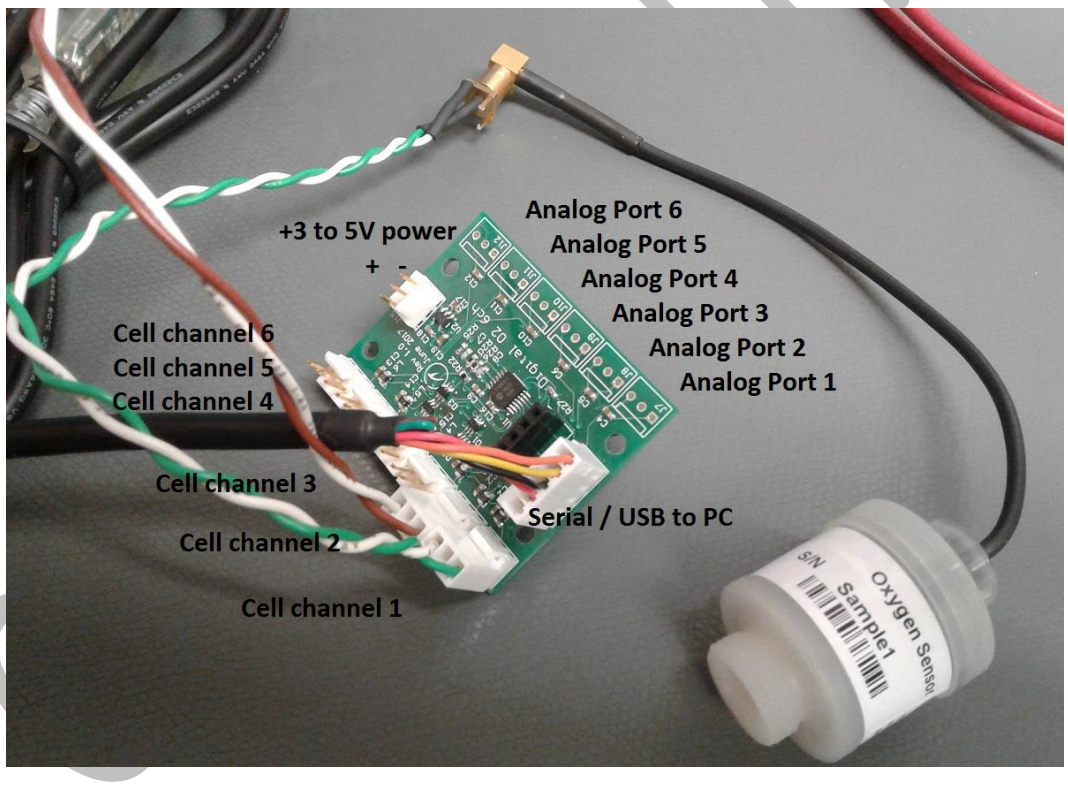
1.0 PURPOSE

This document describes the requirements for manufacturers to meet in supporting Shearwater Research's Digital O2 cell specification. Shearwater supplies assistance in this regard in the form of programming boards and software to make these requirements easier to meet. Shearwater will also provide technical assistance in the integration of the digital O2 features into the manufacturing process of O2 cells.

2.0 PROGRAMMING BOARD

A 6-channel programming board is available to program, test, and troubleshoot the digital interface.



Cell channels 1 – 6: six independent programming channels, connect to cells.

Analog ports 1-6: analog pass-through to cells for measuring cell voltages with multimeter or automated test equipment.

Power: 3-5V power supply for programming PCA, 50mA. A 3.6V SAFT cell may be used.

Serial / USB to PC: USB to UART cable TTL-232RG-VIP-WE, wired to Molex connector:

1. Orange
2. Yellow
3. Black
4. Red
5. No connection (Brown and Green not used)

Cell adapter cables will be needed from Molex connector to SMB Jacks for JJ-CCR type cell connection.

18 CELL PROGRMMING SUPPORT

Up to 18 cells may be simultaneously measured or programmed by using multiple 6-channel programming boards connected to a single UART interface.

3.0 CELL TESTING PROCEDURE

Setup

1. Connect 3-5V power to 6-channel programming boards
2. Connect USB-UART cable to test controller PC
3. Start Digital O2 PC Demo.exe program
4. Connect automated test equipment (ATE) to analog port channels

Test process

1. Connect Digital O2 cell to each cell channel, as required (within pressure pot)
2. Use ATE to measure each cell analog voltage at calibration points (suggest 0.21, 1.0, 2.0 PPO2). Record PPO2 and corresponding mV values to file.
3. Repeat test for each O2 cell.
4. Program cells with test data recorded, as well as serial number, model number, manufacture and expiry dates. Cells may be programmed in a group by loading data file to Digital O2 PC Demo program.

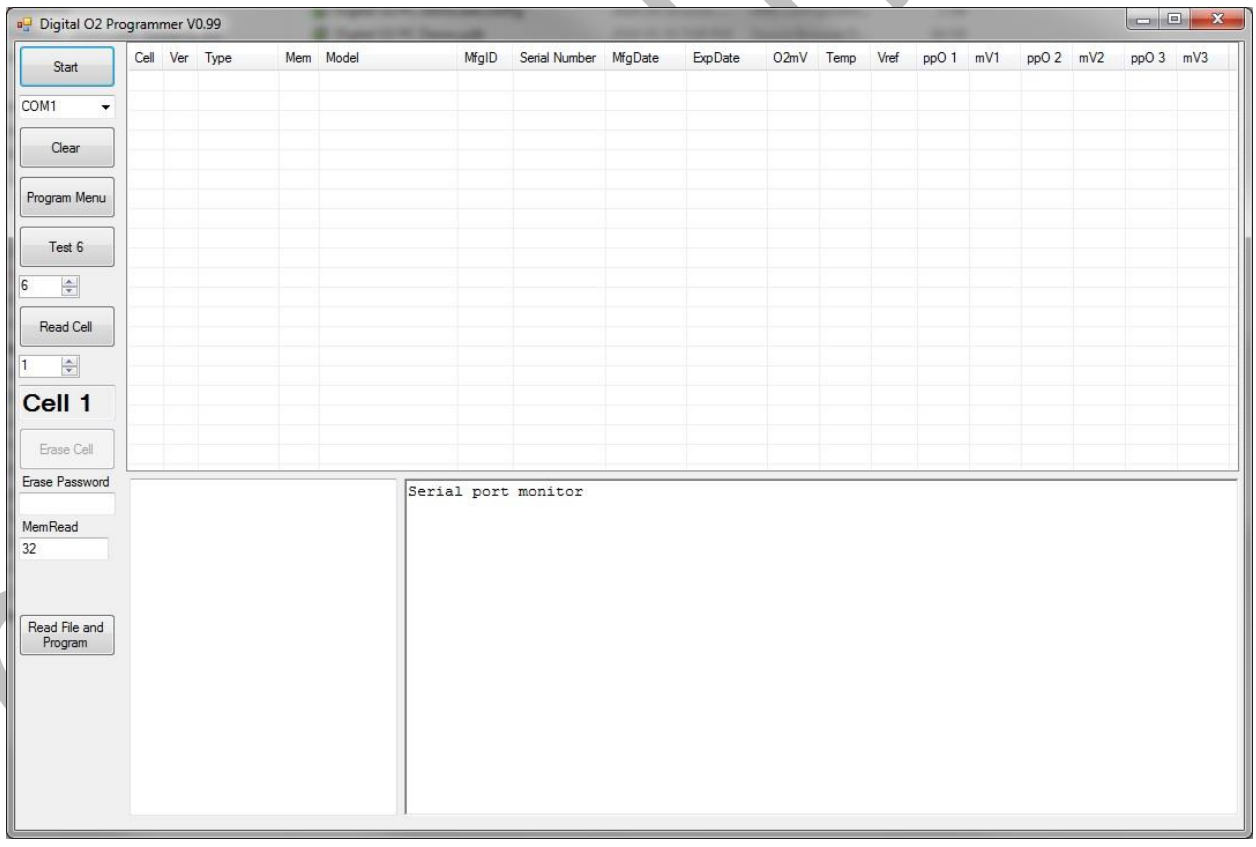
4.0 DIGITAL O2 PC DEMO PROGRAM

The Digital O2 PC Demo Program may be used to program O2 cells through the 6-channel board, via the USB / serial port. This program is compatible with Windows 7 and later operating systems.

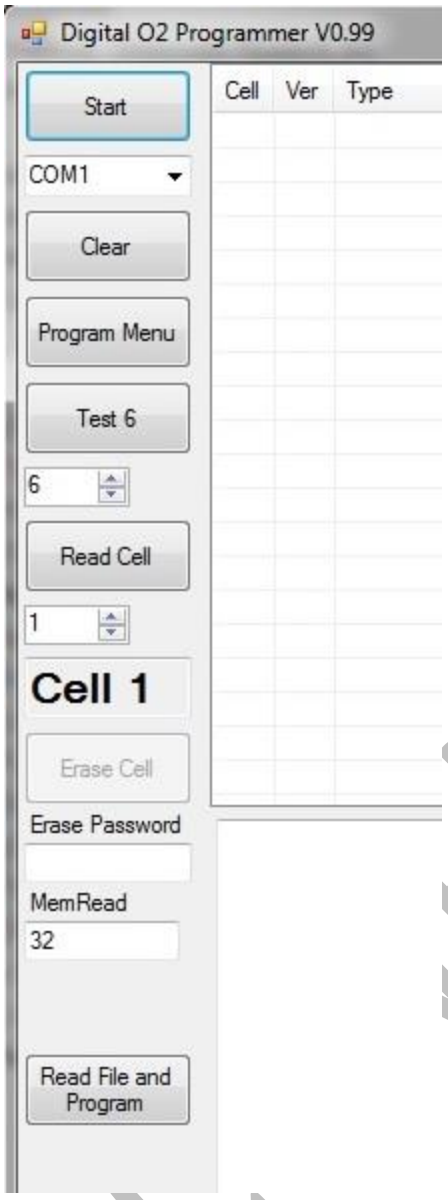
Installation

No special installation is required, just copy the program files to a directory on the test controller PC. The program may be executed by double clicking on the Digital O2 PC Demo.exe file. A shortcut to the executable may also be created for convenient launching.

The main program window should look as shown:



Main Screen Controls



Start / Stop: Initiates communications with programming board or closes the connection.

COM1: Selects the communication port for the USB cable – this should automatically choose the right port (make sure the cable is plugged in before starting the program).

Clear: Clears all report window data (does not affect programmed parts or log files).

Program Menu: Opens the cell programming menu (see below).

Test x: Tests multiple cells in one sequence.

6: Selects the number of cells to read in one test.

Read Cell: Reads (tests) a single cell as selected in the following box.

1: The current cell number for single or multiple cell reads.

Erase Cell: Erases the data areas of a cell. This function is password protected.

MemRead: Specifies the number of entries of the general memory area to read when testing a cell.

Read File and Program: Reads a file with cell data and programs multiple cells at once.

Main Screen Grid Display

The main screen grid area is blank at start-up or when cleared, but will display a running log of cell read tests performed, reporting a number of values for each cell (cells are rows, data types are in columns). A line is used for each cell read – a cell may be read multiple times or multiple cells may be read in sequence.

Cell: Cell channel number being tested and reported.

Ver: Digital O2 firmware version, as read from cell under test.

Type: Digital O2 cell type reported from cell under test.

Mem: Memory size of cell reported, in words.

MfgID: Manufacturer ID code as programmed in cell (up to six characters).

Serial Number: Serial number as assigned and programmed to the cell memory.

MfgDate: Manufacturing date.

ExpDate: Expiry date of cell.

O2mV: Current O2 cell mV reading.

Temp: Current O2 cell reading (only valid once calibrated).

Vref: Digital O2 cell supply voltage generated from interface. This number should be 2200mV or greater for reliable operation.

PPO2 1-3: PPO2 settings used for calibrating cell mV readings.

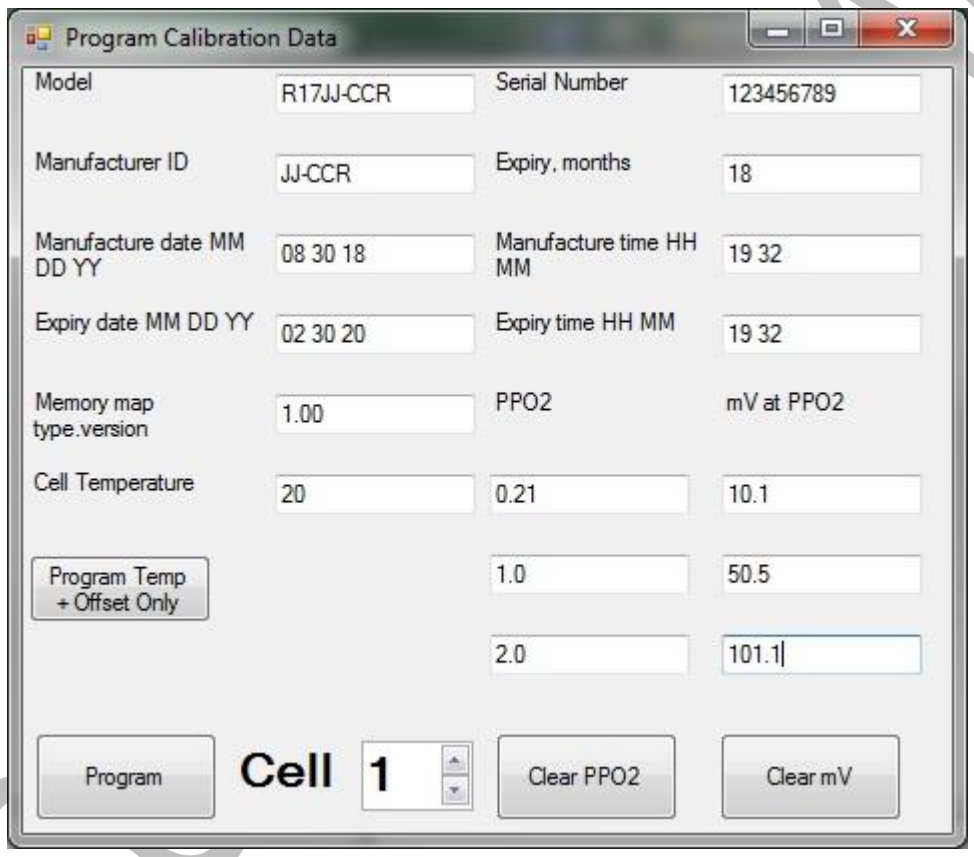
mV 1-3: Cell mV readings at corresponding PPO2 levels from calibration measuring equipment. This calibration data is stored in digital O2 memory cell locations.

Main Screen Diagnostic Windows

The lower left and lower right text panes of the main screen display raw cell readings and data communications information as diagnostic and further detail on cell reading and programming operations. The contents of these windows can be ignored for basic cell manufacturing and testing steps.

Program Menu

This dialog box is opened by pushing the 'Program Menu' button from the main screen. This menu allows manual entry of data to be programmed to a single cell. Multiple cells may be programmed in sequence by repeated presses of the 'Program' button on this dialog. The serial number is automatically incremented (if it is all numeric), and the model, manufacturer ID, and expiry months only need to be entered once. NOTE that the PPO2 test values and corresponding mV values must be entered for EACH cell if using this manual programming method.



Program Temp + Offset Only: This calibrates the temperature reading of the cell to the 'Cell Temperature' field but does not program the other data.

Program: This programs the cell indicated by the channel in the Cell box.

Clear PPO2: Clears the PPO2 fields for easier re-entry of the next cell data.

Clear mV: Clears the mV fields for easier re-entry of the next cell data.

Log Files

A 'Logs' file directory will be written as a sub-directory of the location where the executable is run from. This sub-directory structure will have daily entries of programming and testing logs and well as some diagnostic information about the programming process. These logs are plain text and spreadsheet files that are human readable.

5.0 REVISION HISTORY

Revision	Description	Date (yyyy-mm-dd)	Author
0	Preliminary	2018-08-30	MB
A	Fill-in program operation details	2018-08-31	MB