Germfree

EXPERT ENVIRONMENTS

Vertical Laminar Flow Workstation
User Manual

Contents

Introduction

The BVBI Series Hood is designed for the handling of materials in a sterile working environment. The work area is bathed by positive pressure vertical laminar flow air that has passed through a High Efficiency Particulate Air (HEPA) filter. This filter removes organisms and particulates 0.3 micron in size with an efficiency of 99.99%. It is even more efficient for both larger and smaller particles. The laminar flow principle consists of moving individual streams of unidirectional, ultra-clean air along parallel lines with minimal turbulence. The HEPA filter is positioned above the work area. It is protected by a removable, perforated metal diffuser located immediately below it.

Your BVBI Series Hood has been thoroughly tested. The HEPA filter was integrity tested by the filter manufacturer and again at our factory before it was shipped out. During the testing process, Polyalphaolefin (PAO) or equivalent was aerosolized into the assembled unit on the upstream side of the HEPA filter and an aerosol photometer was used to scan the downstream side for any aerosol droplets that might pass through or around the HEPA filter. Air velocity was measured with a thermoanemometer to insure that the airflow is uniform and unidirectional. All testing was performed in accordance with established standards and procedures, including Federal Standard 209.

Contact Germfree Customer Service

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cs@germfree.com

Installation

The BVBI Series Hood should be transported and moved in an upright position. Your unit will require some assembly and needs to be carefully uncrated. The BVBI Series Hood should be positioned so that it is out of traffic patterns and away from room air currents that could disrupt its airflow. If there is a window in the room it should remain closed at all times. The BVBI Series Hood should not be placed in a location where air conditioning vents might disturb the flow. A simple smoke test will help determine a proper location for the unit.

After installation, the BVBI Series Hood needs to be certified by an independent testing organization. This must be done before it is placed into service and repeated in accordance with the regulations from the pharmacy board in your state (usually 6 months). In addition, whenever the BVBI Series Hood is relocated, it must be certified.

Exhaust Duct Installation Instructions

Remove all cardboard or other protective equipment from the back top and the bottom motor compartment.

TWO PERSON STEP:

Line up the bottom of the exhaust duct with the front row of threaded studs and tilt forward.

The exhaust duct with the threaded hose barb is located to the right when facing the back of the vertical flow workstation. (For BVBI-6SS and BVBI-8SS models only. BVBI-3SS and BVBI-4SS will only have one exhaust duct.)

(See Next Image)

Hose Barb

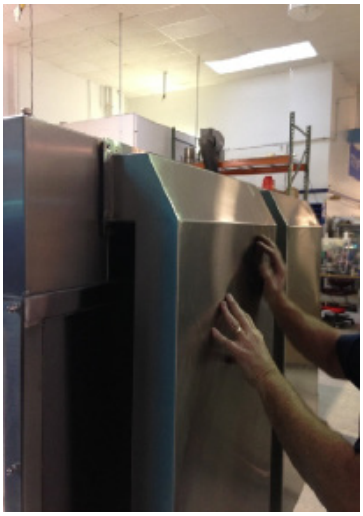
(Hose will be connected during the last step)

With the top firmly in place, install hardware provided in envelope in the order of:

1. #10 Flat Washer
2. #10 Lock Washer
3. #10 Nut
4. #10 Cap Nut

(Shown in image below)

Start from the top then the bottom.



Hardware installed.

(Top View)

Reach behind the Exhaust Duct to install Hardware. Install on all 14 studs, top and bottom. (28 on BVBI-6SS and BVBI-8SS).

(Bottom View)

Repeat the process with the second exhaust duct. (For 6 and 8 foot models only)

Push in Flexible Hose from control panel to the Hose Barb located at the bottom right of the exhaust duct.

Services

All BVBI Series Hoods are shipped complete and include the following accessories: Variable speed blower motor control (BVA-5), metal diffuser in front of supply filter (BVA-15), one prefilter sets and any other accessories ordered at the time of purchase. In addition to the above, the Pharmacy Models (RX) includes a stainless steel I.V. bar (BVA-9) with hooks.

All electrical components are in the control panel located underneath of the work area on the left side of the unit. The pressure gauge is also located here.

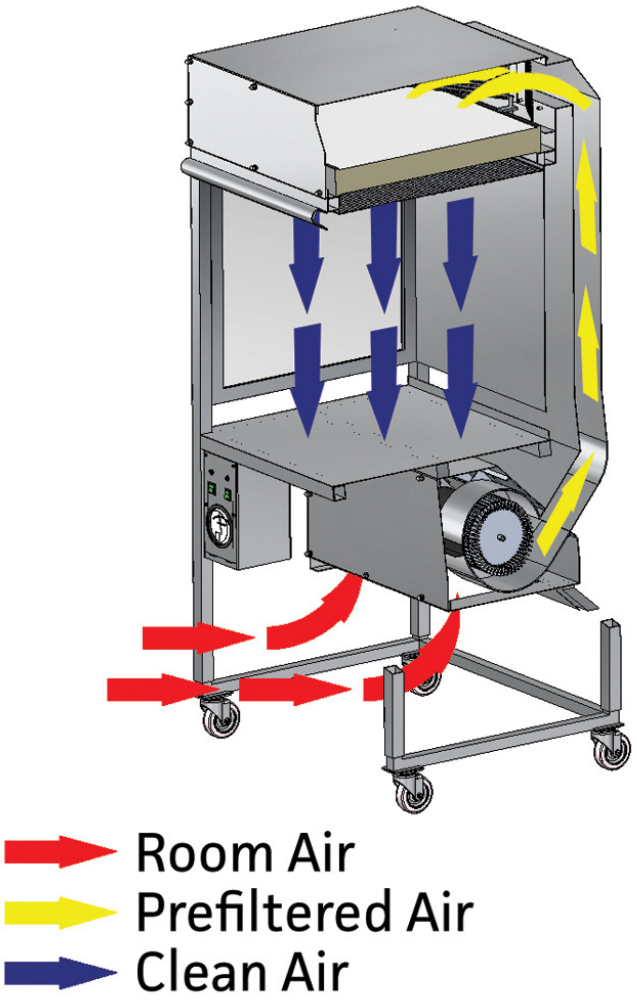
The unit's speed control has been set at the factory. Adjustments may occasionally have to be made during certification. The speed control setting should only be changed if air velocity falls below the specified range, which usually takes several years. This should only be done by your certifier. Do not adjust the speed control without good reason.

Airflow

The Blower Motor is extremely efficient throughout a wide pressure range; it will overcome the resistance of both a clean and moderately loaded HEPA filter. The variable speed control is set at the factory to give a unidirectional airflow of 90 linear feet per minute, +/- 10 feet per minute with a thermoanemometer or velometer.

As the HEPA filter becomes "loaded" with particulate matter, the blower will overcome a considerable increase in resistance without having to be reset. Over time the filter will become loaded requiring an adjustment of the speed control. To best determine when the filters should be changed, direct readings of airflow in feet per minute should be taken. This is usually done with a velometer or thermoanemometer.

If a thermoanemometer or velometer is not available to quantitatively measure airflow, a very rough indication can be made with smoke by creating a smoky condition under the HEPA filter and observing the relative rate and pattern of dissipation.



Use of the BVBI Series Hood

The successful use of the BVBI Series Hood depends upon two factors: advance planning and good technique. Even the most sophisticated and elaborate system would be useless if proper technique were not employed. The head of the involved department should make sure that personnel who use the unit are trained and exercise good technique.

Advance Planning

To achieve maximum sterility from your unit, you must take into account the equipment and materials necessary for the proposed project and outline the procedural details for your particular operation.

The best way to accomplish this is to use a checklist and/or protocol for both materials and procedures. Materials should include equipment, apparatus, media, supplies, diluents, drugs and all other items that will be used. The procedural checklist should include the order of events in sequence and other details that are necessary for the successful completion of the proposed operation or experiment.

Your advance planning should include a layout for the arrangement of items in the work area. This should be planned so that, if there are dirty items, they are segregated from clean ones. The movement of the dirty items behind clean items should be minimized. Base your layout on a logical progression for each specific operation. In a complex situation, an ideal arrangement of equipment may not be achievable, so it may be necessary to compromise.

Good Technique

After the planning phase is complete, the start-up procedure can begin. Turn on the fluorescent lights and the blower motor and let the unit warm up for 5 minutes. After this period, thoroughly clean the stainless steel surface in the work area using a soft, lint free cloth and 70% alcohol.

Periodic cleaning of the plastic surfaces with an acrylic cleaner, available at all home supply or hardware stores, will minimize particle accumulation on these surfaces.

Using your checklist, collect all items for the procedure that will be placed inside the hood. Clean all of these items thoroughly before placing them into the work area. Keep the items at a comfortable distance away from the open front of the unit.

After all the items on the checklist have been arranged in the work area, the unit will have been in operation for at least 10 minutes. Wait an additional 5 minutes before beginning the procedure. This will allow sufficient time for the ultra-clean air passing over the work area to remove airborne contamination, especially particulate matter from the newly introduced items.

The operator is the critical factor in the successful performance of any BVBI Series Hood. It is dangerous to rely on the unit to do all of the work. When properly maintained and operated, the BVBI Series Hood will do an excellent job of controlling airborne contamination.

Prior to beginning work inside the hood, the operator should wash their hands and arms with germicidal soap. It is recommended that technicians working in the BVBI Series Hood wear Personal Protective Equipment (PPE) as per regulations. This will minimize the shedding of skin flora into the work area. Conventional laboratory coats with open cuffs allow the entrapment of contaminated air between the technician's wrist and forearms and the inside sleeves. This contaminated air can thus be introduced into the work area. Abrupt movements of forearms and hands should be avoided. Excessive activity in the room also creates disruptive air currents. Therefore, such activity should be held to a minimum or eliminated when work is being performed.

Maintenance

Prefilters

The prefilter is located horizontally on the bottom of the unit and should be kept in place at all times. The prefilter supplied with the unit is a fiberglass type similar to an air-conditioning filter. Once the unit has been placed into service, the prefilter should be inspected monthly. After it has been determined how long it takes for the prefilter to "load", it should be routinely inspected at this interval to determine if it should be replaced. After some experience is gained, you may prefer to select an arbitrary time to replace the prefilter. However, the prefilter should be changed at least once every 90 days. Replacement prefilters are available from Germfree and are usually a stock item. Please call Germfree Customer Service to order.

Blower Motor

The blower motors were selected because they have the following characteristics: low noise level, low vibration level, compatibility with the variable speed control, and most importantly, the efficiency in delivering air through clean HEPA filters as well as those loaded with a moderate amount of particulate matter. The 3-pronged grounded power cord can be plugged into a standard grounded receptacle. A 20 amp receptacles will be required for the 6 and 8' models.

The motor is located in the center of the blowers. It should rarely be necessary to work on the blower motor assembly. Before servicing the motors, the power cord must be disconnected or, if this is difficult to reach, the fuses should be removed.

Filter Diffuser

The HEPA filter is located behind the removable, perforated metal diffuser. Do not push items such as needles through the diffuser holes and do not hang items from any part of the diffuser. The diffuser should only be removed by your certifier and at that time it can be cleaned.

During routine cleaning, do not spray the diffuser with an aerosol or pump dispenser because you might spray the filter. If an occasional spray mist gets on the filter, it should dry and not cause a problem.

HEPA Filters

The average life of a HEPA filter is 3 to 5 years or longer, depending on the cleanliness of the ambient air. A loaded HEPA filter cannot be cleaned or recycled. New filters are available from the factory and we recommend that they be changed by qualified personnel. The filters are accessed from the top front of the unit.
Your certifier, using R.T.V. silicone sealant, can repair small holes or tears in the filter medium. The filter must be retested for leaks after any repair is made.

Acrylic Sides

The transparent acrylic sides of the work area are designed to provide optimal light in the work area. Many chemicals have an adverse effect on acrylic plastics. Never use gritty soaps or household cleansers such as Comet or Ajax. Acrylics are attacked by concentrated alcohols, strong solvents, chlorinated hydrocarbons and many aromatic hydrocarbons. They are also adversely affected by ultraviolet light.

Acrylic is unaffected by most inorganic solvents, mineral and animal oils, low concentrations of alcohols, paraffinic and olefinic hydrocarbons, amines, alkyl monohalides, esters containing more than ten carbon atoms, alkalines, no-oxidizing acids, salt water, photographic solutions and chemicals, petroleum oils and greases, household cleaning products and chemicals used in treating water. For cleaning, 50% Ethyl Alcohol, 70% Isopropyl Alcohol, or a 5% Clorox solution can be used. Do not use 95% or 70% Ethyl Alcohol, 99% Methyl Alcohol or ammonia based solutions (Windex).

Troubleshooting

This section is to be used as a general guideline. An independent certification agency or a qualified technician specializing in repairs and testing of this type of equipment must do any maintenance or repairs that need to be made.

Trouble	Possible Causes	Remedy
Air supply inoperative	Main switch off	Check main switch See that plug is in the electrical outlet Blue light switch should be on
No air circulation	Blower off	Check blower motor control
	Blown circuit breaker	Check circuit breaker on control panel
	Break in electrical wiring	Use electrical diagram and check wiring connections
Excessive blower vibration	Foreign matter in blower squirrel cage	Remove paper, paper clip, etc.
Exhaust Air Imbalance	Improper adjustment of blower motor control	Adjust to proper reading on pressure gauge – Contact certification company
	Obstruction of plenum	Remove obstruction
	Leak between blower and plenum	Repair leak – Contact certification company
	Filter loaded	Replace Filters – Contact certification company

Trouble	Possible Causes	Remedy
Low velocity air	Low voltage on house current	Measure voltage – contact certification company
	Filter loaded	Replace filters – contact certification company
	Improper adjustment of blower motor	Adjust to proper reading on pressure gauge – contact certification company
	Obstruction in plenum	Remove obstruction
	Leak between blower and plenum	Repair leak – contact certification company
High velocity air	Filter rupture	Replace Filters – Contact certification company
	Supply filter gasket leak	Find and repair leak – contact certification company
	Exhaust air outlet obstruction	Remove obstruction
	Improper adjustment of blower motor speed control	Adjust to proper reading on pressure gauge – contact certification company
Non-laminar airflow	Large object obstructing airflow	Remove item
	Large leak in supply filter	Replace Filters – Contact certification company

Certification / Testing Expectations

Your unit will need to be certified by an independent testing organization when the unit is installed and at least once a year after that for the duration of the hood's operation.

When your unit is first installed, a smoke test should be performed. The certifier can use a smoke tube in the operating room to find the optimal placement locations for the hood. Any turbulent air pockets or inconsistent airflow patterns can be detected by this test.

The hood should be placed in a location with a constant rate and pattern of dissipation of the smoke. This test will not be performed after the initial certification unless the airflow in the building has changed or you plan on moving the machine. During the initial certification, and every year after, two other tests will be performed. The first will be a filter integrity test. The certifier will pump a non-volatile solvent (such as dioctyl phthalate (DOP), polyalphaolefin (PAO) or equivalent) over time into the assembled unit on the upstream side of the HEPA filter. An aerosol photometer will be used to scan the downstream side for any aerosol droplets that might pass through or around the HEPA filter.

The second examination is an airflow test. Using a thermoanemometer or velometer, the certifier will verify that the airflow in the hood is uniform and unidirectional. A thermoanemometer uses a heated probe set in an airstream to determine air speed. The probe determines the heating power required to maintain the high probe temperature. This power is proportional to air speed. Alternatively, the velometer uses a probe that intakes air, and the force against the meter causes a deflection in the needle.

If your facility does not have a certifier, Germfree can assist in finding one in your area.

Parts List

The following list contains reorder information for parts included on the base model.
Germfree Part Numbers in Red

HEPA Filters	
BVBI-3SS	27" x 33" x 3" 375-1011-01
BVBI-4SS	27" x 45" x 3" 375-1011-00 A
BVBI-6SS	27" x 69" x 3" 375-1012-00 A
BVBI-8SS	2 @ 27" x 45" x 3" 375-1011-00 A
Prefilters	
BVBI-3SS	14½" x 31" x 1" 006-1019-00
BVBI-4SS	14½" x 31" x 1" 006-1019-00
BVBI-6SS	2 @ 14½" x 31" x 1" 006-1019-00
BVBI-8SS	2 @ 14½" x 31" x 1" 006-1019-00
Motor / Blower	
BVBI-3SS	3/4 Hp, 1450 rpm, 7.7 Amp Double Motor # 7024-1351 (permanent split capacitor) 182-0008-00
BVBI-4SS	
BVBI-6SS	2 @ 3/4 Hp, 1450 rpm, 7.7 Amp Double Motor # 7024-1351 (permanent split capacitor) 182-0008-00
BVBI-8SS	
Power Cord	
All Models	Molded three prong, 8' gray cord # 17510A 583-0018-00

Switches	
All Models	Qty. (2) Rocker, single pole, single throw (on/off) Carlingswitch # LRGSEK221C, UL & CSA approved 170-0030-00 A
Circuit Breaker	
BVBI-3SS	15 Amp Potter & Brumfield # W58XB1A4A-15, CSA approved 163-0066-00 A
BVBI-4SS	
BVBI-6SS	20 Amp Potter & Brumfield # W58XB1A4A-20, CSA approved 163-0063-00 A
BVBI-8SS	
Speed Control	
All Models	15 Amp. -KB Electronics # KBWC115NS, UL approved 332-0014-00 A
Lighting	
BVBI-3SS	Fluorescent lights 22" bulb 147-4016-00 A (Commonly available at hardware stores and online)
BVBI-4SS	Fluorescent lights 34" bulb 147-4006-00 A (Commonly available at hardware stores and online)
BVBI-6SS	Fluorescent lights 46" bulb 147-4021-00 1 (Commonly available at hardware stores and online)
BVBI-8SS	Fluorescent lights 2 @ 34" bulb 147-4006-00 A (Commonly available at hardware stores and online)

Fluorescent Ballast	
All Models	Advance Transformer Ballast #1CN-2P32-SC35M 147-5016-00 A
	Lamp Holders — (4) Leviton # 11357-N 147-4017-00 A

Service Log

Date	Service Provided

Quality Statement

Accountability
We will deliver our products on time, as promised, and free from defects.

Ownership
We will strive to exceed expectations at every level and we will work to make sure that each customer is satisfied with the service that they receive.

Longevity
All of our products are constructed from the highest quality materials and are designed to operate reliably for decades. We stand behind our work and take pride in our superior craftsmanship.

Our Company

Germfree has been a leading innovator in aseptic control and isolation systems since 1962.

We design and manufacture a diverse range of equipment and facilities for life science applications.

Our systems are integral to critical processes across many sectors. We specialize in complex projects and custom applications that serve the rigorous demands of our clients. Our high-specification bioGO Modular Facilities operate across the world, and are sustainable as permanent facilities in remote regions with harsh conditions.

Germfree's Mission

Creating Environments that Serve Life Science Innovation and Advance Global Health

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Germfree

Appendix A
Line Drawings

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	INITIAL RELEASE	12/19/14	JTP

NOTES:

CONSTRUCTION:

- 12–16 GA MATERIAL
- TYPE 304 SS, #4 POLISHED

CONTROL PANEL:

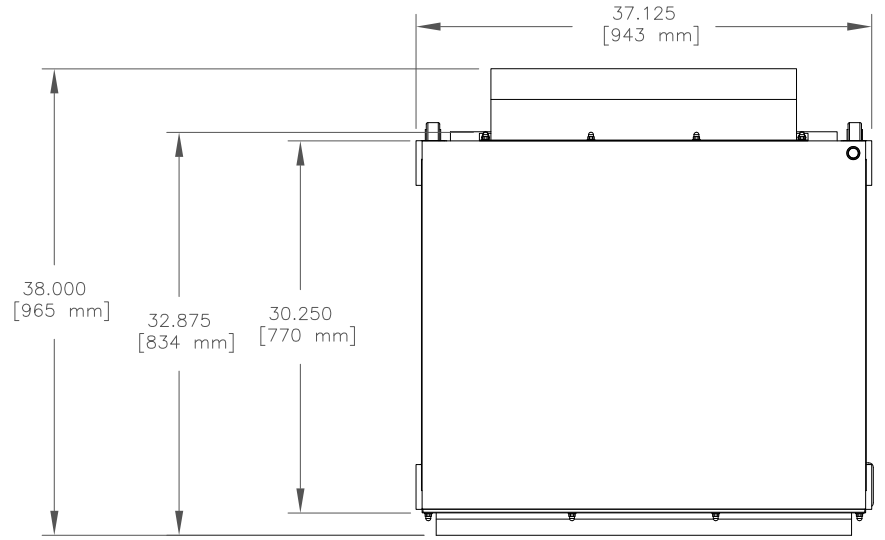
- 1x MAGNEHELIC (PRESSURE GAUGE)
- 1x MAIN POWER SWITCH (15 AMP BREAKER)
- 1x LIGHT SWITCH (2 AMP BREAKER)

FILTER SYSTEM:

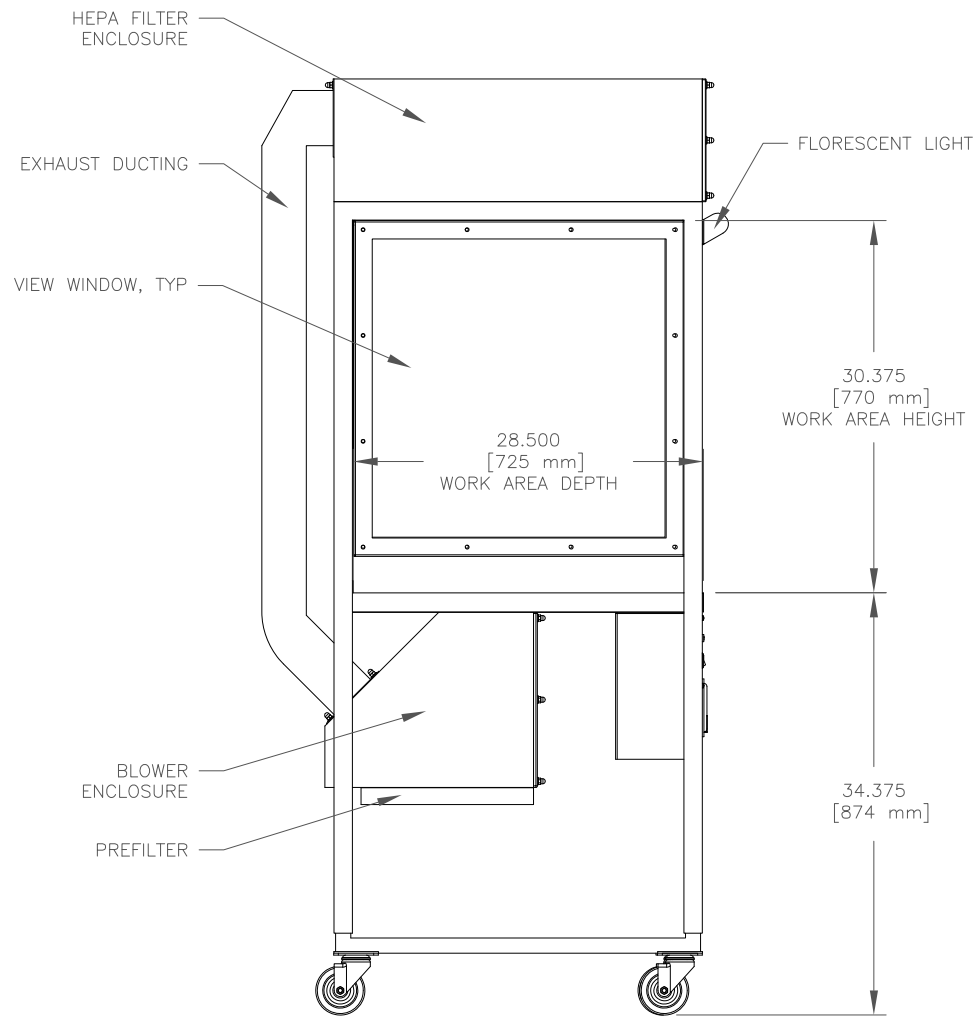
- 1x HEPA FILTER, 33 X 27 X 3 [838 X 686 X 76 mm]

POWER REQUIREMENTS:

- UNIT REQUIRES A DEDICATED SINGLE PHASE CIRCUIT.



TOP VIEW



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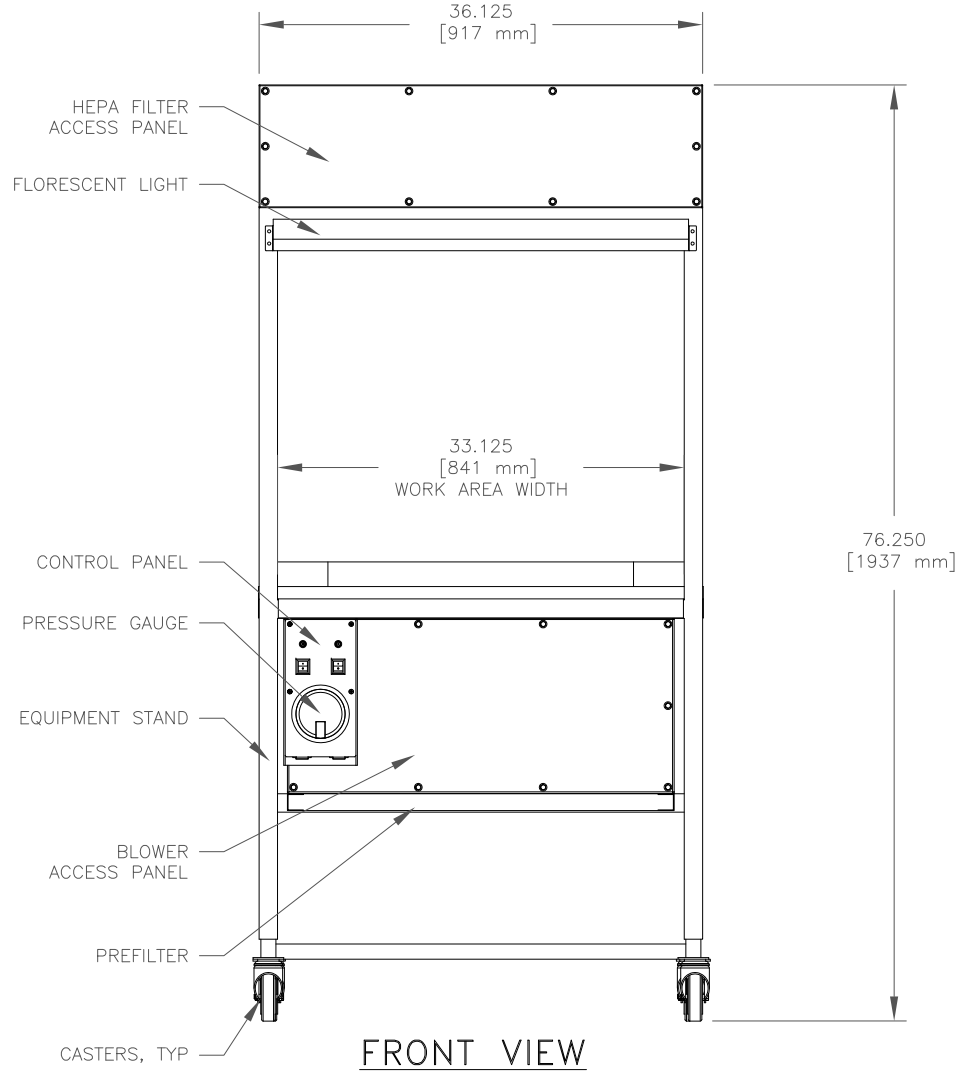

FRONT VIEW

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REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	INITIAL RELEASE	12/19/14	JTP

NOTES:

CONSTRUCTION:

- 12–16 GA MATERIAL
- TYPE 304 SS, #4 POLISHED

CONTROL PANEL:

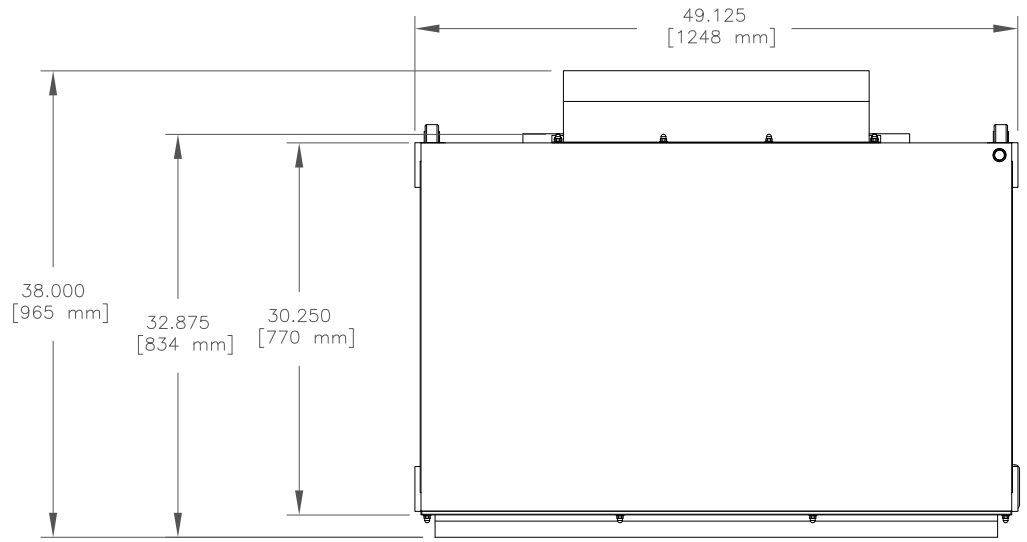
- 1x MAGNEHELIC (PRESSURE GAUGE)
- 1x MAIN POWER SWITCH (15 AMP BREAKER)
- 1x LIGHT SWITCH (2 AMP BREAKER)

FILTER SYSTEM:

- 1x HEPA FILTER, 45 X 27 X 3 [1143 X 686 X 76 mm]

POWER REQUIREMENTS:

- UNIT REQUIRES A DEDICATED SINGLE PHASE CIRCUIT.



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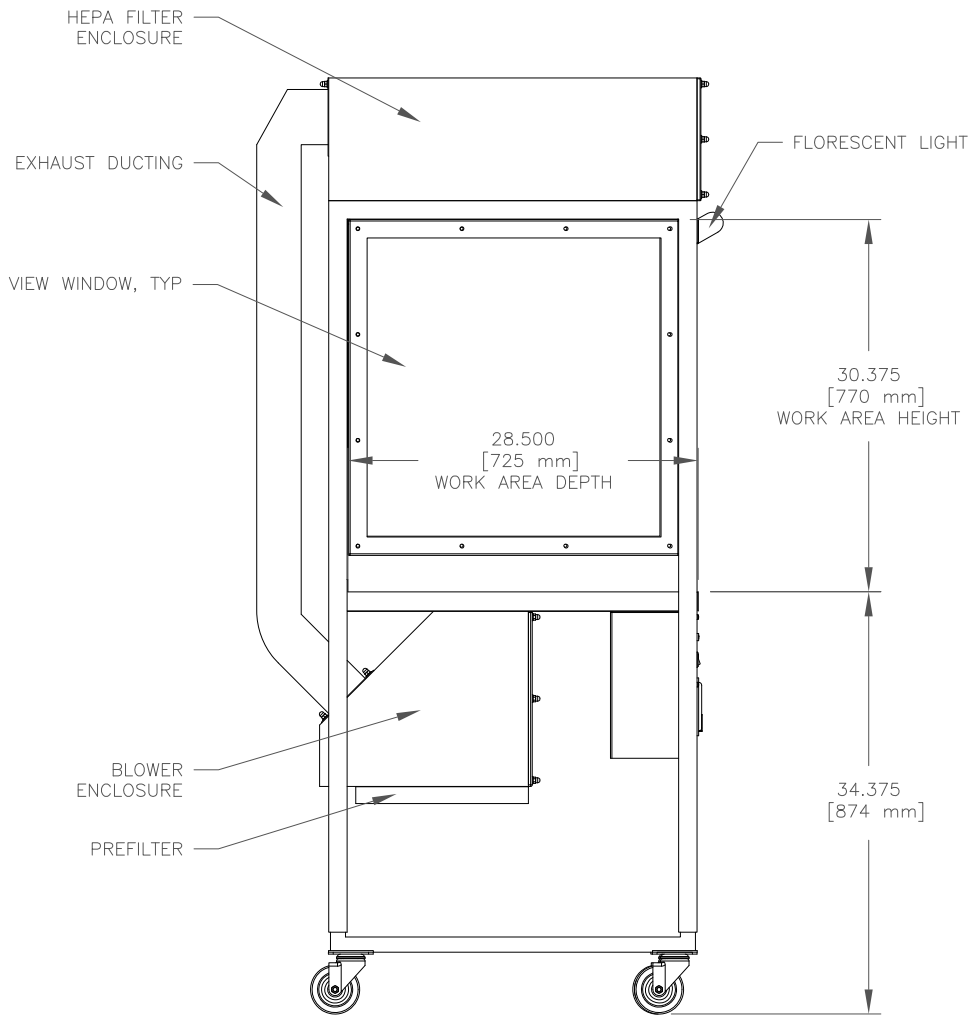

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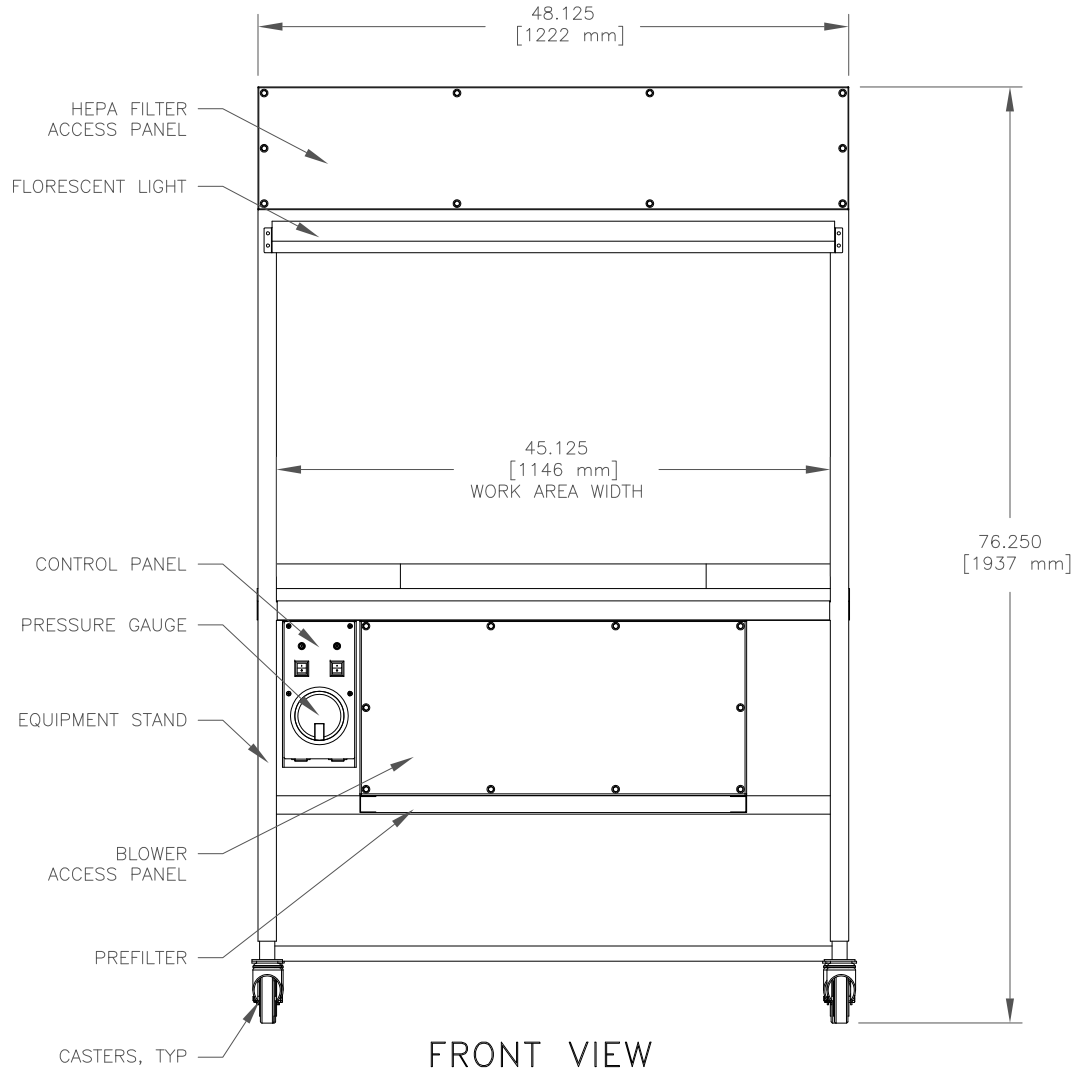

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PARTS LIST:		MATERIAL	
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Germfree Laboratories

LAMINAR FLOW, BV–4, 4FT, MODEL UPDATE

DRAWING NO. 615–0004–00 REV. 1

SCALE NTS FILE NO. SHEET 1 OF 1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	INITIAL RELEASE	12/19/14	JTP

NOTES:

CONSTRUCTION:

- 12–16 GA MATERIAL
- TYPE 304 SS, #4 POLISHED

CONTROL PANEL:

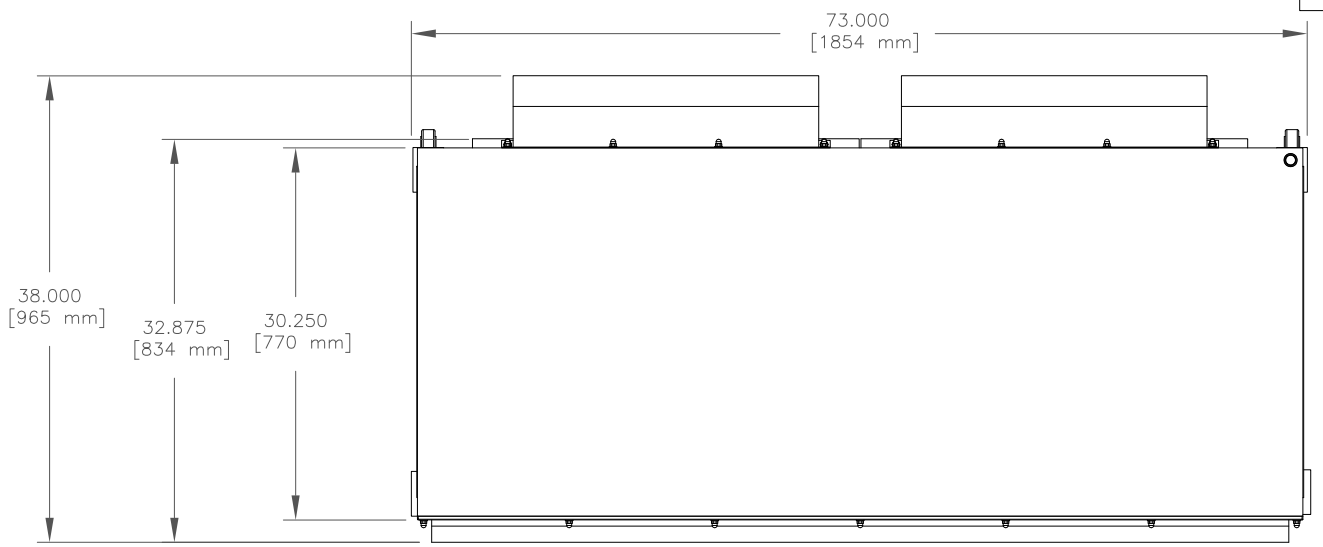
- 1x MAGNEHELIC (PRESSURE GAUGE)
- 1x MAIN POWER SWITCH (15 AMP BREAKER)
- 1x LIGHT SWITCH (2 AMP BREAKER)

FILTER SYSTEM:

- 1x HEPA FILTER, 69 X 27 X 3 [1753 X 686 X 76 mm]

POWER REQUIREMENTS:

- UNIT REQUIRES A DEDICATED SINGLE PHASE CIRCUIT.



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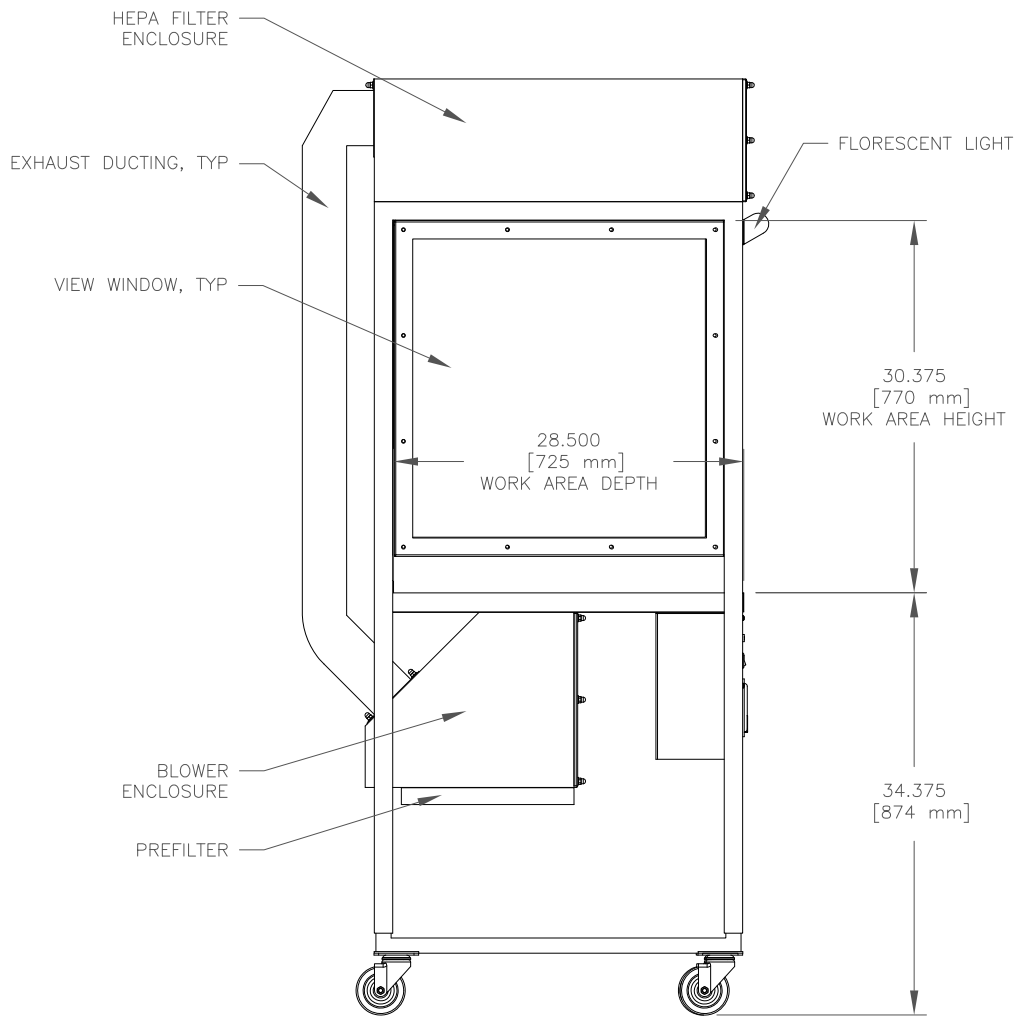

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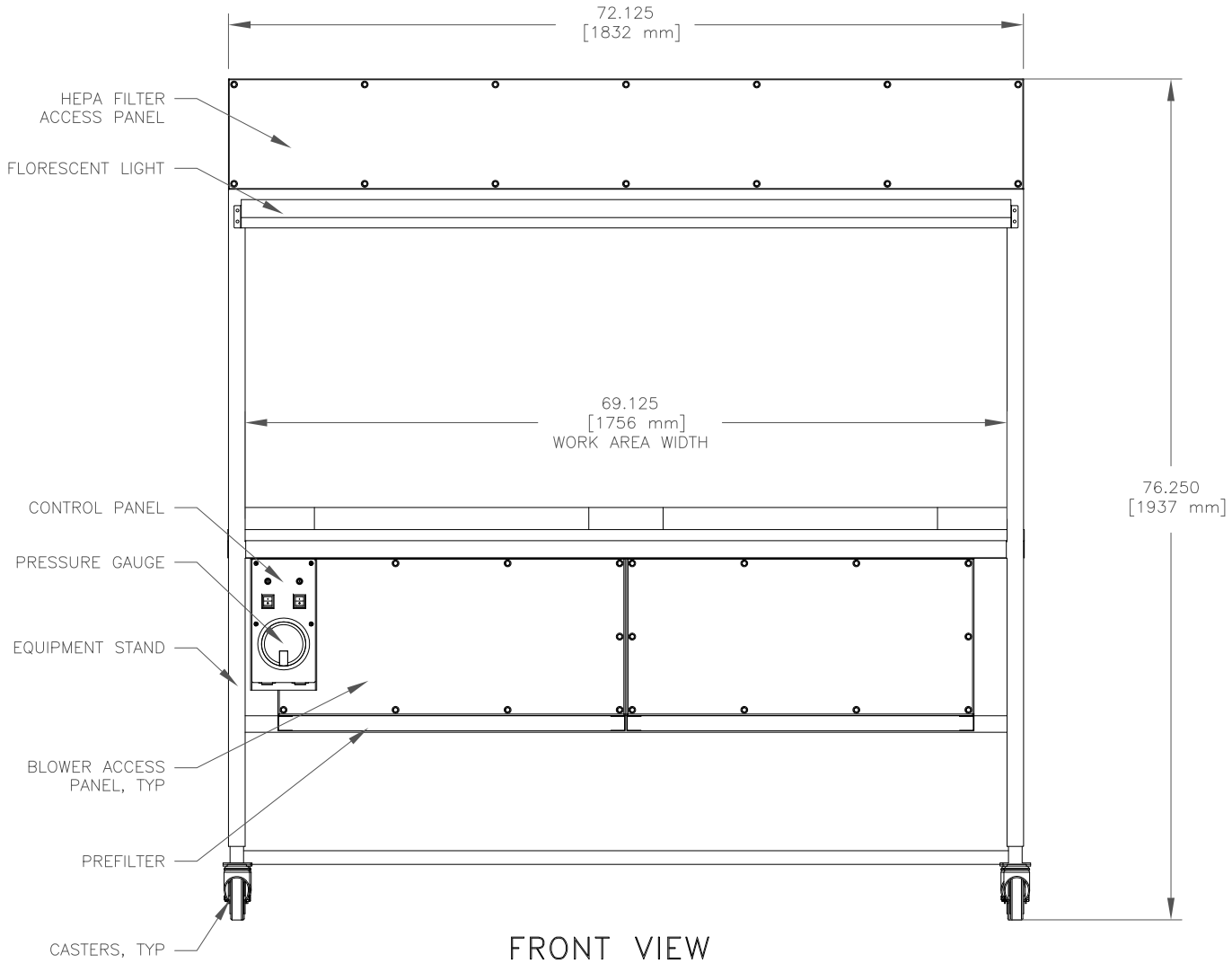

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Germfree Laboratories

LAMINAR FLOW, BV–6, 6FT, MODEL UPDATE

DRAWING NO. 615–0005–00 REV. 1

SCALE NTS FILE NO. SHEET 1 OF 1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
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NOTES:

CONSTRUCTION:

- 12–16 GA MATERIAL
- TYPE 304 SS, #4 POLISHED

CONTROL PANEL:

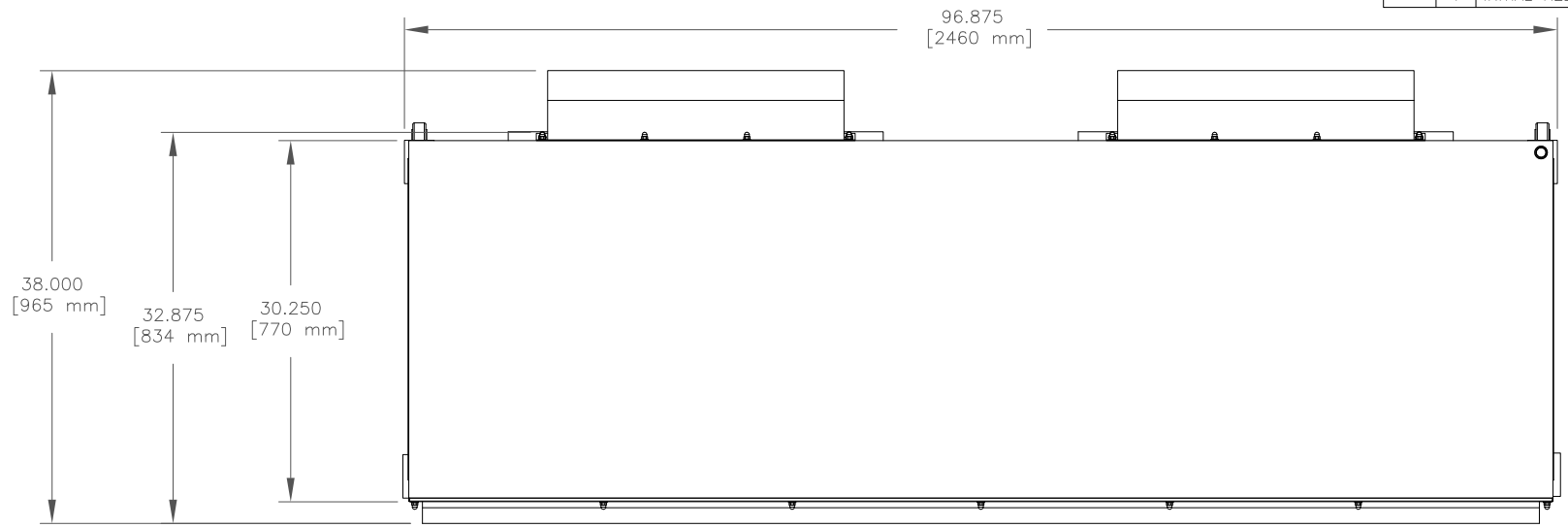
- 1x MAGNEHELIC (PRESSURE GAUGE)
- 1x MAIN POWER SWITCH (15 AMP BREAKER)
- 1x LIGHT SWITCH (2 AMP BREAKER)

FILTER SYSTEM:

- 1x HEPA FILTER, 93 X 27 X 3 [2362 X 686 X 76 mm]

POWER REQUIREMENTS:

- UNIT REQUIRES A DEDICATED SINGLE PHASE CIRCUIT.



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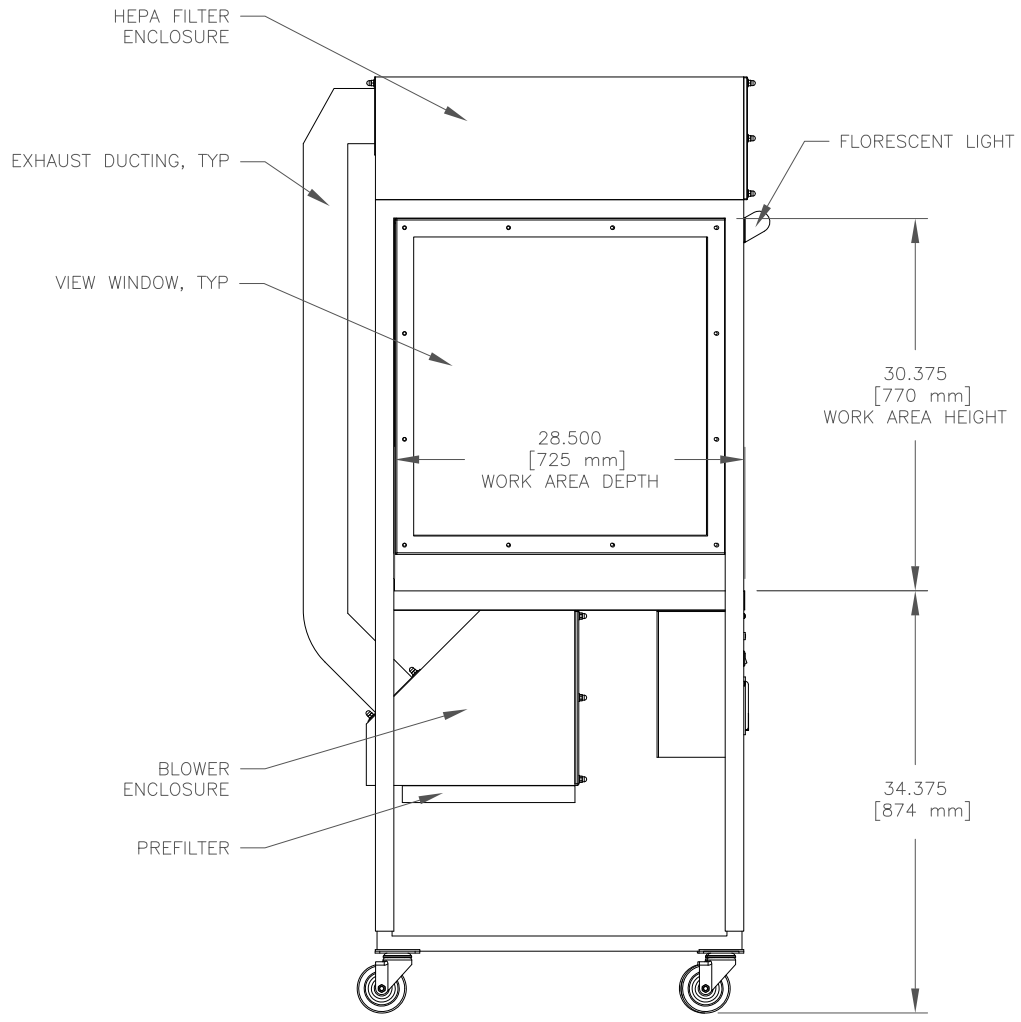

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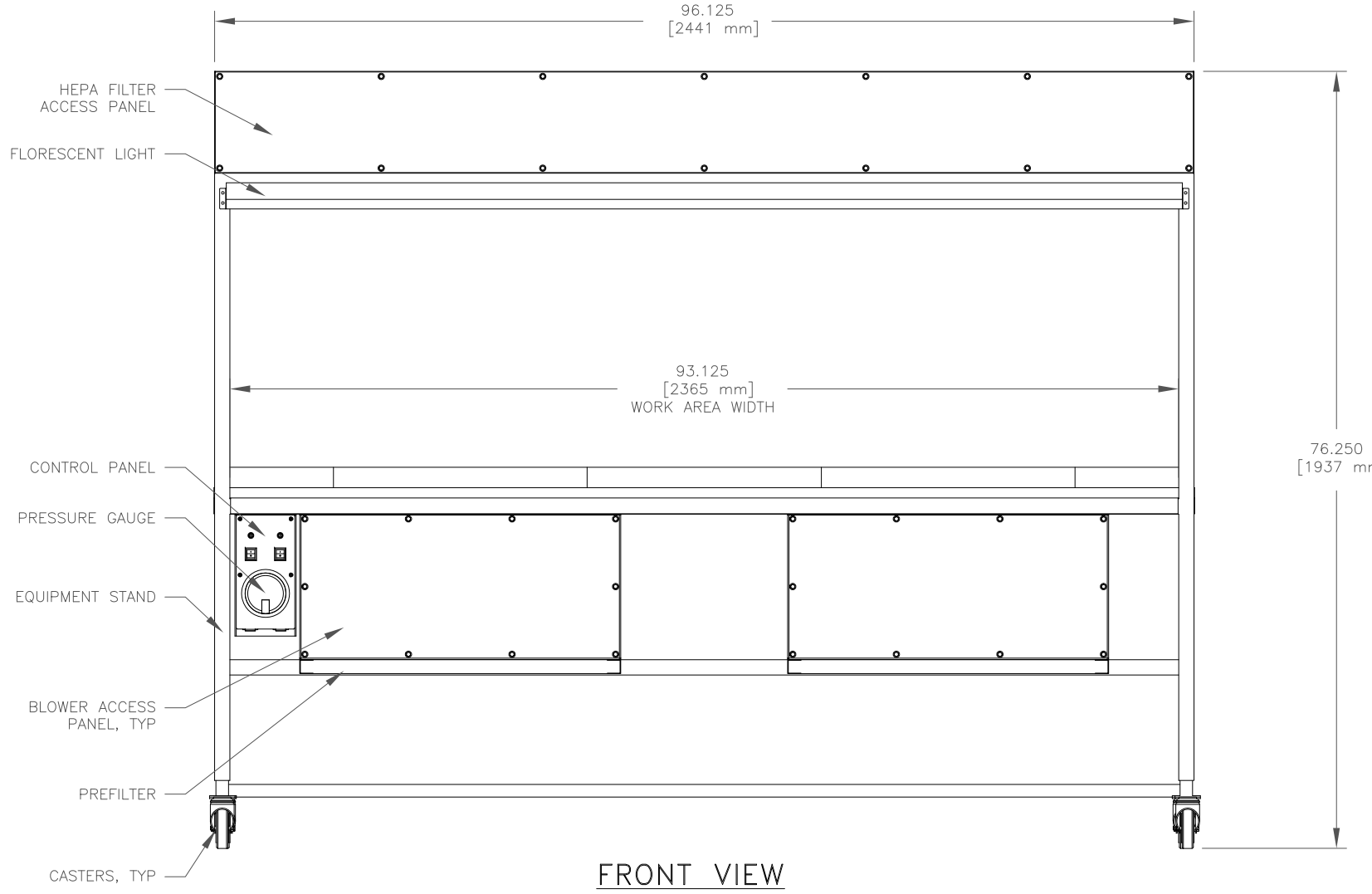

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Appendix B
Wiring Diagrams

REVISIONS				
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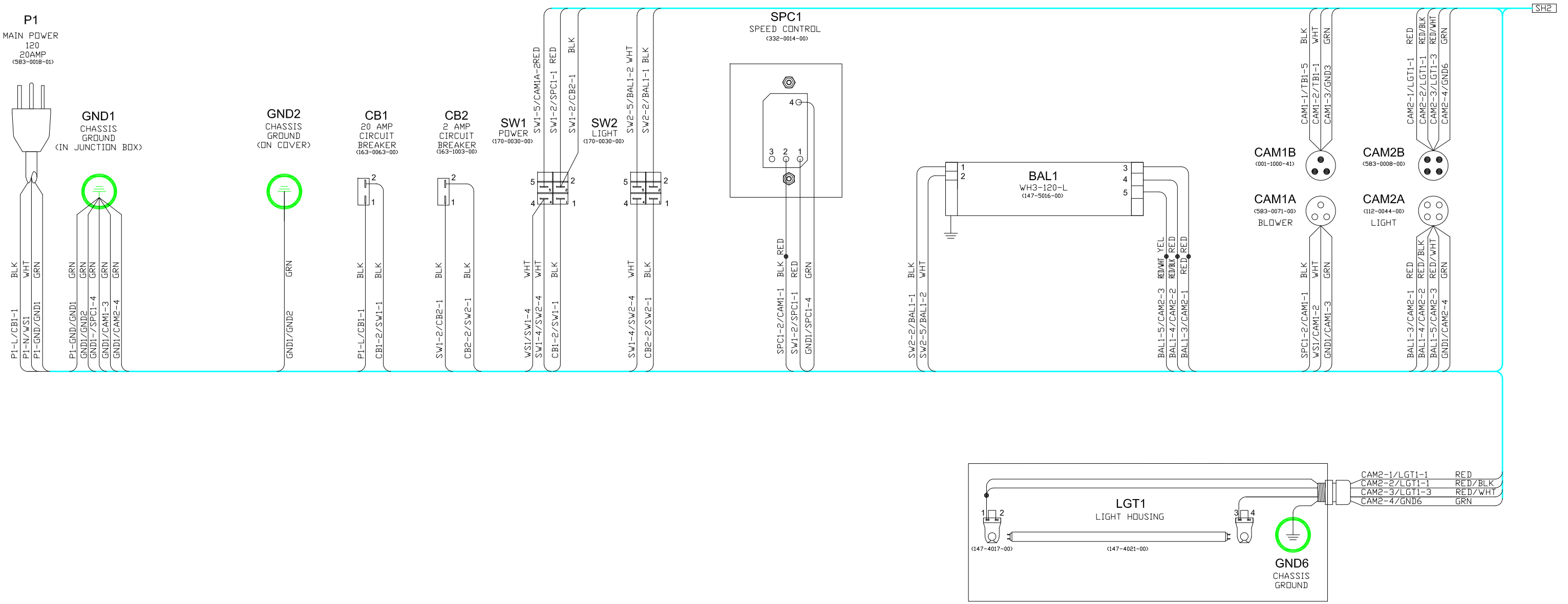


NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	P-BVBI-6,L-BVBI-6

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

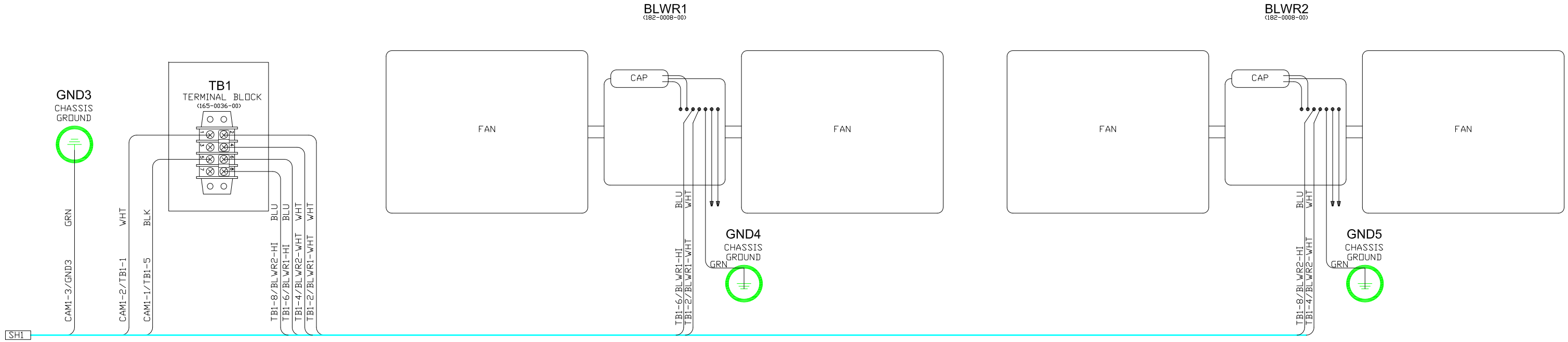
Germfree Laboratories

WIRING DIAGRAM, BVBI w/MAGNEHELIC, 6FT

DRAWING NO.	REV.
906-1497-00	1

SCALE N/A | FILE NO. | SHEET 1 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1–1/SW1–1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBI–6SS

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

Germfree Laboratories

WIRING DIAGRAM, BVBI w/MAGNEHELIC, 6FT

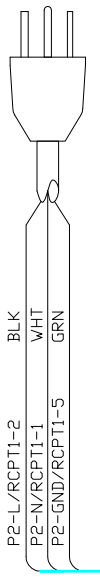
DRAWING NO.	REV.
906–1497–00	1

SCALE	FILE NO.	SHEET
N/A		2 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ

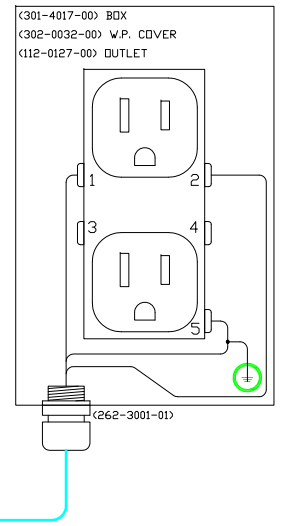
P2

RECEPTACLE
120V
15AMP
(OPTIONAL)
(583-0018-00)



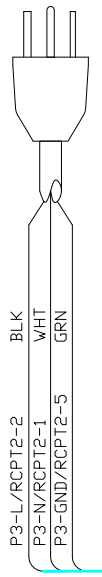
RCPT1

RECEPTACLE
120V



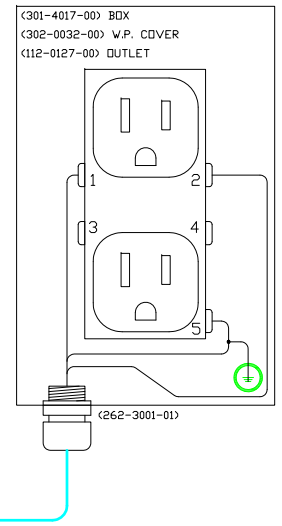
P3

RECEPTACLE
120V
15AMP
(OPTIONAL)
(583-0018-00)



RCPT2

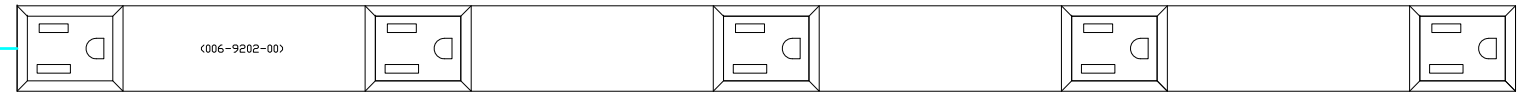
RECEPTACLE
120V



P4

POWER STRIP
120V
15AMP
(OPTIONAL)
(583-0018-00)

NUMBER OF OUTLETS ON POWER STRIP CAN VARY



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBIA2-LT/RT,BV-E

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

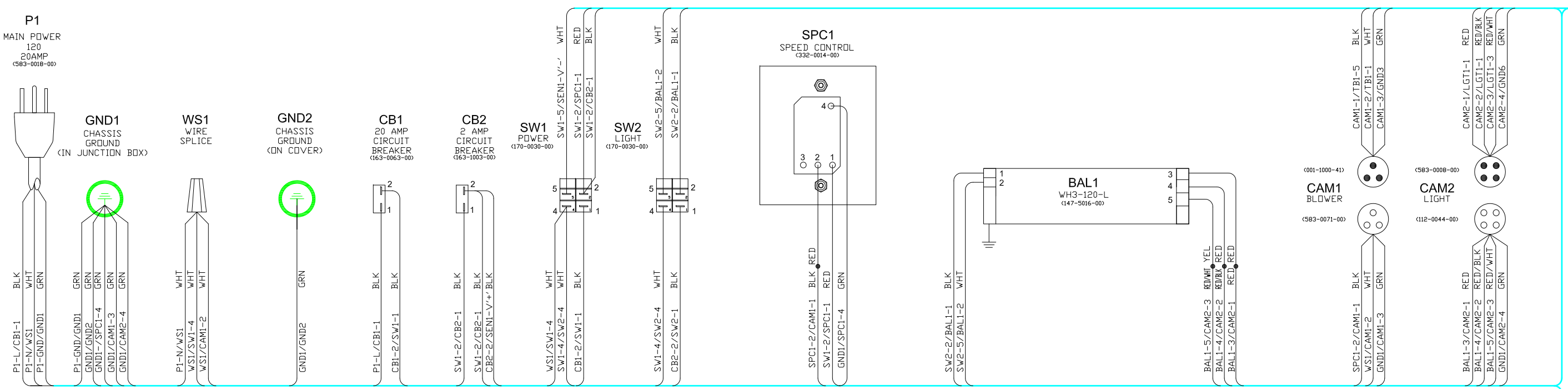
Germfree Laboratories

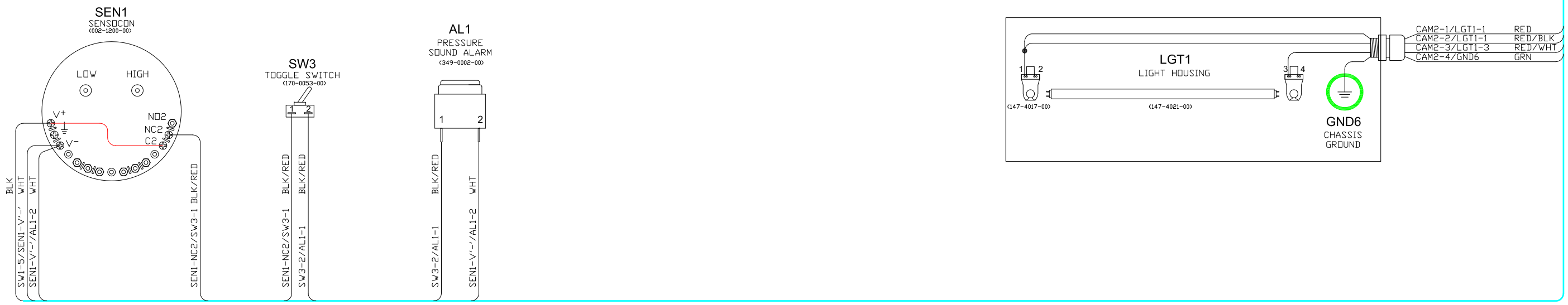
WIRING DIAGRAM, BVBI w/MAGNEHELIC, 6FT

DRAWING NO.	REV.
906-1497-00	1

SCALE	FILE NO.	SHEET
N/A		3 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ





NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	P/L-BVBI-6,W/SE

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

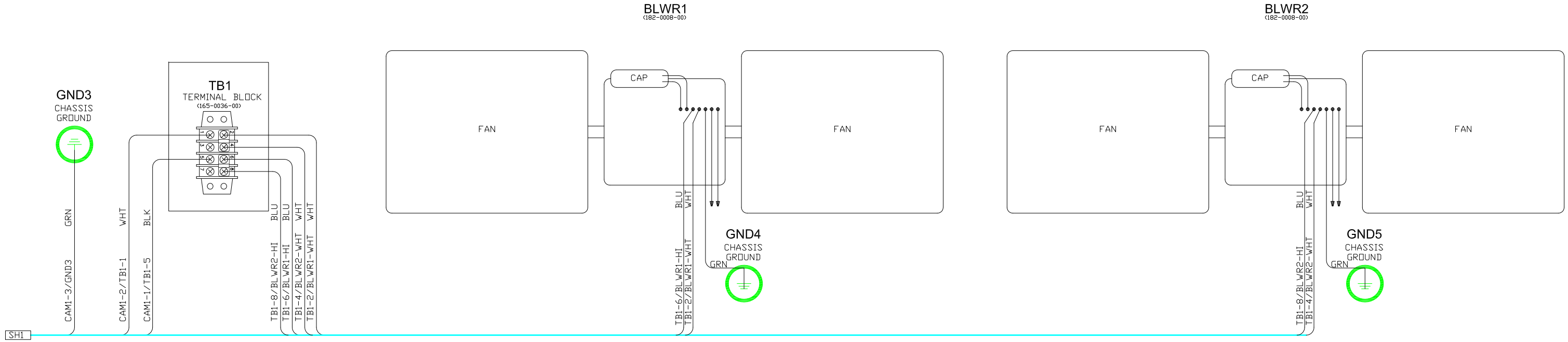
Germfree Laboratories

WIRING DIAGRAM, BVBI w/SENSOCON, 6FT

DRAWING NO.	REV.
906-1498-00	1

SCALE N/A | FILE NO. | SHEET 1 OF 4

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1–1/SW1–1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

APPROVAL DRAWING

NO CHANGES

CUSTOMER SIGNATURE:

APPROVED WITH CHANGES

CUSTOMER SIGNATURE:

REJECTED WITH MARK–UPS

CUSTOMER SIGNATURE:

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBI–6SSS

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

Germfree Laboratories

WIRING DIAGRAM, BVBI w/SENSOCON, 6FT

DRAWING NO.	REV.
906–1498–00	1

SCALE	FILE NO.	SHEET
N/A		2 OF 4

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ

P2

RECEPTACLE
120V
(OPTIONAL)
(583-0018-00)

P2-L/RCPT1-2 BLK
P2-N/RCPT1-1 WHT
P2-GND/RCPT1-5 GRN

RCPT1

RECEPTACLE
120V

(301-4017-00) BOX
(302-0032-00) W.P. COVER
(112-0127-00) OUTLET

1 2 3 4 5

(262-3001-01)

P3

RECEPTACLE
120V
(OPTIONAL)
(583-0018-00)

P3-L/RCPT2-2 BLK
P3-N/RCPT2-1 WHT
P3-GND/RCPT2-5 GRN

RCPT2

RECEPTACLE
120V

(301-4017-00) BOX
(302-0032-00) W.P. COVER
(112-0127-00) OUTLET

1 2 3 4 5

(262-3001-01)

P4

POWER STRIP
120V
(OPTIONAL)
(583-0018-00)

P4-L/OUTLETS-L BLK
P4-N/OUTLETS-N WHT
P4-GND/OUTLETS-GND GRN

NUMBER OF OUTLETS ON POWER STRIP CAN VARY

(006-9202-00)

NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

APPROVAL DRAWING

NO CHANGES

CUSTOMER SIGNATURE:

APPROVED
WITH CHANGES

CUSTOMER SIGNATURE:

REJECTED WITH
MARK-UPS

CUSTOMER SIGNATURE:

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBIA2-LT/RT,BV-E

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

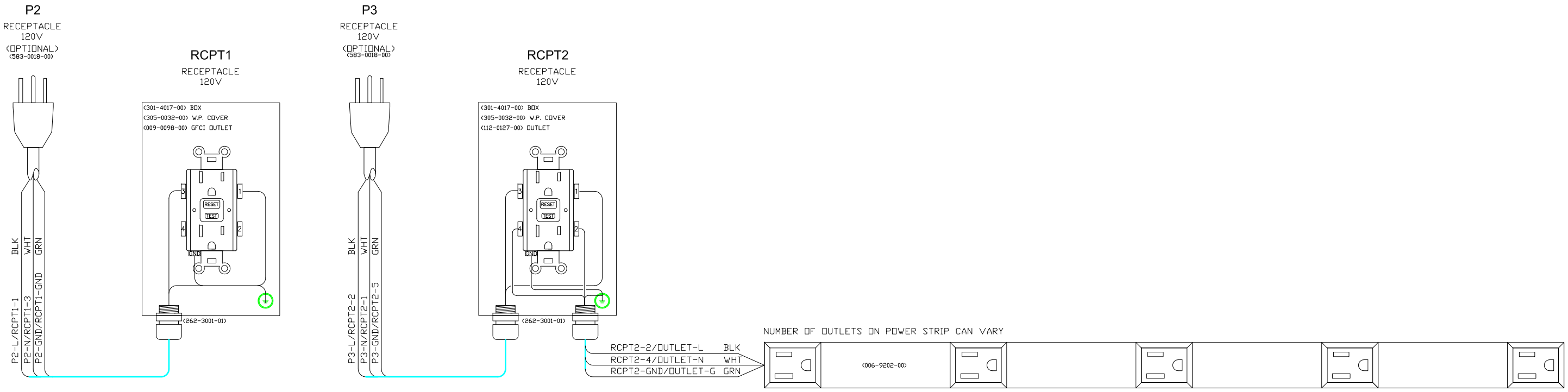
Germfree Laboratories

WIRING DIAGRAM, BVBI w/SENSOCON, 6FT

DRAWING NO.	REV.
906-1498-00	1

SCALE	FILE NO.	SHEET
N/A		3 OF 4

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1–1/SW1–1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"
2. NOTE GFCI TERMINALS 1 AND 3 ARE THE LINE SIDE OF THE GFCI. TERMINALS 2 AND 4 ARE THE LOAD SIDE OF THE GFCI. POWER STRIP IS GFCI PROTECTED FROM THE LOAD SIDE OF RCPT2.

APPROVAL DRAWING

☐ NO CHANGES
CUSTOMER SIGNATURE:

☐ APPROVED WITH CHANGES
CUSTOMER SIGNATURE:

☐ REJECTED WITH MARK–UPS
CUSTOMER SIGNATURE:

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

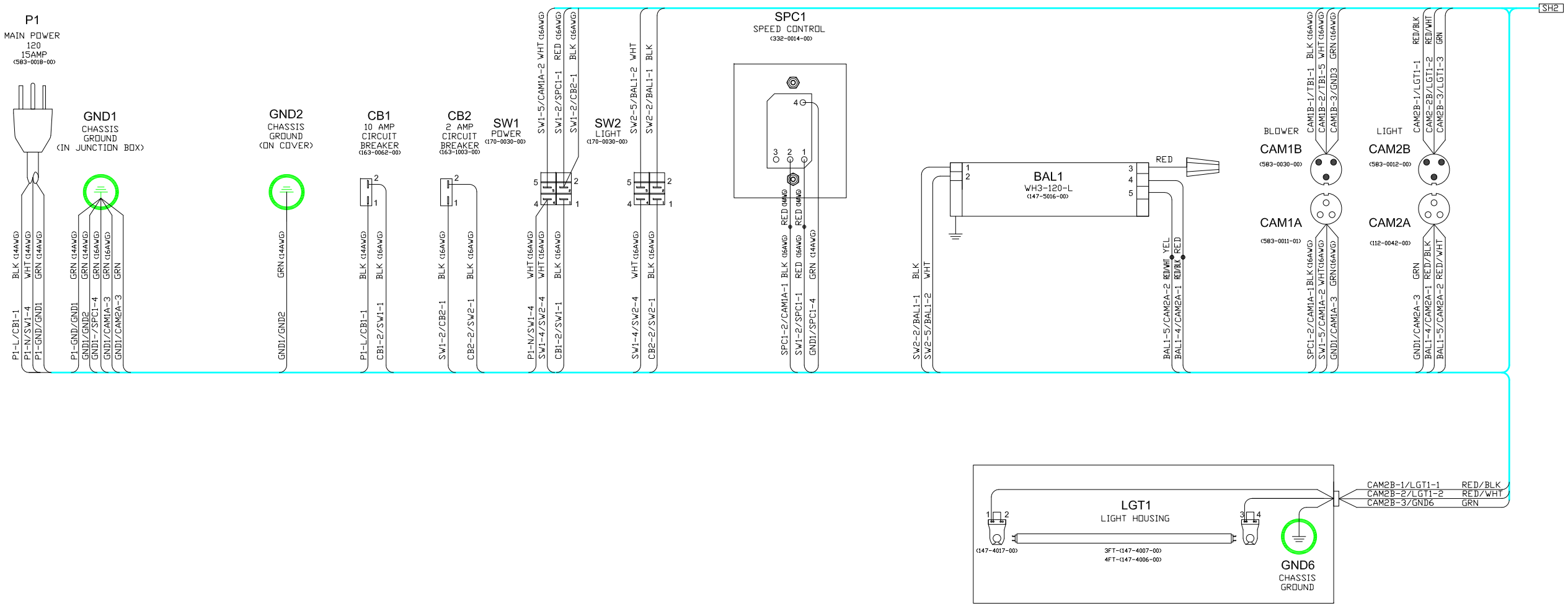
Germfree Laboratories

WIRING DIAGRAM, BVBI w/SENSOCON, 6FT

DRAWING NO.	REV.
906–1498–00	1

SCALE N/A | FILE NO. | SHEET 4 OF 4

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"
2. ALL WIRES 18 AWG UNLESS NOTED OTHERWISE EX. (16 AWG)

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	P-BVBI-3SSRX/4SS

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL: N/A	
FINISH: N/A	

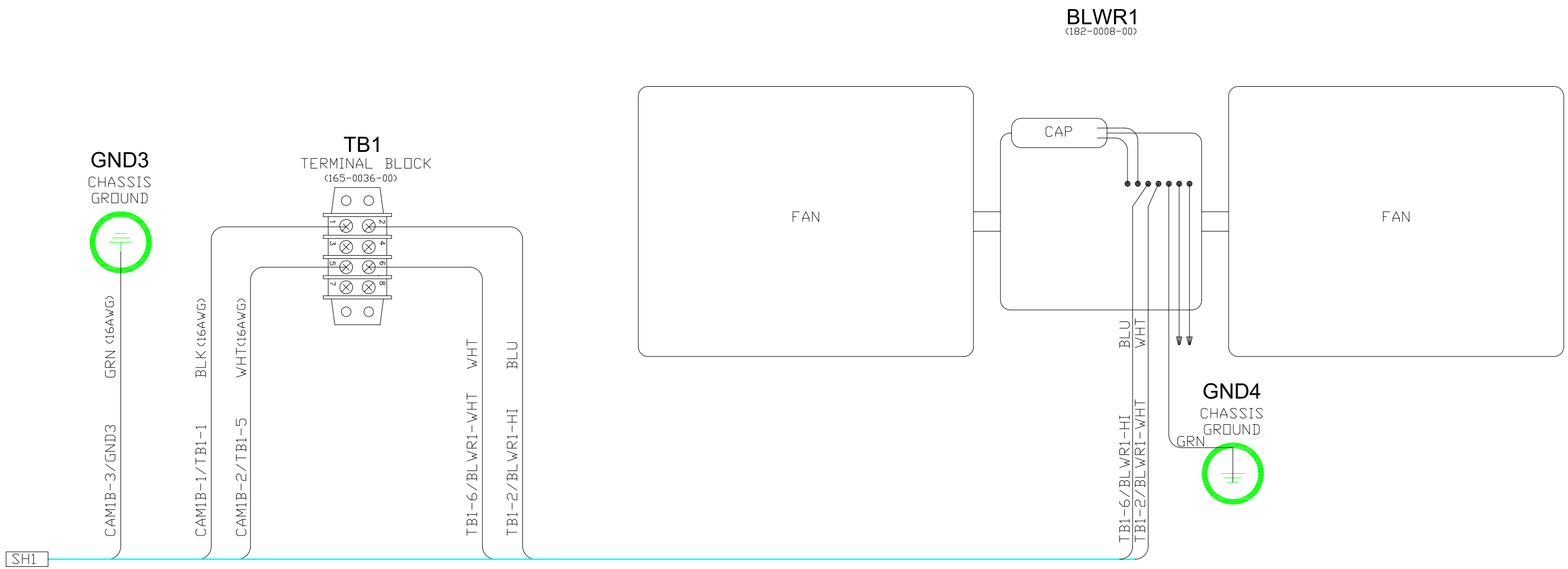
Germfree Laboratories

WIRING DIAGRAM, BVBI W/MAGNEHELIC, 3-4FT
99999-GERMFREE

DRAWING NO.	REV.
906-1554-00	1

SCALE	FILE NO.	SHEET
N/A		1 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"
2. ALL WIRES 18 AWG UNLESS NOTED OTHERWISE EX. (16 AWG)

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBI-3SS/4SS

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

Germfree Laboratories

WIRING DIAGRAM, BVBI W/MAGNEHELIC, 3-4FT
99999-GERMFREE

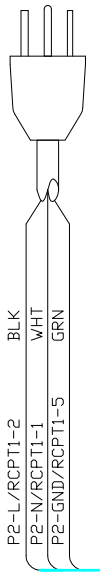
DRAWING NO.	REV.
906-1554-00	1

SCALE	FILE NO.	SHEET
N/A		2 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ

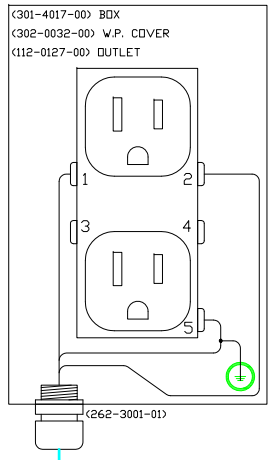
P2

RECEPTACLE
120V
15AMP
(OPTIONAL)
(583-0018-00)



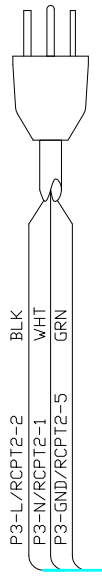
RCPT1

RECEPTACLE
120V



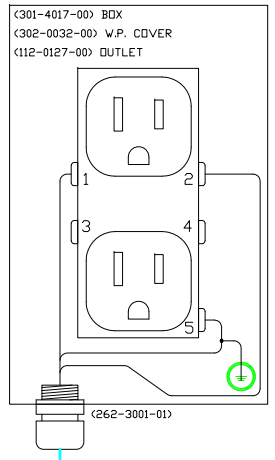
P3

RECEPTACLE
120V
15AMP
(OPTIONAL)
(583-0018-00)



RCPT2

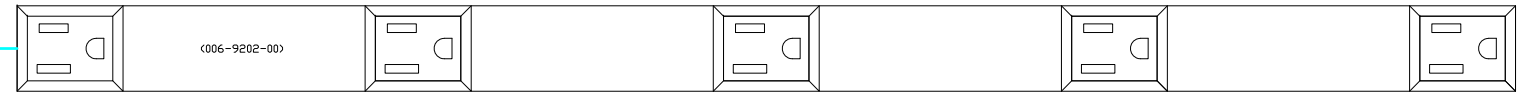
RECEPTACLE
120V



P4

POWER STRIP
120V
15AMP
(OPTIONAL)
(583-0018-00)

NUMBER OF OUTLETS ON POWER STRIP CAN VARY



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

2. ALL WIRES 18 AWG UNLESS NOTED OTHERWISE EX. (16 AWG)

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBIA2-LT/RT,BV-E

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

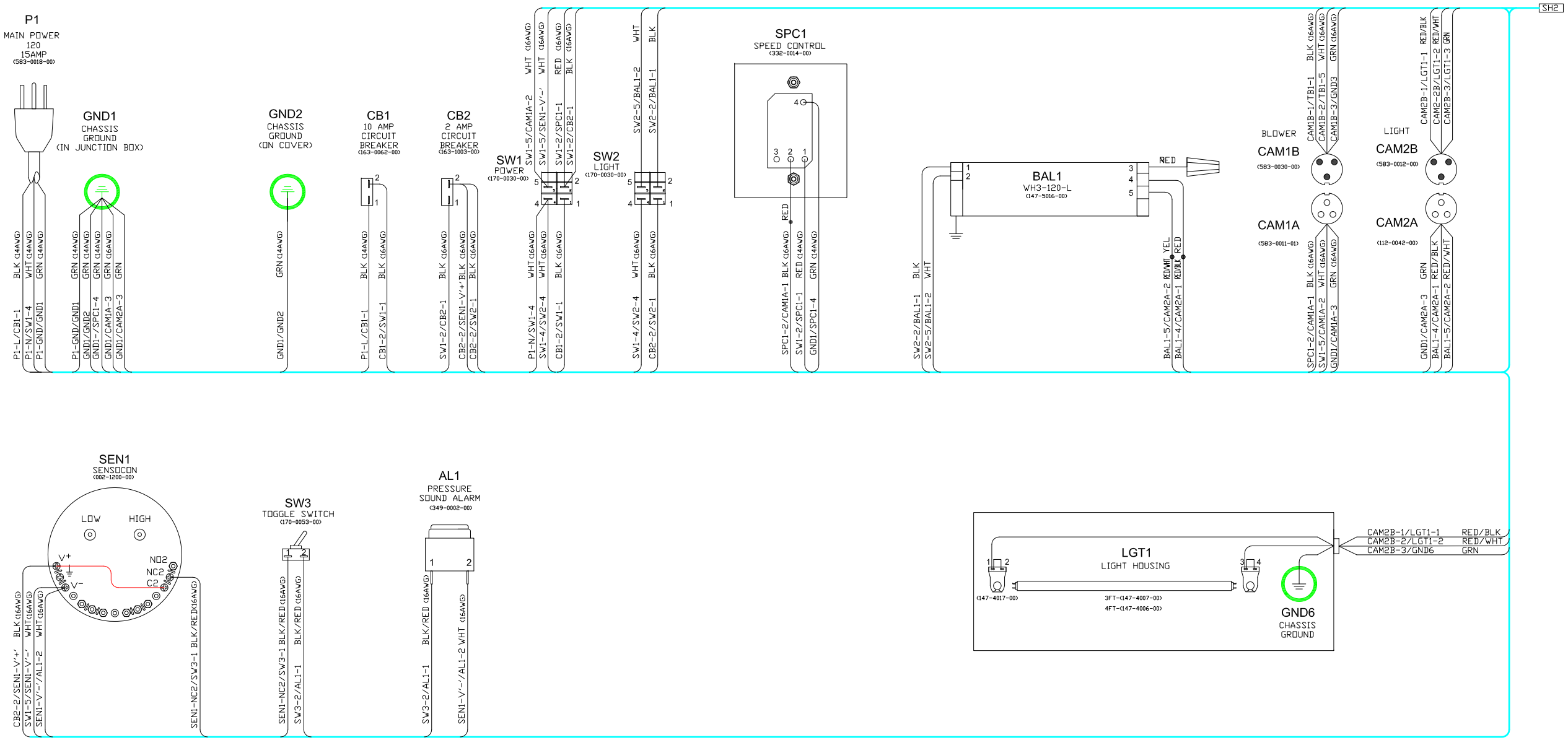
Germfree Laboratories

WIRING DIAGRAM, BVBI W/MAGNEHELIC, 3-4FT
99999-GERMFREE

DRAWING NO.	REV.
906-1554-00	1

SCALE	FILE NO.	SHEET
N/A		3 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"
2. ALL WIRES 18 AWG UNLESS NOTED OTHERWISE EX. (16 AWG)

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	P/L-BVBI-3/4,W/SE

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL: N/A	
FINISH: N/A	

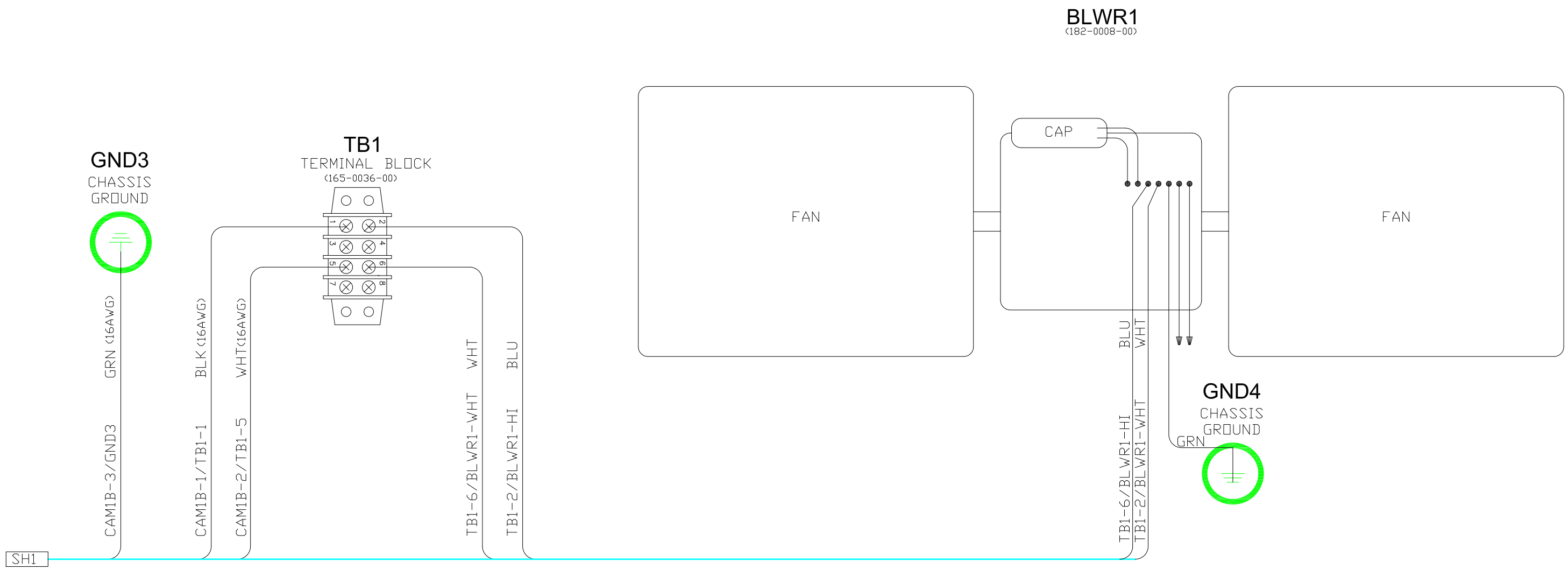
Germfree Laboratories

WIRING DIAGRAM, BVBI W/SENSOCON, 3-4FT
99999-GERMFREE

DRAWING NO. 906-1555-00 REV. 1

SCALE N/A FILE NO. SHEET 1 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"
2. ALL WIRES 18 AWG UNLESS NOTED OTHERWISE EX. (16 AWG)

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBI-3/4SS

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL: N/A	
FINISH: N/A	

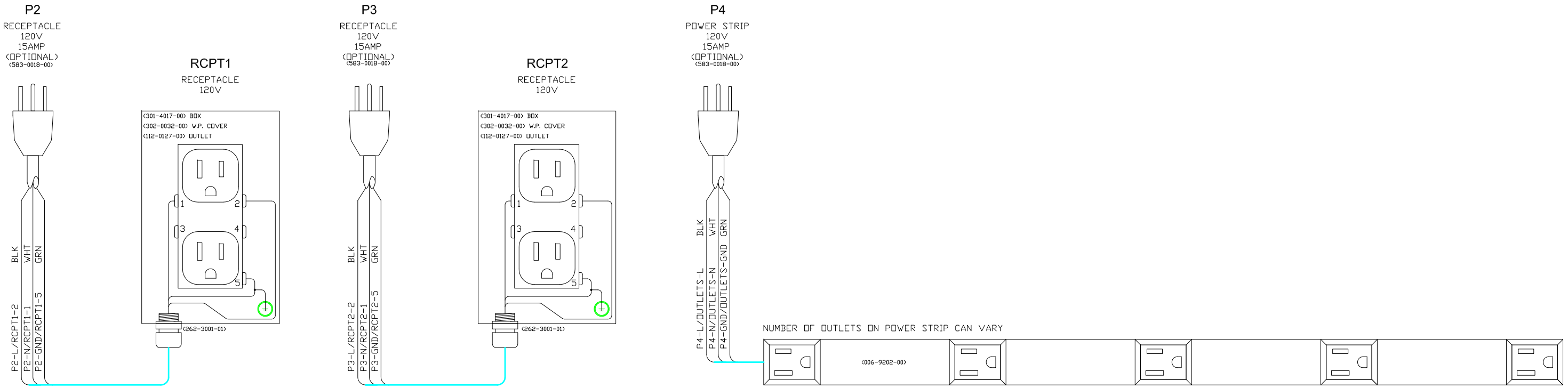
Germfree Laboratories

WIRING DIAGRAM, BVBI W/SENSOCON, 3-4FT
99999-GERMFREE

DRAWING NO.	REV.
906-1555-00	1

SCALE	FILE NO.	SHEET
N/A		2 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1–1/SW1–1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

2. ALL WIRES 18 AWG UNLESS NOTED OTHERWISE EX. (16 AWG)

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBIA2–LT/RT,BV–E

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

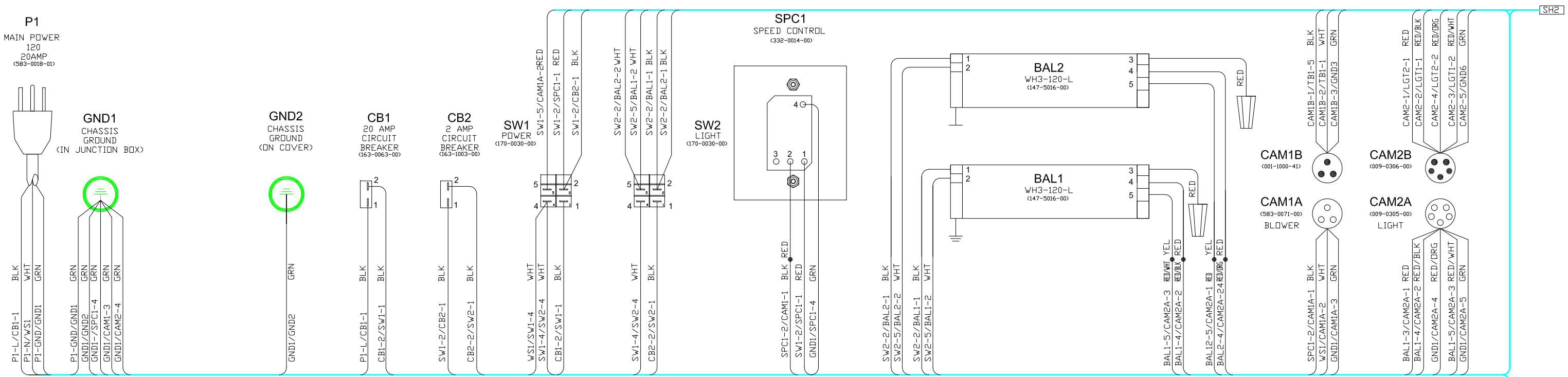
Germfree Laboratories

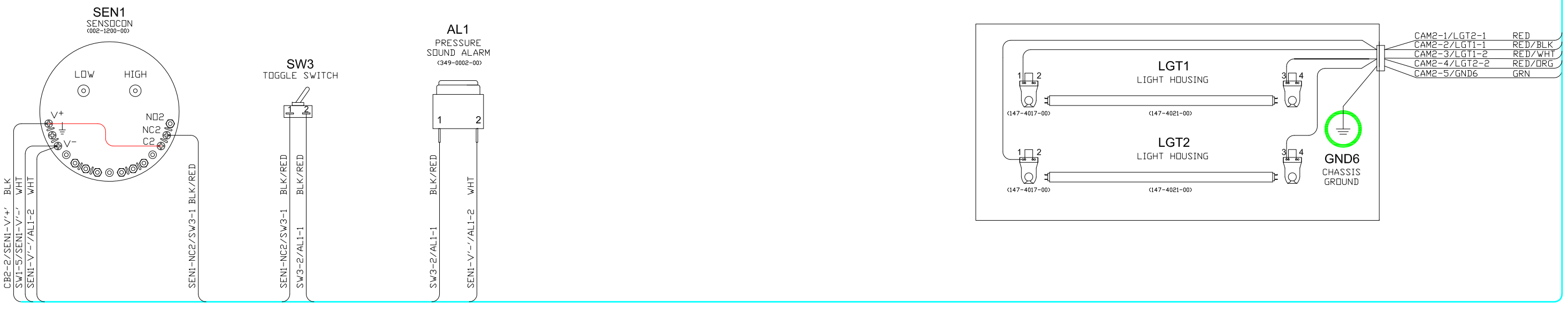
WIRING DIAGRAM, BVBI W/SENSOCON, 3–4FT
99999–GERMFREE

DRAWING NO.	REV.
906–1555–00	1

SCALE	FILE NO.	SHEET
N/A		3 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ





NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	P-BVBI-8,L-BVBI-8

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

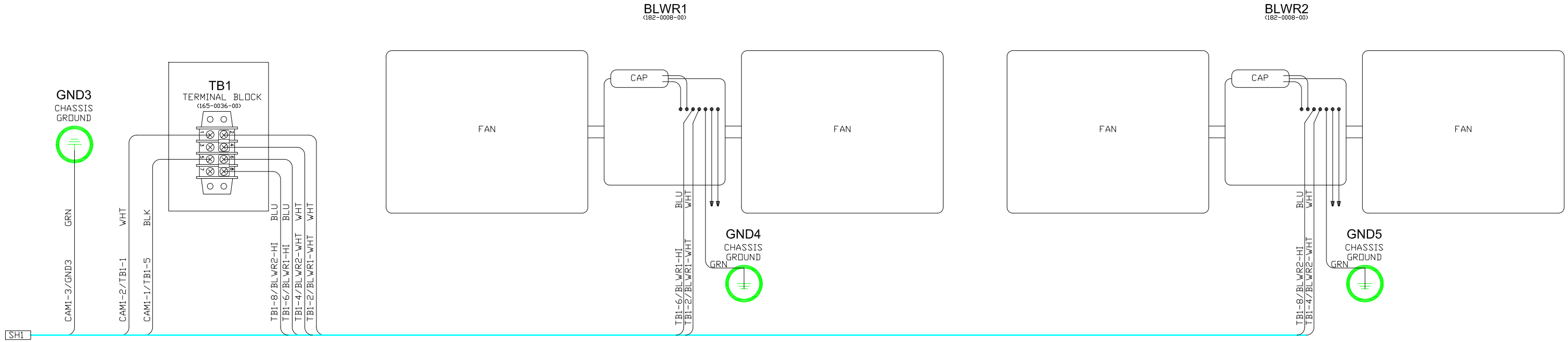
Germfree Laboratories

WIRING DIAGRAM, BVBI w/SENSOCON, 8FT

DRAWING NO.	REV.
906-1560-00	1

SCALE	FILE NO.	SHEET
N/A		1 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1–1/SW1–1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBI–8SS

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

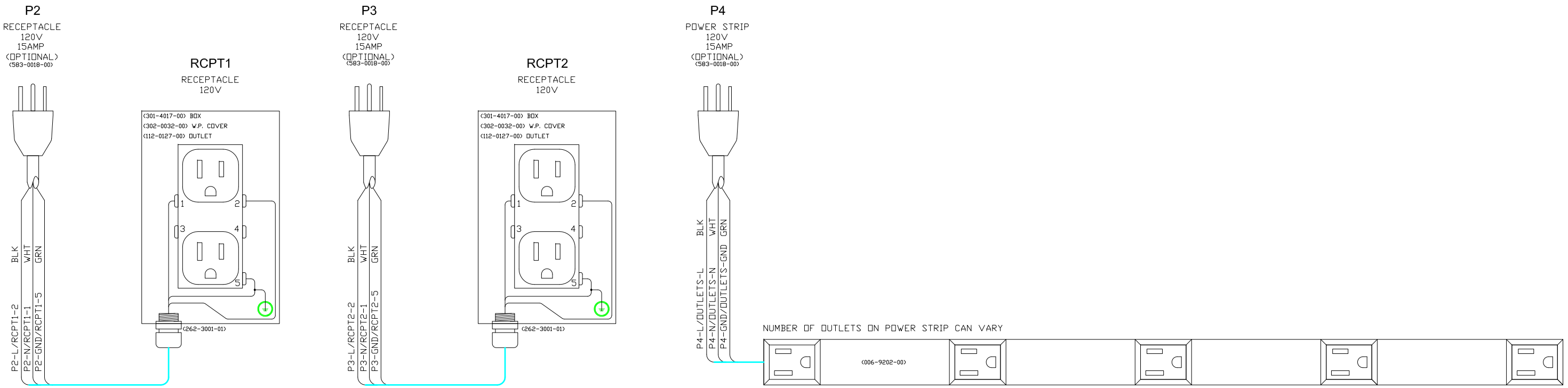
Germfree Laboratories

WIRING DIAGRAM, BVBI w/SENSOCON, 8FT

DRAWING NO.	REV.
906–1560–00	1

SCALE	FILE NO.	SHEET
N/A		2 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1–1/SW1–1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	UNLESS OTHERWISE SPECIFIED: TOLERANCES: .XX = ± .XXX = ± ANGLES = ±1° DIMENSIONS ARE IN INCHES. DO NOT SCALE DRAWING.	SIGNATURES	DATE
WIRE LIST:		DRAWN: J. CARLISLE	06/07/17
PARTS LIST:		APPROVAL: C JAMES	06/09/17
		MATERIAL N/A	
		FINISH N/A	

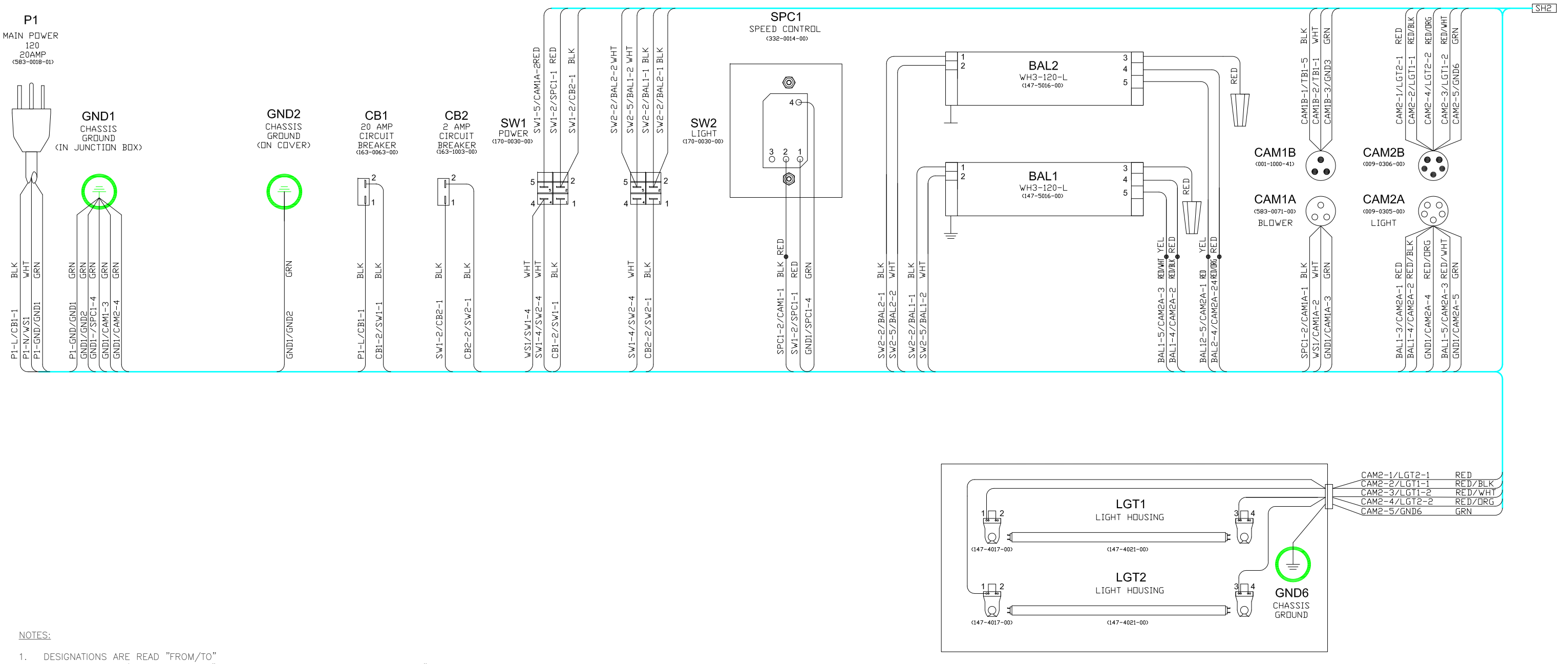
Germfree Laboratories

WIRING DIAGRAM, BVBI w/SENSOCON, 8FT

DRAWING NO.	REV.
906–1560–00	1

SCALE	FILE NO.	SHEET
N/A		3 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	P-BVBI-8,L-BVBI-8

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

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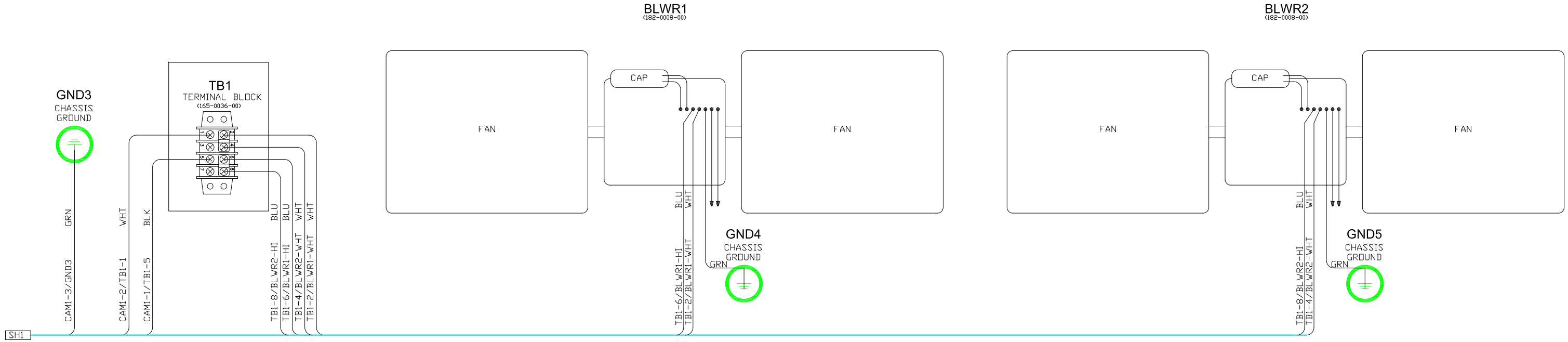
WIRING DIAGRAM, BVBI w/MAGNEHELIC, 8FT

DRAWING NO.	REV.
906-1561-00	1

SCALE N/A | FILE NO. | SHEET 1 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1–1/SW1–1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	BVBI–8SS

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

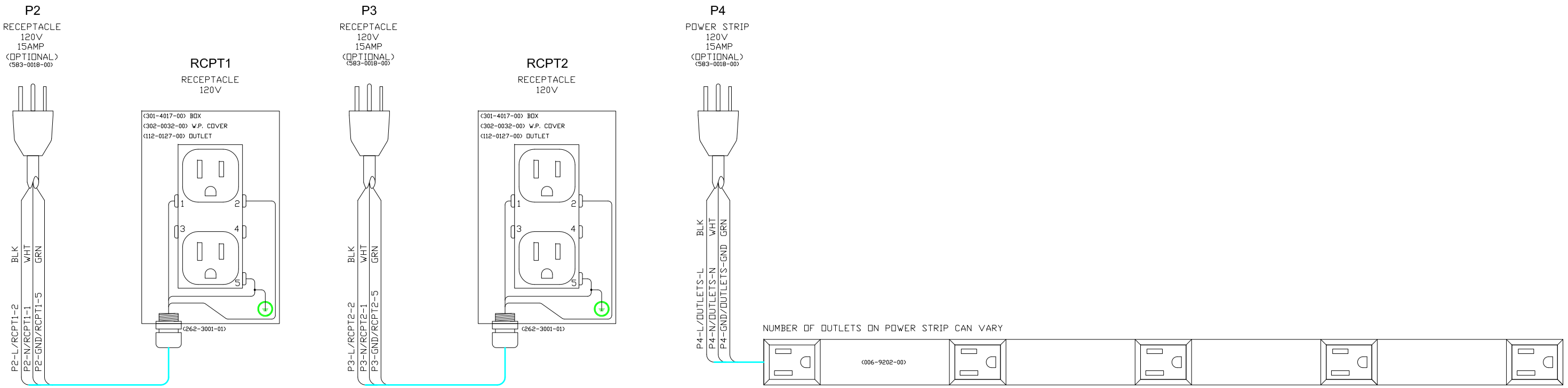
Germfree Laboratories

WIRING DIAGRAM, BVBI w/MAGNEHELIC, 8FT

DRAWING NO.	REV.
906–1561–00	1

SCALE	FILE NO.	SHEET
N/A		2 OF 3

REVISIONS				
REV	DESCRIPTION	DATE	DRAWN BY	APPROVED
1	INITIAL RELEASE	06/09/17	JLC	CMJ



NOTES:

1. DESIGNATIONS ARE READ "FROM/TO"
   EXAMPLE: TB1-1/SW1-1 IS READ "FROM TB1 POSITION 1 TO SW1 POSITION 1"

NEXT ASSY:	
WIRE LIST:	
PARTS LIST:	

UNLESS OTHERWISE SPECIFIED:
TOLERANCES:
.XX = ±
.XXX = ±
ANGLES = ±1°
DIMENSIONS ARE IN INCHES.
DO NOT SCALE DRAWING.

SIGNATURES	DATE
DRAWN: J. CARLISLE	06/07/17
APPROVAL: C JAMES	06/09/17
MATERIAL N/A	
FINISH N/A	

Germfree Laboratories

WIRING DIAGRAM, BVBI w/MAGNEHELIC, 8FT

DRAWING NO.	REV.
906-1561-00	1

SCALE	FILE NO.	SHEET
N/A		3 OF 3

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Appendix C
Sensocon User Manual

Installation and Operation Manual

Series A3 and A4
Differential Pressure Controller

Sensocon, Inc.

Phone: (863) 248-2800
Fax: (863) 248-2798
www.sensocon.com

Contents

The Sensocon A3 and A4 series of differential pressure controllers provide control of low differential pressure applications for air and other compatible non combustible gasses. These instruments have a large LED display for pressure indication, a LCD or OLED display for programming and additional LED's to indicate % of output, setpoints and alarm status. The instruments are fully programmable from the key pad face or by utilizing the Opti-Link™ communication port for no touch programming. Options for the instruments include a 4-20 mA output, and improved accuracies. There is also a low cost weatherproof cover available for outdoor applications.

1.1 Model Number Configuration

Example	A3110-06							Description
Model	A							Round Panel Mount Housing
Display		3						LED display, process arch, LCD
		4						LED display, process arch, OLED
Control			1					Control 2 SPDT relays
Transmitter				0				None
				1				4-20 mA
Accuracy					0			1%
					1			0.50%
Range						-	01	0 – 0.50"
						-	02	0 – 1"
						-	03	0 – 2"
						-	04	0 – 3"
						-	05	0 – 4"
						-	06	0 – 5"
						-	07	0 – 8"
						-	08	0 – 10"
						-	09	0 – 15"
						-	10	0 – 20"
						-	11	0 – 30"

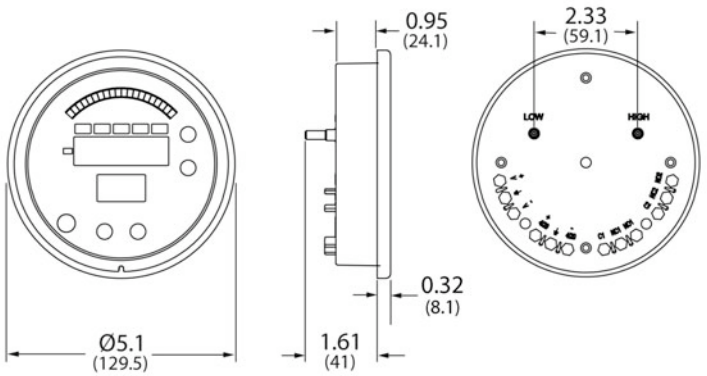
1.2 Specifications

Maximum Pressure: Ranges ≤ 4" w.c. = 2 PSI; Ranges ≥ 5" w.c. = 10 PSI
Media compatibility: Air and compatible non combustible, non corrosive gasses
Accuracy*: Axxx0-xx - 1.00%; Axxx1-xx - 0.50%
Temperature Ranges:
Compensated: -10° to 140°F (-23° to 60°C)
Operating: -10° to 140°F (-23° to 60°C); A3: 10° to 140°F (-12° to 60°C)
Thermal Effect*: +/- 0.012% FS/°F
Output Signal: 4-20 mA (option)

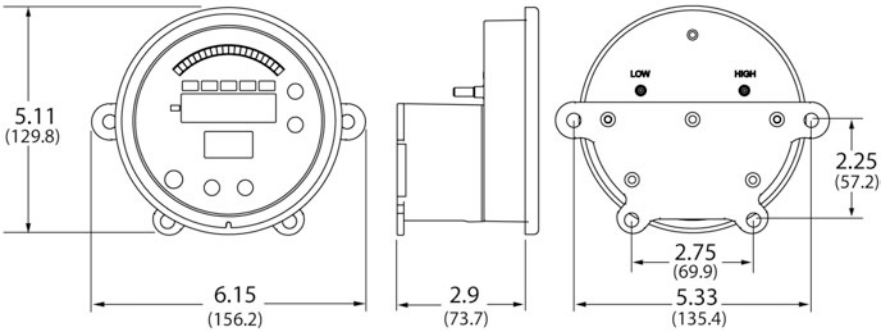
Loop Resistance: 750 Ω Max (for internally sourced power); 1800 Ω Max (for externally sourced power of 36 VDC)
Power Supply: Universal 16-265 VAC or VDC
Housing Material: Glass Filled Nylon
Enclosure Rating: Designed to meet NEMA 4X face; with optional cover the entire product is weatherproof
Relays: (2) SPDT 8 Amps @ 250 VAC, 5A @30 VDC
Electrical Connections: screw terminals
Response Time: <100 ms
Display: 4 Digit, red LED, ½" digits; LCD or OLED programming display
Process Connection: Push on connection for $^{3}/_{16}$" tubing
Agency Approvals: Pending – UL, C-UL, CE
Patents Pending
* Custom calibrations including improved accuracy and improved thermal effect are available.

1.3 Dimensional Drawings

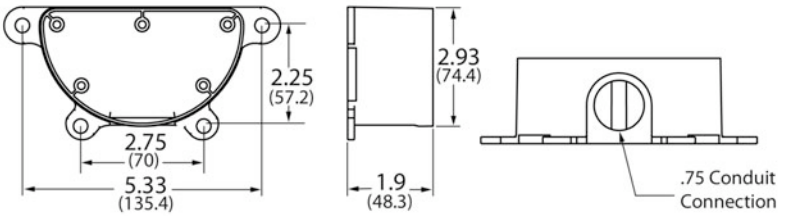
Series A3 and A4



Series A3 and A4 with optional weatherproof cover

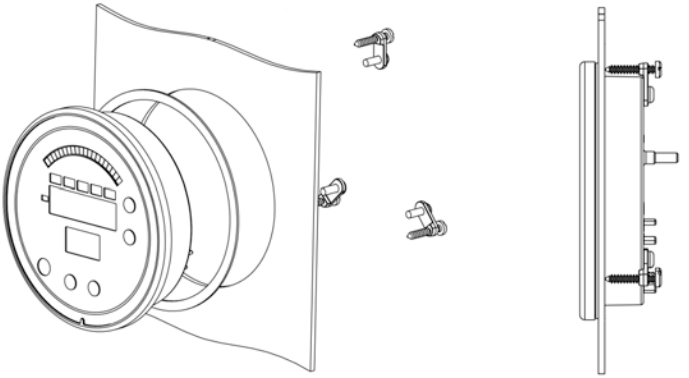


Optional weatherproof cover

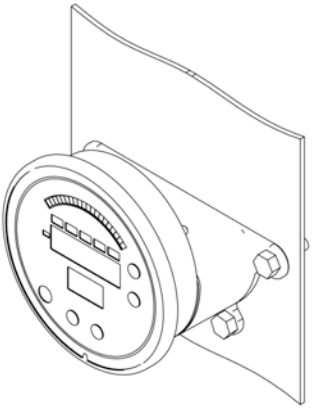


2.1 Mounting

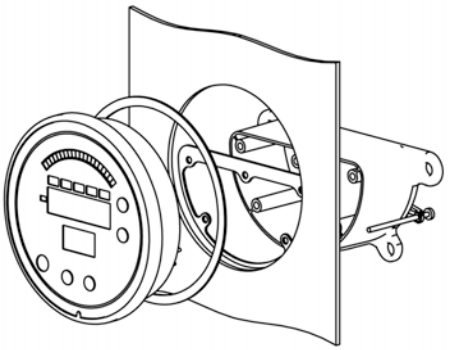
Flush Mounting – For new applications, cut a 4 $^{9}/_{16}$" hole in the panel. Insert the control with the provided gasket through the hole and secure it to the panel with the provided mounting tabs and screws. Retrofitting old technology is also easy with the Series A3 and A4. They have been designed to fit in industry standard holes ranging from 4 $^{9}/_{16}$" to 4 $^{13}/_{16}$" so simply remove the old device and insert the new control into the existing cut out.

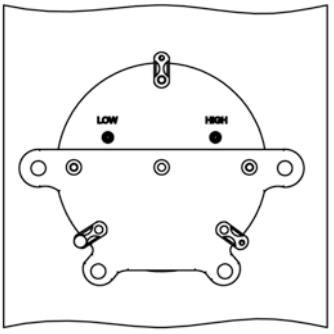


Surface Mounting – Surface mounting the Series A3 or A4 requires the optional weather proof cover. Once the control is wired and the weather proof cover has been attached, the control can be mounted to any flat surface with the four mounting screws provided with the cover.



Flush Mounting with Weather Proof cover – The Series A3 and A4 can also be flush mounted with a weather proof cover. The procedure is the same as above, but utilizes two extra long mounting screws (provided with the weather proof cover) for the bottom two panel connections.

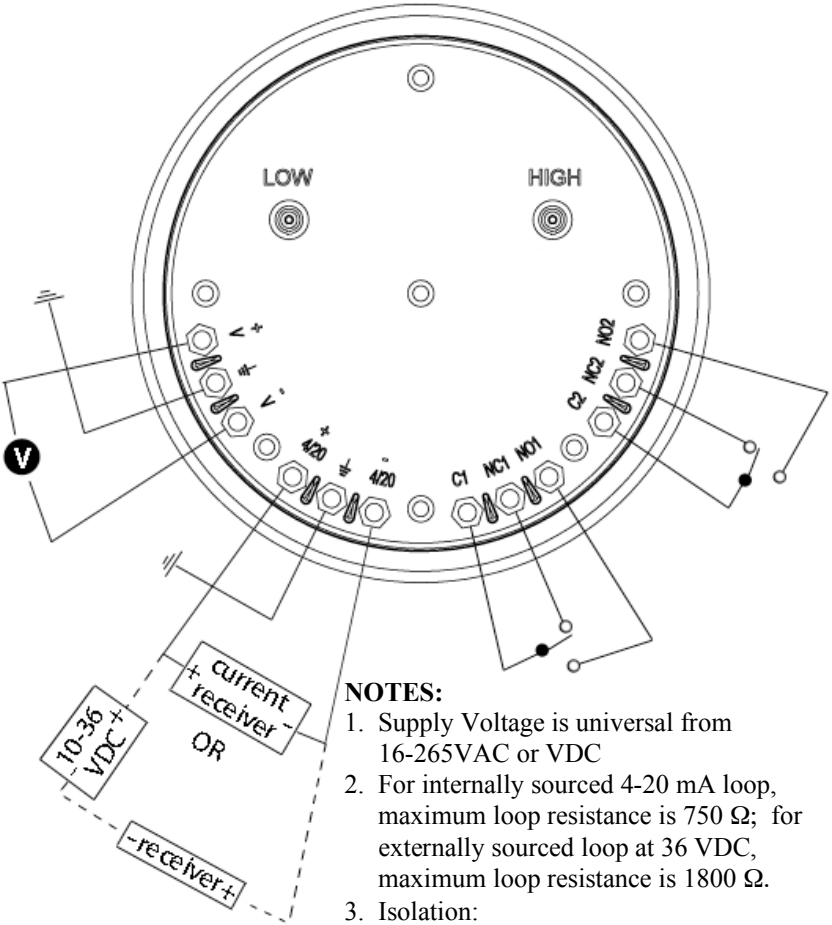




2.2 Pressure Connections

Two 3/16" pressure connections are located on the back of the unit, labeled "High" and "Low". For best results, connect 3/16" I.D. push on tubing to the pressure connections. If the High connection has a greater absolute value than the Low connection, the front display will give a positive value. If the HI connection has a lower absolute value than the LO connection, the front display will give a negative value.

2.3 Electrical Connections

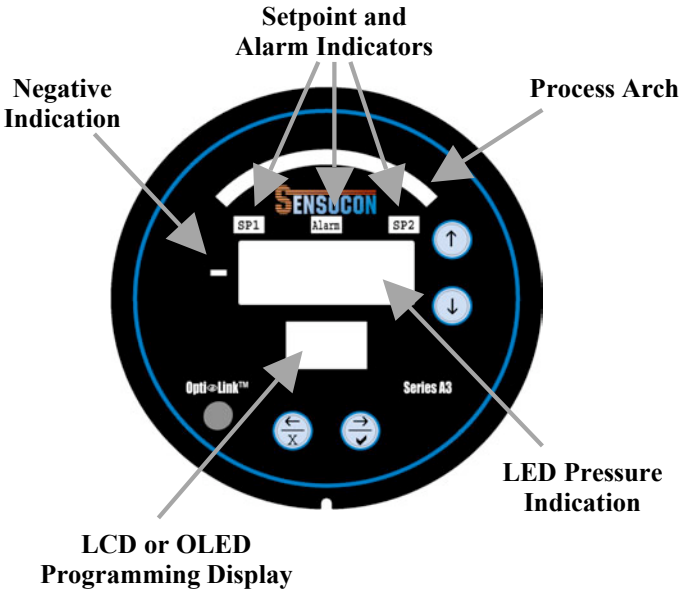


NOTES:

1. Supply Voltage is universal from 16-265VAC or VDC
2. For internally sourced 4-20 mA loop, maximum loop resistance is 750 Ω; for externally sourced loop at 36 VDC, maximum loop resistance is 1800 Ω.
3. Isolation:
   Relays: 1000 VAC to all other inputs and outputs
   4-20 mA: 5000 VAC to all other inputs and outputs.

3.1 Display

The series A3 and A4 were designed to give the user maximum feedback and flexibility. The process arch LED's are designed to mimic the indicating needle of a mechanical gauge. The process arch will light up from left to right as the pressure moves away from zero. Negative pressure will be indicated by the negative sign before the numerical indication. The 4 digit LED displays the numerical pressure reading and will show either 3 or 4 digits based on the users preference. The LCD (or OLED) display is used for programming and displaying the unit of measure and up to 4 other user selected program parameters. The LED indicators for SP1, SP2, and Alarm give indication when the parameter is in the actuated state.



3.2 Key Function

The A3 and A4 have four buttons located on the face of the control used for programming. There is an up arrow, a down arrow, a left arrow/cancel, and a right arrow/accept button as shown below.

up arrow	down arrow	left arrow / cancel	right arrow / accept

To move from one program menu to another, hold the up arrow or down arrow for one second to move up or down one menu level. The control will start in the "Main" menu, one level up is the "Set-up" menu, and one more level up is the "Secure" menu.

The up and down arrows are used to navigate up and down through the parameters in each menu. To change a parameter, use the up and down arrows until the parameter is highlighted, then press the right arrow. This will advance you to another screen where you can change the parameter. There are two different types of parameter change screens, 1) you select a given option or 2) you change a numerical value. To change a number, the left and right arrows are used to select the digit you would like to change, the up and down arrow will increase or decrease the value by the amount selected. Once you have made the change, you can accept the change by holding the accept button for three seconds, this will accept the change and take you back to the menu you were currently in. At any point while in a parameter change screen, you can hold the cancel button for one second to return to the previous menu without accepting a change to that parameter.

To manually reset the alarm after an alarm condition has occurred (if this feature is used) hold the right and left arrows simultaneously until the alarm resets.

4.1 Menu Structure

The factory default menu structure for all of the available variables is shown in the below table. Based on the user selections in the Set-up Menu, some of the variables may not be visible. It is also possible to change the menu structure by moving variables from one menu to another (see Moving Program Variables).

Menu	Variable	Code	Setting
Main Menu	➲ Set Point 1 Low	SP1 lo	⇨ *value*
	➲ Set Point 1 High	SP1 hi	⇨ *value*
	➲ Set Point 1	SP1	⇨ *value*
	➲ Set Point 1 db	SP1 db	⇨ *value*
	➲ Set Point 2 Low	SP2 lo	⇨ *value*
	➲ Set Point 2 High	SP2 hi	⇨ *value*
	➲ Set Point 2	SP2	⇨ *value*
	➲ Set Point 2 db	SP2 db	⇨ *value*
	➲ Alarm Low	AL lo	⇨ *value*
	➲ Alarm High	AL hi	⇨ *value*
Set-up Menu	➲ Control	Ctrl	⇨ 1 SP / 2 SP / SPAL / AL
	➲ Set Point 1 Setting	Set 1	⇨ db / lohi

	➲ Actuation 1	1 act	⇨ dir / rev
	➲ Set Point 1 Delay	SP1 D	⇨ *value*
	➲ Set Point 2 Setting	Set 2	⇨ db / lohi
	➲ Actuation 2	2 act	⇨ dir / rev
	➲ Set Point 2 Delay	SP2 D	⇨ *value*
	➲ Alarm	AL	⇨ lo / hi / hilo
	➲ Alarm Reset	AL Rs	⇨ Manual / Auto
	➲ Alarm Inhibit	AL ih	⇨ Off / On
	➲ Alarm Delay	AL D	⇨ *value*
	➲ Peak	Peak	⇨ *value*
	➲ Valley	Valy	⇨ *value*
	➲ Mode	Mode	⇨ Pres / Vel / Flow
	➲ Units	Units	⇨ inWc / mmWc / cmWc / Pa / kPa / PSI / inHg / mmHg / mBAR / ftWc / oz in / SFPM / M/S / SCFM / M3/S
	➲ Resolution	Res	⇨ 3 dig / 4 dig
	➲ Display	Dis	⇨ std / pct
	➲ Dampening	Damp	⇨ *value*
	➲ Screen Saver	Saver	⇨ Off / On
	➲ Contrast	Contr	⇨ N-lo / N-med / N-hi / I-lo / I-med / I-hi
	➲ K Factor	Kfact	⇨ *value*
	➲ Duct Shape	Xsect	⇨ circ / rect
	➲ Duct Diameter	diam	⇨ *value*
	➲ Duct Width	X dim	⇨ *value*
	➲ Duct Height	Y dim	⇨ *value*
Secure Menu	➲ Zero	Zero	⇨ Reset
	➲ Span	Span	⇨ *value* - Reset
	➲ Access	Access	⇨ Main / Set-up / Secure / none
	➲ Factory Default	Reset	⇨ No / Yes
	➲ Process Output Lo	pol	⇨ *value*
	➲ Process Output Hi	poh	⇨ *value*
	➲ Current Power source	P/S	⇨ Off / On

4.2 Main Menu

The parameters shown in the Main Menu will be dictated by the Control type selected in the Set-Up Menu. The parameters in the Main Menu will also be displayed on the LCD during normal operation if Screen Saver is set to Off. The value chosen for each set point will determine the switch point for that respective

variable. Below are the possible parameters that would be shown with the factory default program.

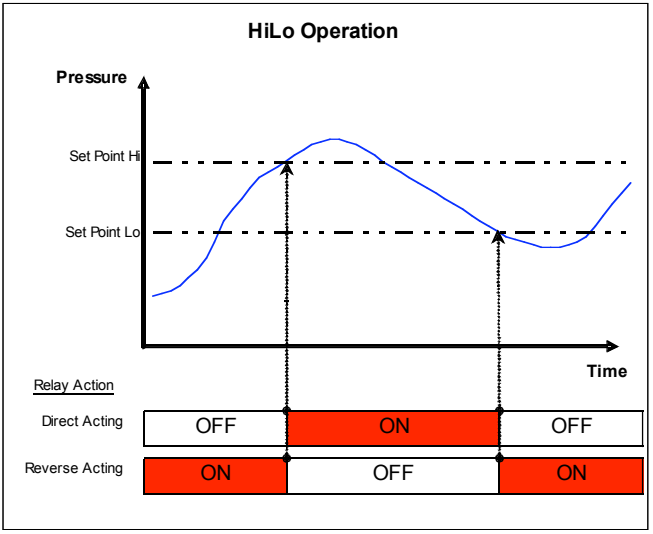
- ***Set Point 1 Low*** *(SP1 lo)*
- ***Set Point 1 High*** *(SP1 hi)*
- ***Set Point 1*** *(SP1)*
- ***Set Point 1 Deadband*** *(SP1 db)*
- ***Set Point 2 Low*** *(SP2 lo)*
- ***Set Point 2 High*** *(SP2 hi)*
- ***Set Point 2*** *(SP2)*
- ***Set Point 2 Deadband*** *(SP2 db)*
- ***Alarm Low*** *(AL lo)*
- ***Alarm High*** *(AL hi)*

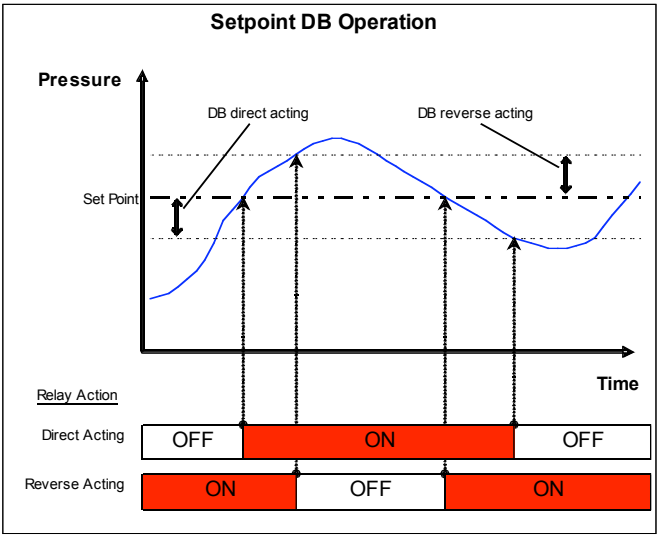
* To change the displayed parameters on the LCD during normal operation, see Moving Program Variables (section 5.1).

4.3 Set-Up Menu

- ***Control*** *(Ctrl)* – Selection of the control type will determine which parameters are or are not available in the remainder of the Set-up Menu as well as the Main Menu. Example: If 1 Set Point is selected, there will be no parameters for Set Point 2 or Alarm in the programming.
  - *1 Set Point (1SP)* – For control with one SPDT relay
  - *2 Set Point (2SP)* – For control with two independent SPDT relays
  - *Set Point Alarm (SPAL)* – For control with one SPDT relay and one alarm relay
  - *Alarm (AL)* – For alarm operation only

- ***Set Point Settings*** *(Set 1 & Set 2)* – Each set point can be entered as a high and low value for the turn on and off point or as an set point and a floating dead band. Low High operation is best suited for applications that have a set turn on and turn off point. Set Point Deadband is suited for application that may require changing the set point from time to time but the deadband will always remain the same. The below graphs illustrate the differences.
  - *Low High (lohi)* – For a high and low set point
  - *Set Point Deadband (SP db)* – For a set point and floating dead band





➲ ***Actuation (1 act & 2 act)*** – The actuation parameter determines whether the relays will react to increasing or decreasing pressure. This parameter also affects the status of the LED indicators on the front of the gauge. The above graphs illustrate the differences.

- ⇨ *Direct* – The relays turn on with increasing pressure
- ⇨ *Reverse* – The relays turn on with decreasing pressure

➲ ***Set Point Delay (SP1 D & SP2 D)*** – This variable sets the minimum amount of time that the process must be above or below the set point for the switch state to actuate.

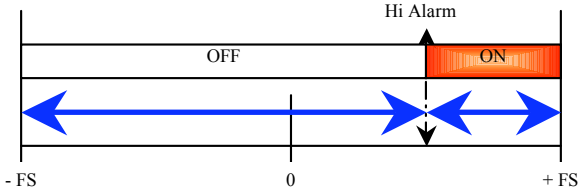
⇨ *value* – Time in seconds

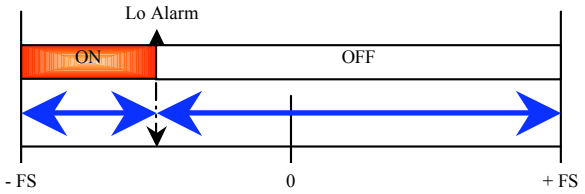
➲ ***Alarm (AL)*** – There are three different alarm types that can be selected, high alarm, low alarm, or high and low alarm. The high alarm will actuate the relay when the process is above the high alarm set point. The low alarm will actuate the relay when the process is below the low alarm set point. The high and low alarm can be used together so the alarm relay is actuated when the process is above or below the high alarm and low alarm set points respectively. The selection will dictate which alarm parameters are shown in the Main Menu. The below figure shows the three alarm types.

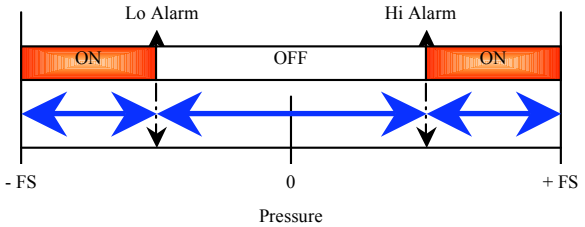
⇨ *High Alarm (hi)* – High alarm

⇨ *Low Alarm (lo)* – Low alarm

⇨ *High Low Alarm (hilo)* – High and low alarm







➲ ***Alarm Reset (AL Rs)*** – In the case of an alarm condition, the control can be configured to automatically reset when the alarm condition goes away or to

require a manual reset by holding the left arrow and right arrow simultaneously on the face of the control.

- ⇨ *Automatic (Auto)* – For automatic reset
- ⇨ *Manual (Manual)* – For manual reset

➲ ***Alarm Inhibit (AL ih)*** – This parameter allows the user to suspend the alarm during power up until the process moves through the low alarm set point. If alarm inhibit is off, and the control is in an alarm condition at power up it will alarm and possibly require manual reset.

- ⇨ *On (On)* – Alarm Inhibit is on
- ⇨ *Off (Off)* – Alarm Inhibit is off

➲ ***Alarm Delay (AL D)*** – This variable sets the minimum amount of time that the process must be above or below the alarm before the switch state alarms.

- ⇨ *value* – Time in seconds

➲ ***Peak (Peak)*** – The peak is the highest value the control has reached since the last time it was reset.

- ⇨ *value* – Allow the user to manually reset the value.

➲ ***Valley (Valy)*** – The valley is the lowest value the control has reached since the last time it was reset.

- ⇨ *value* – Allows the user to manually reset the value.

➲ ***Mode (Mode)*** – The control is capable of measuring and displaying pressure, velocity, or flow. For velocity and flow, a flow sensing device such as a pitot tube, or orifice plate with a know flow coefficient is required. For flow, it is also necessary to know the dimensions of the duct that the flow is being measured in so the control can calculate the area.

- ⇨ *Pressure (Pres)* – To display and control pressure
- ⇨ *Velocity (Vel)* – To display and control velocity
- ⇨ *Flow (Flow)* – To display and control flow

➲ ***Units (Units)*** – The engineering units selected will be displayed on the LCD during programming and normal operation of the control. The unit of measure selected will be used for displaying the pressure, velocity or flow reading as well as all programming variables. If the units are changed after programming has occurred, all values will automatically be changed to the correct corresponding value of the new unit of measure. The unit conversion equivalents are shown in the below table.

Pressure

- ⇨ *(inWc)* – Inches of water column
- ⇨ *(mmWc)* – Millimeters of water column
- ⇨ *(cmWc)* – Centimeters of water column
- ⇨ *(Pa)* – Pascals

- ⇨ *(kPa)* – Kilopascals
- ⇨ *(PSI)* – Pounds per square inch
- ⇨ *(inHg)* – Inches of mercury
- ⇨ *(mmHg)* – Millimeters of mercury
- ⇨ *(mBAR)* – Millibars
- ⇨ *(ftWc)* – Feet of water column
- ⇨ *(oz in)* – Ounce inches

Velocity ***

- ⇨ *(SFPM)* – Standard feet per minute
- ⇨ *(M/S)* – Meters per second

Flow ***

- ⇨ *(SCFM)* – Standard cubic feet per minute
- ⇨ *(M3/S)* – Cubic meters per second

*The displayed reading is based on standard conditions – dry air at 70° F and a barometric pressure of 29.92 inches of mercury.

**The control will automatically switch to x10 or x100 for velocity or flow when the reading exceeds four digits. This will be indicated on the LED by alternating the flow or velocity reading with the "α10" or "α100" symbol. The maximum displayed velocity or flow will be 9999 x100 regardless of units.

Maximum Displayed Pressures

inWc	ftWc	mmWc	cmWc	PSI	inHg	mmHg	mBAR	Pa	kPa	oz in
0.250	0.021	6.350	0.635	0.009	0.018	0.467	0.623	62.27	0.062	0.145
0.500	0.042	12.70	1.270	0.018	0.037	0.934	1.245	124.5	0.125	0.289
1.000	0.083	25.40	2.540	0.036	0.074	1.868	2.491	249.1	0.249	0.578
2.000	0.167	50.80	5.080	0.072	0.147	3.737	4.982	498.2	0.498	1.156
3.000	0.250	76.20	7.620	0.108	0.221	5.605	7.473	747.3	0.747	1.734
4.000	0.333	101.6	10.16	0.145	0.294	7.473	9.964	996.4	0.996	2.312
5.000	0.417	127.0	12.70	0.181	0.368	9.342	12.45	1245	1.245	2.890
8.000	0.667	203.2	20.32	0.289	0.588	14.95	19.93	1993	1.993	4.624
10.00	0.833	254.0	25.40	0.361	0.736	18.68	24.91	2491	2.491	5.780
15.00	1.250	381.0	38.10	0.542	1.103	28.02	37.36	3736	3.736	8.671
20.00	1.667	508.0	50.80	0.723	1.471	37.37	49.82	4982	4.982	11.56
30.00	2.500	762.0	76.20	1.084	2.207	56.05	74.73	7473	7.473	17.34

➲ ***Resolution (Res)*** – The pressure reading on the LED display can be shown with 3 or 4 digits. In some cases, the fourth digit is outside of the accuracy of the product and insignificant. If the fourth digit is used and is insignificant, there may be fluctuations in that digit.

- ⇨ *3 Digit (3 dig)* – 3 digit display
- ⇨ *4 Digit (4 dig)* – 4 digit display

➲ ***Display (Dis)*** – In addition to the selectable units for pressure, velocity, and flow, the display can also be configured to read as a percent output.

- ⇨ *Standard (std)* – Displays selected engineering unit
- ⇨ *Percent (pct)* – Displays 0-100% instead of the selected engineering unit

- ***Dampening (Damp)*** – The control takes a pressure sample every 100 milliseconds. The dampening coefficient tells the control how many readings to average for the displayed value. Displaying readings with too few samples averaged may cause unstable readings as a result of vibration or pressure fluctuations.
  - *value* – Number of samples averaged for the displayed value

- ***Screen Saver (Saver)*** – When the control is in normal operation the screen saver displays only the units of measure on the LCD or OLED display. When the screen saver is in use, touching any button on the face of the control will display the main menu. If turned off, the programming screen will display the parameters in the main menu.
  - *Off (Off)* – Turns the screen saver function off
  - *On (On)* – Turns the screen saver function on

WARNING: NOT USING THE SCREEN SAVER WITH THE SERIES A4 MAY CAUSE THE OLED DISPLAY TO BURN IN.

- ***Contrast (Contr)*** – This allows the image and contrast of the programming display to be adjusted.
  - *Normal low (N-lo)* – Normal image, low contrast
  - *Normal medium (N*-med) – Normal image, medium contrast
  - *Normal high (N*-hi) – Normal image, high contrast
  - *Inverted low (I*-lo) – Inverted image, low contrast
  - *Inverted medium (I*-med) – Inverted image, medium contrast
  - *Inverted high (I*-hi) – Inverted image, high contrast

- ***K Factor (Kfact)*** – For flow and velocity, it is necessary to enter the flow coefficient of the flow sensing device you are using (pitot tube, orifice plate, etc.). This value should be specified by the manufacturer of the device.
  - *value* – coefficient (0.01 to 99.99)

- ***Duct Shape (Xsect)*** – For flow measurement, it is necessary to calculate the area of the duct where the measurement is being taken. The first step is to determine the shape of the duct.
  - *Rectangle (rect)* – For a rectangular or square duct
  - *Circle (circ)* – For a circular duct

- ***Duct Diameter (diam)*** – For circular ducts, enter the diameter for the area calculation.
  - *value* – Diameter in inches (or meters)

- ***Duct Width & Height (X dim, Y dim)*** – For rectangular ducts, enter the width and height for the area calculation.
  - *value* – Height and width in inches (or meters)

4.4 Secure Menu

- ***Zero (Zero)*** – This is a calibration parameter that allows re-calibration of zero. To re-zero the control, disconnect both pressure connections so they are open to atmospheric pressure and reset the value by holding the accept key.
  - *Cancel (Cancel)* – This cancels the zero operation
  - *Reset (Reset)* – This will reset the zero point of the control

  Zero pressure must be maintained during the zero operation.

- ***Span (Span)*** – This is a calibration parameter that allows re-calibration of the span. To re-span the control, first enter the full scale pressure value you will be calibrating to, then apply that pressure to the high pressure port and reset the value by holding the accept key.
  - *value / Accept* – This will reset the span of the control

  The pressure must be maintained at the set value during the span operation.

- ***Security Access (Access)*** – This parameter allows you to prevent users from accessing menus to prevent tampering. Once this parameter is set, a security code must be entered to regain access to the locked menus as shown in the below table. This feature can be used in conjunction with "moving program variables" (section 5.1) to grant or restrict access to specific variables.
  - *Secure menu (Secure)* – Selecting Secure will give the user access to all menus.
  - *Set-up menu (Set-up)* – Selecting Set-Up will give the user access to the Main menu and the Set-up menu.
  - *Main menu (Main)* – Selecting Main will allow access only to the main menu.
  - *No menus (none)* – Selecting none will allow the user to view parameters only in the main menu, but they will not be able to make any changes.

Security Code Table

Menu	Security Code
Main	2312
Set-up*	4534
Secure**	6756

* Entering the security code for Set-up will also give access to Main
** Entering the security code for Secure will give access to all Menus

- ***Factory Default (Reset)*** – By performing a Factory Default, the control will be configured back to the original factory settings. This includes set values and menu structure.
  - *Cancel (Cancel)* – This cancels the factory default
  - *Reset (Reset)* – This accepts the factory default and resets the control

- ***Process Output Low (pol)*** – This parameter allows the 4-20 mA output to be scaled. The value set for this parameter will correspond to the 4 mA output. The default setting will be 0, but can be set at any value lower than Output High.
  - *value* – The pressure that corresponds to the 4 mA output signal

- ***Process Output High (poh)*** – This parameter allows the 4-20 mA output to be scaled. The value set for this parameter will correspond to the 20 mA output. The default setting will be the full scale pressure reading of the control, but can be set at any value higher than Output Low.
  - *value* – The pressure that corresponds to the 20 mA output signal

- ***Current Power Source (P/S)*** – This parameter allows the power for the 4-20 mA loop to be sourced internally by the control or externally.
  - *On (On)* – Power will be sourced by the control
  - *Off (Off)* – External power will be required for the current loop

5.1 Moving Program Variables

The programming menu can be fully customized by the user. Parameters can be moved from one menu to another. This allows the user to reorganize the menu structure to better fit their needs or to put unused or unwanted parameters in one menu and then lock that menu so that those variables can not be accessed.

To move a program parameter to another menu, highlight the parameter to be moved and hold down the left arrow for one second and the following screen will appear:

- ***New Menu***
  - *Main* – Moves the parameter to the Main menu
  - *Setup* – Moves the parameter to the Set-up menu
  - *Secure* – Moves the parameter to the Secure menu

Select the menu you would like the parameter to be moved to and press accept.

5.2 Opti◉Link™

Opti◉link™ is an infrared communications technology that allows the user to upload and download program parameters from one unit to another with a programming key. By using the PK-01 universal programming key, the user may program one unit, download those parameters to the universal programming key and then upload that same program from the key to other controls. By using a

PK-02 lockout programming key, a user may completely lock (or unlock) the face keypad of the control to eliminate the possibility of unwanted tampering of the control.

To download programs from a control to a programming key, place the key within 1 to 6 inches of the Opti👁Link™ port on the control and hold the two outside buttons simultaneously until the numeric LED on the control turns off. The programming key must stay within the 1 to 6 inch range while the download is in progress. During the operation, the Process Arch on the control will give the status of the download. When the download is complete, the programming key will blink green twice to indicate the program is stored on the programming key.

To upload programs from a programming key to a control, place the key within 1 to 6 inches of the Opti👁Link™ port on the control and hold the center button until the numeric LED on the control turns off. The programming key must stay within the 1 to 6 inch range while the download is in progress. During the operation, the Process Arch on the control will give the status of the download. When the upload is complete, the control will read "yes" to indicate the program has been successfully uploaded to the control.

5.3 Limited Warranty

LIMITED WARRANTY

SENSOCON warrants its products to be free from defects in materials and workmanship for a period of one (1) year from the date of shipment, subject to the following terms and conditions: Without charge, SENSOCON will repair, replace, or refund the purchase price at SENSOCON's option products found to be defective in materials or workmanship within the warranty period; provided that:

i. the product has not been subjected to abuse, neglect, accident, incorrect wiring not our own, improper installation or servicing, or use in violation of labels or instructions provided by SENSOCON;

ii. the product has not been repaired or altered by anyone except SENSOCON;

iii. the maximum ratings label and serial number or date code have not been removed, defaced, or otherwise changed;

iv. examination discloses, in the judgment of SENSOCON, the defect in materials or workmanship developed under normal installation, use and service; and

v. SENSOCON is notified in advance of and the product is returned to SENSOCON transportation prepaid before expiration of the warranty period.

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