



SPACE LABS
HEALTHCARE



BleaseSirius

Anesthetic Machine

Technical Manual

BleaseSirius

Anesthetic Machine

With 700/900 Series Ventilators

Technical Manual

MODIFICATIONS LABEL				
ECO A	REV B	REV C	REV D	REV E
PR023288	PR032030	PR033225	PR034475	
REV F	REV G	REV H	REV I	REV J

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CE
 0123

Part Number: 073-227-00
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Important

Read this manual before operating or servicing the machine.

For all users and Service Personnel, refer to the User Manual before operating the machine.

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BleaseSirius

Anesthetic Machine

Chapter 1

Technical Description

Technical Description

1.1 Description

1.1.1 General

The BleaseSirius anesthetic machines contain all the pneumatic circuitry, controls, monitoring, ancillaries and storage required to control, distribute and mix medical gases and anesthetic agents in order to deliver them to a patient system.

The BleaseSirius anesthetic machine is based on the Frontline machines. The BleaseSirius has enhanced components and new features and improvements. The BleaseSirius anesthetic machine is designed to comply with the following:

ASTM F-1850, UL 60601-1, ISO 5358, IEC 60601-1, IEC 60601-2-13, BS EN 740 and other International Standards.

The BleaseSirius machine consists of the major components described below (See Figure 1).

1.1.2 The Frame

The frame is made of steel supported on a cast aluminum base with four castors, there is a brake pedal at the bottom of the trolley. The steel frame is covered by moldings with a painted finish.

1.1.3 Pneumatic Assembly

The frame contains the pneumatic assembly. The pneumatic unit contains the gas supply inputs, the pneumatics that regulate the supply pressures to a usable pressure, the oxygen failure alarm and its logic circuitry, the common gas outlet, the user controls and the pneumatic power outlets. Above the work surface are the cylinder contents and pipeline pressure gauges, flow control valves, hypoxic guard and flowblock assemblies, the vaporizer back bar and the uprights which support the monitor shelf.

1.1.4 The Monitor Shelf

The monitor shelf A in Figure 1, is mounted on top of the machine. Loading should not exceed 25Kg/55.1lbs.

In US markets, use a cord fitted with a NEMA 5-15 hospital grade plug to connect the BleaseSirius to the mains supply. Connection of equipment to the auxiliary mains socket outlets may increase leakage currents to values exceeding the allowable limits.

Technical Description

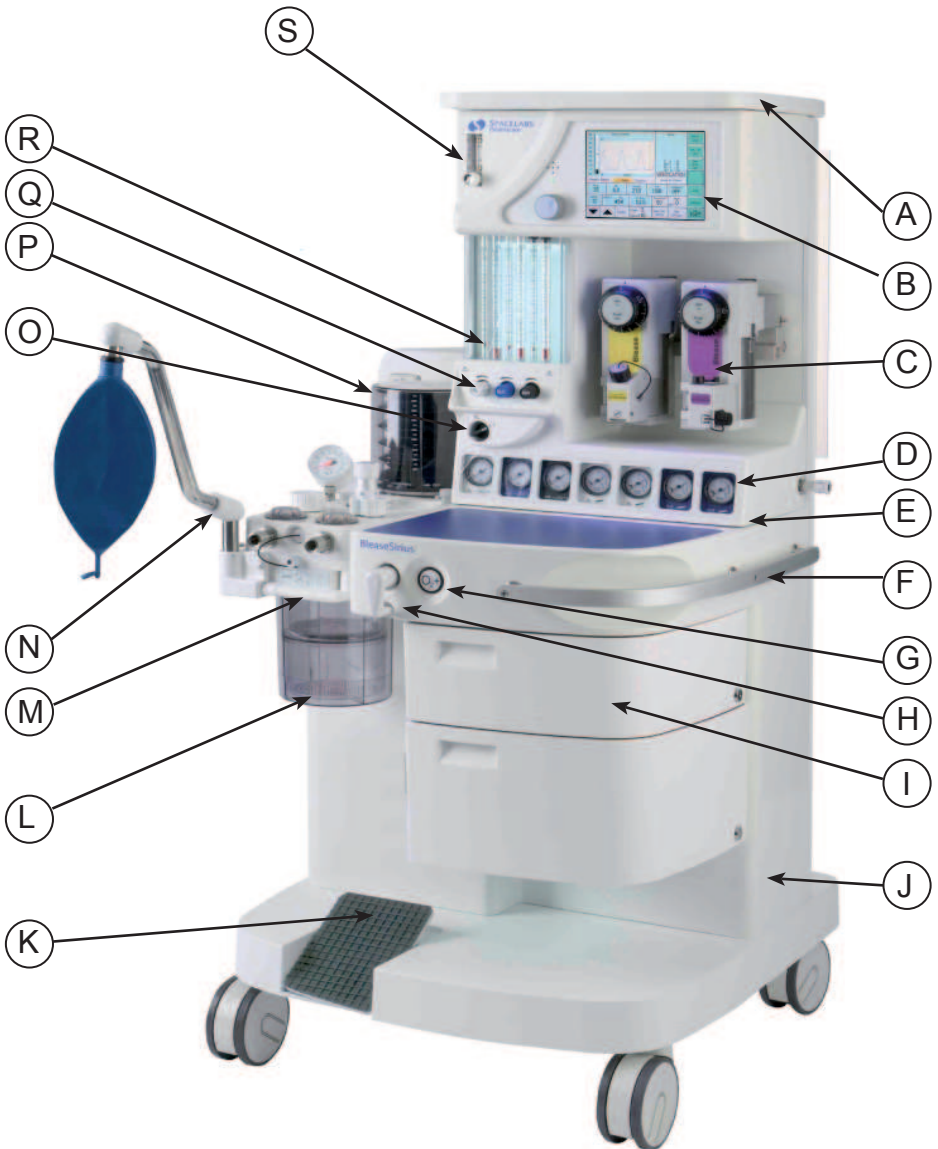


Figure 1 - BleaseSirius Anesthetic Machine

Figure 1 Key

A	Monitor shelf
B	Ventilator
C	Vaporizer
D	Cylinder/pipeline gauges
E	Pneumatic unit - (behind gauge panel)
F	Handle
G	Oxygen flush
H	Common gas outlet (or option A.C.G.O.)
I	Drawer
J	Frame
K	Brake Pedal
L	Absorber
M	Bag Arm Link Pipe
N	Adjustable Bag Arm
O	Main On/Off Switch
P	Suction Controller
Q	Flow Control Valves with Hypoxic Guard
R	Flowblock Assembly
S	Auxiliary Flowmeter

1.2 Specification

1.2.1 Machine Dimension

Height	Max. Width	Depth	Average Weight
1486mm / 158.5"	705mm / 27.7"	747mm / 29"	110kg / 242.5lbs

1.2.2 Work Surface Dimensions

Height	Area
854mm / 33.6"	98612.2mm ² / 152.8" ²

1.2.3 Monitor Shelf Dimensions

Height	Area
1486mm/58.5"	175833mm ² / 272.54" ²

1.2.4 Maximum Loading

Monitor Shelf	Work Surface	Bottom Shelf	Drawers	Extended Work Surface
25kg/55.1lbs evenly distributed	25kg/55.1lbs evenly distributed	8kg/17.6lbs evenly distributed	5kg/11.0lbs evenly distributed	15kg/33.0lbs evenly distributed (intermittent or occasional loading only).



Gross Loading = 250kg/551.1lbs

1.3 Pneumatics

1.3.1 Gas-Specific Color Specifications

Gas	ISO	ANSI
Oxygen	White	Green
Nitrous Oxide	Blue	Blue
MED AIR	Black	Yellow

1.3.2 Gas Supply Combinations

Max No. of Gases	3
Max No. of Cylinders	4
Max No. of Pipelines	3
Max No. of Gauges	7
Max Cylinder Size (using PIV Index)	E
Large Cylinder Kit Max.	2

1.3.3 Common Gas Outlet

The common gas outlet is fitted onto the front of the machine below the work surface. It will accept a 22mm female or a 15mm male taper coupling.

1.4 Technical/Performance Specification

1.4.1 Controls

Oxygen flow	150ml/m to 10 l/m Simplex/ Cascade
Nitrous oxide flow	0ml/m to 12 l/m Simplex/Cascade
MED AIR flow	0ml/m to 15 l/m
Flowblock assembly accuracy	±5% measured value at 20°C and 101.3 kPa/14.6 psi
Oxygen flush	Non-locking 35 to 55 l/m
Vaporizers	Accepts Selectatec
Hypoxic gases	Minimum 21% oxygen/nitrous oxide mixture allowed

1.4.2 Ventilator

A Blease700/900 ventilator is built into the BleaseSirius.

1.4.3 Alarms / Indicators

Oxygen failure	Audible alarm sounds for minimum of 8 secs when oxygen pressure falls below 30 psi.
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1.4.4 Regulator Safety Valve Settings

Cylinder regulator	43 psi - 47 psi		
Cylinder regulator relief valve	> 75 psi		
Machine gas piping design rating	700 kPa/max.	101.5 psi/max	
Secondary hypoxic regulators	25-32 psi	}	O ₂ 0.5 Lpm flow
	25-35 psi		
	N ₂ O		
Common gas outlet relief valve	3.25 psi - 3.95 psi		

1.4.5 Electrical

Voltage	100 / 230 V
Frequency	60 / 50 Hz
Power	1.2 / 1.0 kVa

The auxiliary sockets are numbered 1 through 4, top to bottom and are rated as in the following tables. If the machine has the switching sockets option, sockets 3 and 4 will switch On and Off when the Main On/Off (Figure 1, Key O) is switched On and Off, rather than with the Mains On/Off switch (Figure 2).

230V			
Socket	Outlet Rating	Breaker	Fuse
1	2A	3A	5A
2 - 4	1A	2A	3.15A

110V			
Socket	Outlet Rating	Breaker	Fuse
1 - 4	2A	3A	4A

1.4.5.1 Electrical Labeling

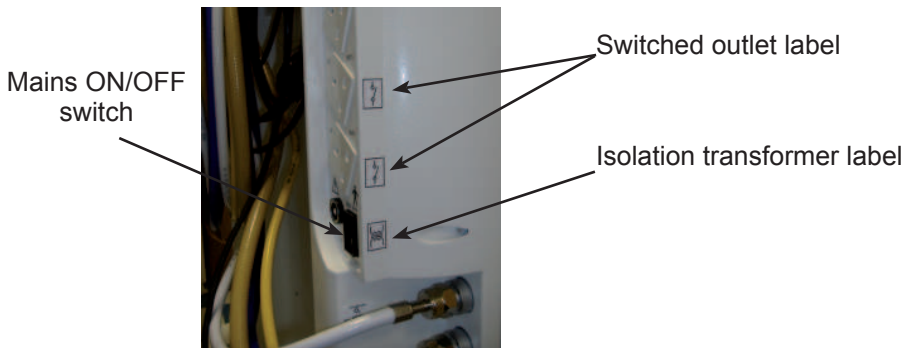


Figure 2 - Electrical Labeling

Technical Description

1.4.6 Supplies

O₂, MED AIR, N₂O pipeline	Nominal pressure 400 kPa/58.0 psi, minimum 275 kPa/39.8 psi, maximum 482 kPa/69.9 psi
Auxiliary pneumatic outlets	MED AIR or O ₂ - 400 kPa/58.0 psi at zero flow. 80 l/m max. flow
Auxiliary Oxygen Outlet	0-15 lpm

1.4.7 Environmental

Operating Temperature	5°C-40°C (41°F-104°F) oxygen cell operates to specification 10°C-40°C (50°F-104°F)
Storage Temperature	-20°C-60°C (-4°F-140°F) with oxygen cell removed 0°C-50°C (32°F-122°F) with oxygen cell in place
Humidity	15-95% Non-condensing

BleaseSirius

Anesthetic Machine

Chapter 2

Overview

Overview

2.1 Description of the Ventilator

2.1.1 Overview

2.1.1.1 PEEP

The Blease700/900 series ventilator continuously monitors and displays the Positive End Expiratory Pressure (PEEP). By default, a PEEP of 2 - 4 cmH₂O is introduced to the circuit, caused by the bellows assembly, which is shown as OFF. A PEEP value between 3 and 20 cmH₂O can be set from the panel, with an automatic alarm of more than 25% above the set value. A minimum difference of 8 cmH₂O in adult and 5 cmH₂O in pediatric is enforced between the set PEEP level and the pressure controls shown below.

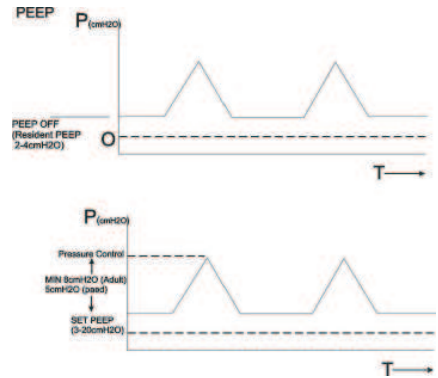


Figure 3 - PEEP Diagram

Mode	Pressure Control
Volume Control	Pressure Limit
Pressure Control	Set Pressure
Pressure Support	Support Pressure
SIMV-VC + PSV	Support Pressure + Set Volume
SIMV-PC + PSV	Support Pressure + Set Pressure

When the user changes a value such that it does not comply with the required difference, the box surrounding the feature being adjusted and the value of the feature causing limiting to be enforced is highlighted red. The value being adjusted could either be the PEEP level or the relevant pressure control.

The user can then:

- Accept the value being adjusted, in which case, it will be set to the nearest acceptable value.
- Adjust the value to a non-conflicting value.

If the user does not make the change before end of time allowed for adjustment, the value will set to the nearest acceptable value.

2.1.1.2 Trigger

The level of negative flow caused by the patient's attempt to breathe before the ventilator initiates flow to assist the patient with the spontaneous breath.

Range: 1 to 15 l/m all modes (SIMV + PSV and Pressure Support).

2.1.1.3 Support Pressure

Breathing circuit pressure level for assistance with patient's spontaneous breath.

Range: 5 cmH₂O to 30 cmH₂O SIMV-PC + PSV and Pressure Support (PEEP referenced).

2.1.1.4 Fresh Gas Compensation

Fresh gas can be compensated for and displayed on screen.

2.1.1.5 Oxygen

A fuel cell sensor can be connected to allow monitoring of 0% to 110% O₂, with alarms of 18% to 110%. The sensor can be calibrated.

2.1.1.6 Tidal Volume

Volume to be delivered by the ventilator in each breath.

Range: 20 ml to 1500 ml all modes.

2.1.1.7 Minute Volume

Measured volume delivered by the ventilator per minute.

Range: 0.3 l/m to 25 l/m all modes.

2.1.1.8 Expired Tidal volume

Expired tidal volume is measured by the sensor in the breathing circuit, in either mechanical ventilator spontaneous breathing mode. The measured value is displayed in the tidal volume window.

2.1.1.9 BPM (Frequency Control)

The mechanical frequency of the ventilator in breaths per minute (BPM).

Range: 2 bpm to 99 bpm all modes.

2.1.1.10 I:E Ratio

The ratio of the inspiratory time to the expiratory time.

Range: 2.0:1 to 1:5.0, all modes in steps of 0.1.

2.1.1.11 Pressure Limit

The breathing system maximum pressure limit.

Range: 10 cmH₂O to 50 cmH₂O Pediatric.

10 cmH₂O to 50 cmH₂O Adult.

2.1.1.12 Peak Pressure

Range: 0 cmH₂O to 100 cmH₂O

2.1.1.13 Mean Pressure

Range: 0 cmH₂O to 100 cmH₂O

2.1.1.14 Compliance

System compliance in ml/cmH₂O

Patient compliance in ml/cmH₂O

2.1.1.15 Volume Measurement

Accuracy of delivered gas at 25°C 101.3 kPa/14.6 psi (volume mode)

= ±10% or ± 10 ml from 50 ml to 1 liter
(whichever is greater)

Volume monitoring accuracy = ± 10% or ± 10 ml (whichever is greater)

Controlled Patient Pressure = ± 10% or ± 2 cmH₂O (whichever is greater)

Monitored Patient Pressure = ± 5% or 1 cmH₂O (whichever is greater)

Delivered PEEP = ±1.5 cmH₂O from 4 to 20 cmH₂O (whichever is greater)

Fresh Gas Flow = ± 10% or ± 200 ml from 300 ml to 15 liters (whichever is greater)

2.1.1.16 Oxygen Measurement

Oxygen Concentration accuracy = 3%.

Drift < 1% over 8 hours at constant temperature.

Response time < 30 seconds for 90% change.

2.2 Pre-use Test

2.2.1 Fresh Gas

Fresh gas (FG) flow adds to the delivered Tidal Volume (TV) during the inspiratory period. To compensate, the delivered volume must be reduced. The formula for this reduction is:

$$\text{Effective TV} = TV - \text{TV due to FG}$$

$$TV_E = TV - ((\text{FG flow rate (mL)}/60) * \text{Inspired time (sec)})$$

$$TV_E = TV - TV_{FG}$$

For example, let

FG flow rate = 5LPM, TV = 600mL, Frequency = 10BPM, I:E = 1:20

$$\text{Inspired time} = \frac{60}{10} * \frac{1}{3} = 2 \text{ Sec}$$

$$TV_{fg} = \frac{5000}{60} * 2 = 83 \frac{1}{3} = 167\text{ml}$$

Therefore,

$$\text{Effective TV} = 600 - 167 = 433\text{mL}$$

2.2.2 Compliance

Compression of gas in the dead space within the breathing system reduces the tidal volume delivered to the patient. In an ideal ventilator, the Set TV would be the volume of gas that is delivered to the patient's lungs. This cannot be achieved because the anatomy of the patient is unknown. However, the Set TV can be accurately delivered from the catheter mount, thus reducing Set TV errors to a minimum.



To calculate the effect of breathing system compliance on the delivered TV, it is necessary to measure the capacity or compliance (Cs) of the system. This can only be done as part of a pre-use check procedure.

Overview

1. Switch the unit ON. The compliance menu will be displayed.



The patient airway flow sensor head must be in the patient circuit in order to carry out compliance compensation.



2. Select Yes to Compliance Compensation and follow the instructions on screen instructions

The ventilator delivers a breath of known volume to the breathing circuit, records the pressure (cmH₂O) achieved and verifies that a leak is not present.

3. The dead space is calculated as follows:

$$\frac{\text{Volume (mL)}}{\text{Pressure (cmH}_2\text{O)}} = \text{dead space compliance (C}_3\text{)}$$

This value is retained in memory until the ventilator is switched off or retested.

4. When the ventilator is set to use on a patient and when the ventilation is stable, the total compliance of system and patient (C_t) is measured. The TV can then be increased to compensate for the volume lost due to compression within the breathing system. The increase in tidal volume is calculated by the formula:

$$\text{Set TV} * \left(1 + \frac{C_s}{C_t - C_s} \right) = \text{new TV (mL)}$$

For example:

A system test measurement at a TV of 200 ml gave a pressure rise of 25 cmH₂O.

$$C_s = \frac{200\text{mL}}{25\text{cmH}_2\text{O}} = 8$$

Running the ventilator on a patient with a set 500ml TV gave a peak pressure of 20cmH₂O.

Overview

To calculate the increase in TV:

$$C_t = \frac{500\text{mL}}{20\text{cmH}_2\text{O}} = 25$$

The 735ml is the actual ventilator output into the breathing circuit to give 500ml at the catheter mount. The value must be recalculated every time volume controlled ventilation starts.

$$\text{new TV} = 500 * \left(1 + \frac{8}{25 - 8} \right) = 735\text{mL}$$

2.2.3 Compensation

Mode	Compliance	Fresh Gas
Volume Control	✓	✓
Pressure Support	✗	✓
SIMV-VC + PSV	✓	✓
SIMV-PC + PSV	✗	✓
Pressure Control	✗	✓

2.2.4 Mode Dependant Features

	SIGH	PAUSE	PRESSURE SUPPORT TRIGGER	PRESSURE SUPPORT PRESSURE	BPM	VOL/ FLOW	I:E	PRESSURE LIMIT
VOLUME CONTROL	✓	✓	✗	✗	Set	Meas/ Set	Set	Pressure Limit
PRESSURE SUPPORT	✗	✗	ALWAYS	ALWAYS	Meas	Meas	Meas	Pressure Limit
SIMV-VC + PSV	✗	✓	ALWAYS	ALWAYS	Meas/ Set	Meas/ Set	Meas/ Set	Pressure Limit
SIMV-PC + PSV	✗	✗	ALWAYS	ALWAYS	Meas/ Set	✗	Meas/ Set	Ptot
PRESSURE CONTROL	✗	✗	✗	✗	Set	IINSP FLOW	Set	Set Pressure

Overview

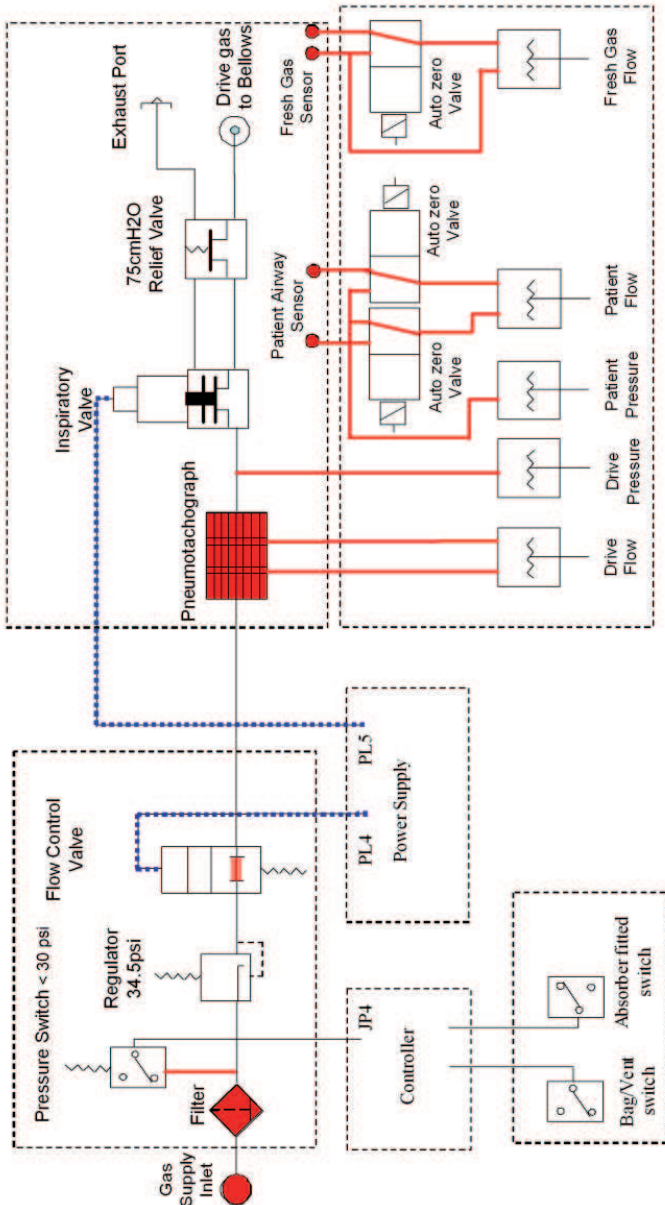
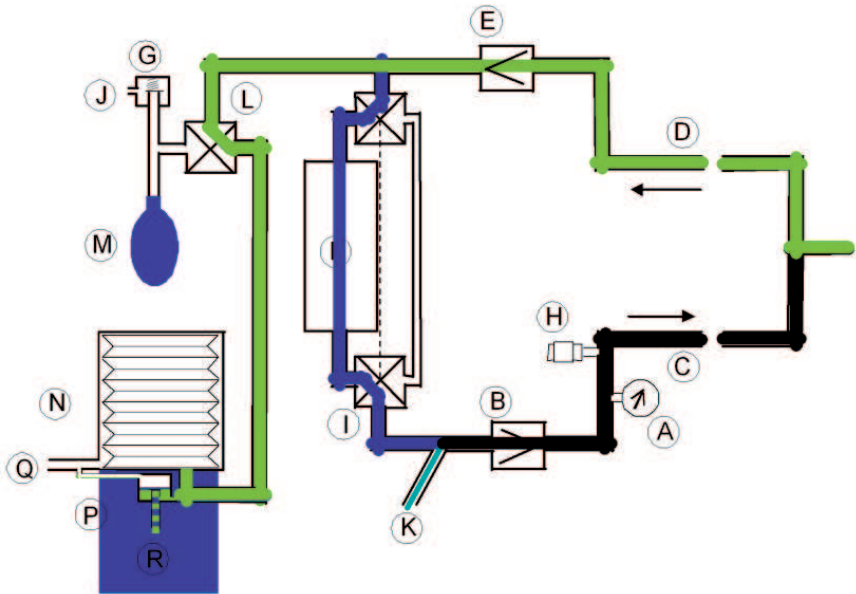


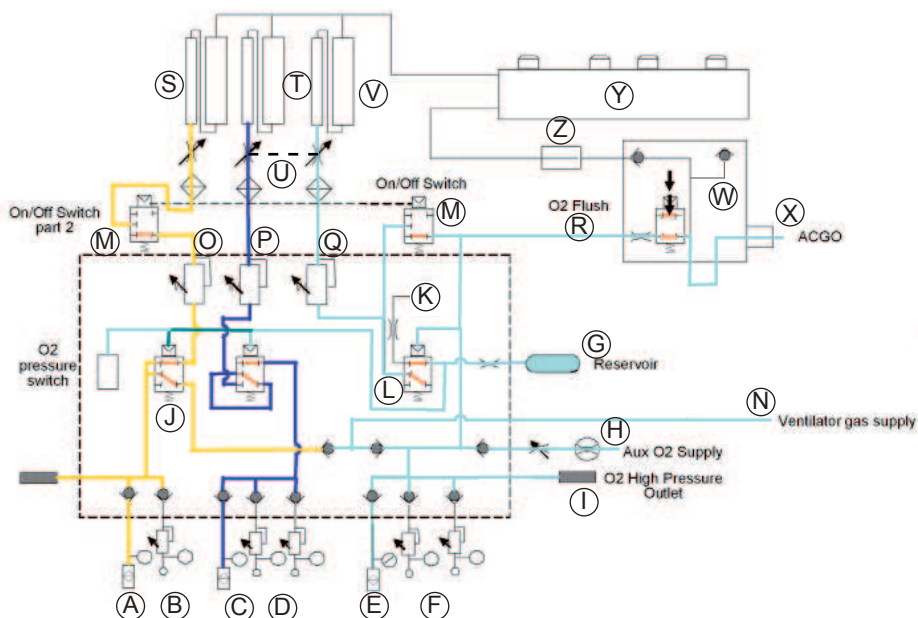
Figure 4 - Ventilator Schematic



- | | | | |
|---|-------------------------------|---|----------------------|
| A | Manometer | J | APL Exhaust Valve |
| B | Inspiratory Non-return Valve | K | Fresh Gas Port |
| C | Patient Inspiratory Connector | L | Bag/Vent Valve |
| D | Patient Expiratory Connector | M | Bag Port |
| E | Expiratory Non-return Valve | N | Bellows |
| F | Canister(s) | P | Pop-Off Valve |
| G | APL Valve | Q | Ventilator Drive Gas |
| H | Oxygen Sensor Port | R | Pop-Off Exhaust |
| I | Bypass Switch | | |

Figure 5 - Absorber Pneumatic Schematic

Overview



A	Air Pipeline	N	Vent Supply
B	Air Cylinder Yoke	O	Air Secondary Regulator
C	N ₂ O Pipeline	P	N ₂ O Secondary Regulator
D	N ₂ O Cylinder Yoke	Q	Oxygen Secondary Regulator
E	O ₂ Pipeline	R	Oxygen Flush
F	O ₂ Cylinder Yoke	S	Air Flowmeter
G	Reservoir	T	N ₂ O Flowmeter
H	Auxiliary Flowmeter	U	Hypoxic Protection Link System
I	O ₂ High Pressure Outlet	V	Oxygen Flowmeter
J	Air Takeover Valve	W	Pressure Relief Valve
K	O ₂ Failure Alarm Whistle	X	CGO
L	O ₂ Failure Alarm Valve	Y	Seletatec Back Bar
M	On/Off Switch	Z	Fresh Gas Flow Sensor

Figure 6 - Pneumatic Circuit

2.3 Principles of Operation

For active inspiration, the flow control valve is opened to provide a specific gas flow into the bellows assembly. Simultaneously, the expiratory solenoid closes and pressure is generated in the bellows assembly producing an inspiratory flow to the patient.

The flow and pressure are measured and monitored by the microprocessor feedback system.

Expiration occurs when the flow control valve is closed and the expiratory solenoid opens and releases the gas from the bellows assembly.

In Pressure Control Mode, the set pressure is achieved during inspiration and maintained at that level by allowing a controlled bypass through the expiratory valve. This allows the required pressure level to be maintained while compensating for any fresh gas flow into the patient circuit.

For expiration, the expiratory solenoid is opened which releases the gas from the bellows assembly.

During all modes of ventilation, an autozero is periodically applied to the flow sensors just prior to a breath being delivered. At this point, there is no flow through the sensors, which ensures that the measured values are maintained as accurately as possible regardless of environmental variations.



A safety valve is present in the drive pressure exhaust 75 cmH₂O. Its function is to protect the patient against pressures exceeding 75 cmH₂O ± 2 cmH₂O by relieving the drive pressure on the bellows.

NEEP is not supported by this machine but patient generated pressures may be measured to - 10 cmH₂O, at which point an alarm will sound.

Notes

BleaseSirius

Anesthetic Machine

Chapter 3

Planned Maintenance

Planned Maintenance

3.1 Planned Maintenance

Only authorized technical engineers should service the machine, since they have the appropriate training and qualifications in the use of high-pressure medical devices. Servicing should take place in a clean and controlled environment taking particular care to prevent contaminants entering the unit while disassembled.

Service Kits	Part Number
Annual Service Kit	14000511
*Four-Year Service Kit	14000512

** Includes all parts required for units with four cylinder yokes installed.*



All parts included in PN 14000512 are not required for all BleaseSirius machines. You can order individual parts instead of ordering PN 14000512.

Four-Year PM Kit Contents	Part Number
*Annual PM Kit	14000511
*Battery	80300025
**Regulator Pressure Relief Valve	019-0831-00
***Filter	53700027
***O-ring	51150283

* Required for every machine

**One kit required for each cylinder yoke installed on the machine.

***Required for machines sold before February 2009.

Planned Maintenance



- Bodocs Seals
- Backbar Seals
- Absorber Stop + O₂ Blanking Plug
- Backbar Dzuz Springs
- AGSS Probe Seal
- AGSS Float Seal
- Pipeline Filter
- Pipeline 'O' Ring
- Bellows Base/Cover
- Ped Bellows
- Bellows Base/Pop off
- Absorber Upper Seal
- Absorber 'O' Rings for Insp/Exp + APL
- Pop off Valve
- Absorber Gauge
- Absorber Control Seal
- Absorber Bottom Canister

Figure 7 - BleaseSirius Annual Planned Maintenance Kit
PN 14000511

Planned Maintenance



- Cylinder Regulator Service Kit
- 'O' Ring for Filter
- Battery

Note:
Includes annual
kit, PN 14000511

*Figure 8 - BleaseSirius Four Year Planned Maintenance Kit
PN 14000512*

3.2 Routine Maintenance and Service Check.

3.2.1 Fitting Planned Maintenance Kit PN 14000511



Bodoc Seals (1), Backbar Seals (2) and O₂ Probe 'O' Ring (3) are duplicated. The duplicated set is to be placed in one of the drawers for the user to replace if one is damaged or fails test during use.

3.2.2 Bodoc Seals

1. Remove cylinders from the yokes, then remove the old Bodoc Seal and replace with new ones.
2. Refit the cylinder.

3.2.3 Backbar Seals

1. Remove vaporizers from the Selectatec backbar then remove all four seals.
2. Replace with new ones.

3.2.4 Backbar Dzus Springs

1. Remove the two Dzus Spring assemblies by undoing the two screws (in the diagonal corners of the plate). Lift the plate up, taking care not to drop the index pin. The index pin must be fitted to the new Dzus Spring assembly before fitting new item.
2. Refit the vaporizers and check that they locate and lock on the backbar currently.

3.2.5 Absorber Stop/'O' Ring

1. Remove the 'O' Ring from the absorber blanking plugs and absorber stop, then replace them. (The new cell is supplied with 'O' ring fitted.)

3.2.6 Pipeline Fitting and 'O' Ring

1. Disconnect pipelines from their supply. Disconnect the pipeline connection from the BleaseSirius.
2. Unscrew the two small grub screws until the main body of the connection is free to rotate.
3. Unscrew the connector, the filter and 'O' Ring can now be changed.

Planned Maintenance

4. Refit the outer part of the connector and tighten the two small grub screws.
5. Repeat for all three pipelines.
6. Note each gas type has a unique fitting and can not be incorrectly mixed.
7. Refit the pipeline and check for leaks.

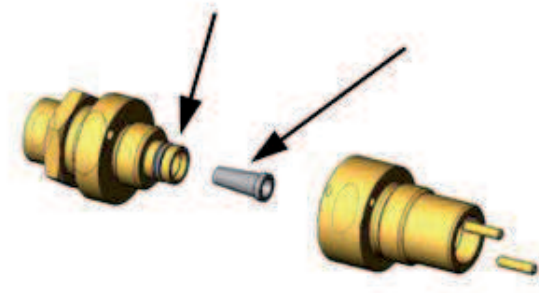


Figure 9 - Pipeline Fitting & 'O' Ring

3.3 AGSS Probe and Float for Spacelabs AGSS PN 14200018, (if Fitted)



The AGSS is not available in the U. S.)

1. Disconnect electrical supply to BleaseSirius
2. Remove the bellows assembly by sliding the absorber forward until the bellows connections become free, then remove the two thumb wheels at the front of the bellows. The bellows assembly can now be lifted clear of the locating pins at the rear of the bellows assembly.
3. Working through the apparatus below the bellows assembly.
4. The AGSS probe can be pulled out of the top of the AGSS unit.
5. Remove the 'O' Ring and replace with the new part.
6. Disconnect the 30mm connector from the side of the AGSS unit, (located approximately 100mm down the AGSS unit).
7. The AGSS unit will now pull off its V mounting bracket and can be removed through the apparatus.
8. Hold the lower black part of the body (where the 30mm connector is) and unscrew the top black part (with the windows).
9. Clean the filter.
10. Remove the top 'O' Ring slide the green float off the central stem and remove the bottom 'O' Ring.
11. Replace the bottom 'O' Ring.
12. Refit the float (make sure it is the correct way up) then replace the top 'O' Ring.
13. Reassemble the fitted/window on top, screw onto the lower sections.
14. Place the AGSS unit back onto its V bracket.
15. Refit the 30mm connector and the AGSS probe.

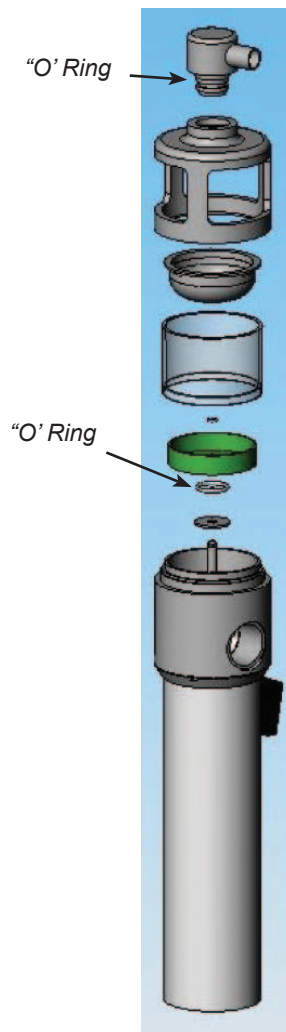


Figure 10 - AGSS

3.4 Bellows Base/Canister

1. Remove the bellows cover (bayonet fitting), then replace the bellows base/canister 'O' Ring.
2. Remove the bellows by gently pulling the lower convolution of the retaining ring.
3. Remove the pop-off valve.
4. Replace the bellows base pop-off valve "O" ring.

3.5 Pop-off Valve

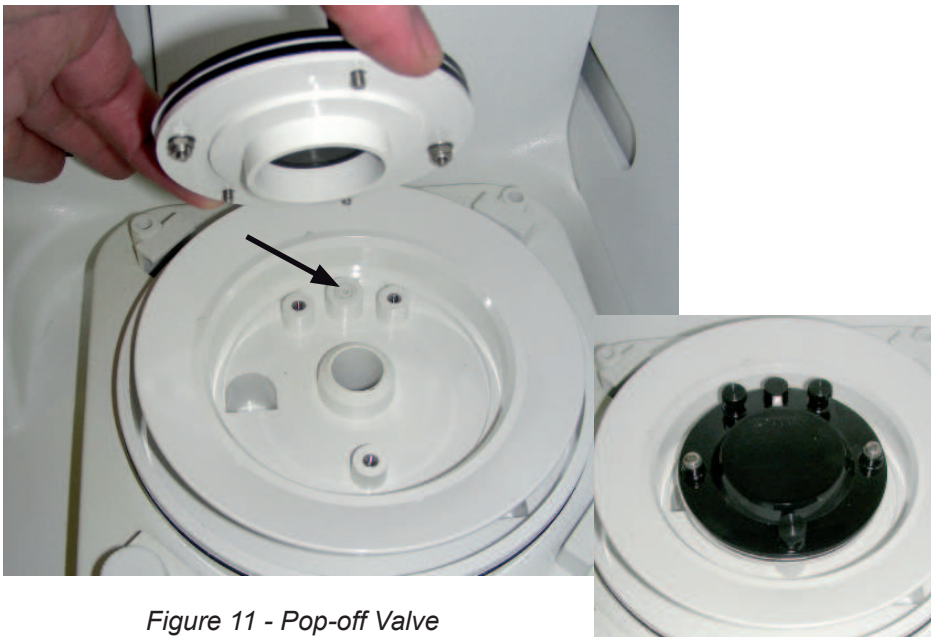


Figure 11 - Pop-off Valve

1. Replace Pop-off valve in bellows base.
2. Refit bellows by gently pulling the lower convolution over the ring in the bellows base.
3. Replace the bellows outer cover.

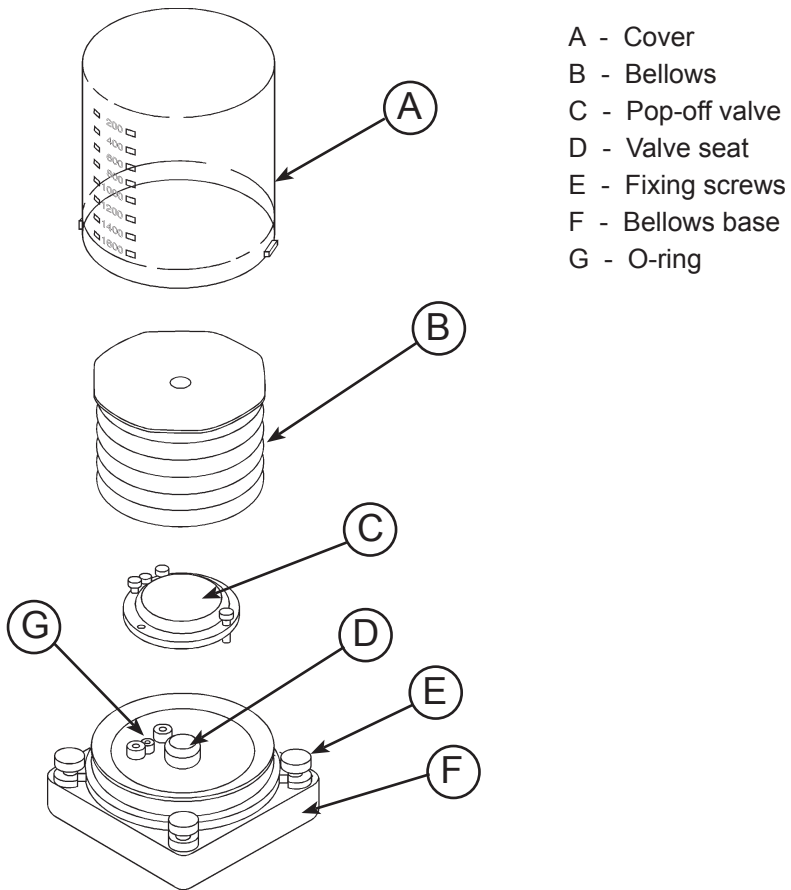


Figure 12 - Bellows Assembly

3.6 Absorber

3.6.1 Valve Covers



When removing or refitting any of these valves, it is important to ensure the metal valve disk and seat are not damaged.

1. Remove the expiratory valve by twisting the clear plastic valve cover.
2. Replace the 'O' Ring seal on the valve cover.
3. Replace the expiratory valve on the absorber.
4. Remove the inspiratory valve cover.
5. Replace the 'O' ring seal.
6. Replace the valve cover.
7. Remove the APL valve.
8. Replace the 'O' ring seal.
9. Replace the APL valve.

3.6.2 Manometer

1. Remove the manometer gauge by pressing the quick release lever at the base of the gauge.
2. Replace the 'O' ring seal.
3. Refit the gauge.

3.6.3 Canister Seals

The outer canister seal is a bayonet fitting.

1. Remove the soda lime canister.
2. The outer canister seal is located on the base of the absorber in the groove.
3. Replace the outer canister seal.
4. The upper canister seal is fitted to a lip inside the bottom absorber molding.
5. Replace the upper seal.
6. The central seal is laid on top of the lower inner canister before the upper canister is fitted.
7. Install the canister assembly onto the bottom of the Absorber.

3.6.4 Fitting 4 Year Planned Maintenance Kit, PN 14000512

The recommended service intervals for the following are every 4 years. The following procedure outlines the steps taken to replace the parts included in the service kit 14200512.

3.6.5 Ventilator Filter

3.6.5.1 Two Valve Version Only (on units before Feb 2009)

1. Ensure all gas supplies are disconnected.
2. See Section 5.1 for removal of top surface and front cover.
3. Once the front cover is removed, you can access the 6 screws that secure the top of the ventilator casing.
4. The front display panel will hinge forward a little. This will allow the top cover to be hinged back.
5. The filler cover is in the inlet manifold which can be seen from the front of the unit.
6. Remove the cover.
7. The filter can then be unscrewed.
8. Replace the filter and cover and make sure the new 'O' ring is fitted.
9. Replace the screws in the top cover and front display panel.
10. Reconnect the O₂ pipeline only and turn on the system.
11. Check that there are no leaks.
12. Turn the systems OFF.
13. Fit the front cover and top surface.

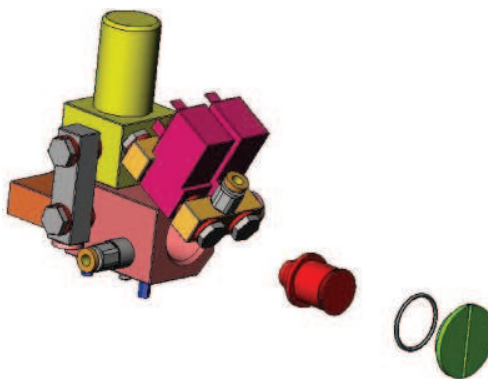


Figure 13 - Pneumatic Module

3.6.5.1 Valve Block on units after Feb 2009

Due to major enhancements in the inlet filtration methods, a valve block filter is no longer required and, therefore, is not fitted.

3.6.6 Cylinder Regulator Pressure Relief Valve, PN 019-0831-00

1. Remove all cylinders.
2. Remove the large back panel.
3. Fit a service kit to each of the regulators.

Disassembly

1. Remove and discard relief valve by turning counter-clockwise using a 15/16" spanner or socket.

Assembly

1. Fit new relief valve and 'O' ring.
2. Reset the pressure as required. See 'ADJUSTMENT' below.

Adjustment

Turn the adjusting screw clockwise to increase and counterclockwise to decrease outlet pressure setting. To reduce pressure, first reduce to a pressure less than that desired, then increase to the desired outlet pressure. Turn the adjusting screw using a 1/8-inch hex key.

Once 45 psi setting has been achieved, secure the locknut.

3.7 CLEANING

Cleaning of external surfaces is possible using water or isopropyl alcohol. Cleaning of internal surfaces and parts should not be required and is not recommended.



This product is intended for use in medical compressed gas systems only. Do not use this product where pressures and temperatures can exceed those listed under Technical Data.

DO NOT use any lubricants that are not compatible with oxygen or medical gases. The use of lubricants not compatible with oxygen may pose a risk of fire or explosion.

Open the cylinder valve slowly to prevent the risk of fire or explosion due to oxygen pressure shocks. The relief valve is a safety device and must only be removed for servicing. When servicing is complete, a new relief valve must be fitted. Do not attempt to adjust or tamper with the relief valve.

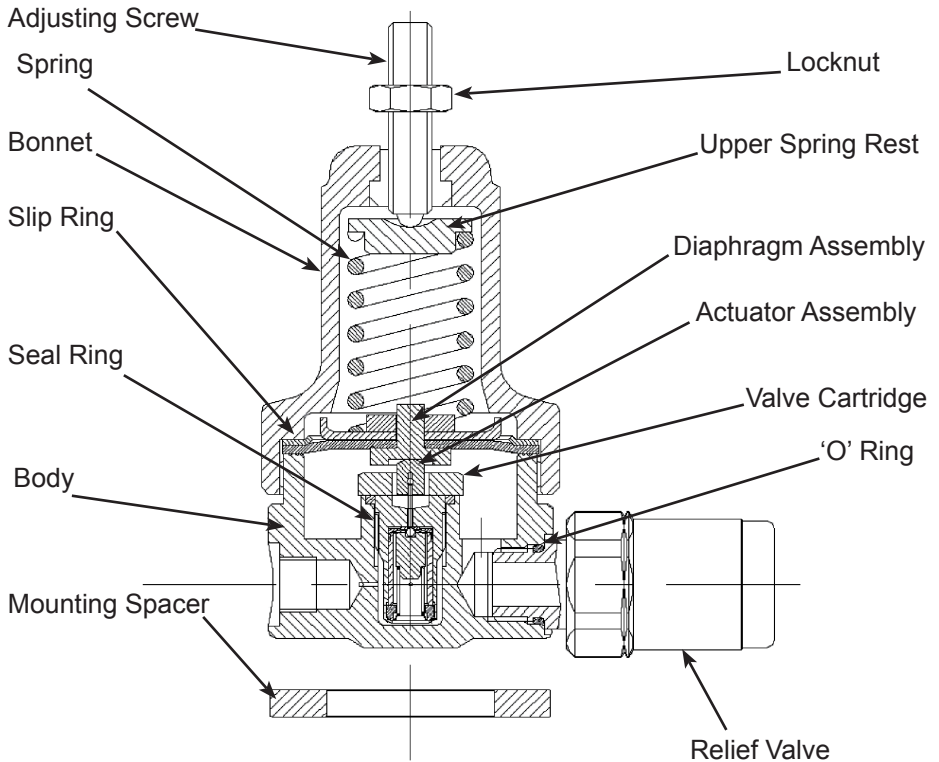


Figure 14 - Primary Regulator

Notes

BleaseSirius

Anesthetic Machine

Chapter 4

System Checks

System Checks

4.1 Overview

This chapter explains the systems checks that must be used on all BleaseSirius anesthetic machines whenever any of the following procedures has been performed:

- Installation
- Planned Maintenance (should be performed annually)
- Service
- Repair

Use the service check sheet, shown on page 64, to record the results.

4.2 Tools and Test Equipment Required

1. 2 mm, 2.5 mm, 3 mm, 4 mm, 1/8 inch Allen key
2. 13 mm wrench
3. Adjustable crescent wrench
4. Pressure measuring device (able to read 0 – 100 psi)
5. Pressure measuring device (able to read 0 – 100 cmH₂O)
6. Flow measuring device (able to read 0 – 100 L/min)
7. Flow measuring device (able to read 20 – 1000 ml)
8. Oxygen analyzer
9. Pressure Gauge (able to read 0 – 200 mmHg)
10. Copy of the BleaseSirius Checkout Sheet (See page 64). You can use a print copy (073-0301-00) or an electronic copy (073-0321-00).

Contact Technical Support at advsupport@spacelabs.com to request an electronic copy of the BleaseSirius Checkout Sheet.

System Checks

Parts Required

Description	Part Number	Quantity
WHITE O2 DRV HOSE O2 NIST-UK MINISCHRAEDER 0.32M	10700007	1
BLACK AIR DRIVEHOSE AIR NIST-UK MINISCHR. 0.32M	10700008	1
GREEN O2 DRIVE HOSE O2 DISS-US DISS 0.32M	10700009	1
CONNECTOR, 22MM FEMALE TO BARB, STAINLESS STEEL	376-0559-00	3
9/16 O CLIP STD GAUGE	ST2161	3
2 LITRE RE-BREATHING BAG	ST2111	2
Patient Flow Sensor	10110090	2
Pediatric Flow Sensor	376-0561-00	2
22mm female – female connector	54100065	1
Clear smooth bore hose	166-7060-00	1
Siemens test lung	54100057	2
17mm male – 22mm female connector	12500055	1
6mm tubing (green)	53500030	100
C.G.O. ADAPTOR	SK2226	3
6mm plug	54200151	5
BACKBAR VALVE TEST KIT	930210	1
22MM MALE /22MM MALE CONN	ST4710	3
PATIENT CIRCUIT ASSEMBLY	M1050-4	1
ANST,HYTREL TUBING,22MM ID,110CM,REUSABLE	709-0488-00	1
Fomblin Lubricant	ST7014	1
Programming Cable	12600015	1
Pressure Sampling Tee	10500003	2
Dowty Seal	50300035	5
Snoop	ST8026	1

System Checks

Description	Part Number	Quantity
Pipeline Leak Test Valve, O2 DISS	010-1981-00	1
Pipeline Leak Test Valve, N2O DISS	010-1982-00	1
Pipeline Leak Test Valve, AIR DISS	010-1983-00	1
<i>Note: Use PNs 010-1981-00, 010-1982-00 and 010-1983-00 for the Reverse DISS Pipeline Leak Test.</i>		
Pipeline Leak Test Valve, O2 NIST	010-1984-00	1
Pipeline Leak Test Valve, N2O NIST	010-1985-00	1
Pipeline Leak Test Valve, AIR NIST	010-1986-00	1
Pipeline Leak Test Valve, O2 SIS	010-1987-00	1
Pipeline Leak Test Valve, N2O SIS	010-1988-00	1
Pipeline Leak Test Valve, AIR SIS	010-1989-00	1

Customer _____
Print Name: _____
Signature: _____
Date: _____

Representative
Print Name: _____
Signature: _____
Date: _____

Sirius SNI: _____
Front Panel SW: _____
Bav Controller SW: _____
Model #: _____
Absorber SNI: _____

Hospital: _____
Address: _____
City: _____ ST: _____
Contact: _____
Phone Number: _____

Visual Inspection			
Description	Pass	Fail	N/A
Cylinder Yokes			
Pipeline Inlets			
Pipeline Hoses			
Absorber Rods			
Hb Outlet (if fitted)			
Backbar			
O2 Flush Assy			
Common Gas Outlet			
Flowmeter Assy / Control Knobs			
Drawers			
Castors			
Pipeline Leak Test			
Description	Pass	Fail	N/A
O2			
N2O (if fitted)			
Air (if fitted)			
Cylinder Leak Test			
Description	Pass	Fail	N/A
O2 (if fitted)			
2nd O2 (if fitted)			
N2O (if fitted)			
2nd N2O (if fitted)			
Air (if fitted)			
Cylinder Output Test (45 ± 2PSI)			
Description	Pass	Fail	N/A
O2 (if fitted)			
2nd O2 (if fitted)			
N2O (if fitted)			
2nd N2O (if fitted)			
Air (if fitted)			
On/Off Switch Gas Cut Off			
Description	Pass	Fail	N/A
Switch "Off" no flow available			
Switch "On" flow available			
Switch "Off" flow drops to "0"			
Switch "On" flow restored			
Oxygen Supply Failure			
Description	Pass	Fail	N/A
Alarm sounds for 8 sec			
N2O drops to "0" (if fitted)			
Air available (if fitted)			

High Pressure Outlets (= or > 80LPM)			
Description	Pass	Fail	N/A
O2 Shraeder (if fitted)			
O2 diss (if fitted)			
Air Shraeder (if fitted)			
Hypoxic Guard/Flow Control Accuracy			
Description	Pass	Fail	N/A
Flowmeter backlight (non-EFM)			
Min. O2 flow (130 - 170ml)			
N2O = 1LPM (O2 = 21 - 30 %)			
N2O = 6LPM (O2 = 21 - 30 %)			
N2O = 12LPM (O2 = 21 - 35 %)			
N2O = 3LPM (O2 = 21 - 30 %)			
O2 = 1.5LPM (O2 = 21 - 30 %)			
O2 = 0.4LPM (O2 = 21 - 30 %)			
O2 & N2O = 3LPM (O2 = 47 - 53 %)			
O2 & N2O = 6LPM (O2 = 47 - 53 %)			
O2 & Air = 3LPM (O2 = 57 - 63 %)			
O2 & Air = 6LPM (O2 = 57 - 63 %)			
Backbar			
Description	Pass	Fail	N/A
Build up (150mmHg in 7 sec)			
T1 (left side)			
T1 (right side)			
T2 (left side)			
T2 (right side)			
Common Gas Outlet			
Description	Pass	Fail	N/A
O2 flush (35 - 55LPM)			
PRV (3.25 - 3.95PSI)			
Suction			
Description	Pass	Fail	N/A
Off position			
Full position			
Reg position			
Absorber			
Description	Pass	Fail	N/A
Expiratory leak test (<60ml/min)			
Inspiratory leak test (<60ml/min)			
APL = 65 (59 - 71cmH2O)			
APL = 30 (24 - 36cmH2O)			
APL = MIN (<5cmH2O)			

Ventilator			
Description	Pass	Fail	N/A
Compliance test			
Systems check			
CALBK: flow control cal			
CALBK: inspiratory valve cal			
CALBK: block and pressure zeros			
Toucscreen calibration			
Fresh gas calibration			
VIT = 250 ±25ML			
VIT = 500 ±50ML			
VIT = 750 ±75ML			
PEEP = 10 ±1.5cmH2O			
Pressure = 30 ±3cmH2O			
Pressure = 30 ±3cmH2O			
Pressure High Alarm			
Alarms			
Description	Pass	Fail	N/A
Apnea			
Sustained pressure			
Low gas pressure			
Pressure low			
O2 supply fail			
Pressure Limit			
Minute voi. Low			
Minute voi. High			
Oxygen low			
Oxygen high			
O2 sensor error			
Mains fail			
Absorber not fitted			
Vaporizer Concentration (if fitted)			
Description	Pass	Fail	N/A
Vap s/n:			
Vap s/n:			
Vap s/n:			
Vap s/n:			
Electrical Safety			
Description	Pass	Fail	N/A
< 300uA(120/100 Vac)/< 300uA(220/240 Vac)			
<0.20			

Figure 15 - BleaseSirius Checkout Sheet (PN 073-0301-00 Rev. C)

4.3 Visual Inspection

Check that the following components are free of damage and are securely mounted to the machine and/or fittings.

1. Cylinder Yokes

Verify the yoke block, index pins and bridges are free of damage and that the tee screw freely threads into the yoke bridge.

2. Pipeline Inlets

Verify that the pipeline inlets are free of damage and inspect the threads for damage as well. Connect pipeline hoses to each inlet and ensure that the hoses connect freely.

3. Pipeline Hoses

Verify that pipeline hoses are free of deterioration and damage. Connect both ends of the hoses and pull them to check for a secure connection.

4. Absorber Rods

Verify that the rods are free of damage, secure and not bent.

5. High Pressure Outlet (if fitted)

Verify that the High pressure outlets are free of damage. Connect the proper hose and check for a secure connection.

6. Backbar

Verify the backbar and backbar valves are free of damage. Check that the o-rings on the valves are free of damage.

7. Oxygen Flush Assembly

Verify that the assembly is free of damage. Push the flush button and ensure it goes in and comes out smoothly.

8. Common Gas Outlet

Verify that the common gas outlet is free of damage. Pull on the outlet and ensure it is secured to the frame.

9. Flowmeter Assembly & Control Knobs

Verify that the flowmeter assembly and knobs are free of damage. Turn the knobs on and off to check for a smooth operation.

10. Drawers

Verify that the drawer(s) are free of damage. Open and close the drawers to check for a smooth operation.

11. Castors

Verify that the castors are free of damage. Check that when the castors brakes are not engaged, the machine can move freely in any direction. Listen for noise. When the brake is engaged, ensure that the machine cannot be moved.

4.4 Pipeline Leak Test

1. Ensure that the On/Off switch is in the “OFF” position.
2. Ensure that all flow control valves are closed.
3. Ensure that no cylinders are fitted to the machine.
4. If fitted, disconnect all pipeline hoses connected to the pipeline inlets coming from the hospital supply. Disconnect the hospital supply before you perform this step.
5. Connect the pipeline test shut-off valve to the appropriate pipeline inlet for the gas being tested (O_2 / N_2O / AIR) and ensure the valve is in the “OFF” position.

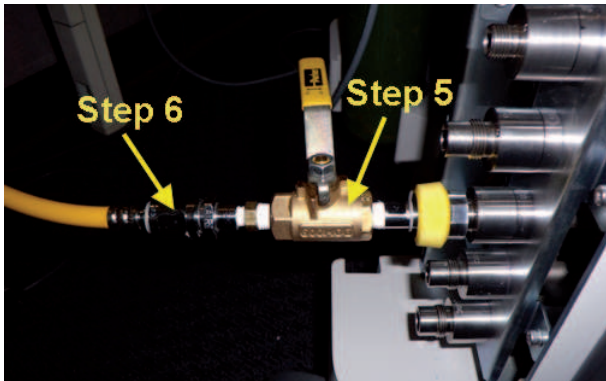


Figure 16 - Connect the Pipeline Test Shut-off Valve

System Checks

6. Connect the appropriate pipeline hose to the pipeline test shut-off valve assembly, and then connect it to the hospital supply.
7. Turn the pipeline test shut-off valve "ON" to allow flow.
8. Verify that the appropriate gauge registers.
9. Wait 15 seconds for the system to pressurize and shut the pipeline test shut-off valve off.
10. Disconnect the pipeline hose from the hospital supply and verify that the appropriate digital gauge is still registering.
11. Verify that the pipeline gauge does not fall 50 kPa, half of a division in three minutes.



Figure 17 - N₂O Pipeline Gauge

12. If the leak test is passed, disconnect the pipeline test shut-off valve from the machine and verify that the pipeline gauges value drops to zero.
13. Repeat steps 5-12 for all additional pipelines fitted.

4.5 Cylinder Leak Test

1. Ensure that all flow control valves are turned off.
2. Ensure that the power switch is in the “OFF” position.
3. Ensure that no pipeline supply is connected to the pipeline inlets.
4. Fit a full O₂ cylinder (at least 1000 psi) to the O₂ yoke.
5. Turn on the cylinder and ensure that the appropriate gauge registers correct.
6. Close the cylinder and verify that the gauge does not drop more than 150 psi (345 kPa) over two minutes.
7. Remove the cylinder and verify the gauge reads zero.
8. Repeat steps 1-7, if two O₂ yokes are fitted.
9. Repeat steps 1-7, if an air yoke is fitted. Use a full air cylinder (at least 1000 psi).
10. Fit a full N₂O cylinder (at least 700 psi) to the N₂O yoke.
11. Turn on the cylinder and ensure the appropriate gauge registers correct.
12. Close the cylinder and verify that the gauge does not drop more than 150 psi (345kPa) over two minutes.
13. Remove the N₂O cylinder and verify the gauge reads zero.
14. Repeat steps 10-13, if two N₂O yokes are fitted.

4.6 Regulator Output Test

1. Remove the lower inspection cover.
2. Ensure that the power switch is in the “OFF” position.
3. Fit a full cylinder to the yoke of the appropriate regulator being tested.
(O₂ / Air: at least 1000 psi and N₂O: at least 700 psi).

System Checks

4. Disconnect the 6 mm plug from the regulator test point, then connect a pressure measuring device to the test point.



Figure 18 - Connect Pressure Measuring Device

5. Turn the cylinder on.
6. Turn the switch to the “ON” position and set a flow of 1 L/min on the flow control valve for the appropriate gas being tested.
7. Verify that the pressure measuring device reads between 45 ± 2 psi.
8. If the reading is out of spec, loosen the nut on the regulator being tested using a 13 mm wrench. Adjust the set screw using a 1/8 inch Allen key to set the regulator to 45 ± 0.5 psi. Once achieved, secure the nut.

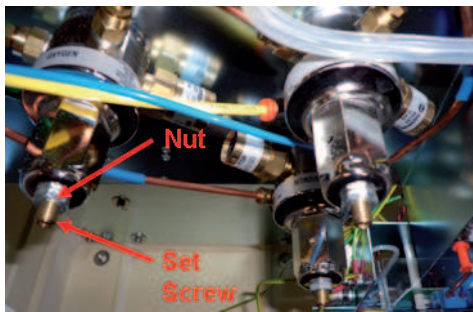


Figure 19 - Regulator Nut and Set Crew Locations

9. Repeat steps 3-8 for all regulators. (Note: When testing outputs or making adjustments on N_2O regulators, ensure that an O_2 supply is connected to the O_2 pipeline inlet.)

4.7 On/Off Switch Gas Cut Off Test

1. Ensure that the power switch is in the “OFF” position.
2. Ensure that a supply is connected to all pipeline inlets.
3. While the switch is in the “OFF” position, check that no flow is available to the flowmeter. Turn the O₂, N₂O, and Air flow control valves counterclockwise to open the valves. You should see no flow.
4. Set the power switch to the “ON” position and ensure flow is available to the flowmeter by setting a flow of 1 L/min on O₂, N₂O, and Air.
5. Set the power switch to the “OFF” position and ensure O₂, N₂O, and Air flow drops to zero. If the system has EFM, ensure that the display powers off.
6. Set the power switch in the “ON” position and ensure that flow is restored.

4.8 Oxygen Supply Failure Test

1. Set the power switch to the “OFF” position.
2. Ensure that the O₂, N₂O, and Air flow control valves are turned off by turning them clockwise.
3. Ensure that a pipeline supply is connected to all pipeline inlets.
4. Set the power switch to the “ON” position.
5. Set a flow of 4 L/min for O₂ and N₂O.
6. Force a failure to the O₂ supply by disconnecting the oxygen supply.
7. Verify that the O₂ failure alarm whistle sounds for a minimum of 8 seconds and that the N₂O flow drops to zero.
8. If fitted with an Air flow control valve, ensure flow is available by turning it counterclockwise.
9. Reconnect the oxygen supply and ensure that the O₂ and N₂O flows are restored.

4.9 High Pressure Outlet Test

4.9.1 Parts required

Only order parts that are required for testing, depending on which high pressure outlet is fitted to the machine.

O2 Schraeder (White)	Air Schraeder (Black)	O2 DISS (Green)
10700007, Quantity: 1	10700008, Quantity: 1	10700009, Quantity: 1
376-0559-00, Quantity: 1	376-0559-00, Quantity: 1	376-0559-00, Quantity: 1
ST2161, Quantity: 1	ST2161, Quantity: 1	ST2161, Quantity: 1
ST4710, Quantity: 1	ST4710, Quantity: 1	ST4710, Quantity: 1

4.9.2 Test Hose Assembly

1. For O₂ and Air Shraeder, cut the NIST fitting end of the hose. For O₂ DISS, cut either end of the hose.
2. Fit the cut end of the hose through the O-clip.
3. Fit the 22 mm female connector through the hose and secure the assembly with the O-clip.

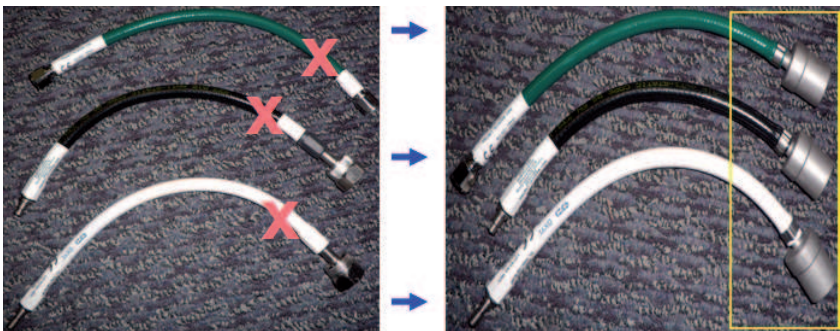


Figure 20 - Test Hose Assembly

4.9.3 Test the High Pressure Outlet(s)

1. Ensure that the power switch is in the “OFF” position.
2. Connect a supply to the pipeline inlet for the appropriate gas type of the high pressure outlet being tested (O_2 or Air).
3. Connect the 22 mm male adapter to the test hose and flow measuring device.
4. Turn the flow control valve for the appropriate gas being tested (O_2 or Air) to maximum flow.
5. Connect the other end of the test hose assembly to the high pressure outlet.
6. Turn the power switch to the “ON” position.
7. Ensure that the reading on the flow measuring device is greater than 80 L/min.
8. Turn the power switch to the “OFF” position.
9. Close the flow control valve.

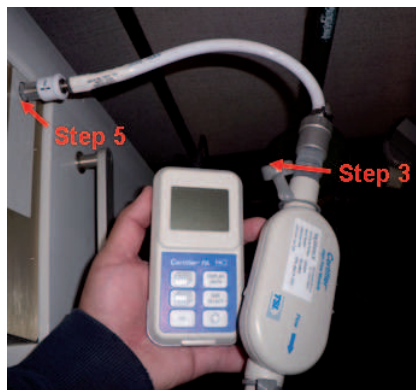


Figure 21 - Test Hose Connections

4.10 Hypoxic Guard and Flow Control Accuracy Tests

1. Ensure that the power switch is in the “OFF” position.
2. Ensure that a supply is connected to the pipeline inlets.
3. Ensure all flow control valves are closed.
4. Connect an O_2 analyzer to the CGO taper.

System Checks

5. Connect a 22 mm reusable tube to the tee piece routed to the AGSS auxiliary port. (Note: If the machine is fitted with an ACGO, ensure that the switch is set to ACGO.)



Figure 22 - Connect O₂ Analyzer (L) and Tubing to AGSS (R)

6. Turn the power switch to the “ON” position.
7. Ensure that the flowmeter backlight is on. (for non-EFM machines only)
8. Ensure minimum O₂ flow is between 130 – 170 ml.
9. Set a flow of 1 L/min on the N₂O flow control valve. Verify the O₂ analyzer reads between 21-30%. (Note: The O₂ flow will increase as the N₂O flow is increased)
10. Set a flow of 6 L/min on the N₂O flow control valve. Verify the O₂ analyzer reads between 21-30%.
11. Set a flow of 12 L/min on the N₂O flow control valve. Verify the O₂ analyzer reads between 21-35%.
12. Set the flow on the O₂ flow control valve down to 3 L/min. Verify that the O₂ analyzer reads between 21-30%. (Note: when the O₂ flow is decreased, the N₂O flow will also decrease.)
13. Decrease the O₂ flow to 1.5 L/min. Verify that the O₂ analyzer reads between 21-30%.
14. Decrease the O₂ flow to 0.4L/min. Verify that the O₂ analyzer reads between 21-30%.

System Checks

15. Close all flow control valves.
16. Set a flow of 3 L/min on the O₂ and N₂O flow control valves. Verify that the O₂ analyzer reads between 47-53%.
17. Set a flow of 6 L/min on the O₂ and N₂O flow control valves. Verify that the O₂ analyzer reads between 47-53%.
18. Close the O₂ and N₂O flow control valves.
19. Set a flow of 3 L/min on the O₂ and Air flow control valves. Verify that the O₂ analyzer reads between 57-63%.
20. Set a flow of 6 L/min on the O₂ and Air flow control valves. Verify that the O₂ analyzer reads between 57-63%.

4.11 Backbar Tests

4.11.1 Pressure Build-up Test

1. Ensure that an O₂ supply is connected to the machine.
2. Ensure that the power switch is in the “OFF” position.
3. Ensure that all flow control valves are closed.
4. Connect a bulb and pressure gauge to the CGO taper.

If the machine is fitted with an ACGO, ensure that the switch is set to ACGO.

5. Turn the power switch to the “ON” position. Set of flow of 0.3 L/min on the O₂ flow control valve.
6. Ensure that a pressure of 150 mmHg is reached within 7 seconds, then turn the power switch to the “OFF” position.



Figure 23 - Pressure Build-up Test

4.11.2 T1 Backbar Test

1. Remove the front cover.
2. Ensure that all flow control valves are closed.
3. Ensure that no pipelines or cylinders are connected to the machine.
4. Remove the 6 mm tubing from the 6 mm push-fit fitting and plug it with a 6 mm plug (Figure 24).
5. Fit TJ43T1 (part of PN 930210) on the left position of the backbar and connect a bulb and pressure gauge to it (Figure 25).
6. Apply a pressure of 200 mmHG and verify that the pressure does not rise or fall 10 mmHg in 30 seconds.
7. If the test is failed, replace the backbar valve being tested.
8. If the test is passed, fit TJ43T1 on the right position and repeat steps 2 through 7.
9. Remove the 6 mm plug and reconnect the 6 mm tube from step 4.

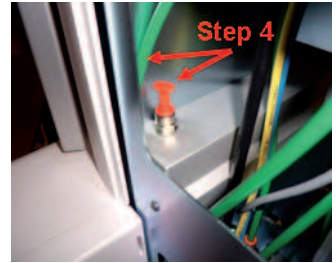


Figure 24 - Fit 6 mm Plug

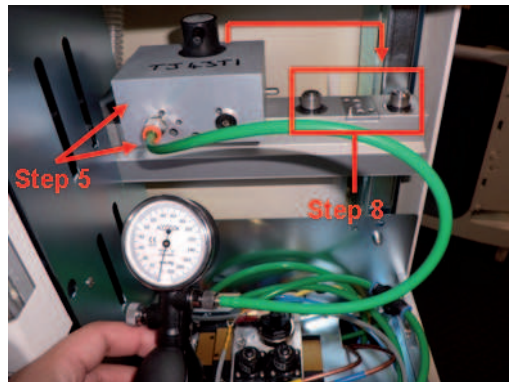


Figure 25 - Steps 5 and 8

4.11.3 T2 Backbar test

1. Ensure that the power switch is in the “OFF” position.
2. Ensure that all flow control valves are closed.
3. Ensure that no pipelines or cylinders are connected to the machines.
4. Plug the CGO taper. If the machine is fitted with an ACGO, ensure that the switch is set to ACGO.

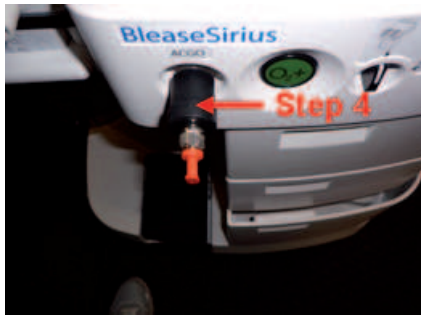


Figure 26 - Step 4: Plug the CGO Taper

5. Fit TJ43T2 (included in PN 930210) on the left position of the backbar and connect a bulb and pressure gauge to it.
6. Apply a pressure of 150 mmHg and verify that the pressure does not rise or fall 35 mmHg in 30 seconds.
7. If the test is failed, replace the backbar valve being tested.
8. If the test is passed, fit TJ43T2 on the right position and repeat steps 1-7.

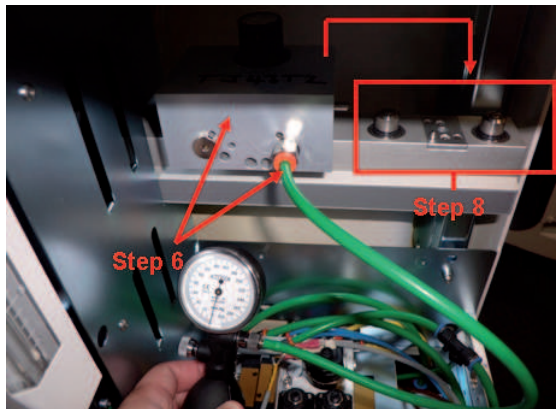


Figure 27 - Steps 6 and 8

4.12 Common Gas Outlet (CGO) Test

4.12.1 Oxygen Flush Test

1. Ensure that the power switch is in the “OFF” position.
2. Ensure that all flow control valves are closed.
3. Connect an O₂ supply to the O₂ pipeline inlet.
4. Connect a flow measuring device to the CGO taper. If the machine is fitted with an ACGO, ensure that the switch is set to ACGO.
5. Push the flush button and verify the flow measuring device reads between 35-55 L/min.



Figure 28 - O₂ Flush Test

4.12.2 Pressure Relief Valve Test

1. Ensure that the power switch is in the “OFF” position.
2. Ensure all flow control valves are closed.
3. Connect an O₂ supply to the O₂ pipeline inlet.
4. Connect a pressure measuring device to the CGO taper. If the machine is fitted with an ACGO, ensure that the switch is set to ACGO.
5. Turn the switch to the “ON” position.
6. Set a flow of 1 L/min on the O₂ flow control valve and verify that the pressure measuring device reads between 3.25-3.95 psi.



Figure 29 - Connect Pressure Measuring Device

4.13 Suction System Test

1. Ensure that the suction controller is in the “OFF” position.
2. Connect a vacuum hose to the vacuum pipeline inlet.
3. Ensure the vacuum system is on.
4. Ensure the suction gauge registers about 0 mmHg and that no suction is available on the suction bowl.



Figure 30 - Suction Gauge and Bowl

5. Switch the suction controller to the full position.
6. Ensure that the gauge registers around -100 to -200 mmHg.
7. Occlude the suction bowl and ensure the gauge registers about -500 mmHg.
8. Switch the suction controller to the REG position.
9. Occlude the suction bowl and ensure the vacuum can be regulated between 0 – 500 mmHg by adjusting the suction controller.

4.14 Absorber Tests

If the machine is fitted with an ACGO, ensure that the switch is set to Absorber.

4.14.1 Expiratory Valve Leak Test

1. Remove all patient circuits from the Absorber.
2. Close the APL valve fully clockwise.
3. Set the Absorber bag/vent switch to bag.
4. Occlude the inspiratory outlet using the O₂ sensor plug.
5. Occlude the O₂ sensor port using the O₂ sensor.
6. Attach a breathing bag to the bag port or bag arm.
7. Attach a flow measuring device on the expiratory port.

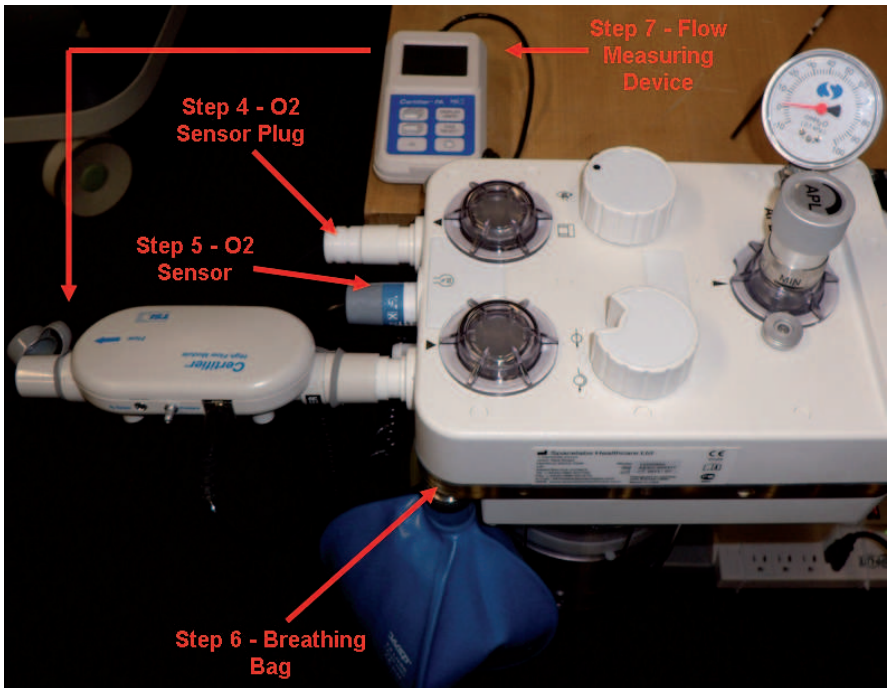


Figure 31 - Expiratory Valve Test Setup

System Checks

8. Pressurize the bag to 30 cmH₂O (using absorber gauge) by turning up the O₂ flow. Once 30 cmH₂O is reached, reduce the O₂ back to its minimum position.
9. Check the flow measuring device for any flow. Less than 60 ml/min is acceptable.
10. If you find a leak, replace the valve seat or valve disc. See Chapter 5 in this service manual for replacement procedures.

4.14.2 Inspiratory Valve Leak Test

1. Remove the O₂ sensor plug and attach an additional breathing bag to the inspiratory port (Figure 32).

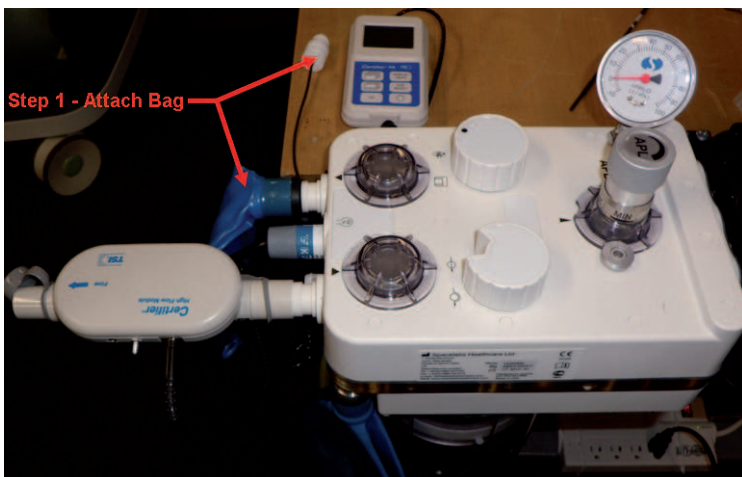


Figure 32 - Setup for Inspiratory Valve Test

2. Pressurize the bag to 30 cmH₂O (using the absorber gauge) by turning up the O₂ flow.
3. Remove the bag on the bag port and attach a flow measuring device as indicated in Figure 33.

System Checks

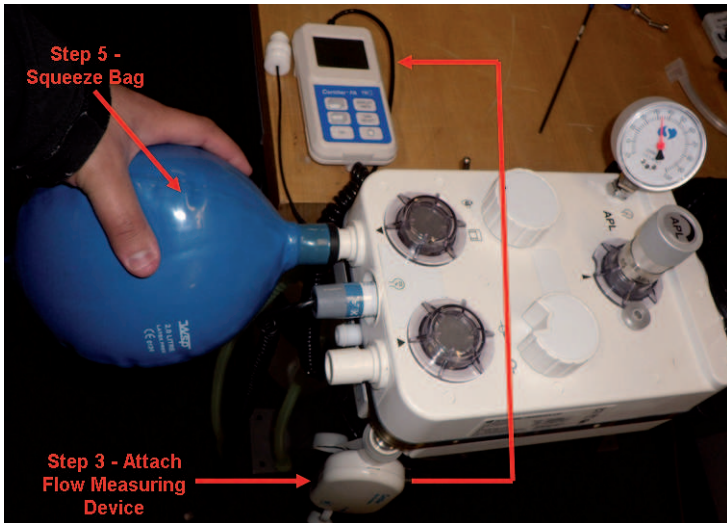


Figure 33 - Steps 3 & 4 of the Inspiratory Valve Test

4. Turn the power switch to the “OFF” position.
5. Gently squeeze the bag on the inspiratory port.
6. Check the flow measuring device for any flow. Less than 60 ml/min is acceptable.
7. If you find a leak, replace the valve seat or valve disc. See Chapter 5 in this service manual for replacement procedures.

4.14.3 APL Valve Check

1. Ensure that an O₂ supply is connected to the machine.
2. Ensure that all flow control valves are closed.
3. Connect a pressure measuring device to a pressure sampling tee.



Figure 34 - Connect a Pressure Measuring Device

System Checks

4. Connect the pressure sampling tee to the inspiratory port and a 22 mm reusable tube to the expiratory port and pressure sampling tee.

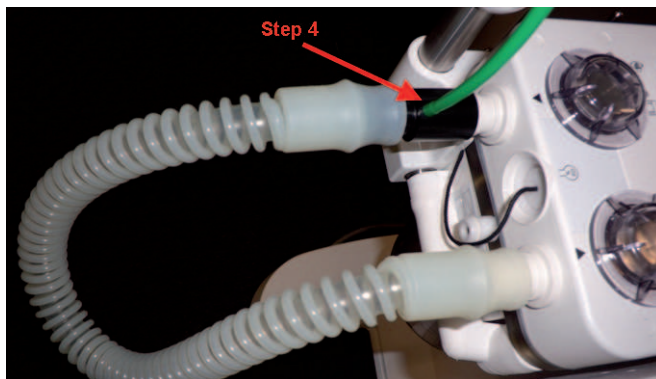


Figure 35 - Connect the Pressure Sampling Tee

5. Occlude the bag port.
6. Set the APL valve to "65".
7. Turn the switch to the "ON" position and set a flow of 6 L/min on the O₂ flow control valve.
8. Verify that the pressure measuring device reads between 59-71 cmH₂O.
9. Set the APL valve to "30".
10. Verify that the pressure measuring device reads between 24-36 cmH₂O.
11. Set the APL valve to "Min".
12. Verify the pressure measuring device reads less than 5 cmH₂O.



*Figure 36 - Step 5:
Occlude the Bag Port*

4.15 Ventilator Test

If the machine is fitted with an ACGO, ensure that the switch is set to Absorber.

1. Ensure that the power switch is in the “OFF” position.
2. Ensure that all flow control valves are closed.
3. Ensure that a gas supply is connected to the pipeline inlets.
4. Turn the power switch to the “ON” position.
5. Perform the compliance test and systems check. Continue using the same circuit used on the compliance and systems check for the remainder of this check-out procedure.
6. Set the ventilator to “Stand by.”
7. Perform a CALBK calibration by pressing Setup > Configuration > Service Mode. Enter the password, CALBK. (Note: Do not perform “Front Panel Zero”, as this will reset the VTI and VTE gain values back to defaults.)
8. Perform the “Flow Valve Calibration” by selecting this option on the touchscreen.
9. Remove the drive gas hose from the rear of the machine and plug the ventilator drive port.



!!IMPORTANT! DO NOT PLUG THE EXHAUST PORT!



Figure 37 - Exhaust Port Location

System Checks

10. Perform the “Inspiratory Valve Cal” by selecting this option on the touchscreen. Once complete, reconnect the drive gas hose onto the drive gas fitting.
11. Disconnect the patient hose from the auxiliary plate.
12. Perform the “Block and Pressure Zeros” calibration by selecting this option on the touchscreen. Once complete, reconnect the patient hose. Press “Home” on the ventilator display.
13. Press Setup > Configuration > Service Mode. Enter the password, TECHY.
14. Select “Touch Calibration” and perform a touchscreen calibration.
15. Select “Fresh Gas” to perform a fresh gas calibration. Use the O₂ flow control valve to set 1-10 L/min. If N₂O is available, set O₂ and N₂O to 10 L/min in order to set 20 L/min. If N₂O is not available, use O₂ and Air. (Note: To set 0 L/min, disconnect the O₂ supply from the machine and press the O₂ flush to release the remaining O₂. Once 0 L/min is set, reconnect the O₂ supply to continue the calibration.
16. Connect a flow measuring device to the inspiratory limb of the breathing circuit as close to the “Y” as possible. Connect a test lung with a filter to the patient flow sensor.



Figure 38 - Step 11: Disconnect Patient Hose



Figure 39 - Connect a Flow Measuring Device

System Checks

17. Set the bag/vent switch on the absorber to Vent.
18. Run the ventilator in volume control mode with the following settings:
 - Volume = 250 ml
 - BPM = 8
 - I:E = 1:2
 - PEEP = OFF
19. Wait for the ventilator to stabilize.



For ventilators with front panel software 10.XX installed, use a pediatric flow sensor when performing this step. Place the ventilator in Standby. On the ventilator display, change the sensor setting from adult sensor to pediatric sensor (Figure 40A) and the sensor placement setting to Pedi Sensor at Patient (Figure 40B).

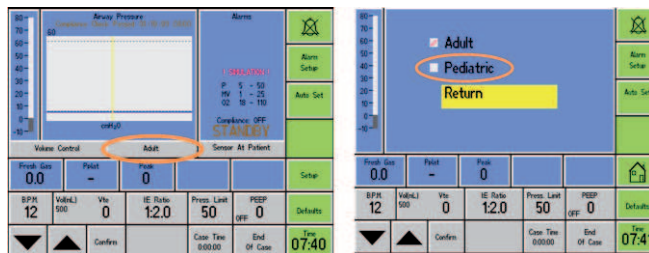


Figure 40A - Change the Flow Sensor Settings



Figure 40B - Pedi Sensor Placement setting

20. Check that the inspired volume (VTI) on the flow measuring device is 250 ± 25 ml. Once complete, switch the ventilator back to adult mode and use the adult flow sensor for the remaining checks.
21. Increase the tidal volume to 500 ml. Wait for the ventilator to stabilize.

System Checks

22. Check that the inspired volume (VTI) on the flow measuring device is 500 ± 50 ml.
23. Increase the tidal volume to 750 ml. Wait for the ventilator to stabilize.
24. Check that the inspired volume (VTI) on the flow measuring device is 750 ± 75 ml.

i *If steps 20, 22 or 24 should fail, perform a PRAAA calibration according to the instructions given in PSN: 076-9027-00.*

25. Place the ventilator in Standby. Connect a pressure measuring device to the inspiratory port of the absorber (Figure 41).



Figure 41 - Connect a Pressure Measuring Device

26. Set the bag/vent switch to Vent.
27. Ensure that the bellows is full.
28. Set the PEEP on the ventilator to 10 cmH₂O.
29. Verify that the pressure measuring device reads 10 ± 1.5 cmH₂O.
 - Change the ventilator from volume control to pressure control mode at the following settings: Pressure = 10 cmH₂O
 - BPM = 8
 - I:E = 1:2
 - PEEP = OFF
30. After 12 breaths, verify that the pressure measuring device reads 10 ± 2 cmH₂O.

System Checks

31. Increase the pressure to 30 cmH₂O.
32. After 12 breaths, verify that the pressure measuring device reads 30 ±3 cmH₂O.
33. Continuously squeeze test lung at the expiratory phase to simulate a high pressure alarm. Ensure that the high pressure alarm is displayed on the ventilator.
34. Remove all test equipment from the breathing circuit. Run the ventilator in volume control mode with the following settings:
 - Volume = 500 ml
 - BPM = 8
 - I:E = 1:2
 - PEEP = OFF
35. Disconnect the O₂ supply and air supply (if fitted). Verify that the following alarms are displayed on the ventilator.
 - Apnea
 - Sustained Pressure
 - Low Gas Pressure
 - Pressure Low
 - O₂ Supply Fail
36. Reconnect the O₂ and Air (if fitted) supplies and let the ventilator stabilize.
37. Lower the pressure limit to 20 cmH₂O. Secure the test lung so that it cannot inflate until the pressure limit alarm is displayed on the ventilator screen. After it is displayed, increase the pressure limit to 50 cmH₂O.
38. Verify that the minute volume (MV) is displayed on the ventilator. Increase the minute volume (MV) lower limit to 8, then verify that the Minute Volume Low alarm is displayed on the ventilator.
39. Decrease the minute volume (MV) lower limit to 2 and the higher limit to 3. Verify that the Minute Volume High alarm is displayed.
40. Disconnect the O₂ sensor from the absorber and expose it to room temperature. Wait for the O₂ to read 21%. Increase the oxygen lower alarm limit to 25, then ensure that the Oxygen Low alarm is displayed on the ventilator.



Ensure that the O₂ sensor used is calibrated.

System Checks

41. Decrease the oxygen lower limit to 18% and the higher limit to 19%. Verify that the Oxygen High alarm is displayed on the ventilator.
42. Disconnect the O₂ sensor, then verify that the O₂ Sensor Error alarm is displayed on the ventilator.
43. Disconnect the 700/900 ventilator AC power cord. Verify that the Mains Fail alarm is displayed on the ventilator and that the green LED light turns red.
44. Disconnect the AC power cord. Verify that the mains fail alarm is displayed, the battery icon is displayed on the ventilator and that the green LED light turns red.
45. Press Setup > Configuration > System Information. Display the second System Information screen and verify that the second battery voltage (Switched) is greater than 11V. If not greater than 11V, ensure the unit has had the battery continually charging for a minimum of 8hrs before verifying. If the voltage is still low after 8 hours of continuous charge, replace the battery.

SYSTEM INFORMATION	
Analogue Voltages:(-5,0,+5)	-5.0V, 0.01V, +5.0V
Digital 5V	5.00V
Alarm 5V	5.1V
6 Volt, 24 Volt, 25 Volts	6.0V, 24.0V, 25.0V
Battery(Unswitched/Switched)	5.1V, 11.6V
Flow- Min/Plateau/Max	0.00, 0.00, 0.00
Gas Exhaust	To atmosphere
0-0-0-0	Calibrated
O2 Consumption	0.0 Liters
N2O Consumption	0.0 Liters
AIR Consumption	0.0 Liters

*System Information Screen #2, Battery (Unswitched/Switched)
Reading is greater Than 11 V*

46. Slightly dismount the absorber. Verify that the Absorber Not Fitted alarm is displayed on the ventilator.
47. Remount the absorber.

4.16 Vaporizer Output Concentration Check

1. Verify that the vaporizer being tested is filled to at least half its capacity.
2. Set the vaporizer dial to "0".
3. Calibrate a gas analyzer (i.e. Riken) according to the manufacturer's instructions.
4. Ensure a waste gas scavenging systems is on, operational and is connected to the absorber.
5. Connect a 22 mm reusable tube to the inspiratory and expiratory ports on the absorber. Connect a breathing bag to the bag port.



*Figure 42 - Step 5: Connect
a Reusable Tube*

System Checks

6. Connect a pressure sample tee to the CGO taper and the CGO boot to the other end of the pressure sample tee. (Note: For ACGO units, connect a 22 mm reusable hose from the other end of the pressure sampling tee to the AGSS auxiliary port and set the switch to ACGO.)

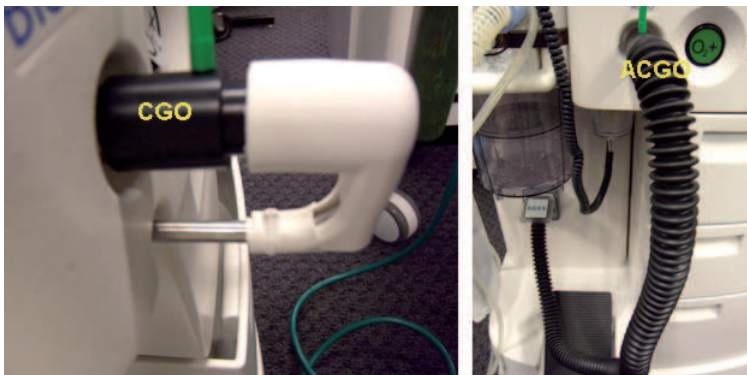


Figure 43 - Connect a Pressure Sample Tee

7. Ensure that the pressure sampling tee is connected to a gas analyzer and ensure that the gas analyzer is also connected to an active scavenger.

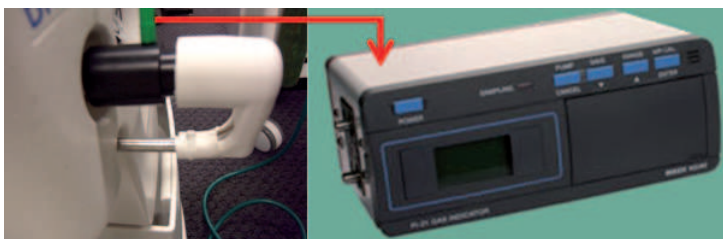


Figure 44 - Gas Analyzer Connection

8. Ensure that the bag-to-vent switch on the absorber is set to Bag. Open the APL valve by turning it fully counter-clockwise.
9. Turn the power switch to the “ON” position.
10. Set a flow of 10 L/min on the O₂ flow control valve to flush the system of any residual gas. Reduce the flow to 4 L/min after one minute.
11. Set the vaporizer dial to 1.0% and wait a few minutes for the vaporizer concentration to stabilize.

System Checks

12. Verify that the reading on the gas analyzer is between 0.8 – 1.2%.
13. Set the vaporizer dial to 2.5% and wait a few minutes for the vaporizer concentration to stabilize.
14. Verify that the reading on the gas analyzer is between 2.0 – 3.0%.
15. Set the vaporizer dial to 5.0% and wait a few minutes for the vaporizer concentration to stabilize.
16. Verify that the reading on the gas analyzer is between 4.0 – 6.0%.
17. If a Sevoflourane vaporizer is being tested, set the vaporizer dial to 8.0% and wait a few minutes for the vaporizer concentration to stabilize.
18. Verify that the reading on the gas analyzer is between 6.4 – 9.6%.
19. If a Desflurane vaporizer is being tested, set the vaporizer dial to 10.0% and wait a few minutes for the vaporizer concentration to stabilize.
20. Verify that the reading on the gas analyzer is between 8.0 – 12.0%.
21. Set the vaporizer dial to 18.0% and wait a few minutes for the vaporizer concentration to stabilize.
22. Verify that the reading on the gas analyzer is between 14.4 – 21.6%.
23. Set the vaporizer dial to “0”.
24. Set the O₂ flow control valve to minimum flow and turn the switch to the “OFF” position.

4.17 Electrical Safety Test

1. Connect the BleaseSirius anesthesia machine to an approved safety analyzer. Verify that the leakage current is less than 300 μ Amps for 120/100 Vac and less than 500 μ Amps for 220/240 Vac
2. Connect the ground pin of the safety analyzer to an external grounding plug. Verify that the resistance to ground is less than 0.2 Ω .

4.18 Complete the BleaseSirius Checkout Sheet

1. Complete the BleaseSirius Checkout Sheet.
2. Sign and date the form and ask the customer representative to also sign and date the form.
3. Make 2 copies of the completed form. Leave one copy with the customer, keep one copy for your records and submit the original form with your service report.

BleaseSirius

Anesthetic Machine

Chapter 5

Detailed Repair Procedures

Detailed Repair Procedures

5.1 Removal/Replacement Instructions

When any repair or exchange is performed on internal components, a complete check must be made on all functions. A complete overall performance check must also be performed when any replacements or repairs have been completed.

5.1.1 Removal of Outer Cases (on units up to Jan 2009)

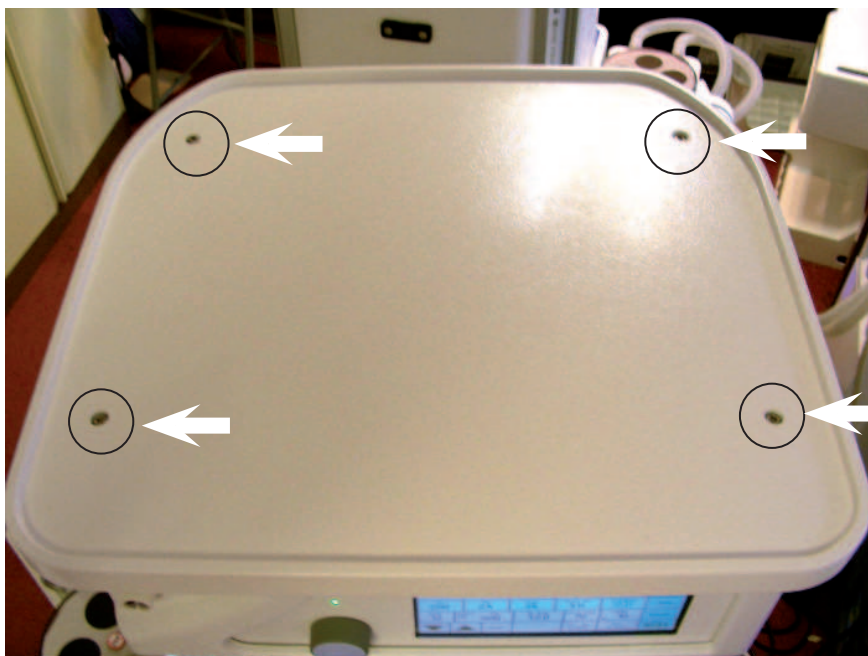


Figure 45 - Removal of Top Surface

1. Remove the 4 screws shown in Figure 45 and lift the top cover off.



Figure 46 - Removal of Screw as Shown

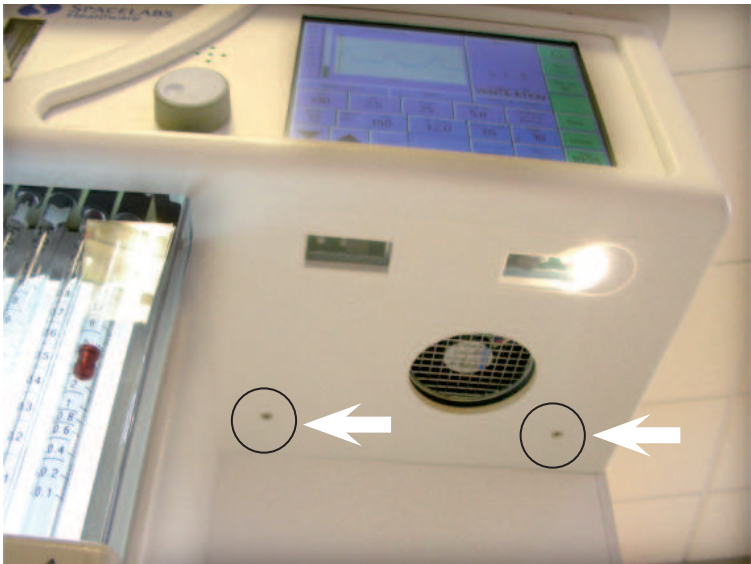


Figure 47 - Removal of Top Screws as Shown

Detailed Repair Procedures

2. Ensure work surface is clear, then slide the front cover forwards in the direction shown.

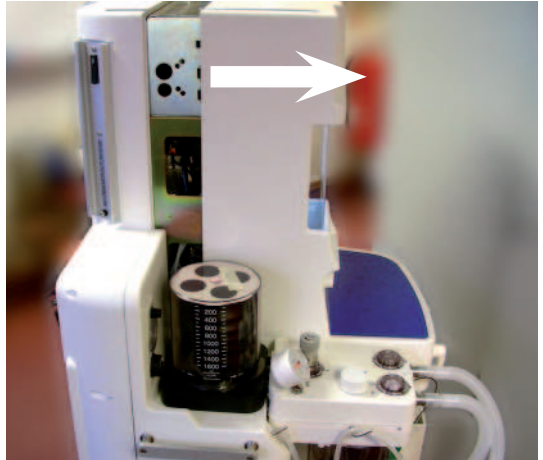
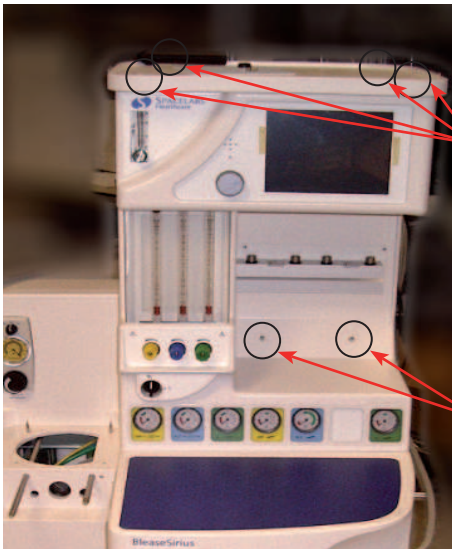


Figure 48 - Removal of Front Cover

5.1.2 Removal of Outer Cases (on units after Jan 2009)

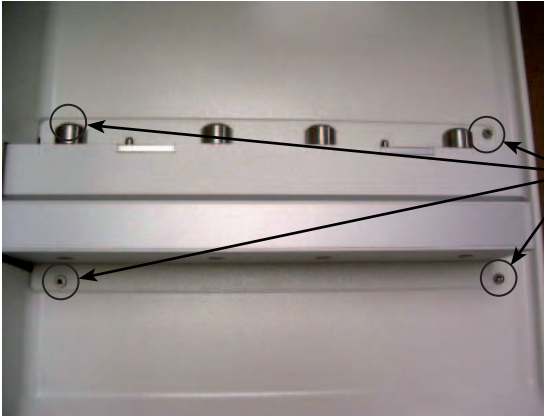


1. Loosen the four screws that hold the top shelf in place. You do not need to completely remove them.

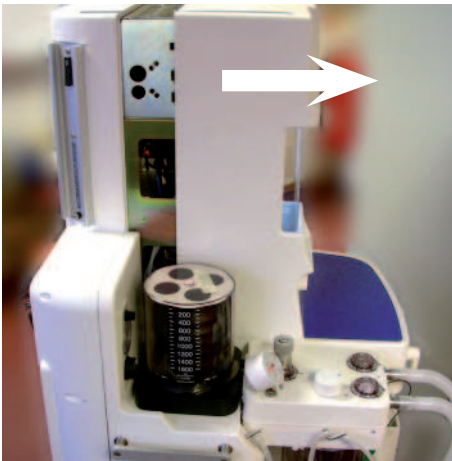
2. Remove the two screws securing the front cover to the BleaseSirius.

Figure 49 - Front Cover Fixing Screws (on units after Jan 2009)

Detailed Repair Procedures



3. Remove the four screws that hold the plate behind the back bar and slide the plate out from behind the back bar.



4. Slide the front cover off the BleaseSirius.

Detailed Repair Procedures

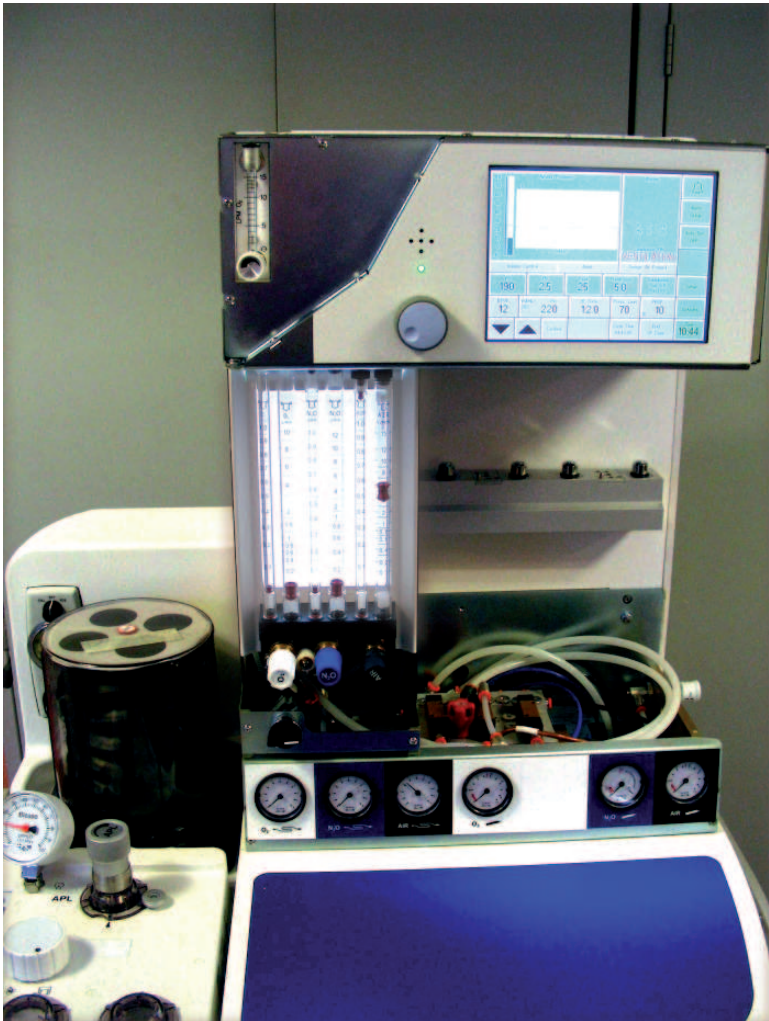


Figure 50 - Front of Machine With Front Cover Removed (Close-up)

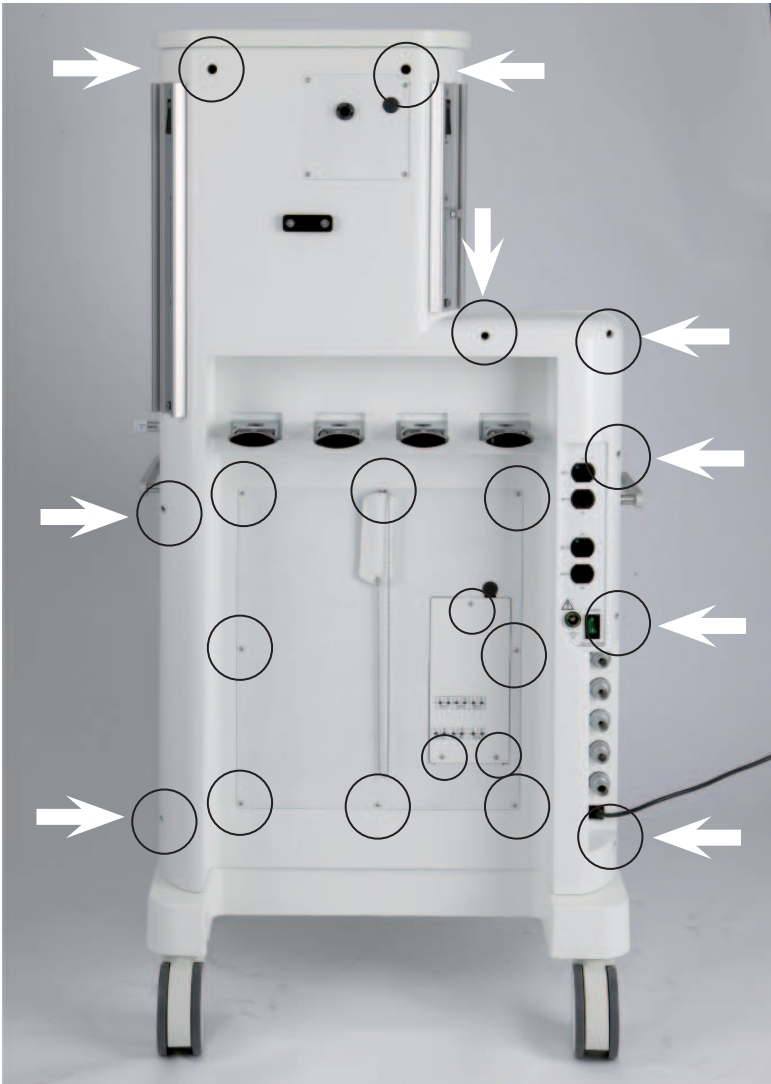


Figure 51 - Rear of Machine

(Not necessary for Routine Service)

5. Remove the back cover - Remove all pipelines and cylinders before removing the screws shown in Figure 51.

Detailed Repair Procedures



Rear Panel Close-Up

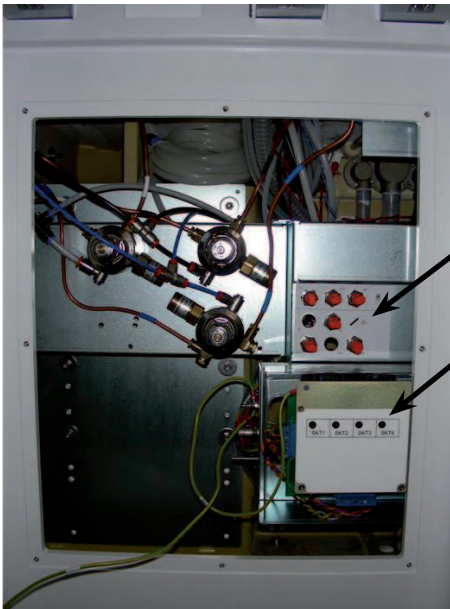


Rear Panel Removal



Rear Panel Open

6. Remove small panel for partial access, remove larger panel for complete access.



Large Rear Panel Removed



Fuse Panel

Figure 52 - Rear Panels

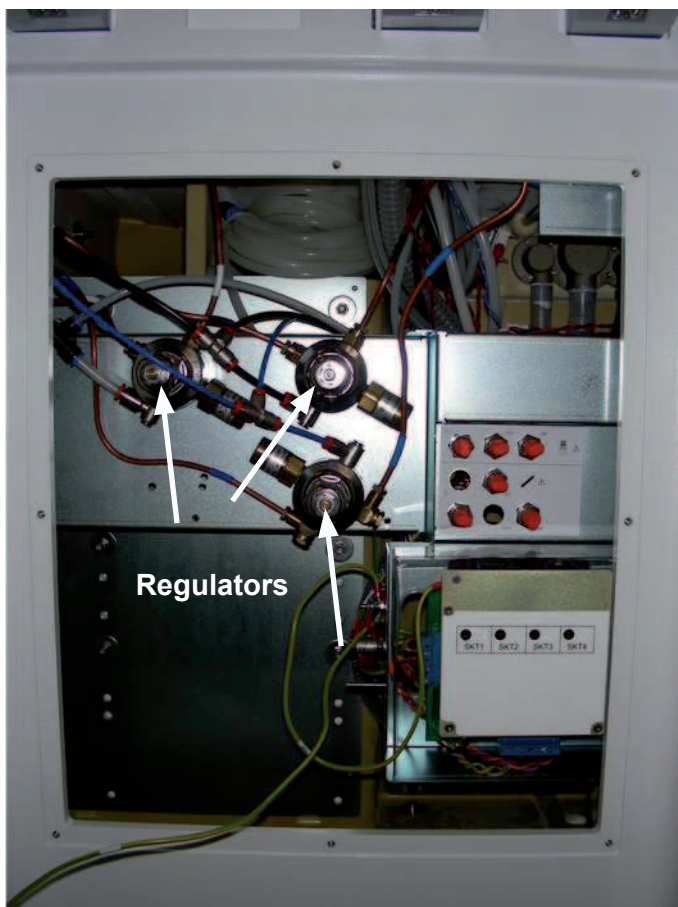


Figure 53 - Removal of Large Rear Panel

5.2 Mechanical Hypoxic Guard Block

5.2.1 Introduction

The hypoxic guard prevents the operator from administering a mixture of gases that contain less than 21% oxygen. To achieve this, the oxygen and nitrous oxide control valves are linked via a set of gears. Any attempt to reduce the flow of oxygen or to increase the nitrous oxide flow to a level which would result in a oxygen concentration below 21%, results in the nitrous oxide valve closing or the oxygen valve opening to maintain the 21% minimum oxygen concentration.



The flow meter has a minimum oxygen flow “Basal Flow” which is only turned off via the main system ON/OFF switch.

- The hypoxic guard is factory-set and requires only routine calibration checks.
- If any of the calibration results are found to be out of specification during routine checking, you can make some adjustment. This adjustment is described later in this section and should be done with extreme caution.
- If it is deemed necessary to replace the hypoxic guard valve block due to damage or wear, you can order a calibrated unit which will be supplied with a test sheet. This sheet lists the regulator output pressures required for correct setting.
- Do not dismantle the flow control valve cartridges. They are gas specific and require no servicing. The cartridges cannot be repaired.

5.2.2 Flow Meter Removal



For information on the Electronic Flowmeter (EFM) option, please see Chapter 6 in this manual.

To remove the Flow Meter Assembly:

1. Remove front cover (see section 5.1).
2. Remove the two M4 screws each side of the flow meter while supporting the flow meter.



Figure 54 - Flow Meter Removal

Detailed Repair Procedures

3. Carefully disconnect the power supply cable from the back light inverter on the rear of the flow meter (marked BL1 in Figure 55).

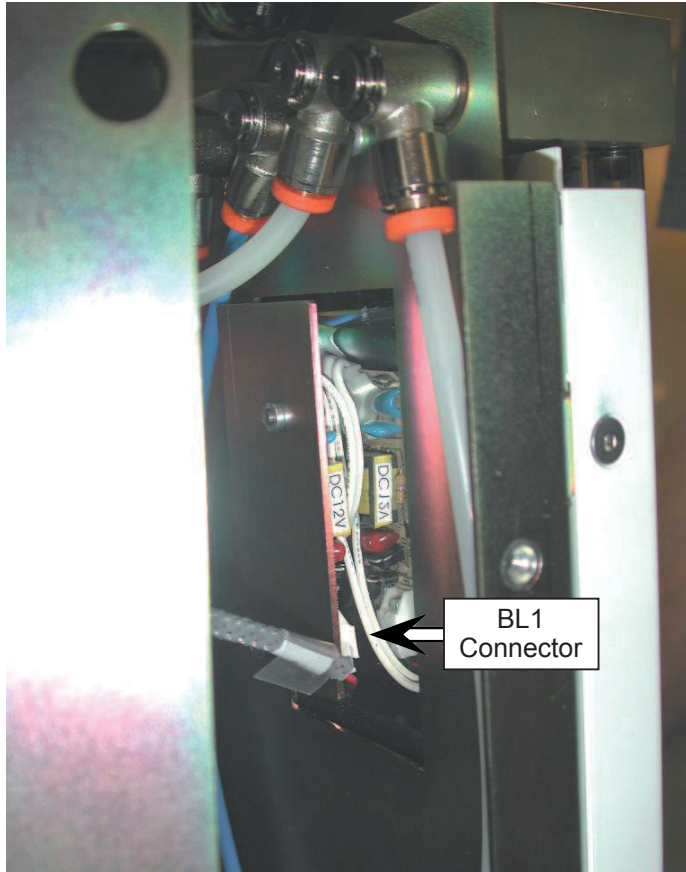


Figure 55 - BL1 Connector Location

4. Mark the positions of the pipes entering the flow meter, and remove them from their fittings.
5. Remove the flow meter from the machine.
6. Replacement is the reverse of this procedure.

Detailed Repair Procedures

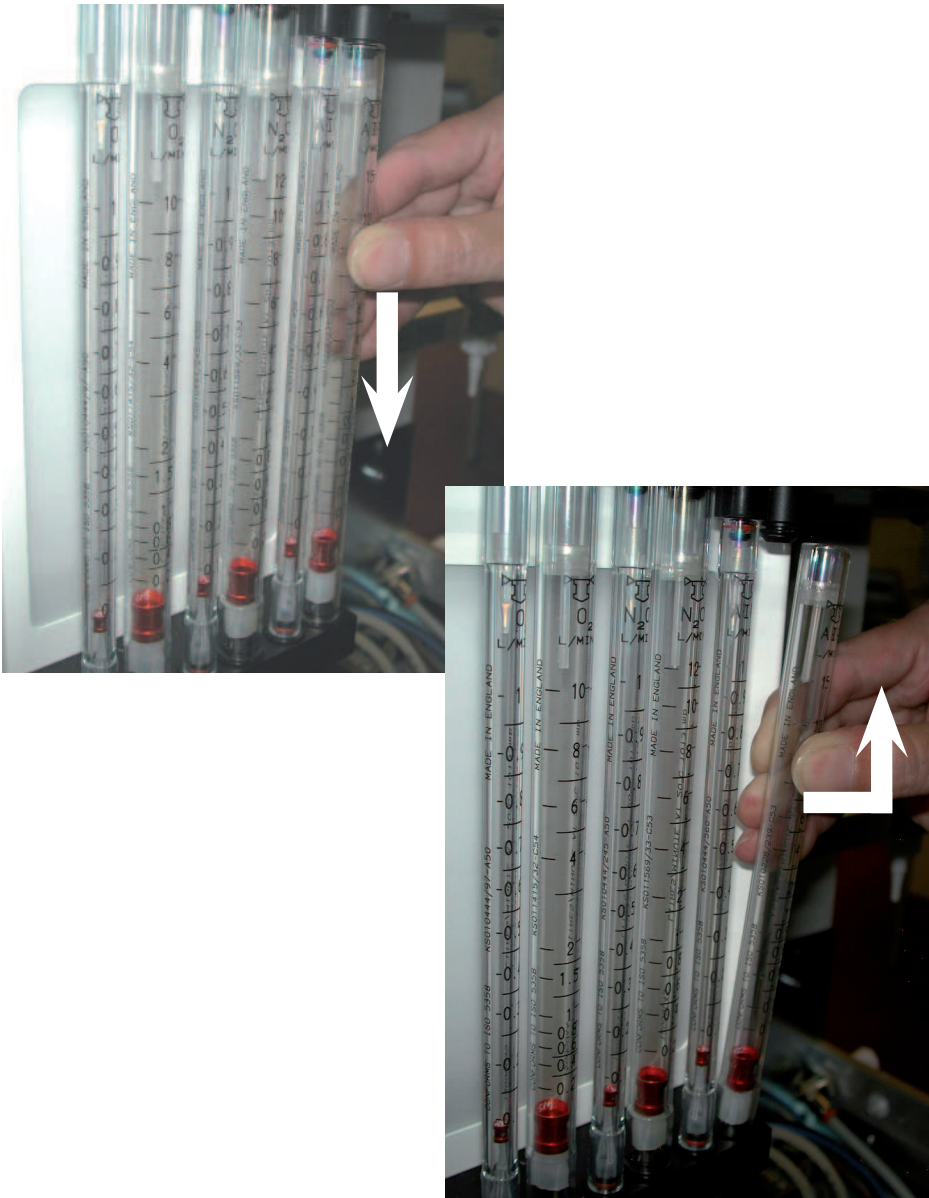


Figure 56 - Flow Tube Removal

5.2.3 Replacement of Hypoxic Guard Block (FR135025)

1. Remove the front cover.
2. Remove the flow tubes (Figure 56).
3. Remove the 2 screws from each side.
4. Take care to support the bottom of the flow meter assembly and gently pull the bottom edge out and then down to gain access to the gas supply pipes and backlight power supply cable.

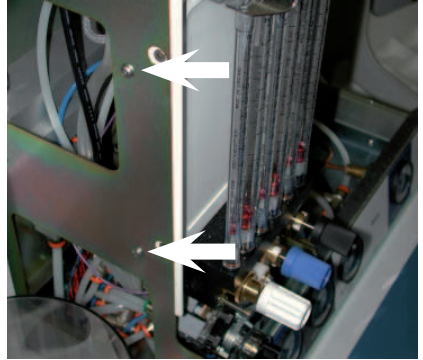


Figure 57 - Removal of Screws on Flow Meter Assembly

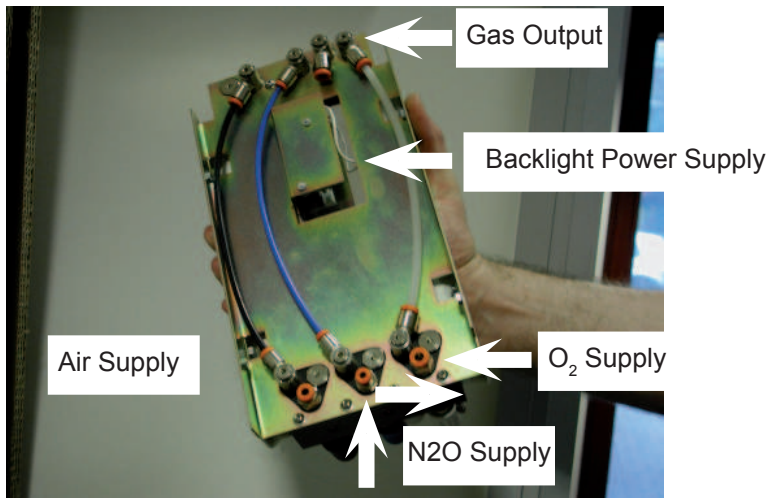


Figure 58 - Rear of Flow Meter Assembly



If only Simplex Gas tubes are fitted, the pipes running from the top to the bottom will not be fitted.

5. Remove the fittings on the back of the Hypoxic Guard Block.
6. Remove the 4 screws
7. Replace the Hypoxic Guard block and re-assemble.
8. The replacement Hypoxic Guard Block (FR135025) will have a test certificate with it, this will give the pressure that the O₂ and N₂O pressure regulation will need to be set to for the hypoxic guard block to work correctly. (See section 6.5 for regulator adjustment.)
9. The replacement hypoxic guard block will also have the configuration details for Cascade or Simplex.

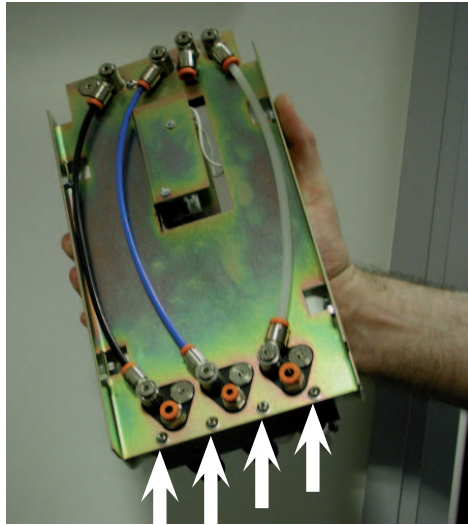


Figure 59 - Hypoxic Guard fixing screws

5.2.4 Calibration of Hypoxic Guard System

In normal use, the Hypoxic Guard unit requires only routine calibration checks. Investigate any variations outside the specified range by checking that the nitrous oxide and air flow valves are shutting correctly (see Section 5.4) or by setting the Basal Flow (see Section 5.3), depending on the nature of the fault.

If the calibration is faulty, the recommended course of action is to replace the block with a calibrated replacement unit. It is possible to recalibrate the block if the valves have not become damaged (the precision valves should never be dismantled. Internal damage to the seat or needle will not be visible to the eye, but can make the valve unusable).

If it is necessary to recalibrate the block, then use the following method. It should be noted that this operation can take some time for the inexperienced engineer to master and should only be used if a replacement block is not available. If it proves impossible to achieve a satisfactory result, then the precision valves are most likely to have become damaged and a new block is the only solution.

5.2.5 Calibration procedure

For the purpose of this procedure we will assume you have removed the front cover and removed the following parts from the Hypoxic block, the valve knobs, (remove end label and undo M3 retaining nut), the idler gear, (release by undoing the M4 nut and pulling the gear and bush from their shaft). The oxygen stop arm and the oxygen gear, this runs on a thread on the body of the oxygen valve, the stop screw can be left in place.

(See Figure 72.)

1. Ensure that the Air and Nitrous oxide valves are shutting fully and not overly tight. Follow the procedure, "Setting Valve shut off stop" (Section 5.4).
2. For a full calibration, set the hypoxic regulators to a 'start' setting of 30 psi, ("Mechanical hypoxic Guard Regulator Adjustment" Section 5.5)
3. Next, set the Oxygen Basal flow, Fit the oxygen gear to the valve and screw it fully on, but DO NOT tighten it. It must be free running.
4. Slide the oxygen stop arm onto the valve shaft and push it up to the oxygen gear just fitted. You will notice there is a groove around the gear into which the small drive 'peg' on the back of the stop should fit.
5. Turn the stop arm clockwise until it hits the stop screw. Turn the oxygen gear counterclockwise until you feel the drive 'dog' hit the end of the groove. (This should give about one full turn of the gear from its fully back position.)
6. There must be a small clearance between the gear face and the back face of the stop arm to ensure that the only point of contact is the 'drive dog.' A 0.005-inch feeler gauge can be used or the thickness of a piece of standard writing paper is a useful alternative (Figure 75).
7. Turn on the machine so that you have an oxygen supply to the flow meter.
8. Hold the stop arm against the stop screw in a clockwise direction and the gear turned fully counterclockwise and hitting the 'drive peg'.

9. Turn the shaft of the valve so that oxygen starts to flow. Adjust the flow to the prescribed Basal flow level (still holding the gear and stop arm in position). When this is achieved, tighten the two grub screws on the stop arm.
10. The stop screw height must now be adjusted. Turn the valve a full turn counterclockwise and check that it just clears the top of the stop screw. If not, adjust the stop by screwing it in till the arm JUST clears and tighten the lock nut. Check that the arm hits the stop when turned clockwise and clears the top when turned counterclockwise.
11. The 'Idler gear' must now be meshed to link the two valves. Turn the stop arm clockwise to the stop and hold, and turn the oxygen gear fully counterclockwise, (as in Step 8). This should give you the 'basal flow' showing on the oxygen flow meter. Turn the nitrous oxide flow up to approximately 400 ml and, while holding the stop and gear in position, carefully insert the idler gear and its bush onto it's shaft. Meshing it's teeth with the oxygen and nitrous oxide gears, then fit the idler gear nut.
12. Carry out a full check of the hypoxic guard calibration as described in Chapter 4.

5.3 Setting Oxygen Basal Flow

If the Basal flow has altered during normal use (this can occur if the valve has been turned down with excess force, reducing the flow), or has increased (sometimes due to settling in of the regulators), the following method can be used to restore the correct flow, often without the need to recalibrate the entire hypoxic guard block.

1. Remove the front cover (Section 5.1). Turn all flow controls to minimum. Turn the machine on and allow basal flow on the oxygen to stabilize for a few minutes.
2. There are two grub screws holding the oxygen stop arm to the valve shaft. Hold the stop arm tight against the stop screw and slightly slacken the two screws. Turn the valve shaft until the basal flow is within limits and retighten the grub screws.

3. Check that when the valve is opened that at its next complete revolution, the stop arm clears the top of the stop screw and that on closing, it engages firmly with the stop screw. If not, the screw may be adjusted by slackening its lock nut and screwing the stop in or out to achieve this.
4. Carry out a full check of the hypoxic guard calibration as described in Chapter 4.

Small variations from the specified Basal flow can usually be rectified using the above method. If this does not give a satisfactory result, it is possible that, if the flow had been shut off completely, the valve seat may have been damaged. In these cases, you may need to replace the block with a new calibrated unit.

5.4 Nitrous Oxide and Air Flow Valve Leak Test

Setting Valve shut off stop.

Due to the precision construction of these valves it is essential that the control needle and its seat are not over tightened. The nitrous oxide and air valves (oxygen valve is never fully closed “Basal Flow”) are fitted with stop collars to prevent this (see Figure 61) first check should be to ensure there is no leakage through these valves.

To check these valves, first remove the front cover (Section 5.1).



Figure 60 - Assembled Hypoxic Guard Unit

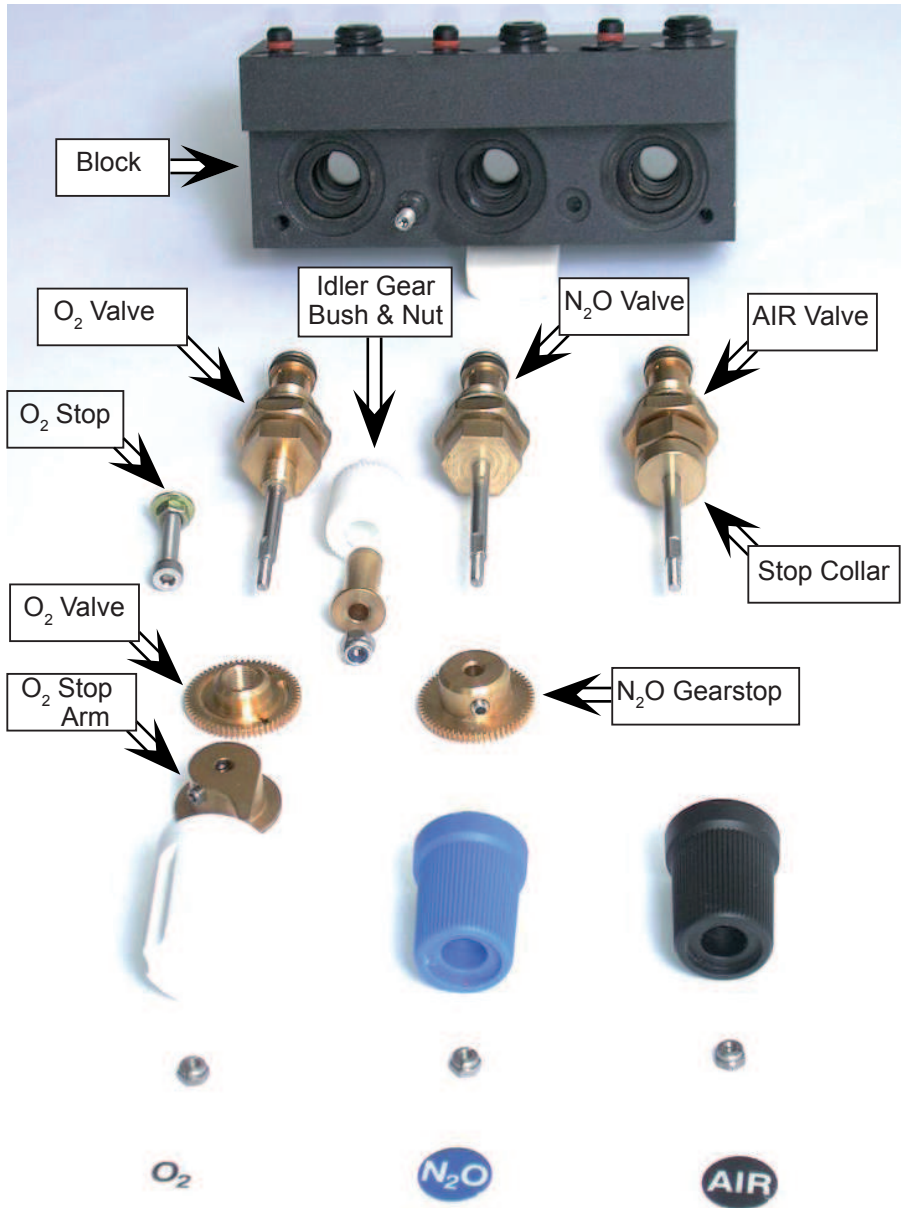


Figure 61 - Exploded View of Hypoxic Guard Components

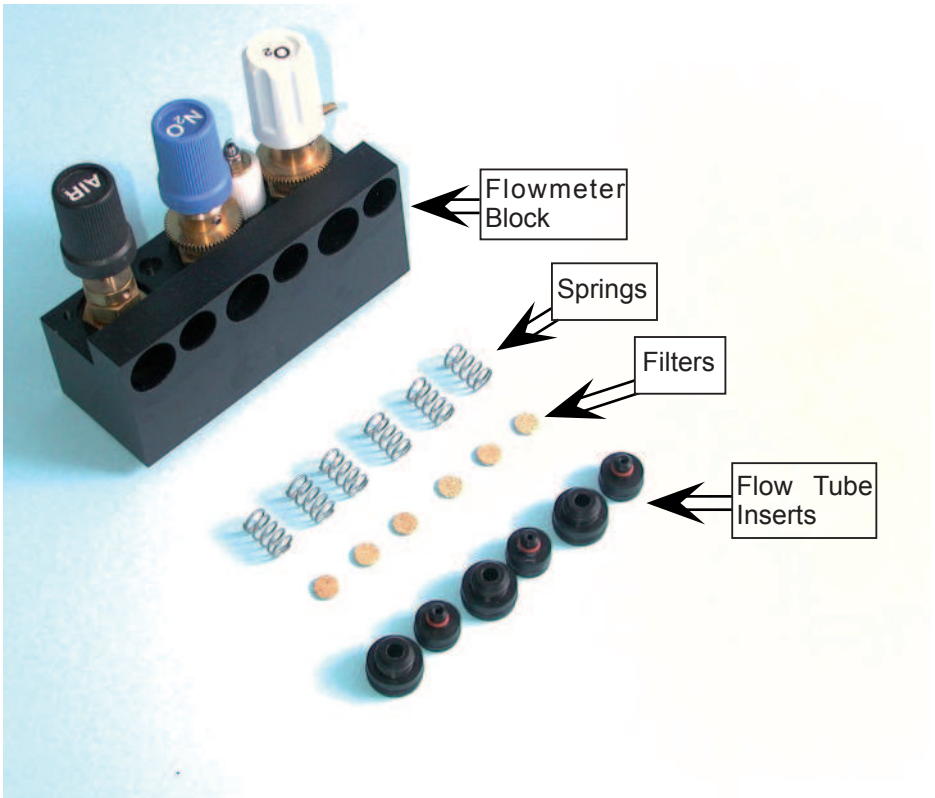


Figure 62 - Flow Block Showing Flow Tube Filters and Tube Lower Inserts

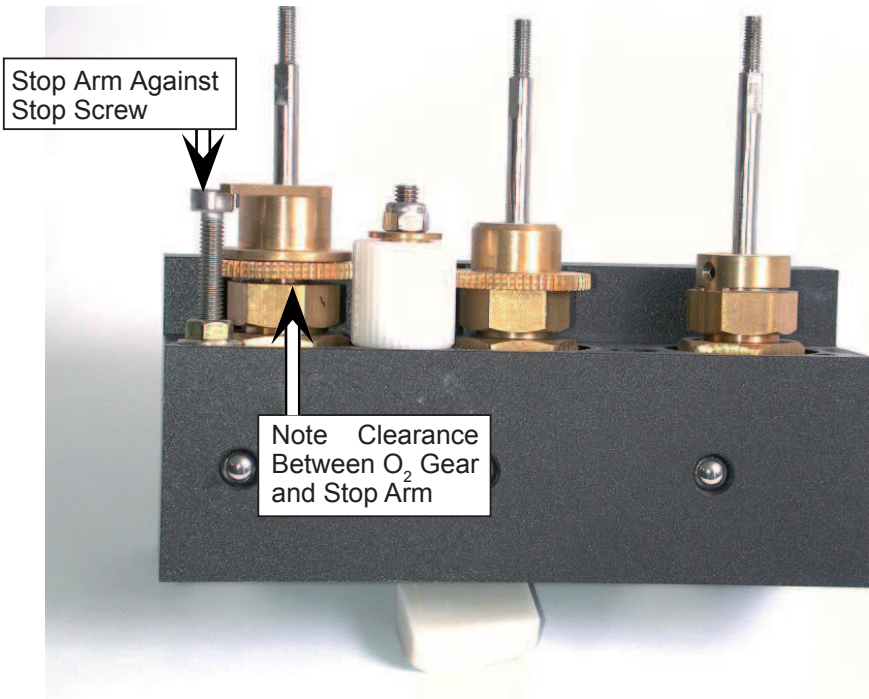


Figure 63 - View of Assembled Hypoxic Guard From Below

Detailed Repair Procedures

1. Remove the smaller of the flow tubes for the gas to be inserted (Removal of Flow Tubes, Section 5.10).
2. Remove the spring and lower insert from the block (Figure 63).
3. Ensure that all flow control valves are set minimum and turn on the machine.
4. Pour a small amount of leak detector fluid such as 'Snoop' into the insert bore of the block (in the absence of 'Snoop' plain water is effective) if the valve is not sealing there will be bubbles visible in the fluid, if there are no bubbles then the valve is sealing correctly.
5. If there are any bubbles, then the valve stop must be adjusted. The stop collars of the two valves differ slightly in that the nitrous oxide valve collar is also the drive gear. Both versions have two Allen grub screws holding them to the valve shaft.
6. To adjust the valve stop, slacken the grub screws slightly and gently turn the valve shaft till no bubbles are present and tighten the collar grub screws.
7. Slightly open and close the valve a couple of times and check that when the valve is shut there are no bubbles visible.
8. Carefully dry out the insert bore and open the valve to ensure that any fluid is blown out. The glass flow tube, the insert and spring can then be replaced.

5.5 Mechanical Hypoxic Guard Regulators, Adjustment and Output Check



Do not adjust regulators if previous checks found the hypoxic guard to be within specification because changes in pressure settings will adversely affect the calibration.

If, due to damage or wear, it is deemed necessary to replace the hypoxic guard valve block, you can order a calibrated unit which will be supplied with a test sheet. This test sheet gives the pressures to which the secondary regulators should be set.

Detailed Repair Procedures

To check or adjust the regulators:

1. Remove the small rear inspection panel.
2. Connect a standard low pressure gauge capable of reading 0 to 100 psi \pm 5% into the test point by removing the blanking plug.
3. Open the oxygen cylinder or connect the O₂ pipeline.
4. Switch on the machine and set a flow of 0.5 lpm on O₂ flow meter.
5. Check that the gauge registers the regulator output pressure.
6. If the pressure is outside the required setting, adjust the regulator output pressure.
7. Remove the front cover, (see section 5.1).
8. Adjust the regulator.
9. Adjust the pressure by undoing the lock nut and turning the hexdrive clockwise to increase and counter clockwise to decrease the pressure. Once the pressure is correct, retighten the locknut.
10. Switch off the machine.

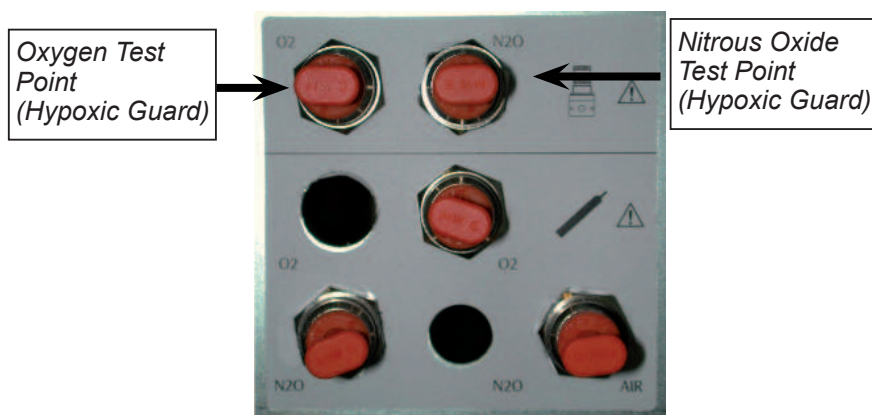


Figure 64 - Test Points

11. Disconnect the pressure gauge and refit the blanking plug.
12. Check the pressure of the secondary nitrous oxide regulator by repeating steps 3 to 10 for the nitrous oxide regulator.

5.5.1 Hypoxic Regulator Replacement (for units manufactured before Feb 2009)

For units manufactured before February 2009

1. Access the regulators from the left side of the flow meter.

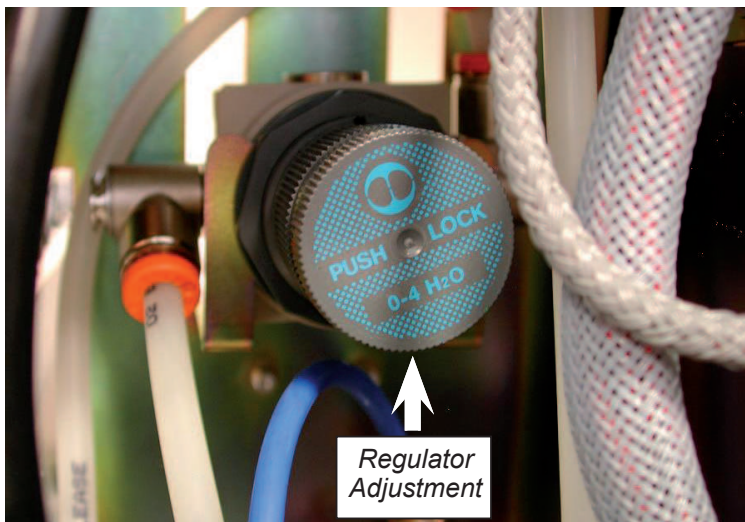


Figure 65 - Pre Feb 2009 Regulator Adjustment

2. Adjust the pressure by pulling the adjusting knob to release it. Turn it clockwise to increase the pressure and counter-clockwise to reduce it. Set the pressure by adjusting the pressure UP to the desired level to give the most stable setting. Once the pressure is correct, push the knob towards the regulator body to lock it in position.

Secondary Regulator Adjustment

1. Retrieve the documentation supplied with the field replacement hypoxic block assembly and verify the O₂ and N₂O step down values.
2. Ensure the ON/OFF switch is in the “OFF” position.
3. Ensure all flow control valves are closed.
4. Connect a supply to the O₂/N₂O/AIR pipeline inlets.
5. Remove the rear cover. (see rear cover removal for instructions)
6. Remove the (8) screws (Figure 66), using a 2.5mm Allen key, then remove the large rear panel.



Figure 66 - Rear Panel Screw Locations (8)

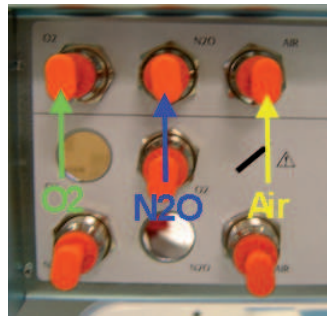


Figure 67 - Secondary Gas Test Point Locations

7. Locate the secondary regulator test points and gas locations (Figure 67).

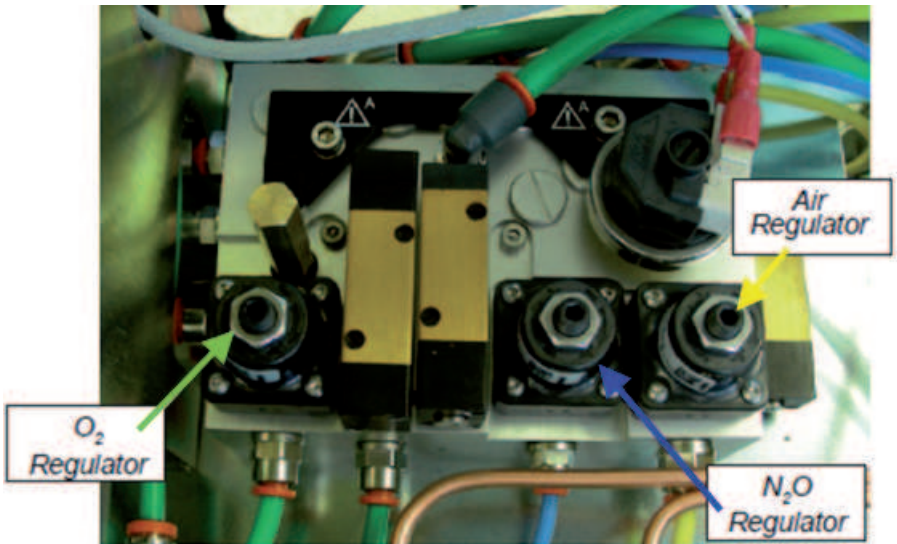


Figure 68 - Secondary Gas Regulator Locations

8. See Figure 68 to differentiate between the secondary regulator gas locations.
9. If fitted the machine is fitted with an AIR flow control valve, complete steps 10 - 17.
10. Remove the 6mm plug connected to the AIR test point and connect a pressure measuring device to it. (Refer to step 7 for test point locations.)
11. Loosen the nut on the AIR secondary regulator using a 13mm wrench.
12. Turn the ON/OFF switch to the "ON" position.
13. Set a flow of 0.5 L/min on the AIR flow control valve.

14. Set the AIR secondary regulator to 30 PSI by adjusting the set screw using a 3mm Allen key (Figure 69). Secure the set screw with the nut once the pressure is set.

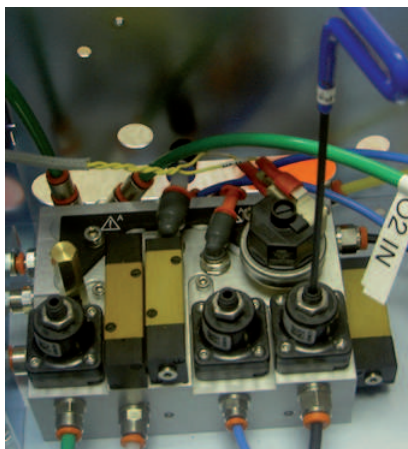


Figure 69 - Adjust the Regulator Set Screw

i Important! *Monitor the flow to ensure that it remains at 0.5 L/min because the flow changes when the set screw is adjusted.*

15. Turn the ON/OFF switch to the “OFF” position.
16. Close the AIR flow control valve.
17. Remove all test equipment and reconnect the 6mm plug removed in step 10.
18. If fitted with an N2O flow control valve, complete steps 19 - 26.
19. Remove the 6mm plug connected to the N2O test point and connect a pressure measuring device to it. (Refer to step 7 for test point locations.)
20. Loosen the nut on the N2O secondary regulator using a 13mm wrench.
21. Turn the ON/OFF switch to the “ON” position.
22. Set a flow of 0.5 L/min on the N2O flow control valve. (Note: An O2 supply must be connected to adjust the N2O secondary regulator.)
23. Set the N2O secondary regulator pressure to the value obtained in step 1 by adjusting the set screw using a 3mm Allen key. Secure the set screw with the nut once the pressure is set. (Important: monitor the flow to ensure that it remains at 0.5 L/min because the flow changes when the set screw is adjusted.)
24. Turn the ON/OFF switch to the “OFF” position.

Detailed Repair Procedures

25. Close the N2O flow control valve.
26. Remove all test equipment. Reconnect the 6mm plug removed in step 19.
27. Remove the 6mm plug connected to the O2 test point and connect a pressure measuring device to it. (Refer to step 7 for test point locations.)
28. Turn the ON/OFF switch to the “ON” position.
29. Set a flow of 0.5 L/min on the O2 flow control valve.
30. Set the O2 secondary regulator pressure to the value obtained in step 1 by adjusting the set screw using a 3mm Allen key. Secure the set screw with the nut once the pressure is set. (Important: monitor the flow to ensure that it remains at 0.5 L/min because the flow changes when the set screw is adjusted.)
31. Turn the ON/OFF switch to the “OFF” position.
32. Close the O2 flow control valve.
33. Remove all test equipment. Reconnect the 6mm plug removed in step 27.
34. Locate the traceability label on the opposite side of the large rear panel and change the secondary regulator settings for O2 and N2O to the new values.
35. Reinstall the large rear panel.

5.6 Cylinder Regulator Pressure Relief Valve Replacement

Tools / Parts Needed	
17 mm Socket Wrench	Regulator Service Kit, PN 53400044
Crescent Wrench	1/8-inch hex key

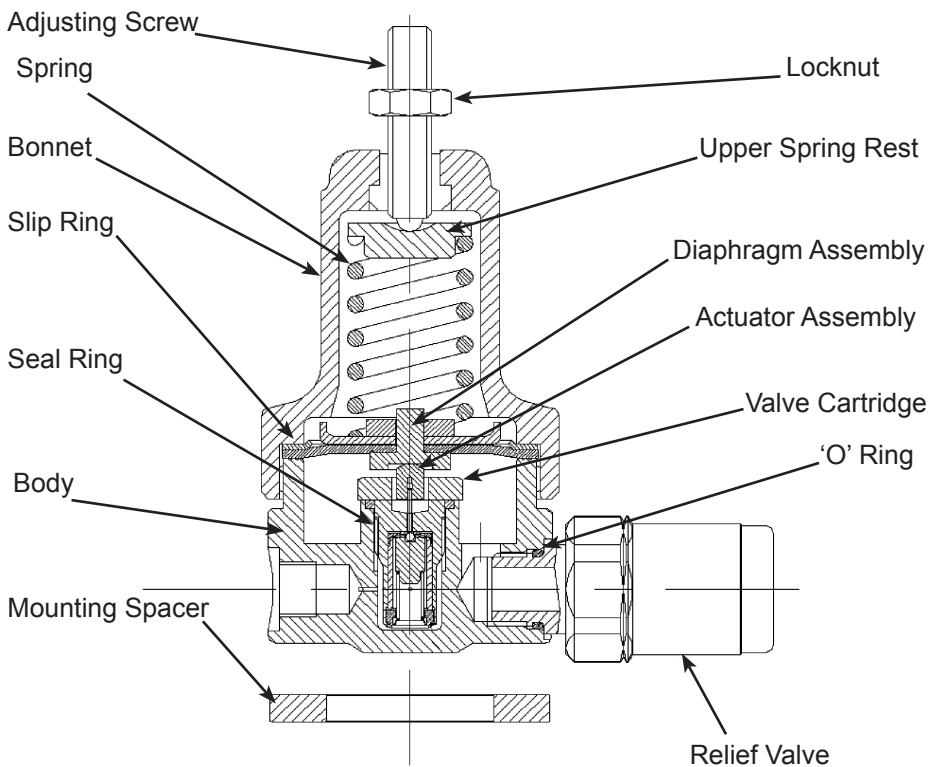


Figure 70 - Primary Regulator Assembly

Replace the Cylinder Regulators

1. Remove all cylinders fitted to the yokes on the back of the machine.
2. Remove the large rear cover to access the cylinder regulators.

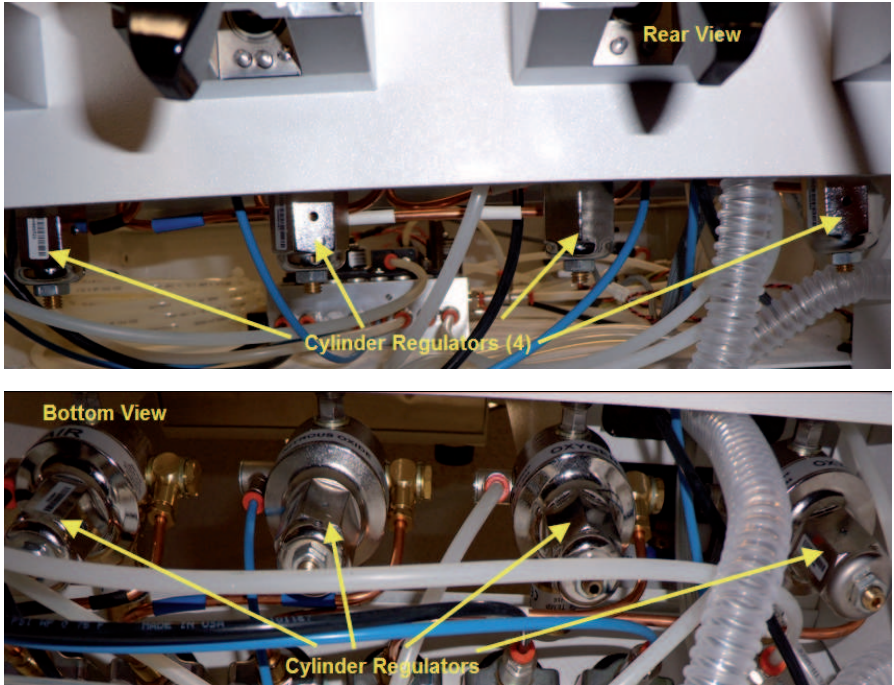


Figure 71 - Cylinder Regulator Locations

3. Release the internal spring tension at the bonnet hex nut using a 1/8"-inch Allen key. Use a crescent wrench to remove the bonnet (Figure 70).

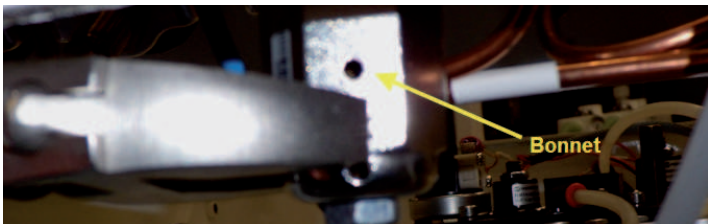


Figure 72 - Location of Bonnet

Detailed Repair Procedures

4. Remove and discard the diaphragm assembly and the actuator assembly (Figure 73).

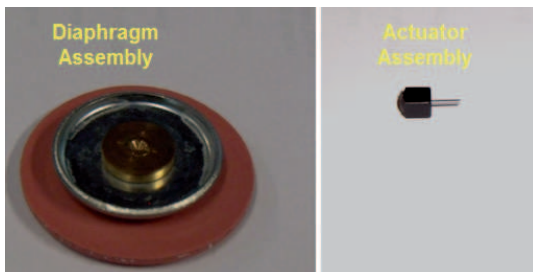


Figure 73 - Diaphragm and Actuator Assemblies

5. Using a 17 mm socket, remove and discard the valve cartridge. Using a crescent wrench, remove and discard the relief valve (Figure 74).

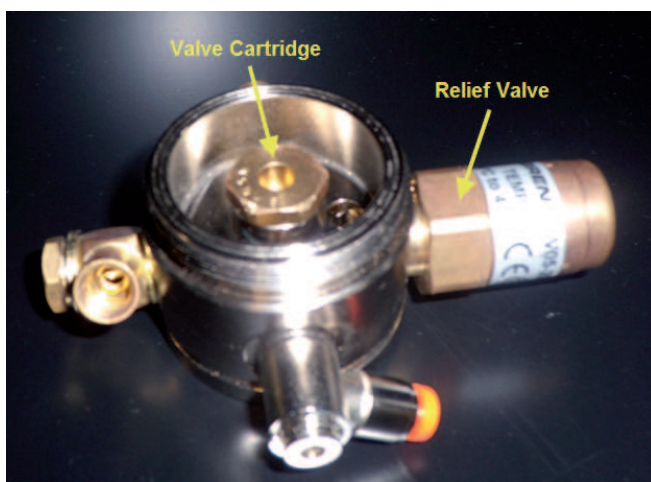


Figure 74 - Valve Cartridge and Relief Valve

Detailed Repair Procedures

6. Fit the regulator parts from the Service Kit (Figure 75).

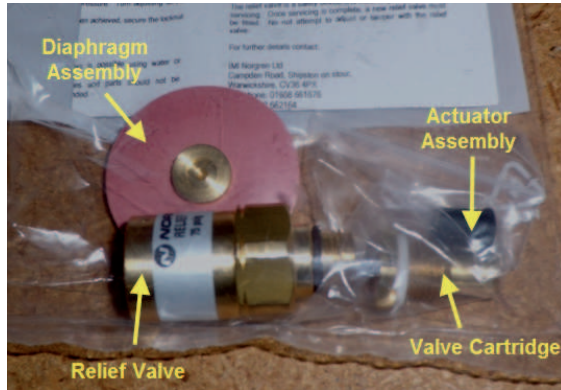


Figure 75 - Regulator Service Kit

7. Install the valve cartridge and seal ring (Figure 76).

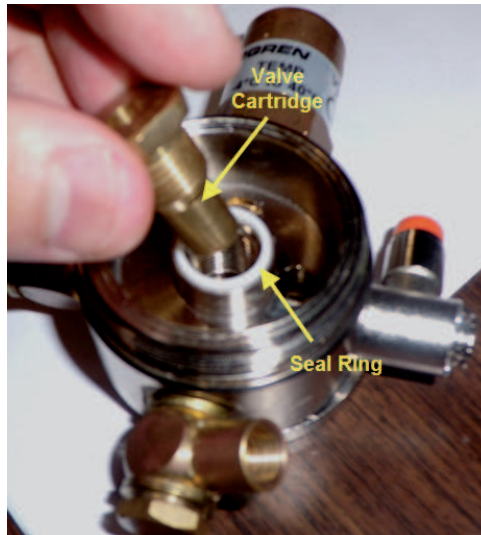


Figure 76 - Valve cartridge and Seal Ring

Detailed Repair Procedures

8. Place the upper spring rest and the spring into the bonnet as shown in Figure 77.

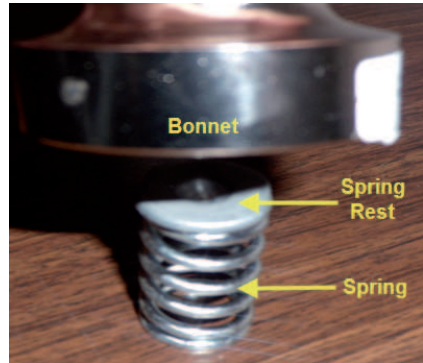
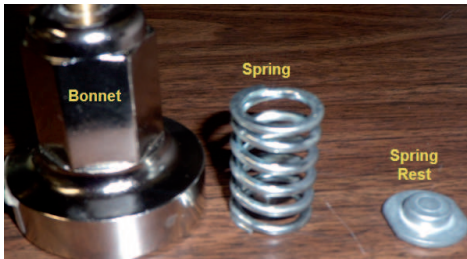


Figure 77 - Assemble the Spring, Spring Rest and Bonnet

9. Place the slip ring into the bonnet, as shown in Figure 78.



Figure 78 - Slip Ring Location

10. Place the diaphragm assembly onto the spring, as shown in Figure 79.



Figure 79 - Diaphragm Assembly

Detailed Repair Procedures

11. Fit the actuator assembly into the valve cartridge as shown in Figure 80.

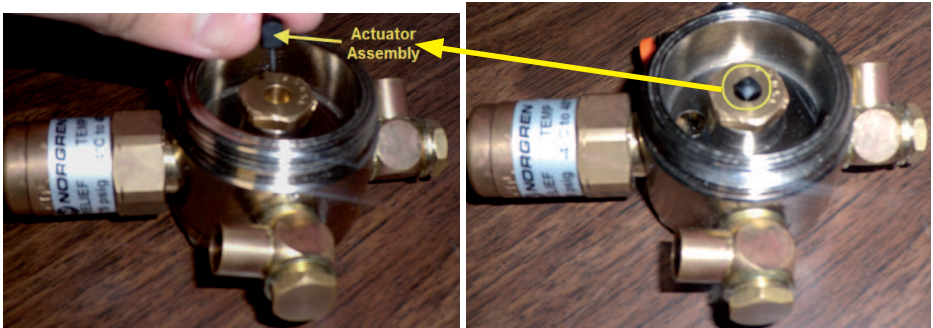


Figure 80 - Fit the Actuator Assembly

12. Fasten the bonnet to the threads of the regulator body (Figure 81). Ensure that the assembly stays in place.

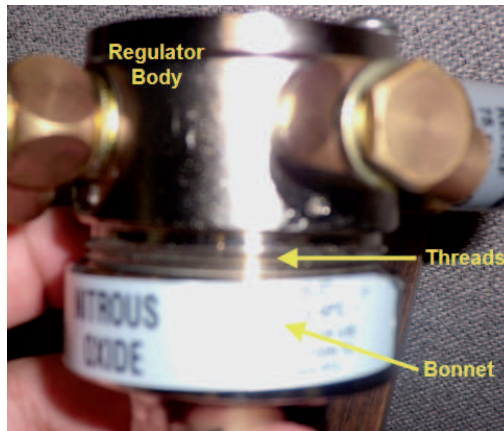


Figure 81 - Attach the Bonnet to the Regulator

Detailed Repair Procedures

13. Fit the relief valve to the regulator body (Figure 82). Ensure that an O-ring is fitted on the relief valve.

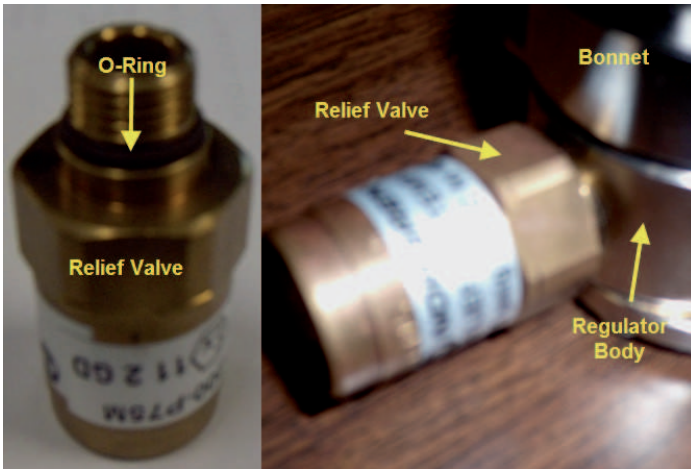


Figure 82 - Fit the Relief Valve to the Regulator

14. Repeat for all remaining cylinder regulators.
15. Install the regulator cover.
16. Fit the cylinders.

5.7 Backbar Valve Replacement

If you find a bypass leak on any Backbar valve, replace the valve.

To remove the defective valve:

1. Loosen the M4 screw on the under side of the backbar, below the valve to be replaced.

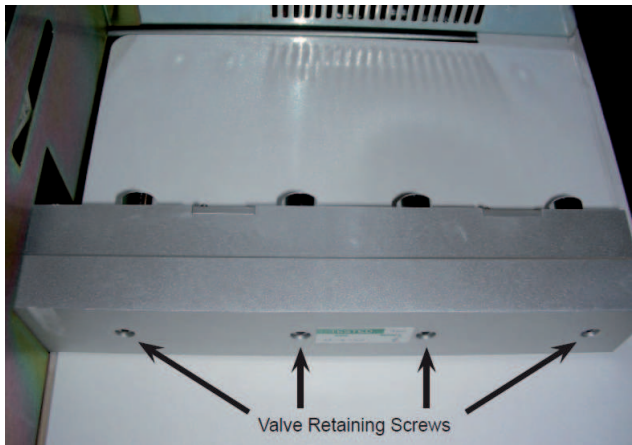


Figure 83 - Location of Valve Retaining Screws

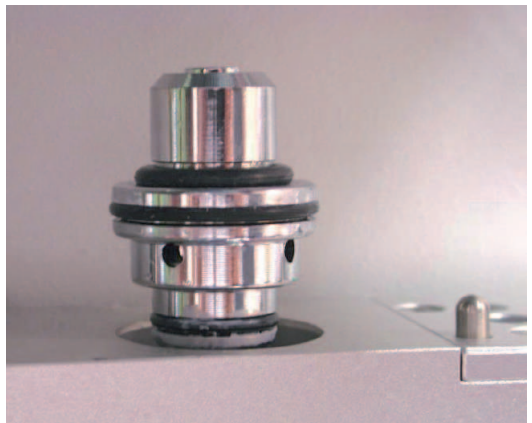


Figure 84- Backbar Valve

2. Use the screw to push the valve upwards to free it from its seals, then remove the M4 screw completely and withdraw the valve.
3. Lightly lubricate the “O”-ring seals on the new valve with ‘Fomblin’ Oxygen safe grease and insert it into the backbar, replace the M4 retaining screw in the backbar and tighten.
4. Carry out the backbar leak tests as described in Chapter 4 to ensure correct operation of valves.

5.8 Common Gas Outlet (CGO) Removal/Replacement (up to Feb 2009)

1. Remove the rubber gas feed connector from the CGO port on the front of the machine.
2. Remove rear panel (see section 5.1).
3. The CGO block is located inside the main work surface of the machine and can be seen from the rear of the machine. There are two pipes connected to it and these pipes are different diameters (6 mm & 8 mm). You can disconnect them without the need for marking.

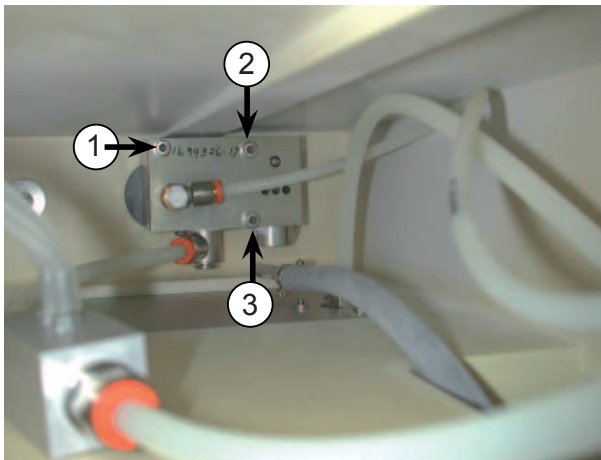


Figure 85 - CGO Block (up to Feb 2009)

4. The block is held in place by three M5 screws. Remove these screws and withdraw the block from the machine.
5. Replacement is the reverse of this procedure.

5.9 Alarm Block Removal/Replacement

5.9.1 On units Manufactured Before Feb 2009

1. Remove the rear cover (see section 5.1).
2. Remove the two M4 fixing screws from the alarm block.
3. The positions of each pipe entering the block should now be marked clearly on each fitting and the relevant pipe (use masking tape or a marker pen), the removal of the fixing screws will allow the block to be moved slightly for access to some of the pipes. Once all pipes and connections are clearly marked (the different gases are also diameter indexed) the pipes may be disconnected and the block removed.
4. The replacement block will require the transfer of the fittings and blanking plugs from the old block to the same positions on the new block. This should be done one item at a time and their positions checked carefully. Once the fittings have been transferred, the block can be reconnected and the fixing screws replaced.
5. Carry out function test on alarm (see section 3.2.2).

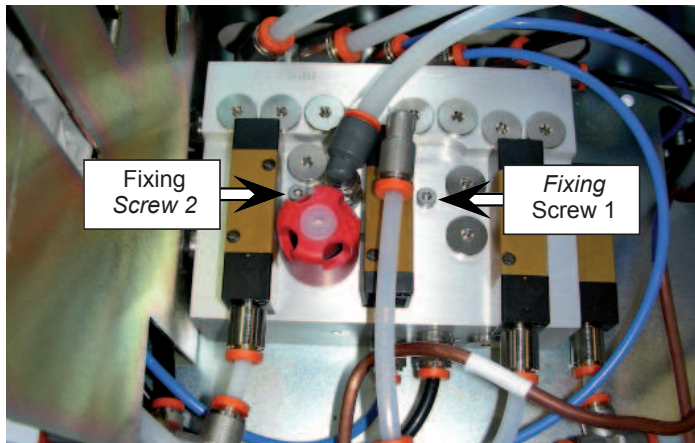


Figure 86 - Alarm Block Removal (up to Feb 2009)

5.9.2 On units Manufactured After Feb 2009Feb 2009 onwards)

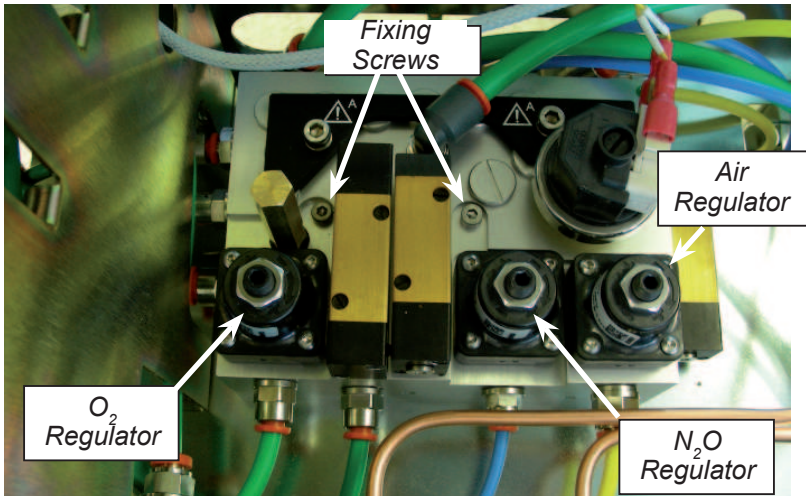


Figure 87 - Alarm Block Removal (Feb 2009 onwards)

1. Remove rear cover (see section 5.1)
2. Remove the two M4 fixing screws from the alarm block.
3. Mark the position of each pipe entering the block clearly on each fitting and the relevant pipe. These will be different for differing build standards, such as two gas or three gas systems and country specifications. The removal of the fixing screws will allow the block to be moved for access to some of the pipes. Once all pipes and connections are clearly marked, disconnect the pipes and remove the block.
4. The replacement block will require the transfer of the fittings and blanking plugs from the old block to the same positions on the new block, this should be done one item at a time and their positions checked carefully. Once the fittings have been transferred, you can reconnect the block and replace the fixing screws.
5. With this new design, the secondary regulators are integrated into the block. These will need to be reset to the original pressures to ensure the hypoxic guard performs correctly.
6. Perform the function test on alarm block.
7. Perform the Hypoxic Guard test (See Chapter 4.)

5.10 Oxygen Flush & Common Gas Outlet Safety Valve Adjustment (up to Feb 2009)

If Oxygen flush flow rate is outside of the specified range or the common gas outlet safety valve requires adjustment.

1. Remove rear panel (see section 5.1).

The CGO block is located inside the main work surface of the machine and can be seen from the rear of the machine. There are two pipes connected to it and these pipes are different diameters (6 mm & 8 mm).

The 8 mm pipe carries the mixed gases and vapors from the flow meter and back bar. The 6 mm pipe is the high pressure supply to the Oxygen flush control.

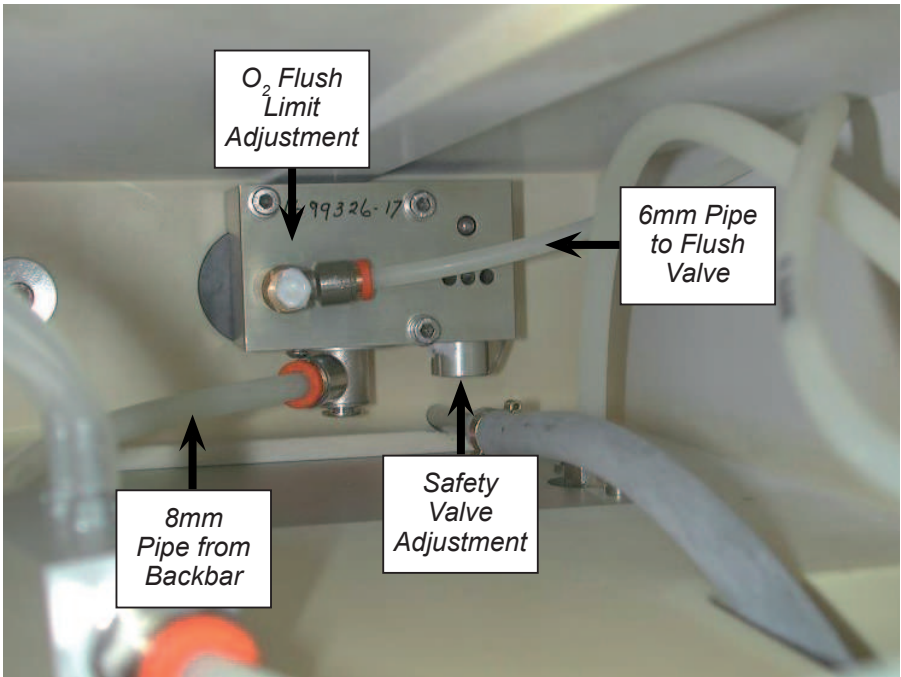


Figure 88 - CGO Adjustment (up to Feb 2009)

5.10.1 Oxygen Flush Adjustment on units sold before July 2010 (Units sold after July 2010 are not adjustable.)

1. To adjust the Oxygen flush flow, first remove the sealing compound from the adjusting screw on the CGO block.
2. Set the flow rate to 45 L/min). Turn the adjuster clockwise to reduce the flow and counter-clockwise to increase the flow.
3. When the flow has been set, seal the adjuster with silicone sealant or something similar.

Common Gas Outlet Safety Valve Adjustment on units sold before July 2010 (Units sold after July 2010 are not adjustable.)

1. To adjust the safety valve, turn the adjuster clockwise to increase the pressure or counter-clockwise to reduce the pressure.
2. If the valve is leaking, remove the block and the valve adjuster. The valve seat and disc bellow can then be accessed and cleaned.



Figure 89 - Valve Adjuster and Disc Removed (up to Feb 2009)

5.10.2 Common Gas Outlet (CGO) Removal/ Replacement (From Feb 2009 onward)

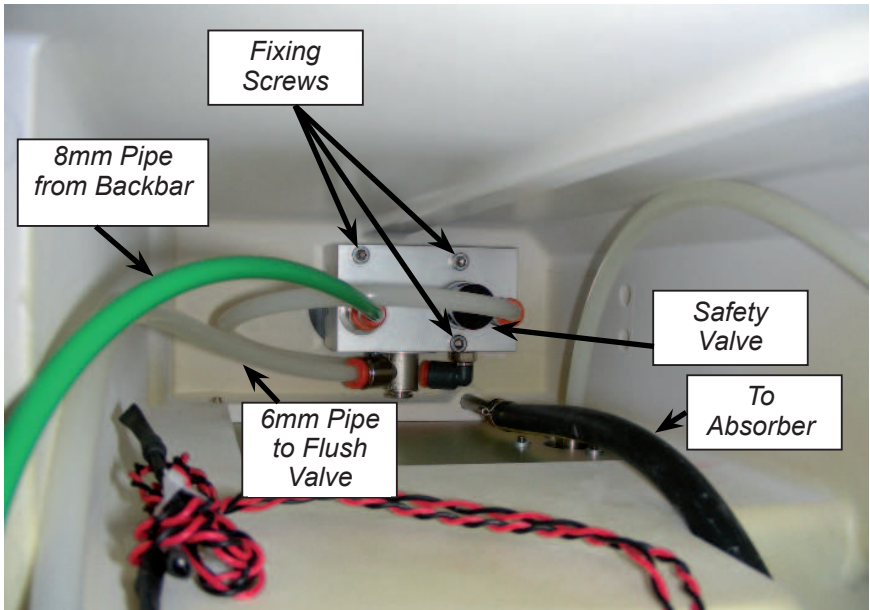


Figure 90 - CGO Block (Feb 2009 onwards)

1. Remove the rubber gas feed connector from the CGO port on the front of the machine.
2. Remove the rear panel (see section 5.1).
3. The block is held in place by three M5 screws. Remove these screws and the block can be removed from the machine.
4. Replacement is the reverse of this procedure

5.10.3 A.C.G.O. Replacement

1. Remove the top drawer.
2. Remove the (4) screws and washers from the suction plate assembly.



Figure 91 - Location of (4) Suction Plate Screws

3. Remove the (3) screws where indicated to remove the ACGO assembly.



Figure 92 - Location of (3) ACGO Assembly Screws

4. Remove the 6 mm tubing where indicated in Figure 93. The tubing is routed to the 6 mm tee that is fitted to the pneumatic block.



Figure 93 - Location of 6 mm Tubing

Detailed Repair Procedures

5. Remove the 8 mm tubing, indicated in Figure 94, that is routed to the flow sensor block assembly.

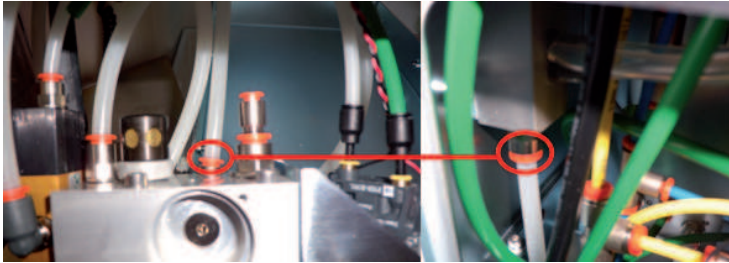


Figure 94 - Location of 8 mm Tubing

6. Remove the 6 mm tubing from the top 4-6 mm increaser routed to the 8 mm/6 mm tee.

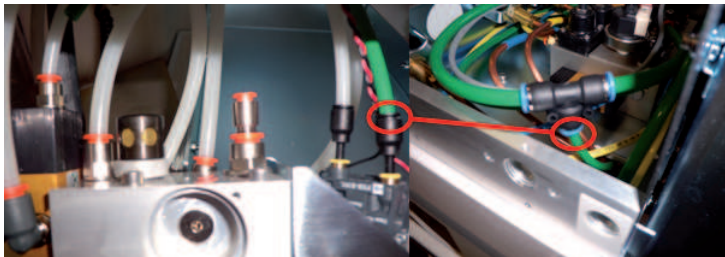


Figure 95 - Location of 6 mm Tubing

7. Remove the 8mm stem clamped to the fresh gas hose routed to the absorber manifold.

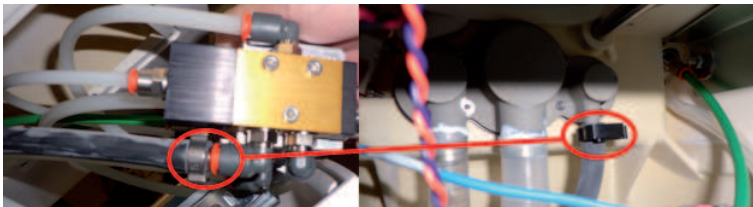


Figure 96 - Location of 8 mm Stem

Detailed Repair Procedures

8. Remove the microswitch, indicated in Figure 97. Note the wire orientation when reinstalling the microswitch.

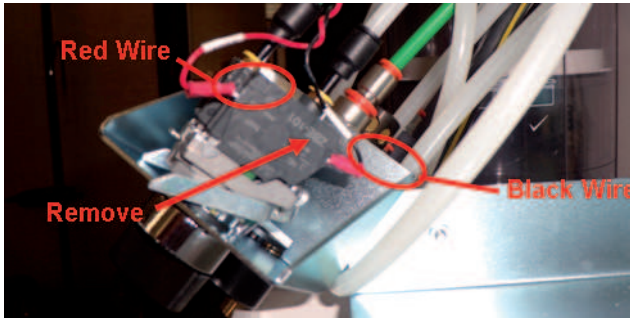


Figure 97 - Location of Microswitch

9. Note the orientation of the tubing, then reinstall the ACGO assembly by reversing the removal procedure.

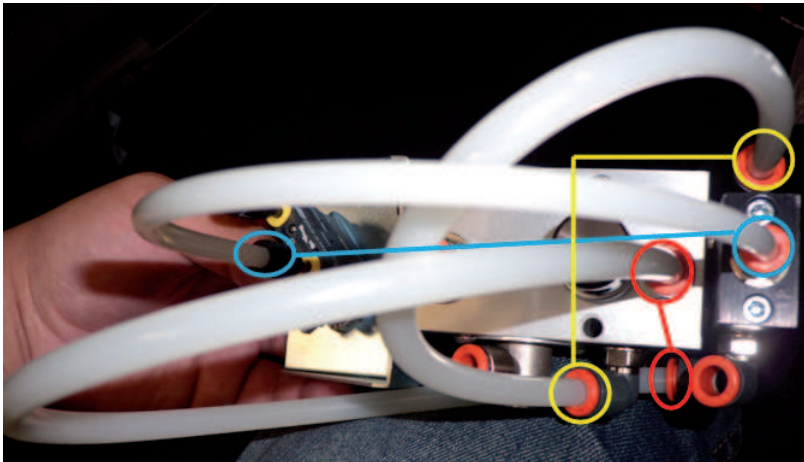


Figure 98 - ACGO Tubing Orientation

Detailed Repair Procedures

10. After the ACGO assembly is installed, turn the ACGO switch to “Absorber” and turn the BleaseSirius on/off switch to the “On” position. Bypass the pre-use test.

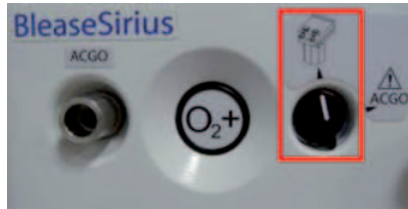


Figure 99 - ACGO Switch Set to Absorber

i *When the ACGO switch is set to “Absorber,” fresh gas is routed to the absorber internally and will not flow through the CGO taper. If the switch is “ACGO,” gas is routed through the taper.*

11. Set the Bag/Vent Switch on the absorber to “Vent” and ensure the ventilator is functioning correctly.
12. Turn the ACGO switch to “ACGO” and ensure ACGO is displayed on the ventilator screen.

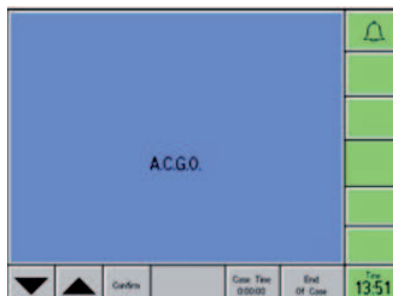


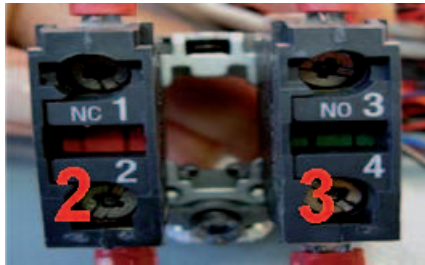
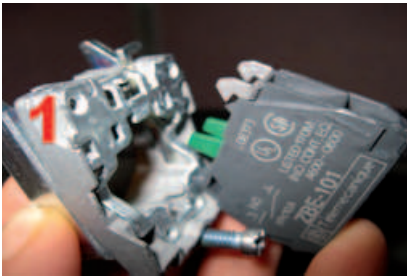
Figure 100 - A.C.G.O Ventilator Screen Display

i *If the ACGO switch is activated during ventilation, the ventilator will continue for about 10 seconds before switching over. If the ventilator is in Standby, the switchover is immediate. To reactivate the ventilator, turn off the ACGO, switch to Bag mode, then back to Vent mode. Also, 100% oxygen calibration is NOT available when the machine is in ACGO mode.*

5.11 ON/OFF Switch (PN FR142028)

Part number FR142028 is already assembled. The following instruction shows the configuration of the switch should disassembly be required.

1. Ensure the machine is powered off and that no pipelines or cylinders are connected to the machine.
2. Remove the front cover of the machine to gain access to the switch.
3. Fit the two microswitches to the switch mounting bracket.



	Description	Part Number
1	Switch Bracket	214-1091-00
2	NC Microswitch	260-0365-00
3	NO Microswitch	260-0364-00

Figure 101 - Microswitch Components

Detailed Repair Procedures

4. Place the vent wires in the correct orientation and secure them with the (4) screws.

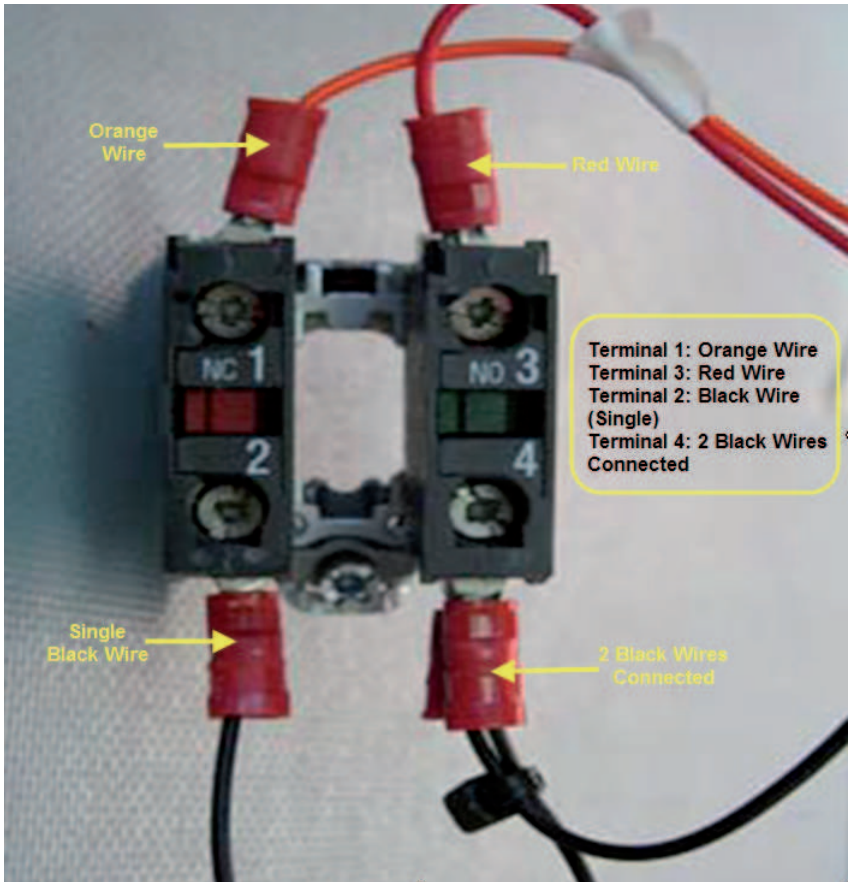


Figure 102 - Ventilator Wire Orientation

5. Mount the (2) NC valves to the micro-switches.

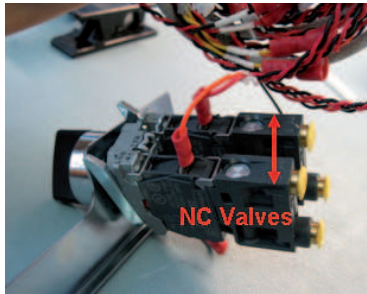


Figure 103 - NC Valves (PN 214-1089-00)

6. Fit (4) 4-6mm increasers into the NC valves and (2) 6-5mm reducers into the 4-6mm increasers.

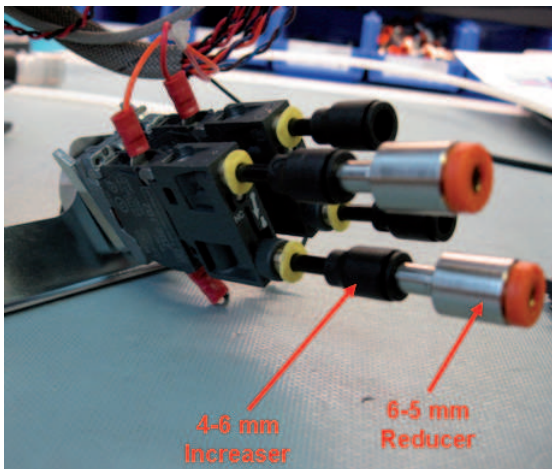


Figure 104 - 4-6 mm Increaser (PN 54200184) and 6-5 mm Reducer (PN 54200110)

Detailed Repair Procedures

7. Connect the 5mm tubing to the 6-5mm reducers and the 6mm tubing to the 4-6mm increasers. See the tubing diagram on the next page.

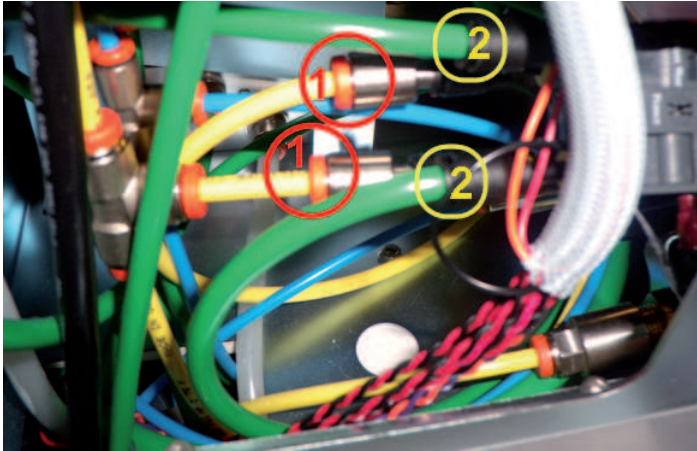


Figure 105 - 5 mm Tubing (1) and 6 mm Tubing (2)

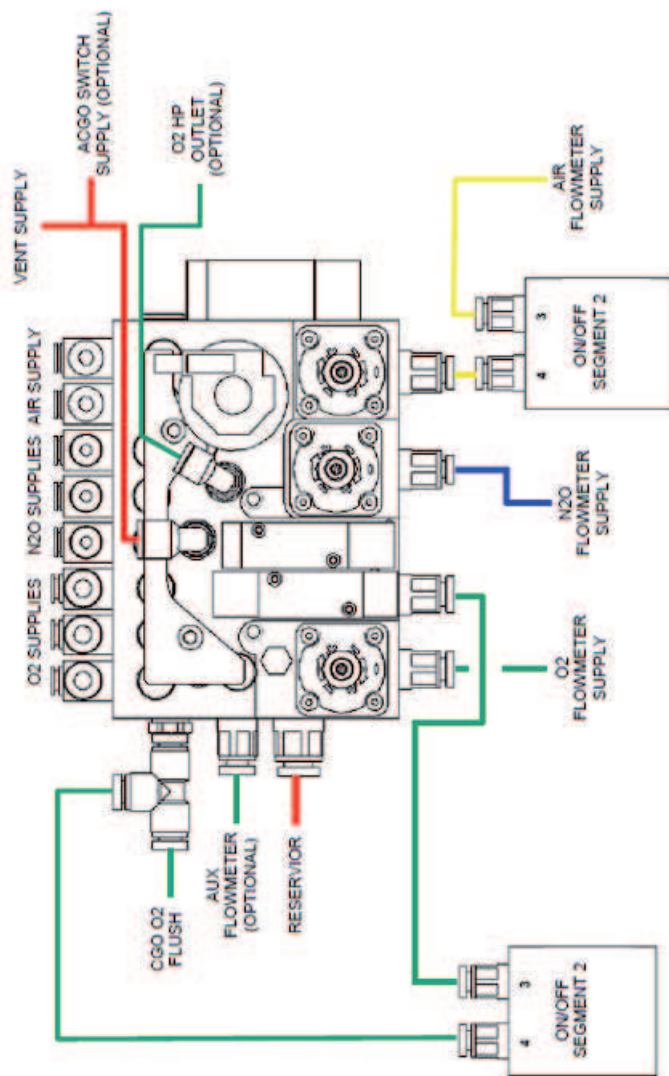


Figure 106 - Tubing Diagram

8. Tighten the (2) screws, indicated in Figure 105, to secure the switch assembly.

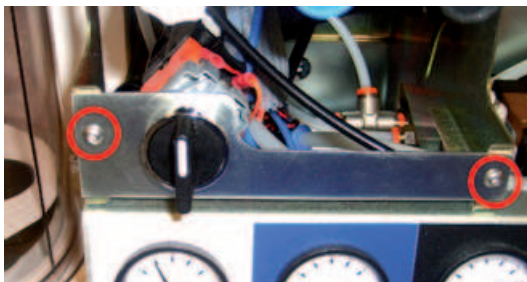


Figure 107 - Tighten Two Screws

5.10.1 Test Procedure for Microswitches

1. Turn the power switch on and ensure the machine powers up.
2. Set a flow of 2 L/min on all gases. Verify that flow is available.
3. Turn the power switch off. Verify that all flows drop to zero and that the machine powers off.
4. Turn the power switch back on and ensure that all flows are restored.
5. Perform a successful leak and compliance test.

5.12 Absorber

5.12.1 General

Original CAS Absorber starting - PN 12205XX

Introduced with the original Sirius system in 2003 and offered with the choice of soda lime capacities and CO₂ bypass fitted as standard.



12200502	CAS Absorber 2kg MRi
12200503	CAS Absorber 1kg MRi
12200504	CAS Absorber 2kg
12200505	CAS Absorber 1kg

(1kg - single canister, 2kg - double canister)

Distinguishing features:-

- All black in color (black top and bottom moldings)
- Metal central body plate (black)
- Stainless steel inspiratory and expiratory patient ports
- Original APL valves without graduated scale
- Manometer case is black.

From October 2006, CAS models starting with PN 122006XX

Introduced in 2006, primarily as a color change, and offered with a choice of soda lime capacities and CO₂ bypass option.



12200606	CAS Absorber 2kg with CO ₂ bypass MRi
12200607	CAS Absorber 1kg with CO ₂ bypass MRi
12200608	CAS Absorber 2kg with CO ₂ bypass
12200609	CAS Absorber 1kg with CO ₂ bypass
12200617	CAS Absorber 2kg without CO ₂ bypass MRi
12200618	CAS Absorber 1kg without CO ₂ bypass MRi

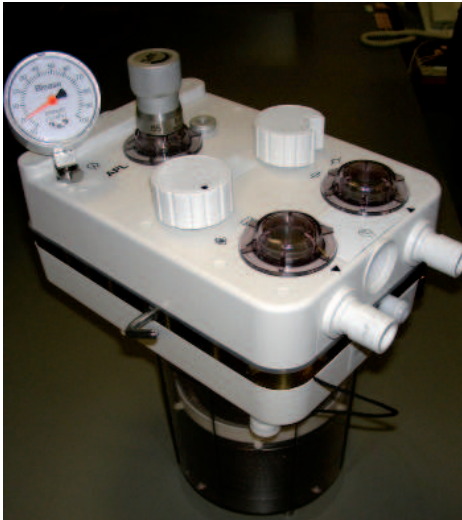
(1kg - single canister, 2kg - double canister)

Distinguishing features:-

- All white in color (white top and bottom moldings)
- Metal central body plate (white)
- Stainless steel inspiratory and expiratory patient ports
- New APL valves with graduated scale
- Manometer case is white.

From January 2008 CAS models starting with 122009**

Introduced in 2009 with re-routed gas flow path for improved moisture handling capabilities and is, to date, the current specification. Offered with the choice of soda lime capacities and CO₂ bypass option:



12200900	CAS Absorber 2kg with CO ₂ bypass
12200901	CAS Absorber 1kg with CO ₂ bypass
12200902	CAS Absorber 2kg without CO ₂ bypass
12200903	CAS Absorber 1kg without CO ₂ bypass
12200905	CAS Absorber 1kg with CO ₂ bypass MRI
12200907	CAS Absorber 1kg without CO ₂ bypass MRI

(1kg - single canister, 2kg - double canister)

Distinguishing features:-

- All white in color (white top and bottom moldings)
- Transparent plastic central body plate
- Plastic moulded inspiratory and expiratory patient ports
- New APL valves with graduated scale
- Manometer case is white.

Interchangeable Parts



Not all parts are interchangeable between MRi and non-MRi units specifically manometer and top molding assembly)

All the 'bolt on' and accessory parts of the CAS absorbers are mechanically interchangeable among the different models with most differences being color only.

- NRV discs and domes (including O-rings)
- Soda lime inner and outer canisters
- Manometer (but not between MRi and non-MRi models)
- APL valve (new & original type are interchangeable)
- All other external seals and O-rings (not including internal central seal, etc.)

For 122005** and 122006** series models, besides the color differences, most main body parts, are interchangeable including bottom moldings, central body plate, central seal etc. **The top molding assembly and manometer are not interchangeable between MRi and non-MRi units.**

Non-Interchangeable parts

The 122009** models do not share any main body (top/bottom moldings, central body plate, central seal etc.) Interchangeable parts with the 122005** and 122006** models. Also for the 122009** models, **the top molding assembly and manometer are not interchangeable between MRi and non-MRi units.**

5.12.2 Absorber Interface Manifold Assembly

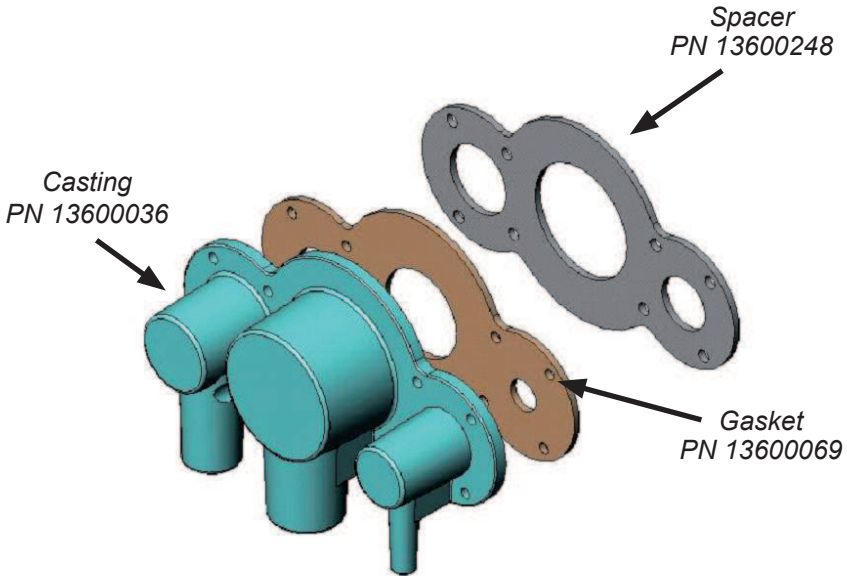


Figure 108 - Absorber Interface Manifold Assembly

The three components are held in place in the main molding with 8 M3 screws. Do not over-tighten these screws or the threaded inserts in the molding may be damaged.

If the pipes are removed from the casting (they are different diameters so they cannot be interchanged before refitting), the mating surface of the casting should be lightly smeared with a silicone sealant to ensure a gas-tight seal to the casting.

5.12.3 Absorber Alignment

It is essential that the absorber and its switching are aligned correctly for the ventilator to work. There are two separate switch functions:

1. Standby/run signal generated from the bag/vent switch
2. Absorber docking signal

5.12.4 Standby / Run

The Ventilator Standby / Run signal is generated by a magnet attached to the absorber Bag / Vent switch and operates a reed switch within the mounting rod. The adjustment range is approximately 5mm. There is no adjustment to the magnet, but the reed switch is adjustable.

1. To adjust the reed switch, remove the rear cover of the machine.
2. The cable attached to the reed switch can be seen coming out of the back of the absorber support rod nearest the outside. The cable is secured by a 'P' clip on the main upright and silicone adhesive at the mounting rod base.
3. Make sure the absorber is correctly positioned. Ensure that there are no foreign objects between the absorber and the main Sirius molding, preventing the absorber from pushing back correctly.
4. Loosen the 'P' clip and remove the silicone adhesive to slide the reed switch in and out, until reliable switching is achieved. Tighten the 'P' clip and check again. If functional, reseal the mounting rod with silicone adhesive.

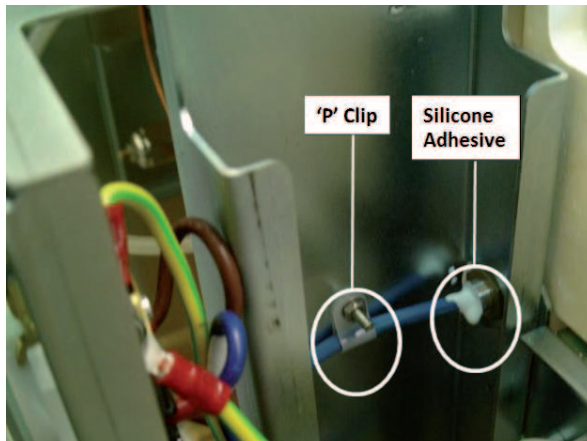


Figure 109 - 'P' Clip

5.12.5 Absorber Docking

The Absorber docking signal is generated by a micro switch within the Sirius that is activated by a short pin on the back of the absorber. Again, making sure that the absorber is correctly positioned, check that this pin is working the micro switch. An error message “ABSORBER NOT FITTED” will be displayed on the ventilator screen, if contact is not made. Ventilation will stop without the Standby/Run or absorber docking signal.

The absorber pin is not adjustable. Test the micro switch at the hole to the right of the short absorber rod to remove the “ABSORBER NOT FITTED” alarm. If faulty, replace the micro switch



Figure 110- Absorber Prongs



Figure 111 - Micro Switch

5.12.6 Setting Ball Catch

1. Fit an Absorber Rod into the Main Plate RF.
2. Fit the Spring Plunger (54600073) and tighten until it “bottoms” solidly. Slacken half a turn.
3. Remove the Rod.
4. Lock the Spring Plunger in place by fitting Grub Screw (SM0870) against it.



Ensure correct setting - the Rod must “click” in and out of the Main Plate.



5. Ball catch and lock screw.



6. Ball end in first, turn a few times, but not all the way in.



7. Insert rod flat end first.



8. The rod is in place.

Figure 112 - Setting Ball Catch

Detailed Repair Procedures



9. Screw in the ball catch until it stops against the rod.
10. Back off half a turn.



11. With ball catch adjusted and rod inserted, screw in the lock screw until tight.
12. Remove the rod and check that when the rod is inserted (pointed end first) that positive lock is achieved on machine groove.

Figure 113 - Lock Screw Insertion

5.13 Internal Absorber

1. To release the lower molding, remove the twelve M5 screws.



Photos show the absorber with bypass switch. Some models do not have the bypass switch.



Figure 114 - Absorber Molding 01

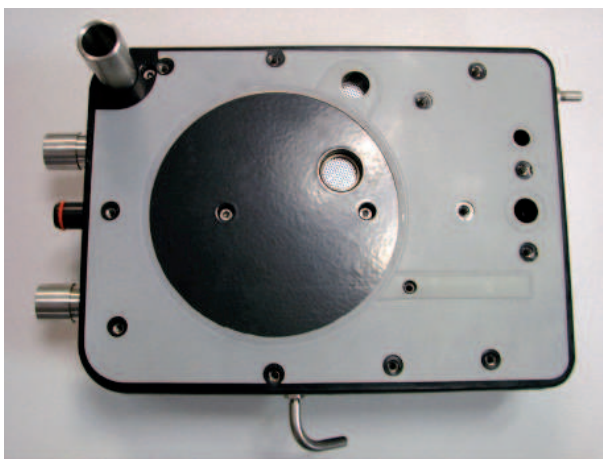


Figure 115 - Absorber Molding 02

Detailed Repair Procedures

2. Remove the gasket to expose the fifteen M4 screws which hold the top molding to the center plate.

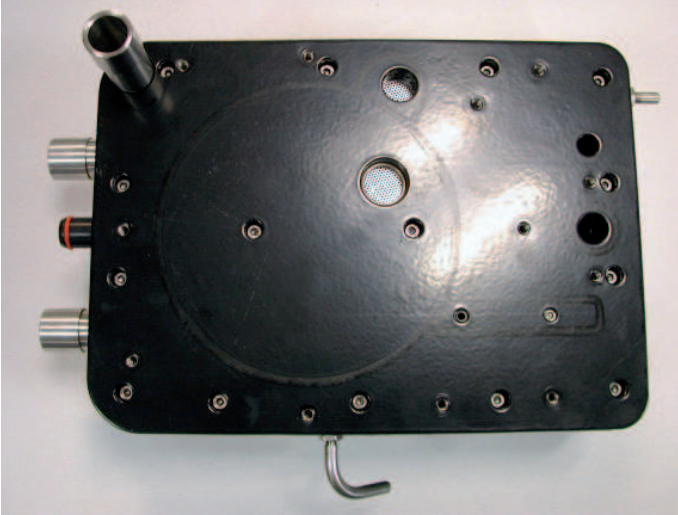


Figure 116 - Absorber Molding 03



Figure 117 - Absorber Molding 04

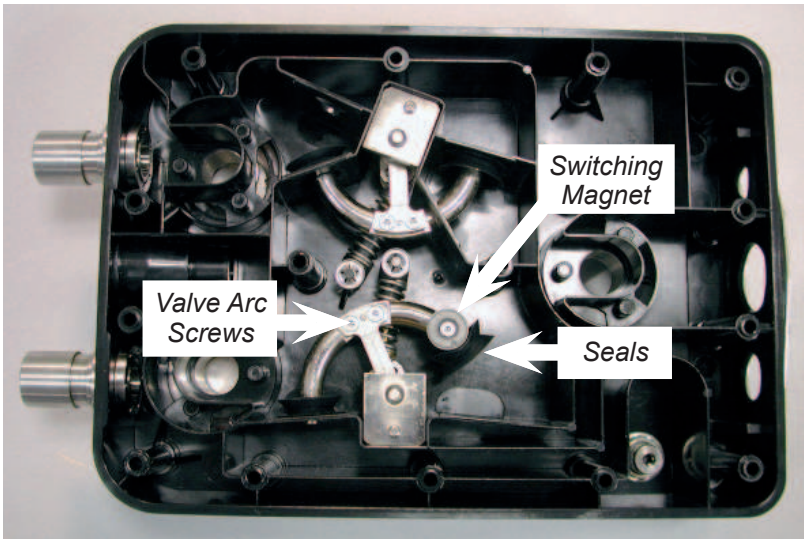


Figure 118 - Internal view of Absorber Moldings

3. To replace seals, remove the two M3 screws from the valve arc.



Figure 119 -Valve Arc

4. Remove seal from arc by removing the center screw and washer.
5. Re-assembly is the reverse of this procedure.

5.13.1 Bellows Interface Gasket



Figure 120 - Bellows Interface Gasket Fixing Screws

1. Remove the six cross-head screws from the gasket plate.



Figure 121 - Gasket Removed

2. Remove the gasket. Do not over tighten screws during re-assembly.

5.14 Servicing the Bag Arm

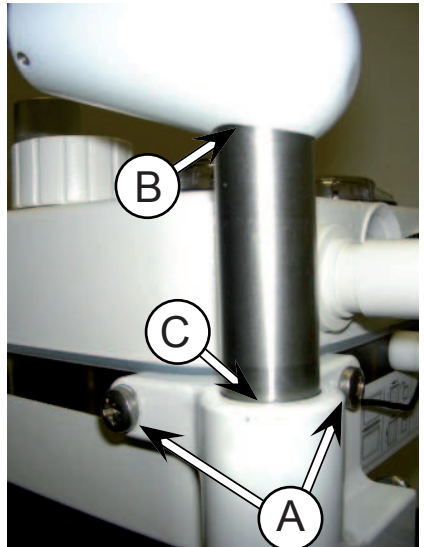


1. Check that the bag arm is complete with no signs of damage to the tube or cast swivels.

Bottom Swivel

- A) Check that the bottom swivel is securely held by the two screws to the central plate of the absorber.
- B) Check that the screw threads, where the top angled casting is screwed onto the upright stainless steel tube, do not show. The stainless steel tube should be free to turn in the bottom swivel.
- C) Check for any build-up of grease or powder on the bottom swivel to the upright stainless steel tube.

If you see any of the above conditions, then remove the bag arm from the absorber for servicing.



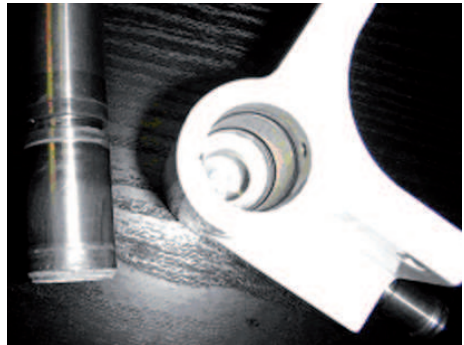
2. Remove the rubber transfer hose connecting the absorber bag port to the bag arm.
3. Remove the two screws holding the bag arm to the absorber central plate. If these were already loose check that the threads are not damaged on the absorber central plate.

Detailed Repair Procedures



4. After removing the arm, loosen the set screw (do not remove it), then pull the arm out of the bottom swivel.

5. There is white, oxygen-safe grease on the stainless steel tube, in the housing and on the rubber “O” rings. These parts should be cleaned and inspected for signs of wear or foreign objects. If no damage is seen, then regrease the parts with oxygen-safe grease and reassemble, ensuring that the set screw is in the groove.



6. If you find damage, replace the parts.
7. If the bottom swivel has been damaged, then it is possible that the angled casting, screwed on top of the stainless steel tube, will start to unscrew.
8. If you see screw thread, remove the remaining thread, clean both internal and external treads. Apply thread lock (Loctite 648) and reassemble.

Bottom Push-to-Twist Joint

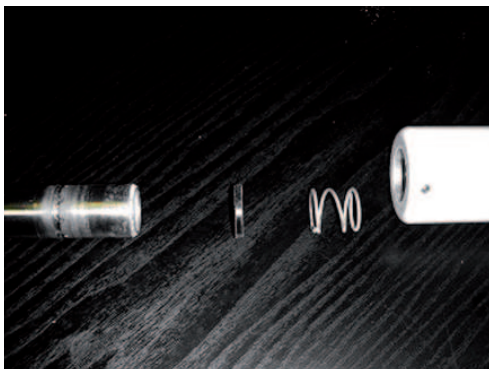


9. The bottom push-to-twist joint should be smooth to operate. If it is not, then strip and check the joint.
10. Loosen the two small set screws until they are flush with the outer body. Remove the stainless steel arm from the cast body.

11. Check the condition of the groove and notches. Ensure that there are no rough edges and no foreign bodies.
12. Check inside the machined body. Make sure that there are no grooves cut into the body by either the stainless steel arm or foreign bodies. If there are any signs of wear, replace the parts.



13. Remove the plastic washer and spring. Check the two “O” rings remaining in the machined body for damage. If you do not see any damage, re-grease the parts with oxygen-safe grease and reassemble. Take care to insert the two small set screws into the groove on the stainless steel arm. Do not over-tighten the two screws to the point where they stop the arm from twisting.



Top Swivel

1. Check that the top swivel is free to rotate and also check the bag port taper for damage.
2. Remove the small set screw and remove the machined body from the arm.
3. Check for any damage inside the body and that the two "O" rings are not damaged. Replace any damaged parts.
4. If you do not see any damage, re-grease with oxygen safe grease and reassemble. Ensure that the set screw is located in the groove.



Refitting and testing

Refit the arm to the absorber, making sure that the two screws (SM0650 M6 x 30 and SM0692 washers) are secure.





Early installation used shorter screws to secure the bag arm to the absorber. Replace these screws with SM0650 screws.

Using the ventilator installed on the BleaseSirius, complete the pre-use system test, then complete the system test. The system test specifically checks the bag arm and associated components for leaks and blockages.

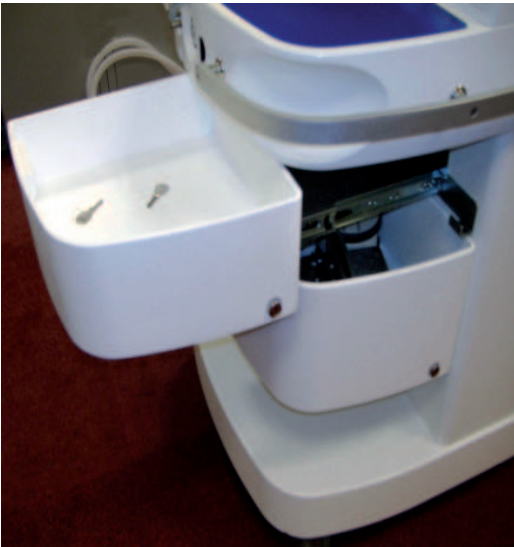
For more information:

If you have any questions regarding the above instructions, please contact your local Spacelabs Healthcare representative or Spacelabs After Sales Care via e-mail: advsupport@spacelabs.com

5.15 Drawer Removal/Replacement



1. Check that the drawer(s) are unlocked.



2. Slide the drawer(s) fully forward.

Figure 122 - Drawer Mechanism

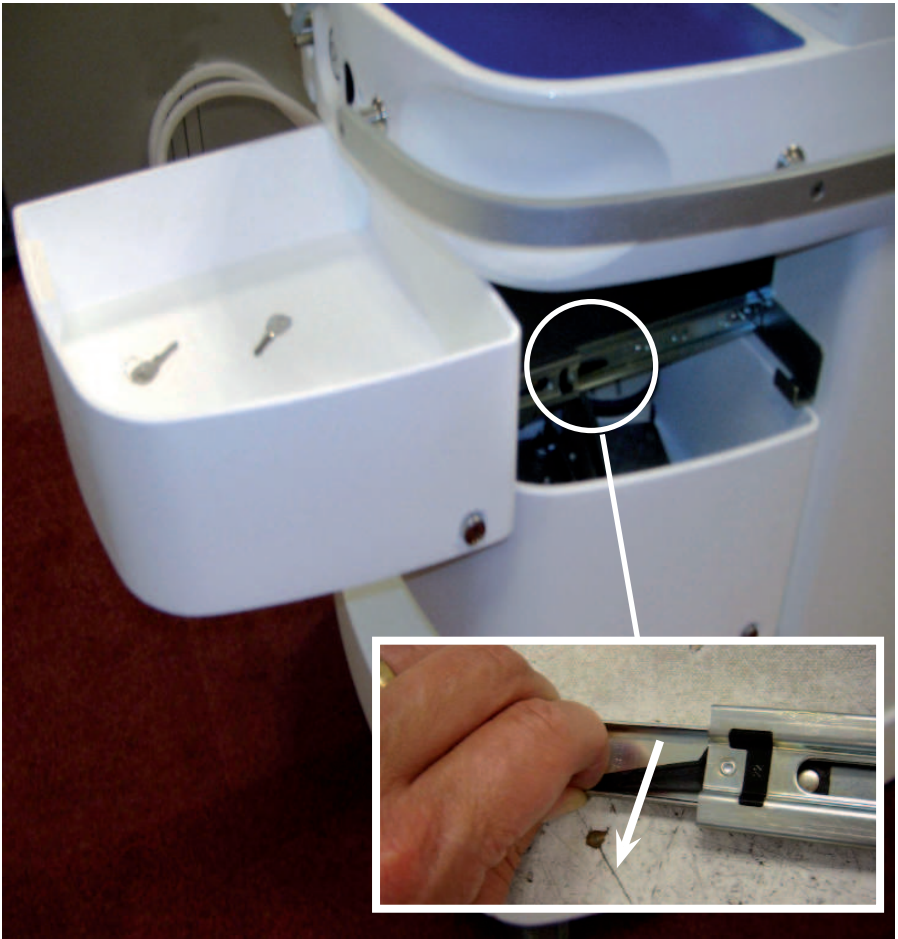


Figure 123 - Location of Drawer Mechanism and Removal

3. Move the black plastic slide to adjacent position to release drawer mechanism. Repeat for the other side.
4. Continue to slide drawer forward.



The Drawer will slide off the end of the runners - take extra care.

Detailed Repair Procedures



Figure 124 - Drawer Mechanism



Figure 125 - Drawer Re-Assembly

5. Remove the three screws then remove the slide.
6. Re-assembly is the reverse of this procedure

5.16 Braking System Maintenance.

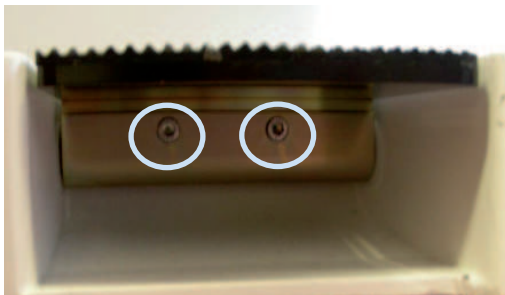


Figure 126 - Pedal Screw Location

1. Remove the 2 pedal screws.
2. Slide the pedal out.



Figure 127 - Hex Bar



Figure 128 - Hex Bar Removal

3. Slide the hexagonal bar out.

5.17 Castors Maintenance



To replace any of the castor mechanisms, you must tip the BleaseSirius. This positioning requires AT LEAST 2 people to perform.

Remove the Vaporizers, monitoring, cylinders, all loose items and all add-ons from the machine.

With the assistance of at least one additional person, tip BleaseSirius onto its back, preferably on a protective surface. Be sure to prevent the rear castors from rolling as you lay it down. Lay the BleaseSirius on its back to access all 4 castors.



Figure 129 - Location of Caster Retaining Screw

1. Remove the caster retaining screw.

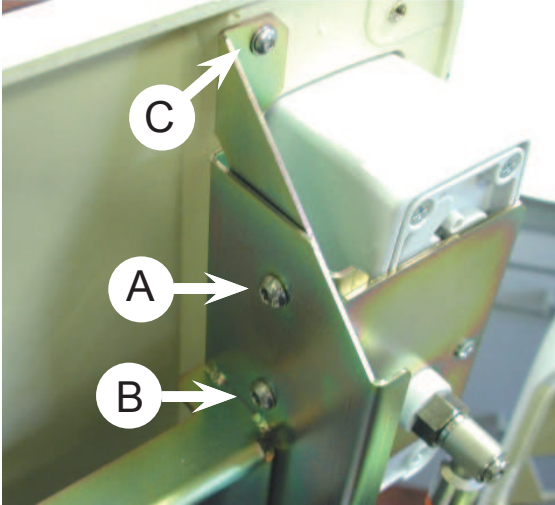


2. Remove the caster.

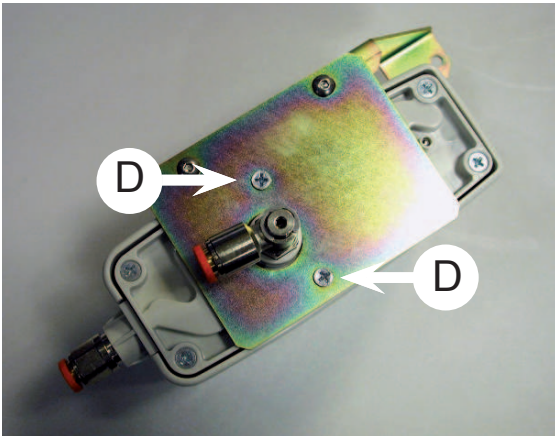
Figure 130 - Caster Removal

5.18 Suction Controller Removal/Replacement

1. Remove rear panel (see section 5.1).



2. Remove the two M5 screws (A&B) and the M4 screw (C). The controller and its bracket can be pulled back clear of the front molding. Disconnect the pipe connections.



3. Remove the suction controller from its bracket by removing the two 'pozi-drive' screws (D).

Figure 131 - Suction Controller Removal / Replacement

Detailed Repair Procedures

4. Replacement is the reverse of this procedure.



Figure 132 - Suction Controller in Place

Detailed Repair Procedures

Electrical

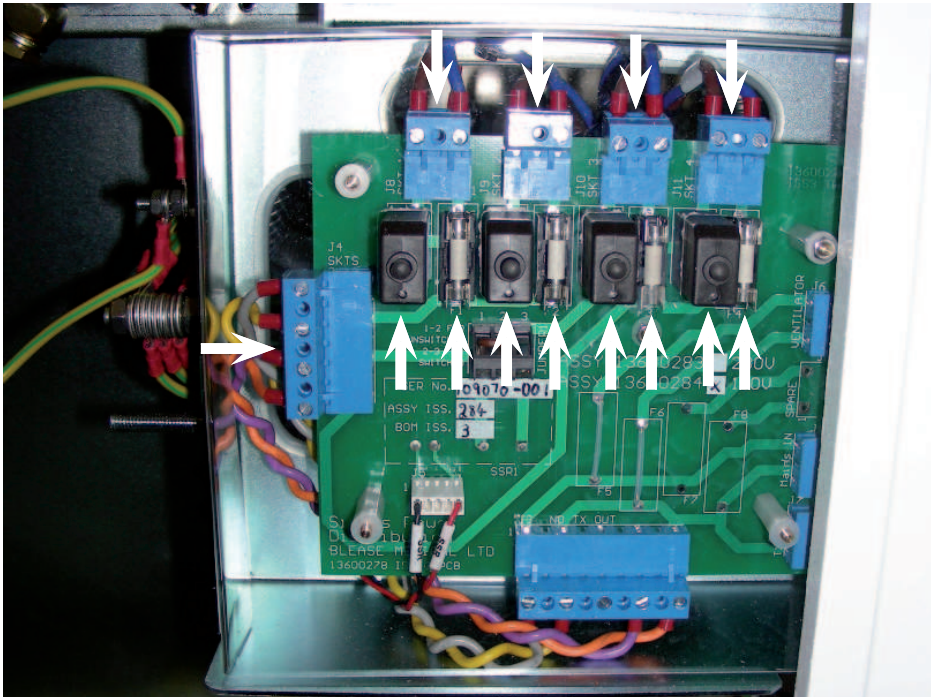


Figure 133 - Electrical Fuses

5.19 Ventilator

After the ventilator has been serviced or repaired, perform the ventilator Checkout Procedure described in Chapter 4.

5.19.1 Inspiratory Block Assembly

The inspiratory block (Part No. **FR137025**) is replaceable as an assembly. The inspiratory block is fully calibrated. The following installation procedure must be preformed.

1. Disconnect the gas supplies and ensure the electrical supply is turned off.
2. Remove the Top molding, front cover and the main rear cover (see section 5.1).
3. Remove the six screws around the edge of the ventilator case top.

The front of the ventilator will now hinge forward a little to allow the top to open up completely.

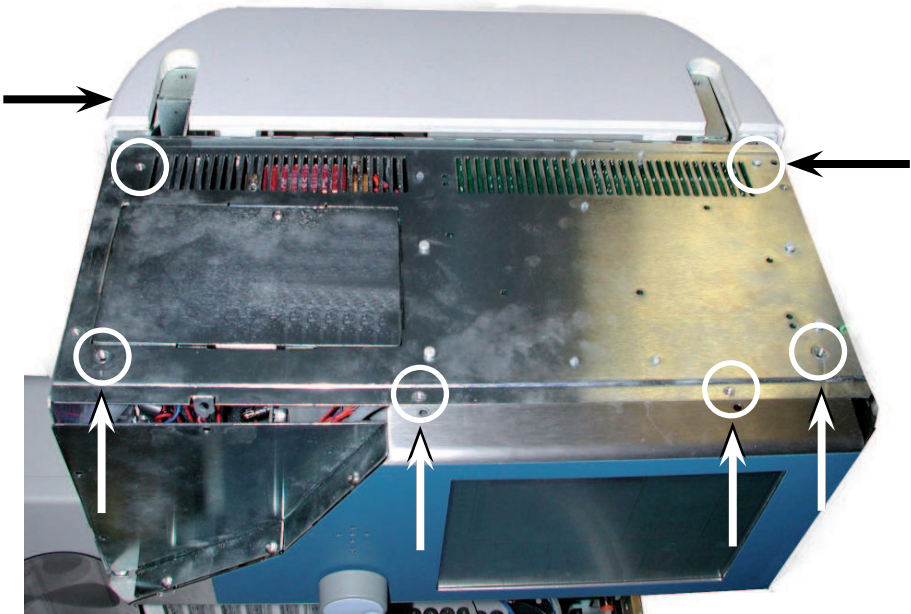
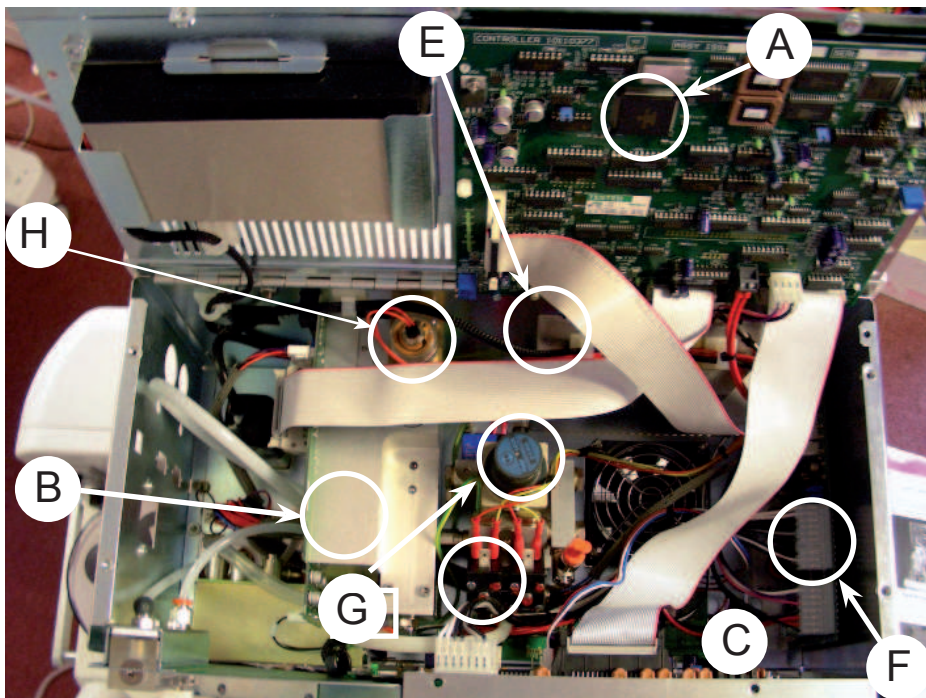


Figure 134 - Ventilator Case Top

5.198.2 Ventilator Internal System

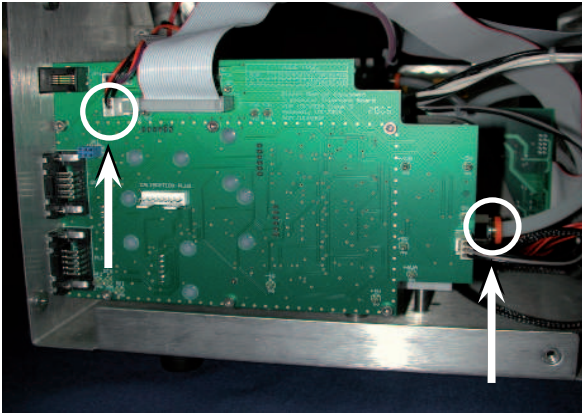
5.19.2.1 Replacement of Major Components



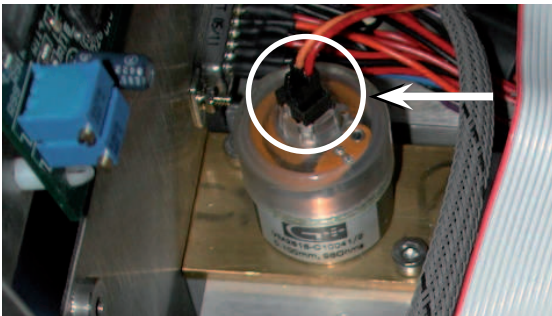
- A BAV Control PCB (FR101027)
- B Inspiratory Block (FR137025)
- C Front Display Board & Screen Inverter. (050-0547-00, 050-0548-00)
- D Switch Mode Power Supply (FR136025)
- E Inlet Manifold (FR140026)
- F BAV Power Supply (FR136029)
- G Gas Inlet Assembly (FR137027)
- H Inspiratory Valve (FR137028)

Figure 135 - Inside the Ventilator (Top View)

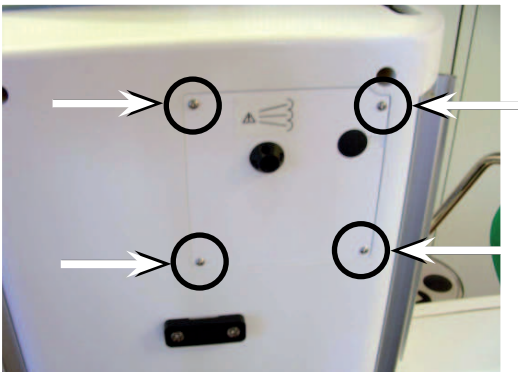
5.19.3 Removal of Inspiratory Block (FR137025)



1. Disconnect the electrical connectors and gas supply as shown.



2. Remove the connector from inspiratory valve as shown.

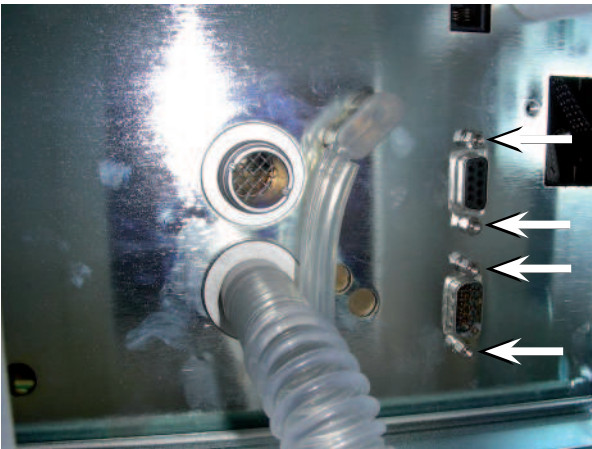


3. On the rear of the ventilator, remove the four screws as shown, then remove the cover.

Detailed Repair Procedures

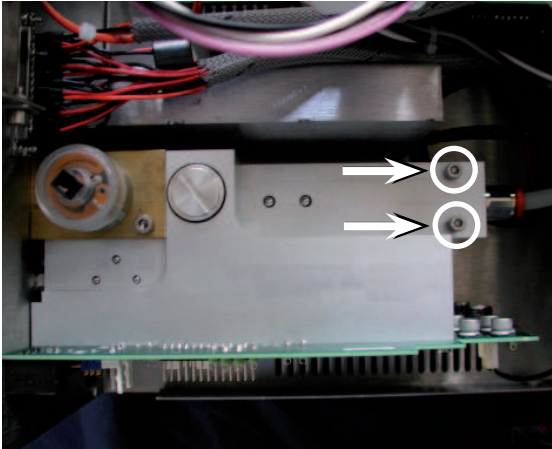


4. Remove the drive gas connector as shown left.



5. Remove the four connector-retaining posts.

Detailed Repair Procedures



6. Remove the two screws as shown and lift the inspiratory block from machine.

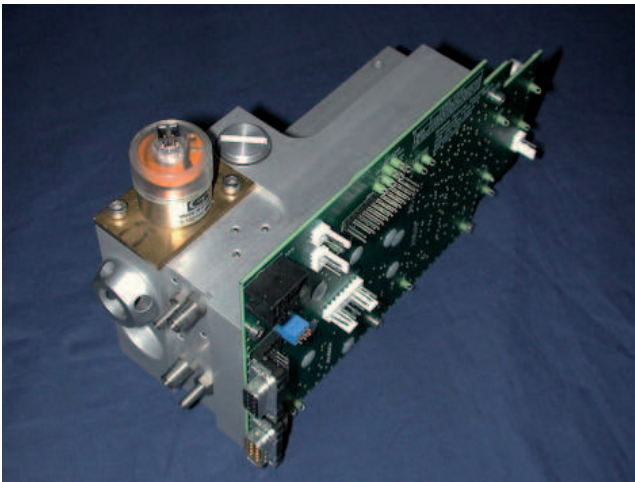


Figure 136 - View of Removed Inspiratory Block

7. Re-assembly is the reversal of the removal procedure.



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5.19.5 Removal of BAV Power Supply (FR136029)

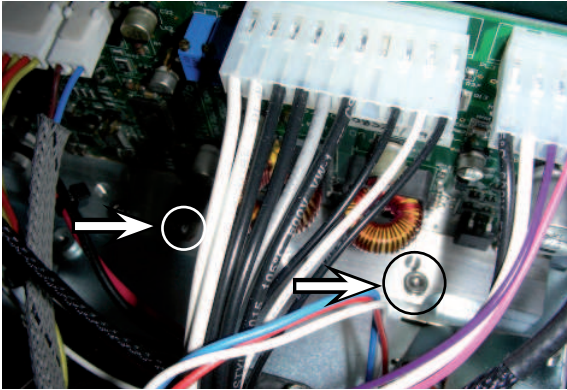


Figure 138

5. Remove the two screws as shown.

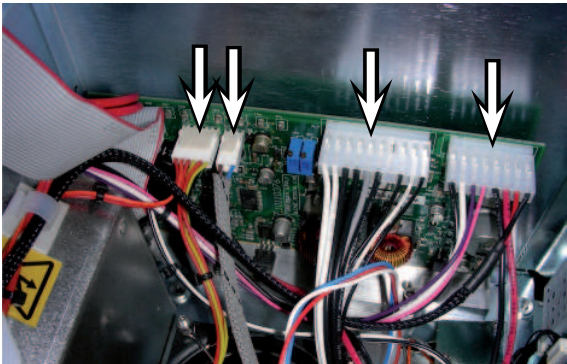


Figure 139

6. Disconnect all connectors and the ribbon wire to the BAV controller.

5.19.6 Removal of Front Panel (FR101026)

1. Pry the center cap from the Ventilator Control Knob.
2. Remove the nut and then the knob.



Cap in Place



Cap Removed

Figure 140 - Ventilator Control Knob

Detailed Repair Procedures

3. Remove the three screws from the bottom of the front molding (Figure 120) and lift out the front panel assembly.

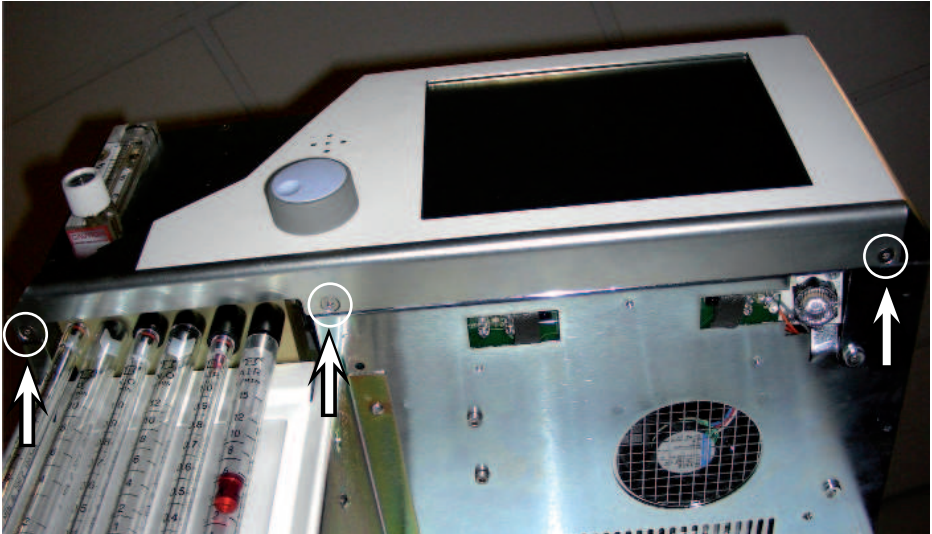
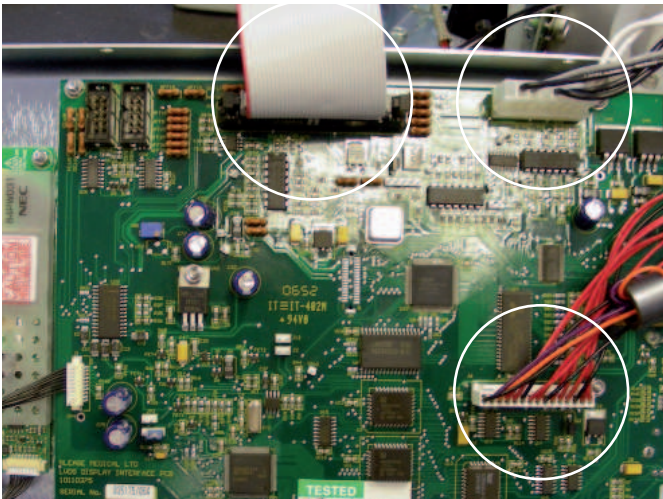


Figure 141 - Front Panel Retaining Screws

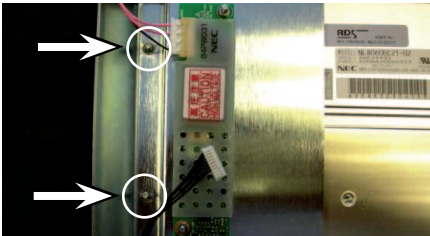
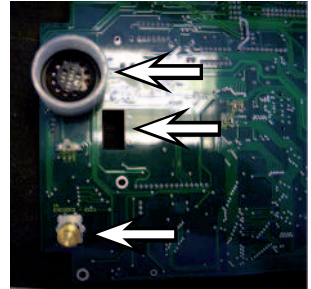
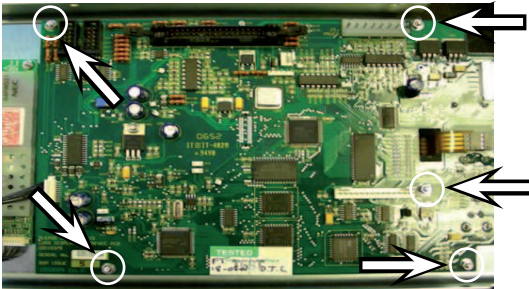


4. To remove the board, disconnect connectors as shown.

Figure 142 - Front Panel (Rear View)

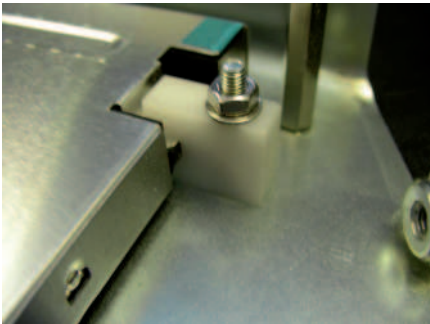
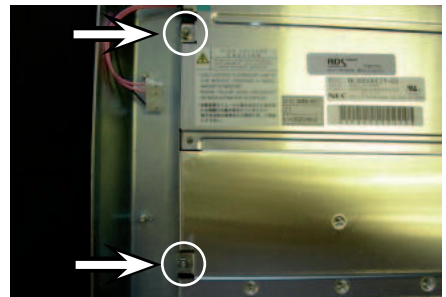
5.19.7 Removal of the Screen (FR812025)

1. Remove the five nuts indicated below.
2. Remove the circuit board from the chassis.



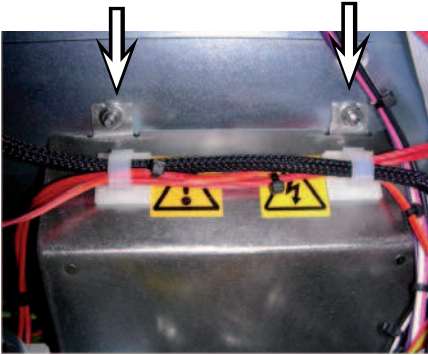
3. Take care not to lose or damage parts. Rear of display with circuit board removed.
4. Remove two nuts on left.

5. Remove next two nuts.
6. Lift edge gently to clear the threads.

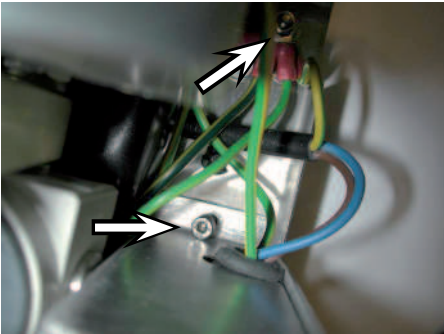


7. Slide the screen out from the plastic fittings on the other side.

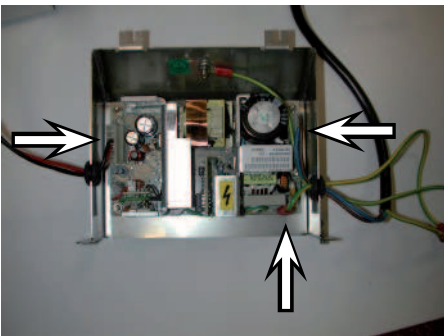
5.19.8 Removal of Switch Mode Power Supply (FR136025)



1. Remove the two screws located at the sides of the power supply.



2. Remove the earth bonding nuts.

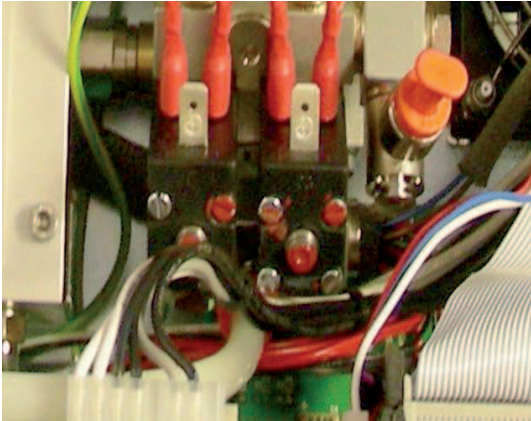


3. Remove the three connectors.
4. Remove the four nuts from each corner.

5.19.9 Removal of Flow Control Valves (up to March 2009)

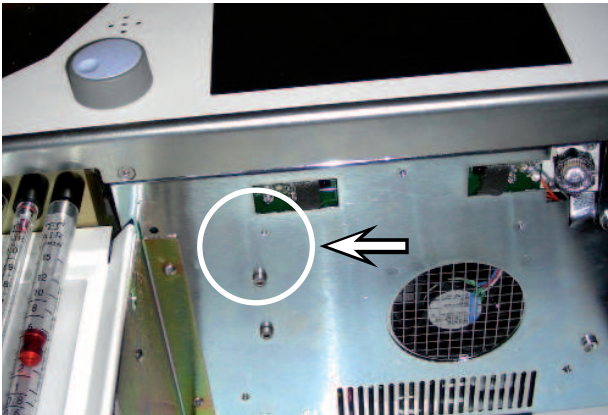


From March 2009 the Flow Control Valve and Gas Inlet Module have been combined into one unit (FR137027). ***The valves must be replaced as a pair only. See 137P1004 in Appendix 1 for full replacement and test details.***



1. Disconnect the four spade connectors and the hoses as shown.

2. Remove the two nuts as shown, which in turn releases the valves.



5.19.10 Removal of Gas Inlet Module (FR 140026) (up to March 2009)

1. Disconnect the gas supply.

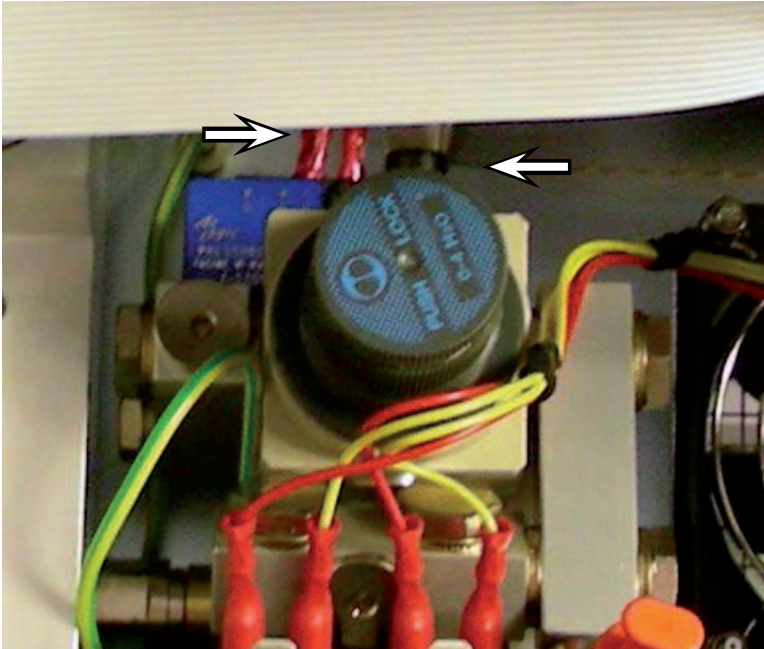


Figure 143 - Gas Inlet Module

2. Disconnect the outlet hose and the two connectors to the pressure switch.

5.19.11 Replacement of Battery (80300025)

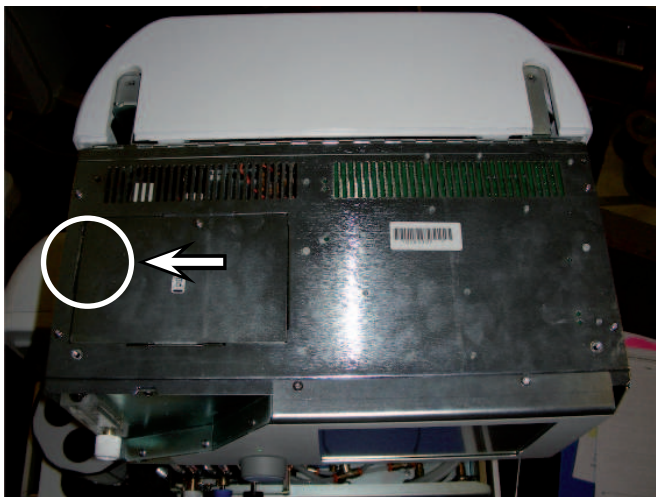


Figure 144 - Replace the Battery

1. Remove the three screws as shown.
2. Remove the plate to expose the battery.



Do not short battery connectors together. Ensure correct polarity of cables when reconnecting the battery - Red to positive and Black to negative.

5.19.12 Exchanging of Fuses (EF533789)



WARNING: *The use of incorrectly rated fuses constitutes a fire hazard. Replace the two fuses only with the correct type and rating of fuse.*

The combined IEC socket/fuse holder is located underneath the ventilator, below the flowblock.

1. Locate the two small tabs.
2. Pull these tabs toward you using your finger and thumb.
3. The fuses are now visible and can be replaced.
4. After replacing the fuses, push the compartment back into the outlet.
5. If a fuse fails a second time, contact a Spacelabs technical engineer.

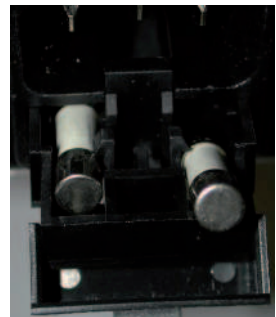


Figure 145 - Replace the Fuses

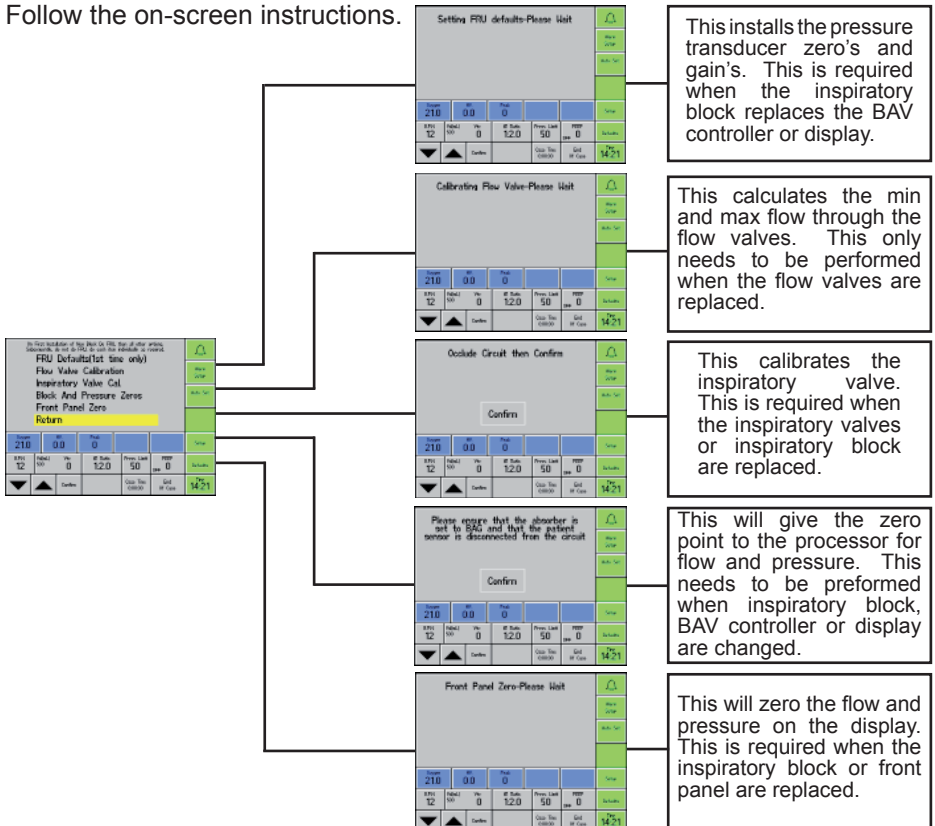
5.20 Major Component Installation

If you replace any of the following components: BAV controller, display board, inspiratory blocks or flow valves, you must complete the following on-screen installation routine.

To access the on-screen installation;

1. Select the Setup button.
2. Select the Configuration option.
3. Select Service Mode.
4. Enter the password 'CALBK' by turning the TrakWheel to highlight each letter, then press the TrakWheel to select that letter.

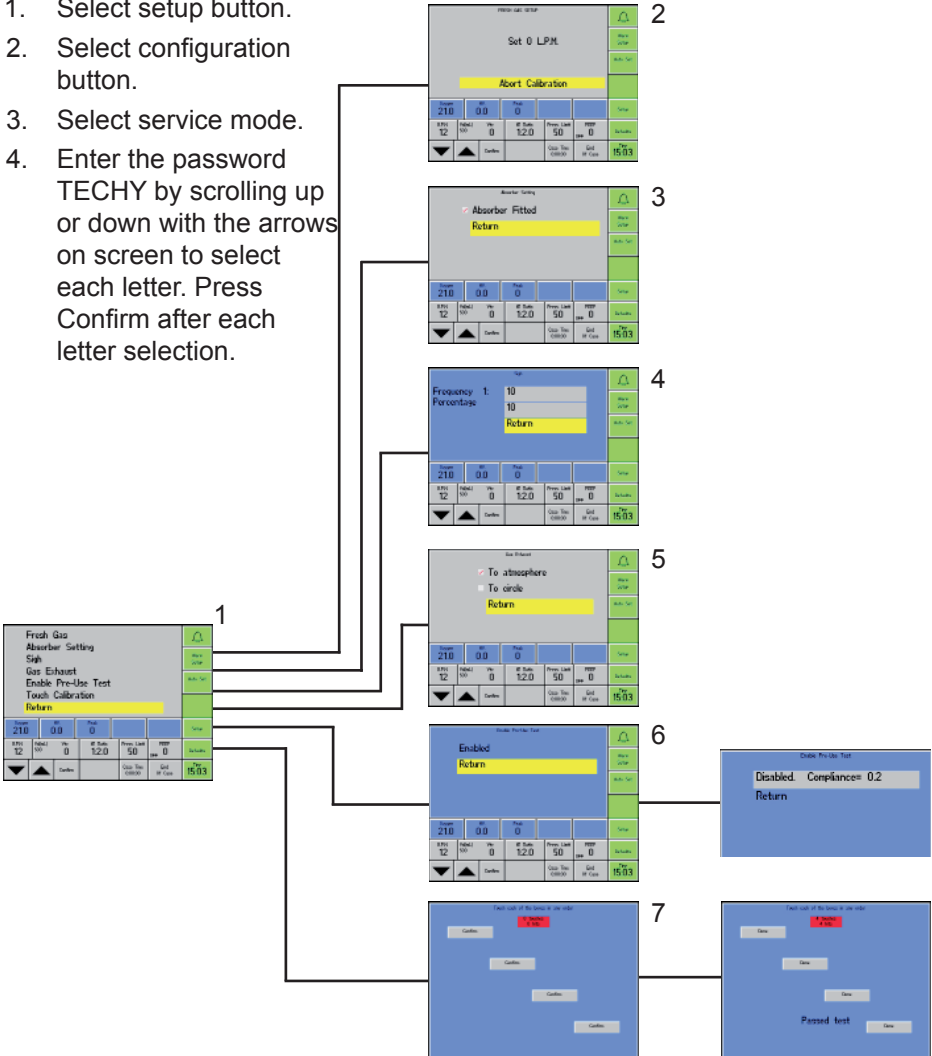
Follow the on-screen instructions.



5.21 Set up Options

To access the on screen setup options (screen 1 below):

1. Select setup button.
2. Select configuration button.
3. Select service mode.
4. Enter the password TECHY by scrolling up or down with the arrows on screen to select each letter. Press Confirm after each letter selection.



5.22 Fresh Gas Calibration (2)

The ventilator must be in STANDBY. The first reading is at ZERO. Therefore, because of the basal flow set on the flow meters, the only option is to disconnect all oxygen supplies (cylinders and pipeline). All other gases must be reduced to ZERO flow on the flow tubes. A warning message will be displayed stating LOW SUPPLY GAS. Ignore this message for this test. The flow tubes themselves are accurate enough for this calibration but an external flow monitor can be used to check if required.

From this menu, select Fresh Gas.

1. Set Zero flow (on the flow tubes), then Confirm.
2. Set 1 L/min (on the flow tubes), then Confirm.
3. Set 2 L/min, 3 L/min, 4 L/min, 5 L/min, 6 L/min, 7 L/min, 8 L/min, 9 L/min, 10 L/min and, finally, 20 L/min

If all is correct, the ventilator will bleep and state DONE on the screen. After a few seconds, you will be returned to the normal run screen.

If an error occurs, the calibration will be aborted. The only reason for this error is that there was not a step change between one calibration point and the next.

5.23 Absorber fitted (3)

This option allows the ventilator to be used with a system that does not have a BAG/VENT detect switch fitted.

5.24 Sigh (4)

This option allows the fixed sigh amount to be set. For example, every 10 breaths a 10% extra will be delivering. Select one of the parameters in the base to change using the arrow keys or use the Trakwheel™.

5.25 Gas Exhaust (5)

The exhaust from the gas analyzer is normally connected to the exhaust of the system and is collected by the AGSS. This setup is referred to as atmosphere.

In very low flow applications, it is often necessary to return the sample gas to the breathing system to prevent the bellows from slowly collapsing.

It is important that the ventilator knows where the return point is, so that it can make the correct compliance correction. The instructions to follow vary, depending on which option is selected here.

If the return is to atmosphere/AGSS, the user will be told to remove the sample line before pre use test.

If the return is to the breathing circuit, the user will be told to ensure the analyzer is switched on and that the sample line is connected.

5.26 Enable Pre-use Test (6)

For most users, this option will be enabled. This option will request that the user performs the pre-use test.

On some models or for some installations, this option can be turned off by selecting disable and then setting a fixed compliance correction. The value of this compliance correction should be selected to give a good approximation of a 'normal set-up,' i.e., measure the system with a normal absorber full of soda lime and the most frequently used breathing system in place. Look at the measured system compliance displayed on the main screen. Then set this value for the disabled value.

5.27 Touch Calibration (7)

A small red square is displayed at the top left of the Touch Calibration screen. Touch this square as accurately as possible with your finger. Once touched, another red square will be displayed to the right and lower than the first square. Again touch this square as accurately as possible. Repeat this sequence until the tenth square is displayed at the very bottom right.

Next, four boxes are displayed as a confirmation screen. Touch each of the four boxes as near to the centre as possible. When an acceptable reading is obtained, the box will show 'DONE.' When all four boxes are 'DONE,' the screen will be calibrated and will display 'passed'.

5.28 Ventilator Service Mode Passwords

5.28.1 Passwords used in the Service Mode

ADMIN Select: Defaults>Save Hospital Defaults> ADMIN

This entry saves the hospital defaults to the current settings of the ventilator.

CLEAR Select: Defaults>Save Hospital Defaults>CLEAR

This entry resets the machine settings back to the factory defaults.

RENEW Select: Defaults>Save Hospital Defaults>RENEW

This entry resets the Save Hospital Defaults password back to ADMIN, if it has been changed.

SIMUL Select: Setup>Configuration>Service Mode>SIMUL





This entry places the ventilator into a simulator mode without gas connected. The word, **! SIMULATION !**, is displayed in red, below the Alarms section.



Ventilator Passwords

TECHY Service Menu

Select: Setup>Configuration>Service Mode>TECHY

Fresh Gas					
System Settings					
Sigh					
Gas Exhaust					
Enable Pre-Use Test					
Touch Calibration					
Return					
Fresh Gas	Ppikt	Peak			
0.0	-	0			
BPM	Vol(InL)	Vte	IE Ratio	Press. Limit	PEEP
12	500	0	1:2.0	50	OFF 0
		Confirm		Case Time	End Of Case
				0:00:00	
					Time 15:32

Fresh Gas

Select this option to calibrate the fresh gas flow reading on the ventilator.

System Settings

Select one of the following options:

- The Absorber Fitted setting will allow a ventilator without a BAG/VENT switch to use RUN/STANDBY on the ventilator display.
- The EFM Fitted is defaulted to be unchecked. This option should not be activated unless the Electronic Flow Meter is installed.

Sigh

Select this option to select settings to simulate a sigh during ventilation.

Ventilator Passwords

Gas Exhaust

The exhaust from the gas analyzer may be connected to the system's gas scavenger and is referred to as atmosphere. In very low flow applications, a circle system is often required to return the sample gas to the breathing system. This system prevents the bellows from slowly collapsing.

Step 2 of the pre-use instructions to the user are changed depending on which option is selected. If the return is to atmosphere, the user will be told to remove the sample line before performing the pre-use test. If the return is to the breathing circuit the user will be told to ensure the gas analyzer is switched on and that the sample line is connected.

Enable Pre-Use Test



Select this option to set a fixed compliance value to be set from 0.2 to 10.0 mL/cmH₂O in 0.2 increments.

Touch Calibration

Select this option to perform a touch screen calibration.

TECH2 Service Menu

Select: Setup>Configuration>Service Mode>TECH2

FAN FAIL ABSORBER BYPASS cmH ₂ O/hPa Touch Sensitivity Return						
						Alarm Setup
						Auto Set
						RUN/ STANDBY
Fresh Gas 0.0	Pplat -	Peak 0				
BPM 12	Vol(nL) 500	Vte 0	IE Ratio 1:2.0	Press. Limit 50	PEEP OFF 0	
				Case Time 0:00:00	End Of Case	
Confirm		Time 15:56				

Ventilator Passwords

FAN FAIL

Select this option to turn the fan fail alarm on and off. For stand alone versions of the ventilator, this option will remain unchecked. For integrated ventilators this will be checked.

Absorber Bypass

A Spacelabs Healthcare future option.

cmH20/hPa

Select this option to change displayed pressure units from cmH20 to hPa.

Touch Sensitivity

Select this option to allow the Display to return to home screen and allow the user to verify the accuracy of the touchscreen calibration by leaving a trace of all active touches. The unit must be powered down to exit.

CALBK Service Menu

Select: Setup>Configuration>Service Mode>CALBK

On First Installation of New Block Do FRU, then all other options.
Subsequently, do not do FRU, do each item individually as required.

FRU Defaults(1st time only)
Flow Valve Calibration
Inspiratory Valve Cal.
Block And Pressure Zeros
Front Panel Zero
Return

Fresh Gas 0.0	Pylst -	Peak 0				Alarm Setup
						Auto Set
						RUN/ STANDBY
						Home
BPM 12	Vol(mL) 500	Vte 0	IE Ratio 1:2.0	Press. Limit 50	PEEP OFF 0	Defaults
▼	▲	Confirm		Case Time 0.00.00	End Of Case	Time 15:45

FRU Defaults

FRU Defaults is required when the Inspiratory Block, the BAV controller, or Front Panel is replaced. Select this option to set defaults on component being replaced.

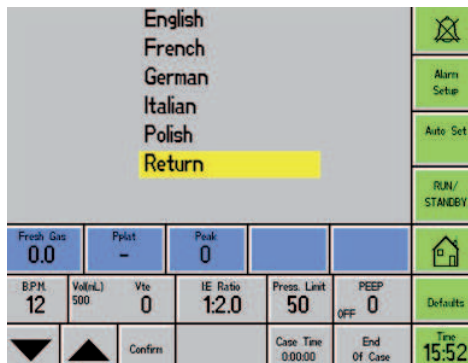
Ventilator Passwords

- Flow Valve Calibration** Select this option to calculate the min and max flow through the flow valves. Flow Valve Calibration needs to be performed only when the flow valves are replaced.
- Inspiratory Valve Cal** Select this option to calibrate the inspiratory valve. Inspiratory Valve Cal is required when the inspiratory valve or inspiratory block are replaced.
- Block and Pressure Zeros** Select this option to give the zero point to the processor for flow and pressure. Always perform the Block and Pressure Zeros when the inspiratory block, BAV controller or Front panel is replaced.
- Front Panel Zero** Select this option to zero the flow and pressure on the Front Panel. Always perform Front Panel Zero when the inspiratory block or front panel is replaced.

Front Panel Zero will also reset gain values set in the PRAAA calibration back to the default values of 286.

LINGO Service Menu



Select: Setup>Configuration>Service Mode>LINGO



You choose a different language on this menu, if a language pack has been installed.

SUPER Service Menu

Select: Setup>Configuration>Service Mode>SUPER

O2 Monitoring Disabled Languages Return						
						Alarm Setup
						Auto Set
						RUN/ STANDBY
Fresh Gas 0.0	Pplat -	Peak 0				
BPM 12	Vol(ml) 500	Vte 0	IE Ratio 1:2.0	Press. Limit 50	PEEP OFF 0	
		Confirm		Case Time 0:00:00	End Of Case	
					Time 15:56	

O2 Monitoring Disabled

Select this option to enable or disable the O₂ monitoring and O₂ Alarms (Option available from SW 10.06 and above).

If O₂ monitoring is disabled, a warning message is displayed on the screen to advise the user.

Languages

Select this option to choose a different language, if a language pack has been installed.

Ventilator Passwords

PRAAA Service Menu

Select: Setup>Configuration>Service Mode>PRAAA

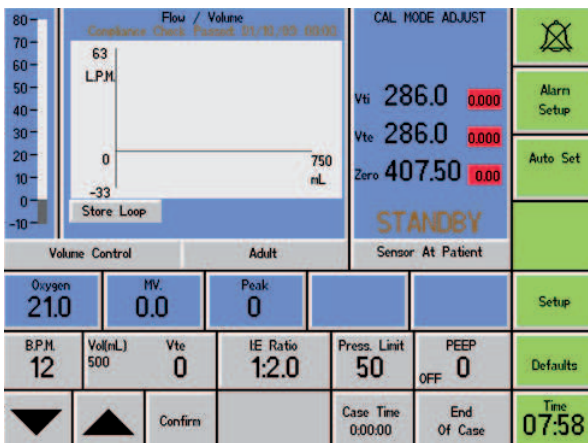


Select this option to manually adjust the monitored Vti and Vte. The Zero value should not be changed.

Using the PRAAA Password

Prepare the device.

1. Set up a patient circuit and test lung with a flow measuring device attached to the inspiratory port of the patient circuit.
2. Perform the pre use leak and compliance checks.
3. Enter SETUP > CONFIGURATION > SERVICE MODE. Enter the password, PRAAA. The following screen will be displayed.

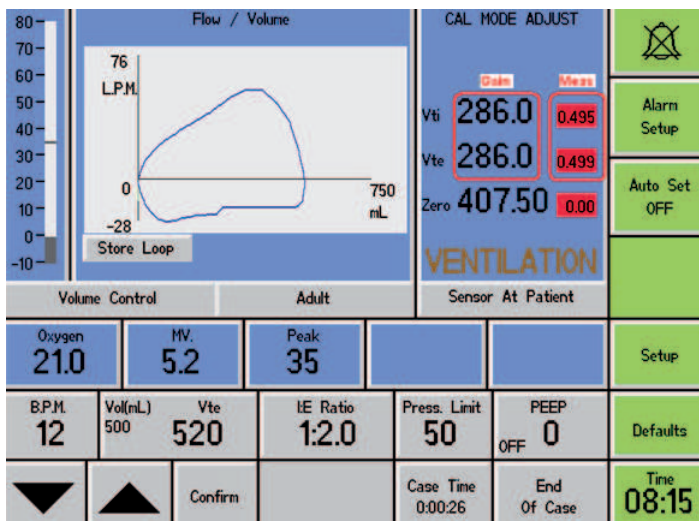


4. Run the ventilator in volume control with the sensor at the patient using the following settings:

BPM	12
Volume	500 ml
I:E	1:2.0
Pressure Limit	50
PEEP	OFF

5. Once the volume has stabilized, verify that the measured volume on the flow analyzer attached to the inspiratory port is 450 - 550 ml. The Vte and Vti readings on the ventilator (displayed in the red box) should represent the measured delivered volume +/- 5ml. If an adjustment is necessary, the gain factor can be adjusted for both Vte and Vti to align the ventilators displayed measured volume with the actual measured delivered volume.

Detailed Repair Procedures



6. The gain factor is an offset, so for example, if the measured value is 495ml and the ventilator Vte display (red box in above screen) is showing 560ml, the default gain factor of 286.00 for Vte on the vent screen should be adjusted up to bring the measured value of 560ml down to 495ml. When a change is made to the gain factor, it will not take effect on the screen until the ventilator is cycled from VENT mode to BAG mode and then back to VENT mode. Adjustments should be made until the value in the red box aligns with the measured value +/- 5ml. The same procedure is to be used for Vti.
7. When all adjustments are complete, power down the unit to save the changes and exit the calibration screen.

Test Procedure

1. Run the ventilator using the settings noted in Step 4 of the previous section. Ensure that the displayed and measured values are accurate with one another and both are 500 ml +/- 50 ml.
2. Set the tidal volume to 250 ml and ensure both readings are 250 ml +/-25 ml.
3. Set the tidal volume to 750 ml and ensure both readings are 750 ml +/-75 ml.

5.29 Reprogramming

The software for the Blease700/900 series of ventilator consists of two parts, the control software and the monitor software.

The control software is held on the BAV controller (FR101027). A replacement BAV controller will have the latest version of software pre-installed.

The monitor software is held on the display board (FR101026). A replacement display board will have the latest version of monitor software pre-installed.

The version of software installed on the ventilator can be seen on the screen by selecting Setup, Configuration, System Information. The display software will be displayed next to the FRONT PANEL software and will be in the format V700900 x.ox followed by the date. The control software will be displayed next to control board software and will be in the format BAV040-700900-V9_5x_ followed by the date.

There are three occasions when the software needs to be upgraded:

- To update the software version
- To update the language option
- To update the ventilator model

5.29.1 Software Upgrade Procedure

Three files are required for software upgrade.

- Ventflash 2.1.0.2.exe This is a download program.
- The program file for Control Processor, BAV040_700900_V10_5x.ABS
- The program file for the display processor, FP700900_9_1X_combined_A20

5.29.2 To use VentFlash

1. Connect the PC to the ventilator using the programming cable (12600015).
2. Turn on the ventilator.
3. Open VentFlash.



The screen (Figure 146) will be displayed:

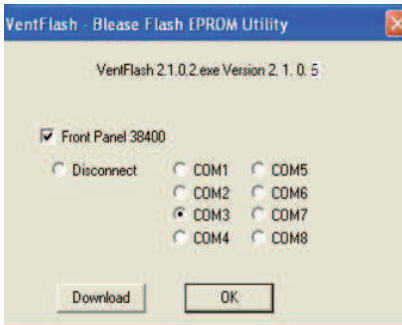


Figure 146 - VentFlash Screen

Front panel 38400 will be checked.

This is the baud rate for programming the front panel. (It only needs to be unchecked for early 8500 ventilator.)

VentFlash should automatically detect the com port in use. Should it not automatically detect, click on the com port you are using.

4. Select download.
5. Go to the directory that the new files are stored in.
6. Select and open the file, BAV_040_700900_v9_Xx____ABS

This screen (Figure 147) will be displayed on the P.C. and a comms error will be displayed on the ventilator screen.

When completed, the ventilator will reboot and the VentFlash screen will be displayed.

7. Click download and select FP700900_10_ox_combined.a20

The ventilator screen will display programming.

When programming is completed, the ventilator will reboot.

8. Select OK on the VentFlash screen to finish.

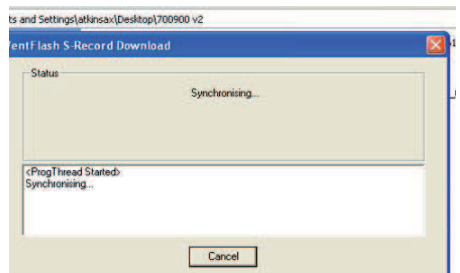


Figure 147 - VentFlash Sync Screen

5.29.3 To upgrade the Language File

1. Connect the P.C. to the ventilator using the programming cable (PN 12600015).
2. Turn on the ventilator.
3. Open the VentFlash program.



Only VentFlash 2.1.0.5 will recognize the language packs. If you have an older version please delete the old file.

4. Select the language pack required.
5. Once the language pack is installed, select OK on the VentFlash to finish.
6. On the ventilator, select Setup>Configuration>Service Mode.
7. Enter the LINGO password.
8. Select the required language.



The language file version number must match the front panel software version number. Otherwise, only group 1 languages will be available.

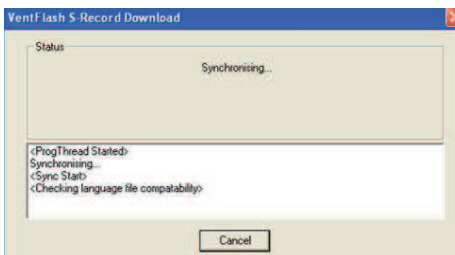


Figure 148 - VentFlash Check Language Screen

5.29.4 To Upgrade the Ventilator Model

When a ventilator model upgrade package is purchased, these files will be sent. All three files must be placed into one folder on your PC.

- Vent Key Prog.exe VLC.dLL xxxxxxxx_YYY.VFF
- Vent Key Prog.exe is the download program
- Vlc.DLL is an operating file the Vent Key Prog will need.

Xxxxx-YYY.VFF this is the upgrade file when xxxxxxx is the serial number of the ventilator to be upgraded and—YYY is the model type that the ventilator will be upgraded to.



This file will only work on the ventilator with matching serial number.

1. Open the Vent Key Prog. Exe file.
2. Select the required Com port.
3. Select Program Key file.
4. Open the required xxxxxxx.YYY.VFF file.
5. When download is complete, the ventilator will reboot.
6. Select OK to finish.

Ventilator upgrade part number

Part Number	Description
14000712	From 710 feature set to 720 feature set
14000713	From 710 feature set to 730 feature set
14000715	From 710 feature set to 750 feature set
14000723	From 720 feature set to 730 feature set
14000725	From 720 feature set to 750 feature set
14000735	From 730 feature set to 750 feature set
14000957	From 950 feature set to 970 feature set
14000959	From 950 feature set to 990 feature set
14000979	From 970 feature set to 990 feature set

Detailed Repair Procedures

BleaseSirius

Anesthetic Machine

Chapter 6

EFM Option

EFM Option

6.1 EFM Technical Description

6.1.1 General

The Electronic Flowmeter (EFM) is an option for the BleaseSirius that provides a digital display for the fresh gas control. EFM replaces the traditional mechanical flowmeter and glass flow tubes with flow sensors. It incorporates a glass flow tube that displays the total combined gas flow.

The needle valves and hypoxic guard components of EFM are identical to the traditional mechanical flowmeter components. These components are installed in a new block allowing the EFM flow sensors for each gas to be fitted.

The EFM display can be configured for all regional orientations.

An SD Card reader slot is provided on the EFM for software upgrades and service.

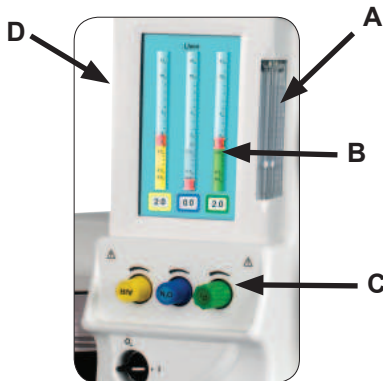



Figure 149 Key

A	Total Combined Flow Tube
B	Flow Sensor Display
C	Flow Controls
D	SD Card Reader (on the side)

Figure 149 - EFM Components

6.1.2 Technical Specifications

Controls	<p>O₂ flow: 150 ml/m to 15 lpm</p> <p>N₂O flow: 0 ml/m to 12 lpm</p> <p>Med Air flow: 0 ml/m to 15 lpm</p>
Graphics Resolution	<p>Log spaced from 0.1 lpm to 2 lpm</p> <p>Lin from 2 lpm to 13 lpm</p>
Flowblock Accuracy*	<p>O₂: 10% - 100% Full scale \pm 10% of reading or 150ml/min when <10% of full scale.</p> <p>N₂O: 10% - 100% Full scale \pm 10% of reading or 150ml/min when <10% of full scale.</p> <p>AIR: 10% - 100% Full scale \pm 10% of reading or 150ml/min when <10% of full scale.</p> <p>Total gas flow: \pm 8% of reading</p> <p>*Accuracy at 21°C (70°F) and 1013mbar</p>
Hypoxic Gases	<p>Minimum oxygen concentration of 21% for oxygen/nitrous mixtures</p>
Alarms	<p>Unrecoverable errors are displayed on the EFM LCD by the warning triangle.</p>  <p>Three errors are identified on the ventilator screen by the alarm message, CHECK TOTAL FLOW. The three conditions triggering this alarm are:</p> <ul style="list-style-type: none"> • Oxygen flow is less than 100 ml/min. • Gas flow is absent (indicated on the EFM display by dashed lines). • The ventilator receives no flow data from the EFM for more than 45 seconds.

EFM Option

LCD	Resolution 800x480
Touch Screen	For service applications only.
Backlight	The backlight can not be turned off. This option is removed from the Configuration menu in the Ventilator software.
EFM Data Output	<p>The EFM is connected to the ventilator.</p> <p>During a case, the O₂, Air and N₂O consumption is displayed in liters on Page 2 of the System Information screen (Figure 148). All flow data is transferred to the ventilator for further review or export to the hospital information system via the RS232.</p>

SYSTEM INFORMATION			
Analogue Voltages(-5,0,+5)		-5.0V, 0.01V, +5.0V	
Digital 5V		5.00V	
Alarm 5V		5.1V	
6 Volt, 24 Volt, 25 Volts		6.0V, 24.0V, 25.0V	
Battery(Unswitched/Switched)		5.1V, 5.2V	
Flow- Min/Plateau/Max		-28.45, 0.00, 50.95	
Gas Exhaust		To atmosphere	
0-0-0-0		Calibrated	
O2 Consumption	0.0	Liters	
N2O Consumption	0.0	Liters	
AIR Consumption	0.0	Liters	

Figure 150 - System Information, Page 2

6.2 Planned Maintenance

No planned maintenance procedures are required for EFM.

6.3 EFM Replacement Procedures

Replaceable parts on the EFM include:

- Hypoxic Guard Block
- Display Screen
- Circuit Board
- Flow Sensor(s)

6.3.1 Replace the EFM Hypoxic Guard Block

The EFM hypoxic guard gearing and basal flow setting is identical to the conventional mechanical flowmeter system. For information on the hypoxic guard block, refer to Section 5.2 in this manual.

The hypoxic guard block itself is modified to fit the EFM flow sensors that replace the mechanical flow tubes.



Figure 151 - EFM Hypoxic Guard Block Assembly

Parts and Tools Needed:

- Appropriate Replacement Hypoxic Guard

Part Number	Description
050-0554-00	3 Gas, ISO Configuration
050-0556-00	2 Gas, ISO Configuration
050-0555-00	3 Gas, ANSI Configuration
050-0557-00	2 Gas, ANSI Configuration

- 2.5mm and 3mm hex keys
- Phillips screwdriver

To replace the EFM hypoxic guard block:

1. Remove the top shelf cover, the front cover and the backbar cover from the BleaseSirius system. See Section 5.1.2 in this manual for instructions.
2. Remove the four retaining screws (two on each side) that secure the EFM to the machine (Figure 152).

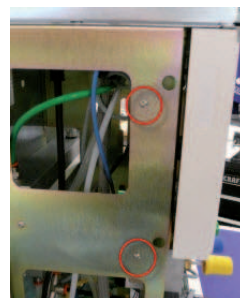


Figure 152 - EFM-Machine Retaining Screws

3. Disconnect the ribbon cable and the power connector from the EFM (Figure 153).
4. Remove the light pipe from the EFM circuit board (Figure 153).

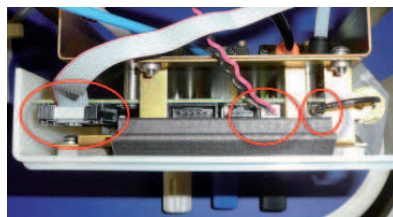


Figure 153 - Ribbon Cable, Power Connector and Light Pipe Locations

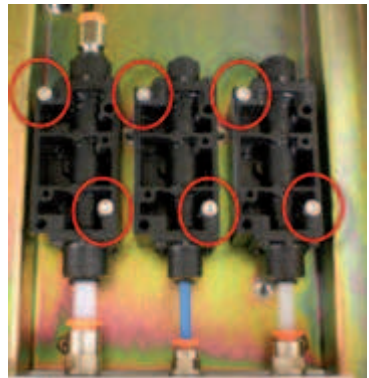
EFM Option

5. Disconnect the four gas flow tubes from the back of the EFM (Figure 154).
6. Remove the EFM from the machine. Place it on a clean surface with the display side down.



Figure 154 - Flow Tube Locations

7. Remove the two hex screws that secure each flow sensor to the EFM (Figure 155), then retract each push-to-connect fitting to remove each flow sensor.



*Figure 155 - Flow Sensor
Screw Locations*

8. Using a 3mm hex key, disconnect the banjo fitting from the side of the hypoxic guard block (Figure 156).



Figure 156 - Banjo Fitting

9. Using a 2.5mm hex key, remove the four hex screws (two on each side) that secure the hypoxic guard block to the EFM.
10. Remove the faulty hypoxic guard block and discard it.
11. Position the replacement hypoxic guard block on the EFM.
12. Attach the four hex screws (two on each side) to secure the hypoxic guard block to the EFM.
13. Connect the banjo fitting to the side of the hypoxic guard block with the 3mm hex key.
14. Install each flow sensor on the back of the EFM. Attach the two hex screws to each sensor to secure them.
15. Connect the four gas flow tubes.
16. Connect the light pipe to the EFM circuit board.
17. Connect the ribbon cable and the power connector to the EFM.
18. Replace the EFM on the machine and secure it with the four hex screws [two on each side] .
19. Replace the three system covers.
20. Set the secondary regulator pressure to the value specified for the type of hypoxic guard you installed. Refer to the specification sheet included in the hypoxic guard replacement kit.

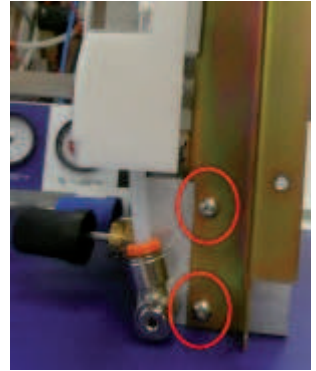


Figure 157 - Hypoxic Guard Retaining Screws

i *The hypoxic guard is calibrated at the factory.*

6.3.2 Replace the EFM Display Screen

Parts and Tools Needed:

- 050-0552-00 - Service Kit, EFM Display and Bezel
- 2.5mm and 3mm hex keys
- Phillips screwdriver

To replace the display screen assembly:

1. Remove the top shelf cover, the front cover and the backbar cover from the BleaseSirius system. See Section 5.1.2 in this manual for instructions.
2. Remove the four hex screws (two on each side) that secure the EFM to the machine.
3. Disconnect the ribbon cable and the power connector from the EFM.
4. Remove the light pipe from the EFM circuit board.
5. Disconnect the four gas flow tubes from the back of the EFM.
6. Remove the EFM from the machine. Place it on a clean surface with the display side down.
7. Using a 3mm hex key, disconnect the banjo fitting from the side of the hypoxic block.
8. Remove the four retaining screws (2.5mm hex key) from the back of the EFM and gently hinge the display screen assembly (Figure 158).



Figure 158 - Screen Retaining Screws

9. Carefully remove the three circuit board connectors (Figure 159).
10. Remove the faulty display screen assembly and discard it.
11. Position the replacement display screen on the EFM, then reattach the three circuit board connectors.
12. Reattach the four screen retaining screws on the back of the EFM.
13. Connect the banjo fitting to the side of the hypoxic guard.
14. Connect the four gas flow tubes to the EFM.
15. Connect the light pipe to the circuit board.
16. Connect the ribbon cable and the power connector to the EFM.
17. Replace the EFM on the machine and secure it with the four retaining screws (two one each side).
18. Replace the three system covers.
19. Power up the system and verify that the EFM display is functional.

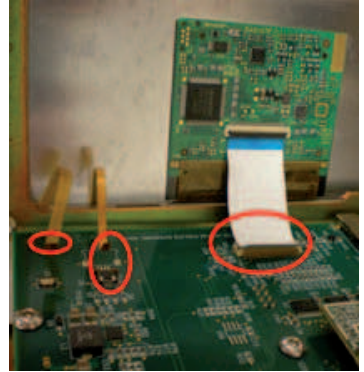


Figure 159 - Screen-Circuit Board Connectors (3)

6.3.3 Replace the EFM Circuit Board

Parts and Tools Needed:

- 050-0553-00 - Service Kit, EFM, PCBA and SOM Assembly
- 2.5mm and 3mm hex keys
- Phillips screwdriver
- ESD protection



All persons handling ESD must be properly grounded via a 1mW resistive grounded wrist strap.

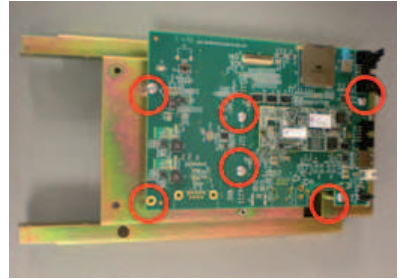
Cover all ESD bench tops with grounded conductive mats and connect all work surfaces and equipment to earth ground.

To replace the EFM circuit board:

1. Remove the top shelf cover, the front cover and the backbar cover from the BleaseSirius system. See Section 5.1.2 in this manual for instructions.
2. Remove the four hex screws (two on each side) that secure the EFM to the machine.
3. Disconnect the ribbon cable and the power connector from the EFM.
4. Remove the light pipe from the EFM circuit board.
5. Disconnect the four gas flow tubes from the back of the EFM.
6. Remove the EFM from the machine. Place it on a clean surface with the display side down.
7. Using a 3mm hex key, disconnect the banjo fitting from the side of the hypoxic block.
8. Remove the four retaining screws (use a 2.5mm hex) from the back of the EFM and gently hinge the display screen assembly.
9. Carefully remove the three circuit board connectors.

EFM Option

10. Remove the six screws that secure the circuit board (Figure 160).
11. Remove the circuit board assembly and discard it.
12. Position the replacement circuit on the EFM, then attach the six retaining screws to secure the board (Figure 155).
13. Attach the three circuit board-screen connectors.
14. Assemble the display screen over the circuit board and attach the four retaining screws to secure the display screen.
15. Connect the banjo fitting to the side of the hypoxic guard.
16. Connect the four gas flow tubes to the EFM.
17. Connect the light pipe to the EFM circuit board.
18. Connect the ribbon cable and the power connector to the EFM.
19. Replace the EFM on the machine and secure it with the four retaining screws [two on each side].
20. Replace the three system covers.
21. Power up the system to verify that the EFM is functional.
22. Use the Service Application to upload the EFM software and configure the flow tubes.



*Figure 160 - Circuit Board Screws
(6)*

6.3.4 Replace an EFM Flow Sensor

Parts and Tools Needed:

- Appropriate Replacement Flow Sensor.

Part Number	Description
117-0206-00	Flow Sensor, O ₂
117-0207-00	Flow Sensor N ₂ O
117-0208-00	Flow Sensor, Air

- 2.5mm hex key
- Phillips screwdriver



Figure 161 - Flow Sensor

To replace an EFM flow sensor:

1. Turn off the machine, if necessary.
2. Remove the top shelf cover, the front cover and the backbar cover from the BleaseSirius system.
3. Remove the four hex screws (two on each side) that secure the EFM to the machine.
4. Disconnect the ribbon cable and the power connector from the EFM.
5. Disconnect the light pipe from the EFM circuit board.
6. Disconnect the four gas flow tubes from the back of the EFM.
7. Remove the EFM from the machine. Place it on a clean surface with the display side down.
8. Remove the two hex screws that secure the faulty flow sensor to the EFM.
9. Release the push-to-connect fittings to remove the faulty flow sensor and discard it.
10. Install the replacement flow tube.
11. Install the two hex screws to secure the flow sensor to the EFM.

EFM Option

12. Reconnect the four flow tubes to the EFM.
13. Reconnect the light pipe to the EFM circuit board.
14. Connect the ribbon cable and the power connector to the EFM.
15. Replace the EFM on the machine and secure it with the four retaining screws [two one each side].
16. Using the Service Application, configure the flow tubes.

6.4 The EFM Service Application

The EFM Service Application allows you to install/upgrade the EFM user software, configure the EFM flow tubes, diagnose the hardware issues, extract, download and delete the service logs and calibrate the touch-screen. Initial installation of the EFM user software and configuration of the flow tubes are performed by manufacturing prior to shipment.

Parts and Tools Needed:

- EFM SD Card, PN 063-2071-XX

6.4.1 Install/Upgrade EFM User Software

1. Remove the label covering the EFM SD Card Reader located on the left side of the EFM.
2. With the machine power off, insert the EFM SD card into the EFM SD Card Reader.
3. Turn on the machine to boot to the SD Card. After about 1 minute, the EFM Service Application opens. The startup screen displays the Software Update Panel which lists the version numbers for the current software and hardware (Figure 162).

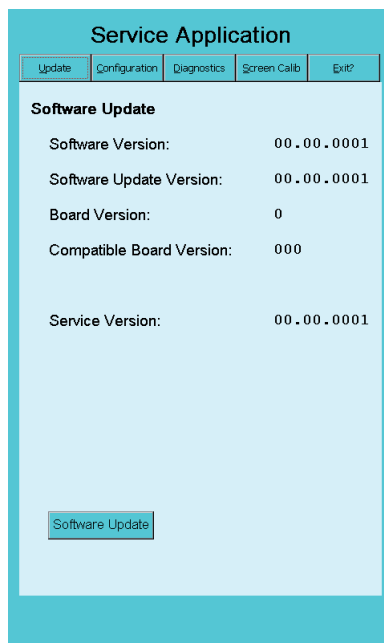


Figure 162 - Software Update Panel

Note: The EFM Board only functions with EFM Software Versions that are compatible with the EFM Board Version. The Service Application will display an error message if the EFM software update is not compatible with the EFM Board Version. You cannot install incompatible software.

4. Select Software Update to install the user software on the EFM Flash drive. This installation takes less than 1 minute.

Note: If the touch screen does not function, reboot the system.

5. After the software is installed, you must configure the Flow Tubes as described in the next section. Do not exit this application before configuring the flow tubes!

Note: The Software Update preserves the Touch-Screen calibrations, so you do not need to reconfigure the Touch-Screen after a software installation.

6.4.2 Configure the Flow Tubes

1. Select the Configuration tab at the top of the panel.
2. Select the settings for the Flow Tube Position and Flow Tube Color that are appropriate for your country (Figure 163).
3. Select the Gas Configuration for the installed EFM model.
4. If the facility is at an altitude over 1000 meters (3000 feet), use the slide bar to enter the altitude in meters. Tapping the slider bar to the right or left of the slider moves the slider in 100m increments. Reminder: For non-metric countries, be sure to enter the altitude in meters.
5. Verify the settings, then select Set to save the configuration.
6. Select the Exit tab at the top of the panel.
7. When you see the message, “OK to turn off the system,” power off the system to exit the service application (Figure 164).
8. Remove the SD card from the reader and store it in a secure place. Place a new label over the EFM SD Card Reader.

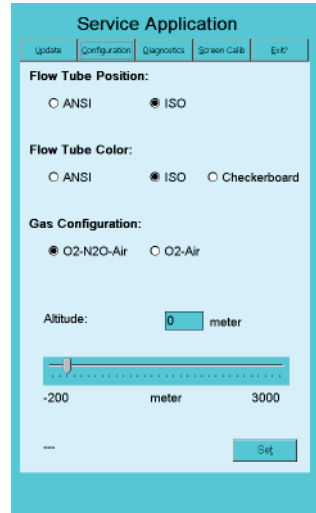


Figure 163 - Configuration Panel

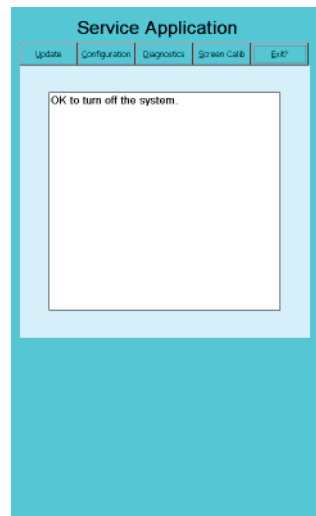


Figure 164 - Exit Panel

6.4.3 Troubleshooting the EFM

If you suspect a sensor or software problem, use the Diagnostics panel. On this panel you can identify faulty sensor(s), extract and delete logs and recover the flash drive.

1. Remove the label covering the EFM SD Card Reader located on the left side of the EFM (as you face the unit).
2. With the machine power off, insert the EFM SD card into the EFM SD Card Reader.
3. Turn on the machine to boot to the SD Card. After about 1 minute, the EFM Service Application opens. The startup screen displays the Software Update Panel.
4. Select the Diagnostics tab (Figure 165), then select the function that best suits your needs. See the descriptions that follow for more information.

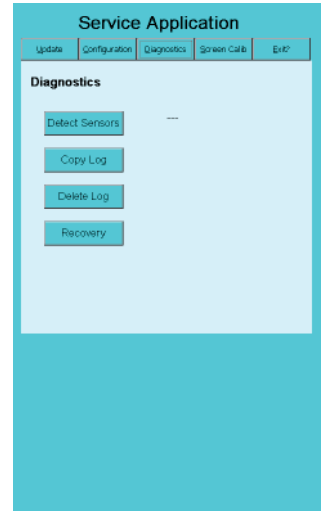


Figure 165 - Diagnostics Panel

Note: If the touch screen does not function, reboot the system.

5. Remove the SD card when you have completed the required diagnostics and store it in a secure place. Place a new label over the EFM SD Card Reader.

6.4.4 Detect Sensors

Note: The gas sensors are displayed in the order of their position on the EFM. Figure 166 shows a 3-gas ISO system listing “O2 N2O Air.” This display indicates that the O2 sensor is connected in the far left position, N2O in the center and Air in the far right position.

1. If you suspect a faulty sensor, select Detect Sensors. The application displays the name of the sensor if it is working properly (Figure 164). You will see a dashed line, if it is faulty or missing. For a 2-gas system, the sensor for the N₂O will be a dashed line.
2. Select the Exit tab, when you are finished. When you see the message, “OK to turn off the system,” power off the system.

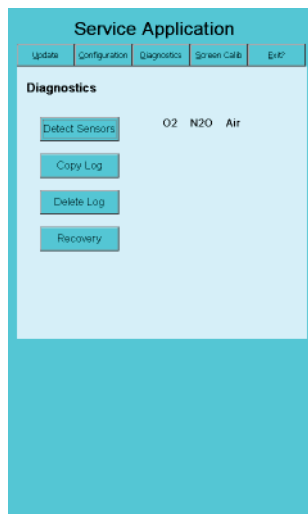


Figure 166 - Detect Sensors Display

6.4.5 Copy Log/Delete Log/Recovery

This feature is only used to trouble shoot unanticipated issues under the guidance of Spacelabs Technical Support. If you suspect a software problem, contact Spacelabs Technical Support.

1. Select Copy Log. A new log file is created with the filename log_000000000X.txt. Note that each time you select Copy Log, the last digit of this filename increments. Therefore, the most recent log file has the highest number in its filename. The file is copied to the /efm/log folder on the SD card. This process takes less than one minute.
2. When the log is copied, remove the SD card from the EFM reader.
3. Connect a SD card reader to your laptop, then insert the SD card into the reader.
4. Retrieve the log from the /efm/log folder on the SD card. Typically, there is only one log file, but there can be more than one depending on the issue. If a StackTrace_000000000X.txt is also in the /efm/log folder, retrieve that file as well.
5. Email the most recent log file (or all log files) and the StackTrace file (if available) to Spacelabs Technical Support.

Technical Support may also instruct you to delete the log and collect fresh data. To delete the log, select Delete Log, then select Yes to confirm the action.

You may be instructed to recover the flash drive. When you select Recovery, the flash drive is erased. Select Yes to confirm the action. Under normal conditions, you should not use this feature.

6. Select the Exit tab. When you see the message, “OK to turn off the system,” power off the system.

6.4.6 Calibrate the Touch-Screen

With heavy use, the touch-screen accuracy may degrade. You calibrate the touch-screen using the Screen Calib tab (Figure 167).

1. Select the Screen Calib tab.
2. Select Run Calibration Test.
3. Press the cross on the screen and briefly (1-2 seconds) hold your finger on it. Touch the screen in another area to “Escape” the calibration.
4. Repeat Step 3 until you no longer see the crosshair. When the crosshair disappears, the touch-screen calibration is completed. Touch the screen anywhere to exit calibration.
5. Double-touch the screen to accept the calibration, then select Save Calibration after you exit the calibration screen.
6. Select the Exit tab. When you see the message,
“OK to turn off the system,” power off the system

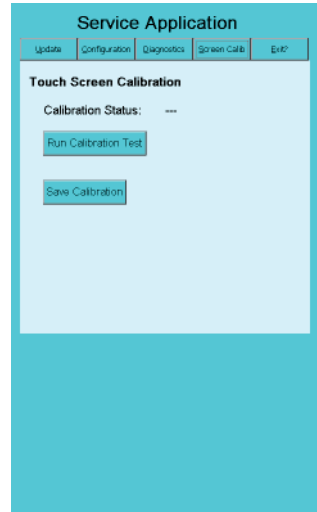


Figure 167 - Touch-Screen Panel

6.4.7 Exit the Program

Before you turn off the machine, always exit the EFM Service Application using the Exit Panel (Figure 168).

1. Select the Exit tab.
2. When you see the message, “OK to turn off the system,” you may power off the system.
3. If you see an error message, do not turn off the system. You need to complete a task, such as configure the flow sensors, before you power off. Follow the instructions given in the error message to continue.
4. Remove the SD card when you are finished and store it in a secure place. Place a new label over the EFM SD Card Reader.

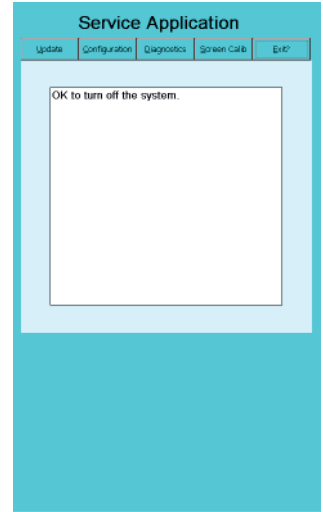


Figure 168 - Exit Panel

6.5 EFM Baseboard Schematics

REVISONS			
REV.	ECO NUMBER	DESCRIPTION OF CHANGE	CHECKED BY DATE
A	PR021256	Initial Release	See ECO
B	PR022248	Changed R61 to 100 ohm, R63 to 174 ohm	See ECO

Pages

- 1) Title Block
- 2) SOM Interface
- 3) Power
- 4) I/O Sensors
- 5) Serial
- 6) LCD Digital
- 7) LCD/LCD Power
- 8) SD card
- 9) Development Circuits

PCB Layout Note:
Do not label (screenshot) Designators that start with N or MH.
Testpoints labeled TP should be probable from the top of the PCB

PCB Mounting holes

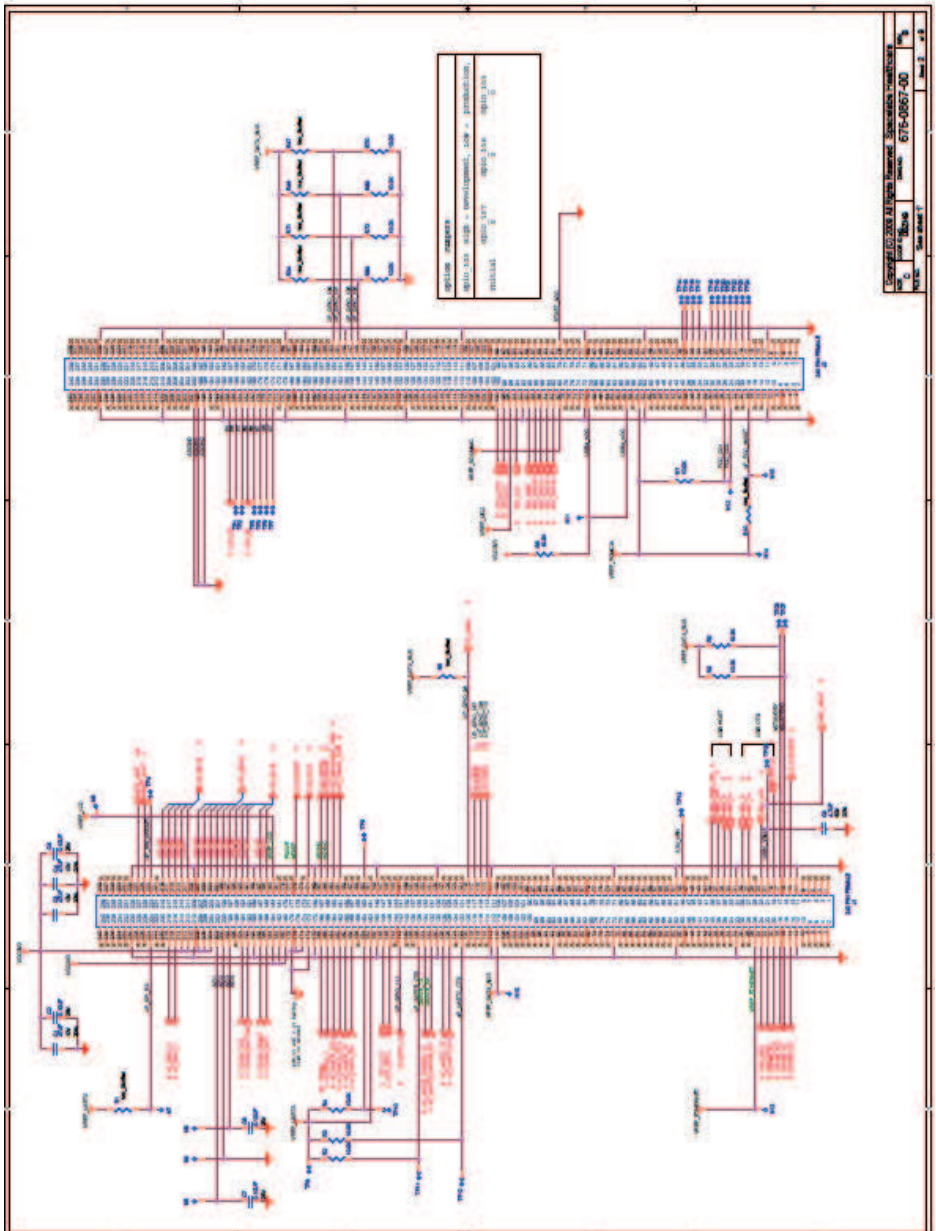
Board Fiducials

SOM Module mounting holes

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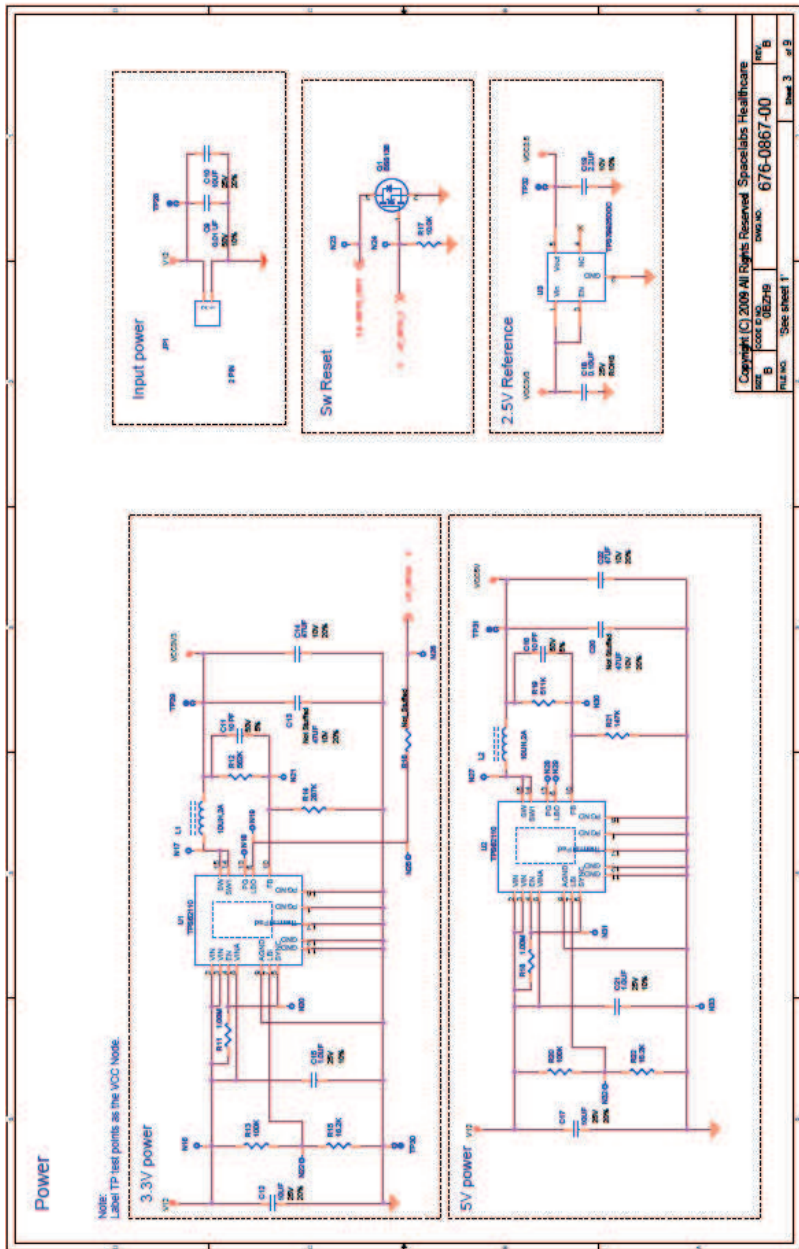
		Copyright (C) 2009 All Rights Reserved Spacelabs Healthcare	
APPROVALS	DATE	SIZE	TITLE
DRAWN George Katsopoulos	05 - FEB - 2012	A	Schematic, Electronic Flow Measurer
CHECKED		CODE ID NO.	DWG NO.
(SIGNED)		0BZH9	676-0867-00
		FILE NO.	REV. B
		Sheet 1 of 9	

EFM Option



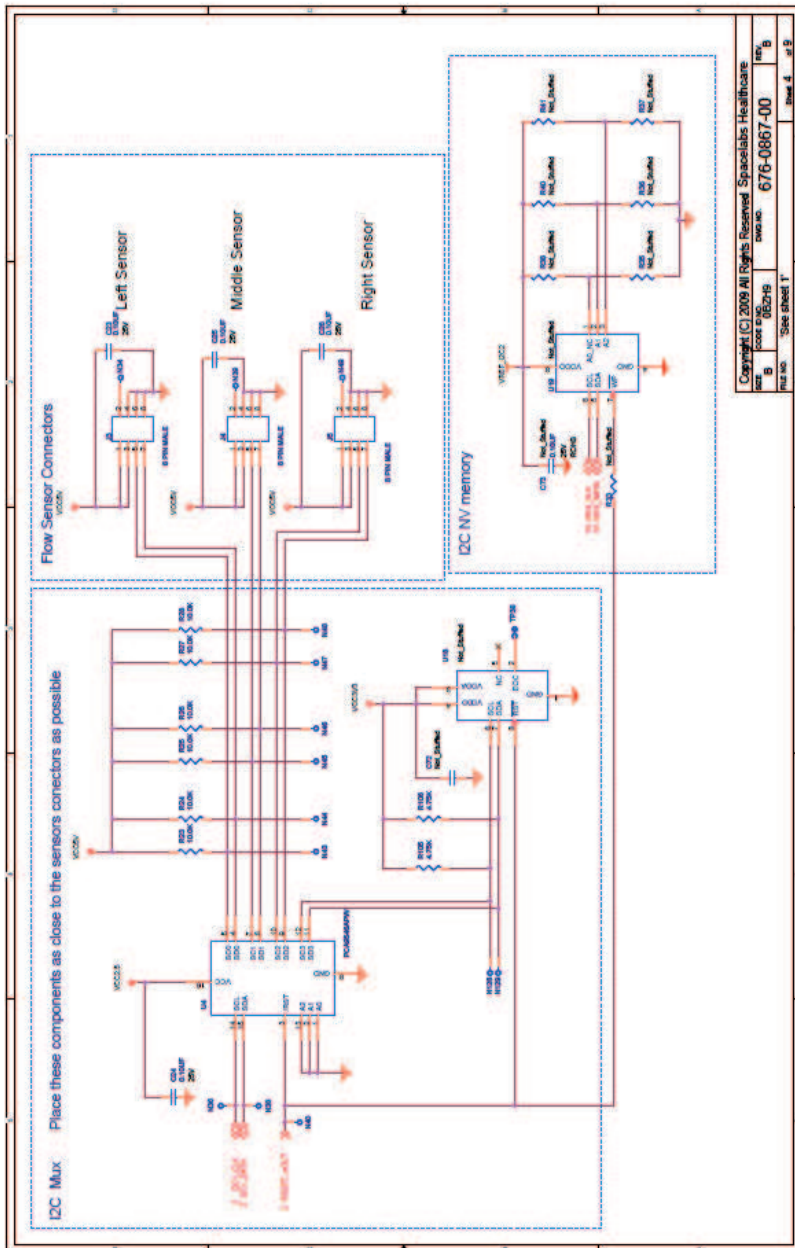
Schematic 2 - SOM Interface

EFM Option

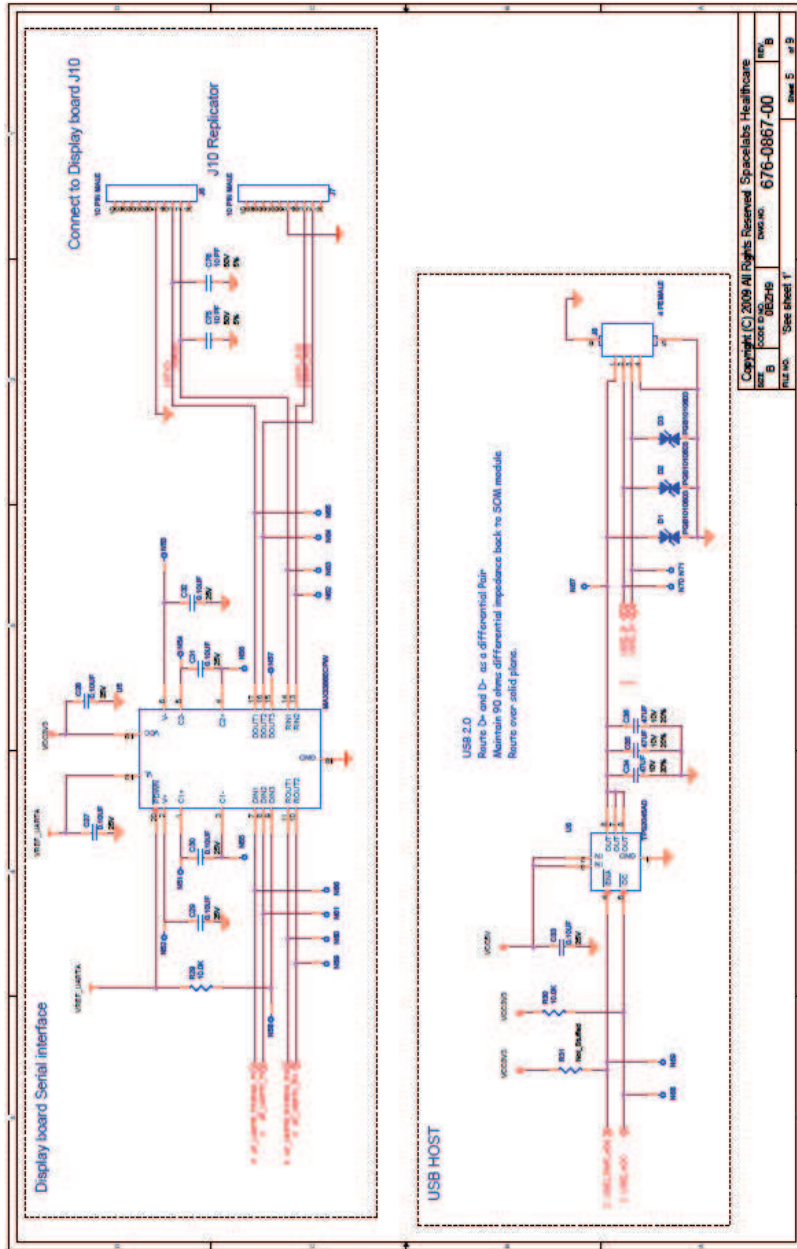


Schematic 3 - Power

EFM Option

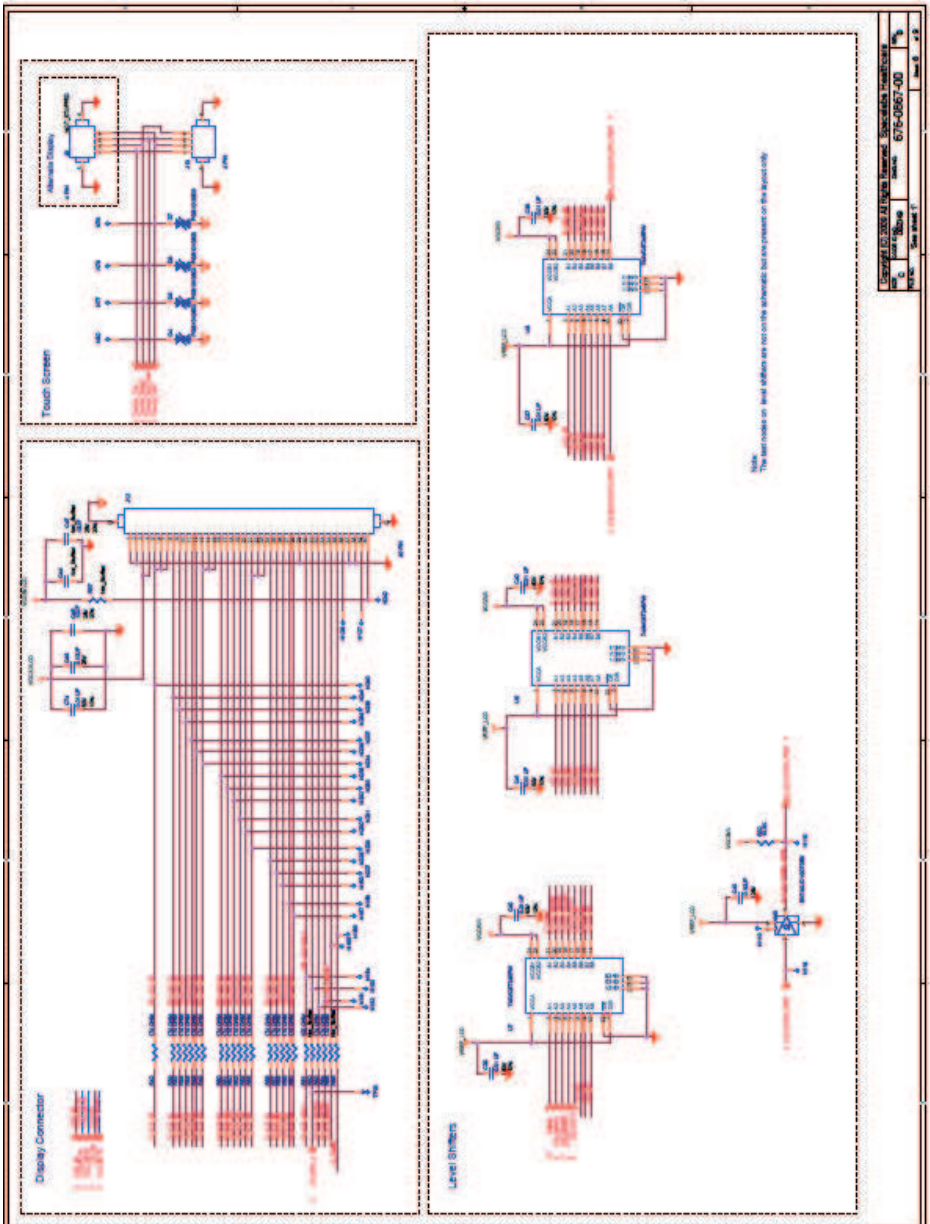


Schematic 4 - I2C Sensors



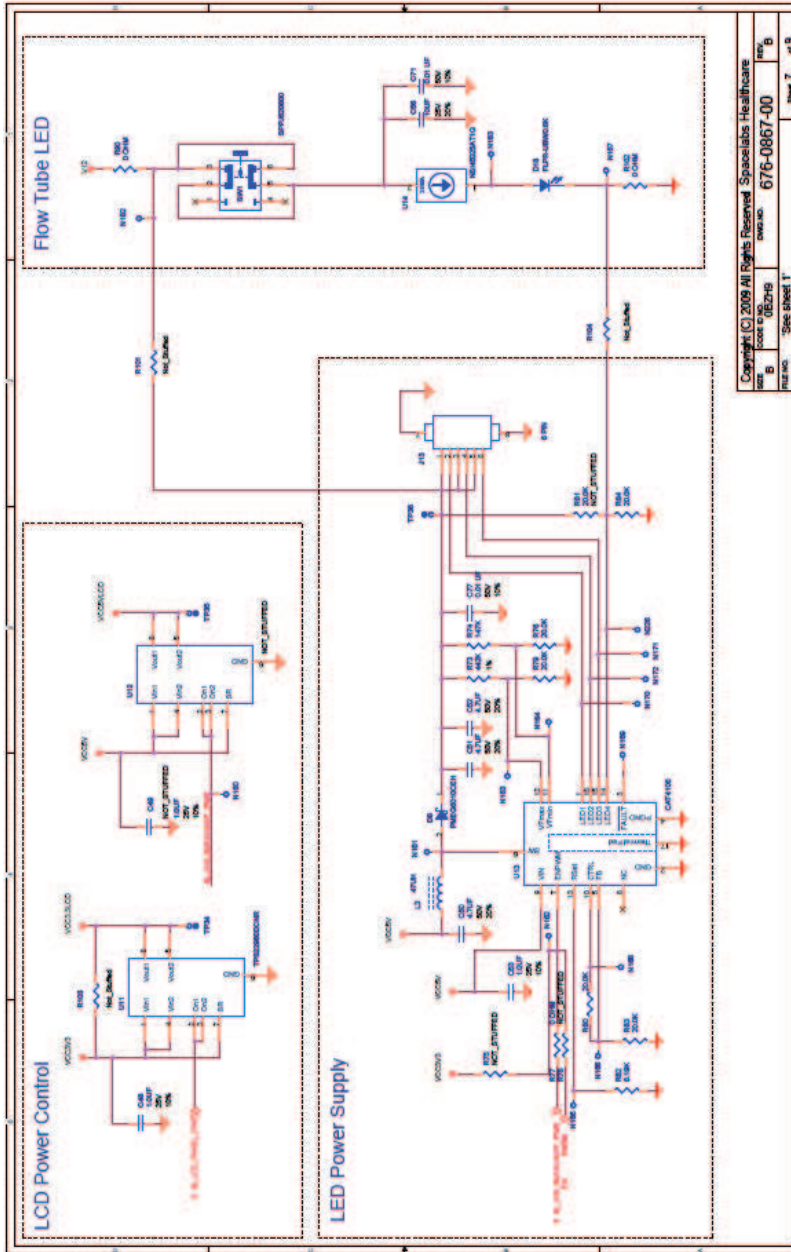
Schematic 5 - Sensors

EFM Option



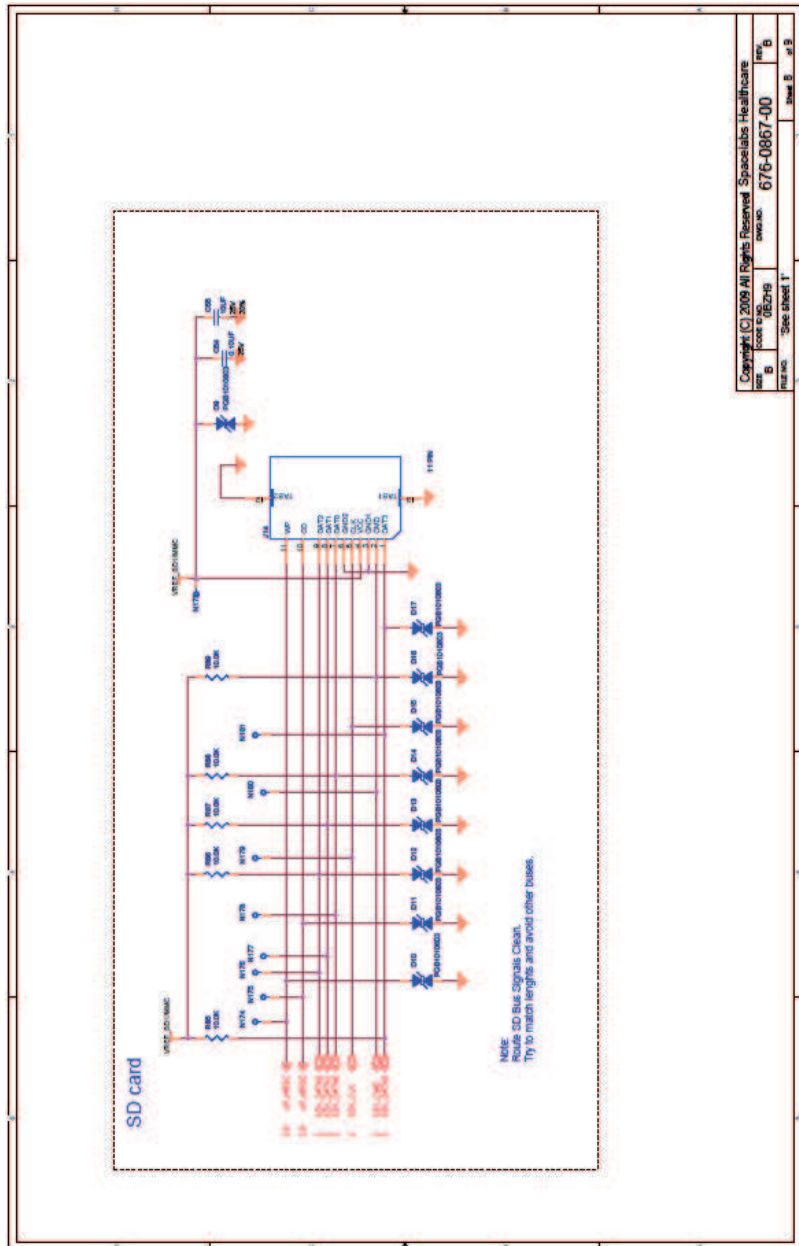
Schematic 6 - LCD Digital

EFM Option

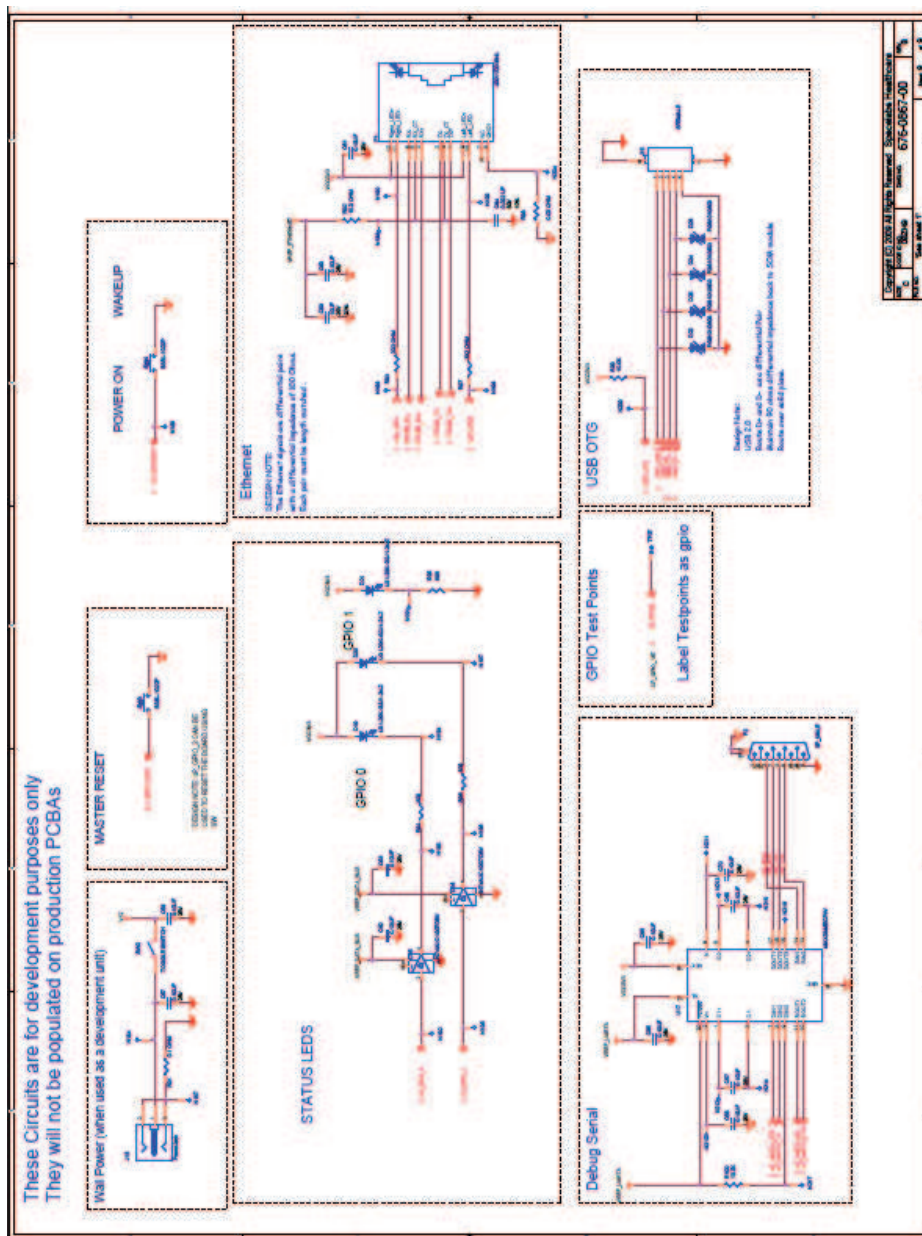


Schematic 7 - LCD/LCD Power

EFM Option



Schematic 8 - SD Card



BleaseSirius

Anesthetic Machine

Chapter 7

Error Codes

Error Codes

7.1 Error Codes

7.1.1 Error codes on the Blease700/900 series Ventilators

This list includes error codes which were assigned to the 64180 controller board, but which are not applicable to the MPC68302 controller board. These are described as N/A. It also includes codes which only apply to 6x00 serial vents with control potentiometers - these are indicated 6x00 only.

The following table includes only the error codes that the Blease700/900 series of ventilators will generate, with their common cause and corrective action.

Error Codes

Error Code	Error Name	Description	common cause	Corrective action
20	E_ADC_FLOWZERO_LOW	Drive Flow zero is too low	Drive flow pressure transducer (PT1) has lower output then expected	Use CALBK to reset Zero. If error still remains replace inspiratory block
21	E_ADC_FLOWZERO_HIGH	Drive Flow zero is too high	Drive flow pressure transducer (PT1) has Higher output then expected	Use CALBK to reset Gain. If error still remains replace inspiratory block
23	E_ADC_TEST0	Internal i/o test line 0 failed	Multiplexer U23 is not functioning	Replace BAV controller
24	E_ADC_TEST1	Internal i/o test line 1 failed	Multiplexer U22 is not functioning	Replace BAV controller
25	E_ADC_TEST2	Internal i/o test line 2 failed	Multiplexer U21 is not functioning	Replace BAV controller
26	E_ADC_TEST3	Internal i/o test line 3 failed	Multiplexer U20 is not functioning	Replace BAV controller
27	E_ADC_PPRESZERO_LOW	Patient pressure zero is too low	Patient pressure transducer (PT2) has lower output then expected	Use CALBK to reset Zero. If error still remains replace inspiratory block
28	E_ADC_PPRESZERO_HIGH	Patient pressure zero is too high	Patient pressure transducer (PT2) has higher output then expected	Use CALBK to reset Gain. If error still remains replace inspiratory block
29	E_ADC_DPRESZERO_LOW	Drive pressure zero is too low	Drive pressure transducer (PT3) has lower output then expected	Use CALBK to reset Zero. If error still remains replace inspiratory block
30	E_ADC_DPRESZERO_HIGH	Drive pressure zero is too high	Drive pressure transducer (PT3) has higher output then expected	Use CALBK to reset Gain. If error still remains replace inspiratory block
31	E_ADC_5VANEG	The -5V supply is out of specification	The -5v supply generated on the BAV controller is low	Replace BAV controller
32	E_ADC_5VA	The 5V Analog supply is out of specification	The +5vA supply generated on the BAV controller is low	Replace BAV controller
34	E_ADC_5VALARM	The 5V Alarm supply is out of specification	The +5v Alarm supply generated on the Power supply board is low	If the supply atTP7 on the power supply is low - Replace the PSU. If the supply is good then the monitoring circuit on the controller could be faulty - Replace BAV controller
35	E_ADC_5VD	The 5V Digital supply is out of specification	The VCC supply generated on the BAV controller is low	Replace BAV controller
37	E_TEST_LINK	The 8 way test link header is incorrect	A link has been left on JP3	Remove the link
104	E_PARAM_CHKSUM	Stored Config & Calibration Data invalid	Calibration/ serial numbers have not been stored	Use SpacelabsTerm to store serial number. Use CALBK to store calibration.

BleaseSirius

Anesthetic Machine

Chapter 8

Spare Parts

Spare Parts

Spare Parts

8.1 Parts List

Description			Part Number	
Regional Specific Parts				
Pipeline Fittings	ANSI/NIST	ISO/DISS	RDISS	SIS
O ₂	13600518	13600521	103-0220-00	14200200
NO ₂	13600519	13600522	103-0221-00	13600634 + 13600635
AIR	13600520	13600523	130-0222-00	13600636 + 13600637
VAC	13600147	13600237	130-0218-00	13600638 + 13600639
AGSS	13600242	13600547	130-0219-00	13600640 + 13600641
Internal Tubing				
Oxygen 8mm	53500027 (white)	53500061 (green)	Please order tubing by meter lengths.	
Nitrous Oxide 4mm	53500041 (blue)	53500041 (blue)		
Air 5mm	53500042 (black)	53500043 (Yellow)		
Moldings				
	Grey Moldings	White Moldings up to Feb 2009	White moldings from Feb 2009	
Bottom Wall CGO	13600031	14200027	14200120	
Bottom Wall ACGO		14200026	14200121	
Top Cover	13400059	13401114	14200123	
Rear Cover	13600030	13600255	14200122	
Top Shelf	13600130	13600254	13600254	
Drawer	13600035	13600536	13600536	
		13600537	13600537	
Electrical				
Power Sockets				
UK			80200039	
EUROPE			80200040	
USA / CANADA			80200082	

Spare Parts

Description	Part Number
Power Sockets cont.	
SA	80200083
CHINA	80200084
Circuit Breaker	
230V	13600283
110V	13600284
4A Fuse US	81308015
Fuse Board 110V	13600284
Absorber detect switch	ER2275458
O ₂ sensor board (base molding)	13600217
O ₂ Sensor cable Curly	940453
Ext peep connector (base molding)	13600316
On / Off Switch knob	14200003
Switch segment PXB_291	SI0112
Switch segment ZB2-BE102	70600006
Switch segment ZB2-BE1016	54200059
Reed Switch Assy	13600100
Pneumatics	
CGO Assy	FR136027
Alarm module 3 gas	13400005
Alarm whistle	11901909
On/Off switch assy	14200003
Alarm valve position 1, 3 and 4	53000010
Alarm valve position 2	53000011
Flush tap valve (clipard)	53000025
DISS Outlet	13602110
O ₂ Flush button label (green)	13600260

Spare Parts

Description	Part Number
Fittings	
4mm push fit equal Tee	54200116
5mm push fit equal tee	54200107
6mm push fit equal tee	SI0315
6mm push fit blanking plug	54200151
4mm 1/8" bsp fitting	54200115
5mm 1/8" bsp fitting	54200108
6mm 1/8" bsp fitting	SI0302
8mm 1/8" bsp fitting	54200076
4mm 1/4" Fm connector	54200115
5mm 1/4" Fm connector	54200112
6mm 1/4" Fm connector	54200064
Pipeline gauge fitting washers	52700038
6mm bulkhead fitting	SI0334
4mm 1/8" banjo	54200118
5mm 1/8" banjo	54200111
6mm 1/8" banjo	SI0300
6mm 1/8" FM bulk head fitting	54200119
4mm to 6 mm stem	SI0322
5mm to 6mm stem	54200110
Blanking plug 1/8" ALY	13600565
Blanking plug 1/8" ALY ORING	ST4032
8mm push fit blanking cap	54200146
Yokes	
Yoke bridge	13500127
Yoke block O ₂	13500317
Yoke block N ₂ O	13500318
Yoke block Air	13500319
Transfer manifold	13600063
Transfer manifold nut	SM1681
Transfer manifold washer	SM1690

Spare Parts

Description	Part Number
Yokes Cont.	
Yoke bridge bolt	SM0808
Yoke T Screw	800102-3
Copper pipe	50369
Banjo body	ST2294
Banjo Bolt	ST2295
Straight adapter 1/8"bsp-enots	ST2265
Enots nut	ST2298
Cylinder Gauge O ₂ /Air	54300043
Cylinder Gauge N ₂ O	54300044
Primary regulator service kit	53400044
Dowty seals 1/8" bsp	503000035
bodoc seals	ST2531
Absorber CAS II	
Absorber Top No bypass white (NEW)	FR122030
Absorber Top With bypass white (NEW)	FR122031
Absorber Top No bypass white (OLD)	FR122028
Absorber Top With bypass white (OLD)	FR122029
Absorber 2kg No bypass White	12200902
2Kg outer canister no drain	12200228
1Kg outer canister no drain	12200229
Inner canister	12200221
Central Seal (middle)	12200556
Upper Seal (top)	12200557
Cas Top seal	12200235
Cas plate seal top	12200535
CAS outer canister seal	SI0821
Rear seal Black	12200432
Rear seal White	12200533
Absorber plate seal lower	12200433
Absorber manifold gasket (base molding)	13600069

Spare Parts

Description		Part Number
Absorber CAS II cont.		
O ₂ Plug and Absorber Plug O-Ring		51240110
Bag Port Connector O-Ring		51050150
O ₂ Sensor cable Curly		940453
O ₂ Sensor T-Piece		70300025
O ₂ Probe (single part) (sensor)		70300001
APL Valve Assembly		FR122001
Pressure Gauge (white)		54300047
Insp and Exp Domes		12200025
Dome O-ring		51640415
NRV Disc		12200162
Bag Arm Assembly		14200007
Backbar		
Dzus Spring (complete)		930201
Dzus Spring (spring only)		SI212
Backbar Assembly (complete)		14200103
Backbar valve		12001003
Sealants/Adhesives		loctite no.
Screwlock low strength 50ml	(222)	ST7716
Threadlock 50ml	(225)	ST7573
Threadlock 10ml	(241)	53800027
Threadlock 50ml	(241)	ST7601
High Temp med strength	(242)	SI0900
Loctite no (270) 50ml		ST7574
Loctite no (290) 250ml		53800034
Instant adhesive black 20g	(480)	53800028
Instant adhesive clear 20g	(IS496)	ST7576
Retaining Compound 10ml	(601)	ST7575
Retaining Compound 50ml	(601)	53800030
Retainer 250ml	(603)	53800025

Spare Parts

Description		Part Number
Sealants/Adhesives cont.		loctite no.
High strength retainer 50ml	(638)	SI0901
Retaining compound 10ml	(641)	ST7781
High strength/temp retainer	(648)	ST7869
Polyolefin Primer for 406 10g	(770)	53800029
Activator Spray Can 500ml	(7649)	53800039
Superflex Silicon Clear 80g		53800026
Araldite 2part epoxy 2x15ml		ST7018
Silcoset RTV Adhesive Sealant		ST7578
snoop 8oz		ST8026
Fomblin Thin OT20		91600027
Fomblin Thin RT15-0		91600029
Fomblin Thick RT15-2		ST7014
Ventilator		
BAV Power Supply		FR136029
BAV Display PCB		FR101026
BAV Controller Board Type 3		FR101027
BAV Switchmode Power Supply		FR136025
BAV Inspiratory Block		FR137025
		FR137027 REPLACES BOTH THESE PARTS
BAV Flow Valve Assembly		
BAV Gas Inlet Assembly		
Inspiratory Valve Solenoid		FR137028
8.4 LVDS TFT with Touchscreen		FR812025
Battery		80300025
Low Supply Pressure Switch		53000008
Mains Inlet Filter Unit		80200048
Worklight and Daylight PCB		13600299

Spare Parts

Description	Part Number
Flow Meter/Backbar	
Hypoxic guard UK	FR135025
Hypoxic guard USA	FR135026
O ₂ low flow tube	12000035
O ₂ Simplex tube	12000044
N ₂ O low flow tube	12000037
N ₂ O Simplex tube	12000045
Air low flow tube	12000046
Air Simplex tube	12000039
Small insert	951029
Large insert	951032
Spring	ST4629
2nd regs	53400003
Flow Meter/Backbar cont.	
O ₂ knob US	13400126
N ₂ O knob UK/US	13400044
Air Knob US	13400127
Aero nut	SM0380
Backlight panel INC INVERTER	13400067
Auxiliary Flowmeter	54700042
Aux f/m Knob US	50800062
Filter flat	331038
Air flow meter valve	
Bellows	
Bellows Assembly Complete (white)	12500011
Adult Bellows Canister Cover	83035
Pop Off Valve Assembly (new)	12500014
Bellows Base (white) with pop off valve	12500012
Adult Bellows	83034

Spare Parts

Description	Part Number
Labels	
Electrical socket label	13600264
Federal law label	13600365
inlet ground label	13600363
Gas label gauges and knobs	13600361
Gauge label / cylinder and pipeline (PSI)	13600361
Drawers	
Drawer slider	54600085
drawer lock identical key	55000026
drawer lock cam	55000027
Frame	
Front Castor	13600337
Rear Castor	13600336
White V bracket	13600261
Accessories / Random	
patient flow sensor	10110090
Flow Sensor Caps (pkg of 50)	54100063
patient flow sensor tubing 1.5m	10110219
patient flow sensor tubing 2m	10110218
patient flow sensor tubing 3m	10110102
patient flow sensor tubing 6m	10110103
Fresh gas flow sensor tubing	10110104
Fresh gas flow sensor	10110105
Suction controller	11400060
Suction Filter	11400063
Suction Filter housing	11400064
Suction filter housing oring	11400065
Fomblin grease	ST7014
Silicoset 151	ST3201

Spare Parts

Description	Part Number
Accessories / Random cont.	
Flip up shelf mat (both)	13600568
Work Surface Mat	13600194
Iso Key Filler	10010001
Sevo Key Filler	10040001
PM Kit	
One Year PM Kit (BleaseSirius)	14000511
Four Year PM Kit (BleaseSirus)	14000512
One Year PM Kit (Sirius 3000,2000)	13600530
Four Year PM Kit (Sirius 3000,2000)	13600531

Spare Parts

NOTES

BleaseSirius

Anesthetic Machine

Chapter 9

Notices and Important Information

Notices and Important Information

9.1 Product Improvement

Spacelabs Healthcare has a policy of continued product improvement and therefore reserves the right to make changes which may affect the information contained in the manual without giving prior notice.

9.2 Responsibilities of the User

The Blease700/900 Series Ventilator conforms with the specifications and operating procedures described in this manual and on any accompanying notices and labels only if it has been installed, used and maintained in accordance with the instructions. The safe function of the ventilator can only be guaranteed if it is regularly checked and serviced at or in excess of the standards specified in this manual.

If the ventilator is suspected of being worn, defective or otherwise unfit for use, it should under no circumstances be used.

Broken, worn, missing or contaminated component must be replaced immediately; contact the Spacelabs Healthcare distributor from whom the ventilator was obtained for further service advice.

9.3 Responsibilities of the Manufacturer

The manufacturer accepts responsibility for the effects on safety, reliability and performance of the equipment only if:

- assembly operations, extensions, adjustments, modifications and repairs are carried out by persons with written authorization from the manufacturer.
- the equipment is used in accordance with the instructions for use.
- the electrical installation of the relevant room complies with the 'Regulations for the Electrical Equipment of Buildings'.



NOTE: If during the warranty period the equipment is serviced by an unauthorized party, the warranty will be void.

9.4 Disclaimer

Opening of the control unit by unauthorized personnel automatically voids all warranties and specifications. The prevention of tampering is solely the user's responsibility; the manufacturer assumes no liability for any malfunction or failure of the ventilator if the control unit is opened.

9.5 Technology Disclaimer / Tamper Proof Seal

Unauthorized removal of or damage to seal will invalidate product warranty and could affect accuracy and performance of this product.

In the interest of both patient and user safety no unauthorized calibration or access to technical techniques and practices including calibration information of this product will be issued.

The technical performance and characteristics of this product belong to Spacelabs Healthcare. Under no circumstances will those details be issued to non-Spacelabs Healthcare personnel.

Technical data, calibration co-efficients and all intellectual property rights of this product remain the property of Spacelabs Healthcare. To ensure correct functioning, the equipment must be serviced at regular intervals.

9.6 Note to Service Personnel

The Blease700/900 Series Ventilators and integrated equipment must only be serviced by Qualified Technical Engineers.

The contents of this manual are not binding. If any significant difference is found between the product and this manual, please contact Spacelabs Healthcare for further information.

To ensure correct functioning, the equipment must be serviced at regular intervals.

Spacelabs Healthcare recommends that the machine should be serviced at intervals not exceeding 12 months. Qualified Technical Engineers and genuine spare parts should be used for all servicing and repairs. Spacelabs Healthcare will not otherwise assume responsibility for the materials used, the work performed or any possible consequences of the same.

Notices and Important Information

In communication with Spacelabs Healthcare, quote the model and serial number of the equipment, with the approximate date of purchase. If the equipment is being returned for repair, indicate the nature of the fault or the work you require to be carried out.

Contact your local dealer:

Spacelabs Healthcare Inc.
Company Headquarters
35301 SE Center Street
Snoqualmie, WA 98065
USA



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Anesthesia Delivery and Ventilation
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Fax: +44 (0)1992 501213

e-mail (enquiries): advsales@spacelabs.com
e-mail (technical): advsupport@spacelabs.com
www.spacelabshealthcare.com

9.7 CE Mark



The product is labeled with the CE mark and number of Notified Body.

9.8 Trademarks and Acknowledgements

The following trademarks and acknowledgements may appear in Spacelabs Healthcare Manuals.



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9.9 Hazard Notices

This handbook contains important hazard information. You must read this hazard information before using the Blease700/900 Series Ventilators.



Warning Notices

Warning notices denote a potential hazard to the health and safety of users and/or patients. These notices clearly state the nature of the respective hazard and the means by which it can be avoided.

Warning notices appear in full in the preliminary pages and are repeated at their points of application in the manual.



Caution Notices

Cautionary notices denote a potential hazard to the physical integrity of equipment/software but NOT a danger to personnel. These notices clearly state the nature of the hazard and the means by which it can be avoided.



Relevant or helpful

9.9.1 BleaseSirius Warnings

The following statements are made to comply with the requirements of IEC 60601-1 and IEC 60601-2-13

IEC 60601-1 Classification;

- Class I equipment
- Continuous operation
- Type B applied part
- Not for use with flammable anesthetic agents

1. This equipment must only be connected to gas pipeline supply lines that are fitted with pressure relief valves that limit the supply pressure to less than 7bar.
2. The functioning of this machine may be adversely affected by the operation of equipment such as high frequency surgical (diathermy) equipment, defibrillators or shortwave therapy equipment in the vicinity. Increasing the distance from such equipment will minimize any possible interference.
3. Prior to connecting the machine to a patient carry out the preuse check to verify correct alarm operation. To verify the O₂ alarm, set the flowmeters to give a concentration of 50% oxygen. Using the controls on the oxygen monitor panel, set the low oxygen level to 60% and verify the oxygen low alarm operates. Set the high oxygen alarm level to 40% and verify that the oxygen high alarm operates.
4. The oxygen flow can only be reduced to zero by turning the ON/OFF switch to the OFF position. Excessive force on the oxygen control knob may damage the hypoxic guard.
5. To avoid explosion hazards, flammable anesthetic agents such as ether and cyclopropane must not be used in these machines. Only anesthetic agents which comply with the requirements on non-flammable anesthetic agents in IEC 60601-2-13 'Specification for Anesthetic Machines', are suitable for use in these machines.
6. As these machines are not suitable for use with flammable anesthetic agents such as ether and cyclopropane the use of antistatic breathing tubes and face masks is not necessary.

The use of antistatic or electrically conductive breathing tubes when utilizing high frequency surgery equipment may cause burns and is therefore not recommended in any application that involves such apparatus.

Notices and Important Information

7. The equipment must be periodically checked and maintained to ensure proper operation.
8. Performance of the equipment may be affected at temperatures below 10°C (50°F) and above 40°C (104°F).
9. The performance of the anesthetic machines and vaporizers may be degraded if the two are mismatched. Refer to the vaporizer manufacturer's instruction manual before use.
10. If the integrated oxygen monitor is not fitted, an oxygen monitor complying with ISO 7767 shall be used when the anesthetic machine is in use.
11. CO₂ monitor complying with ISO 9918 shall be used when the anesthetic machine is in use.
12. Adult breathing circuits used with the anesthetic machine shall comply with ISO 8835-2.
13. Any vaporizer fitted to the anesthetic machine shall comply with ISO 8835-4. Additionally whilst the vaporizer is in use an anesthetic agent monitor complying with ISO 11196 is to be used
14. The units use semiconductor devices which are susceptible to damage by overloading, reversed polarity, electrostatic discharge and excessive heat or radiation. Avoid hazards such as reversal of batteries, prolonged soldering, strong RF fields or other forms of radiation, use of insulation testers or accidentally applied short circuits. Even the leakage current from an unearthed soldering iron may cause trouble.
15. The BleaseSirius machine is not suitable for use in a MRI environment.
16. Connection of equipment to the socket outlets will increase leakage currents. It is the users responsibility to ensure compliance to IEC 60601-1-1 (collateral standard for electrical medical systems). In the USA equipment connected to the socket outlets must comply with UL 60601-1 and the total sum of the system leakage current shall not exceed 300 microamps. It is the USER'S responsibility to ensure compliance with the above standard and that the leakage current limits are not exceeded.
17. Connection of equipment to the auxiliary mains socket outlets may increase leakage currents to values exceeding the allowable limits.
18. The BleaseSirius is latex free. Note that any replacement parts must not use latex.

19. The following equipment is mandatory, please refer to the relevant user manuals for instructions in usage; blood oxygen monitor, CO₂ alarm, blood pressure alarm, ECG alarm, anesthesia agent concentration.
20. The machine is to be equipped with an anesthetic gas scavenging transfer and receiving system, complying with ISO 8835-3 or applicable local standard before being put into service.



9.9.2 Electrostatic Sensitive Devices (ESD) Warnings and Cautions



- All ESD must be stored in approved conductive packaging, tubes, shipping bags, foam or tote bins.
- All persons handling ESD must be properly grounded via a 1MΩ resistive grounded wrist strap.
- Cover all ESD bench tops with grounded conductive mats and connect all work surfaces and equipment to earth ground.
- Transport all assemblies containing ESD in a conductive bag or container.
- DO NOT use cellophane adhesive tape to wrap DIP (dual inline package) tubes together.
- DO NOT handle ESD by their pins or mix them with other routine electronic parts.
- Never place ESD on ungrounded surfaces or leave them unattended in an open area.
- Avoid cellophane wrappers, synthetic (non conductive) carpeting, warm or cool air blasts, Styrofoam coffee cups, etc. when working with ESD.
- Use only properly designed heat lamps, heat chambers and/or 'antistatic' quickchill sprays during troubleshooting or stress testing procedures.



NOTE: In particular electronic assemblies in the BleaseSirius® range of machines are easily damaged by ESD and require special handling.



9.9.3 Cautions

Anesthetic Machines

- Do not leave gas cylinder valves open if the pipeline supply is in use and the system master switch is turned ON. Pressures from both supplies may become equal and, if simultaneously used, cylinder supplies could be depleted, leaving an insufficient reserve supply in case of pipeline failure.
- The hypoxic guard control system only ensures that oxygen-nitrous mixtures will have a minimum oxygen concentration. HYPOXIC MIXTURES MAY BE DELIVERED IF GASES OTHER THAN OXYGEN, NITROUS OXIDE OR MED AIR ARE USED, OR WHEN OPERATING AT LOW OXYGEN FLOW RATES. When using carbon dioxide, as an additional gas, make sure the proportions of all gases are carefully adjusted in accordance with accepted clinical practice. Gas mixtures within the breathing system must be monitored when using these gases.
- Leaking gases and vapors (downstream of the flow control valves and Oxygen Flush valve) may deprive the patient of metabolic gases and anesthetic agent may pollute the atmosphere. Tests that detect leaks must be performed frequently. If detected, leakage must be reduced to an acceptable level.
- Do not use the anesthesia system if the hypoxic guard control system does not operate within permitted ranges. Using an incorrectly operating control system may result in incorrect gas mixtures and injury to the patient.
- When occluding the breathing system for test purposes, do not use any object small enough to slip completely into the system. Objects in the breathing system can interrupt or disrupt the delivery of breathing system gases, possibly resulting in injury to the patient. Before using the breathing system on a patient, always check the breathing system components for foreign objects.
- Do not place materials weighing more than 25kg/55.1lbs on the bottom shelf, or more than 25kg/55.1lbs on the upper monitor shelf. Overloading may cause damage to the shelves or cause instability. (Refer to Specification on page 30 for more details).
- Secure any equipment placed on the shelves.

Notices and Important Information

- To avoid stripping threads, do not use tools on the yoke gate T screws. Use only one cylinder gasket per yoke. Using more than one gasket could cause cylinder gas leakage.



Ventilator Warnings

- The volume sensor must be correctly installed at either the distal location in the patient system's expiratory limb or the proximal end of the Y connector. If the sensor is installed incorrectly, volume data will be inaccurate and associated alarms, including the low minute volume alarm will not function properly.
- Position the volume sensor's tubing with care. If the cable is pinched or cut, the ventilator's volume monitoring may not function correctly.
- Ventilator inoperative messages indicate that a problem exists in the ventilator. Do not attempt to use the ventilator while a ventilator message is displayed.
- Do not attempt to use the ventilator if the alarm mute button will not silence alarms.



WARNING:

If an alarm condition cannot be resolved, do not continue to use the system.

- Sterilize the bellows assembly periodically to minimize the risk of cross infecting patients. Use a sterilization schedule that complies with your institution's infection control and risk management policy. Only use Spacelabs medical approved sterilization methods.
- If any foreign materials or liquids are trapped in the driving gas circuit, or the pop off valve or the bellows base they could impair the valve's operation. Do not use the bellows assembly if you suspect that materials are trapped. Have the assembly repaired by Trained Technical Personnel.
- Perform the Pre-Use Check procedures after cleaning and sterilizing the bellows.
- Always perform the Pre-Use Check procedures for volume sensing functions after cleaning or replacing the volume sensor.

- Do not obstruct the drive gas exhaust. An obstruction may lead to the ventilator not functioning correctly.

9.9.5 Hazard Information



Warnings

1. USE OF EQUIPMENT

Incorrect use of the equipment described herein may result in injury to the patient. Read this manual before operating the machine. You must be familiar with the machine and its functions before using it on a patient.

2. SHORT INSPIRATORY TIMES

Short inspiratory times may result in inconsistent breath delivery. Avoid control combinations that may produce very short inspiratory times (<150ms).

3. PRESSURE LIMITING

Pressure limiting is a safety feature and is also used in adult and pediatric mode to provide ventilation (Pressure Control). It should not be used for any other purpose, such as creation of micro-breaths or emulation of specialized high frequency/low volume ventilation systems, otherwise injury to the patient may result.

4. PATIENT CIRCUIT DISCONNECTION

Patient circuit disconnection is a hazard to the patient. Take extreme care to prevent such an occurrence.

5. AUDIBLE ALARM

An audible alarm indicates an anomalous condition that may result in damage to the equipment or injury to the patient. The cause of each alarm should be investigated and any necessary measures taken to remove the alarm condition.

6. REDUCED MINUTE VOLUME

If the supply gas pressure is reduced, the patient minute volume may be reduced and injury to the patient may result. Do not use the ventilator if the supply pressure cannot be maintained.

7. VENT INOPERATIVE ALARM

The Vent Inoperative Alarm indicates that the ventilator cannot provide ventilation functions. Under no circumstances should the ventilator be used on a patient while this alarm is activated.

8. EXPLOSION HAZARD

An explosion hazard exists if this equipment is used with flammable anesthetic agents such as ether or cyclopropane. To avoid the risk of explosion, use this equipment only with anesthetic agents that comply with the requirements on non-flammable anesthetic agents in the IEC standard 'Particular Requirements for the Safety of Anesthetic Machines'.

9. DRIVING GAS

Use of a driving gas other than oxygen or MED AIR may damage the ventilator and will cause inaccurate operation, resulting in potential injury to the patient. Do not use any other driving gas.

10. OPERATING TEMPERATURE

The performance of this equipment may be adversely affected by extremes of temperature. The equipment should not be used if the ambient temperature is below 10°C (50°F) or above 40°C (104°F).

11. ANTI-STATIC OR ELECTRICALLY CONDUCTIVE BREATHING TUBES

The use of anti-static or electrically conductive breathing tubes and high frequency electric surgery equipment may cause burns and is therefore not recommended in any application of this machine. The ventilator is not suitable for use with flammable anesthetic agents such as ether and cyclopropane and therefore the use of anti-static breathing tubes and face masks is in any case unnecessary.

12. VENTILATOR MALFUNCTION

Injury to the patient may result if a faulty ventilator is used. If there is any malfunction, do not use the ventilator. Refer to Section 5 Troubleshooting for help. If the malfunction cannot be rectified, call an authorized technical engineer or return the ventilator to the supplier.

13. ALARM OPERATION

If an alarm condition is ignored, injury to the patient may result. Always check the alarms before connecting the ventilator to a patient. If the audible alarm or the visual indicator of any alarm function fails to activate during an alarm condition, or fails to reset after the alarm has been cleared, the ventilator must not be used. Contact an authorized technical engineer.

14. ALARM SETTING

Alarms should not be set to extreme values that can cause the alarm system to not warn correctly.

15. BELLOWS PRESSURE

At pressures above 10cmH₂O differential positive pressure, the bellows may be dislodged from the mounting ring, resulting in a dangerous malfunction of the ventilator. Do not exceed the stated pressure.

16. ELECTRIC SHOCK HAZARD

Lethal voltages are present within this equipment when it is connected to the mains electrical supply. Do not remove any of the ventilator covers or panels. Refer all repairs and servicing to an authorized technical engineer

17. FUSES FIRE HAZARD

The use of incorrectly rated fuses constitutes a fire hazard. Replace the two fuses only with fuses of the correct type and rating

18. LIQUID INGRESS

Ingress of liquid into the control unit may damage the unit or result in injury to personnel. Ensure that no liquid enters the control unit, and always disconnect the unit from the mains electrical supply before cleaning.

19. SIMV

The SIMV modes use a flow Trigger to sense the patient attempt to breath. Therefore, SIMV modes will be unable to work with patient sensor placed at the absorber.



9.9.6 Cautionary Notices

1. GAS SUPPLY PRESSURE

This equipment may be damaged if the gas supply pressure is too high. The ventilator must only be connected to gas pipeline supply lines that are fitted with pressure relief valves that limit the supply pressure to less than 7bar/101.5psi.

2. HIGH FREQUENCY SURGICAL EQUIPMENT

The ventilator may be adversely affected by the operation of equipment such as high-frequency surgical (diathermy) equipment, defibrillators or short-wave therapy equipment in the vicinity.

3. BATTERY LIFE

To preserve battery life, never store the ventilator with its battery discharged. Do not store or use the ventilator in close proximity to heat sources of any kind.

4. POWER FAILURE

In the event of a mains electrical power failure when the ventilator is running from its internal battery, do not remove the mains plug from the mains supply as this would prevent the immediate resumption of normal operation when the mains power is restored.

5. ELECTROMAGNETIC INTERFERENCE

Excessive electronic noise caused by poorly regulated devices may interfere with the proper functioning of the ventilator. To avoid this, do not connect the ventilator to the same mains supply outlet into which an electrocautery unit is connected.

6. EXHAUST GAS

The driving gas is discharged through the port on the rear panel of the ventilator. This port must be completely free of any obstruction and should have nothing connected to it. The exhaust gas is oxygen or MED AIR and does not contaminate the environment.

7 BELLOWS EXHAUST

A negative or positive pressure applied to the EXHAUST port of the bellows assembly results in positive pressure in the patient breathing system. The scavenging system must therefore not generate more than 5cmH₂O positive or negative pressure when connected to the ventilator. The use of an AGSS to EN 740:1999 is recommended. Do not connect a PEEP valve to the EXHAUST

port of the bellows base. This will increase the pressure inside the bellows and cause it to detach from the base, resulting in a serious malfunction. Any problem arising from an improperly functioning scavenging system is solely the responsibility of the user.

8. DAMAGE TO INTERNAL COMPONENTS

Excessive penetration of fixing screws into the ventilator may damage internal components. Ensure that the screws do not penetrate more than 7mm/0.2" into the ventilator.

9. CLEANING AGENTS

The ventilator surfaces are not scratch-resistant. Do not use abrasive cleaning agents otherwise damage to the surfaces will result.

Chemical decontaminants or liquid sterilization agents will damage the sensor and must NOT be used for cleaning or sterilizing. If autoclaving the patient sensor, the autoclave must only be used with distilled water.

10. VALVE SEAT

If the bellows valve seat is damaged, the pop-off valve will leak and may cause serious malfunction. Take care not to damage the precision-molded surface of the valve seat while cleaning. Never use a hard object or abrasive detergent. Use only a soft, lint-free cloth.

11. STERILIZATION (bellows)

To avoid damage to the equipment:

- Peak sterilization temperature must not exceed 134°C.
- Do not sterilize the control unit.
- Gas sterilization should be followed by quarantine in a well-ventilated area to allow dissipation of residual absorbed gas.
- Follow the sterilization agent manufacturer's instructions.

12. CALIBRATION PORT

Improper connection of equipment or any power sources to the calibration port may permanently damage the ventilator. Only a qualified technician should connect monitoring equipment to this port. Such equipment must be Spacelabs Healthcare -compatible and meet the regulatory standards of the countries in which the ventilator is used.

13. FLOW SENSOR TUBING

Check flow sensor tubing regularly for trapped water as it could affect ventilator readings.



9.9.7 Vaporizer Warnings

1. Do not use any vaporizer that is visibly misaligned on the manifold or that, when it is locked, can be lifted off the manifold. Incorrect mounting may result in incorrect delivery of gases.
2. A vaporizer is calibrated and labeled for one agent only. Do not fill with anything other than the designated agent.
3. If a vaporizer is filled with the wrong agent, draining will not eliminate the agent, because the wick will have absorbed some of the agent. The wick must be thoroughly cleaned and dried by trained service personnel.
4. The vaporizers must be completely upright for the sight glass to properly indicate agent levels.
5. Never oil or grease any oxygen equipment unless the lubricant used is made and approved for this type of service. In general, oils and greases oxidize readily, and - in the presence of oxygen - will burn violently. Fomblin is the recommended oxygen service lubricant (stock number ST7014).
6. After performing any maintenance or repair procedure, always verify proper operation of the system before returning to use.
7. Use cleaning solution sparingly. Do not saturate system components. Excessive solution can damage internal devices.
8. Following ethylene oxide sterilization, quarantine the equipment in a well ventilated area to allow dissipation of absorbed ethylene oxide gas. In some cases, aeration periods of seven days or more may be required. Aeration time can be decreased when special aeration devices are used. Follow the sterilizer manufacturer's recommendations for aeration periods required.



9.9.8 Absorber Warnings

1. Use of Equipment

Incorrect use of the equipment described herein may result in injury to the patient. Read this manual before operating the machine. You must be familiar with the equipment and its functions before using it on a patient.

2. Absorber Malfunction

Injury to the patient may result if a faulty absorber is used. If there is any malfunction, or if the absorber does not pass all pre-use tests, do not use the absorber. If the malfunction cannot be rectified, call an authorized service engineer or return the absorber to the supplier.

3. Spontaneous Breathing

If the APL valve is not in the OPEN position, it will not operate until the pressure reaches as much as approximately 65cmH₂O. This may result in injury to the patient. Set the APL valve to the OPEN position to allow spontaneous breathing.

4. Soda Lime

Soda lime is caustic. Observe the manufacturer's instructions for correct handling and storage. When handling, always wear suitable eye, face and hand protection as crushed soda lime can degrade to a fine dust which may be harmful by inhalation. To minimize the levels of soda lime dust, ensure that the soda lime is not crushed and that regular cleaning of the absorbers and breathing circuits is carried out. To prevent injury to the patient, always protect the patients face using a facemask.

5. Filling Canisters

Under-filling of canisters can lead to inefficient CO₂ absorption. Overfilling can result in poor canister sealing. Fill the reusable canisters only to the recommended level.

6. Condensate

The condensate in the bottom of the circuit is caustic. Drain the condensate periodically. Accidental splashes should be rinsed immediately with water.

7. Absorber Orientation

Use the absorber only in the upright position. Use in any other orientation may affect the gas flow or damage the absorber.



9.9.9 Cautionary Notices

1. Cleaning

The surfaces of the absorber may be damaged by caustic substances. Do not use caustic substances such as trichlorethylene for cleaning.

2. Sterilization

Sterilization will damage the manometer. Remove this item before sterilizing the Absorber. The PEEP valve should be separated.

3. Refilling Soda Lime Canister

When refilling the absorber canister with Soda Lime, there have been instances when the upper seal (Part Number 12200235) has not been replaced resulting in a leak.

This seal is located above the upper soda lime canister, attached to the black molding within the body of the absorber.

Please ensure all seals are correctly replaced when re-assembling the absorber.

BleaseSirius

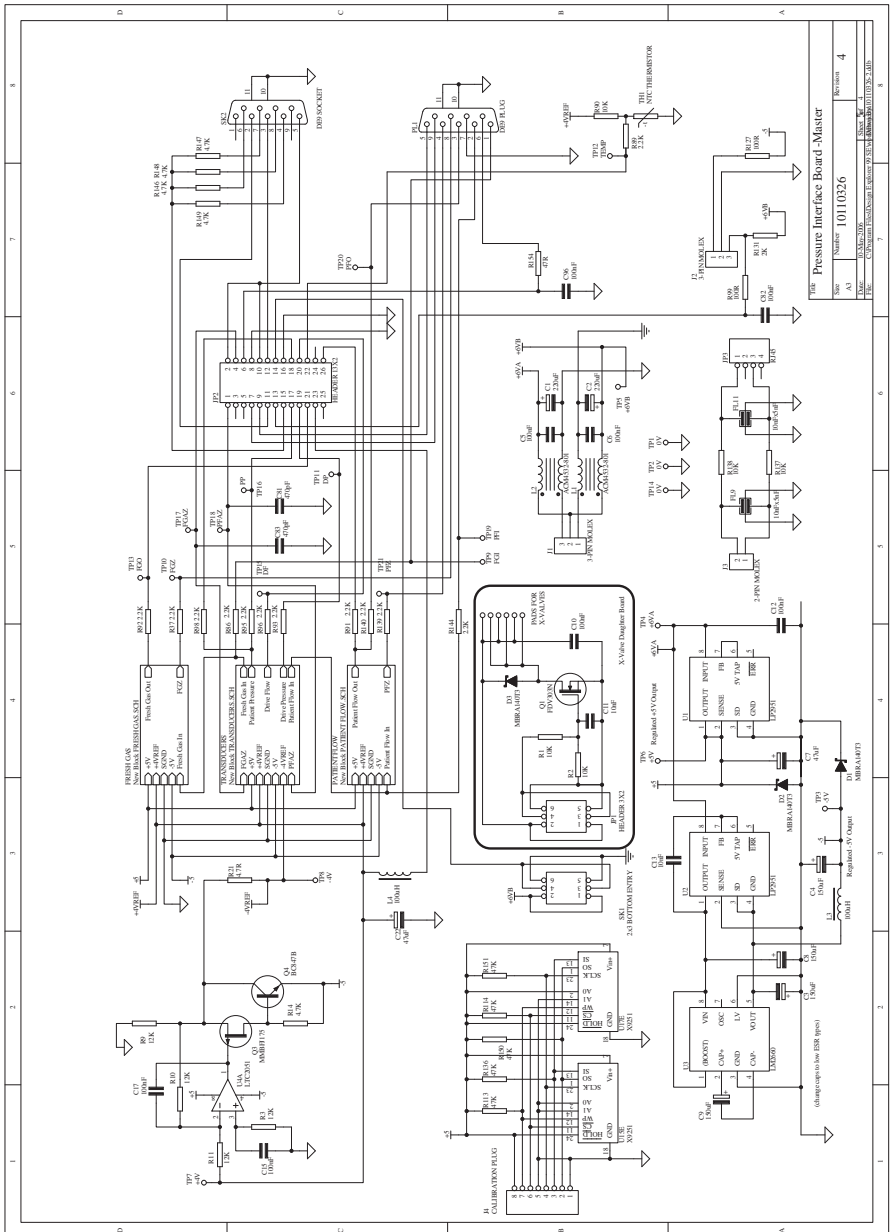
Anesthetic Machine

Chapter 10

Schematics

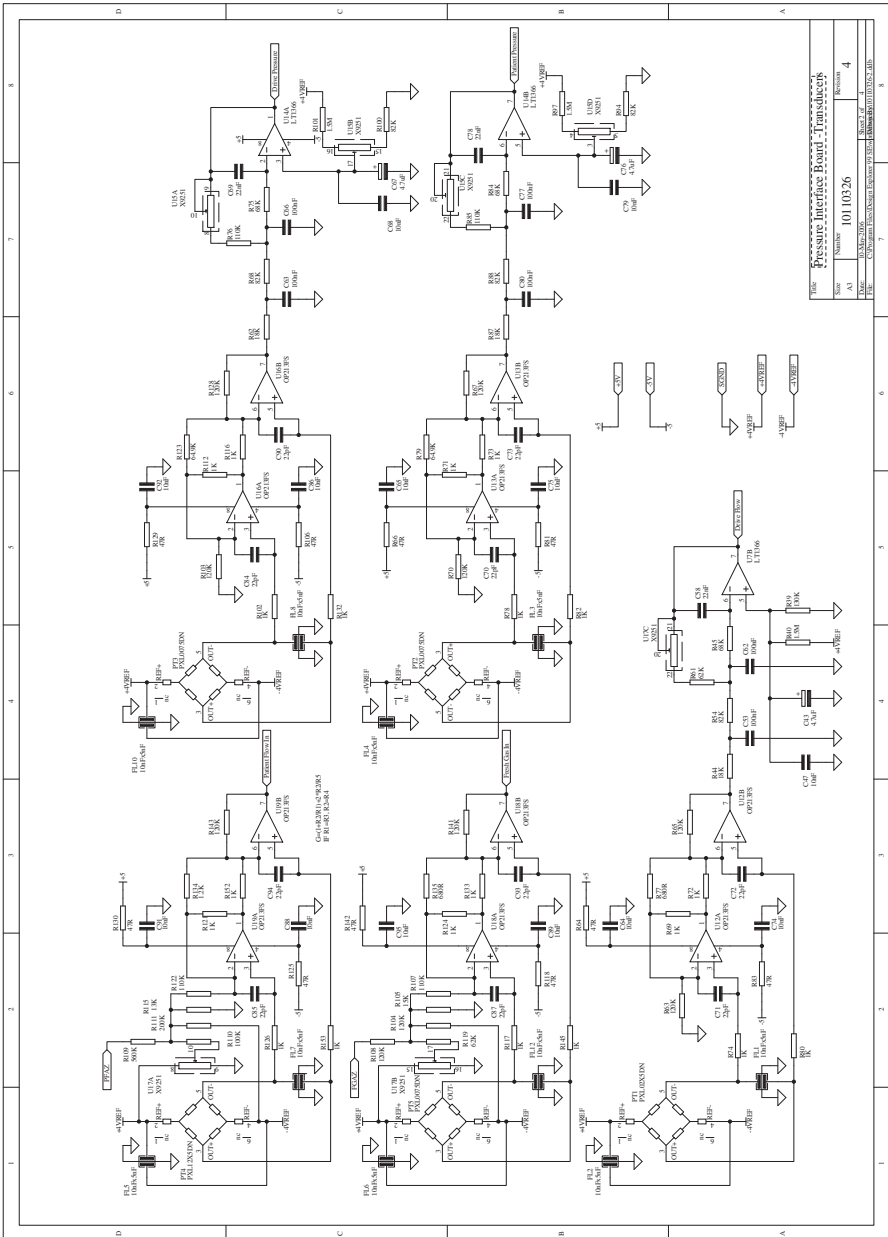
Schematics

Schematics



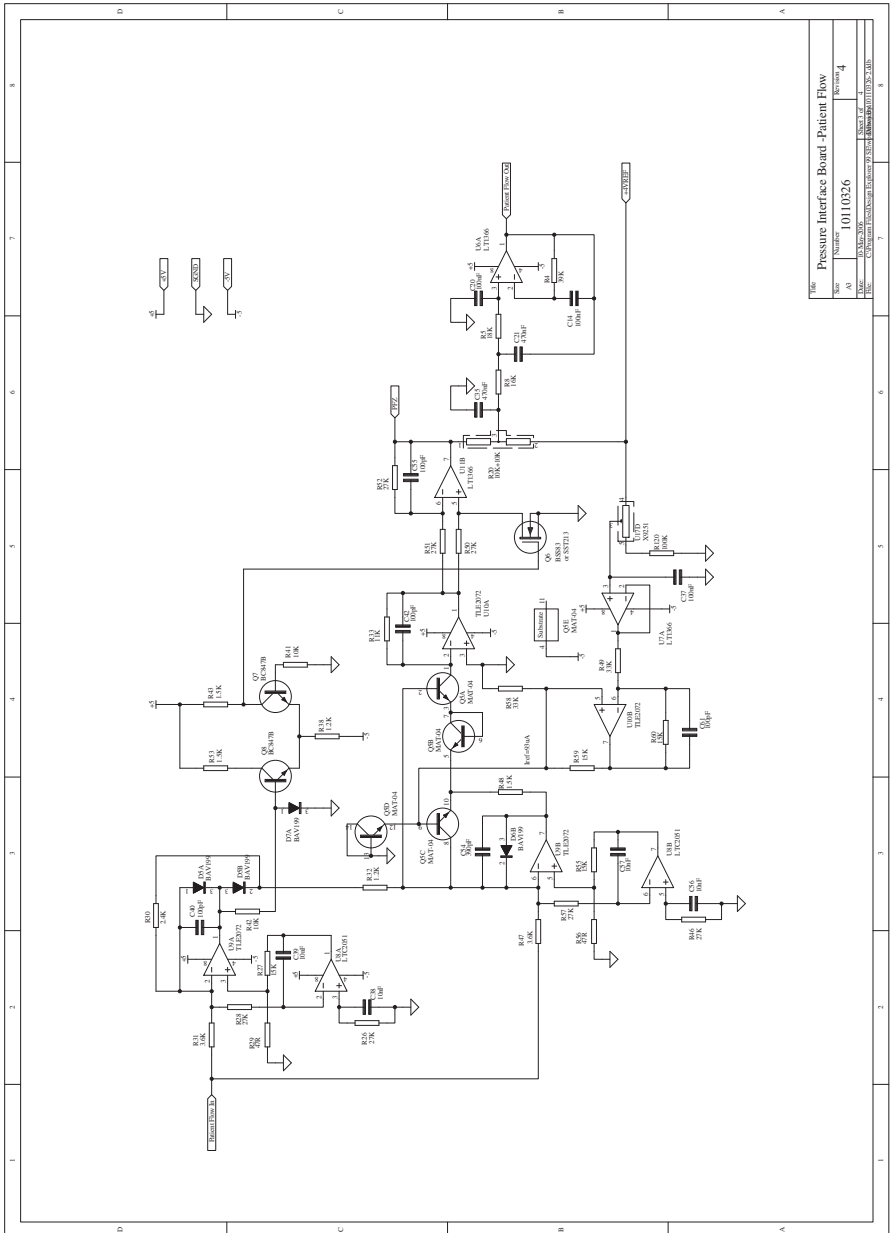
Schematic 10 - 10110326 Pressure Interface Board - Master

Schematics



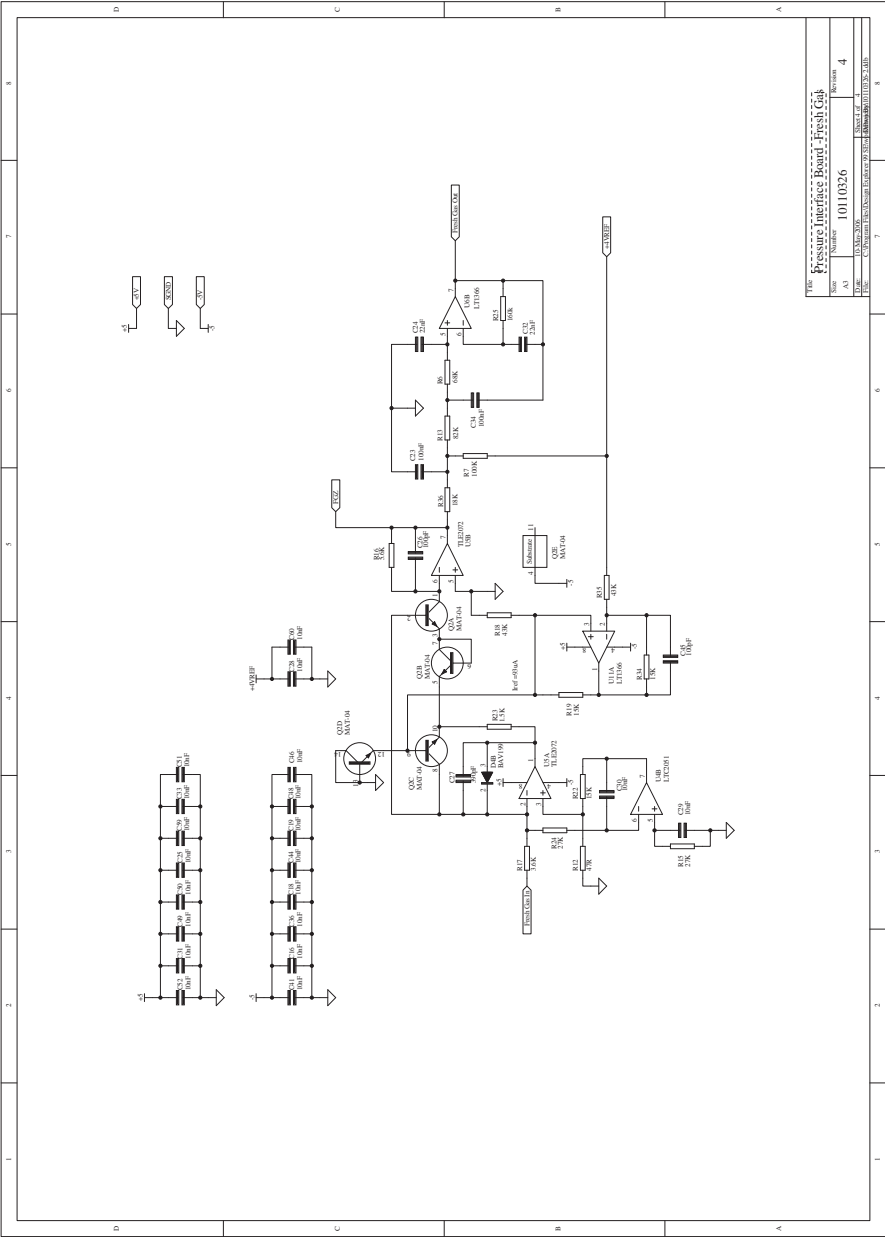
Schematic 11 - 10110326 Pressure Interface Board - Transducers

Schematics



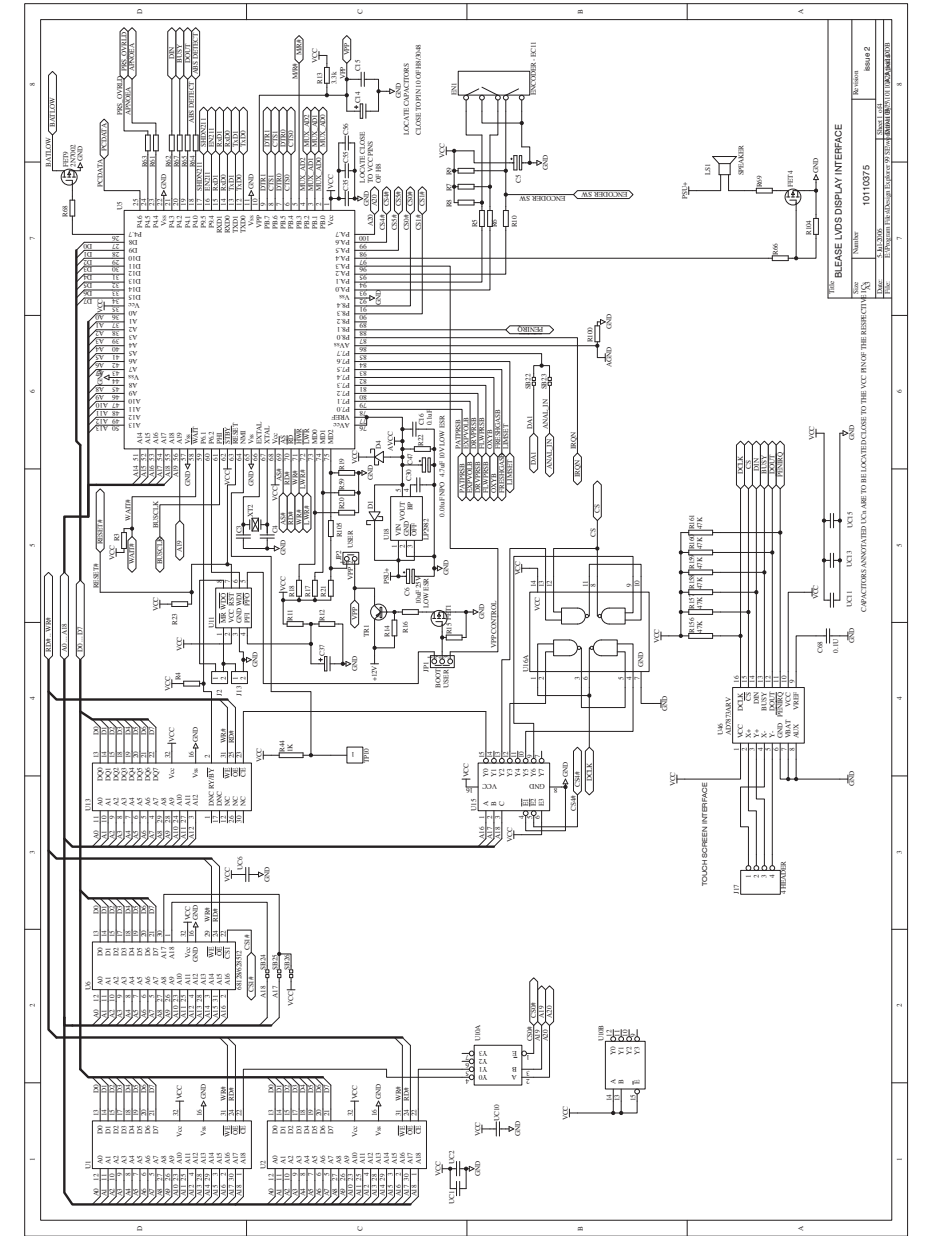
Schematic 12 - 10110326 Pressure Interface Board - Patient Flow

Schematics



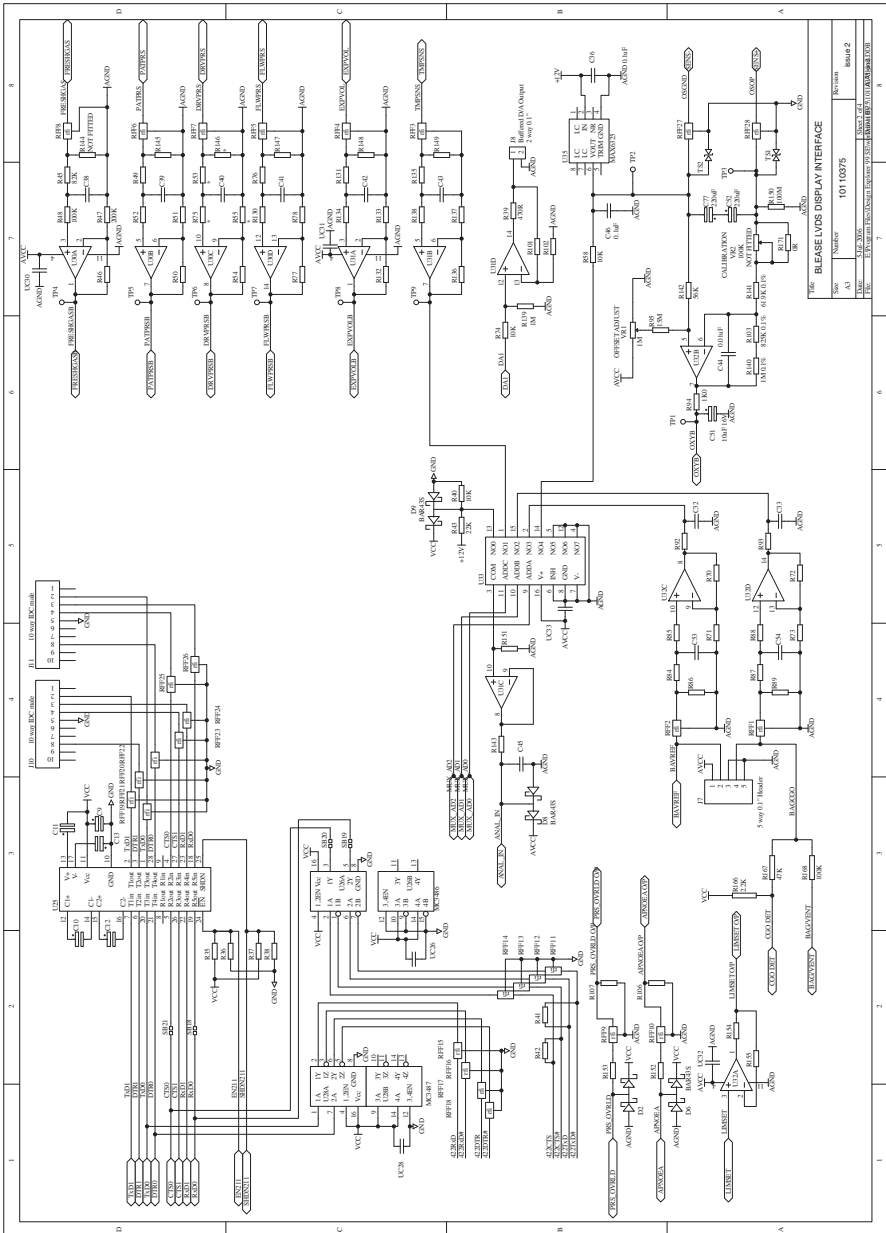
Schematic 13 - 10110326 Pressure Interface Board - Fresh Gas

Schematics



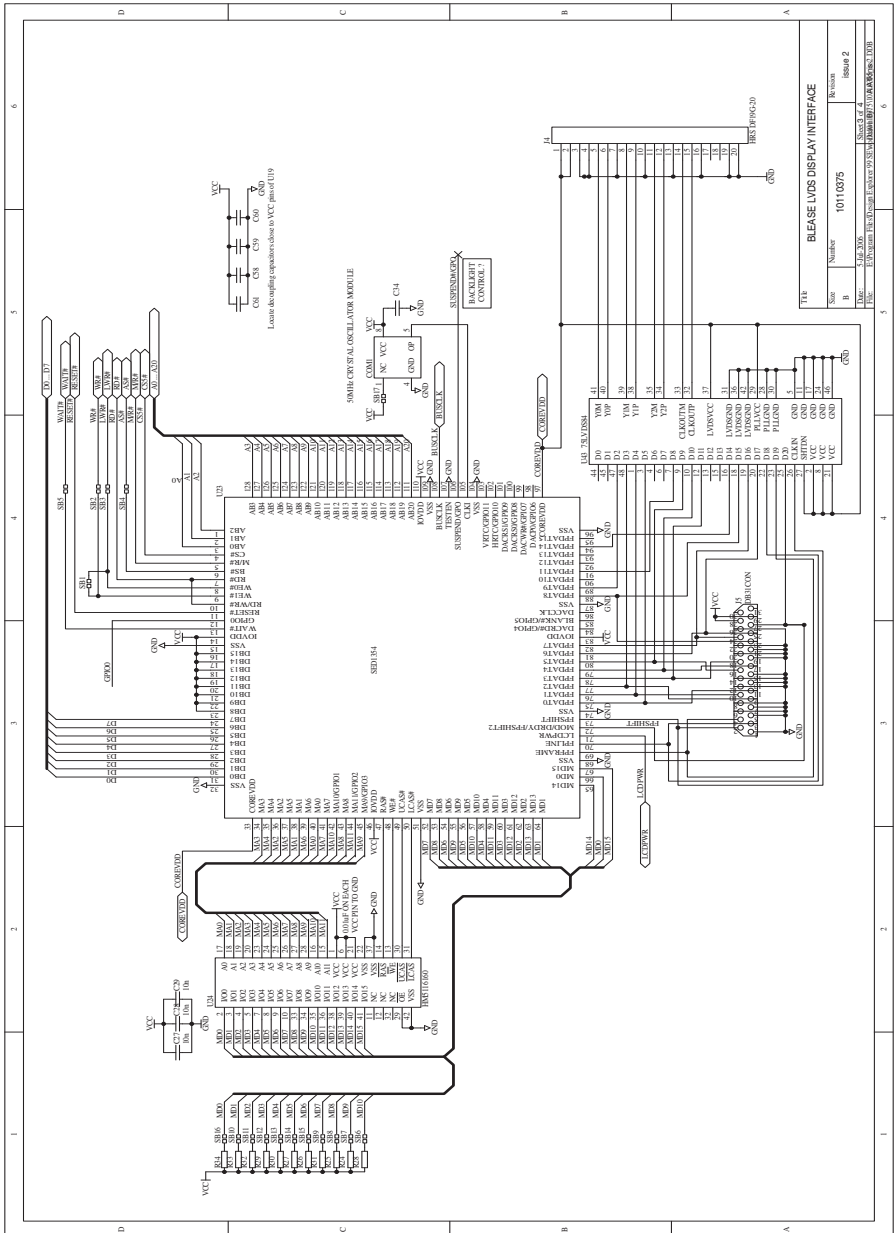
Schematic 14 - 10110375 Blease LVDS Display Interface sht. 1 of 4

Schematics

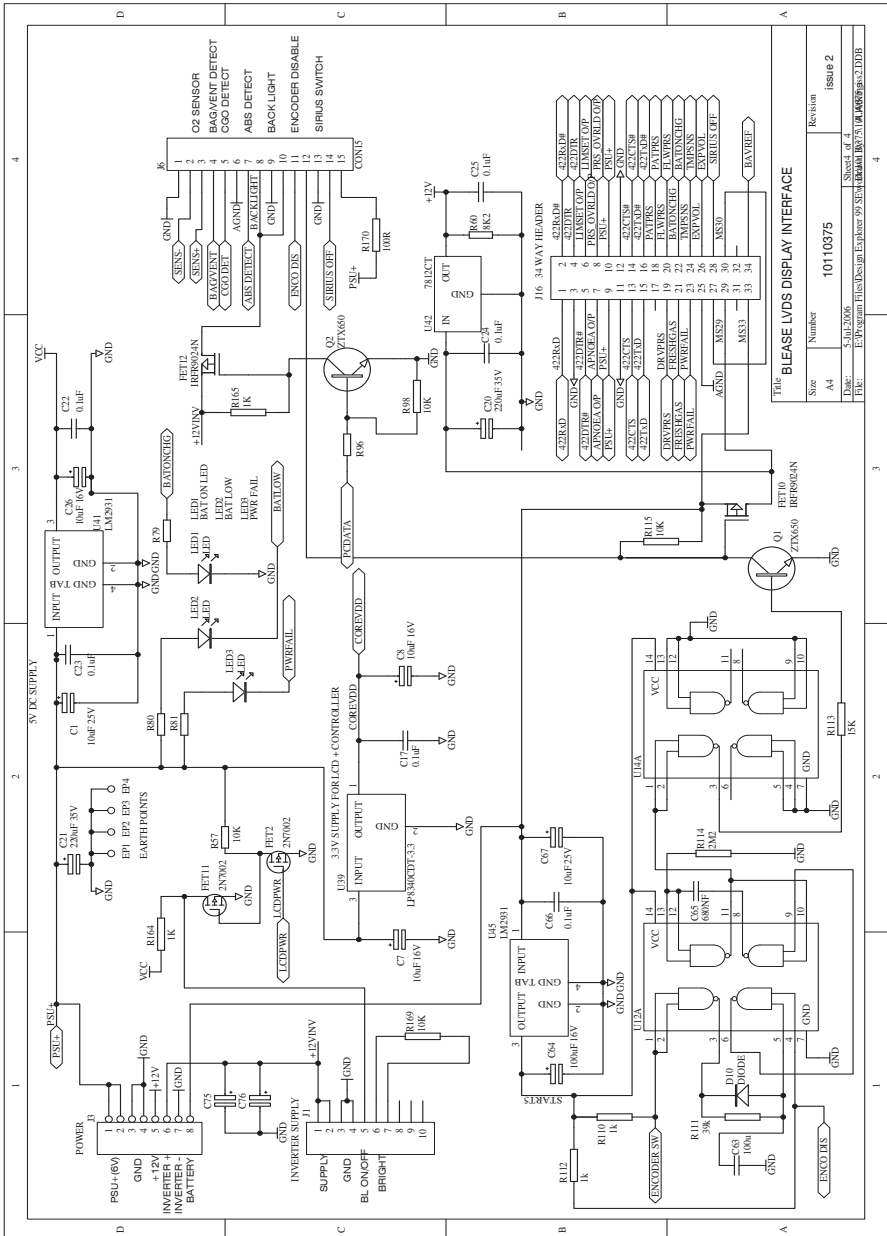


Schematic 15 - 10110375 Blease LVDS Display Interface sht. 2 of 4

Schematics

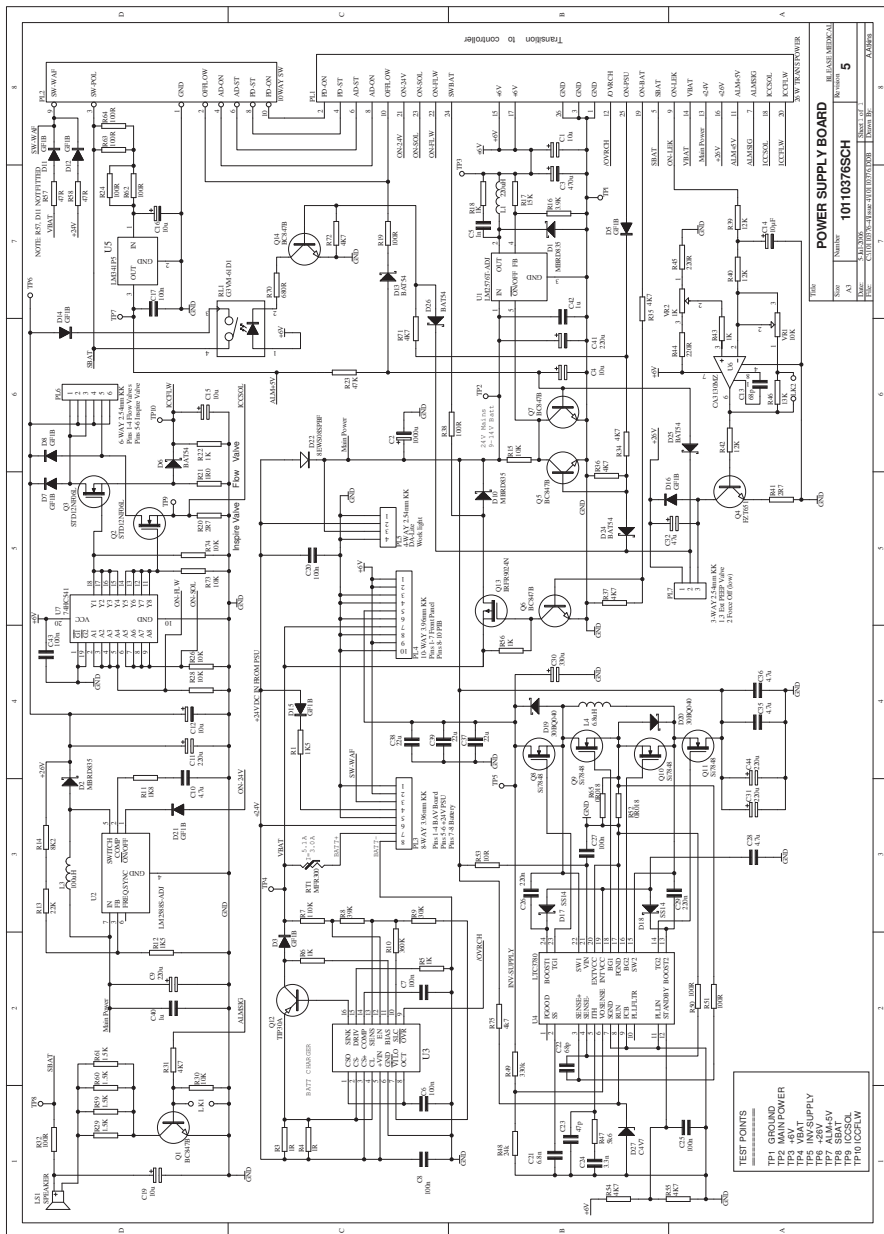


Schematics



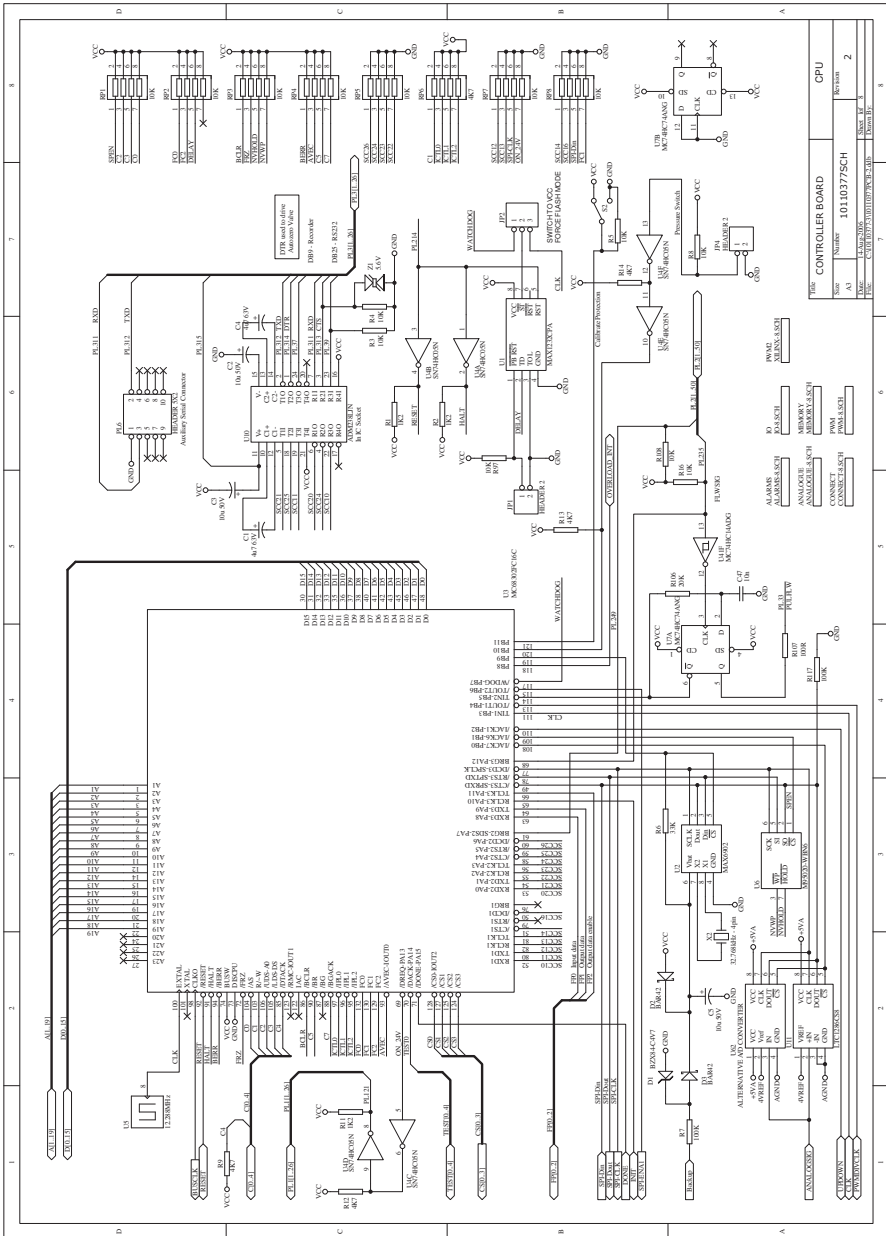
Schematic 17 - 10110375 Blease LVDS Display Interface sht. 4 of 4

Schematics



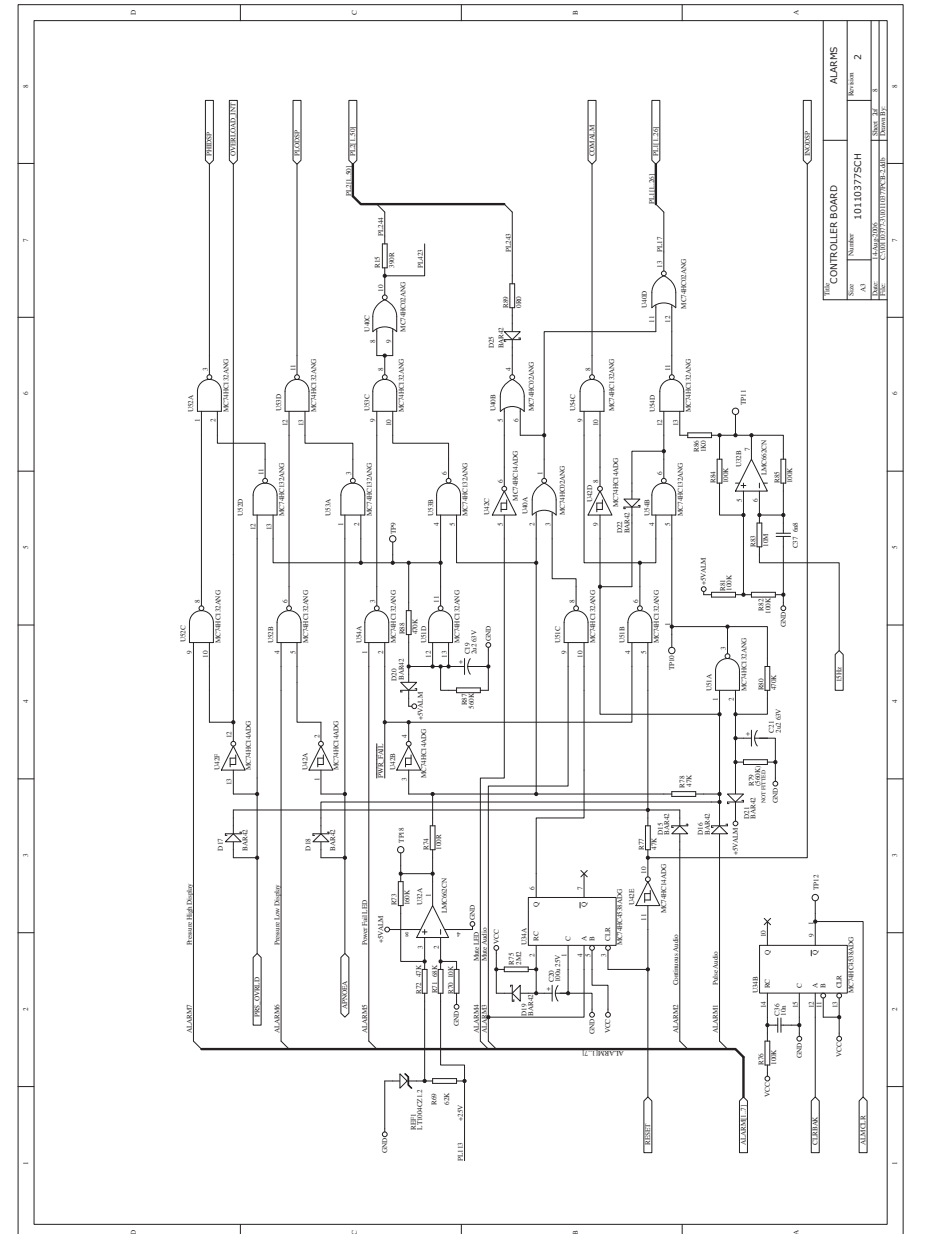
Schematic 18 - 10110376SCH Power Supply Board

Schematics



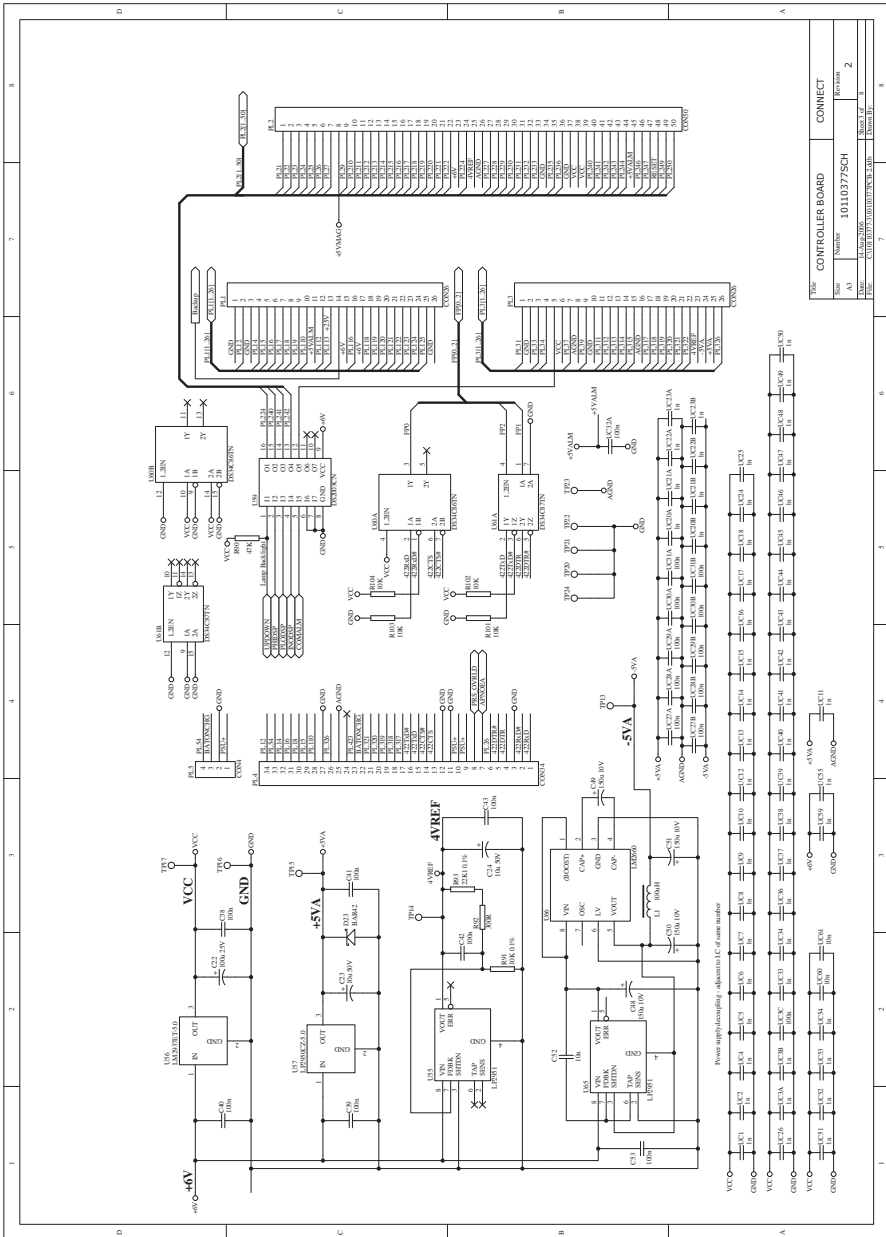
Schematic 19 - 10110377SCH Controller Board, CPU

Schematics



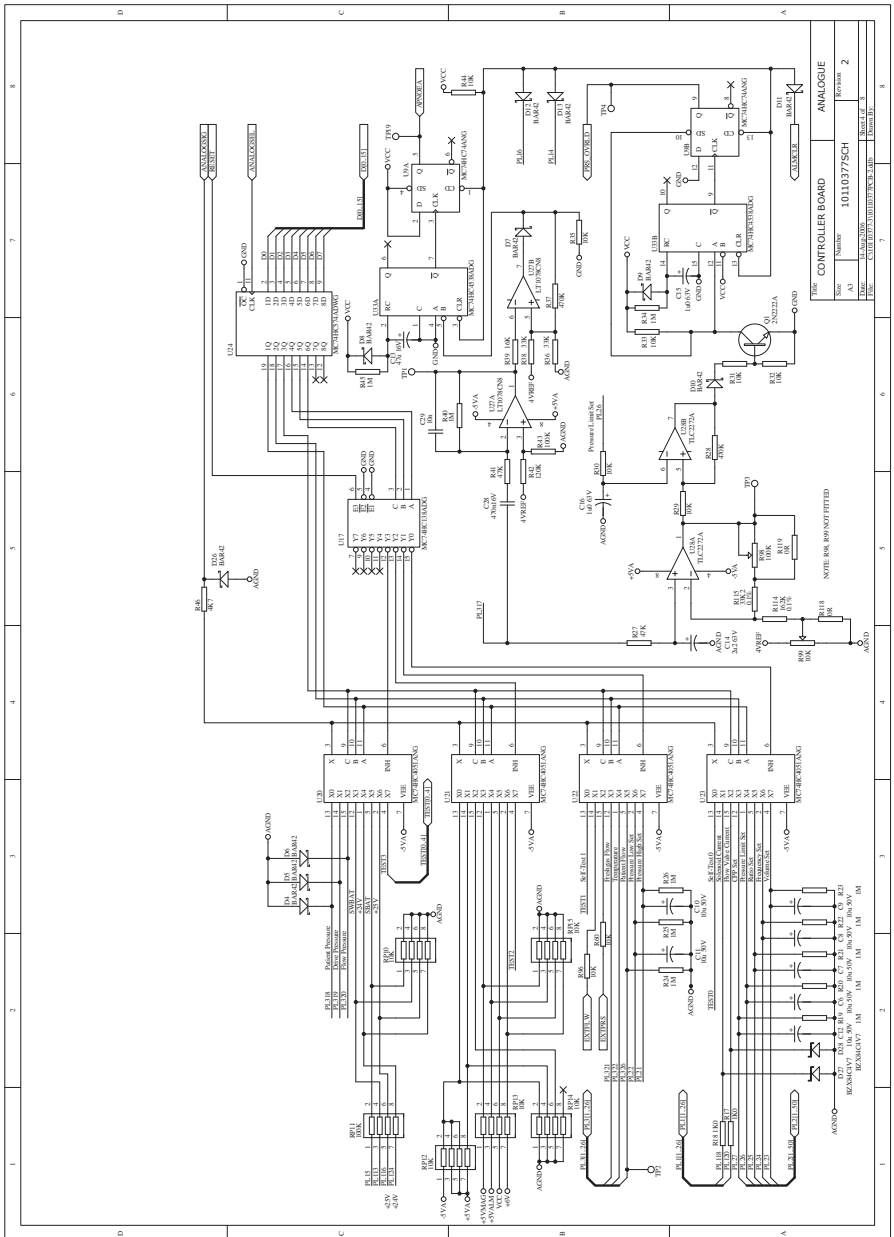
Schematic 20 - 10110377SCH Controller Board, Alarms

Schematics



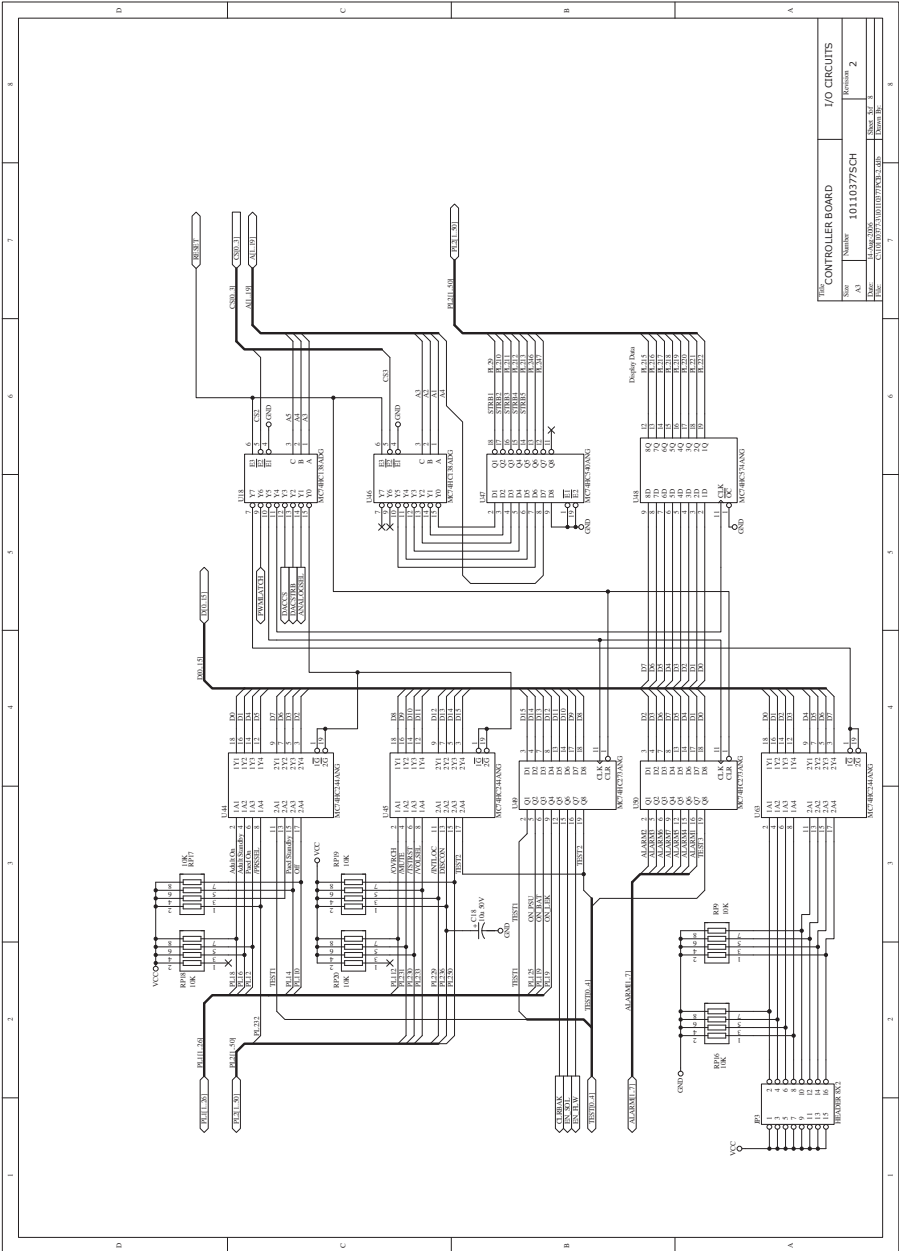
Schematic 21 - 10110377SCH Controller Board, Connect

Schematics



Schematic 22 - 10110377SCH Controller Board, Analogue

Schematics

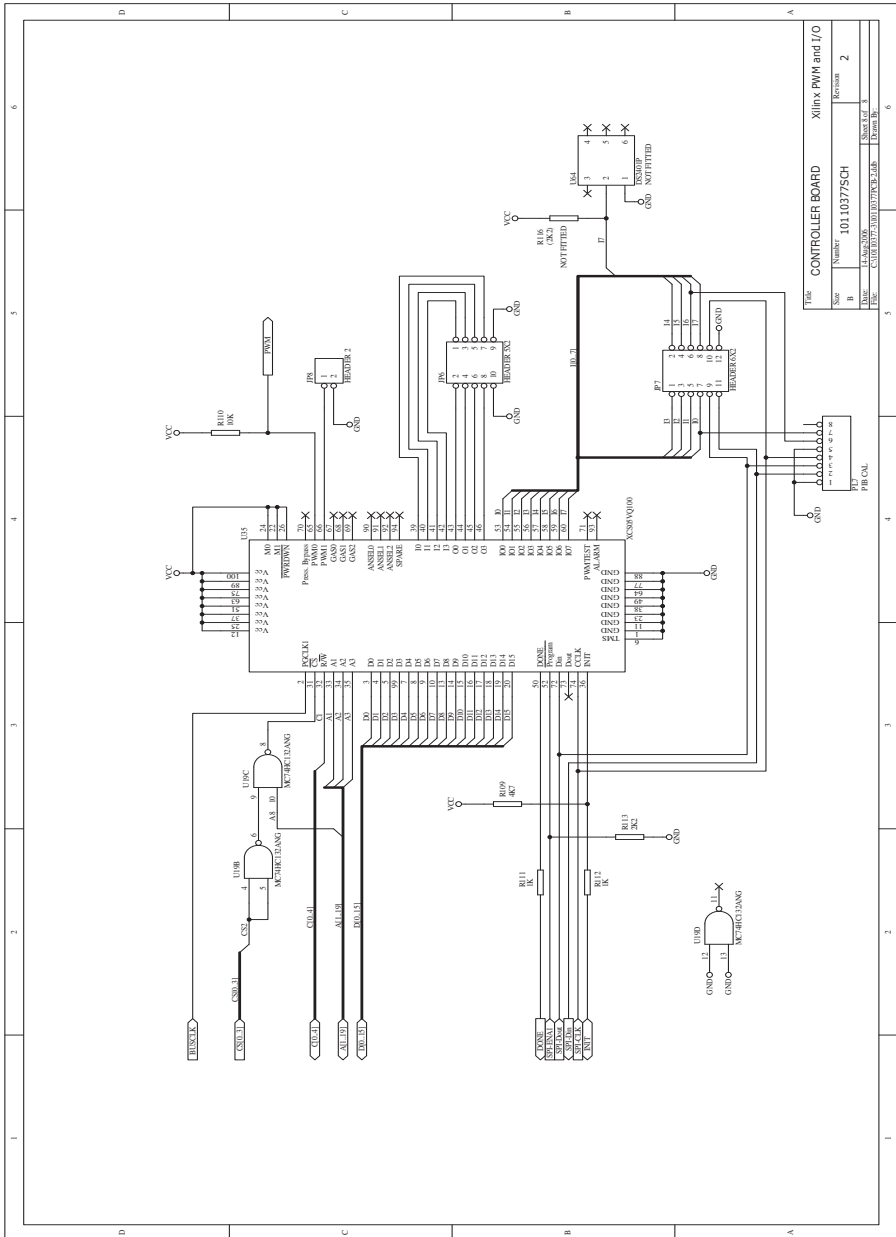


Schematic 23 - 10110377SCH Controller Board, I/O Circuits

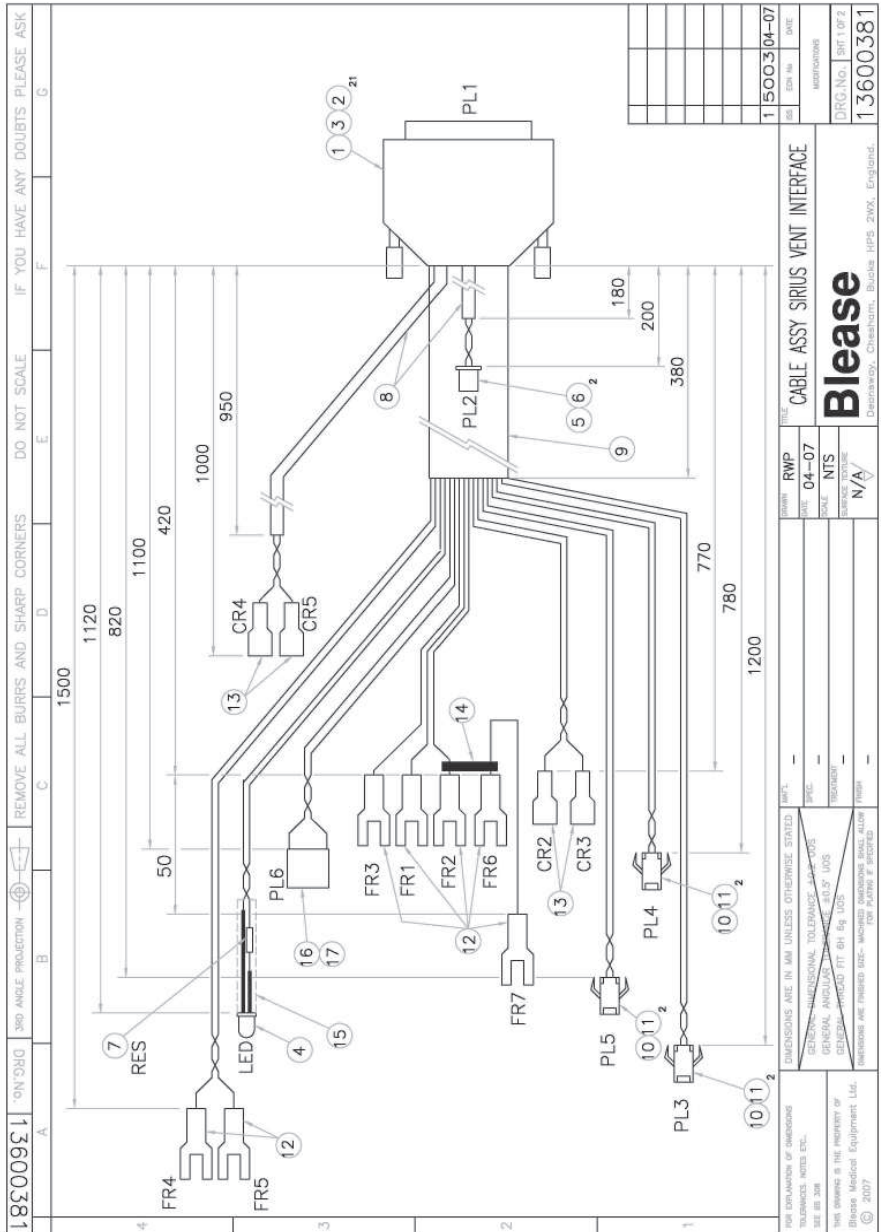
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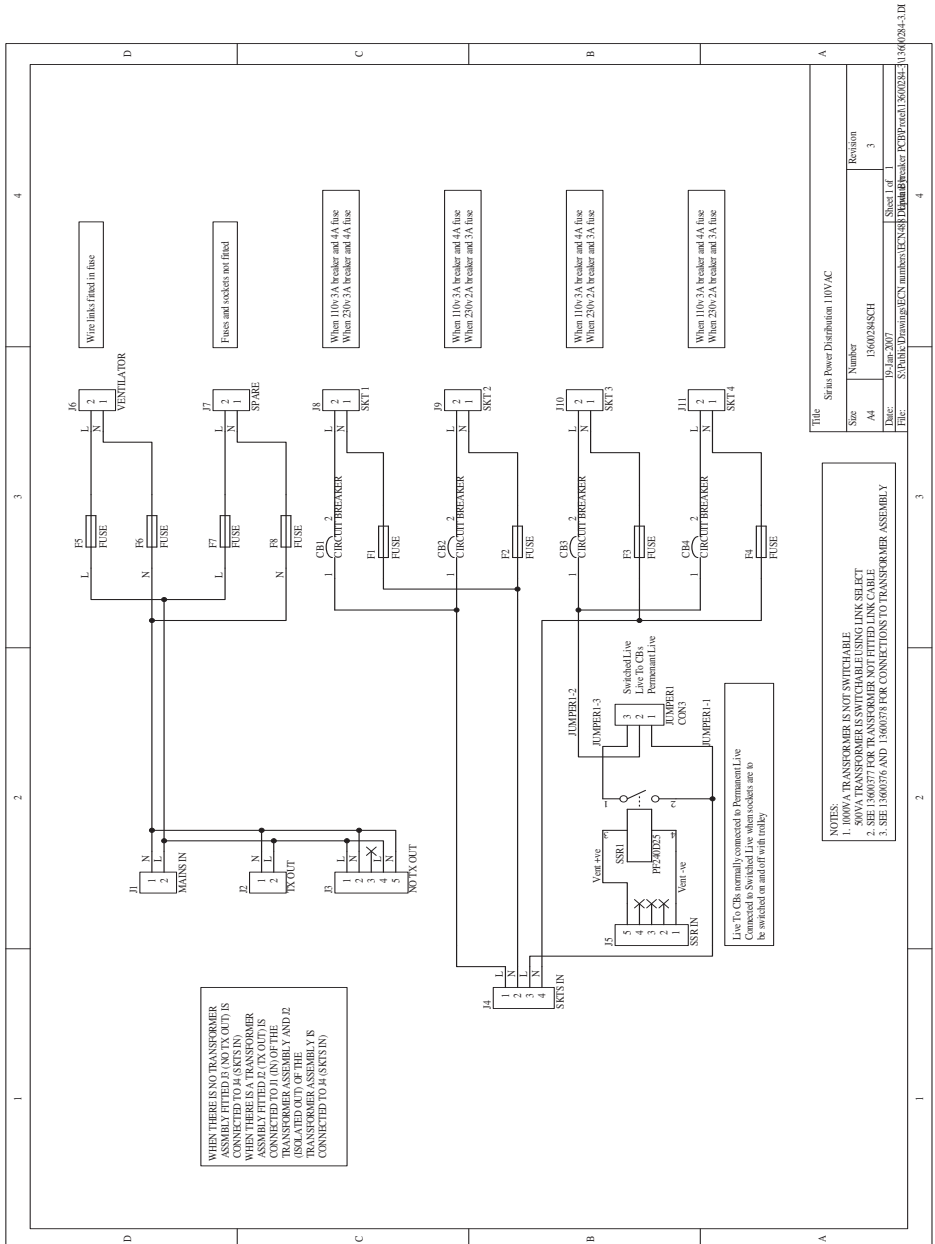
Schematics



Schematic 27 - 13600381 Cable Assy Sirius Vent Interface sht 2of 2

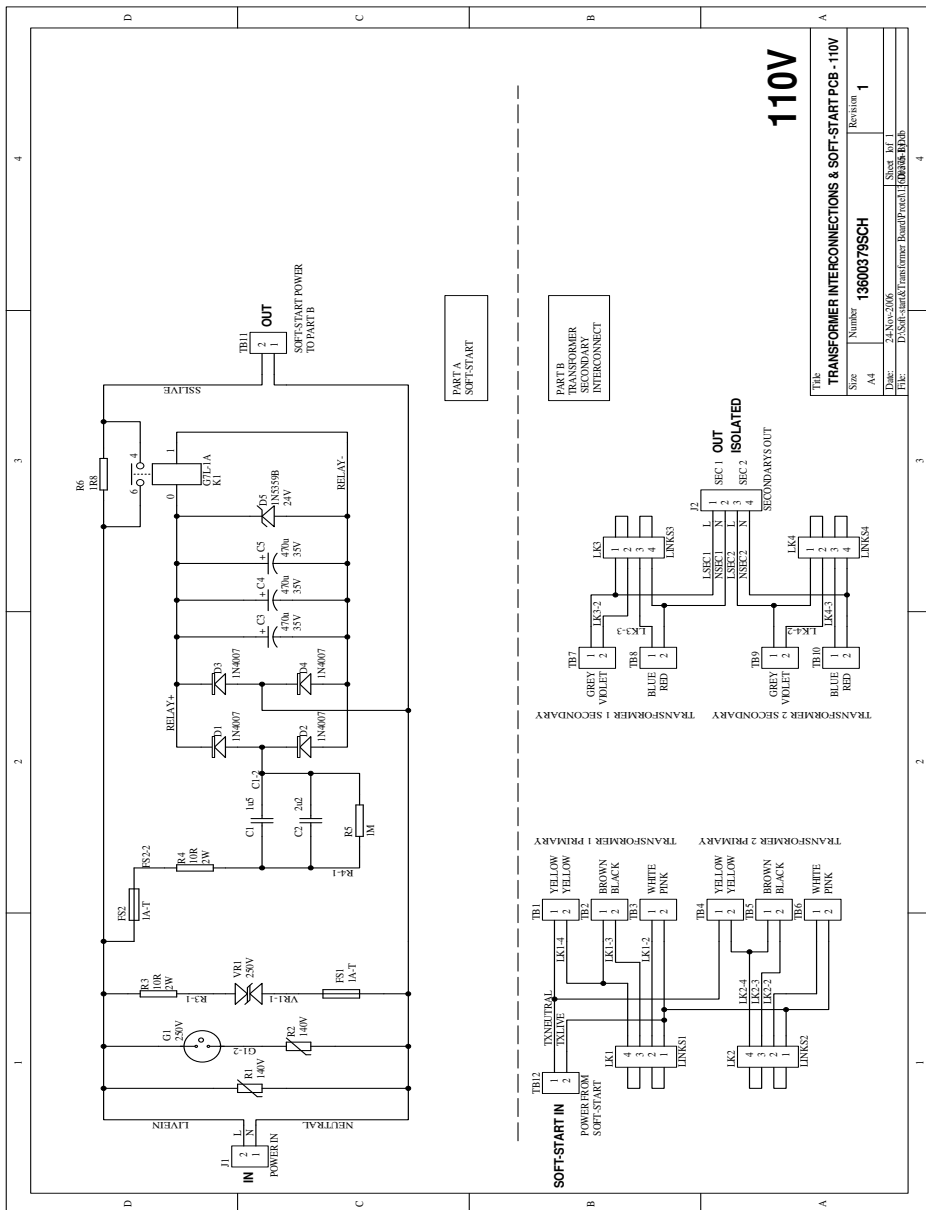
A		B		C		D		E		F		G									
13600381		3RD ANGLE PROJECTION		REMOVE ALL BURRS AND SHARP CORNERS		DO NOT SCALE		IF YOU HAVE ANY DOUBTS PLEASE ASK													
REF	DESCRIPTION	MANUFACTURER	MANUFACTURER PART No	QUANTITY																	
1	PLUG HOUSING 0.25 WAY	ITW MCJURDO	DB228PDT	1																	
2	BLACK D-TYPE BACKSHELL	ITT	DPK24-BLACK-K	1																	
3	LED-5MM 45DEG BLUE	MARL	NSPB2203	1																	
4	2-WAY CONNECTOR KIT HOUSING 2.5mm PITCH	JST	XHP-2	1																	
5	RESISTOR 0.5W 360R	WELWYN	NSP01-20.6	1																	
6	RESISTOR 0.5W 360R	WELWYN	WFR4 360R	1																	
7	SLEEVING BRAD 4mm GRV	HELLERWANN TYTON	6154-4N GREY	APPROX 1130mm																	
8	SLEEVING BRAD 10mm GRV	HELLERWANN TYTON	YOGTD-14 GREY	APPROX 360mm																	
9	CRIMP SOCKET 1.5W	JST	BNF-2011-0.8BS	6																	
10	CRIMP SOCKET 1.5W	JST	FWWS1 28-BSA (LF)	7																	
11	CRIMP TERM. FORK RED 3mm	TYCO	735278	4																	
12	CRIMP TERM. SHROUDED FEMALE RED 6.3X0.8mm	TYCO ELECTRONICS AMP		7																	
13	CRIMP TERM. SHROUDED FEMALE RED 6.3X0.8mm	TYCO ELECTRONICS AMP		4																	
14	HEAT SHRINK DIA3.0X4.5R X1 POLYOLEFIN	TYCO ELECTRONICS RAYCHEM	BNF-100-MINI-SPI-332-BK	4/R																	
15	2.54mm (0.1) PITCH KK CRIMP HOUSING	MOLEX		1																	
16	2.54mm (0.1) PITCH KK CRIMP HOUSING	MOLEX		1																	
17	2.54mm (0.1) PITCH KK CRIMP TERMINAL	MOLEX	08-50-0032	2																	
					NOTES:																
					1. REF 7, RESISTOR TO BE CONNECTED BETWEEN PL1-2 AND LED AND SECURED WITH HEATSHRINK TAPE.																
					2. ALL WIRES SHOULD BE TWISTED TOGETHER WHERE APPLICABLE.																
					3. LABEL EACH WIRE GROUP ACCORDING TO WIRING LIST APPROXIMATELY 15mm FROM CONNECTOR WHERE POSSIBLE.																
					4. ALL DIMENSIONS SHOULD BE WITHIN +/-10mm. DIMENSIONS ARE AS IF WIRE IS STRAIGHT.																
					5. ALL WIRES TO BE PULL AND CONTINUITY TESTED.																
					6. THIS CABLE ASSY IS A SUPERSSET OF 13600292 ISSUE 1.																

Schematics

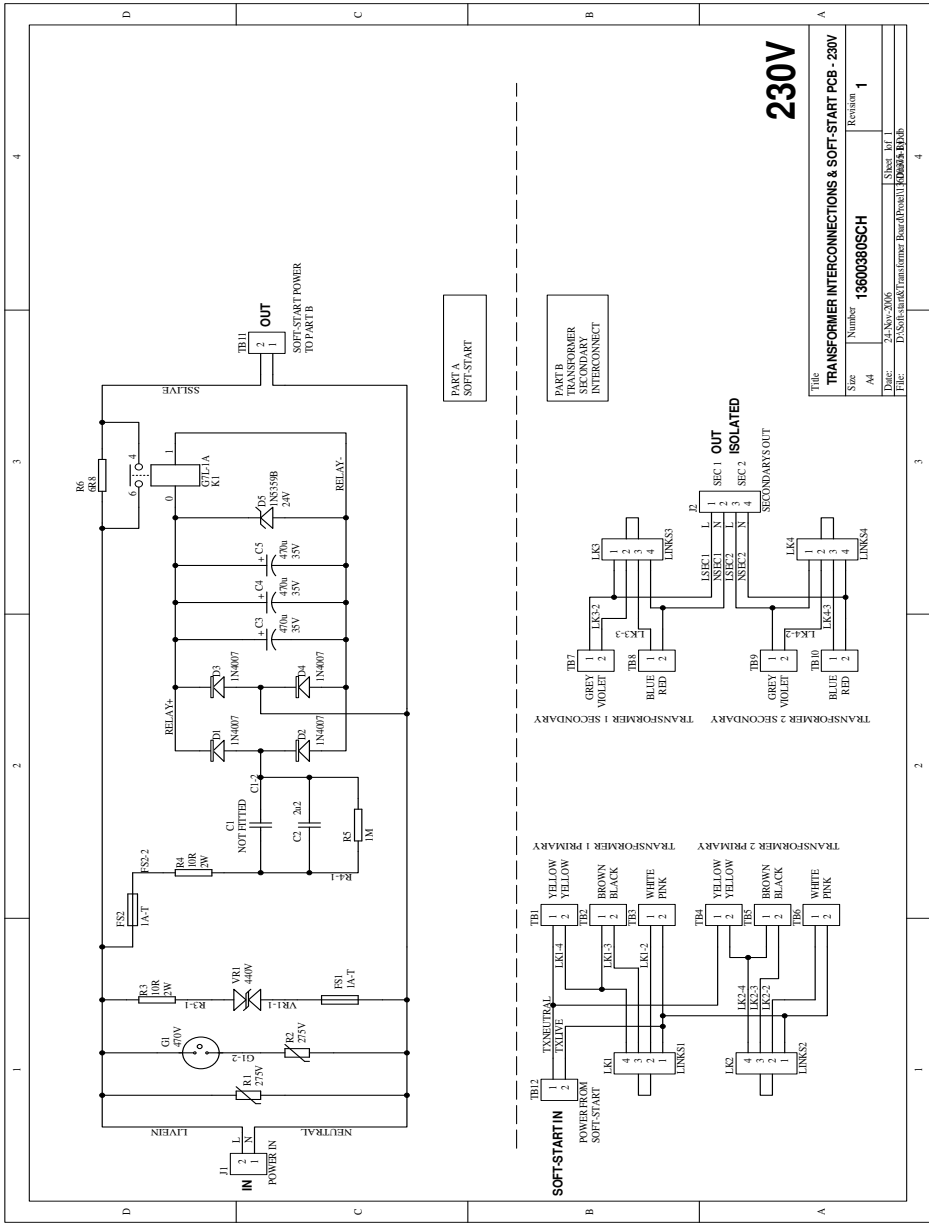


Schematic 28 - 13600379SCH Sirius Power Distribution 110VA

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Schematics



Schematic 30 - 13600379SCH Transformer Interconnections & Soft-Start PCB - 230V

NOTES



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