



Model 6202-1

Reduced Oxygen Breathing
Device 2

Operator's Guide

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This manual is designed under the law under U.S. Patent Application No. 14/123,456.

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**READ THIS MANUAL CAREFULLY BEFORE USING THIS INSTRUMENT.
FAILURE TO DO SO MAY VOID THE WARRANTY,
DAMAGE THE INSTRUMENT OR CAUSE SERIOUS INJURY.**

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LIST OF ABBREVIATIONS / ACRONYMS

AC	Alternating Current
EMI	Electromagnetic Interference
HZ	Hertz
LCD	Liquid Crystal Display
LPM	Liters Per Minute
MFC	Mass Flow Controller
NAG	Nitrogen and Air Generator
P&ID	Piping and Instrument Diagram
PSIG	Pounds Per Square Inch Gauge
RFI	Radio Frequency Interference
SUT	Subject Under Test
VAC	Volts, Alternating Current
VDC	Volts, Direct Current

OVERVIEW

The second generation Reduced Oxygen Breathing Device (ROBD2) is a computerized gas-blending instrument. The system uses Thermal Mass Flow Controllers (MFC) to mix breathing air and nitrogen to produce the sea level equivalent atmospheric oxygen contents for altitudes up to 40,000 feet. The MFCs are calibrated on primary flow standards traceable to the National Institute of Standards and Technology (NIST). NIST is a federal agency whose mission is to develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life. Several safety features are built into the ROBD2 to prevent over-pressurization of the Pilot's mask and to prevent reduced oxygen contents below those being requested for a particular altitude. The software is Menu driven. The main operator's menu consists of three selections, simplifying the use of the system for the field operator. Built in self-tests verify all system component functionality before the operation of the system can begin. If any self-tests fail, the system will not operate.

This manual contains information and guidance for setting up and operating the ROBD2.

Step by step instructions are provided for connecting power and gas sources, running self-tests, running the self-calibration routines and running a pre-programmed sequence of altitudes on the subject under test (SUT).

Descriptions of alarms and safety features are provided along with actions to be taken in the event of an alarm condition.

A piping and instrument diagram (P&ID) is provided on the last page of the manual for an overview of the electrical, pneumatic and electro-pneumatic components contained within the instrument.

IMPORTANT: The ROBD2 operator should be certified in first-aid and CPR and have access to communication in the event of an emergency.

Prior to participation in ROBD2 training or research, the subject under test should have the equivalent to a FAA physical of any class or military flight physical and be screened for current health status prior to the run.

SYSTEM LAYOUT

Front Panel Layout



Figure 1 - Front panel layout

SYSTEM LAYOUT

LCD Display

The liquid crystal display (LCD) is a four line, 20 characters display, protected by a clear lens. The display is illuminated when the system is in operation.

Function Keys

Three function keys (F1, F2 and F3), located below the display, and are used to make various selections from the menu displayed on the bottom line of the screen. The current function of each key is displayed above each function key. The function of each key will change, depending on the current operating mode.

Advance and Stop keys (program)

The ADVANCE and STOP keys are used while running a program in the Pilot Test Mode (START mode). The STOP key aborts the program immediately upon pressing the key. The ADVANCE key immediately advances the program to the next step.

Numeric Keypad

The numeric keypad is used for data entry of numbers 0 through 9 and a decimal point. Pressing the ENTER key completes the entry of the numeric data selected.

Arrow Keys

The arrow keys are used to move the cursor on the display screen to and from different fields located on the different entry screens or to scroll up or down a menu or list of information. Pressing and holding the arrow keys will cause them to repeat.

Menu Key

The MENU key has no function while the system is in the Operator's mode. This key is used to move between multiple menus while the system is in the Administrator (ADMIN) mode. The ADMIN mode is restricted to those who program the ROBD2.

Oxygen dump switch

This emergency stop switch causes the supply of 100% O₂ to the subject under test.

Breathing mask connector

This female connection port (MS 22058-1), with spring-loaded cover, is for the pilot's breathing mask connection.

Pulse oximeter

The new 6202-1 pulse oximeter has a color touch screen. The details of the pulse oximeter are covered in the pulse oximeter section of this manual.

SYSTEM LAYOUT

Rear Panel Layout



Figure 2 - Rear panel layout

SYSTEM LAYOUT

Power Input

The power entry module supplies AC power to the internal power supplies. The internal power supplies convert and regulate the AC signal to the five DC voltages required by the system electronics. The power entry module has integrated EMI/RFI filtration and switch one or both hot lines dependent upon 110 or 220 VAC operation. The power entry module also has two replaceable fuses.

Gas Inputs

These gas inputs supply source gas to the system components. The optional quick connect fittings for these ports are colored and keyed. The Nitrogen input is black, the Air input is yellow and the oxygen input is green. The Nitrogen and air inputs should be pressurized to a dynamic pressure of 40 PSIG and the oxygen input should be adjusted to a dynamic pressure of 20 PSIG.

RS-232 Port

One 9-pin RS-232 serial port is connected to the embedded controller of the ROBD system. This port is used for remote control of the ROBD2 using a host computer and communications software. Communication protocol is provided in the programming and technical guide. This protocol can be used to develop control and data collection programs using programs such as National Instruments' LabVIEW.

Cooling fan

The cooling fan moves approximately 36 cu/ft per minute of filtered air through the ROBD chassis and out the cooling vents on the top cover of the chassis. The cooling fan should not be obstructed.

Service port

The service port is used for factory calibration of the thermal mass flow controllers.

Important: The silver plug must not be removed during normal operation.

Pulse oximeter probe connector

Plug the pulse oximeter probe into this port. Once connected the probe is latched. The probe is removed, by pressing the side tabs on the probe connector and pulling it out.

SYSTEM LAYOUT

Vent port

This port vents the excess flow of gas not used during inhalation and exhalation and also limits the pilot mask pressure.

Important: A filtered vent plug has been installed into the vent port. This vent plug will provide a slight positive pressure to the breathing mask. If the absence of positive pressure is desired, remove the threaded plug. When the instrument is not being used, reinstall the plug. This vent plug should only be hand tightened. Do not install any other type of fitting into this port, as the breathing loop may become over-pressurize and cause damage to the instrument.

Note: Removing the vent plug does not diminish the amount of gas, that the subject under test receives, when inhaling.

UNPACKING AND INSTALLATION

Standard packaging and unpacking

1. Remove the system from the cardboard box in which it was delivered from the factory.
2. Remove and read any important instructions or notes found within the box.
3. Save and store the box and foam inserts in the event the system needs to be returned to the factory or delivered to another site for operation.
4. If the optional pressure regulators were purchased with the system, they are delivered in a separate box.

Transport case option and unpacking

1. The transport case is provided with the ability to be locked. If a lock has been added, remove the lock and undo the rotary latches.
2. Remove the cover and pull the system out by the side handles.
3. If the optional pressure regulators were purchased with the system, they are stored under the area taken up by the ROBD2.

Installation

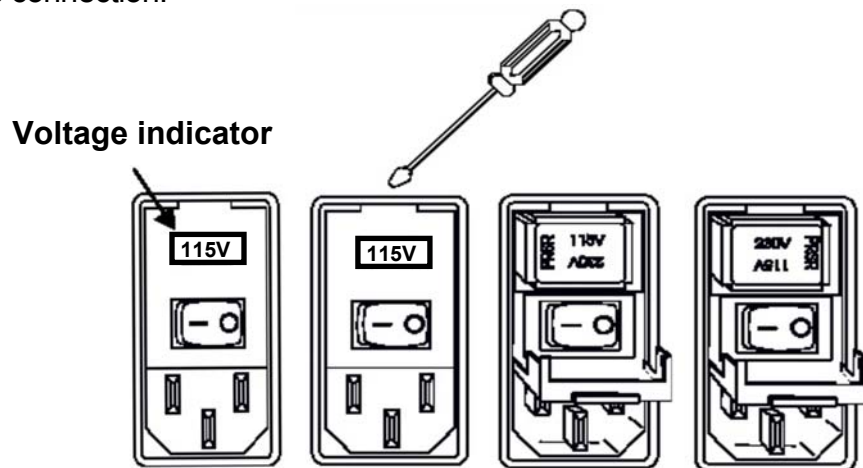
1. Install the system on a table or cart
2. Remove caps on the N₂, air and O₂ in ports. Do not remove the plug in the Service port or the vented plug in the Vent port. See the rear panel layout section, on page 6 for instructions for the vent plug in the vent port.
3. Proceed to the section titled *Power and gas connections*.

POWER AND GAS CONNECTIONS

After the ROBD2 is unpacked, the system should be connected to power and the appropriate gas sources to the gas inlet ports on the rear panel. Environics recommends the use of a power conditioner, as recommended for computers, to eliminate power problems from affecting system operation.

Power Connection

1. The indicating insert of the power entry module should read either 115V or 230V dependent upon the actual voltage being used. If it is not set for the voltage being connected, remove the insert, rotate it to the correct setting and reinstall; see below. Set for 115V for 100-120 VAC 50/60 HZ and 230 V for 200-240 VAC 50/60 HZ operation.
2. Insert the standard power cord supplied with the system into the power connector on the rear panel and insert the plug into a properly grounded outlet. The standard unit allows for 110 – 240 VAC (50/60 Hz).
3. Do not turn the power on at this point, proceed to the section titled Gas connection.



Gas Connection

Input Gas Connections

Input Gas connections are keyed and colored quick connect fittings.

1. On the rear of the ROBD2, connect the air (yellow) and nitrogen (black), at a pressure of 40 to 50 PSIG, to the respective ports. Connect the 100% oxygen (green) source at a pressure of 20 PSIG. These pressures may need to be adjusted while the system is flowing. The above listed pressures are dynamic.

It is important that the gas pressures stay within the ranges specified for each gas port. Otherwise, the system may produce gas blends that fall outside the accuracy specifications of the system.

2. Connect the pilot mask to the Breathing mask connector on the front panel of the system.
3. Proceed to the Section titled *Power-up and self-tests*. As an option the following *Quick start* procedure can be used. This is a less detailed step by step guide on how to operate the instrument.

QUICK START PROCEDURE

1. Before Powering on the system make sure to perform the steps outlined in the section titled *Power and gas connection*.
2. Connect the pulse oximeter probe any time before or after powering on the instrument.
3. Power on the system.
4. Allow the warm-up time to elapse (10 minutes)
5. Once warm up time has elapsed, press the SELFTST function key. Follow the self-test prompts carefully as errors in following the prompts will cause failures in the self-test. After the self-tests have run, the system will perform a self-calibration. The O₂ sensor will calibrate and test altitudes will be performed.

DANGER: During self-tests, gas will be delivered to the mask and vent port. Do not breathe through the mask during the self-test or self-calibration process, since oxygen will not be present at all times.

6. The pilot's mask can now be connected.
7. Press the START key to enter the PILOT TEST MENU.
8. Enter RUNPRG to run a pre-programmed sequence. Select one of twenty pre-saved programs.
9. Either allow program to complete or select **MENU** to run a manual altitude. Manual altitude will interrupt the program. Select **EXIT** to return to the program.
10. Select **ADVANCE** or **STOP** keys to perform the respective function. **ADVANCE** will automatically skip to the next step in the program, **STOP** will abort the program.
11. If the subject is at risk of becoming hypoxic, press the O₂ **DUMP** emergency switch. Once the switch is turned off (turn clockwise) the flow of 100% O₂ will stop.

POWER UP AND SELF-TESTS

Power up

The system power switch is on the rear panel power entry module. It is important that all gas connections are made before self-tests. Refer to the section titled Gas connection.

Warmup

The system requires a 10 minute warmup period after it is powered up. During the warmup period, the screen will display WARMUP and show a 600 second (10 minute) countdown. During the warmup period, the system cannot be run and no self-tests can be performed. The only available function is the OPTION key. After the warmup period, the system will show TEST ERR, indicating that the system self-tests have not been run. The SELFTST function key is now available, allowing the system self-test to be run.

Self-test/calibration

Pressing the SELFTST key will automatically run all self-test and calibration steps sequentially. Some tests require user interface while others do not.

At any time after the system has been powered up and self-tests have run for the first time, these self-tests can be run again, either individually or all together, from the OPTION menu. This is useful for troubleshooting purposes to detect a failure that has occurred after the initial power up self-test routine.

Select SELF-TEST from the options menu to run the system self-tests. Select SELF-CALIBRATE to run the system calibration functions, including O₂ sensor calibration.

DANGER: During self-tests, gas will be delivered to the mask, breathing bag and vent port. Do not breathe through the mask during the self-test or self-calibration process, since oxygen will not be present at all times.

Self-test Operations

Oxygen sensor test

The oxygen sensor test will check the on-board oxygen sensor accuracy. The system will provide air to the sensor for 20 seconds and report the O₂ content as read by the un-calibrated O₂ sensor. If the O₂ content falls outside the limits set by the test, the test will fail. Click OK to acknowledge the failure.

Oxygen dump test (tests the O₂ switch, O₂ valve and alarm)

This test checks the operation of the emergency oxygen dump switch and the valve that provides the flow of 100% oxygen. The operator will be prompted in this test to activate and de-activate the dump switch. Pay close attention to the prompts. After the switch is tested, the system will verify the operation of the DUMP valve by verifying that the O₂ sensor reads 100% O₂. Finally, the test will sound the audible oxygen alarm. The operator will be prompted to press **OK** if the alarm is audible and **FAIL** if it is not.

Oxygen pressure switch test

This test will verify that the oxygen pressure switch works properly. The operator will be prompted to remove pressure from the oxygen port. This can be done by disconnecting the hose at the O₂ cylinder. The quick connect fitting on the gas regulator has a check valve. When the hose is removed, the gas regulator is isolated. Be sure to follow the prompts carefully.

Pulse Oximeter test

This test verifies that the embedded micro controller, of the ROBD2, can communicate with the integrated pulse oximeter and that the pulse oximeter has passed its own internal self-test. The pulse oximeter has its own built in self-test which runs upon power up.

Air MFC shutdown test

This test confirms the operation of a safety feature to shut the system down in the event of low input air pressure. The air MFC has an alarm signal that activates if the internal MFC valve opens to maximum capacity. This generally indicates that there is not enough pressure on the MFC to satisfy the required flow rate. This would lead to elevated N₂ levels in the breathing loop during normal operation. This feature uses the MFC alarm signal to stop flow and provide 100% oxygen to the breathing loop. The operator must follow the prompts to disconnect and reconnect the air source to confirm the passage of test.

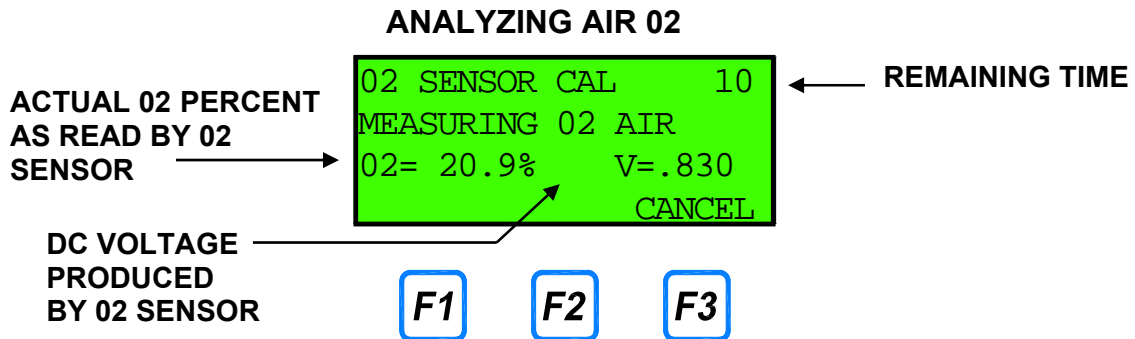
Self-Calibration Operations

Before running programs, the system must run through its self-calibration routine at the start of each operating day, and every time the system is powered on. These tests will run automatically after the system has warmed up for 10 minutes. If this process is not run, the system will not allow the operator to enter the START mode. At any time after the system has run the automatic self-test function, individual self-tests or self-calibration routines can be run individually from the OPTION menu. To run the self-calibration sequence, select the self-calibration menu item from the OPTION menu. Depending upon the gas source being used, the self-calibration process will vary. Either way, no operator interface is required during each self-calibration routine.

Oxygen sensor calibration

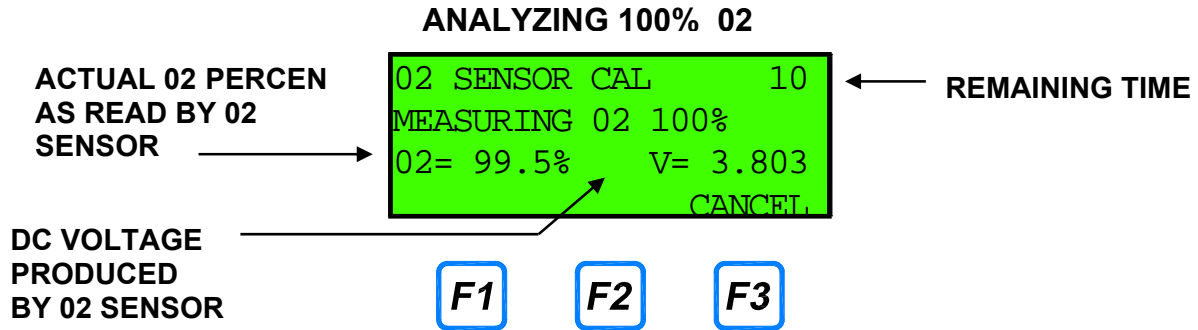
The oxygen sensor calibration is run automatically from the SELFTST key, or can be run separately by selecting CAL O₂ SENSOR from the OPTION – SELF CALIBRATE menu.

To calibrate the oxygen sensor, first air is delivered to the oxygen sensor. The O₂ content of air is known to be 20.947. The following will be displayed:



POWER UP AND SELF-TESTS

Once the system has calibrated the sensor for air, it will proceed to supplying 100% O₂ to the sensor. The following will be displayed:

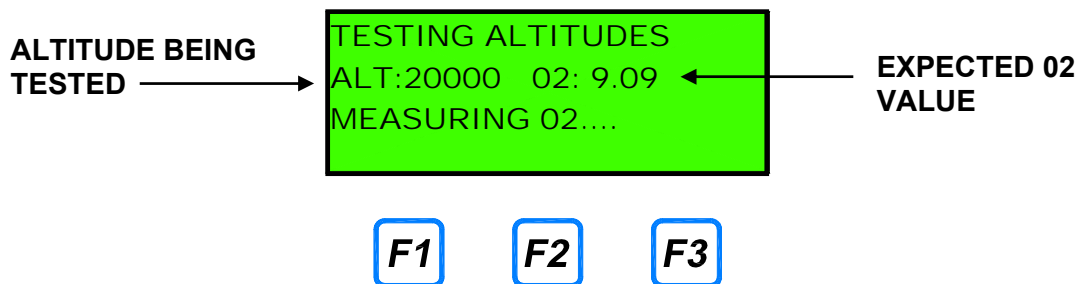


Once the sensor has calibrated to 100% O₂, the calibration will display complete and automatically move on to the next calibration routine. If any failures occur during this test, refer to the troubleshooting section in the *Programming and Technical Guide*.

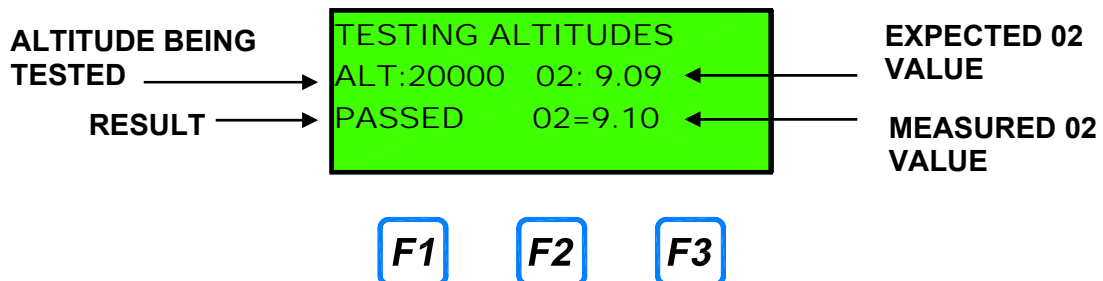
Pressing **CANCEL** during the process will terminate the calibration process and the new calibration data will not be stored.

Test altitudes

This routine checks the accuracy of the blending system and the oxygen sensor by running air and nitrogen blends that span the full range of the MFCs. Three altitudes are tested; 5000 feet, 20000 feet and 34000 feet. From the **OPTION** menu, select **TEST ALTITUDES**. The following information will be displayed during the testing of each altitude:



The following information will be displayed after each altitude is tested:



SYSTEM OPERATION

Entering data

At various times during system operation the operator is required to enter data into the system.

Entry of numeric data is performed by using the numeric keypad. Press the number key(s) representing the desired data values and press `ENTER` to record the data in the appropriate field. If the numbers entered completely fill the field, the value is automatically accepted and the `ENTER` key is not required. Pressing an arrow key will also complete the entry and move the cursor to another field. The system automatically adds a decimal point followed by zeros to fill the rest of the field, if required.

For fields requiring alphanumeric data to be entered, the arrow keys may also be used to input data. The following listing shows the order of the alphanumeric and punctuation symbols that can be accessed by pressing the up and down arrow keys:

ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789.+-/()%#

Note that the digits **0 – 9** and **.** can also be entered directly by pressing the corresponding key on the numeric keypad.

To enter alphanumeric data, press the up/down arrow until the desired character is displayed. Then press the `ENTER` key, or use the left/right arrow keys to position the cursor in the desired location.

The `SPACE` function key is used to enter a blank space.

The `CLEAR` function key will clear all data entered.

The `ENTER` function key will complete the entry of data.

Main Screen - Ready mode

The ROBD2 was designed with emphasis on simplicity and ease of operation. The system's menu-driven software guides the operator through all operating routines. The following menu items are available to the user.



```
(DAY) (DATE) (TIME)
ENVIRONICS ROBD2
READY
START SELFTST OPTION
```

START

The START key is used to enter the Pilot Test mode. The Pilot Test mode is where all pilot testing takes place. The START key is disabled until the warmup time has elapsed, and all self-test and calibration operations have completed successfully.

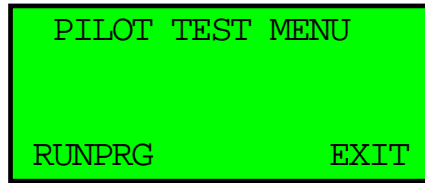
SELFTST

The SELFTST key runs the system self-test and calibration operations. These operations must be run before the START key can be used to enter the Pilot Test mode. The menu selection disappears after the Self-test process has run. Self-test and self-calibration routines can be run individually or together from the OPTION menu.

OPTION

The OPTION key is used to enter the OPTION menu, which is used to set various system options, display self-test results and run self-test and self-calibration. Also, the OPTION menu is used to set time and date, adjust display contrast and view software revision and system serial number.

START – Pilot Test mode

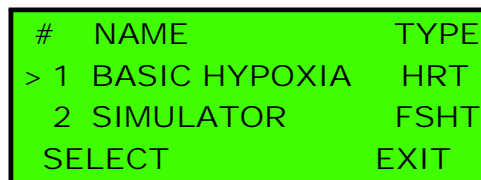


Standby status in Pilot Test mode

Once in this menu, the operator can select to run a program.

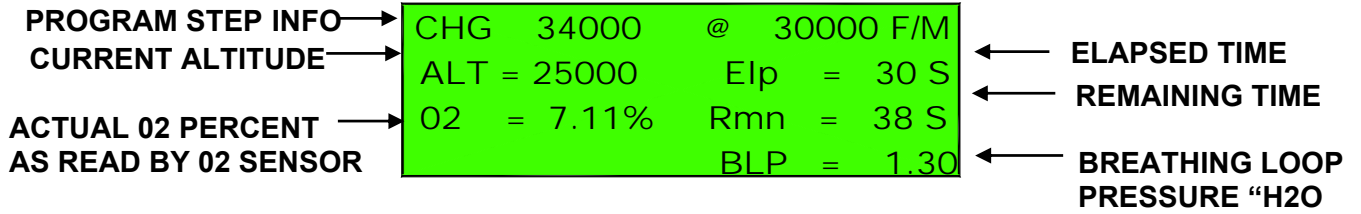
RUNPRG – Running a flight profile

The RUNPRG mode is used to conveniently recall one of 20 saved programs with up to 99 steps of altitude changes. The program must be setup prior to using the RUN mode (refer to the PROGRAM mode section of the technical manual). When entering the RUNPRG mode, the following screen will appear (Note: program names shown are for example purposes only).

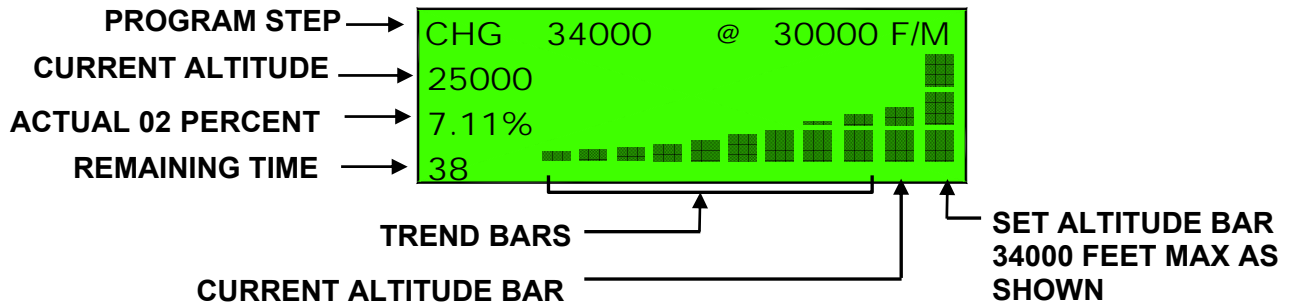


Using the up and down arrow keys, select the program to run. The highlighted program will have the greater than sign to the left of the program number. NOTE: this mode requires instrument pre-programming. This programming information is in the Programming and technical manual. The following information will be seen in two separate screens. By pressing the **MENU** key and **VIEW**, the screens can be toggled.

RUNPRG SCREEN 1



RUNPRG SCREEN 2



RUNPRG EXAMPLE

- STEP 1: HOLD AT 34000 FEET FOR 2 MINUTES
- STEP 2: CHANGE TO 0 FEET AT 18000 FT/MIN
- STEP 3: HOLD AT 0 FEET FOR 1 MINUTE
- STEP 4: CHANGE TO 20000 FEET AT 30000 FT/MIN
- STEP 5: END OF PROGRAM

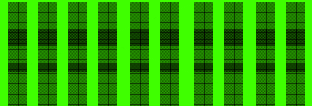
STEP 1:

SCREEN 1

```
HLD 34000 FOR 2 MIN
ALT = 34000 Elp = 50S
O2 = 4.4% Rmn = 70S
BLP = 1.35
```

SCREEN 2

```
HLD 34000 FOR 2 MIN
34000
4.40%
70
```



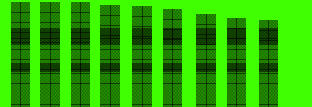
STEP 2:

SCREEN 1

```
CHG 0 @ 18000 F/M
ALT = 34000 Elp = 20 S
O2 = 4.37% Rmn = 113 S
BLP = 1.20
```

SCREEN 2

```
CHG 0 @ 18000 F/M
34000
4.37%
113
```



STEP 3:

SCREEN 1

```
HLD 0 FOR 1 MIN
ALT = 0 Elp = 10S
O2 = 21.2% Rmn = 50S
BLP = 1.25
```

SCREEN 2

```
HLD 0 FOR 40S
0
21.2%
50
```

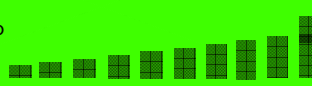
STEP 4:

SCREEN 1

```
CHG 20000 @ 30000 F/M
ALT = 13000 Elp = 26S
O2 = 12.42% Rmn = 14S
BLP = 1.42
```

SCREEN 2

```
CHG 20000 @ 30000 F/M
13000
12.42%
14
```



While in the RUNPRG mode, pressing the **STOP** key will abort the program.

Pressing the **ADVANCE** key while in the run mode will advance the program to the next step, regardless of how much time remains in the current step.

Pressing the 02 DUMP switch will cause the program to shut down and the system will supply 100% O₂ to the SUT. O₂ will continue to flow until the dump switch is disengaged by turning it clockwise.

Pressing the MENU key while in the run mode will toggle the screens back and forth between the two run mode display screens. One screen contains the bar graph representation of desired altitude, actual altitude and a running trend of altitude. The other display screen gives more detailed information, including breathing loop pressure, elapsed step time, remaining step time, actual O₂ content as read by the onboard oxygen sensor, desired altitude, current altitude and the actual program step information.

Manual altitude override

While in the RUNPRG mode, you can manually override a program step and go directly to any desired altitude. Entering a manual altitude will pause the current program and ascend or descend to the new altitude entered.

To enable manual altitude control while running a program, press the **MENU** key and then select **MANUAL**. Enter the new altitude and press **ENTER**.

You can enter new altitude values as often as desired. You can also increase or decrease the current altitude in increments of 1000 ft., but pressing the up or down arrow keys.

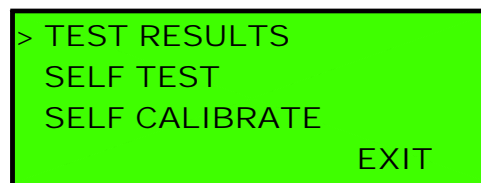
To resume the program from where it was interrupted, press **EXIT**

SYSTEM OPERATION

Option menu

The OPTION menu is used to run self-test and self-calibration functions, and to change various system settings.

Pressing the OPTION key will bring up the following display.



The OPTION menu contains a menu with the following items:

```
TEST RESULTS
SELF-TEST
SELF CALIBRATE
ROBD FLOW RATE
ADMIN MODE
SET TIME/DATE
ADJUST CONTRAST
SYSTEM INFO
```

Select the desired function by using the arrow keys, then press ENTER.

TEST RESULTS

The Test Results function displays the results of all Self-test and Self Calibrate functions. The test item is listed on the left, with the result shown on the right. Below is a sample test result display:

```
TEST RESULTS
PULSE OXIM      - OK
O2 DUMP VALVE   - OK
O2 DUMP SWITCH  - FAIL
O2 DUMP ALARM   - OK
O2 PRESS SW     - OK
O2 SENSOR       - OK
O2 SENSOR CAL   -SKIP
ALTITUDE TEST   -SKIP
AIR MFC SHUTDN -FAIL
```

"OK" indicates that the test has been run and completed successfully.

"FAIL" indicates that the test has been run but has failed.

"SKIP" indicates that the test has been skipped and has not yet been run.

The software will not allow access to the PILOT TEST menu until all tests show "OK"

Press the EXIT key to return to the OPTION menu.

SELF-TEST

The Self-test function allows various self-tests to be run, either all at once or individually. The available menu items are shown below.

```
TEST ALL
TEST MFCS
TEST O2 SENSOR
TEST O2 DUMP
TEST O2 PRESS SW
TEST PRESS SENSOR
TEST PULSE OX.
TEST MFC SHUTDOWN
```

To run all Self-tests, position the cursor on TEST ALL and press ENTER. For each self-test, the software will ask you to confirm that you want to run the test. Select YES to run the test, or NO to skip to the next test.

SYSTEM OPERATION

To run an individual self-test, position the cursor on the desired test and press ENTER.

While a test is running, you may be prompted to perform various actions. Be sure to follow the prompts carefully, otherwise the test may fail. In the event that a test fails, you will be prompted with "TEST FAILED. REPEAT TEST?". Press YES to rerun the test, otherwise press NO.

SELF CALIBRATE

The Self Calibrate function allows self-calibration checks to be run, either all at once or individually. The available menu items are shown below.

CAL ALL
CAL O2 SENSOR
TEST ALTITUDES

To run all Self Calibrations, position the cursor on CAL ALL and press ENTER. For each test, the software will ask you to confirm that you want to run the test. Select YES to run the test, or NO to skip to the next test.

To run an individual test, position the cursor on the desired test and press ENTER.

While a test is running, you may be prompted to perform various actions. Be sure to follow the prompts carefully, otherwise the test may fail. In the event that a test fails, you will be prompted with "TEST FAILED. REPEAT TEST?". Press YES to rerun the test, otherwise press NO.

ROBD FLOW RATE

The flow rate of the 6202-1 is adjustable from 40 LPM to 80 LPM. The nominal setting is 50 LPM to provide enough gas flow to the subject under test while preserving valuable gas. However, if there is not enough flow to satisfy a subject under test, it can be increased.

NOTE: With the new flow range of 40 to 80 LPM for mask flow, adjust the pressure of O2 accordingly to match the flow of O2, during emergency oxygen delivery, to the total mask flow during a flight profile. Do not exceed 35 PSIG on the oxygen pressure setting.

ADMIN MODE

The ADMINInstrator MODE allows access to Administrator level functions, which include programming of test routines (PROG mode) and system functions (SYSTEM mode) such as MFC calibration.

To enter ADMIN mode, select ADMIN MODE from the menu and press ENTER. If there is an Administrator password, you will be prompted to enter it. If there is no password, the system will automatically switch to ADMIN mode.

To exit ADMIN mode, select ADMIN MODE from the menu, and press ENTER. The system will disable administrator mode, regardless of any password setting.

When the system is in Admin mode, "ADMIN" will be displayed on the main menu screen.

SET TIME/DATE

The SET TIME/DATE function allows you to set the Time and Date displayed on LCD screen. Three fields to display the day, date and time will appear.

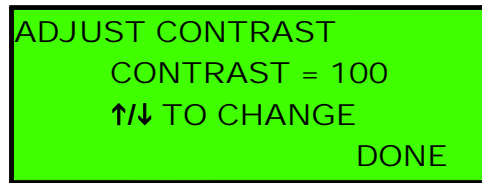
With the left/right arrow keys, move the cursor to the desired date or time field to be changed and press the up and down arrow keys to set the correct time and/or date. Note: the day of the week is calculated by the system automatically.

When the correct time and date are entered, press the EXIT function key to return to the OPTION menu.

ADJUST CONTRAST

The contrast of the LCD display is affected somewhat by the angle at which the display is viewed as well as the ambient temperature. To adjust the contrast for optimum results:

1. Using the up and down arrow keys, move the pointer cursor down to the line that reads **ADJUST CONTRAST** and press the `ENTER` key. The following screen appears:



2. Press the up arrow to increase the contrast on the screen. When increasing the contrast, the contrast number will increase to a maximum 100. Use the down arrow to decrease the contrast on the screen. When decreasing the contrast, the contrast number will decrease to a minimum value of 0. The numerical value is shown for reference since the user may not detect a change in contrast on the screen. The contrast value will change in increments of five.
3. After reaching the desired contrast setting, press `DONE` to return to the `OPTION` menu.

SYSTEM INFO

Selecting System Info will bring up a display of the system model number, serial number and software version.

SAFETY FEATURES

There are a number of built-in safety features to either alert the operator or stop the operation of the system and go to a “safe” mode of operation.

Oxygen dump switch

An emergency Oxygen Dump switch has been provided to supply 100% oxygen on demand as the subject under test (SUT) becomes hypoxic. The emergency switch is activated by depressing it, which starts the flow of oxygen. Once the SUT has recovered as determined by pulse oximeter analysis, turning the switch clockwise will stop the flow of 100% O₂.

When the O₂ dump switch is pressed, the following screen appears, assuming a program is running. Data displayed will be dependent upon altitude

```

===TEST ABORTED===
ALT=28000      EIp=4S
OXYGEN DUMP PRESSED
DELIVERING 100% O2
  
```

F1

F2

F3

The concentration of oxygen read by the internal O₂ sensor will be displayed. If the concentration of oxygen is not above 90% within 5 seconds, an internal alarm will sound. Also, if the concentration of O₂ drops below 90% after 5 seconds, the alarm will sound. The alarm is deactivated at the time the O₂ dump switch is disengaged and the system will go into standby status in the pilot Test Menu.

NOTE: With the new flow range of 40 to 80 LPM for mask flow, adjust the pressure of O₂ accordingly to match the flow of O₂, during emergency oxygen delivery, to the total mask flow during a flight profile. Do not exceed 35 PSIG on the oxygen pressure setting.

Oxygen pressure switch

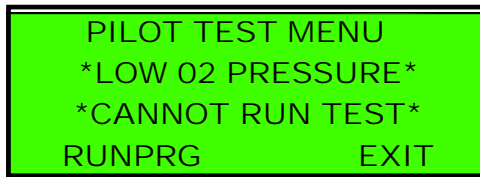
The oxygen pressure switch monitors the input pressure on the oxygen port. This prevents operation of the system if there is insufficient pressure to supply enough O₂ to the SUT when the O₂ Dump Switch is activated.

This pressure should normally be set between 15 and 20 PSIG. If this pressure is less than 10 PSIG, the system will not allow any Pilot Test operations.

SAFETY FEATURES

If Low O₂ Pressure is detected in the Ready mode, the system will display LOW O₂ instead of READY, on the screen

In the Pilot Test Menu, if any of the Pilot Test keys (RUNPRG or PPT) are pressed during a Low O₂ Pressure condition, the system will display the following screen and prevent the system from running in the Pilot Test Menu.



The system will once again function when pressure is restored above 12 PSIG.

Oxygen alarm

The O₂ alarm will sound for two different scenarios. The O₂ alarm is only active for the O₂ dump feature. After pressing the emergency oxygen dump switch, if the O₂ has not reached 90% in 5 seconds, the alarm sounds. The alarm will remain active until the emergency switch is turned off. Also, if during an O₂ dump, the oxygen content drops below 90%, the alarm will sound.

Oxygen analysis

Using the onboard oxygen sensor, if the oxygen content, in any pilot test mode, drops below 3.8%, the system will automatically turn on the oxygen dump and display a warning message.

Overpressure detect

Using the onboard pressure sensor, if the pressure to the mask rises above 20" H₂O, the system will turn on the oxygen dump

Low air flow detect

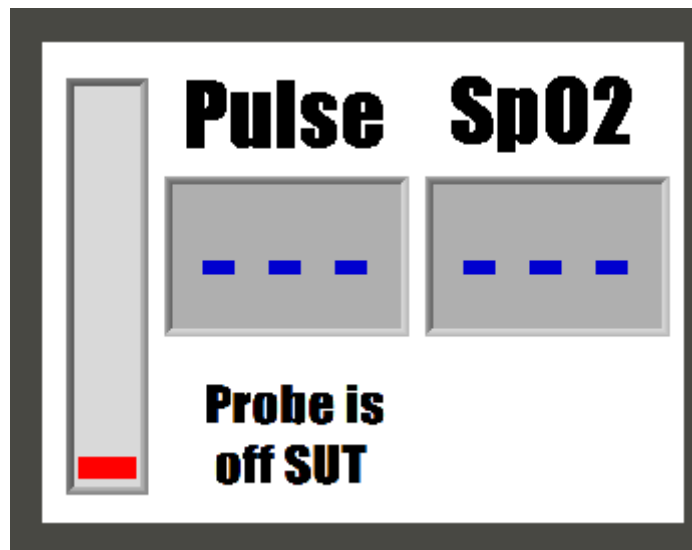
The Air MFC (MFC1) has an alarm signal that activates if the internal MFC valve opens to maximum capacity. This generally indicates that there is not enough pressure on the MFC to satisfy the required flow rate. This would lead to elevated N₂ levels in the breathing loop during normal operation. This feature uses the MFC alarm signal to stop flow and provide 100% oxygen to the breathing loop. A message appears indicated the failure.

PULSE OXIMETER

SpO2 and Pulse Rate Displays

Like the 6202 pulse ox, the 6202-1 takes about 10 seconds after placing the probe on the finger to register valid data. This is inherent to the pulse oximeter electronics/firmware.

The measured SpO2 and pulse rate are displayed side by side as shown in the diagram below. The oximeter ensures that only valid pulsatile signals are processed. Bad, invalid or the absence of data causes alerts to occur and may also cause the displays to show “- - -” and “- - -” in the SpO2 and pulse rate displays.



The displays are updated every half a second as the monitor is acquiring data. The message box, in the lower left hand corner of the display, will indicate whether or not the probe is connected to the unit or if the probe is connected to the unit, but not connected to the SUT. Otherwise, when actively displaying valid data, this message box will be blank. The area in the lower right corner of the display is used for alarms and information related to the pass or fail state of the internal self-test of the pulse oximeter.

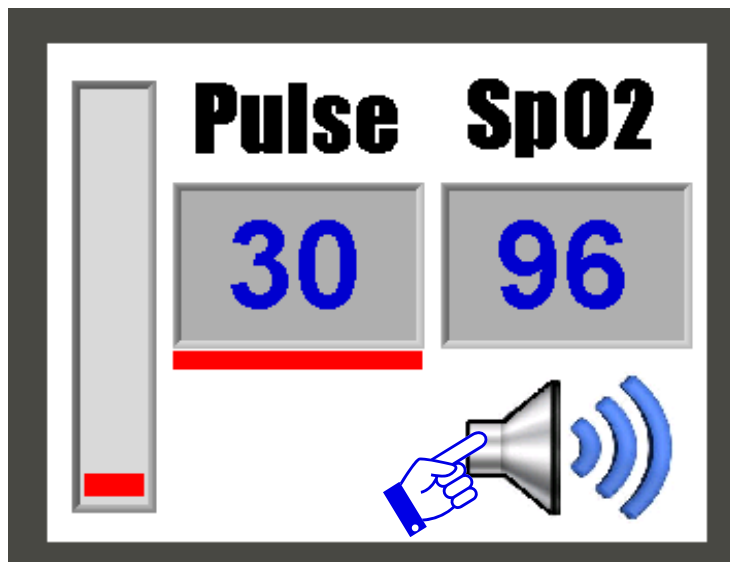
Pulse Activity Bar

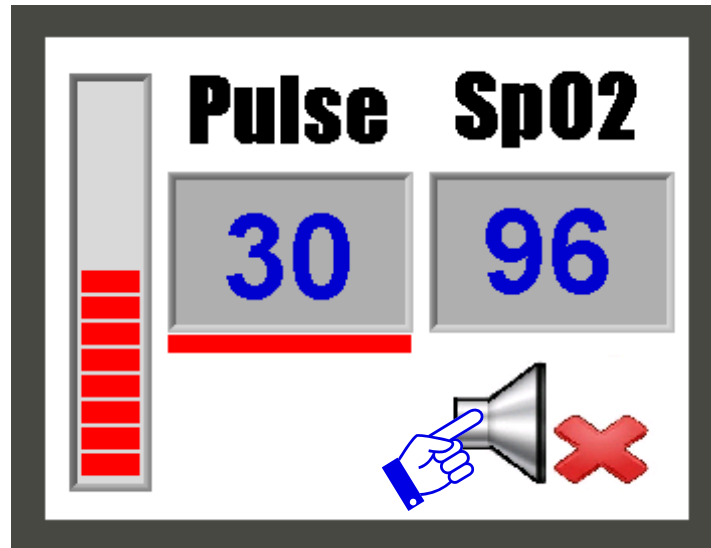
The signal bar or pulse activity bar, on the left side, is derived from the pulsatile signal that is measured by the monitor. The height of the bar, with each pulse beat, is proportional to the strength of the signal. This pulse activity bar represents the subject's pulse and should show regular rhythmic movement. Erratic or non-rhythmic movement may indicate a poorly positioned or applied sensor, or may be indicative of excessive subject movement at the sensor site.

SpO2 and Pulse Rate Alarms

Alarm Limit Violations

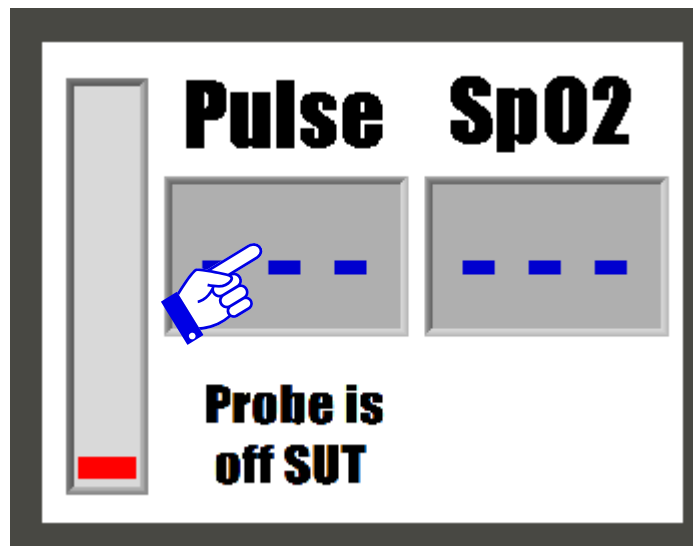
When the oximeter detects SpO2 or pulse rate values that exceed either the high or low limits, both an audible alarm tone and visual alarm are generated. The audible alarm volume can be adjusted, or an alarm can be muted. The visual alarms are the speaker icon below and the out-of-range numeric value. The numeric value, which is out-of-range, will flash when a violation is active. If the alarm condition no longer exists, the alarms will stop. An alarm bar shows up to give a quick indication of which alarm value is in violation. In the case below, it is low pulse. If it were a high alarm violation, the bar would be fixed above the value exceeded. To mute the speaker, press the speaker icon while it is active. The icon will change, as seen on the top of the following page. To mute the alarm indefinitely, set the volume of the alarm to zero.





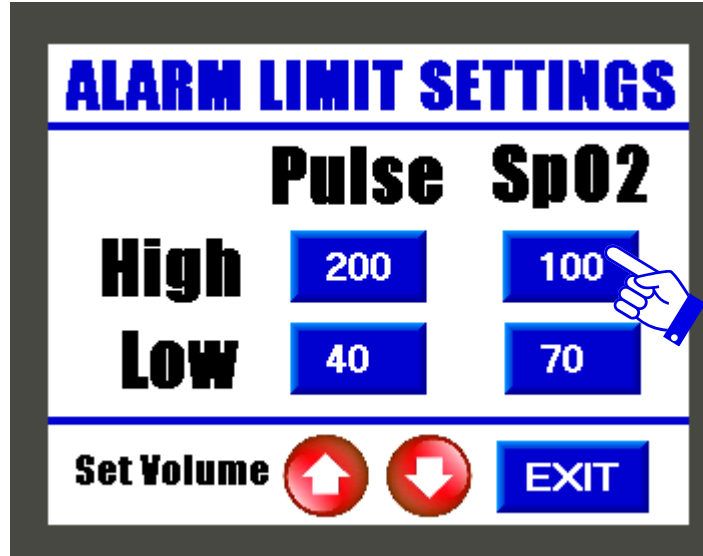
Setting SpO₂ and pulse rate alarm limits

To access the alarm setting screen, press the pulse or SpO2 display windows shown below. For touchscreen variables either a finger or stylus can be used.



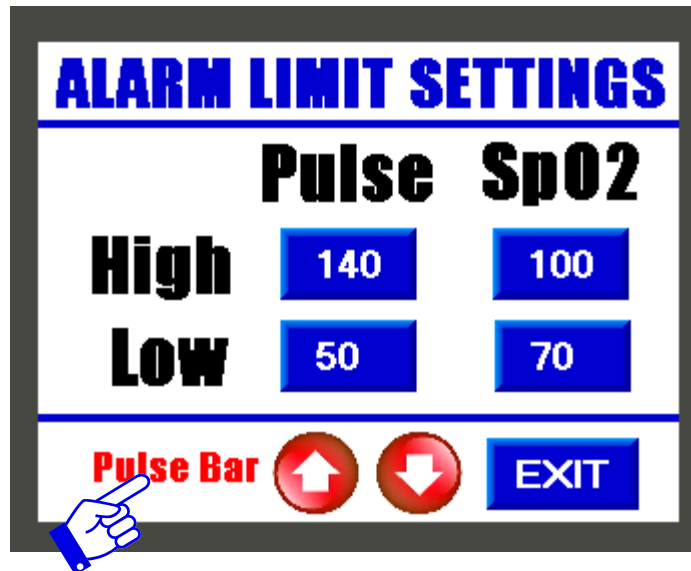
PULSE OXIMETER

Press on one of the four blue limit buttons and a virtual numeric keypad, shown below, will appear. Enter the new value and press the enter key. This will accept the new value back into the screen below and save it indefinitely. If an alarm becomes active, access to the alarm setting screen is denied until the alarm condition clears. If an alarm condition becomes active while in the alarm setting screen, the HMI will jump to the main pulse oximeter screen.



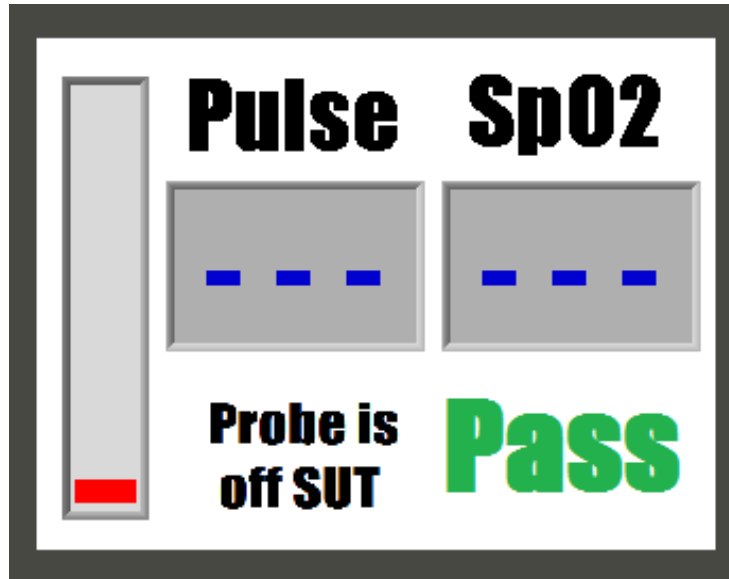
Adjusting the alarm and pulse bar volume

To change the pulse bar, pulse alarm, and SpO2 alarm volumes, press Set Volume. Each time that field is pressed, the new variable to adjust will appear. Once on the desired variable, press the up or down arrow key. The value setting will flash on the screen and the beeper will beep to the new volume level. The pulse bar volume and both alarm volumes are factory set to 1; the lowest audible volume. To indefinitely disable the volume for either of these setting, set the volume to zero.

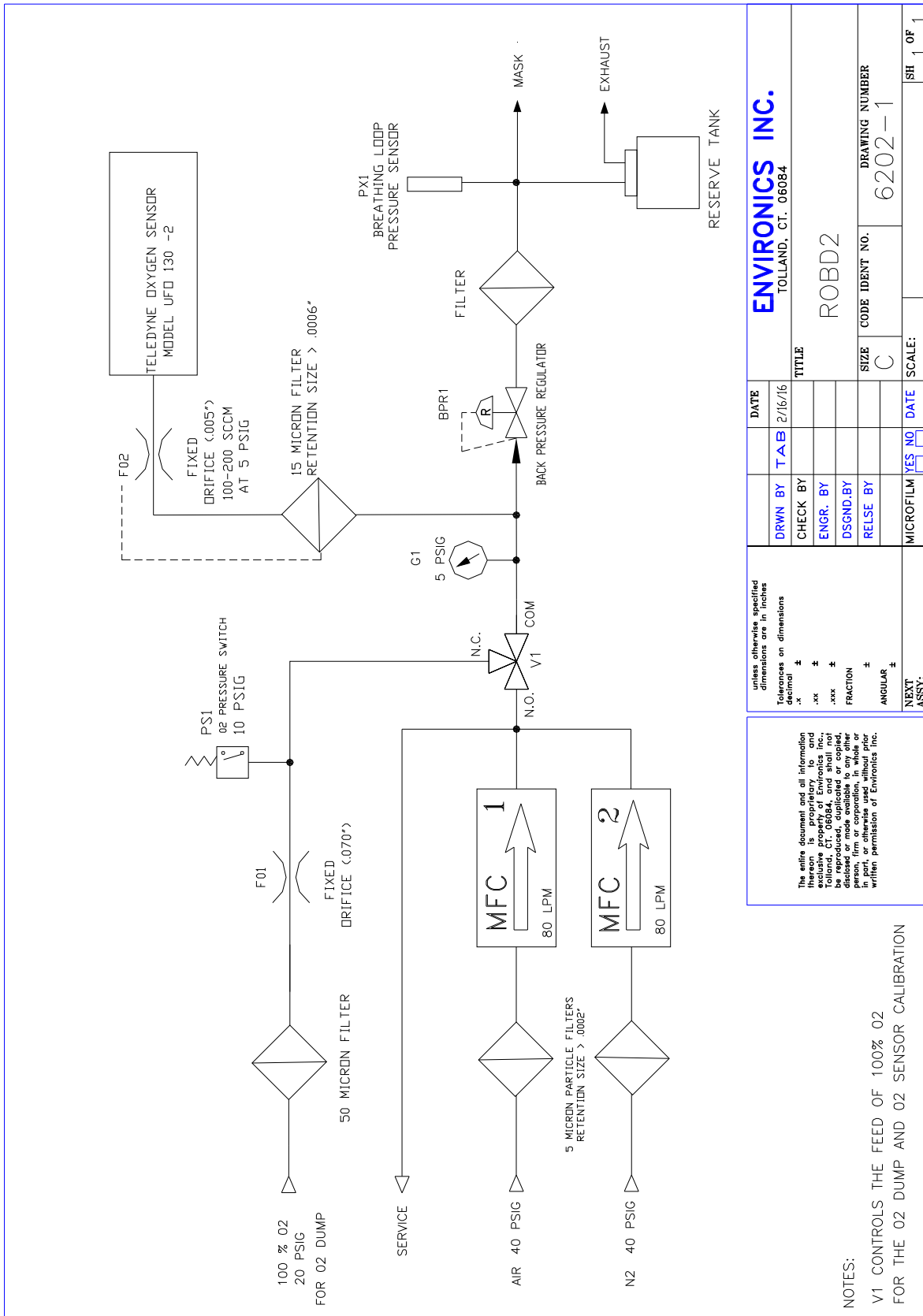


Pulse oximeter self-test

When the 6202-1 is powered on, the classic tone sequence of the 6202 pulse oximeter will be heard. After the initial sound sequence, there will be a single tone, within about 8 seconds, and the screen will flash pass in the lower right hand corner. This means that the internal pulse oximeter self-test has passed. If for some reason the internal self-test fails to pass, the word fail will appear and remain on the screen until the self-test passes. This will also prevent the 6202-1 self-test from passing as well, rendering the 6202-1 inoperable. If during normal operation, the 6202-1 computer loses its communication link with the pulse oximeter and is unable to recover, the word fail will appear.



PULSE OXIMETER



DRWN BY	TAB	DATE	2/16/16
CHECK BY		TITLE	ROBD2
ENGR. BY		SIZE	C
DSGND. BY		CODE IDENT NO.	6202-1
RELSE BY		SCALE:	SH 1 OF 1
MICROFILM	YES NO	DATE	

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NOTES:
 V1 CONTROLS THE FEED OF 100% O₂ FOR THE O₂ DUMP AND O₂ SENSOR CALIBRATION

Figure 3 - P&ID