FLUKE®
Calibration

CalTool for molbloc™ Extension

COMPASS® for Flow

Users Manual

June 2012

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Introduction

The CalTool for molbloc Extension is a set of components that lets you use COMPASS® for Flow to calibrate molblocs.

Note

The term, CalTool for molbloc Extension, does not show anywhere on the COMPASS for Flow run screens.

Table 1 is a list of abbreviations and acronyms used throughout this manual.

Table 1. Common Abbreviations

Abbreviation	Definition
DUT	Device Under Test
VOC	Verification of Calibration
MFC	Mass Flow Controller

How to Contact Fluke Calibration

To contact Fluke Calibration, call one of the following telephone numbers:

- Technical Support USA: 1-877-355-3225
- Calibration/Repair USA: 1-877-355-3225
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31-40-2675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- China: +86-400-810-3435
- Brazil: +55-11-3759-7600
- Anywhere in the world: +1-425-446-6110

To see product information and download the latest manual supplements, visit Fluke Calibration's website at www.flukecal.com.

To register your product, visit http://flukecal.com/register-product.

Equipment Requirements

Table 2 is a list of equipment for molbloc calibration.

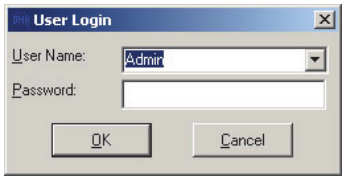
Table 2. Equipment Requirements

Item	Description
1	Adjustable regulated GAS SUPPLY
2	molbox for Reference molbloc(s)
3	molbox for DUT molbloc
4	Flow Controllers: • molbloc-L: needle valve or MFC's of appropriate ranges and connecting hardware • molbloc-S: adjustable pressure regulator and connecting hardware
5	Reference molbloc(s)
6	DUT molbloc
7	System Controller (PC) running COMPASS for Flow with CalTool for molbloc Extension and interfaced via RS232 to both of the molboxes
8	Vacuum pump if calibrating molbloc-S.

Software Configuration

If using the database installed by these instructions, the database already has a default Admin and Test User without passwords, configured devices for the Reference and DUT molboxes and several flow controllers, and a configured molbloc-L Linearity and separate VOC test definitions:

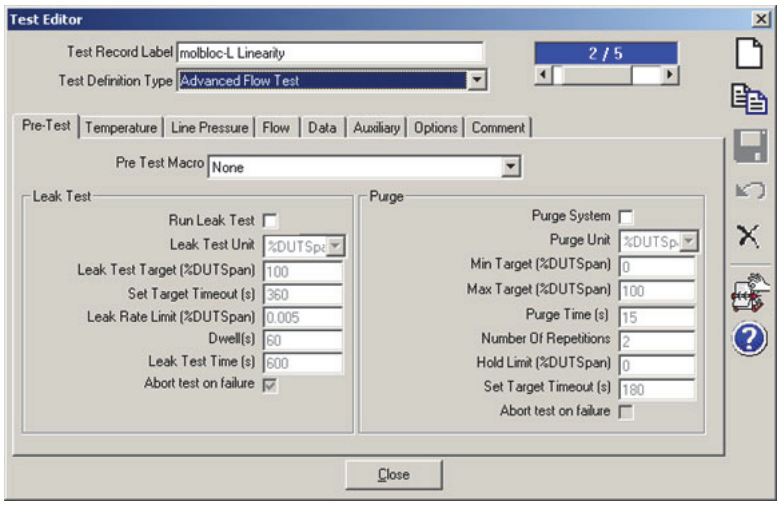
- Users and passwords can be added from the main run screen under **Database** > **Users**.
- The same configured Reference and DUT molboxes will be used for all molblocs.
- The molbloc-L Linearity Test Definition should be used as a template for individual molblocs, with individual tests tailored to individual molbloc ranges.



gxq01.jpg

To configure the software:

1. Under **Setup** > **Test**, select the **molbloc-L Linearity** file to bring up the Test.



gxq02.jpg

The Test Record should be copied before proceeding to retain the integrity of the original record. The copied record will initially look the same but with the addition of "COPY" in the Test Record Label and **Editing New Record** flashes red in the upper right corner.

2. Change the Test Record Label to reflect the type of molbloc this will be used for, for example, molbloc-L Linearity 1slm or molbloc-L Linearity 1E3-L.

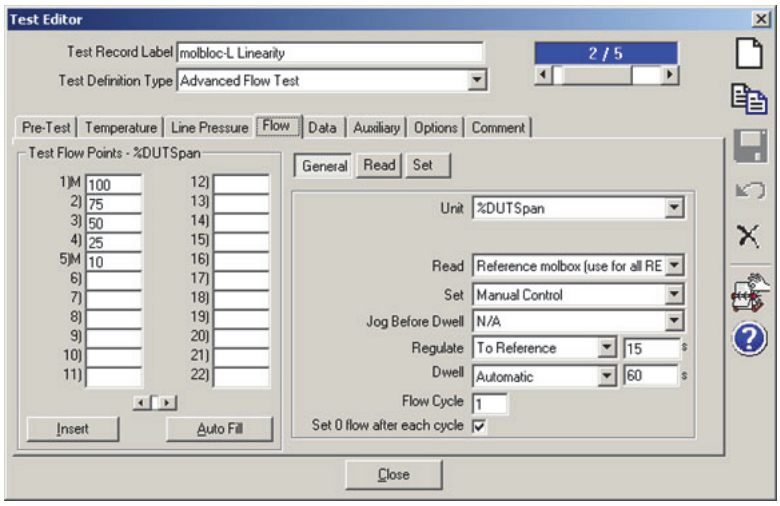
   It is recommended at this point to remove the word "COPY" from the Test Record Label.

3. Within the Test Record, select the **Flow** tab.

   The default test points are in %DUT Span fields with points at 100, 75, 50, 25, and 10 %. It is recommended to leave the Units as %DUT Span. Flow units may be selected with appropriate molbloc range specific flow values entered under the Test Flow Points.

   - In the default Test Record and all copies of the default Test Record, the "M" before points 1 and 5 indicates a pre-point macro intended to automatically TARE the Reference and DUT molboxes.
   - Additional Test points can be added with the Insert button and specifying where to insert the new point.

4. The Read device is the Reference molbox, this should not be changed.



gxq03.jpg

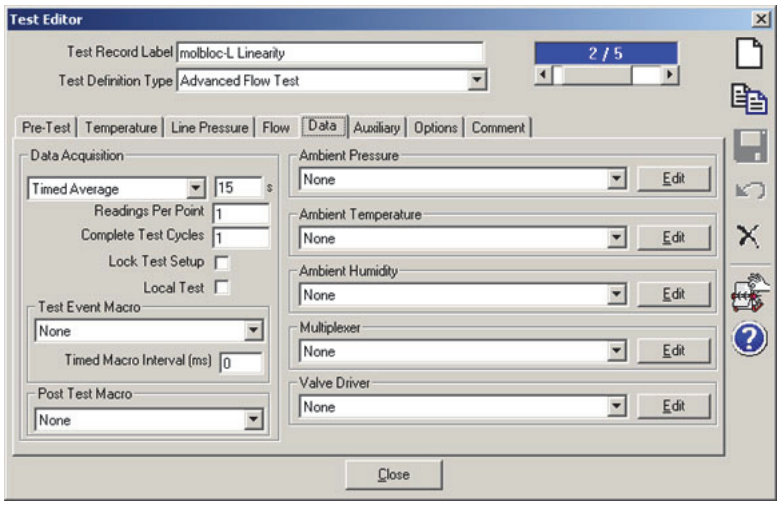
5. The Set device is for the flow control:
   - If a needle valve or other manual flow control is to be used, leave this set to Manual Control.
   - This setting can also be left as Manual Control and the actual flow control can be selected when starting a test run.
   - If a specific Mass Flow Controller (MFC) will be used with this test every time, select the appropriate MFC range from the drop down list or configure a new MFC range from the main COMPASS window under **Setup** > **Support Device** (existing MFC records can be used as examples).

When using an MFC, see Table 3 for the minimum recommended Regulate and Dwell times found in various molbloc flow ranges. For automated test definitions, it is recommended to regulate To Reference and use an Automatic dwell. Automated tests are not recommended for higher (sonic) flows.

Table 3. Regulate and Dwell Time

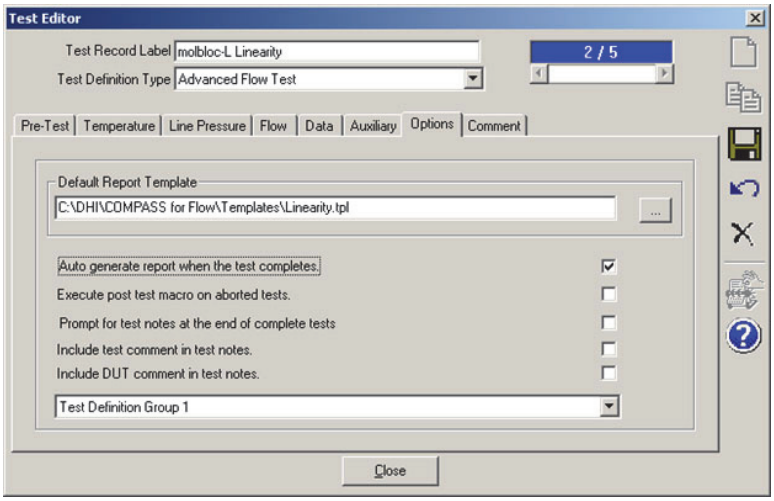
molbloc model	molbloc flow range	Regulation (seconds)	Dwell (seconds)	Averaging (seconds)
1E1	≤20 sccm	360	3600	3600
5E1	50 sccm	180	1800	900
1E2, 2E2	≤200 sccm	60	600	300
5E2, 1E3	≤1000 sccm	36	360	180
5E3, 1E4, 3E4, 1E5	≤100 slm	6 or Manual	60 or Manual	30
Any molbloc-S	>100 slm (sonic)	Manual	Manual	15

6. Within the Test Record, select the **Data** tab. The minimum recommended Timed Average can be found in Table 3 for various molbloc flow ranges.



gxq04.jpg

7. Go to the **Options** tab to select the end of test data template.



gxq05.jpg

8. Click  to save the Test Record.

How to Start

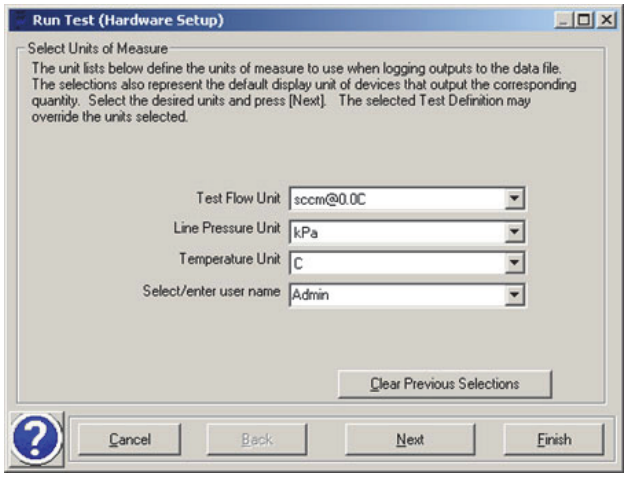
Note

It is highly recommended to create a restore record using the molTools software included with this package. See page 17 for more information.

1. Run the COMPASS for Flow program.
2. On the main run screen, under the **Run** selection, choose **Run Test Definition** or **Run Manual Test**.
   - Run Test Definition–runs a test with pre-defined test points.
   - Run Manual Test–allows the user to set and take points manually.
3. Choose the initial settings for flow unit and user name and select **Next**.

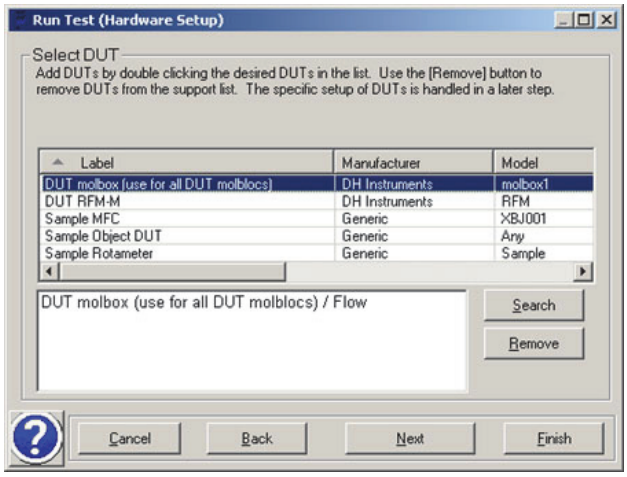
Note

It is recommended to use only sccm@0.0C or slm@0.0C for flow units, kPa for pressure units, and C for temperature units as functionality and calculation of molbloc calibration coefficients have not been verified using other units.



gxq06.jpg

4. Select the generic DUT (Device Under Test) molbox. This will be used for any molbloc (laminar molbloc-L or sonic molbloc-S).
5. Select **Next**.

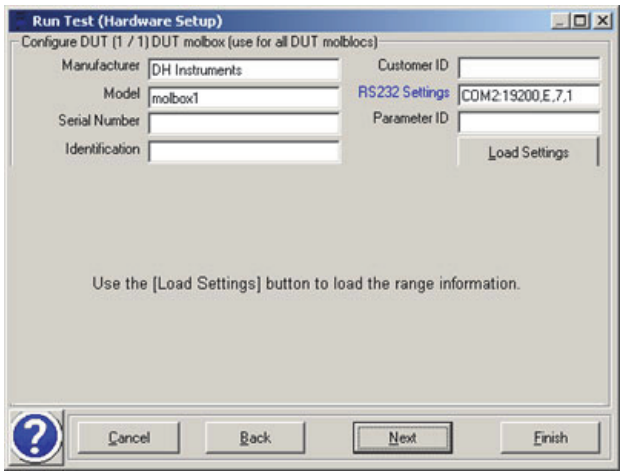


gxq07.jpg

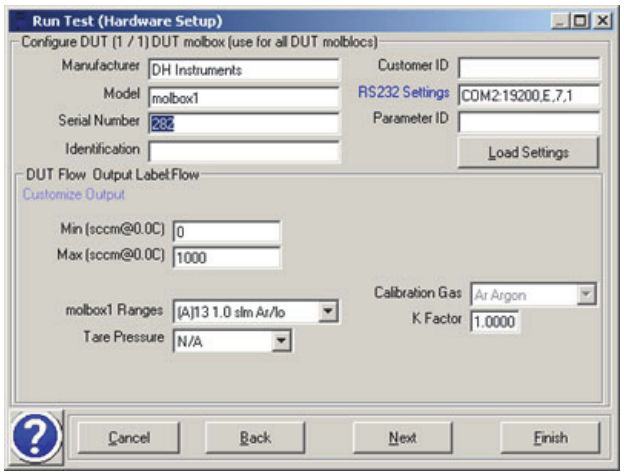
6. On the Configure DUT screen, select **Load Settings** to load the molbox and molbloc. Select **Next**.

Note

Selecting Next without selecting Load Settings will load the molbloc on the currently active molbox channel only. Select Load Settings to read both channels.



gxq08.jpg



gxq09.jpg

7. On the Configure DUT screen after loading the molbloc(s), select the molbloc to be calibrated under the molbox Ranges dropdown. The Ranges field shows the molbox channel A or B, the attached molbloc(s) serial number, nominal molbloc range with flow unit, and for a new style molbloc only the named cal gas calibrations.

   Legacy molbloc-Ls with serial numbers less than 4000, legacy molbloc-S with serial numbers less than 1000 will display and will work with any molbox embedded software version.

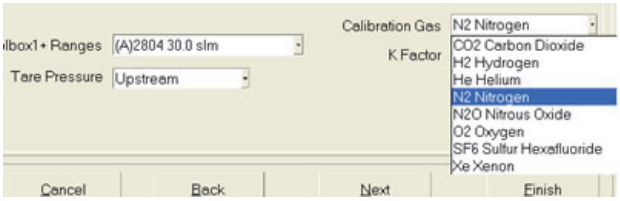
8. Select the molbloc under the Ranges dropdown, select the gas under the Calibration Gas dropdown

   - Tare Pressure selection is relevant to molbloc-L only, choose Upstream for molblocs calibrated for pressure >200 kPa, select Downstream for molblocs where the downstream is venting to atmosphere.
   - For legacy molblocs, all gases will display but this does NOT indicate the molbloc was ever calibrated for those gases. Refer to the most recent Fluke or DHI calibration report for the molbloc to see the calibrated gases.

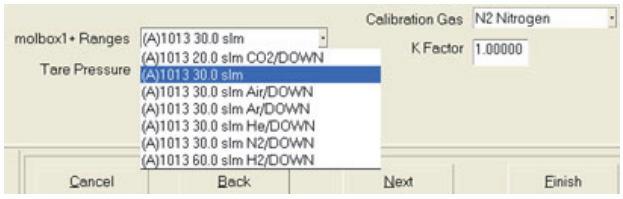
   New molbox1+ format molbloc-Ls with serial numbers 6000 and up, molbloc-S with serial numbers 4000 and up, or older molblocs that have been upgraded to the new formats will display only when connected to a molbox1 v5.40 or molbox1+ v6.00 and higher embedded software. These molblocs will display as **invalid molbloc** or **no bloc** if connected to older versions of molbox software.

9. Select the molbloc and related named calibration the Ranges dropdown, this will automatically select the Calibration Gas:
   - Tare Pressure selection is relevant to molbloc-L only, choose Upstream for molblocs calibrated for pressure >200kPa, select Downstream for molblocs where the downstream is venting to atmosphere.
   - The named calibrations indicate the gases and position the gases were calibrated for:

     LOP = 200 – 325kPa Upstream
     HIP = 325 – 525kPa Upstream
     DOWN = 85 – 105kPa Downstream
     NSP = a non-standard specific pressure or range.

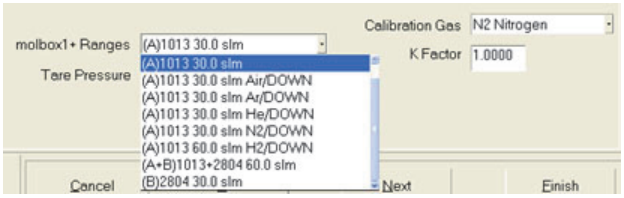


gxq10.jpg



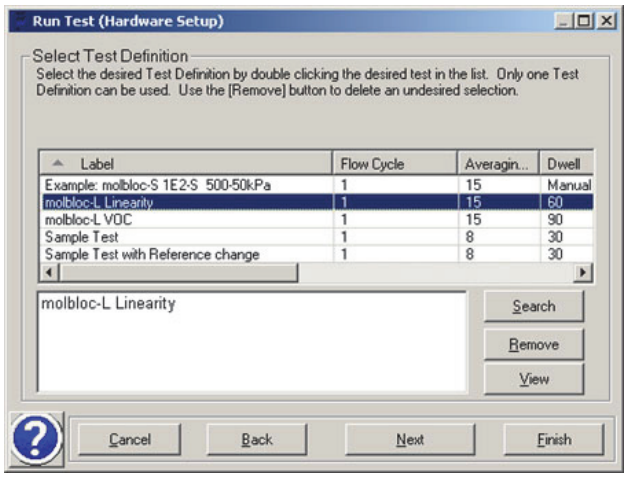
gxq11.jpg

Below figure is shown for information only on the display with a molbox1+ format on Channel A and a legacy molbloc on Channel B.



gxq12.jpg

10. After choosing the molbloc and calibration gas, select **Next** to advance to the Select Test Definition screen. (This screen will not appear if Run Manual Test was selected.)
11. Double-click on the Test Definition that was created for the molbloc range to be calibrated and it will appear in the area to the left of the Search button.
12. Once selected, choose **View** to verify that the selected test is the one intended to be run. Select **Next**.

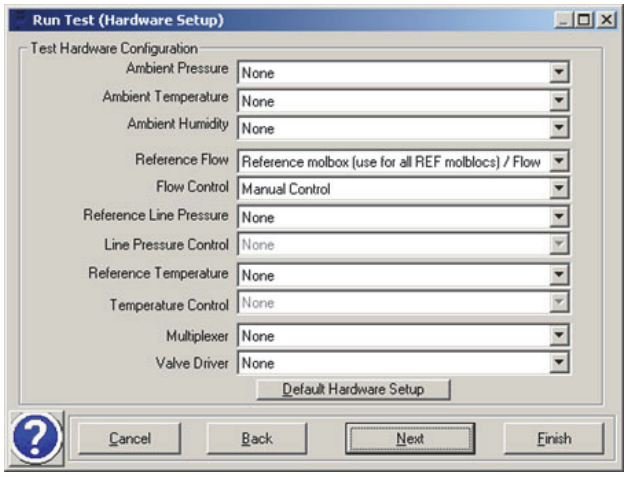


gxq13.jpg

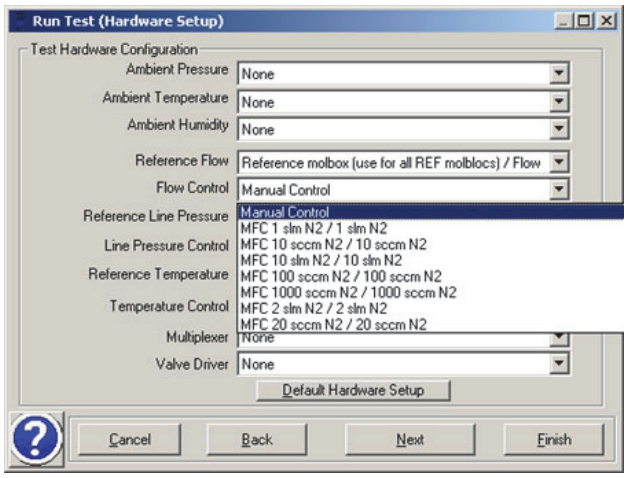
On the Test Hardware Configuration screen:

- Reference Flow will always be the Reference molbox.
- Under Flow Control, an MFC will either be pre-selected if one was chosen in the Test Definition (an MFC can be selected at this time) or Manual Control is used.

13. Select **Next**.



gxq14.jpg



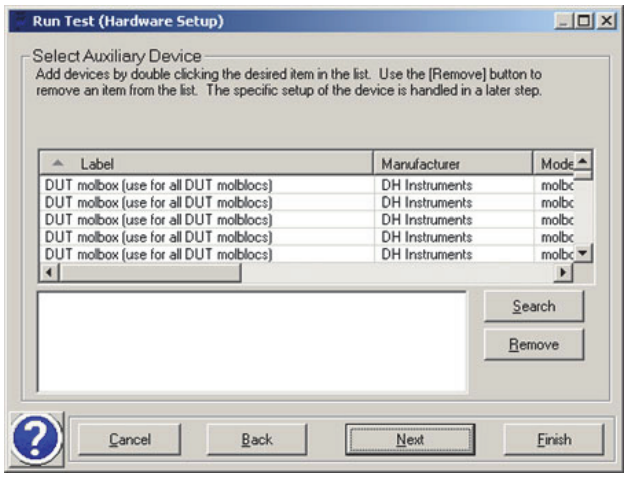
gxq15.jpg

On the Select Auxiliary Device screen, additional measurement devices can be selected, but none are necessary for molbloc calibration.

14. Select **Next**.

Note

*From the main COMPASS window, under **Tools > Options > Initialize Test Form**, the Auxiliary Device window can be prevented from displaying by selecting the **Skip auxiliary device test step**.*



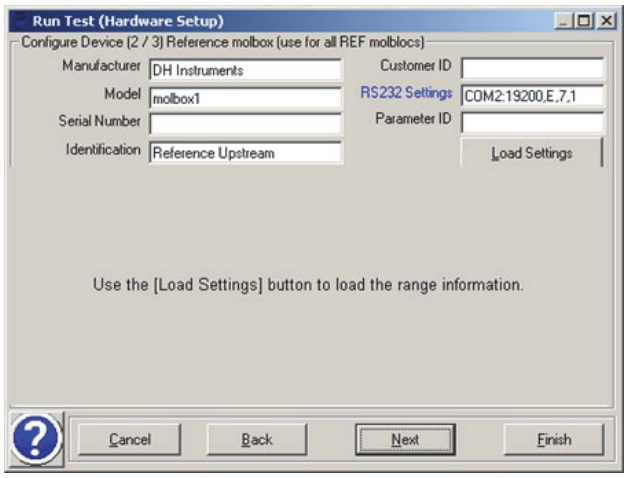
gxq16.jpg

On the Configure Device (#/#) Reference molbox…. window, the reference molbox and molbloc(s) are loaded in the same manner as the DUT as described in steps 5 and 6. Ensure that the reference flow range and calibration gas are the same as the DUT selections.

15. Select **Next**.

Note

If more than one reference is chosen (a Reference Change was defined in the Test Definition) the screen will display Configure Device (2/#)…. After the first reference is loaded another almost identical window appears with Configure Device (3/#)… and the second reference molbloc will need to be loaded.



gxq17.jpg

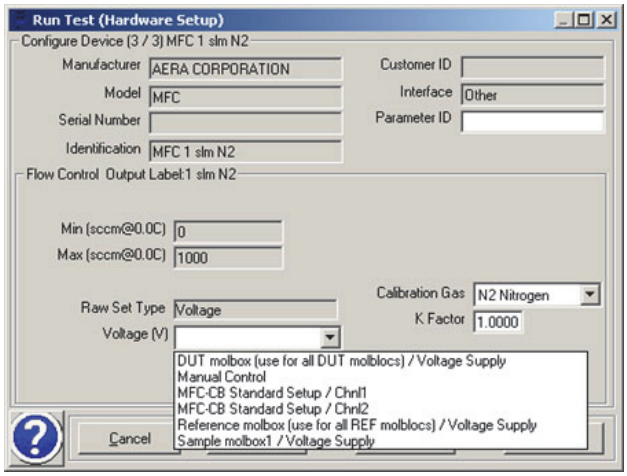
16. On the Configure Device (3/3) MFC…. screen, the analog control source must be selected for the MFC, such as a Reference or DUT molbox that has the analog option or a channel on an MFC-CB. Select **Next**.

    If Manual Control was selected, this window will not appear.

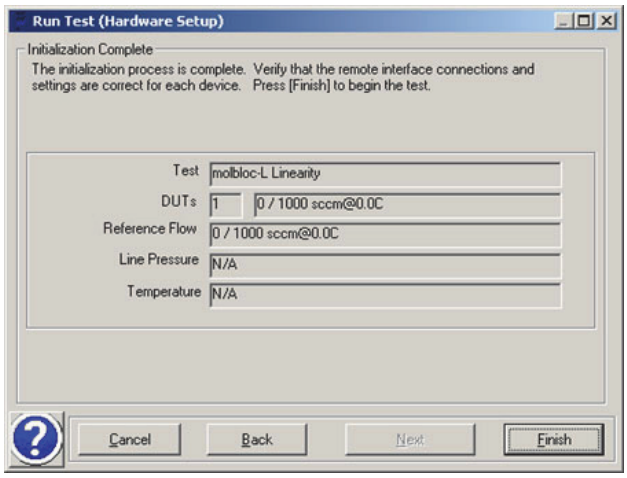
17. On the Initialization Complete window, review the information presented and select **Finish**.

    COMPASS continues with its automated initialization from this point, loading molbloc coefficients and other information before continuing to the main test Run screen:

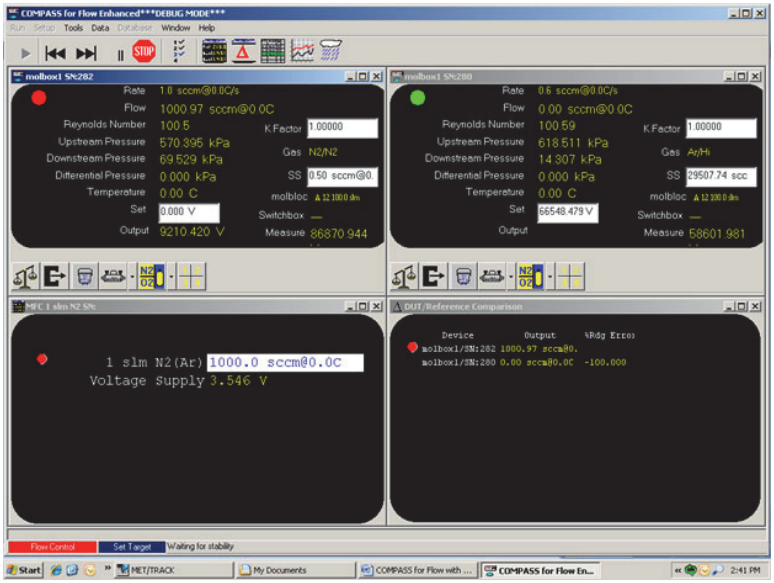
    - Selecting Finish is the last manual step to a Run Test Definition until the end of the test.
    - If Run Manual Test was selected, after the automated initialization completes:
        - A data file will need to be opened by the user by selecting the yellow file folder on the COMPASS tool bar.
        - The user will have to select the dwell and averaging times on a per point bases using the controls on the COMPASS tool bar.
        - The user will have to select Stop from the COMPASS tool bar to end the test.



gxq18.jpg



gxq19.jpg



gxq20.jpg

See the next sections for data reporting, writing new coefficients to a molbloc, and restore records.

Data Reporting and Activating Coefficients

This section is about how to report data and activate coefficients in a COMPASS for Flow-CalTool for molbloc test.

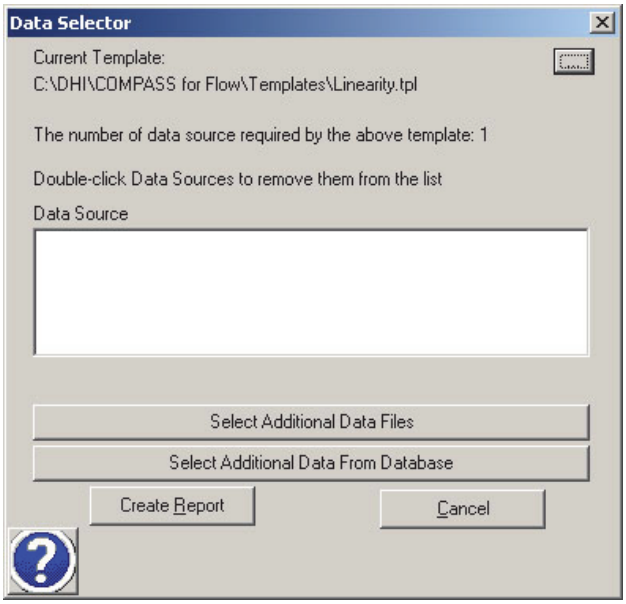
Depending on the option settings, at the end of a Test Definition the data report may automatically generate. If a Manual test was run or the report does not generate automatically:

- From the End of Test window, Generate Report can be selected to bring up the Report Editor.
- From the main COMPASS window in idle mode, Data > Report Editor can be selected.

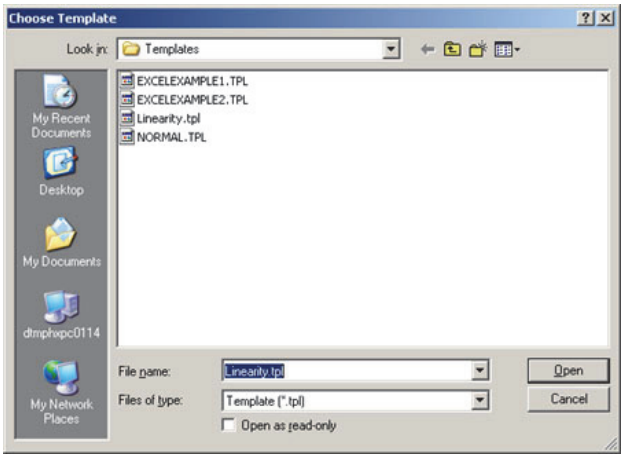
To setup:

1. If the Linearity.tpl is not selected under the Current Template on the Data Selector window, select the button on the right side of the window to bring up the

Choose Template window and browse to find the linearity template. After choosing the template, the view will return to the Data Selector window.

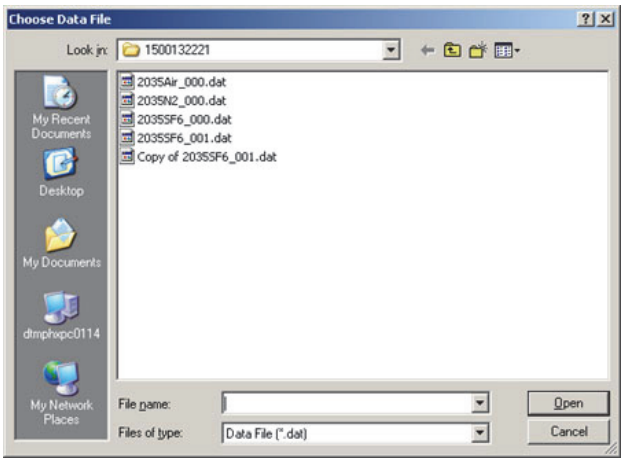


gxq21.jpg

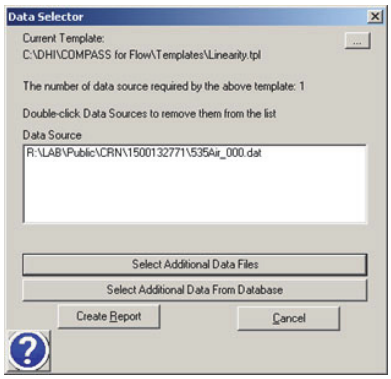


gxq22.jpg

2. Use the **Select Additional Data Files** button on the Data Selector window to select the data file from which to generate the coefficients.
3. Select **Open**. The Data Selector window will return.
4. Use **Create Report** to continue.

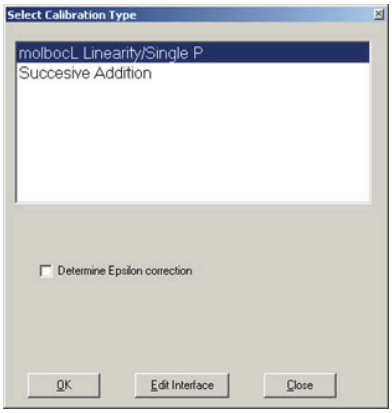


gxq23.jpg

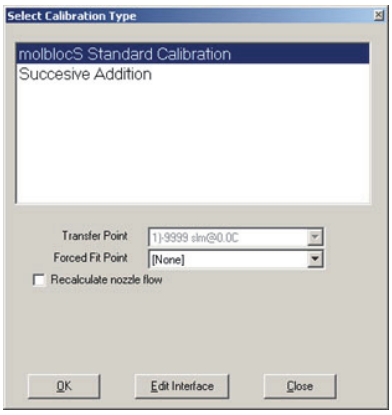


gxq24.jpg

5. After you choose the molbloc calibration type, click **OK** to continue generating the report:
   - For a molbloc-L, molbocL Linearity/Single P is chosen. Determine Epsilon correction can be chosen if the molbloc already has an epsilon or to flatten a parabolic curve from the data.
   - For a molbloc-S, molblocS Standard Calibration is chosen.



gxq25.jpg



gxq26.jpg

6. The Report Editor will briefly display a window titled Working before the generated report will display with a Activate Calibration molbloc SN: #### form on top of the report window.

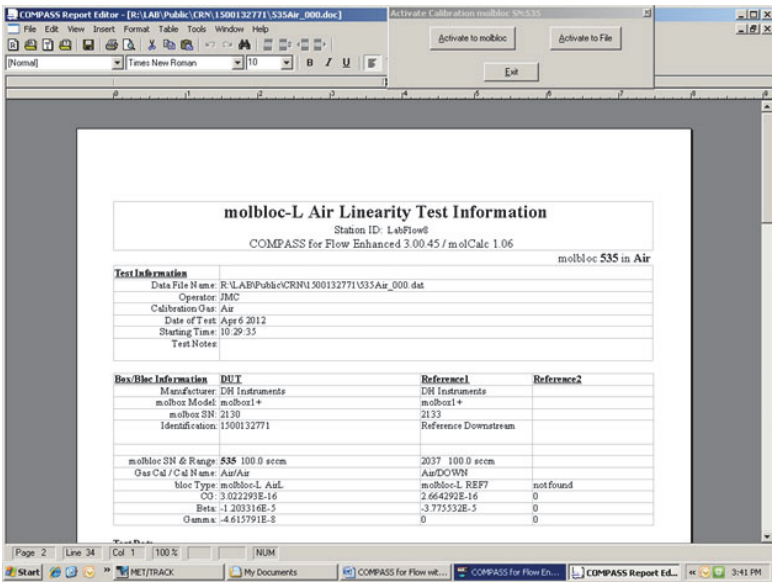
   - After reviewing the as received data, predicted results, and new coefficients, to activate the new coefficients to the molbloc select Activate to molbloc from the Activate form.

     Activate to file will create a second data file with a .res (results) file extension that includes the predicted data and new coefficients. Selecting Activate to molbloc also creates the same .res file after writing coefficients to the molbloc.

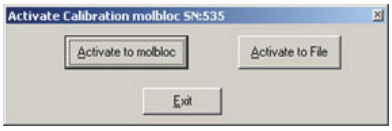
   - Yes is selected from the Are you sure confirmation prompt.
   - The RS232communications settings to the DUT molbox must be confirmed or selected. Once set or confirmed, OK is used to continue.

     Double-clicking on the Port area will bring up a RS232 settings form for changing the port and communications settings. OK is used to continue.

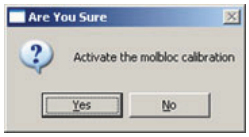
   - The Activate Calibration…. Form will display several progress messages as it activates the new coefficients to the molbloc.
   - The status messages, **Successfully activated the calibration** (the coefficients were written to the molbloc) and **Successfully activated the calibration to file** (.res file was created), will appear.



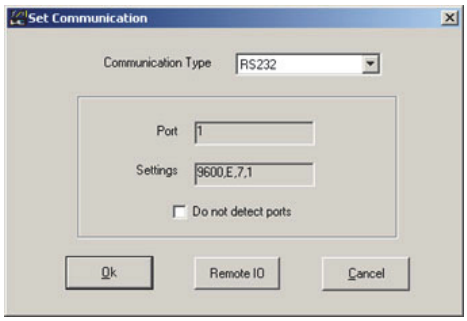
gxq27.jpg



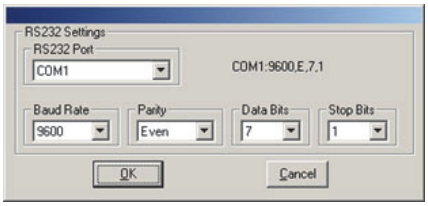
gxq28.jpg



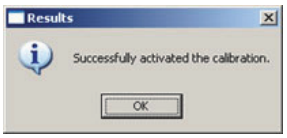
gxq29.jpg



gxq30.jpg



gxq31.jpg



gxq32.jpg

gxq33.jpg

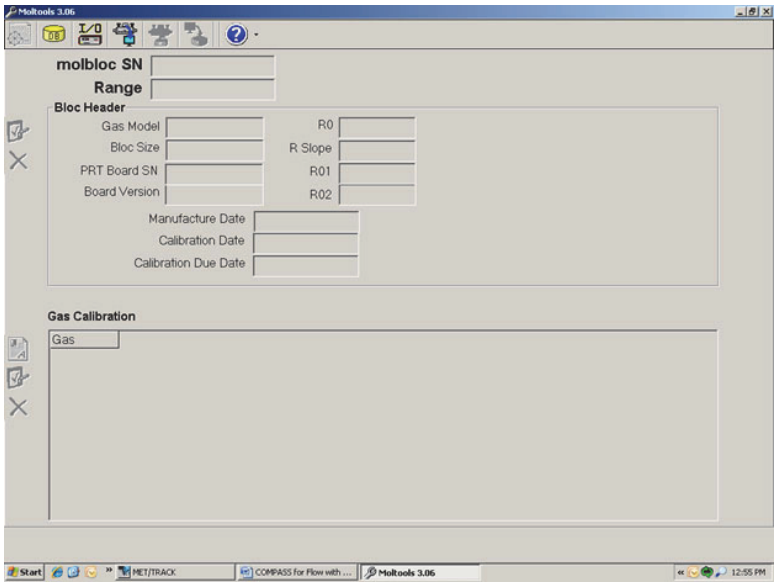
The calibration and activation are now complete. It is recommended to run the Test Definition or Manual Test again as a Verification of Calibration (VOC). Also, it is recommended at this point to use the molTools software that is part of this software package to create a restore record, see page 17.

Restore Records with molTools

Table 4 is a list of the icons used to operate molTools in Bloc Mode.

Table 4. molTools in Bloc Mode

Icon	Name	Description
	Create Report	Only active once a molbloc is loaded; this will generate a printable report from the screen data.
	Database Mode	Used to switch from Bloc Mode to Database Mode.
	Setup Communication	Used to set the communications settings to a molbox for all functions in molTools from either Bloc Mode or Database Mode. When restoring a molbloc from a restore record it may be necessary to switch from Database Mode to Bloc Mode to set the communication before returning to Database Mode.
	Load Bloc	Only active once a molbloc is loaded; Used to load the current data from the molbloc to the molTools screen prior to creating a restore file or editing the molbloc contents.
	Lock Bloc	Only active once a molbloc is loaded; indicates the molbloc is unlocked, and using this icon will lock the molbloc and prevent changes.
	Unlock Bloc	Only active once a molbloc is loaded; indicates the molbloc is locked, and using this icon will unlock the molbloc and allow changes.
	Create Restore Record	Only active once a molbloc is loaded; this will create a date/time stamped restore record viewable from Database Mode.



gxq34.jpg

Creating a Restore Record from a molbloc

To create a restore file for a molbloc from Bloc Mode, the Setup Communication icon is used to establish communications to the molbox that the molbloc is attached to. This will bring up the same Set Communication form, and double-clicking the Port area will bring up the port settings window.

Note

If the DUT molbloc is always connected to the same molbox at the same communication settings, this step only needs to be done once.

Selecting OK from these forms will prompt molTools to query the molbox; if no response is received from the molbox molTools will report an error and will not continue until communications with a molbox are established.

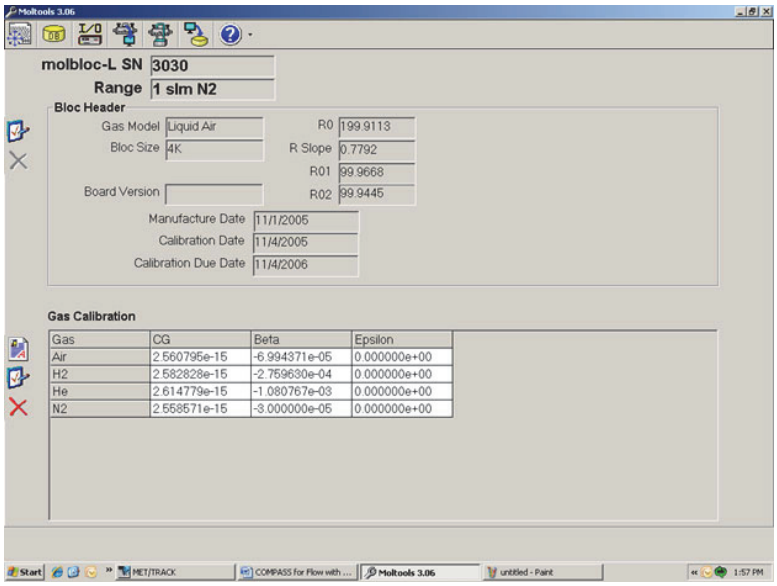
The Load Bloc icon is used to read all of the information from the molbloc attached to the molbox for molbloc-L or for molbloc-S.

The Create Restore Record icon is used to start the restore sequence:

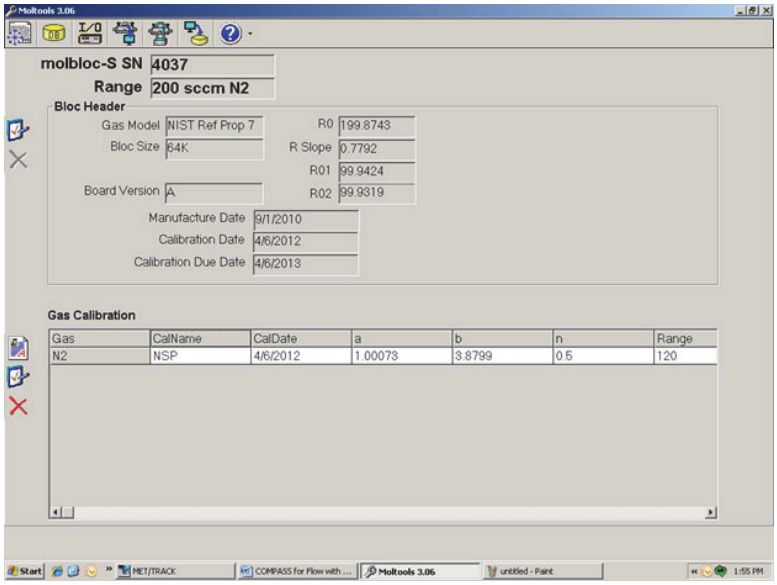
- The Save Restore confirmation form requires acknowledgement.
- The dates programmed into the molbloc need to be confirmed or updated. The Yes option will continue the restore creation. The No option will allow editing of the dates in the molbloc and then continue with restore creation.
- A comments form allows for user entry of notes relative to this molbloc or restore record.

A form will appear if all steps complete successfully and the record was created, followed by the Locked notification that indicates the molbloc is locked to prevent further changes.

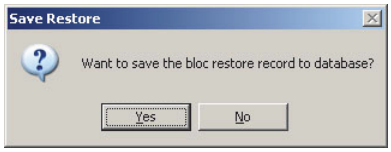
The user can switch to Database Mode to view the new record or historical records.



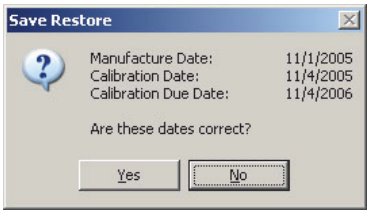
gxq35.jpg



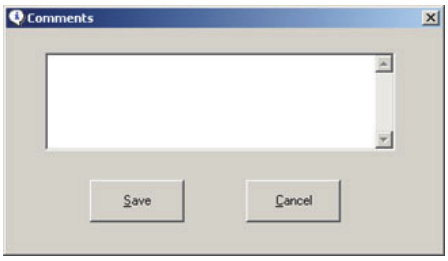
gxq36.jpg



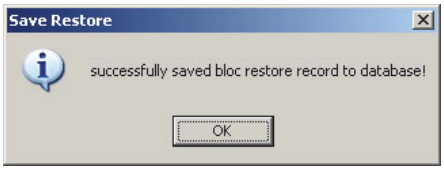
gxq37.jpg



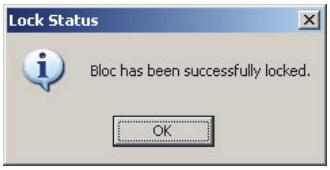
gxq38.jpg



gxq39.jpg



gxq40.jpg



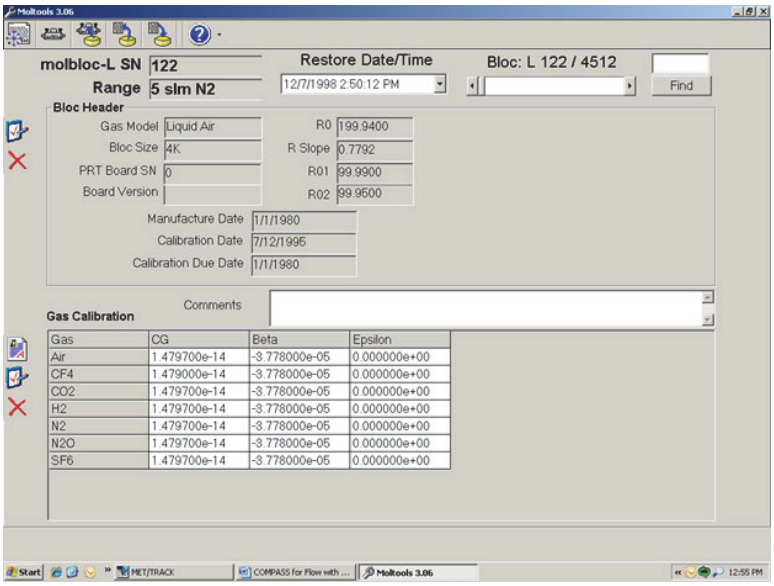
gxq41.jpg

molTools in Database Mode

Table 5 is a list of icons that are used to operate molTools in Database Mode.

Table 5. molTools in Database Mode

Icon	Name	Description
	Create Report	Used to generate a printable report from the currently visible restore record.
	Bloc Mode	Used to switch from Database Mode to Bloc Mode.
	Restore Bloc	Used to restore a molbloc from the CURRENTLY VISIBLE restore record being viewed in Database Mode. When restoring a molbloc from a restore record it may be necessary to switch from Database Mode to Bloc Mode to set the communication before returning to Database Mode.
	Create BRS File	Creates a portable restore file for use with other molbloc restore utilities. A choice of restore type is given: • BRS files for Legacy molblocs to restore molblocs from the molLoad utility. • MDB files for molbox1+ format enhanced molblocs to restore molblocs from the molTools simple mode (molTools.exe run without a license).
	Import Restore File	Import a molLoad style BRS file into molTools. This is NOT compatible with BRS restore files made by the obsolete standalone CalTool for molbloc program.



gxq42.jpg

To restore a molbloc:

1. Switch to Bloc Mode, load the molbloc, and confirm the molbloc is unlocked before returning to Database Mode.

   This is not necessary for molblocs that present a NO BLOC error when connected to a molbox. A NO BLOC error may occur if a static discharge has erased the molbloc EEPROM.

2. Use molTools to find the Database record of the molbloc to be restored:

   - Type in the serial number in the upper right corner and select **Find**.

Note

Many legacy molbloc-L and molbloc-S have overlapping serial numbers: if one of each are in the database the molbloc-L will be shown first, to navigate to the molbloc-S use the right arrow button next to the Find button.

   - Clicking in the white area of the slide bar to the left of the Find button advances 10 records at a time.

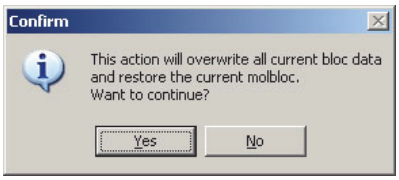
3. Within the Database record for the molbloc, select the desired restore date from the Restore Date/Time drop down list. The most recent records are listed first.

4. Use the **Restore Bloc** icon to begin the restore process:

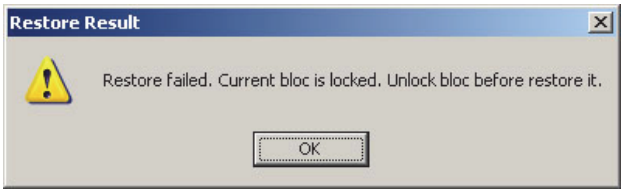
   - Confirm that the molbloc is to be restored
   - The same Set Communication form will appear, and double-clicking the **Port** area will bring up the port settings window.

     Selecting **OK** from these forms will prompt molTools to query the molbox. If no response is received from the molbox, molTools will report an error and will not continue until communications with a molbox are established.

   - Once communications are established, if Step 1 of this section was not observed and the molbloc is locked, an error message shows and the restore process will abort.

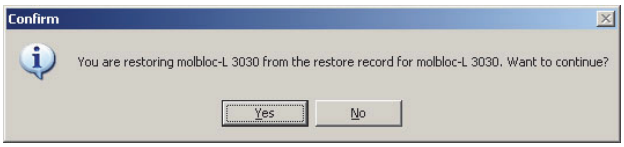


gxq43.jpg

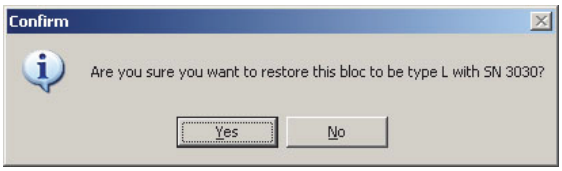


gxq44.jpg

5. molTools will present several status messages in the lower left corner as it reads the molbloc through the molbox before presenting the form:
   - Confirm the molbloc type and serial number match the restore record type and serial number
   - A damaged or erased EEPROM will begin an error message:
     - If the EEPROM is damaged beyond recovery, the four error messages below will appear in succession and the restore will fail.
     - An erased or empty EEPROM will continue the restore process as in Step 6.



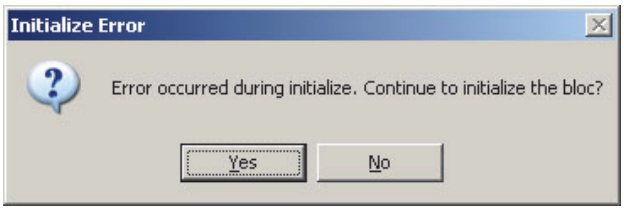
gxq45.jpg



gxq46.jpg

gxq47.jpg

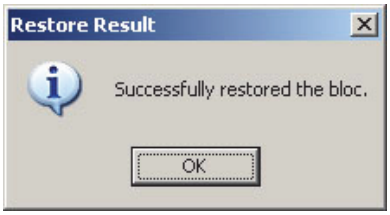
gxq48.jpg



gxq49.jpg

gxq50.jpg

6. Several more status messages will show in the lower left corner as the restore progress continues until the Restore Result form is shown.



gxq51.jpg

The molbloc is now ready for use with the selected restore file and coefficients.

Note

Comments in a restore record are NOT stored on the molbloc.