF*
Clean Filter	30 Days
Test GFCI	*OFF*
Drain Water	*180 Days*
Change Cartridge	OFF
Clean Cover	*OFF*
Treat Wood	*OFF*
Change Filter	*180 Days*

May be changed by end-user (if enabled)

Blue Indicates New Custom Configuration Default (Setup 1)

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BP2100 Configuration Options

Special Features

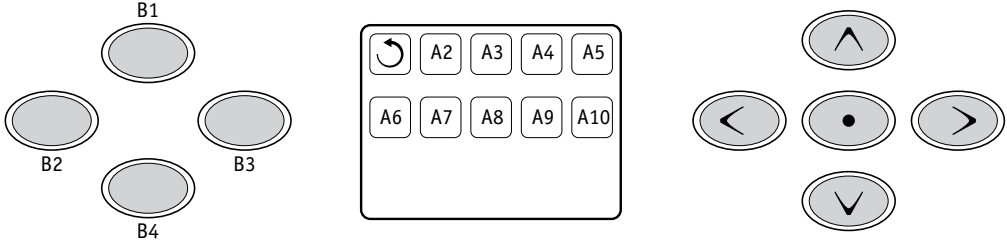| Feature	Default
Special Amperage Rule A	No Limitation
Special Amperage Rule B	Max 2 HS Pumps
Drain Mode	Disabled
Demo Mode	Disabled
Automatic GFCI Test	Disabled
Ozone Slaved to Heater Pump	*Yes in Circ Setups* No in Non-Circ Setups
Dual Voltage Heater	N/A
Safety Suction	Disabled

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TP800 Panel Configuration

Button Layout Table

Feature #	3 Pumps & Circ	3 Pumps & NO Circ	2 Pumps & Circ	2 Pumps & NO Circ
	Setup 1 & 2	Setup 3	Setup 4	Setup 5
A1	N/A	N/A	N/A	N/A
A2	Jets 1	Jets 1	Jets 1	Jets 1
A3	Jets 2	Jets 2	Jets 2	Jets 2
A4	Jets 3	Jets 3	Light 1	Light 1
A5	Light 1	Light 1	Invert	Invert
A6	Invert	Invert	(Circ Icon)	Undefined
A7	(Circ Icon)	Undefined	Undefined	Undefined
A8	Undefined	Undefined	Undefined	Undefined
A9	Undefined	Undefined	Undefined	Undefined
A10	Undefined	Undefined	Undefined	Undefined
A11	N/A	N/A	N/A	N/A
A12	N/A	N/A	N/A	N/A
A13	Undefined	Undefined	Undefined	Undefined
A14	Undefined	Undefined	Undefined	Undefined
A15	Undefined	Undefined	Undefined	Undefined
A16	Undefined	Undefined	Undefined	Undefined
B1	Jets 1	Jets 1	Jets 1	Jets 1
B2	Jets 2	Jets 2	Jets 2	Jets 2
B3	Jets 3	Jets 3	Undefined	Undefined
B4	Light 1	Light 1	Light 1	Light 1

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TP800 Panel Configuration

Spa Screen

B1

B2   B3

B4

| ↺ | A2 | A3 | A4 | A5 |
| A6 | A7 | A8 | A9 | A10 |

∧

‹   •   ›

∨

Shortcuts Screen

B1

B2   B3

B4

A13

A14 ↺ A15

A16

A13

∧

‹   •   ›

A14   A15

∨

A16
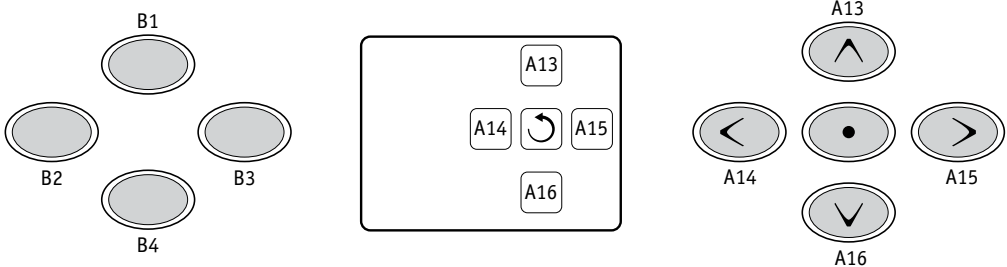
Note: *Buttons 11 and 12 are not used in this configuration.*

Button 1 is fixed.

A Circ Icon will appear when a Circ Pump is configured.

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w a t e r   g r o u p

BP2100 Configuration Options

Auxilliary Panel Features on Bank 1*

Feature	Default
Aux Button A1	Jets 1
Aux Button A2	Jets 2
Aux Button A3	Jets 3
Aux Button A4	Light

Auxilliary Panel Features on Bank 2*

Feature	Default
Aux Button A5	Jets 1
Aux Button A6	Jets 2
Aux Button A7	Jets 3
Aux Button A8	Light

*Bank 1 consists of J5 on the Main Circuit Board.
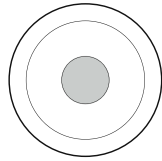
Bank 2 consists of J8 on the Main Circuit Board.

Aux Connection Splitter PN25257 may be required.

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BP2100 Configuration Options

Auxilliary Panel Features

AX10 Panels on Bank 1*

A1, AX10A1   No O/L   52803

A2, AX10A2   No O/L   52804

A3, AX10A3   No O/L   55805

A4, AX10A4   No O/L   52806

AX10 Panels on Bank 2*

A5, AX10A1   No O/L   52803

A6, AX10A2   No O/L   52804

A7, AX10A3   No O/L   52805

A8, AX10A4   No O/L   52806

**Call Customer Service for
additional information about Auxiliary Panels.**

Auxiliary Panel Part Number _____

Overlay Part Number _____

*Bank 1 consists of J5 on the Main Circuit Board.

 Bank 2 consists of J8 on the Main Circuit Board.

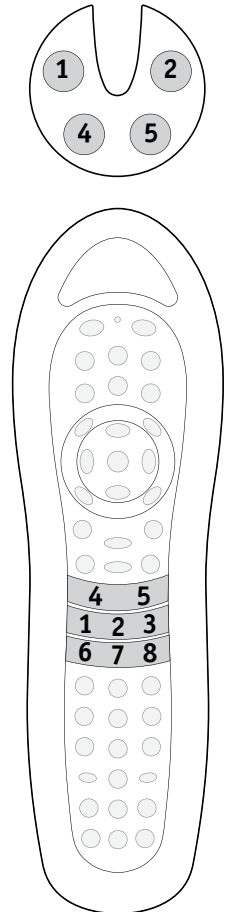 **Aux Connection Splitter PN25257 may be required.**

AX40 Auxiliary Panel plugged into Bank 1 will operate A1 + A2, A3 and A4.

AX40 Auxiliary Panel plugged into Bank 2 will operate A5 + A6, A7 and A8.

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BP2100 Configuration Options

Remote Panel Features

Feature	Default
Remote Button A1	Jets 1
Remote Button A2	Jets 2
Remote Button A3	Jets 3
Remote Button A4	Undefined
Remote Button A5	Light
Remote Button A6	Undefined
Remote Button A7	Undefined
Remote Button A8	Undefined

Remote Panel Part Number _____

Overlay Part Number _____

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