

BioCal/BioCal SP

Cooling Tower Biocide Dispenser

Installation and Operating Manual



PREFACE

This manual describes how to install, set up, operate and maintain the BioCal/BioCal SP Water Treatment Systems. Material in this manual is subject to change without notice. Manual revisions will be made on an as needed basis. Special circumstances involving important design, operation or application information will be released via Technical Service Bulletins.

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INTRODUCTION

The BioCal/BioCal \SP unit (hereafter called “BioCal”) is a cooling tower biocide dispensing unit. It uses a revolutionary one dial, one LCD setup to allow easy programming of all biocide functions. Available with or without dual integral, 24

gpd/100 psi pumps, the BioCal can control up to three biocide feeds with cycle time selectable from one day to four weeks. A total of 32 separate programmable events can be scheduled. An example of a programmable event is to have Pump #2 run for 45 minutes starting at 10:30 PM on days 1,3,5 and 7 of weeks 2 and 4 during a 4 week cycle. The unit can be programmed to lock out any bleed functions during biocide feed times.

PROGRAMMING

Programming the BioCal unit is accomplished by means of the user interface, which consists of the LCD display and the single control knob. The knob is a two-function device. Rotating the knob scrolls the cursor through the different screens and values, and pushing the knob selects the desired screen or value. Control information is displayed on the LCD as a series of screens, as shown in **Table 1**.

SCREEN NAME	SCREEN VIEW	DESCRIPTION
Default	BIOCAL 4 WEEK CYCLE DAY 4 WEEK 3 10:26:54 AM	Shows the current time, the selected cycle period, and the current day and week of the cycle period. Turning the knob has no effect on this screen because the cursor is inactive. Pressing the knob will cause the MAIN SELECTION screen to be displayed.
Main Selection	EXIT REVIEW EVENTS PRIME PUMPS EDITING MENUS	Has four options, each appearing on a separate line.
Review Events	EXIT EVENT=01 PUMP=2 START=10:15 AM RUN=120 MIN DAY 1 2 3 4 5 6 7 WK 1 2 3 4	Allows the user to review how all of the different events are programmed.
Prime Pumps	EXIT PRIME PUMP #1 PRIME PUMP #2 PRIME PUMP #3	Allows the user to prime one of the integral or attached pumps by energizing the selected output while the knob is depressed.
Edit Menus	EXIT EDIT EVENTS EDIT SYSTEM SETUP EDIT PUMP HOURS	This selection either takes the user directly to a selection screen for editing events, system setup or pump hours, or takes the user to ACCESS CODE screen and requests a previously set access code before allowing the user access to the editing menus.
Edit Events	EXIT EVENT=1 PUMP=2 START=10:15 AM RUN=120 MIN DAY 1 2 3 4 5 6 7 WK 1 2 3 4	Displays the same screen as the REVIEW EVENTS selection. The difference is that the user can edit the information in each of the fields from this screen.
Edit System Setup	EXIT TIME = 12:56:42 AM CYCLE = 2 WEEK DAY = 5 WEEK = 1	Allows the user to set current time, the cycle period, the current day of the cycle period, and the current week of the cycle period.
Edit Pump Hours	EXIT PUMP #1 = 0041 HR PUMP #2 = 0000 HR PUMP #3 = 0023 HR	Shows the cumulative run time hours for the three pumps controlled by the BioCal. The hours fields for all three pumps are changeable.
Access Code	EXIT ACCESS CODE → 0000	Displayed when entering the EDIT EVENT screen only if an access code has been programmed in order to limit user access to editing menus.

Table 1. User Interface Screen

SPECIFICATIONS

Size

	Height	Width	Depth
BioCal	8.0 20.3	12.0 30.5	8.0 (inches) 20.3 (cm)
BioCal SP	6.0 20.3	8.0 20.3	6.0 (inches) 15.2 (cm)

Weight

BioCal	10.6 lbs 4.8 kg
BioCal SP	8.1 lbs 3.7 kg

Cabinet

Polycarbonate with hinged door
NEMA 4X
Meets UL-94-5V requirements

Display

	Height	Width
	1.0	3.0 (inches)
	2.5	7.6 (cm)

4-Line LCD, alpha-numeric, backlit, high contrast

Controls

Dual-function rotary and push button encoder: Twist-to-select, push-to-set knob

Pumps

BioCal 2 integrated 24 gpd/100 psi piston pumps, pigtails provided for control of external third pump and feed lock-out control.

BioCal SP 3 external pump pigtails, 1 feed lock-out pigtail

Input

120 VAC, 50-60Hz, 9 Amps maximum

Outputs

BioCal Two 120 VAC outlets, 3 Amp fast blow fuse

BioCal SP Four 120 VAC outlets, 2 Amp fast blow fuse

Ambient Operating Temperature

+36° to 120° F (+2° to 49° C)

INSTALLATION & SETUP PROCEDURES

MOUNTING

Mount the BioCal at eye level in a convenient location. The unit may be bolted to the wall or any flat surface using the four flange holes on the back of the unit. Refer to the mounting diagram in **Figure 1**.

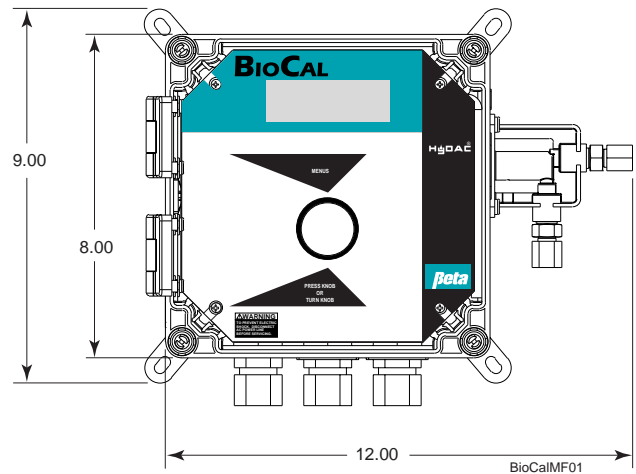


Figure 1. Mounting Diagram



Installation and service must only be done by qualified personnel and must comply with all applicable electrical codes. Dangerous voltages are wired into this unit and are present in the enclosure.

ELECTRICAL REQUIREMENTS

1. Connect power cord to 120V AC/60 Hz receptacle.
2. Connect third pump (if used) to external pigtail on bottom of unit.
3. Connect power for a bleed control device to Lock-Out pigtail.
4. If using BioCal SP, connect additional external pumps to pigtails provided on bottom of the unit.

CHEMICAL FEED POINTS

1. Locate a convenient access point for the injection of chemicals.
2. If the main circulating pump is turned OFF frequently, the controller should be programmed to add biocide only when the circulating pump is ON.
3. Always remember to program bleed Lock-Out times to coincide with any biocide program to reduce biocide waste.

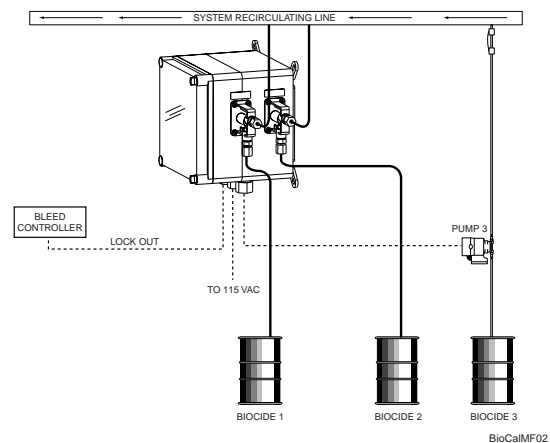


Figure 2. BioCal System Complete with Chemical Feed Points and Bleed Lock-out.

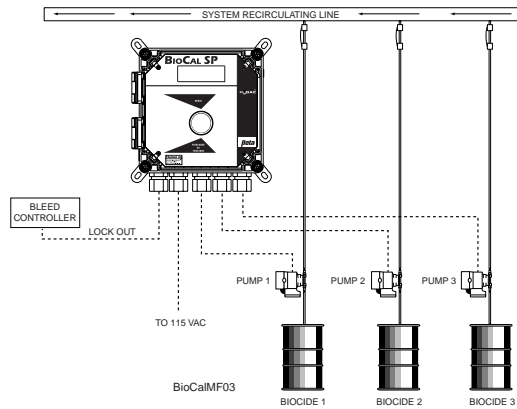


Figure 3. BioCal SP System Complete with Chemical Feed Points and Bleed Lock-out.

PRE-STARTUP PROCEDURE

Before operating the system, verify the following:

1. All chemical pump fittings and connections are tight.
2. All wiring is correct.
3. LCD light turns on when you turn power switch to ON.

OPERATING INSTRUCTIONS

PROGRAMMING THE BIOCAL UNIT

This section describes how to use BioCal's LCD screens and programming knob to program, review and adjust the functions of the BioCal unit. For a hierarchical overview of the different screens, see the flowchart (Figure 4).

Follow these simple steps to program the BioCal:

Step 1.

Turn knob to desired parameter.



Step 2.

Push knob to select.



Step 3.

Turn knob to desired value.



Step 4.

Push knob to lock in value.



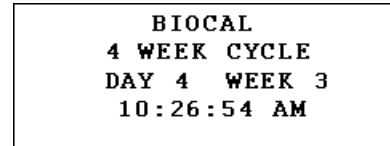
Step 5.

Repeat as necessary.

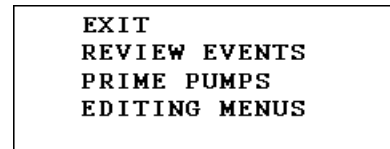
SYSTEM SETUP

From the DEFAULT SCREEN:

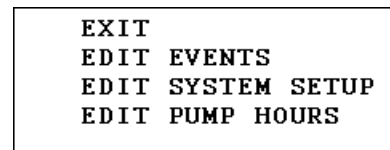
1. Press the knob once to get to the MAIN SELECTION screen.



Rotate the knob until EDITING MENUS is blinking.



2. Press the knob to select it. Enter access code if one has been programmed.
3. Turn the knob until the EDIT SYSTEM SETUP option is blinking.



4. Press the knob to select it.

The EDIT SYSTEM SETUP screen lets the user set the current time, desired cycle (1 day to 4 weeks) and the day and week of that cycle.

SETTING TIME AND CYCLE

1. From the EDIT SYSTEM SETUP screen, turn knob until the TIME field is flashing, and press knob.
2. Rotating the knob will allow you to adjust to desired setting. When the desired value appears, press knob to lock the value.
3. Turn knob to next field to be edited, and press knob to select it. Change to desired setting, and press knob to lock in value.
4. Repeat until correct time is set.
5. Turn knob to select CYCLE field, and repeat the above steps until desired cycle time is set.



If system is programmed for a cycle less than seven days, the display will not show weeks (WK=) as it is not applicable.

The cycle period selected on this screen will also affect the EDIT EVENTS screen display. The number of days and weeks available on the EDIT EVENTS screen will correspond to the cycle period selected on this screen.

SETTING DAY AND WEEK OF CYCLE TIME

1. If you are already several days into the cycle for which you are programming the unit, you may adjust the DAY and WEEK fields to reflect this.
2. Rotate knob until desired field is blinking and press knob to select that field for editing. Scroll to desired value and press knob to lock in that value.

When SYSTEM SETUP is complete, turn knob until the EXIT field is blinking and press the knob to exit back to the EDIT MENUS screen.

```
EXIT
TIME = 12:56:42 AM
CYCLE = 2 WEEK
DAY = 5 WEEK = 1
```

BioCalM06

SETTING UP FEEDING EVENTS

From the EDITING MENUS screen, rotate knob until the EDIT EVENTS field is blinking and press the knob to select that option. You may program up to 32 separate events. Each programmed event will activate one of the pumps or outlets for up to 999 minutes on user selected days and weeks of a programmed cycle. An example of an event is to have pump #2 run for 45 minutes, starting at 10:30pm on days 1,3,5 and 7 of weeks 2 and 4 during a 4 week cycle. This event will be used as an example of how to program the BioCal in the next section.

```
EXIT
EDIT EVENTS
EDIT SYSTEM SETUP
EDIT PUMP HOURS
```

BioCalM05



The duration of the CYCLE period is set in the EDIT SYSTEM SETUP screen.

EDITING EVENTS

Rotating the knob will move blinking cursor to editable fields. Pushing the knob will select that field for editing. Now, rotating the knob will allow you to change the value in the field. Another knob press will lock in that value. When the blinking cursor is on one of the DAY or WK field values, pressing the knob will toggle the value on or off.

```
EXIT EVENT=01 PUMP=2
      START=10:15 AM
      FEED= 120 MIN
DAY 1234567 WK 1234
```

BioCalM03

1. In the EDIT EVENTS menu, turn knob until EVENT field is blinking and press knob.
2. You can now cycle through programmed events by turning the knob. For each event, all fields can be modified by selecting that field and adjusting to desired value.
3. When the blinking cursor is on one of the DAY or WK field values, pressing the knob will toggle the value on or off.

When finished with event, you may either rotate dial until the EVENT field is blinking and press knob to select another event to edit, or until EXIT is blinking, and pressing the knob will allow you to exit EDIT EVENTS screen.

PROGRAMMING LOCKOUT FEATURE

If you want to lock out any bleed during, and for a period after biocide feed times, you must program an event and designate the PUMP as #L. Using the example and a desired lockout of bleed of 5 hours, perform the following steps:

- Go to the EDIT EVENTS screen and select an event, for instance EVENT=03.
- Program PUMP=L, START=10:30 PM, RUN=300 MIN and DAY=1•3•5•7 WK=•2•4.
- Turn knob until EXIT is flashing and press knob to exit programming.

Now your bleed controller will be locked out for 5 hours at the same time as each biocide feed period.

PRIMING PUMPS

From the DEFAULT SCREEN, press knob to get MAIN SELECTION screen.

```
EXIT
REVIEW EVENTS
PRIME PUMPS
EDITING MENUS
```

BioCalM02

Select PRIME PUMPS by turning knob until selection is blinking.

```
EXIT
PRIME PUMP #1
PRIME PUMP #2
PRIME PUMP #3
```

BioCalM04

On the PRIME PUMP SCREEN, rotating the knob moves the blinking cursor, and pressing the knob activates the selection.

The selected pump will prime as long as the knob is held down.

REVIEWING EVENTS

From the DEFAULT SCREEN press knob to enter MAIN SELECTION SCREEN.

```
EXIT
REVIEW EVENTS
PRIME PUMPS
EDITING MENUS
```

BioCalM02

Rotate knob to REVIEW EVENTS and press.

```
EXIT EVENT=01 PUMP=2
      START=10:15 AM
      FEED= 120 MIN
DAY 1234567 WK 1234
```

BioCalM03

Turn knob until EVENT field is blinking, then press.

You may now scroll through all programmed events by turning the knob. You can view but not edit any events from this screen. To change an event, go to the EDIT EVENTS screen of the EDITING MENUS.

EDITING ACCUMULATED PUMP RUN TIMES

The BioCal unit will record the time that each pump has run. Two integral pumps run at 24gpd or 1gph. This allows the user to more accurately track chemical usage. Pressing the knob selects that value, and rotating the knob will change that value. Pressing the knob again locks any changes.

RESTRICTING ACCESS

When exiting the EDITING MENUS screen, the ACCESS CODE screen will be displayed. If you would like to restrict access to the unit, you may enter a number here that will be required every time an operator attempts to enter the EDIT EVENTS screen. If you leave this value as "0000", the unit will not prompt you for the information and there will be unlimited access.

CLEARING ACCESS CODE

If you forget your access code, you will need to deactivate the access code, resetting it to 0000.

1. Disconnect power to unit.
2. Remove four screws to disconnect the face of the unit, and turn over to expose back side of PCB.
3. Locate the small, white button labeled "SW2."
4. Press button and hold for about five seconds.

Access code will be cleared from system. You will need to reset current time and desired cycles, but programmed events will remain intact.

TO DE-ACTIVATE AN EVENT

Go to the EDIT EVENTS screen, select the event to be deactivated and enter PUMP=0. This will clear the entire event from memory.

BioCal Menu Hierarchy

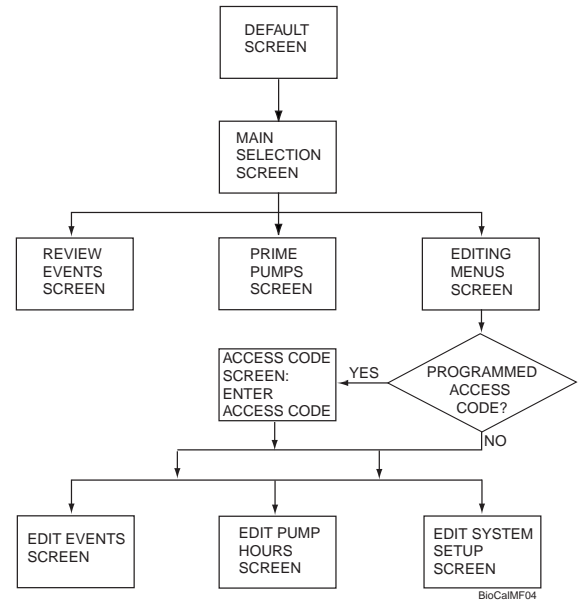


Figure 4. Flowchart Showing Hierarchy of BioCal Screen Menus.

MAINTENANCE & TROUBLESHOOTING

TROUBLESHOOTING

Pump Problems		
Symptoms	Possible Cause	Remedy
Pump does not prime/run	Suction line blocked	Open suction line/check foot valve
	Discharge line blocked	Open discharge line/check injection fitting
	Suction duckbill open	Clean or replace duckbill
	No chemical	Add chemical
	Product too viscous	Check viscosity
	Pump too far from chemical	Suction lift not to exceed 10 ft with water thin viscosity fluid. Check fuse, DC voltage to motor. Should have at least 24 VDC.
Chemical leaking from drain hole in pump housing	Pump O-ring failure on piston	Replace pump O-rings
PCB/Display Problems		
No Display	No power to unit/transformer bad	Check power source, fuses, and check for 24 VAC to input of PCB
Time of day inaccurate	Battery on PCB	Send unit to Beta Technology for battery replacement
Unable to program settings	Rotary switch bad	Replace PCB assembly or send to Beta Technology for repair
Programming/Event Problems		
Pump event did not occur	Setup programming	Recheck cycle period, event times and days, pump numbers and run times

SPARE PARTS-BIOCAL

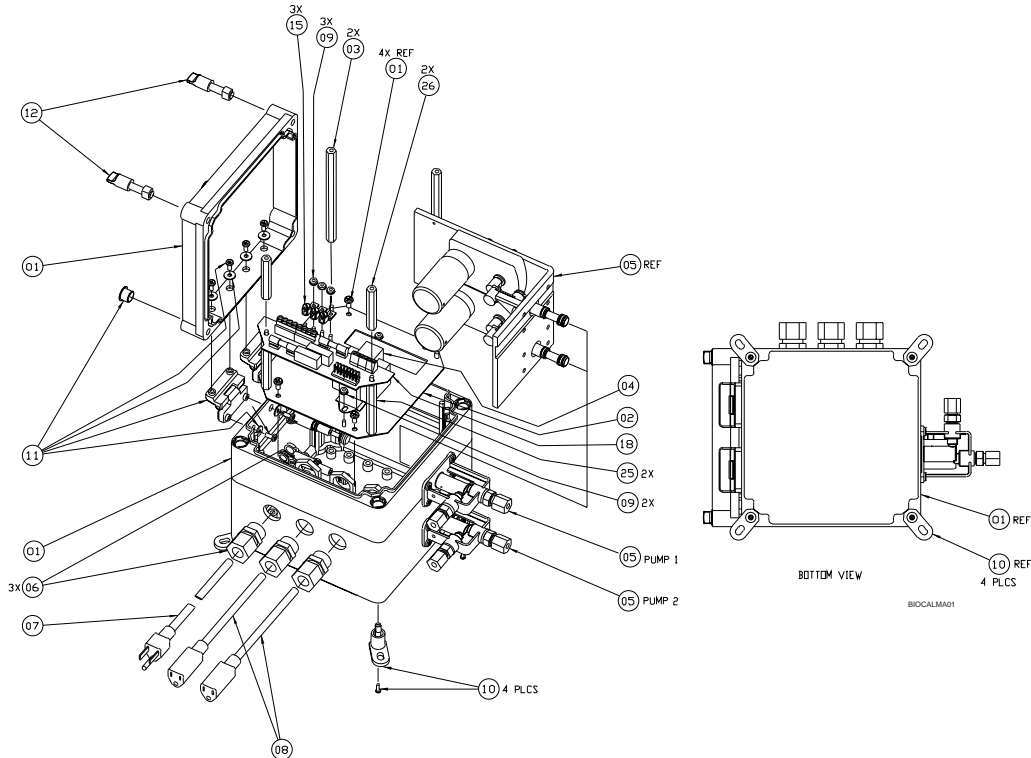
Item#	Description
094888	Piston, piston seals, tube fittings
027090	Duckbill valve
098925	Inserts for suction and discharge
097189	Pump block, clear
097958	Screw kit for enclosure
016667	1 Amp slow blow fuse
092238	3 Amp fast blow fuse (packet of 5)
098990	PCB, Power
050562	Transformer
098529	PCB, Main

SPARE PARTS-BIOCAL SP

Item#	Description
097958	Screw kit for enclosure
016667	1 Amp slow blow fuse
092238	2 Amp fast blow fuse (packet of 5)
098988	PCB, Power
098529	PCB, Main
094786	Transformer

APPENDIX

BIOCAL

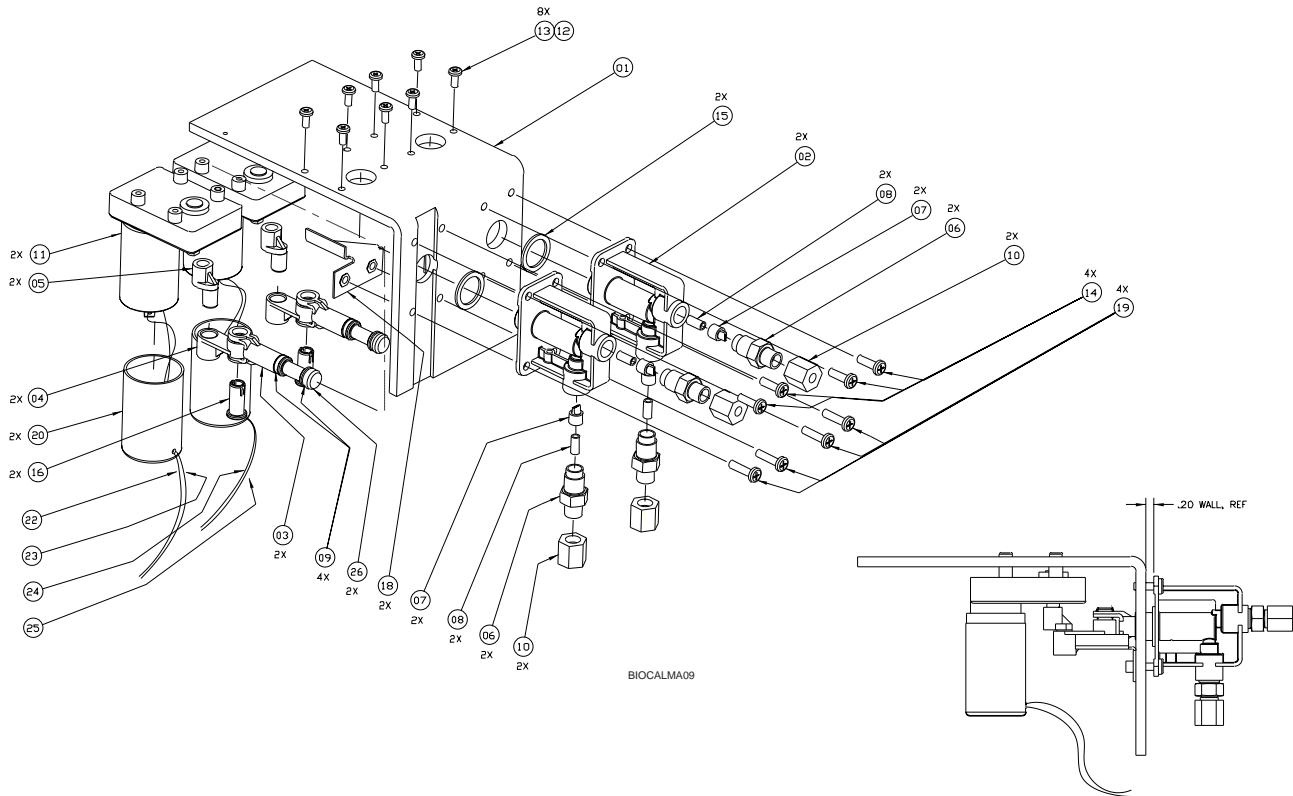


Seq#	Item#	Description
01	097945	ENCL, MOD, 8X8X7.5,BIOCAL
02	097947	PNL, BASE, AL, BIOCAL
03	097946	STDF, FF, 3/8HEX, 8-32X55/8, ALM
04	050562	XFMR, PWR, 120/208/240, 40VA
05	097943	PMP PS/A, DUAL PMP, PSTN, 24V
06	090369	STRN RLF, SLNG, .230-.546, NYL
07	014045	CORD ASSY 3CND, 16GA, 84L, SJOW
08	090203	PWR CD, BLK, 16GA, 12", NEMA 5 15R

Seq#	Item#	Description
09	041088	NUT, KEP, 6-32
10	097960	MTG FOOT KIT, PCARB, GRY
11	097959	HINGE KIT, PCARB, GRY
12	097958	SCR KIT, WG HD, DR, PCARB, GRY
15	041711	TERM BLK, 1X1, PNL, GND LUG, #8
18	098990	PCB ASSY, BIOCAL POWER
25	099059	STDF MF, 3/8HEXX8-32X3 1/8, ALM
26	099058	STDF, FF, 3/8HEXX8-32X2 7/16, ALM

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BIOCAL-PUMP ASSEMBLY

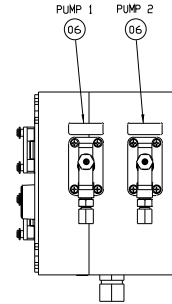
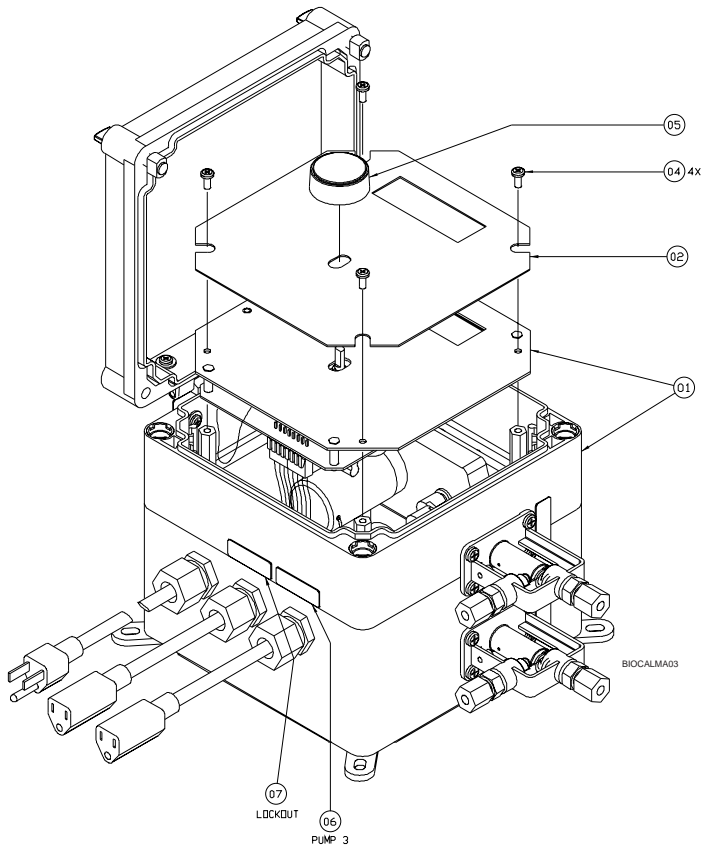


FRONT VIEW, ASSEMBLED

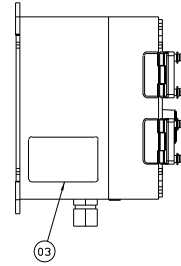
Seq#	Item#	Description	Seq#	Item#	Description
01	097948	BRKT, PMP, DUAL, AL	12	042028	ADH, THREADLOCKER, LOCTITE 242
02	097189	HSG, PMP, PSTN, ISOPLST, CLR	13	026131	SCR, PH PNH 8-32X3/8 SST
03	099977	PSTN, PSTN PMP, CARILON	14	094542	SCR, PH PNH, 10-32X5/8, SST
04	098926	CRANK, PSTN PMP, CARILON	15	094967	WSHR, FL, 1.00DX .75IDX.06,NPRN
05	098927	LINK, PSTN PMP, CARILON	16	094785	PIN, WRIST, PSTN PMP, DEL
06	094888	TFTG, VLV BODY, 1/4, 1/2-20MTHD	18	095061	BRKT, SPRT, PSTN, SST, LIQCL
07	027090	VLV, DCKB, 3 /16IDX1/8SLT, AFLAS	19	041003	SCR, PH PNH, 10-32X3/4
08	098925	INSR, DUCKBILL VLV, CARILON	20	095689	CAP, MOT, 1.44IDX1.50LX.06THK
09	094685	O-RING, .299X.103, AFL, D80	22	041343	WIRE, RED, 18GA, TR-64, PRBND
10	092213	TFTG, NUT, VP, 1/4T, SG, PPYLN	23	027231	WIRE, BLK, 18GA, TR-64, PRBND
11	099975	GR MOT, 24VDC, 45RPM, 9" LEADS, VAR	24	041343	WIRE, RED, 18GA, TR-64, PRBND
			25	027231	WIRE, BLK, 18GA, TR-64, PRBND

APPENDIX

BIOCAL



PUMP SIDE OF
ENCLOSURE
CLEAR COVER
NOT SHOWN
SCALE 0.500

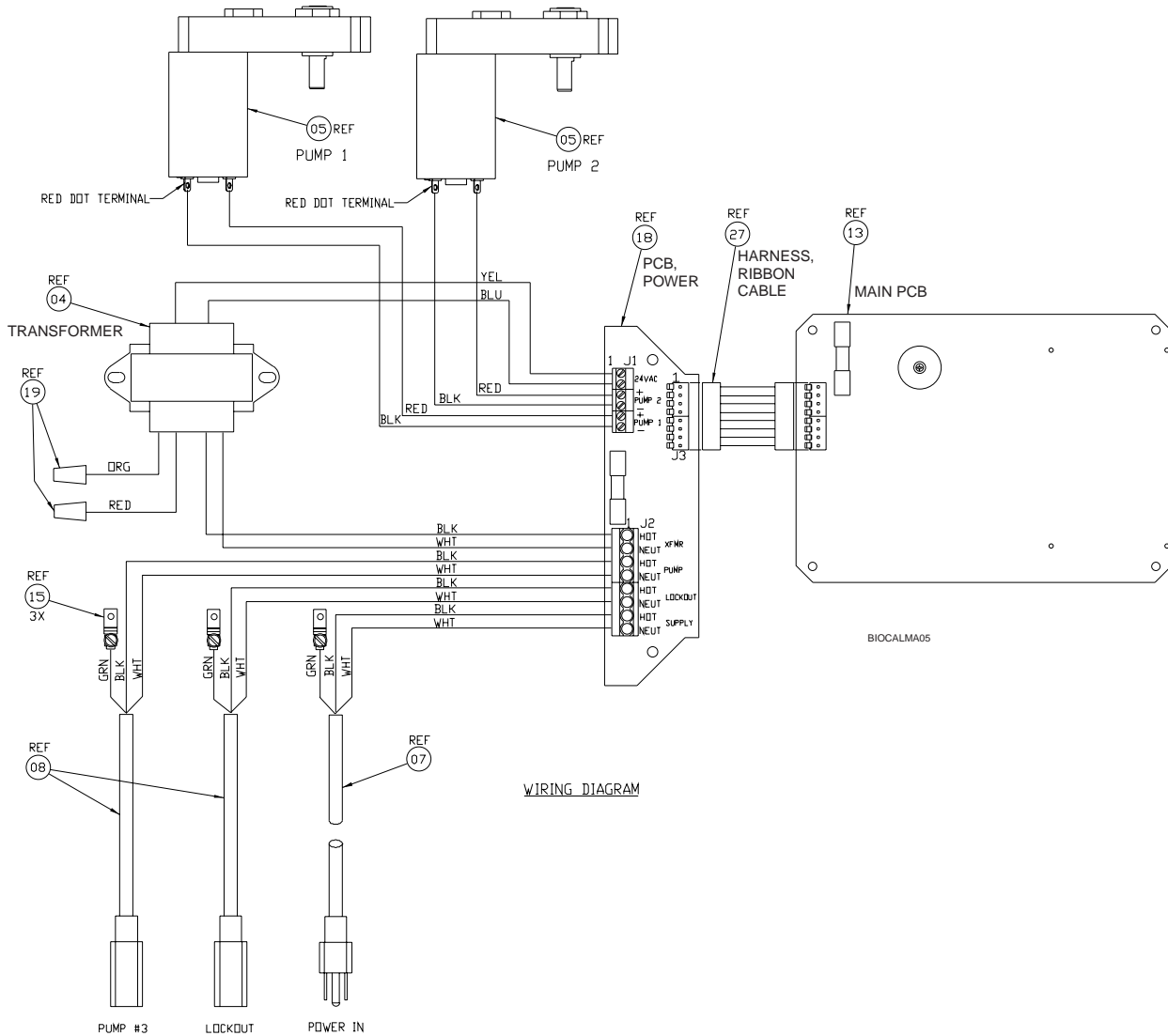


HINGE SIDE OF
ENCLOSURE
CLEAR COVER
NOT SHOWN
SCALE 0.500

Seq#	Item#	Description
01	097941	MBA BASE, BIOCAL, 120/240VAC
02	098054	LBL, SS, BIOCAL, BETA
03	097955	LBL, RATING, MDL, BIOCAL, 120VAC
04	026182	SCR, 8-32X3/8, PH PNH TY-F, SS
05	098001	KNOB, 1.5" DIA, 6MM BUSHING
06	011198	DECAL, PUMP
07	011202	DECAL, LOCK-OUT .59

APPENDIX

BIOCAL-WIRING

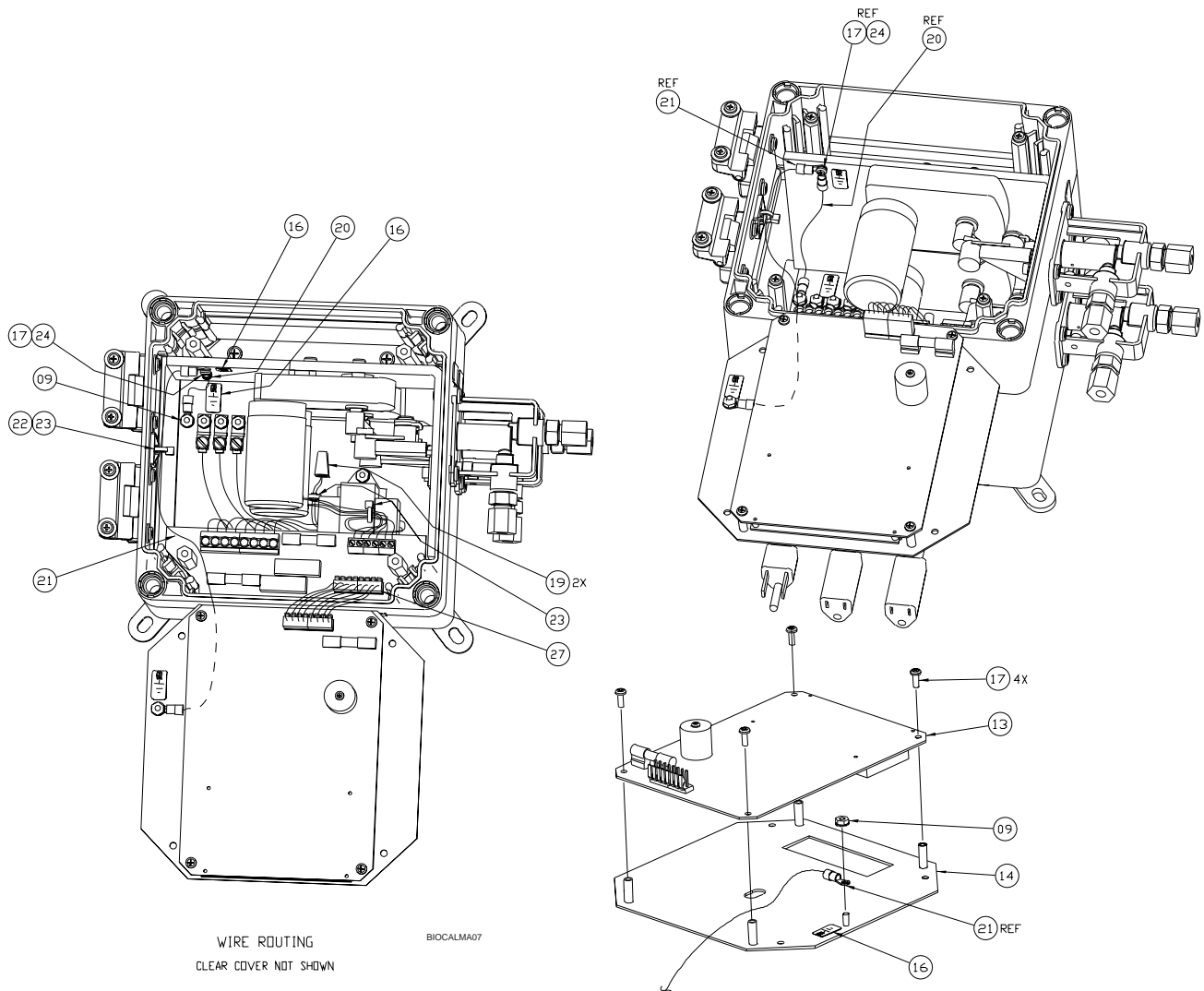


WIRING DIAGRAM

Seq#	Item#	Description
04	050562	XFMR, PWR, 120/208/240, 40VA
05	097943	PMP PS/A, DUAL PMP, PSTN, 24V
07	014045	CORD ASSY 3CND, 16GA, 84L, SJOW
08	090203	PWR CD, BLK, 16GA, 12", NEMA 5-15R
13	098529	PCB ASSY, BIOCAL
15	041711	TERM BLK, 1X1, PNL, GND LUG, #8
18	098990	PCB ASSY, BIOCAL POWER
19	092282	WRNUT, 16-22GA, THRMPLSTC, GRY
27	099069	HARN, POWER PCB, BIOCAL

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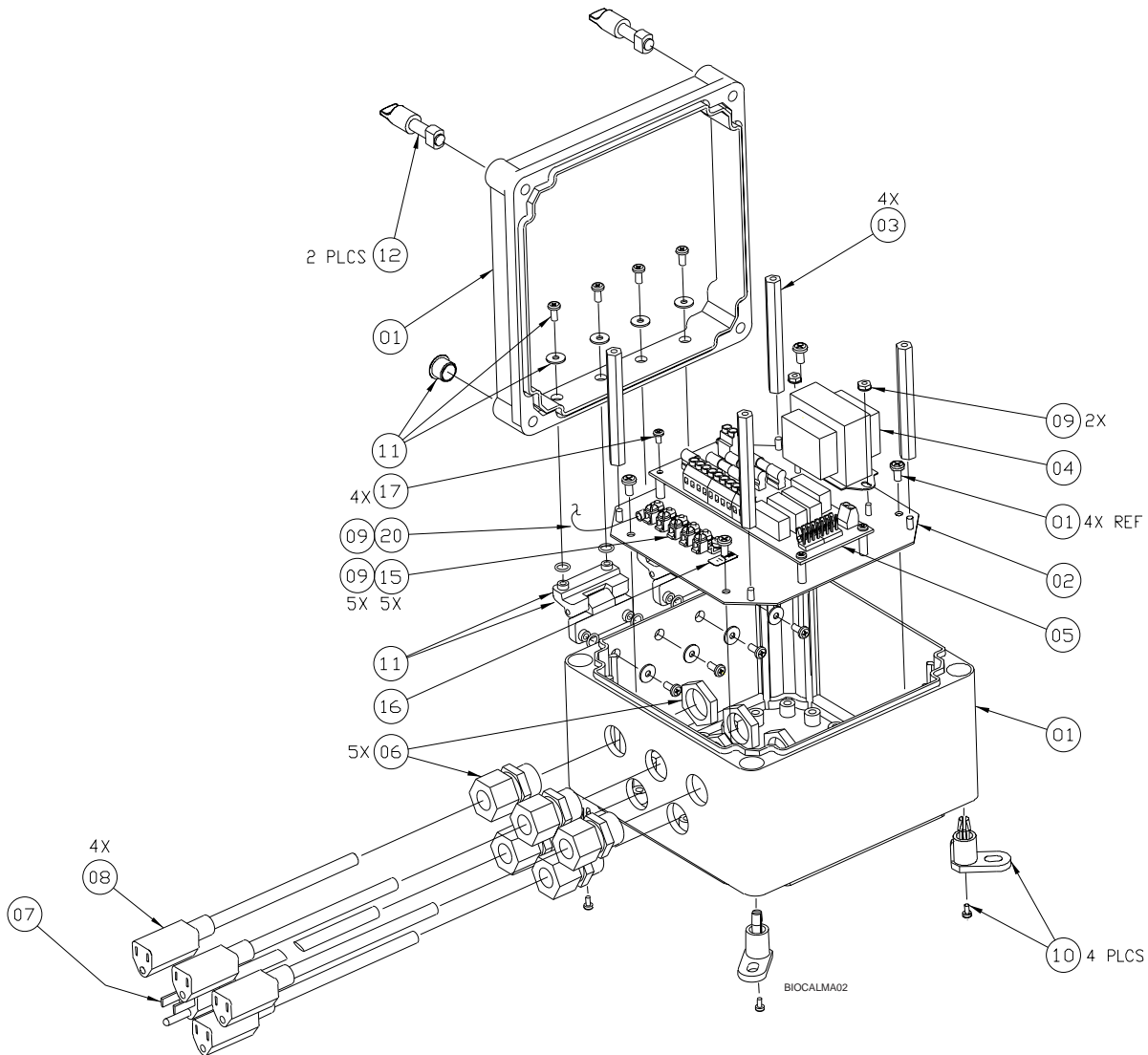
BIOCAL



Seq#	Item#	Description
09	041088	NUT, KEP, 6-32
13	098529	PCB ASSY, BIOCAL
14	097949	PNL, DSPL, AL, BIOCAL
16	039409	LBL, GROUND SCREW
17	040993	SCR, PH PNH, 6-32X3/8, SST
19	092282	WRNUT, 16-22GA, THRMPLSTC, GRY
20	094964	WIRE S/A, GRN/YEL, 6", 16GA, R/R
21	097954	WIRE, S/A, GRN/YEL, 11", 16GA, R/R
22	041323	TIWRP, AHR, ADH, RB, 3/4", NYL, NAT
23	017467	TIWRP, .10X4L, NYL, NAT
24	041111	WSHR, LK, SPT, #6
27	099069	HARN, POWER PCB, BIOCAL

APPENDIX

BIOCAL SP

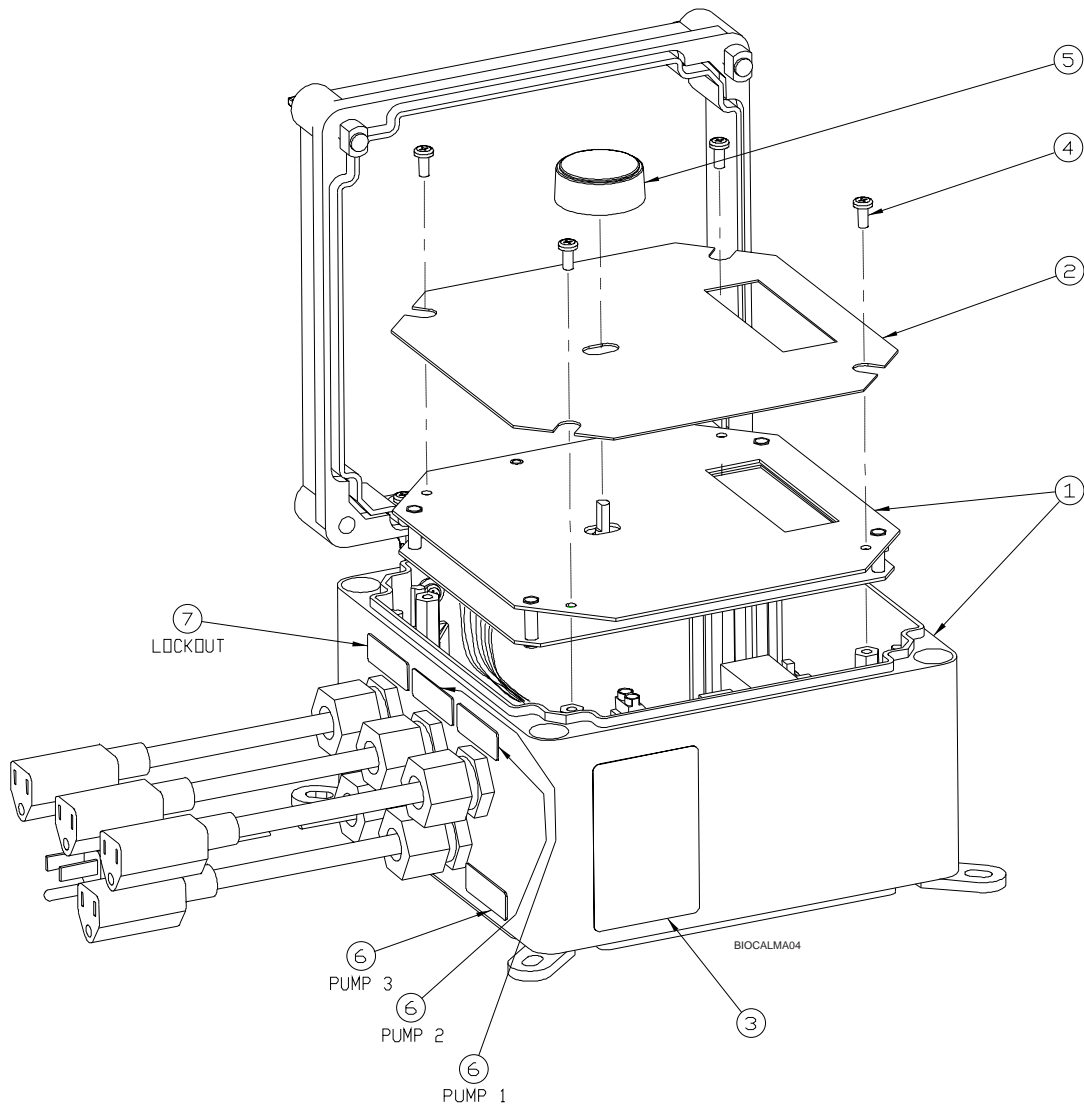


Seq#	Item#	Description
01	098840	ENCL, MOD, 8X8X4, BIOCAL SP
02	098846	PNL, BASE, ALUM, BIOCAL SP
03	098842	STDF, F-F, 3/8HEX, 8-32X3 3/8, AL
04	094786	XFMR, PWR, 120/208/240V, 24V
05	098988	PCB ASSY, BIOCAL SP POWER
06	090369	STRN RLF, SLNG, .230-.546, NYL
07	014045	CORD ASSY, 3CND 16GA, 84L, SJOW
08	090203	PWR CD, BLK, 16GA, 12", NEMA 5-15R
09	041088	NUT, KEP, 6-32

Seq#	Item#	Description
10	097960	MTG FOOT KIT, PCARB, GRY
11	097959	HINGE KIT, PCARB, GRY
12	097958	SCR KIT, WG HD, DR, PCARB, GRY
15	041711	TERM BLK, 1X1, PNL, GND LUG, #8
16	039409	LBL, GROUND SCREW
17	040993	SCR, PH PNH, 6-32X3/8, SST
20	097954	WIRE, S/A, GRN/YEL, 11", 16GA, R/R

APPENDIX

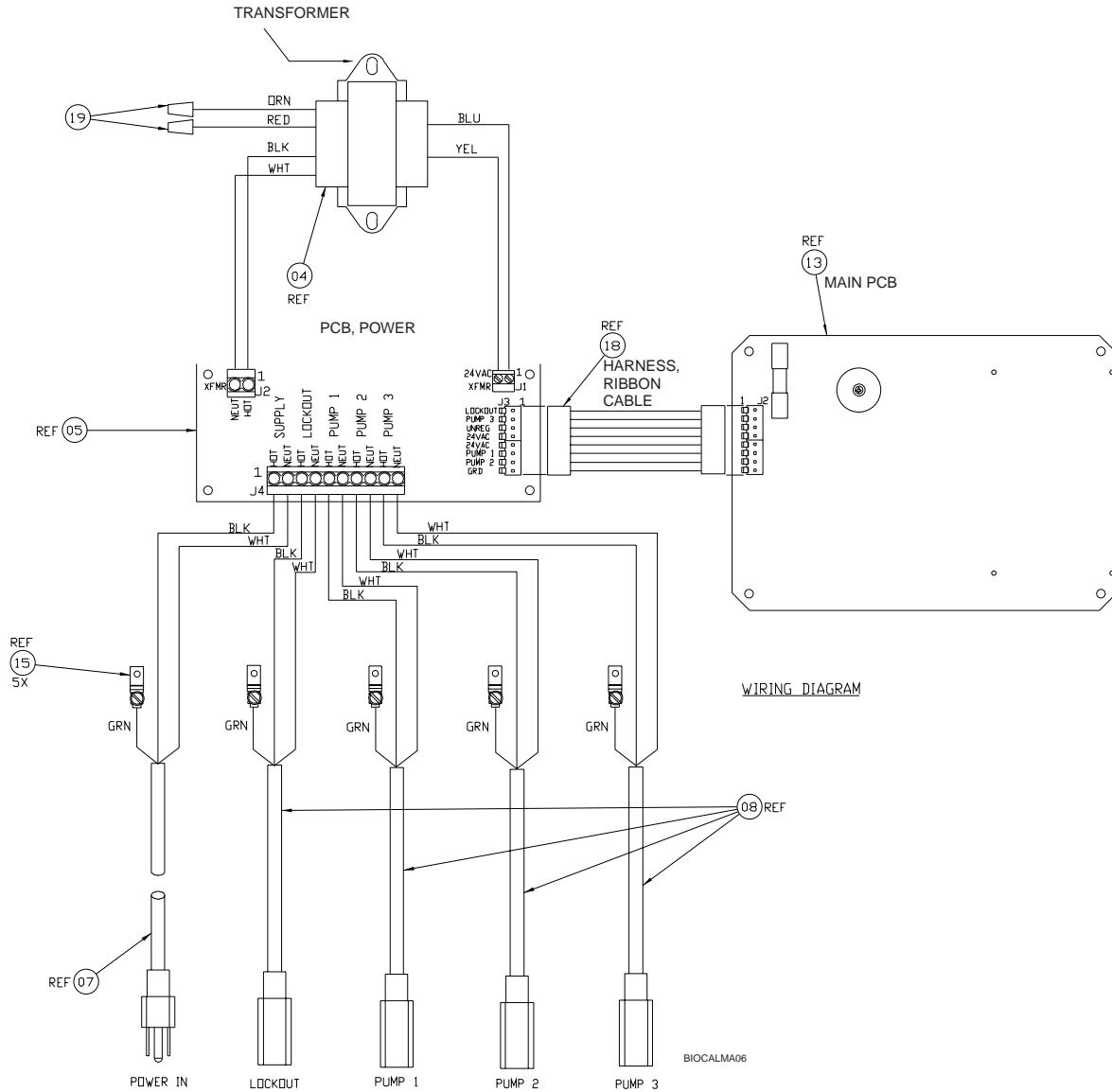
BIOCAL SP



Seq#	Item#	Description
1	098839	MBA BASE, BIOCAL SP, 120VAC
2	098914	LBL, SS, BIOCAL SP, BETA
3	099091	LBL, RATING, MDL, BIOCAL SP
4	026131	SCR, PH PNH 8-32X3/8 SST
5	098001	KNOB, 1.5" DIA, 6MM BUSHING
6	011198	DECAL, PUMP
7	011202	DECAL, LOCK-OUT .59

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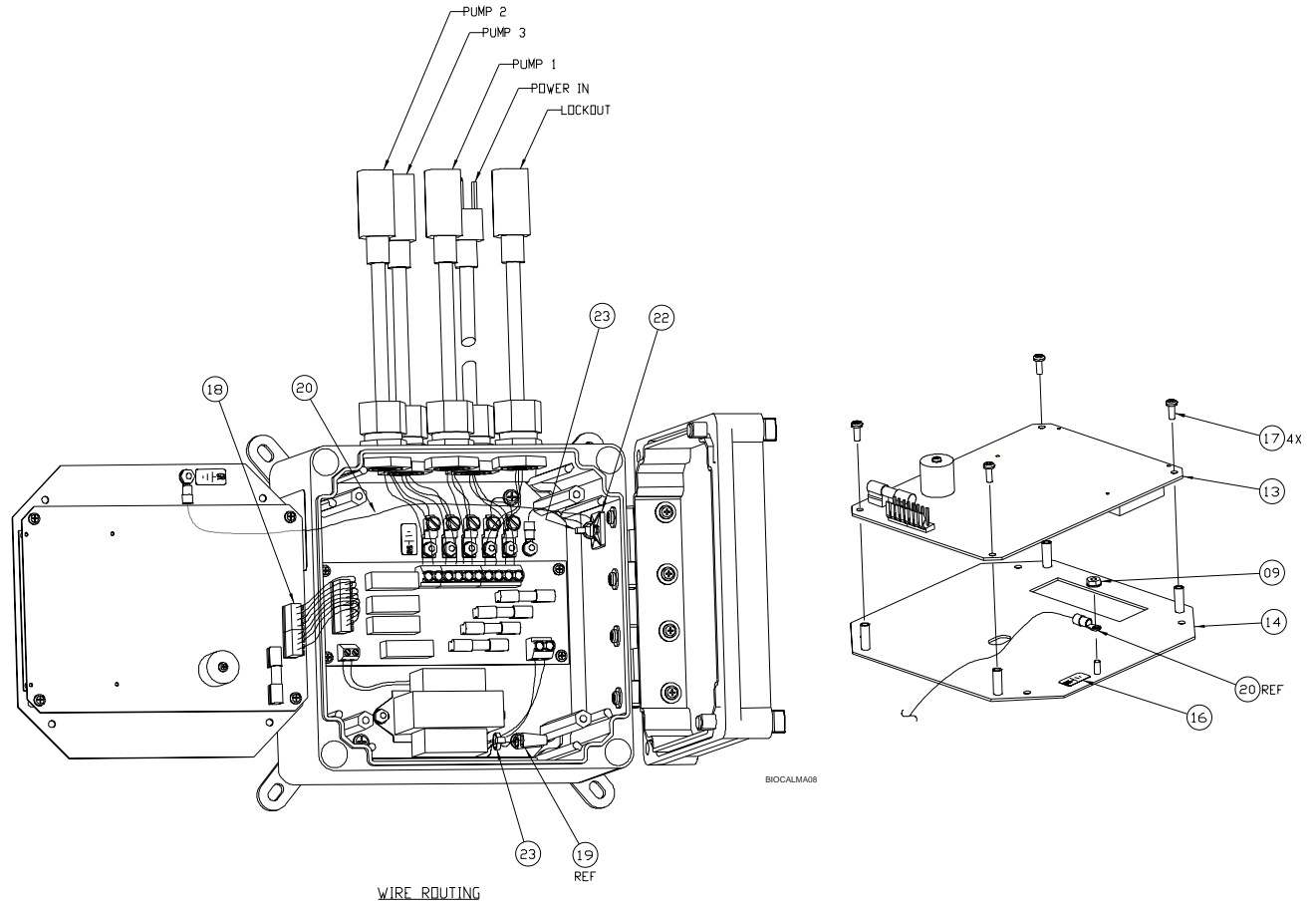
BIOCAL SP-WIRING



Seq#	Item#	Description
04	094786	XFMR, PWR, 120/208/240, 24V
05	098988	PCB ASSY, BIOCAL SP POWER
07	014045	CORD ASSY 3 CND, 16GA, 84L, SJOW
08	090203	PWR CD, BLK, 16GA, 12", NEMA 5-15R
13	098529	PCB ASSY, BIOCAL
15	041711	TERM BLK, 1X1, PNL, GND LUG, #8
18	099069	HARN, POWER PCB, BIOCAL
19	092282	WRNUT, 16-22GA, THRMPLSTC, GRY

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BIOCAL SP



Seq#	Item#	Description
09	041088	NUT, KEP, 6-32
13	098529	PCB ASSY, BIOCAL
14	097949	PNL, DSPL, AL, BIOCAL
16	039409	LBL, GROUND SCREW
17	040993	SCR, PH PNH, 6-32X3/8, SST
18	099069	HARN, POWER PCB, BIOCAL
19	092282	WRNUT, 16-22GA, THRMPLSTC, GRY
20	097954	WIRE S/A, GRN/YEL, 11", 16GA, R/R
22	041323	TIWRP, AHR, ADH, RB, 3/4", NYL, NAT
23	017467	TIWRP, .10X4L, NYL, NAT



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