SERVICE DOCUMENT

Blower

Blower Problem can be identified into three types

1) Part-1(controller)

2) Part-2(Blower driver)

3) Part-3(Pressure sensor)

Part-1(Controller)

1) Set Microcontroller (STM32) DAC signal to 3.3v.

2) Check Microcontroller (STM32) DAC signal has 3.3v.

3) This signal is given to LM358.

4) Check LM358 gives 5.3v output to Blower driver.

Part-2(Blower driver)

1) Check Blower Driver has 24v DC input from Buck Converter.

2) Run a Blower to a Maximum Speed input signal comes from LM358.

3) check Pressure Above 60.

4) if Above condition becomes True Blower, Blower Driver, Blower Base, Pressure Sensor All are working.

5) if Above Condition becomes fail, Check Blower Ready pin.

6) Check Blower Ready Pin Status.

7) if Ready pin fails then Motor driver is Problem.

8) if Blower ready pin status becomes true Then Problem can be happened in Blower Base or Pressure sensor.

Part-3(Blower Base or Pressure Sensor)

1) check pressure sensor if pressure sensor is work then Blower Base is the Problem.

2) if pressure sensor is failure, then Blower base is working.

3) close the expiratory valve.

4) check NRV good one is placed.

5) check pressure sensor offset milli volt as 200 to 300 mv when it has 5v input.

6) connect fluke analyzer machine to device, then Run Blower with full speed and measure the Pressure sensor output voltage then subtract with above offset millivolt and then divide the value with 44.13(sensitivity of pressure sensor) we get one decimal value compare that value with fluke pressure value it will become +-1 cmh2o. if it comes true then Blower base is the problem or it comes fail pressure sensor problem. We use some mathematical calculation to obtain a pressure value in cmh2o.

Pressure\_sensor\_value = Pressure\_sensor\_Raw\_value - Pressure\_sensor\_offset\_value

Pressure\_in\_cmh20 = Pressure\_sensor\_value /44.13;

Pressure Sensor

1)check input voltage of the pressure sensor has 5v.

2)check voltage divider Resistors are good condition.

3)check filter circuit are good condition.

4)check Tubing Near Pressure Sensor is properly connected.

5) check NRV good one is placed.

6) close the expiratory valve.

7) Then check offset voltage it comes around 200 to 300 mv.

8)If Blower is working condition, then do the below step.

9)Then Run a Blower with full speed Then check the pressure sensor output voltage it will definitely give above 2.7v to below 3.2 volt. If this condition becomes true pressure sensor working or pressure sensor fault.

Flow sensor

Flow Sensor Problem can be identified into two parts.

1)Part-1(ADS1115)

2)Part-2(7002 sensor)

Part-1(ADS1115)

1)Check ADS1115 module has 5v input.

2)check ADS1115 has Pullup resistors in SCL and SDA line of I2C.

3)check I2C Communication between STM32 and ADS1115 module.

4)If this condition pass, then only goes to next part.

Part-2(7002 sensor)

1)check Input voltage of the flow sensor.

2)check filter circuit are in good condition.

3) check Tubing Near Flow Sensor is properly connected.

4)close the expiratory valve.

5)check NRV good one is placed.

6) Then check offset voltage it comes around 2.5v.

7)If Blower is working condition, then do the below step.

8)Remove a Test Lung, then Run a Blower full speed.

9)Flow sensor gives 2.9v output. if this result comes 7002 sensor is working otherwise it is faulty one.

Expiratory valve test

1) check expiratory valve GPIO status led indication pin ON and OFF when Expiratory valve open and close.

2) check PARKER valve has 12v input supply.

3) check 12v is cross from these circuit MOSFET, DIODE, RESISTOR to Parker valve when EXPIRATORY valve open and close.

4)check parker valve using hand when valve open and close. it can be felt when switching.

5)check expiratory valve flop is damaged or not.

6)check tubing direction.

7)check NRV is working condition

8) If Blower is working condition, then do the below step.

9)Run a blower to reach 60 cmh2o in this condition close a valve for 3 seconds.

10)Then off the blower in this condition open valve then maintain a minimum pressure on lung for three seconds.

Oxygen Supply failure

Oxygen problem can be identified by 2 parts

1)Part – 1(Parker valve + CIRUS sensor)

2)Part – 2 (servo motor)

Part – 1(Parker valve + CIRUS sensor)

1) Set Microcontroller (STM32) DAC2 signal to 3.3v.

2) Check Microcontroller (STM32) DAC2 signal has 3.3v.

3) close a servo motor, check servo motor closed. If it doesn’t work, then do the below part – 2 Otherwise Then follow 4th step.

4) check Proportional valve has 12v input.

5) DAC2 Signal is given as LM358 Reference signal1.

6) Then proportional valve open then oxygen flows to blower.

7) check oxygen flow sensor output gives the LM358 Reference signal 2 to maintain 3.3v.

8) If Blower is working condition, then do the below step.

9) Run a blower with full speed.

10) check O2 CIRUS sensor mv Reaches above 55mv.

Part-2(Servo motor)

1) if servo is not close check the PWM output is comes or not.

2) Then check the output of the optocoupler gives a PWM signal or not.

3) check servo correctly placed or not.

Nebulizer Test

1)ON the nebulizer check it is On or not.

2)OFF the Nebulizer check it is OFF or Not.

Led Test

1)Blink RGB LED’s Manually Works or Not.