SACKSAFOAM BLADDER

OPERATIONS MANUAL

2019A

SACKSAFOAM BLADDER MANUAL

Version 2019A
Part Number 002260

PLEASE READ BEFORE USING.

This manual is applicable to the following models:

8018 (# 004338)
2044 (# 004339)
5550 (# 004340)

Physical copies of this manual (# 002260) are available from SEI.
The manual is available on the SEI website.
Register for manual update notifications at bambiupdate@sei-ind.com

This manual is based on information that was available at the time it was printed and may not be applicable to products received before the issue date and customized items.

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Revision Summary

Version	Release Date	Revision Description	Pages	App.
2019A	19-Jan-2019	• General Revision	-	AW

Table of Contents

Section 1: Introduction

This manual provides helicopter operators with important information on the operation and maintenance of the Sacksafoam Bladder foam dispensing system for use with the Bambi and Bambi MAX Bucket.

Please read this manual prior to flying the bucket, particularly the sections on installation, filling, and dispensing. For your own protection and for longer system life, always heed the instructions and warnings. Ignoring these warnings could result in personal injury, bucket damage, Sacksafoam damage, or aircraft damage.

Overview

Sacksafoam is a foam injection system that uses a pump to dispense a controlled amount of foam concentrate from a reservoir into the water in the bucket. The operation of the Sacksafoam is controlled by the pilot through a control unit, which is mounted in the cockpit.

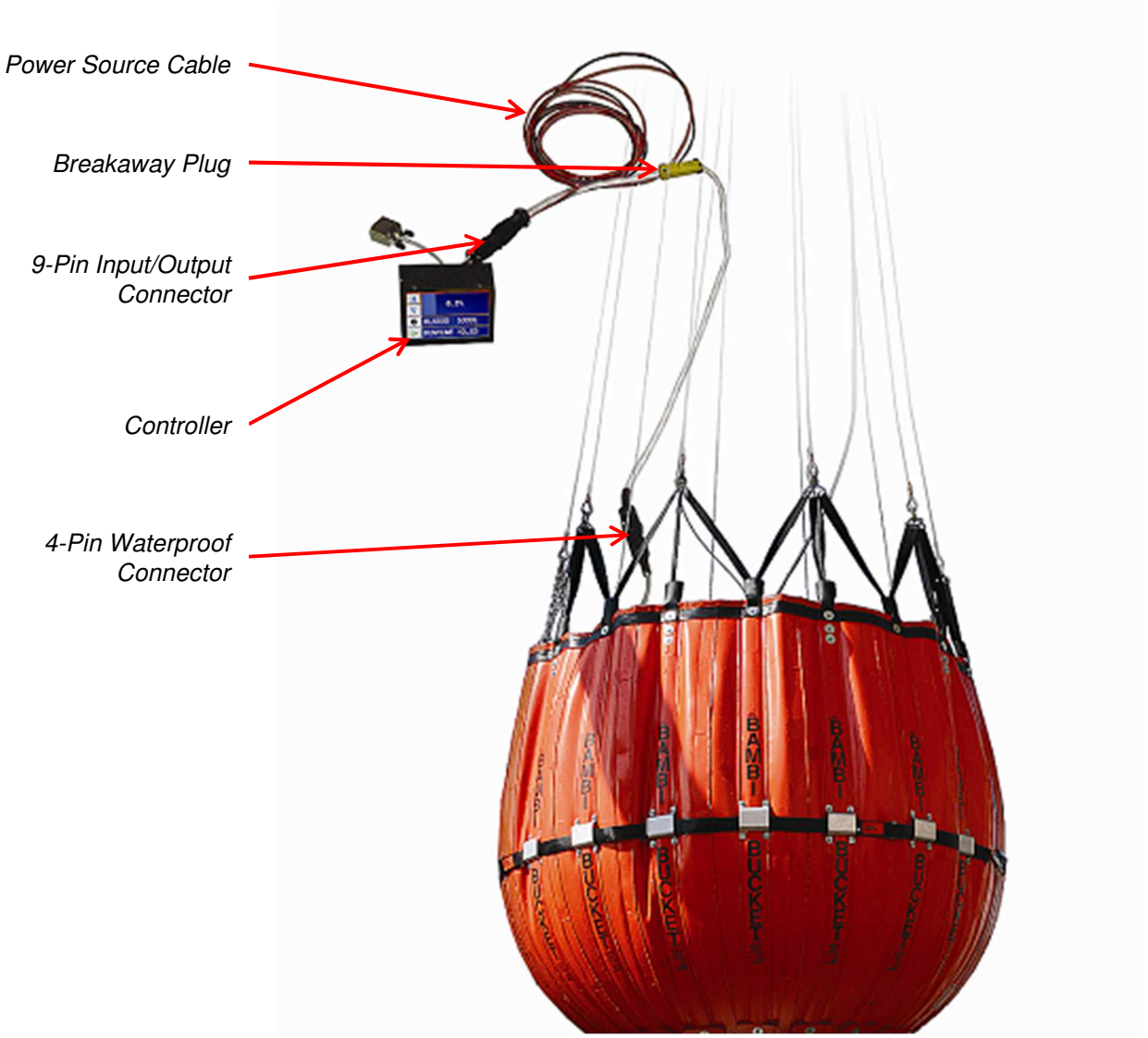
The Sacksafoam Bladder has several advanced features to enhance the efficiency of helicopter firefighting:

- The bladder containing the foam concentrate mounts inside the bucket. This eliminates spillage and possible corrosion damage associated with carrying foam concentrate inside the helicopter. An internal check valve stops water from flowing into the bladder and ensures that foam is dispensed only while the injection pump is operating. Because the foam in the bladder displaces the water in the Bambi Bucket, the total payload is always constant.
- An optional foam transfer pump for easily filling the Sacksafoam Bladder is available from SEI Industries. This portable pump greatly facilitates the filling of the Sacksafoam Bladder and is powered by 24 volts DC, either from the aircraft or from an auxiliary power source.
- The operation of the Sacksafoam Bladder can be quickly mastered by users with no prior experience. Several dumps with foam will provide familiarity with the use of the system.

SEI offers complete parts supply and repair facilities for the Sacksafoam Bladder. For maintenance and repair purposes, parts diagrams and descriptions are provided in *Section 8: Specifications and Parts.* When ordering parts, please provide the model information which is silk-screened on the bladder.

Additional copies of this manual are also available from SEI Industries Ltd. or by visiting our website at www.bambibucket.com for more information on these products. An online version of this manual is also available at this website.

Sacksafoam System



Section 2: Installation

Installation Procedure

NOTICE

If the Bambi Bucket cinch strap hook is on the ballast side of the bucket, it must be rotated 180 degrees to the opposite side, to allow cinch adjustment once the bladder is installed.

To install the bladder:

1. Release the bottom end of the ballast side IDS restrainer cable by removing the clevis pin from the restrainer bracket inside the bucket.

2. If you do not wish to permanently replace the IDS restrainer cable with the Sacksafoam restrainer strap, tie the restrainer cable out of the way where it will not interfere with bucket operation. Otherwise cut off the IDS restrainer cable.

3. Attach one end of the chain to the 1/4" shackle and attach the shackle to the IDS hub. Determine the length of chain by matching the total length of the assembly to the IDS restrainer cable. Insert the quick link into the determined chain length and insert the quick link into the D-ring at the end of the webbing strap and secure.

4. Connect the lower end of the restrainer strap to the restrainer bracket, reinstalling the clevis pin. Use a new cotter pin to secure the clevis pin to the restrainer bracket.

5. The installation should now look as shown.

6. Disconnect the bottom end of the IDS restrainer cable, opposite the ballast, by removing the clevis pin from the restrainer bracket. Attach the supplied shackle and length of chain to the IDS restrainer cable and re-connect it to the bracket. If the IDS cable already has a chain fitted, extend it to its longest length.

7. Attach hanger assemblies to the top of bladder.

8. Fold up the bladder and slide it in between the spokes and into the bucket. For smaller buckets, remove one spoke at the shell end. The bladder should be centered on the ballast pouch. The IDS restrainer strap attached, in steps 3 and 4, should pass around the bottom of the bladder.

CAUTION

Do not remove the Bambi Bucket's ballast pouch when fitting the bladder. This could cause unpredictable flight characteristics.

9. Install the shackles onto the webbing suspension straps at the bucket rim to line up with the spring links on the bladder. Chain links are supplied with the hanger assemblies if the bladder is out of alignment.

10. Straighten out the bladder so that it sits straight inside the bucket.

11. Connect the control cable to the waterproof connector on the bladder. Ensure that the white waterproofing washer is installed inside the receptacle.

12. Install the breakaway connector in the control cable, near the Bambi control head.

13. Secure the control cable to one of the Bambi suspension cables using the tie wraps provided. The connector may be taped together to prevent premature release.

CAUTION

IDS restrainer cable and strap adjustments are required to keep the IDS hub as flat as possible throughout its vertical range of travel. If improperly adjusted, the IDS hub will not sit level when the bucket is empty.

This is due to the deformation of the Bambi Bucket shell, caused by the weight of the Sacksafoam. Improper adjustment may result in fouling of the trip line pulley on the IDS hub (small series) and/or severe damage to the entire IDS (all models).

Section 3: Controller

Wiring the Controller

The Sacksafoam Controller (SFC) is used to accurately control the Sacksafoam pump. It operates on 24 to 28 VDC power and should be connected to a circuit capable of providing at least 10 amps. The SFC interfaces with the bladder harness through the adapter cable which is provided with the controller. The adapter cable is also used to interface with a customer-installed switch.

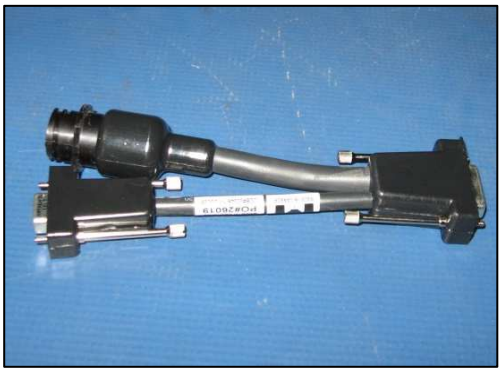
The controller can be mounted to the helicopter with DZUS fasteners.

Standard Sinking Adapter

The adapter harness included with new Sacksafoam systems is designed to allow a customer-installed switch to provide a sinking signal to the controller. One end of the switch must connect to aircraft ground while the other connects to the adapter harness. *Please see Section 10: Drawings for sinking adapter wiring diagram.*

Optional Sourcing Adapter

Some customers may have harnesses which require a sourced signal from a customer-installed switch. The recommended installation for this harness uses two wires connected to the switch and the D-Sub connector on the harness. The sourcing adapter is available as a custom option. *Please see Section 10: Drawings for sourcing adapter wiring diagram.*



Long Lines

The supplied control cable connecting the control box and bladder, fits Bambi Buckets with standard length suspension lines. The cable is sized to provide 24V to the injection pump when 28V is supplied to the control box. If the Bambi Bucket is suspended from the helicopter with an additional long line, the standard control cable may not be long enough.

See the following chart for recommended longline wire sizes for the Sacksafoam Bladder.

Wire Length		Wire Type	Connectors	
Feet	Meters		Top	Bottom
0–100	0–30	14/2 SOW	NEMA 1-15P	NEMA 1-15R
100–200	30–61	12/2 SOW	NEMA 1-15P	NEMA 1-15R

Wire Specifications

Control cables supplied with the Sacksafoam Bladder unit meet Mil-C-27500 specifications. Individual hook-up wires meet Mil-W-22759/16 specifications. It is recommended that any replacement wire or cable meet these specifications. Extra cable and wire are available from SEI Industries Ltd.

Section 4: Preflight Safety Checklist

Safety Checklist

Along with the aircraft, the Bambi Bucket and Sacksafoam system should also receive a preflight inspection each day. Follow the checklist below, beginning at the bottom of the bucket and working upwards.

1. Are all the attachments connecting the bladder to the Bambi Bucket firmly secured?
2. Is the wiring connector (close to the bladder) tightly secured? Does it have the white waterproofing washer installed inside the receptacle?
3. Is the power cable leading to the bladder secured to one of the Bambi Bucket suspension lines?
4. Is there a breakaway plug installed in the power cable near the cargo hook? Is it taped together to prevent premature release?
5. Is the control box operating properly? (Cap the outlet port on the bladder to avoid dispensing foam when testing the control box.)
6. Are the wires in the helicopter secured to avoid tripping and tangling?
7. Prior to take off, ensure that the cam lock cap on the foam outlet port is removed.

Refer to the Bambi Bucket manual for the preflight check on the Bambi Bucket itself.

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Section 5: Operations

Filling the Bladder

1. If any adjustment of the Bambi Bucket cinch strap is required, it should be made prior to the filling of the bladder, if possible. Adjusting the cinch strap is difficult when the bladder is full of foam.

NOTICE

The volume of the bladder should be reduced 20% for every 10% reduction in Bambi Bucket volume.

2. Remove the cam lock plug from the fill port.
3. Pour or pump in foam concentrate.

CAUTION

Overfilling the bladder with the Bambi Bucket cinched down may cause the dump valve to jam.

4. All air trapped in the bladder must be removed, otherwise the Bambi Bucket may not sink when dipped in the water. If the bladder is lying on the ground, excess air can be removed by opening the vents on each side and pressing down in the centre of the bladder. Close the vents tightly after exhausting all the air.

5. Replace the cam lock filler plug.

6. Remove the cam lock cap from the foam outlet port. An internal check valve ensures foam is dispensed only while the injection pump is operating.

Removing the Bladder from the Bucket

1. Reverse installation sequence.
2. If there is any appreciable amount of foam left in the bladder, it should be pumped out until the pump runs dry. At this point the bladder can be easily removed from the bucket. The remaining foam (approximately four litres with the 8018bladder) can be removed through the drain port.
3. The bladder should be flushed with fresh water and pumped out. This will also clean the pump. Drain any residual water through the drain port.
4. Clean off the outside of the bladder to remove any foam residue.

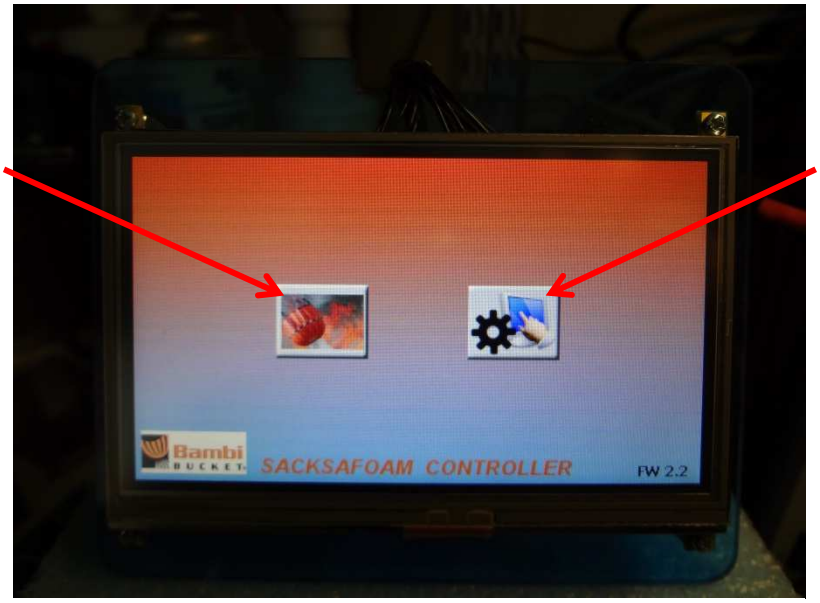
NOTICE

Proper cleaning of the bladder prior to storage will increase the life span of the unit.

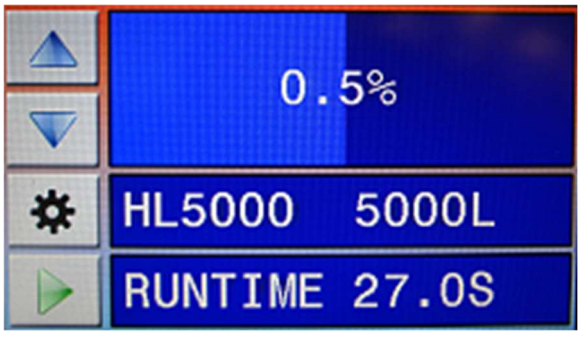
Using the Controller

Start-Up, Calibration and Main Screen

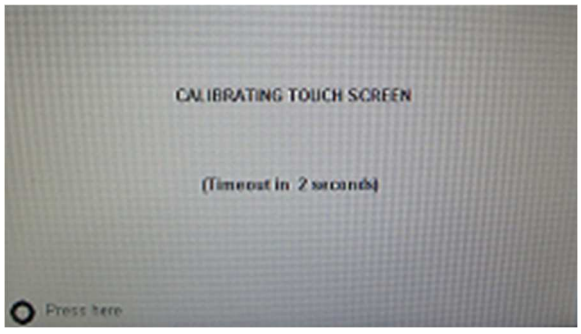
The Sacksafoam controller (SFC) is based on touchscreen technology. All functions are accessible via the tapping of virtual symbols or via the tapping of designated touch areas on the SFC's display screen. The injection of foam concentrate can be initiated by means of the touch screen as well as the use of an external operator switch. After power-up, the SFC displays its start-up screen. If necessary, you can calibrate the touchscreen to your preferences by tapping the symbol on the right or you can proceed directly to the SFC main screen by tapping the symbol on the left.



Start-up screen



Main screen



Calibration Screen

Changing Foam Concentrations

Setting display windows are touch-sensitive. In the following example, tapping in the window area to the RIGHT of an imaginary window "center line" INCREASES the setting for the foam concentration while the area to the LEFT of the imaginary window "center line" DECREASES the foam concentration setting.

Tapping on the LEFT side DECREASES the setting for the foam.

Tapping on the RIGHT side INCREASES the setting for the foam.

Main Screen

Left side symbols perform the same operation. Choosing your method is a personal preference.

Tapping on the UP symbol INCREASES the setting while tapping on the DOWN symbol DESCREASES the setting.

Main Screen

Preparing the SFC for Operation

For a standard Sacksafoam system, preparing the controller is as easy as choosing your bucket model. The SFC retrieves all the relevant bucket parameters from its internal database. Tap the set-up symbol or tap within the bucket model window until the model you're using is displayed.

Tap the set-up symbol to select your model or tap within the model window.

This brings up the set-up screen (see below).

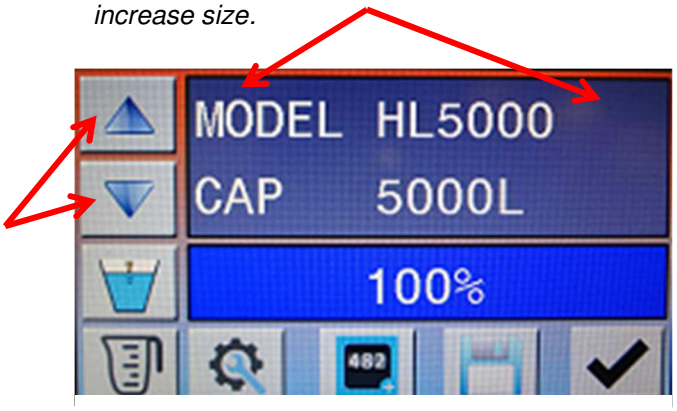
Main Screen

This brings up the set-up screen (photo showing litres).

To select your model size using the touch screen, tap left to decrease size and right to increase size.

Select your model size by using the arrows.

The top arrow increases size while the bottom arrow decreases size.

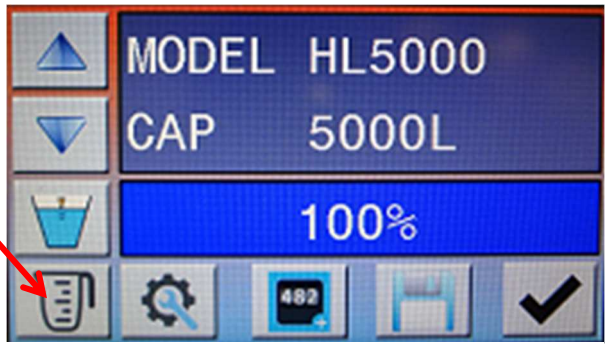


Set-Up Screen

Changing the Unit of Measurement

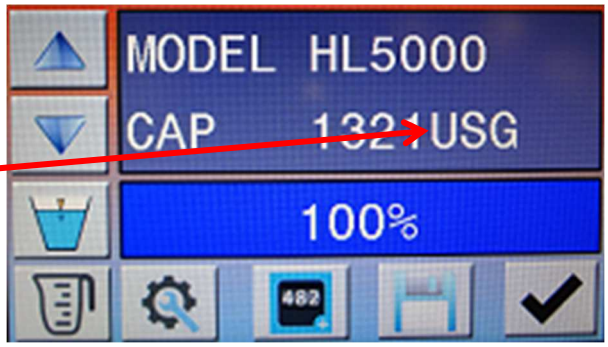
From the set-up screen, tap on the symbol displaying the measurement cup symbol or tap within the units of measurement (UOM) window. Each tap will cycle through the available units of measurement from litres to US gallons to Imperial gallons.

Tap the measuring cup to select either litres, US gallons, or Imperial gallons.



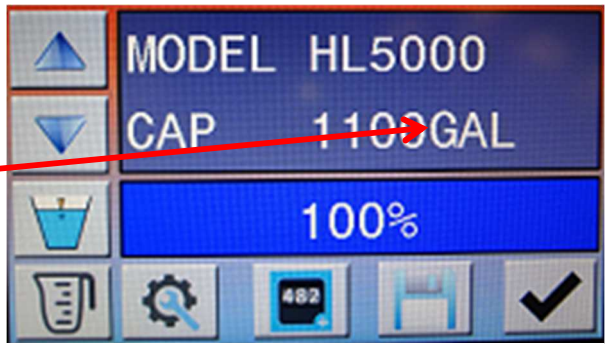
Set-Up Screen

In this photo, note the change from litres to US gallons.



Set-Up Screen

In this photo, note the change from US gallons to Imperial gallons.



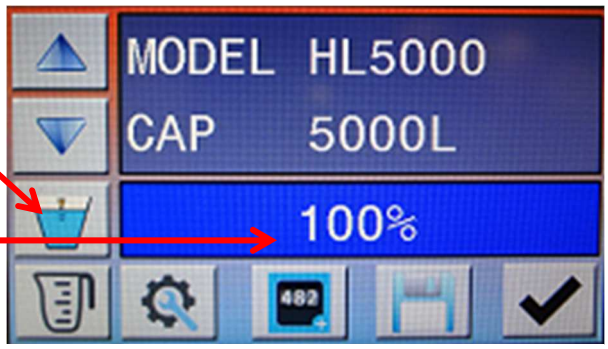
Set-Up Screen

Setting Foam Percentage

If the Bambi Bucket cinch strap is being used, you can adjust the amount of foam to maintain the desired foam percentage by selecting the foam set-up symbol or by tapping the percentage window, left or right.

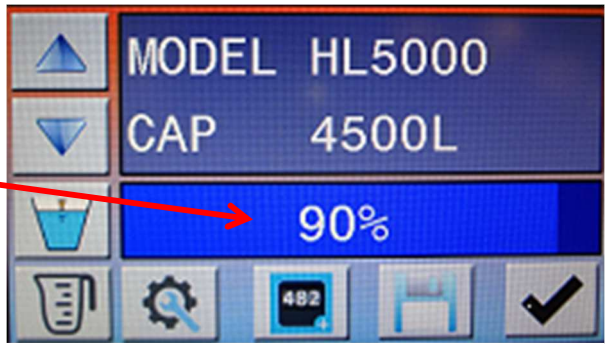
Tap the foam symbol to cycle through percentage options.

Or tap the percentage window, left or right.



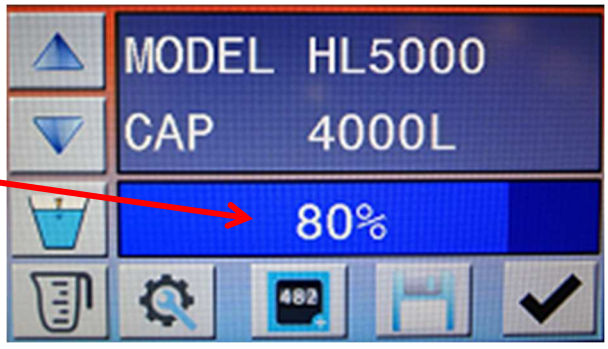
Set-Up Screen

Notice the adjustment in the percentage.



Set-Up Screen

Notice the adjustment in the percentage.

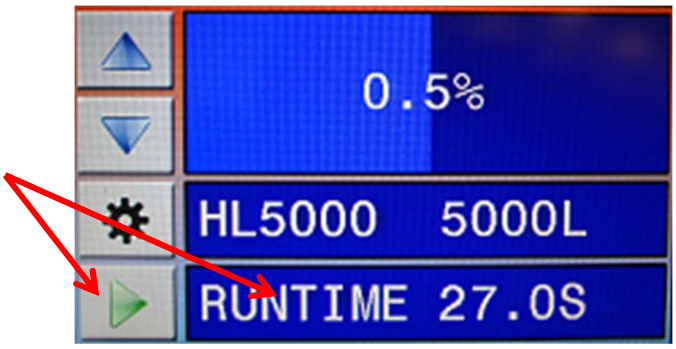


Set-Up Screen

Initiating Foam Injection

To initiate foam injection, set the intended foam concentration using the main screen. Tap the green arrow symbol or tap within the runtime window or activate your external operator switch. The SFC will display the injection progress.

Initiate foam injection by tapping the green arrow or tap within the runtime window or use your external switch.

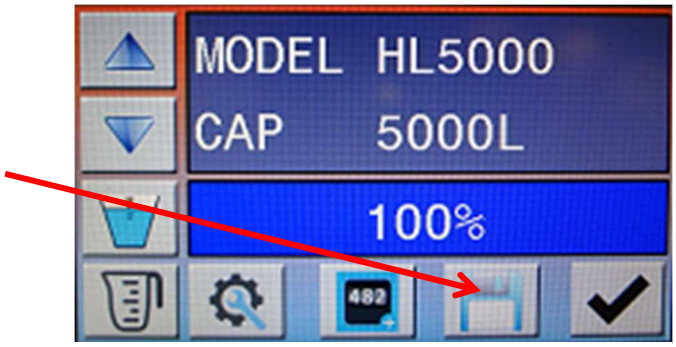


Main Screen

Saving Settings Permanently

Settings can be permanently saved to non-volatile memory. Upon a restart of the SFC, the saved settings are automatically loaded. From the set-up screen, tap the disk symbol to save your settings. A confirmation window will open to inform you of the successful save operation.

Tap the save icon.



Set-Up Screen

To dismiss this window, tap on the checkmark symbol.

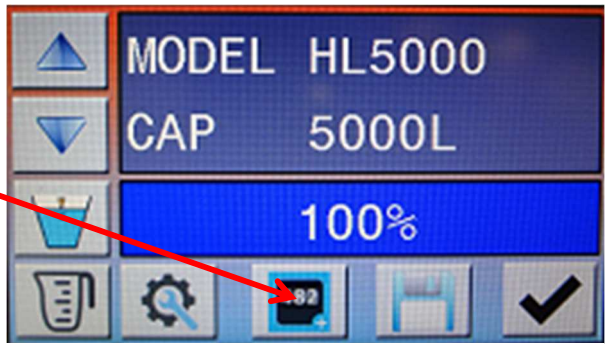
Set-Up Screen

Counting Drops

The Sacksafoam controller can be used to count the number of drops with or without foam.

First, tap the gear symbol to access the set-up screen.

Then tap the number symbol to access the count screen.



Set-Up Screen

Once you are at the count screen, you can inject foam using the green arrow. Both the ALL and FOAM count increase each time you inject foam. If no foam is used, the count will not increase in the ALL count area. To increase the ALL count, manually press the plus + sign.

Inject foam using the green arrow.

If no foam used, you can increase count by pressing + sign in ALL.

Count Screen

Touch to clear individual numbers.

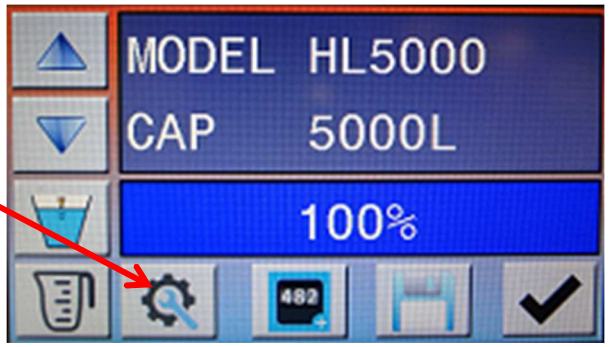
Touch to return to main screen.

Count Screen

Custom Set-Up

Normally, you would not require this option unless you are using a non-standard bucket, or you employ load shedding or cinching. If so, the bucket capacity and, if necessary, the flow rate of the injection system can be configured to suit your operational requirements. To begin, from the set-up screen, tap the gear symbol.

Tap the gear symbol



Set-Up Screen

Tap the arrows on the configuration screen to adjust capacity or flow rate as desired. When finished, tap the check mark.

Tap arrow up or down to adjust capacity.

Tap arrows up or down to adjust flow rate.

Configuration Screen

Tap the check mark when finished.

Configuration Screen

Section 6: Troubleshooting

Troubleshooting Chart

Problem	Possible Cause	Solution
Pump fails to operate	Blown breaker	Check helicopter breaker and breaker on back of control box
	Bad connection	Using a multimeter, check that current is reaching control box and bladder. Check contacts and waterproof connector.
Incorrect foam concentration	Pump hooked up backwards	Check pump output by pumping into bucket. Reverse connections to pump and try again. Select connection that gives highest output.
Bambi Bucket dump valve not working	Bladder fouling valve	Reduce amount of foam in bladder until it clears valve.
	IDS hub tipping and fouling trip line	Adjust IDS restrainers so that hub sits level.

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Section 7: Maintenance

Maintenance Procedures

The Sacksafoam Bladder unit requires no maintenance other than cleaning. Daily, after use, and prior to storage, the bladder should be flushed out with clean water. Clean off the outside of the bladder to remove any residual foam.

NOTICE

Proper cleaning of the bladder prior to storage will increase the life span of the unit.

Flushing Procedure

1. Insert a water hose into the fill port and run the dispenser pump until the water runs clean.
2. Wash out the side of the bladder until clean.
3. Remove the drip tube to drain any residual foam.

CAUTION

Residual foam will form a waxy substance that can prevent proper operation of the Sacksafoam.

Pump Maintenance

Check wires and connectors periodically to be sure corrosion is not adding additional resistance to the motor circuit and causing a low voltage condition at the motor. Low voltage can inhibit the motor from starting and can cause a fuse to blow. Full voltage should be available to prevent motor damage. At the end of each fire season, the pump should be flushed with clean water as foam will dry out over time causing the impeller to stick. Some water can remain in the pump while in storage. Also, if the pump is idle for long periods of time, the impeller may stick to the pump body, preventing motor rotation and causing blown fuses. To correct, remove the end cover and the impeller, clean the body and impeller, then lubricate with water or a small amount of grease before re-assembly.

If the pump is stored in freezing temperatures, drain it by loosening the end cover screws, allowing any foam or water to drain completely. A service kit or spare impellers should be carried onboard to be assured of pumping capability. Spares kits are supplied with each pump and additional kits can be ordered from SEI (see parts list).

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Section 8: Specifications and Parts

Capacity and Weight Specifications

Capacities and weights are accurate to within 5%. Specifications are subject to change.

Sacksafoam Models

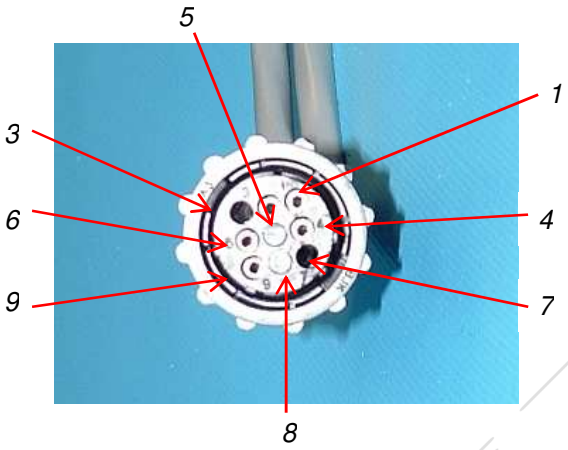
Bucket Model	Model	Bladder Capacity			Current @ 28VDC	Empty Weight		Gross Weight	
		Imp Gal	US Gal	Litres		lb	kg	lb	kg
BB8096	8018	10	12	45	5 AMPS	14	6	113	51
BB9011									
BB1012									
BB1214									
BB1518									
BB1821									
BB2024	2044	25	30	114		17	8	268	122
BB2226									
BB2732									
BB3542									
BB4453									
BB5566	5550	60	72	272		23	10	621	282
BB6780									
BB7590									
BBHL4000									
BBHL5000									

Control Box Specifications

Control Box Dimensions: 4.58 x 3.41 x 2.06 inches (116 x 87 x 52 mm)

Control Box Weight: 20 oz. (550 grams)

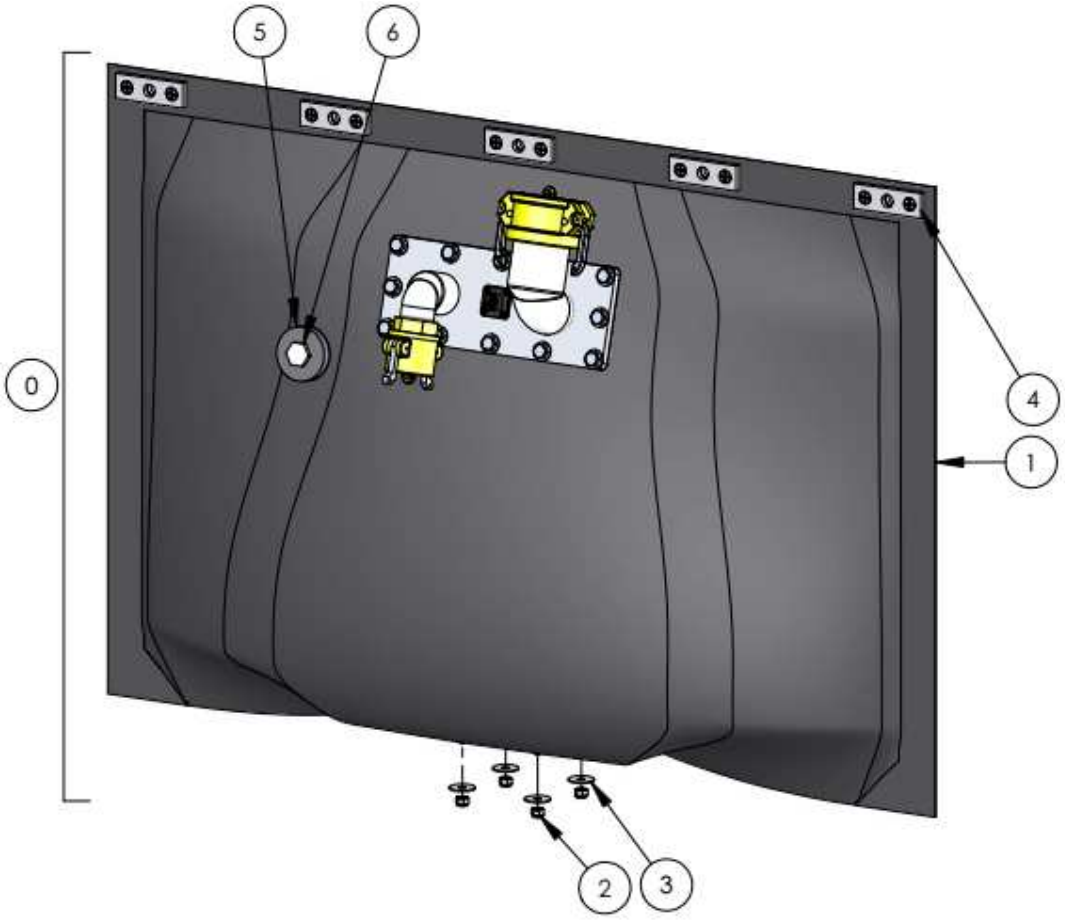
Control Box 9 Pin Connector Configuration

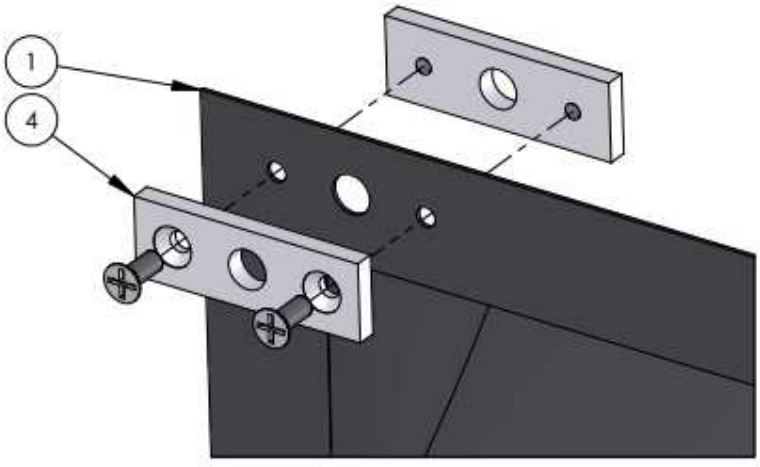


PIN	DESCRIPTION	WIRE COLOR
1	+ 24VDC supply	Red
2	- 24VDC supply	Black
3		
4	+ 24VDC to foam dispense pump	White
5	Plugged	
6	- 24VDC to foam dispense pump	White / Blue
7		
8	Plugged	
9	+ 24VDC from Bambi dump button	Green

Parts

Bladder Assembly*



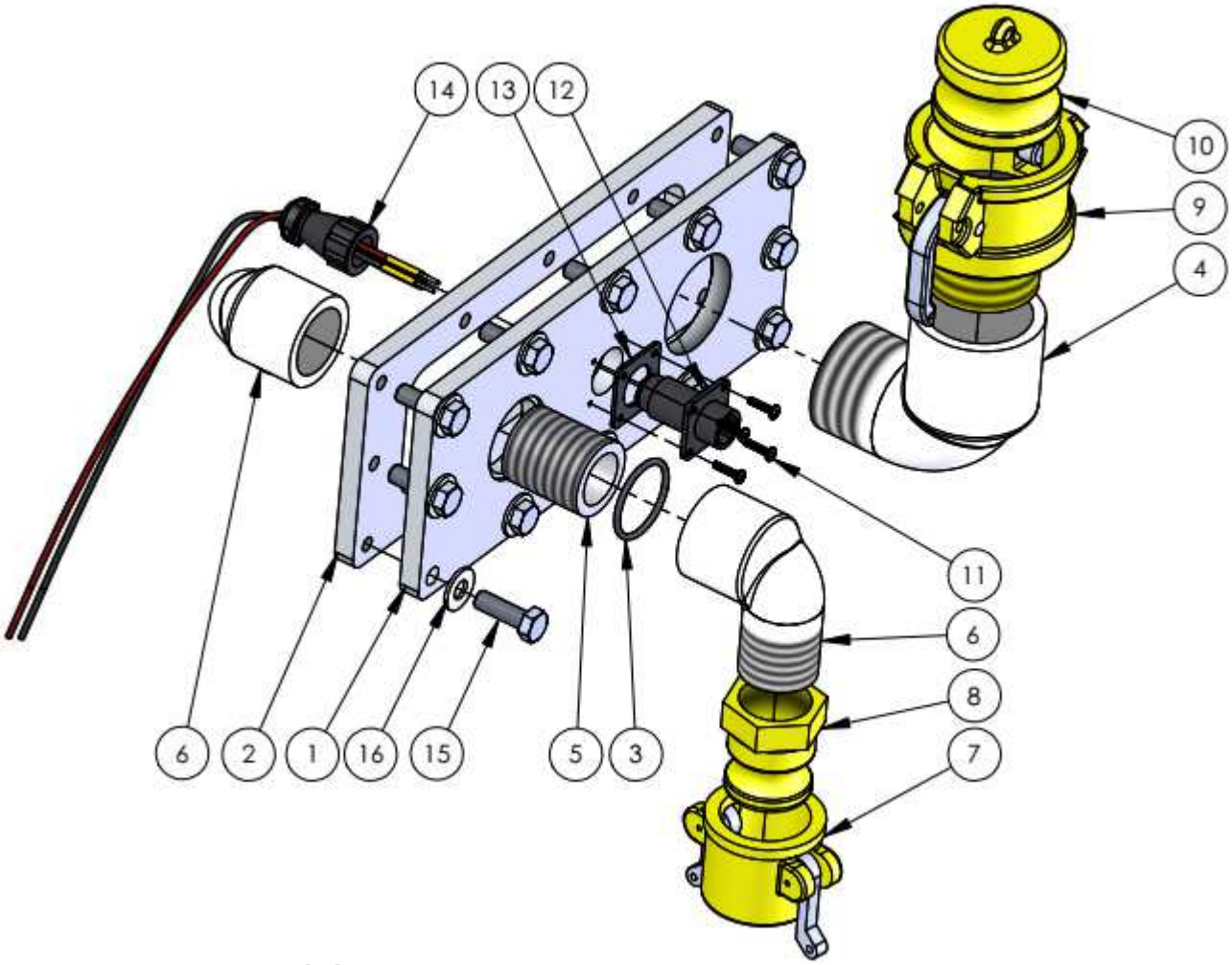


**Not an accurate representation of all models.*

Bladder Assembly (continued)

ITEM	MODEL	PART #	DESCRIPTION	QTY
0	8018	004355	BLADDER, 12USG, ASSY	1
	2044	004358	BLADDER, 30USG, ASSY	
	5550	004360	BLADDER, 72USG, ASSY	
1	8018	004353	BLADDER, 12USG	1
	2044	002399	BLADDER, 30USG	
	5550	004359	BLADDER, 72USG	
2	ALL	001662	NUT, HX, NYL, 1/4-20, SS	4
3		001858	WASHER, FLAT, 1/4 x 1, FND, SS	4
4	8018	004361	PLATE, REINFORCING, ASSY	5
	2044			
	5550			7
5	8018	002695	FLANGE, BLKHD, 1/2" FNPT, PVC	1
	2044			2
	5550			
6	8018	002712	PLUG, 1/2" MNPT, PVC SCH-40	1
	2044			2
	5550			
7	ALL	015806	PLATE, REINFORCING, FRONT	1
8		015807	PLATE, REINFROCING, BACK	1
9		000459	SCREW, 1/4-20 x 5/8, FHPH, SS	2

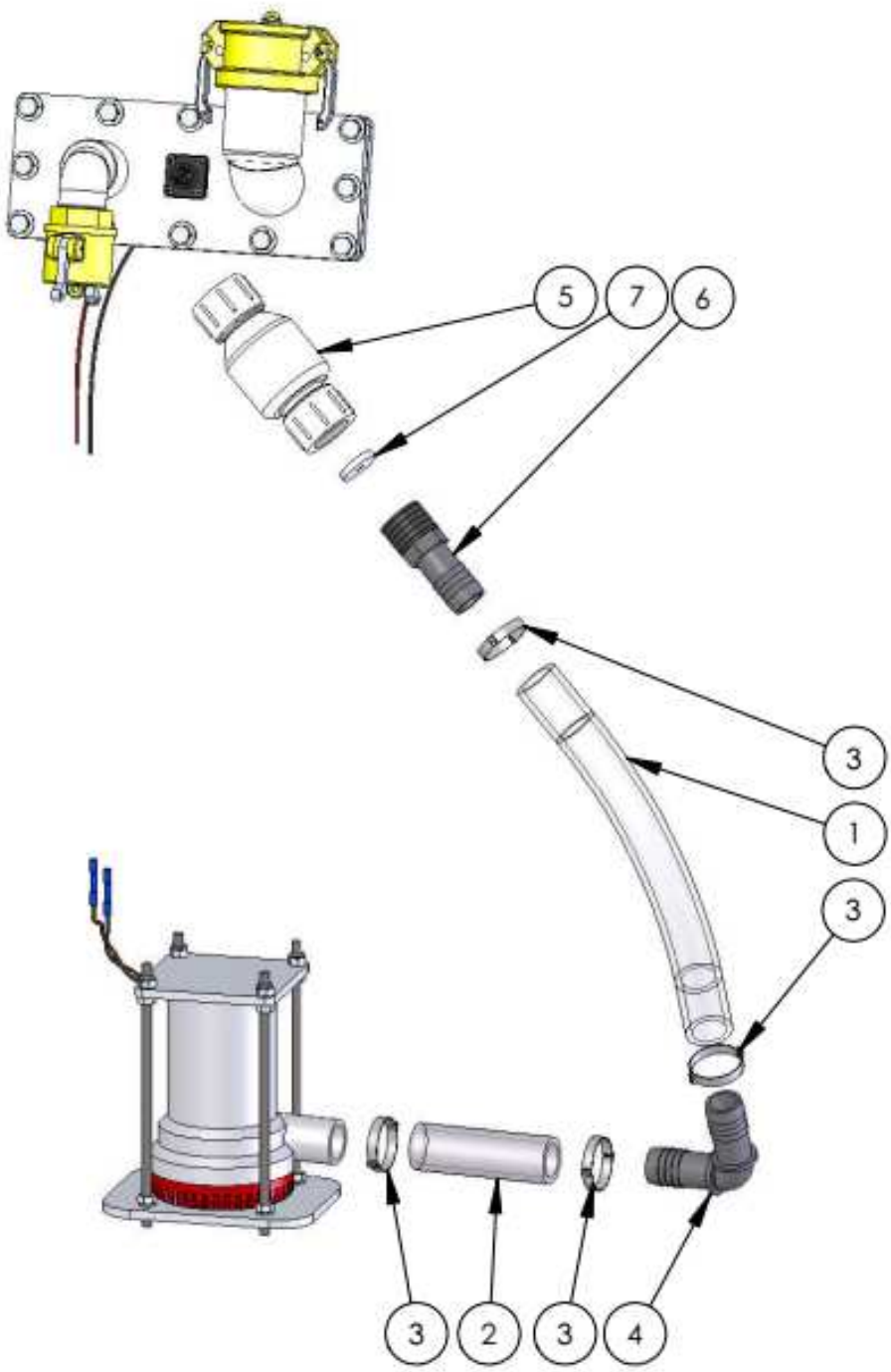
Gate Assembly



Gate Assembly (continued)

ITEM	MODEL	PART #	DESCRIPTION	QTY
1	ALL	014627	FLANGE, OUTER	1
2		004288	FLANGE, INNER	1
3		001890	O-RING, BUNA N, #124	1
4		002686	ELBOW, STREET, 1.5” NPT, PVC	1
5		002667	NIPPLE, CLS, 1” NPT, PVC	1
6		002685	ELBOW, STREET, 1” NPT, PVC	2
7		002655	CAMLOCK, DC, 1”, NYL	1
8		002666	CAMLOCK, D, 1”, NYL	1
9		002657	CAMLOCK, B, 1.5”, NYL	1
10		002653	CAMLOCK, DP, 1.5”, NYL	1
11		015759	SCREW, 4-40 X 1/2”, PNPH, SS, SEAL	4
12		014492	RECEPTACLE, PM, 4 PIN, SEALING	1
13		014493	GASKET, SIZE-11	1
14		000955	CLAMP, 4 PIN, SMALL	1
15		000386	BOLT, HX, 5/16-18 X 1, SS	12
16		001807	WASHER, 5/16” X 3/4”, 1/16”, NYL	12

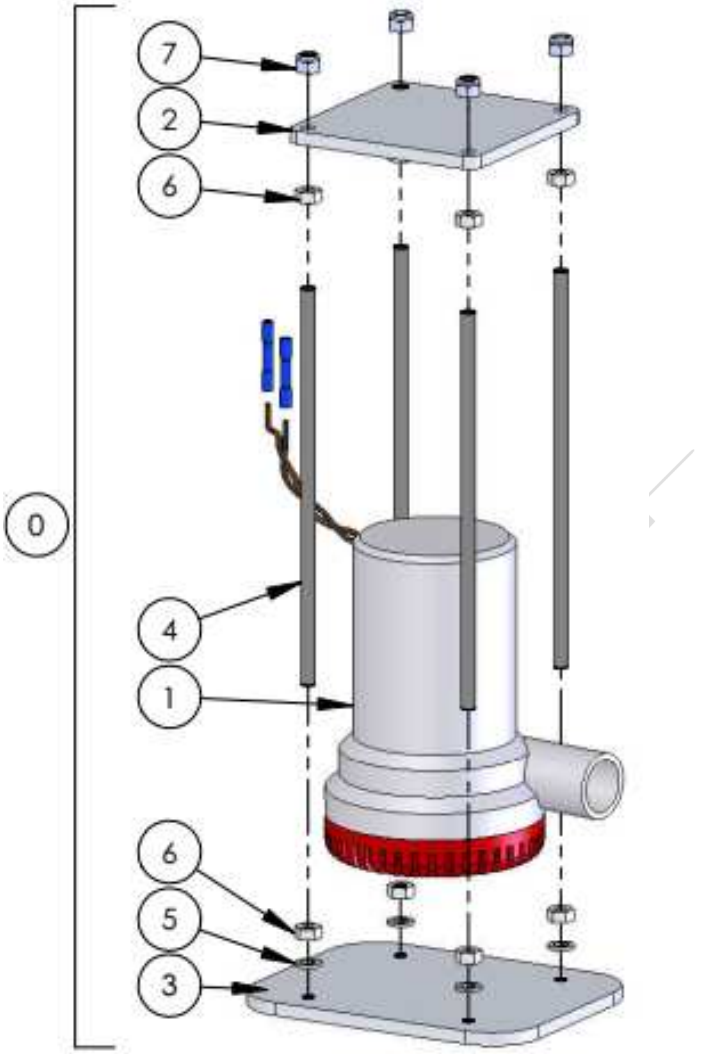
Pump Hose



Pump Hose (continued)

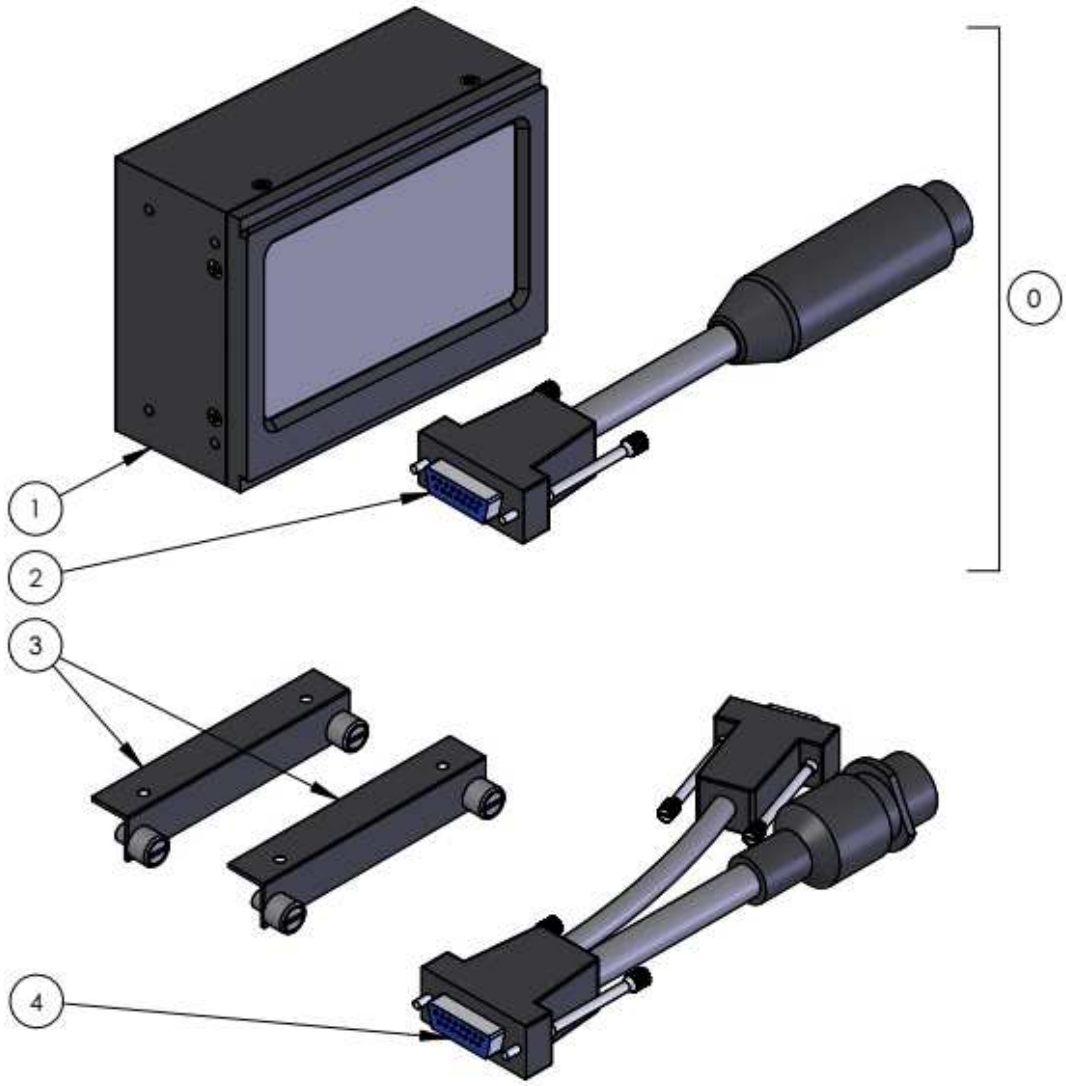
ITEM	MODEL	PART #	DESCRIPTION	QTY
1	8018	002892	TUBE, PVC, 1”	8 FT
	2044			12 FT
	5550			13 FT
2	ALL			3 FT
3		003049	CLAMP, OETIKER, 1-7/16”, SS	4
4		002684	ELBOW, BARB, 1”, PVC	1
5		002916	VALVE, CHECK, SPRING, 1”, FNPT, PVC	1
6		002683	ADAPTER, BARB,1” x 1”, MNPT, PVC	1
7		005058	ORIFICE, 3/16	1

Pump Dispenser Assembly



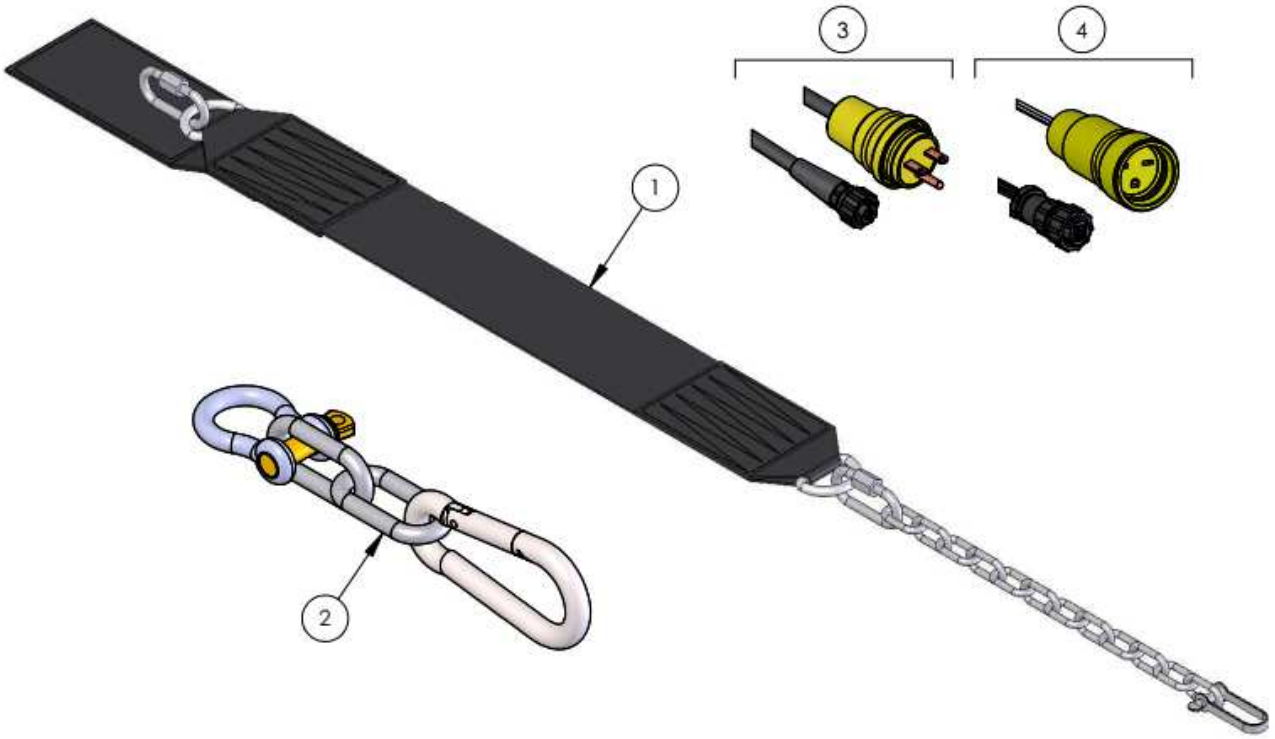
ITEM	MODEL	PART #	DESCRIPTION	QTY
0	ALL	004319	PUMP, DISPENSE, ASSY	1
1	ALL	004250	PUMP, 33GPM, 24V	1
2		004291	PLATE, TOP, PUMP	1
3		004292	PLATE, BOTTOM, PUMP	4
4		004293	ROD, MOUNTING	2
5		001852	WASHER, LOCK, SPLIT, 1/4, SS	4
6		001655	NUT, HX, 1/4-20, SS	4
7		001662	NUT, HX, NYL, 1/4-20, SS	4

Controller Kit



ITEM	MODEL	PART #	DESCRIPTION	QTY
0	ALL	010550	CONTROLLER SFC, w/ADAPTER	1
1	ALL	010600	CONTROLLER, SFC, ASSY	1
2		012913	CABLE, ADAPTER, SINKING, SFC	1
3		010602	DZUS, MOUNTING, SFC, KIT	1
4		010603	CABLE, ADAPTER, SOURCING, SFC	1

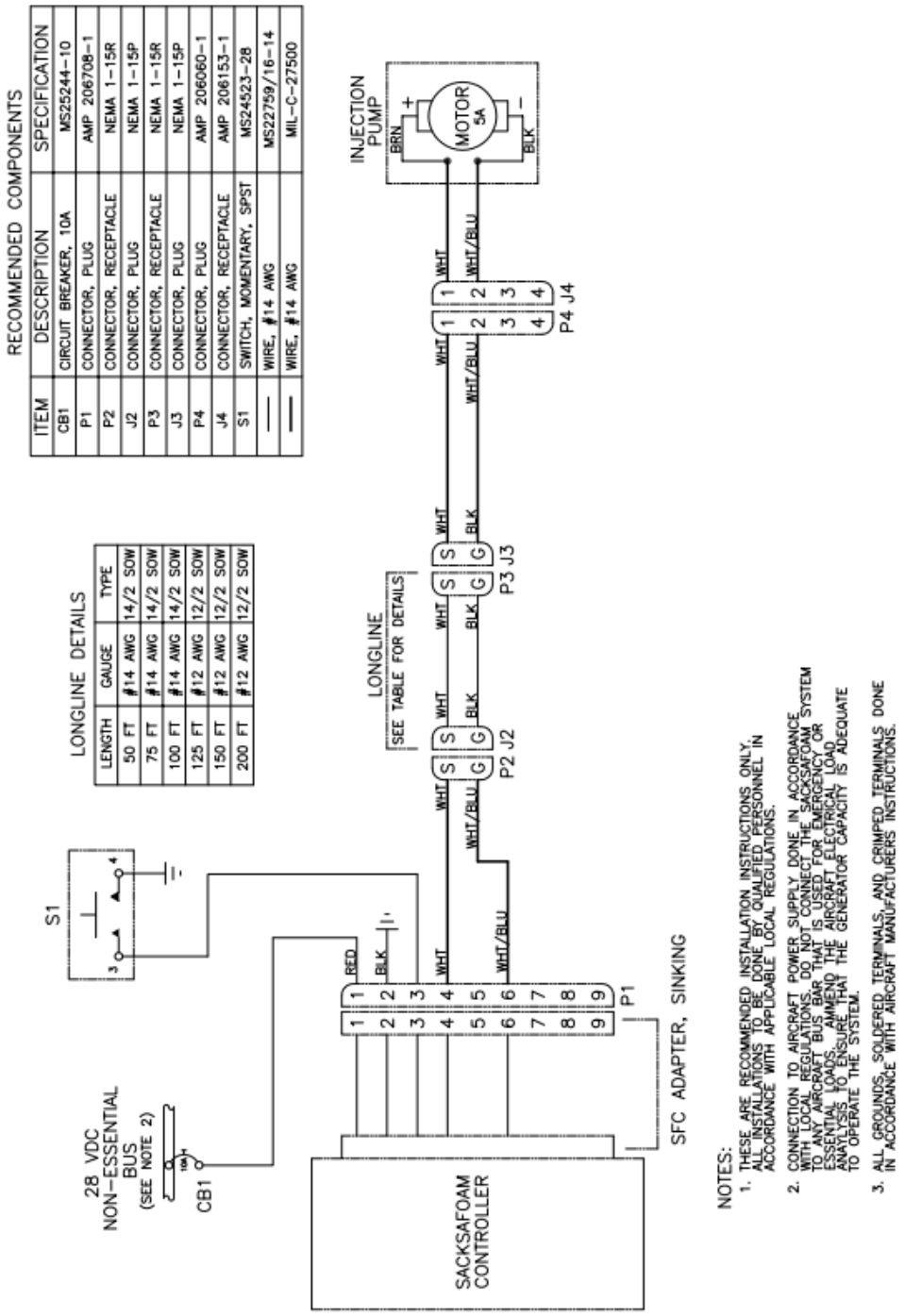
External Parts



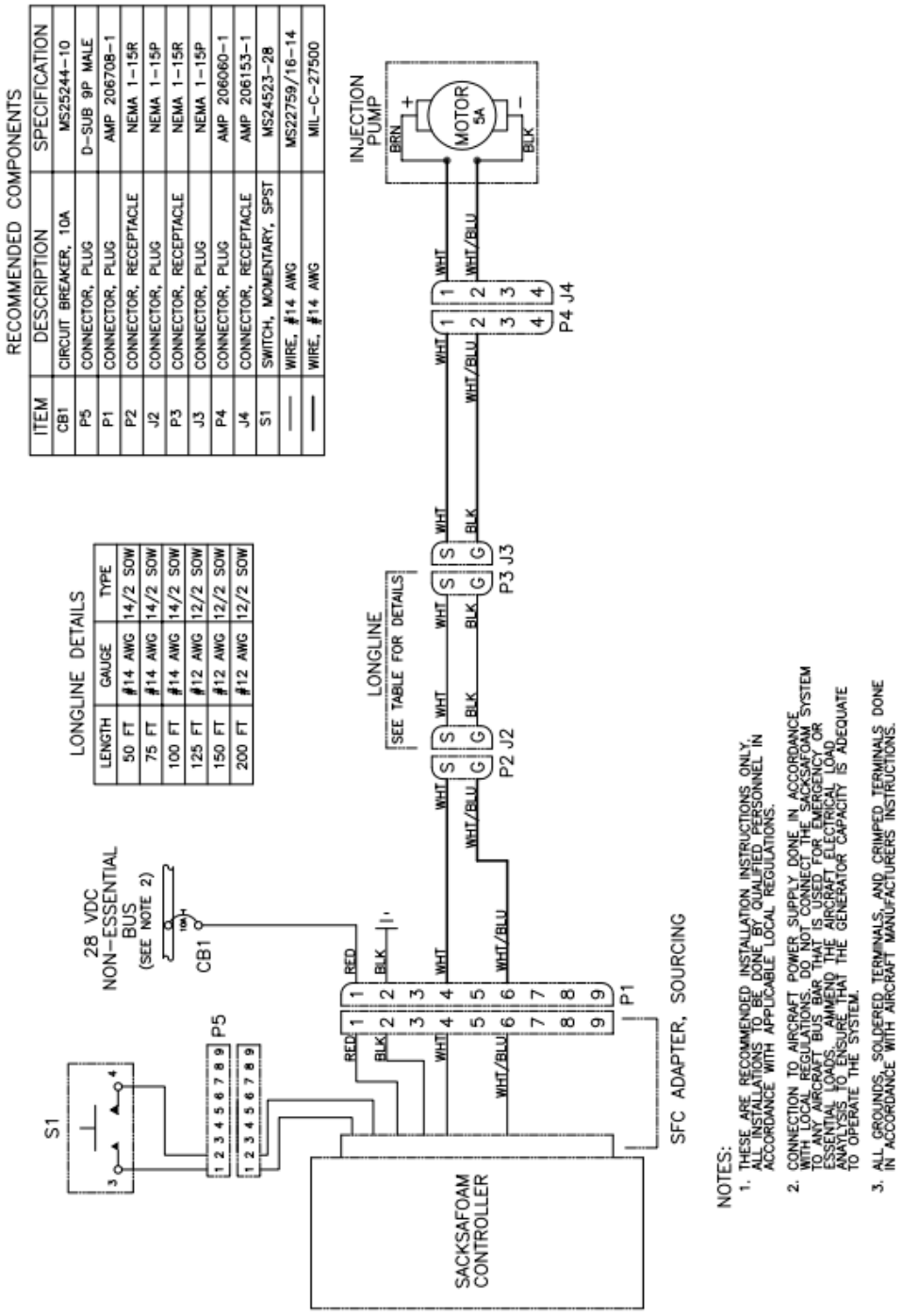
ITEM	MODEL	PART #	DESCRIPTION	QTY
1	8018	015953	RESTRAINER, STRAP, ASSY	1
	2044	015954		
	5550	015955		
2	8018	015958	HANGER, ASSY	5
	2044			7
	5550			
3	ALL	014635	HARNESS, LOWER, SACKSAFOAM	1
4		014636	HARNESS, LOWER, SACKSAFOAM	

Section 9: Drawings

Sinking Adapter Wiring Diagram



Sourcing Adapter Wiring Diagram



Section 10: Warranty

SEI Industries Ltd. (the company) agrees to grant a warranty for a period of one year from the date of purchase of Bambi Bucket systems on the following conditions:

a) The company's sole obligation under this warranty is limited to repairing or replacing, at the company's sole discretion, any product shown to be defective.

b) The company's products are not guaranteed for any specific length of time or measure of service, but are warranted only to be free from defects in workmanship and material for a period of one year to the original purchaser.

c) To the extent allowable under applicable law, the company's liability for consequential and incidental damages is expressly disclaimed. **The company's liability in all events is limited to and shall not exceed, the purchase price paid.**

d) This warranty is granted to the original purchaser of Bambi Bucket systems and does not extend to a subsequent purchaser or assignee.

e) The company must receive notification in writing of any claims of warranty from the original purchaser which must give details of the claimed defect in the product.

f) Where the original purchaser is claiming under warranty, the product must be returned to the company for inspection with all transportation and duty charges prepaid.

g) The warranty does not extend to any product that has been accidentally damaged, abraded, altered, punctured, abused, misused or used for a purpose which has not been approved by the company.

h) This warranty does not apply to any accessories used with the product that are not supplied by the company and any warranty on such accessories must be requested from the manufacturer or dealer of the accessories.

i) In the event the original purchaser does not give notice of a warranty claim, within one year of the original purchase of the product, it is understood that the purchaser has waived the claim for warranty and the purchaser and/or any subsequent purchaser must accept the condition of the product, without warranty.

j) Any technical information supplied by the company regarding the product is not a condition of warranty but rather is information provided by the company to the best of its knowledge.

k) There are no implied warranties nor is there any warranty that can be assumed from any representation of any person, except the company itself.

Exclusions

l) This warranty is void if the product is not installed, used and/or maintained in accordance with the operations manual supplied by SEI.