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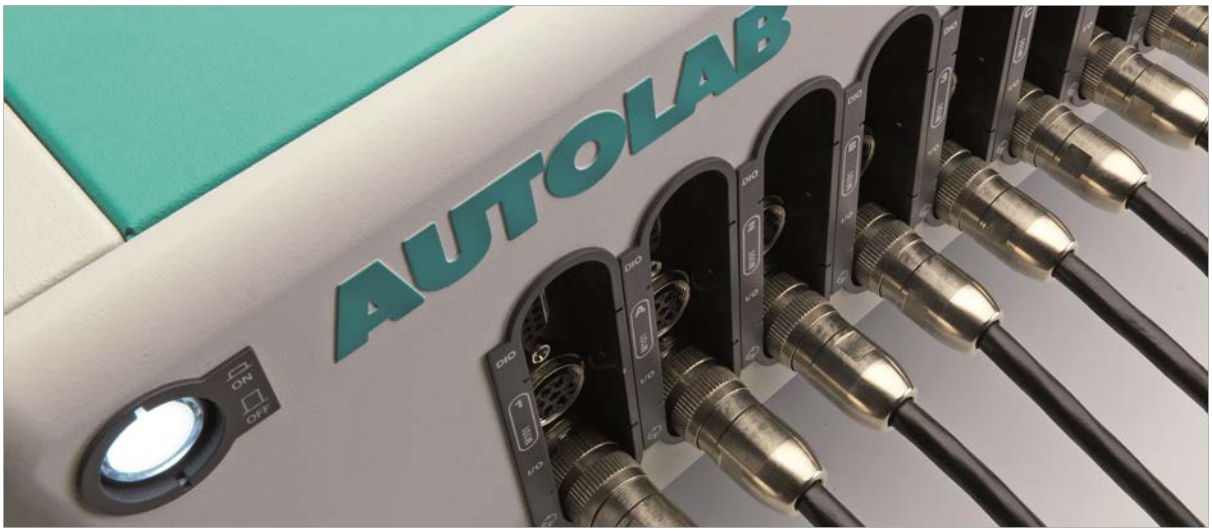
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INSERT A NEW MODULE FOR THE MULTI AUTOLAB CABINET



Editorial
Metrohm Autolab B.V.
Kanaalweg 29 G, 3526 KM Utrecht
The Netherlands
Tel: +31 30 2893154
Fax: +31 30 2880715
E-mail: autolab@metrohm-autolab.com
Website: www.metrohm-autolab.com

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1 – Introduction

The Multi Autolab instruments consist of a Multi Autolab Cabinet, or MAC, with a total of 12 module bays. The Multi Autolab Cabinets are identified by the serial numbers beginning with **MAC8**.

2 – Overview of compatible modules

Module	Items	Quantity	Required software
BA	Module label BA M101	1	Nova 1.7 or higher
	BNC-Coax –Banana cable	1	
	Alligator clip	1	
	Analog bus cable	1	
FRA32M	Module label FRA32M M101	1	Nova 1.8 or higher
	Analog bus cable	1	
MUX	Module label MUX M101	1	Nova 1.7 or higher
	Digital MUX cable	1	
pX1000	Module label pX1000 M101	1	Nova 1.7 or higher
	Cover for front connector	1	
	Lemo to banana cable (V+, V-)	2	
	Analog bus cable	1	
EQCM	Module label EQCM M101	1	Nova 1.7 or higher
	Oscillator box	1	
	DB9 Oscillator connection cable	1	
	Crystal 6 MHz Au/TiO_2 polished	2	
	EQCM cell	1	
	Au counter electrode	1	
	Reference electrode Ag/AgCl, 3M KCl	1	
	Driving force adjustment tool	1	
	Spare O-ring Reference electrode	1	
	Spare O-ring Counter electrode	1	
	Spare O-ring Viton Crystal	4	
	Spare O-ring Cell cover	1	
	2.5 mm hex driver	1	
	Spare EQCM cell screw	3	

Table 1 – Module compatibility table

Table 1 provides the overview for loose modules available for Multi Autolab instruments, the part list for each module and the software and hardware requirements or restrictions.

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3 – Opening the Multi Autolab Cabinet

The Multi Autolab instruments are fitted in the N form factor cabinet shown in Figure 1.



Figure 1 - The Multi Autolab Cabinet

Follow these steps to open the Multi Autolab Cabinet:

1. Switch off the instrument and unplug from the mains
2. Unscrew the four screws on the rear of the Cabinet (indicated in Figure 2). Leave the screws in the top cover.

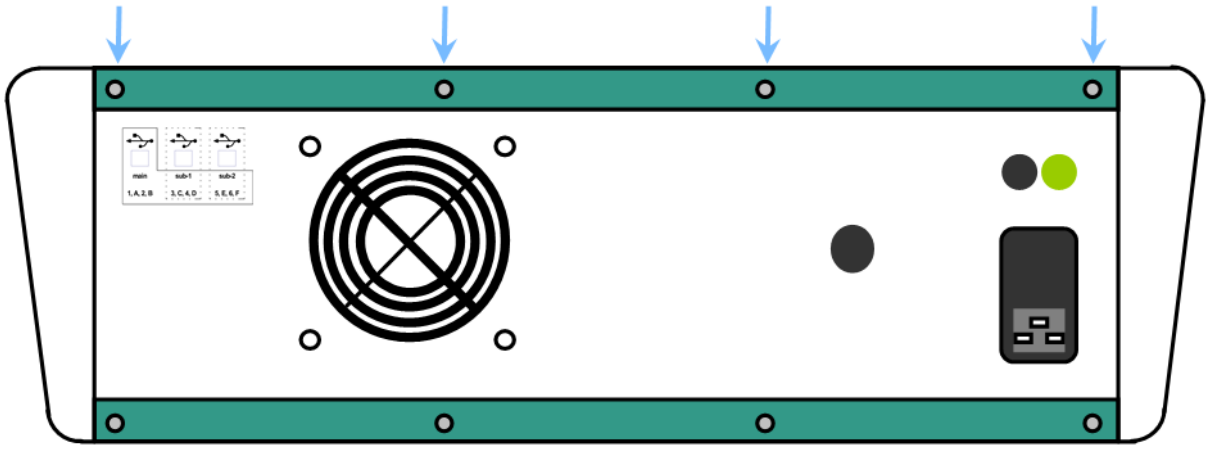


Figure 2 – Locate the four indicated screws on the back plane of the cabinet

3. Remove the top cover by sliding it from the front to the rear. The best way to do this is to stand in front of the instrument, put both hands at the rear part of the top cover and press with your fingers on the rear panel, while pressing on the top cover (see Figure 3). The top cover should come off easily.

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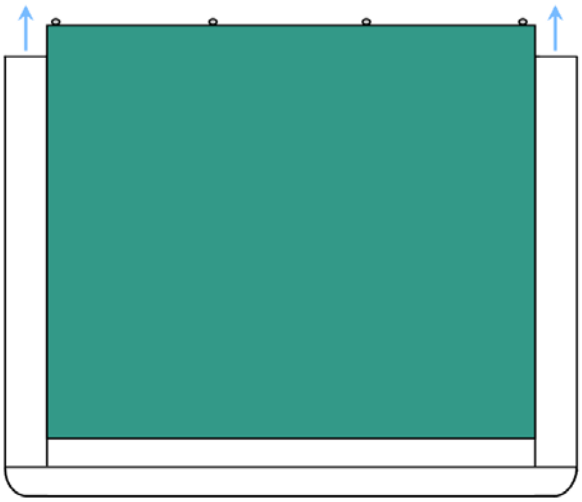


Figure 3 – Open the cabinet by sliding the cover of the cabinet

4. Lift the top cover and remove it from the instrument and disconnect the earth cable (see Figure 4).

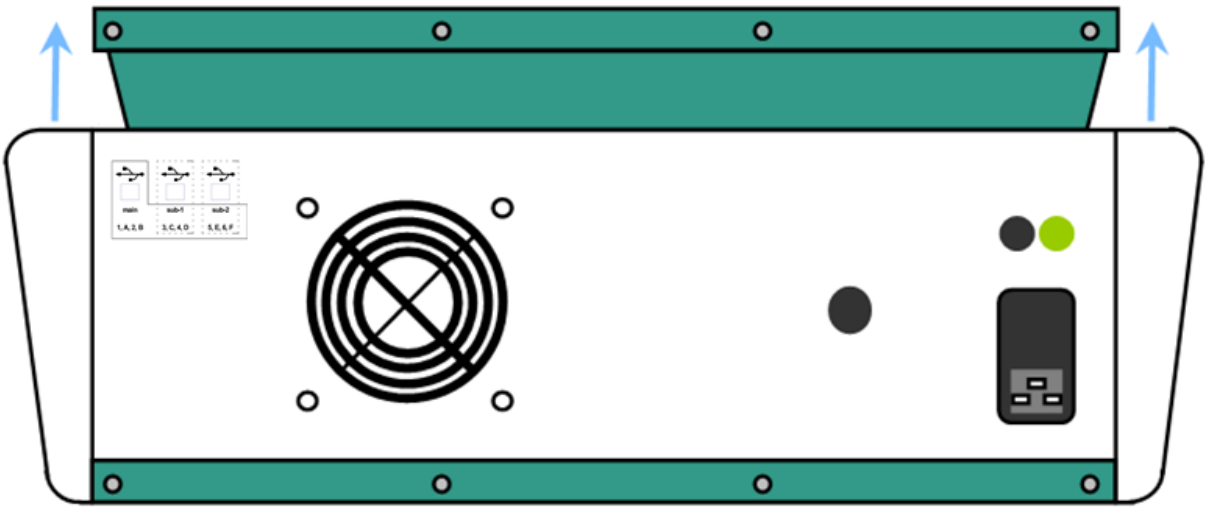


Figure 4 – Lift the cover

Follow these steps to remove the front panel:

1. Unscrew the four screws, indicated in Figure 5, holding the front panel to the frame from the mounting tabs.

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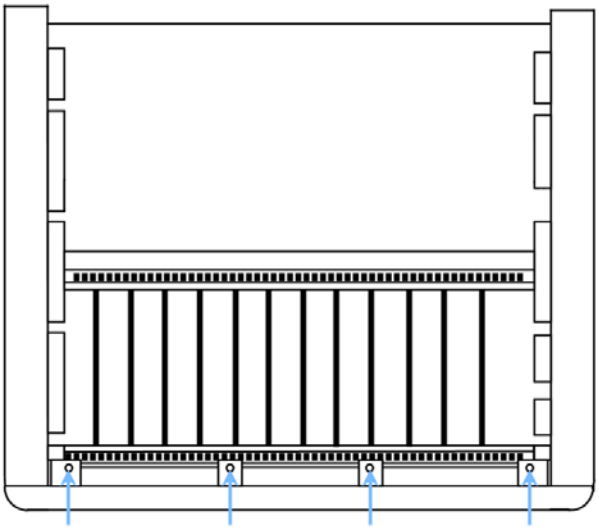


Figure 5 – Locate the four indicated screws holding the front panel

2. At the bottom of the front panel the same construction is used. The screws can be reached through holes in the bottom cover. These screws must be removed **without turning the Autolab upside down**. In order to do this, slide the instrument slightly over the edge of the table and remove the four screws indicated in Figure 6 from below.

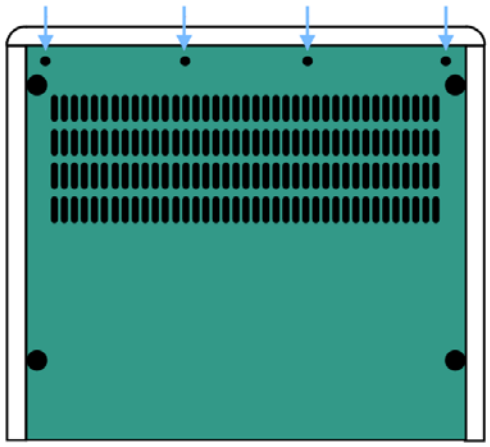


Figure 6 – Remove the four indicated screws from below the instrument

3. Now the front panel can be shifted smoothly to the front and taken off (see Figure 7).

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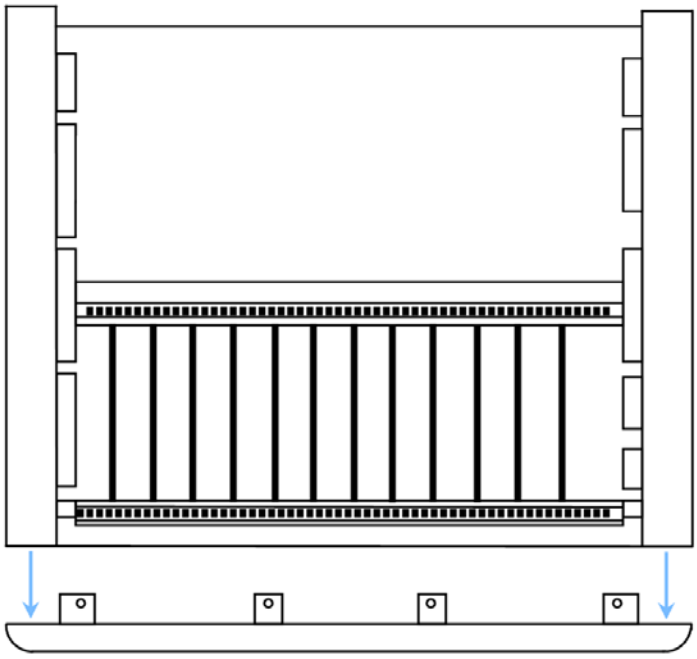


Figure 7 – Remove the front panel

4 – How to insert the new module(s)

The Multi Autolab Cabinets are fitted with a total of 12 module bays. The module bays have alternating roles. Six bays are referred to as Parent positions, the six others are referred to as Daughter positions, as shown in Figure 8.

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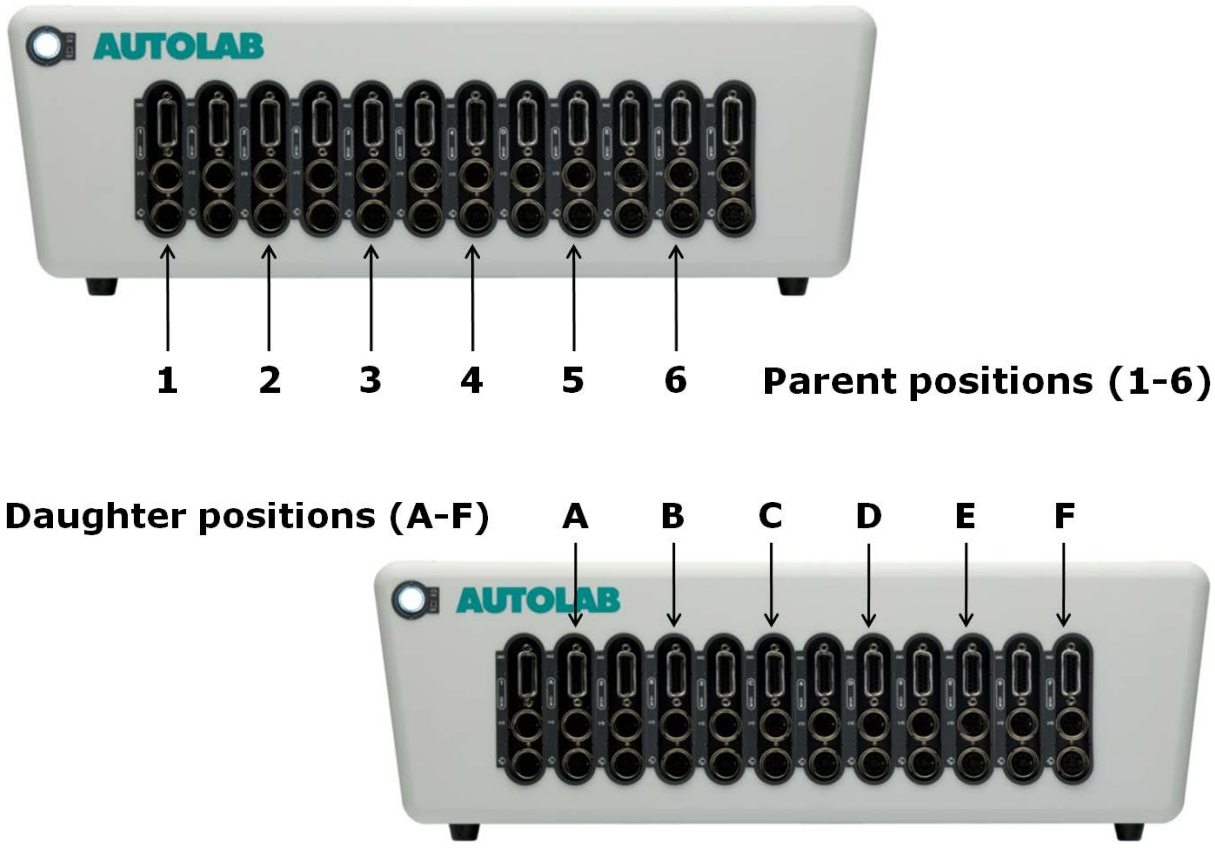


Figure 8 – The Multi Autolab Cabinets are fitted with 6 Parent positions (top) and 6 Daughter positions (bottom)

Depending on the type of module bay, the following modules can be inserted in the cabinet:

- **Parent position:** this module bay can accommodate the M101 Potentiostat/Galvanostat module.
- **Daughter positions:** this module bay can accommodate either an additional M101 Potentiostat/Galvanostat module or an optional module (see Table 1 for the compatible optional modules). When an optional module is installed in a daughter position, it will be controlled by the M101 module installed in the parent position immediately to its left.

4.1 – Restrictions

The following restrictions apply to the Multi Autolab Cabinets:

1. The minimum number of M101 modules is 1.
2. The maximum number of M101 modules is 12.
3. The maximum number of optional modules is 6.
4. Optional modules cannot be installed in Parent positions.
5. Optional modules cannot be installed in a Daughter position without having a M101 module installed in the corresponding Parent position.

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4.2 – Installation procedure for M101 modules into Multi Autolab Cabinet

The Multi Autolab Cabinet is fitted with a USB hub on the back panel of the instrument which can be used to share the control of the modules installed in the instrument between a maximum of three computers (see Figure 9).

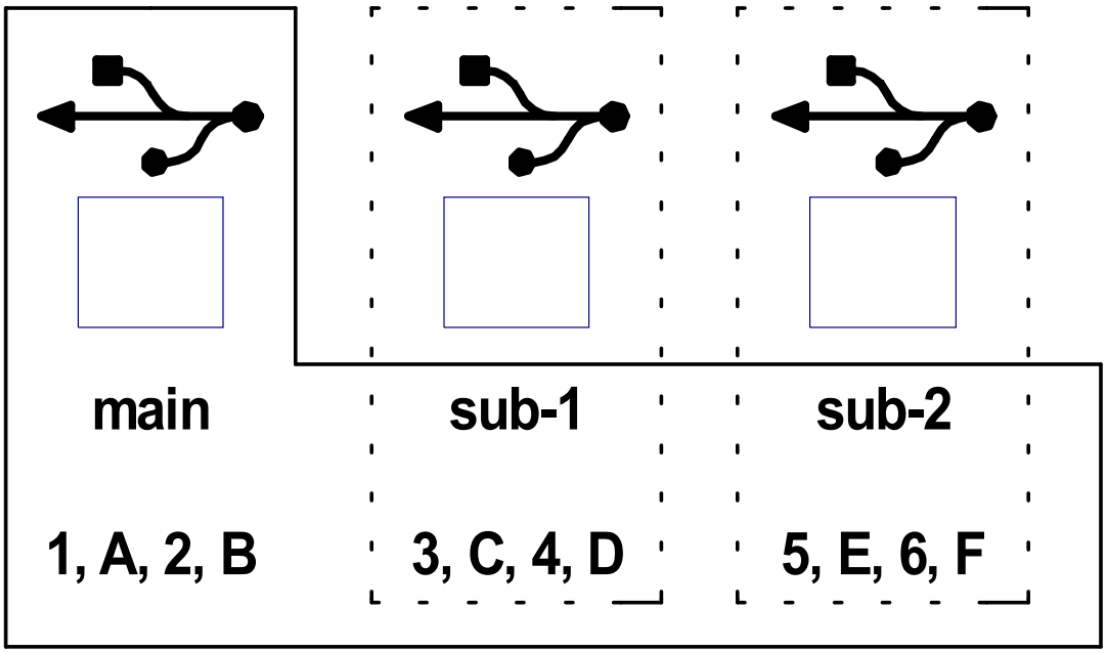


Figure 9 – The USB hub located on the back plane of the Multi Autolab Cabinet

Depending on the connection to the USB hub, the host computer can control the following module bays:

- **main USB:** all the module bays in the Multi Autolab cabinet are controlled.
- **sub-1 USB:** module bays 3, C, 4 and D are controlled.
- **sub-2 USB:** module bays 5, E, 6 and F are controlled.

When M101 modules are installed into a Multi Autolab Cabinet, the following guidelines should be followed:

1. Install M101 modules in the Parent positions first and only use the Daughter positions if the number of M101 modules is > 6 (see point 3).
2. Alternate the positions of the M101 modules in the Multi Autolab Cabinet in order to optimize the use of the USB hub located in the back plane of the instrument (see Figure 10 and Figure 11).

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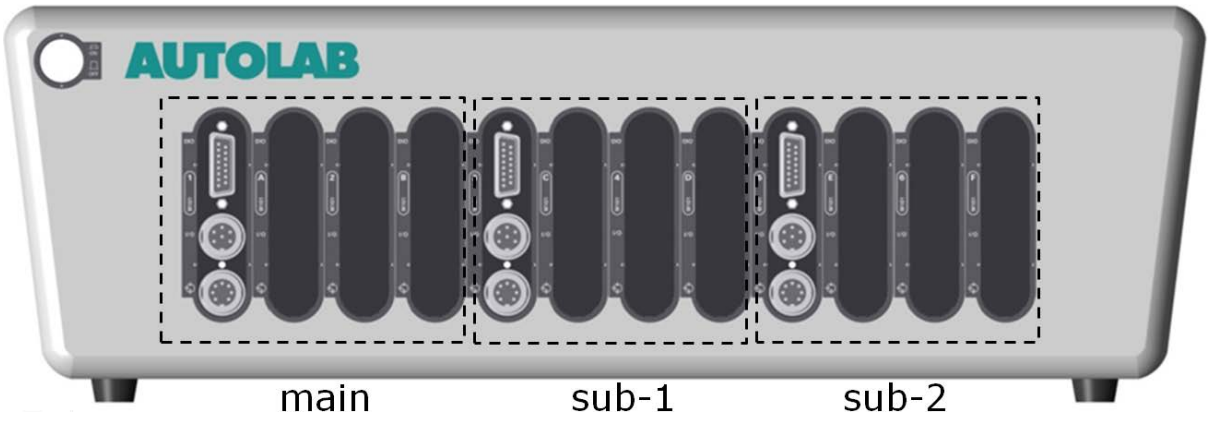


Figure 10 – Installing the first three M101 modules into the Multi Autolab Cabinet

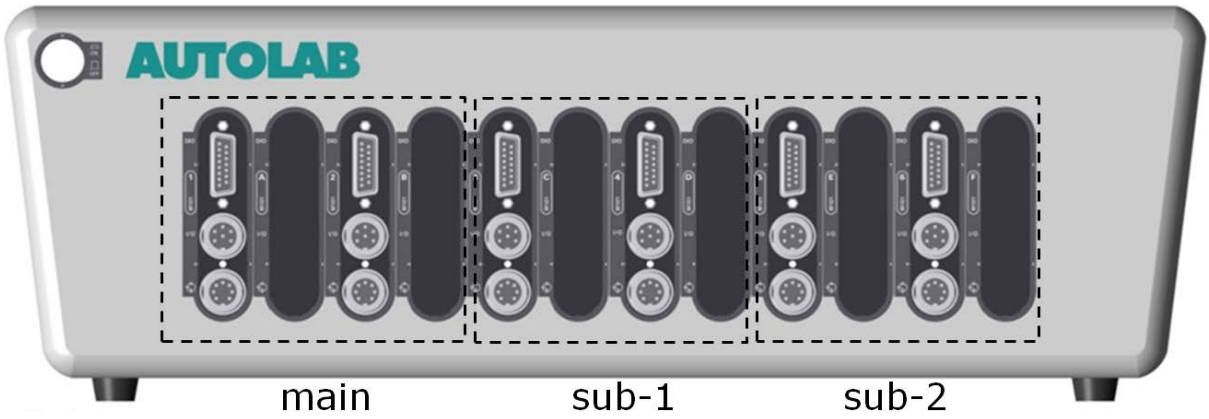


Figure 11 – Installing the following three M101 modules into the Multi Autolab Cabinet

3. When all the Parents positions are filled, continue with the Daughter positions.
4. The same alternating strategy is suggested for the Daughter positions (see Figure 12 and Figure 13).

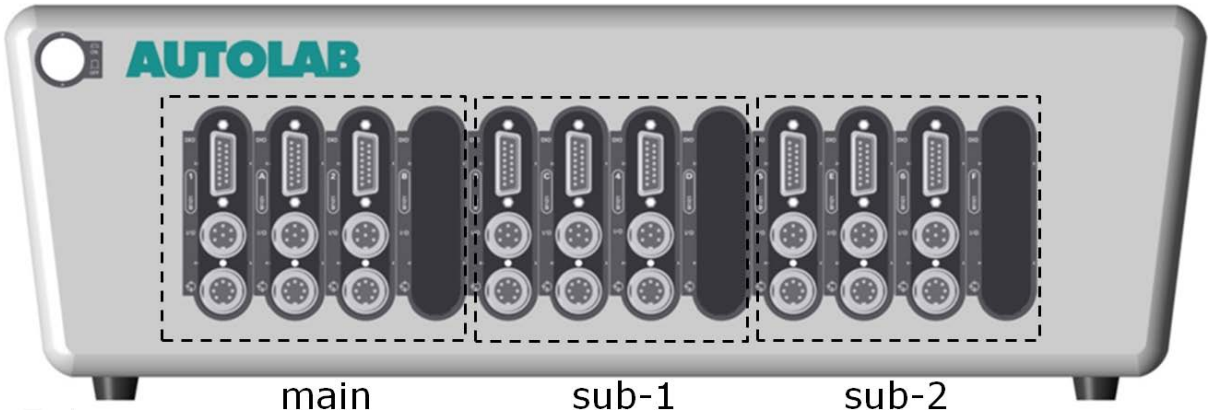


Figure 12 – Installing the next three M101 modules into the Multi Autolab Cabinet

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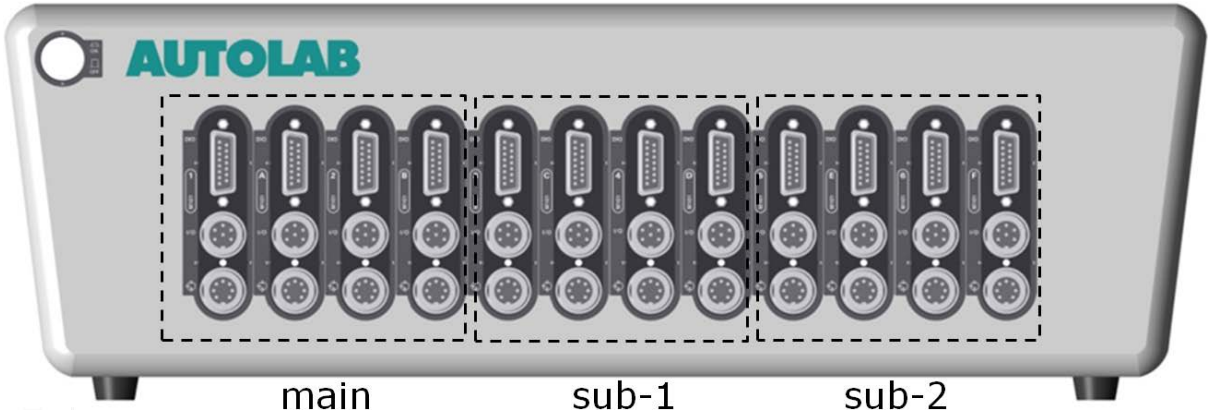


Figure 13 - Installing the final three M101 modules into the Multi Autolab Cabinet

5. Optional modules cannot be installed in Parent positions.
6. Optional modules cannot be installed in a Daughter position to the right of an empty Parent position.

4.3 – Installation procedure for optional modules into Multi Autolab Cabinet

The Multi Autolab Cabinet can accommodate the following optional modules into a Daughter position:

- pX1000
- MUX
- EQCM
- BA
- FRA32M

The optional modules can only be installed in Daughter positions and only if the Parent position immediately to the left of this Daughter position is occupied by a M101 module.

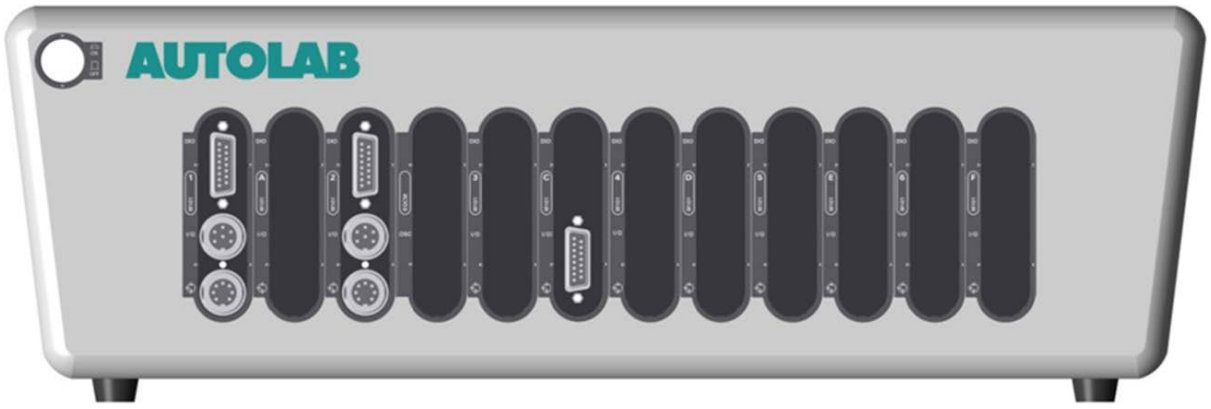


Figure 14 – [INCORRECT SITUATION] Installation of an optional module into a Multi Autolab Cabinet

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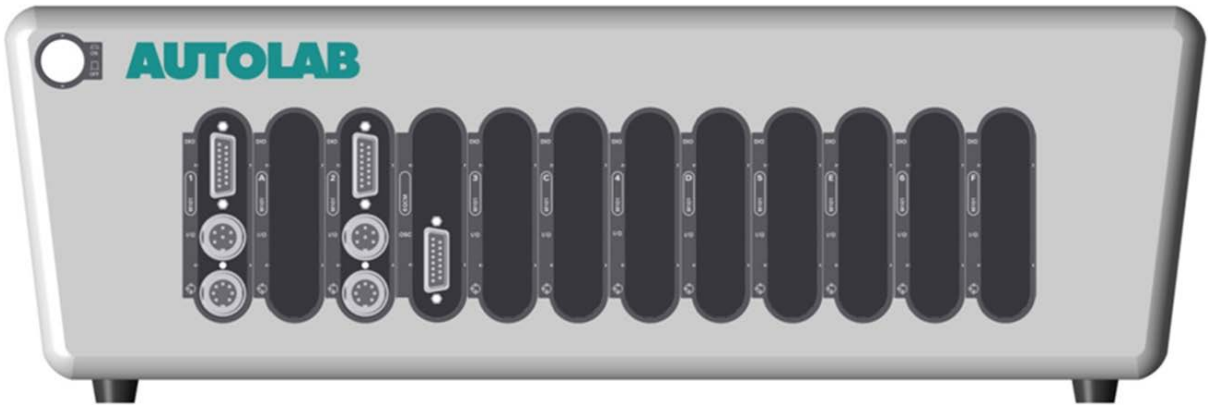


Figure 15 – [CORRECT SITUATION] Installation of an optional module into a Multi Autolab Cabinet

Note: optional modules can only be installed in the Daughter position. This means that each M101 module can only control a single optional module. The situation shown in Figure 16 is therefore not correct. The situation shown in Figure 17 is correct.

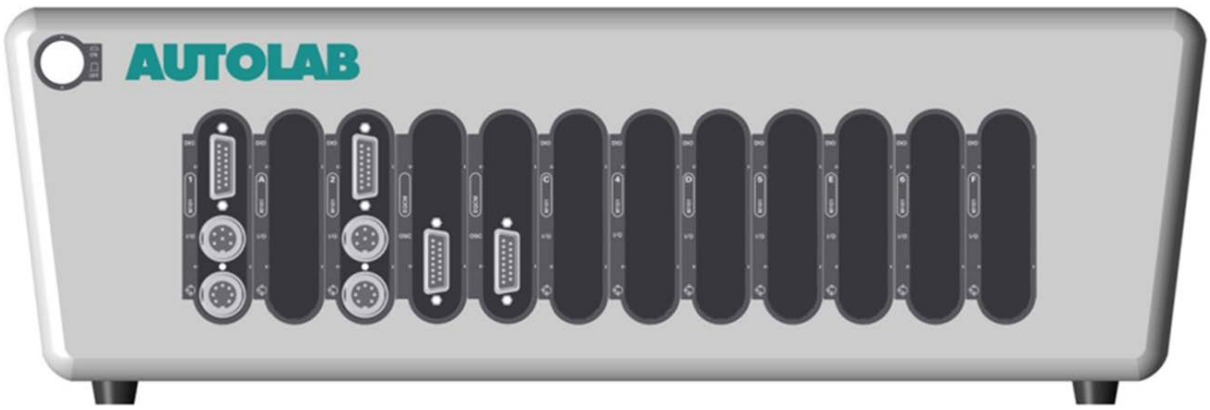


Figure 16 – [INCORRECT SITUATION] Optional modules can only be installed in a Daughter position

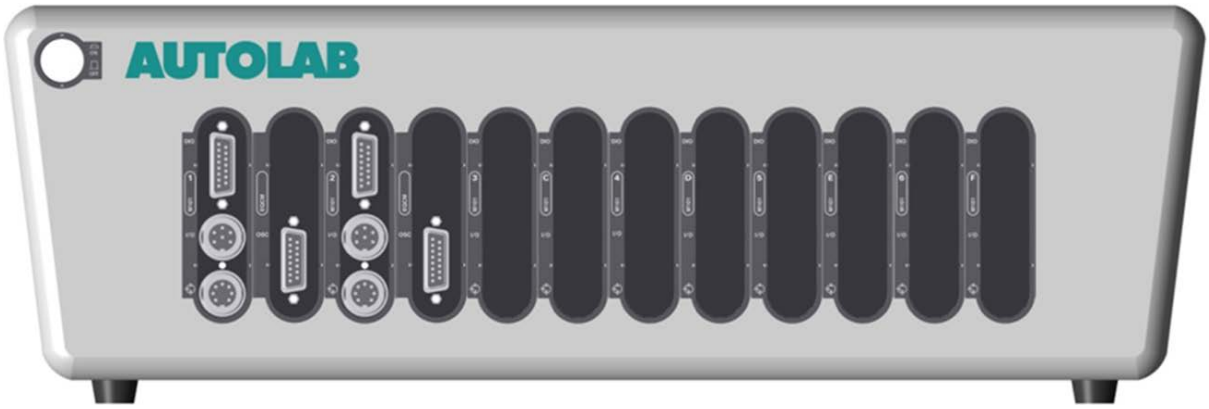


Figure 17 – [CORRECT SITUATION] Optional modules can only be installed in a Daughter position

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4.3.1 – Module label

The Multi Autolab Cabinet is fitted with 12 M101 module labels on the front panel identifying the different positions available in the cabinet. When installing an optional module, simply replace the M101 module label by the module label shipped with the optional module.

Note: for recycling purposes, please send the unused module labels back to Metrohm Autolab.

4.3.2 – Analog bus connections for optional modules

The following optional modules need to be connected to the parent M101 module using the provided dedicated analog bus:

- pX1000
- BA
- FRA32M

The analog bus has a universal connector for the parent M101 module and a dedicated set of connections for the daughter module. Figure 18, Figure 19 and Figure 20 show the analog bus connectors for the pX1000, the BA and the FRA32M module, respectively.

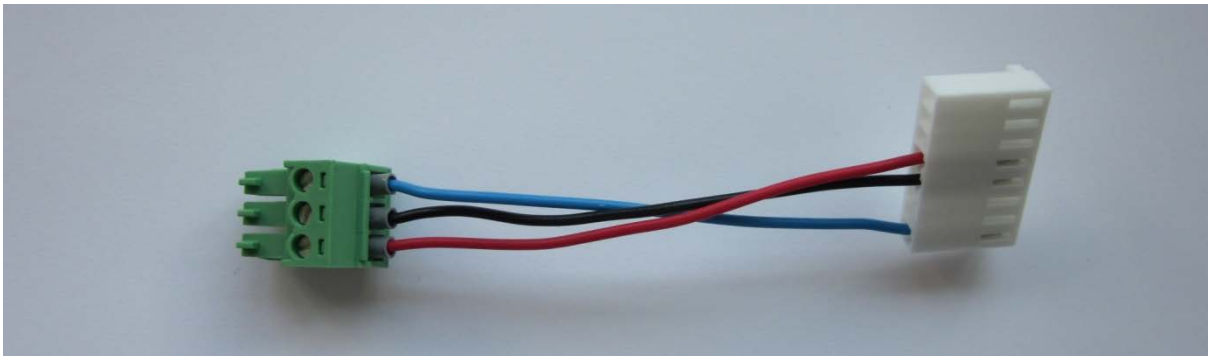


Figure 18 – Analog bus connector for the pX1000 module

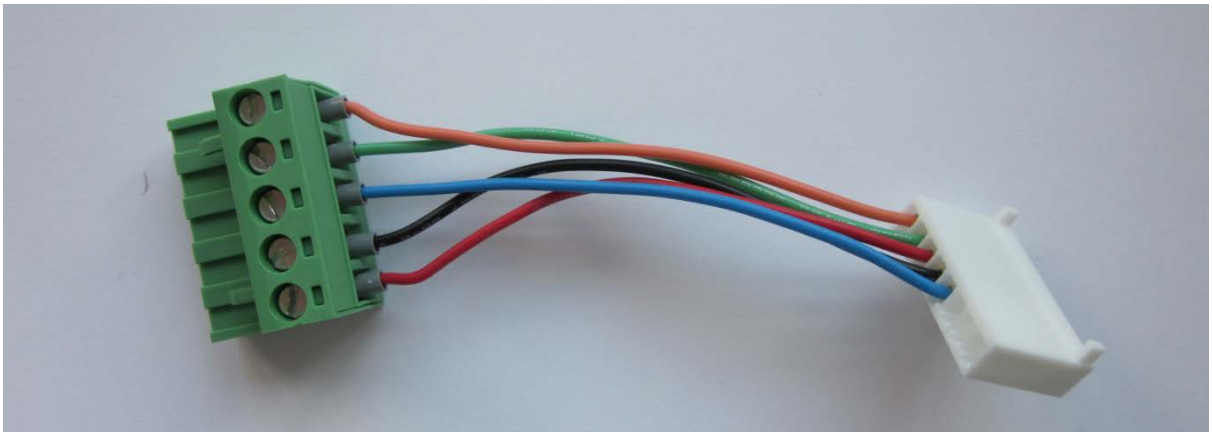


Figure 19 – Analog bus connector for the BA module

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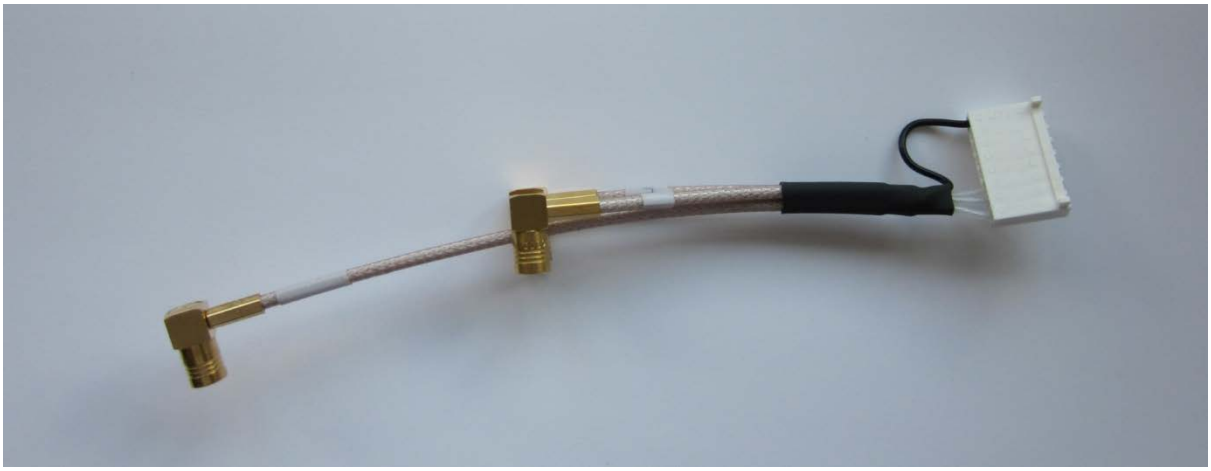


Figure 20 – Analog bus connector for the FRA32M module

The dedicated analog bus connectors for the pX1000 and the BA modules can only be installed in one way. Both the white universal M101 connector and the module specific green connector only fit the corresponding holders on the modules in one direction. Additional information is therefore not required.

The connector for the FRA32M, shown in Figure 20 comes with three different SMB connectors. A white label is wrapped around each cable. The long cable is labelled 'DSG', while the two shorter ones are labelled 'E' and 'I', respectively. These cables must be connected to the optional FRA32M module, according to the instructions shown in Figure 21.

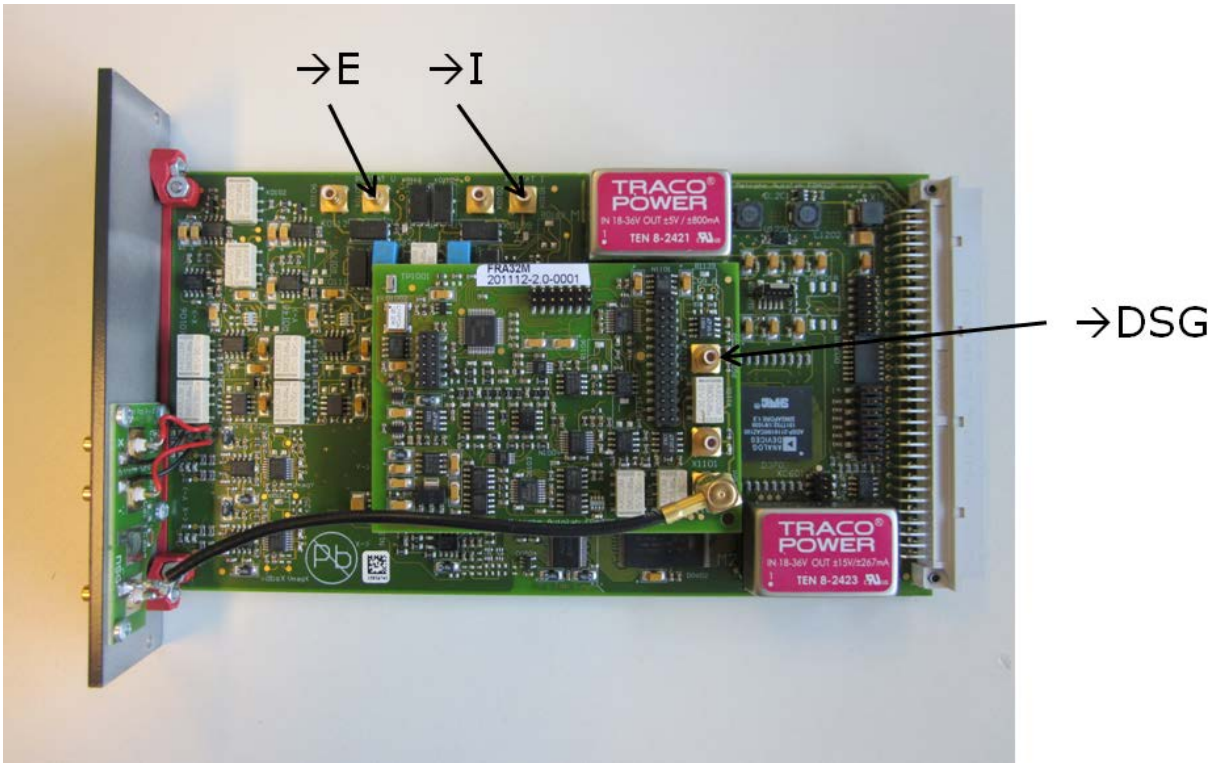


Figure 21 – Overview of the SMB connectors of the FRA32M module

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The universal white connector provided with the three analog bus connectors shown in Figure 18, Figure 19 and Figure 20 must be installed on the 8 pin connector located behind the main heat sink on the M101 module (see Figure 22).

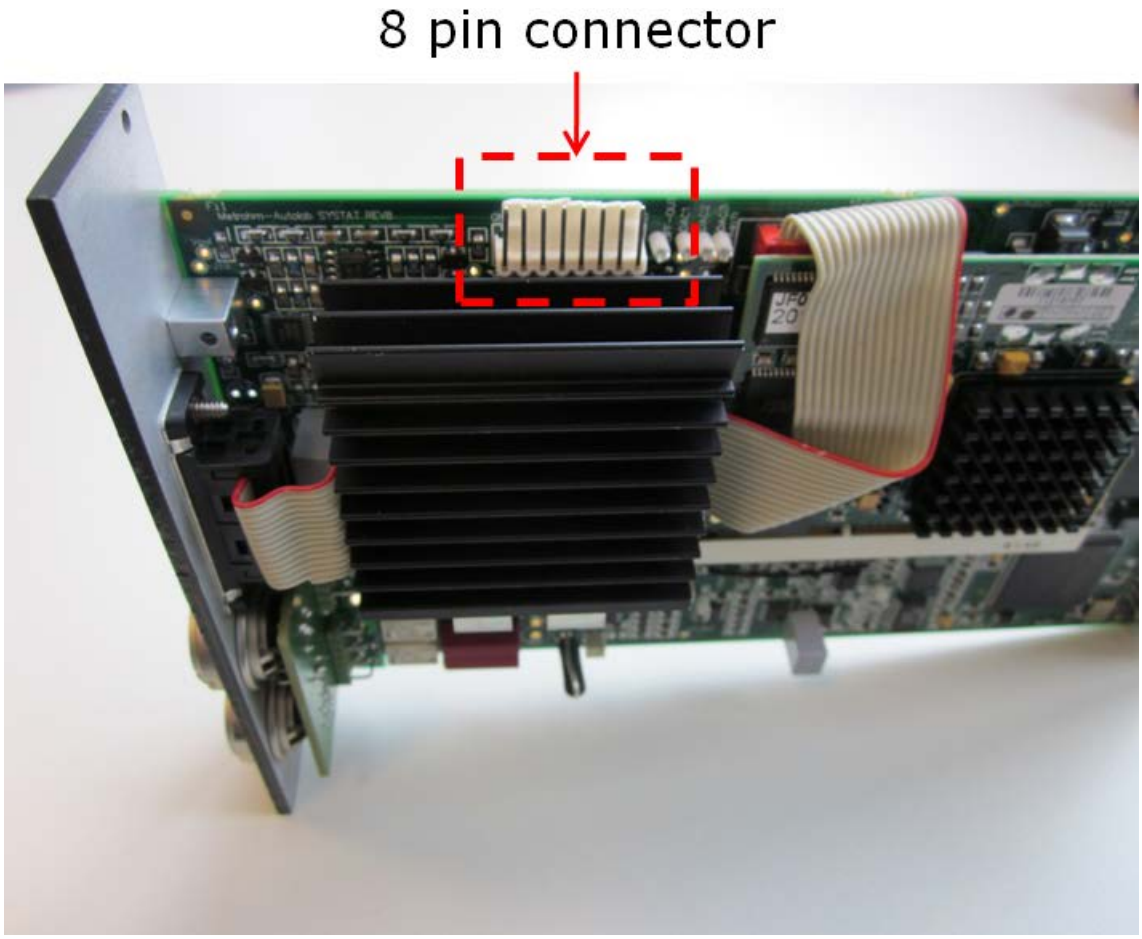


Figure 22 – The analog bus connectors must be installed on the 8 pin connector located on the M101 PCB, behind the main heat sink

Note: install the white connector with the two notches facing towards the M101 pcb (see Figure 23).

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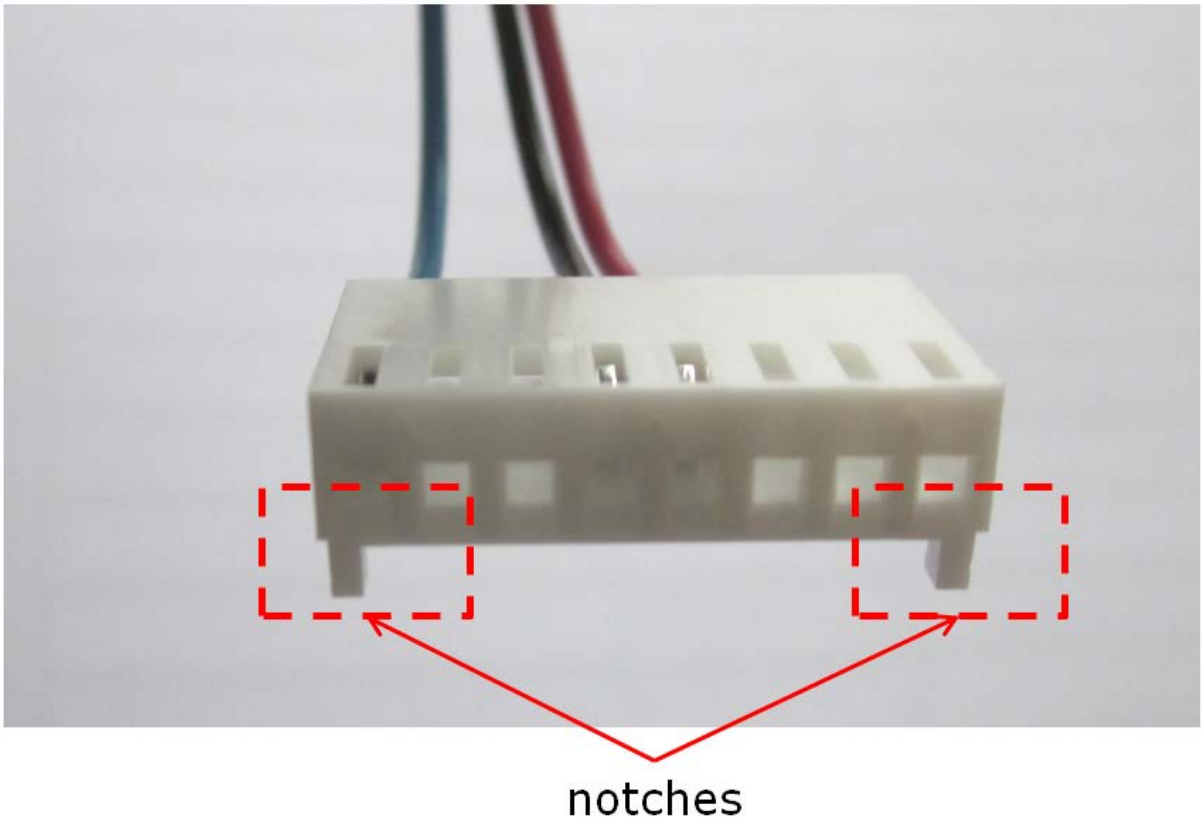


Figure 23 – The analog bus connector must be installed with the two notches facing towards the M101 PCB

Figure 24 shows an example of optional modules installed in Daughter positions and properly connected to the Parent M101 module through the dedicated analog bus connectors.

Note: Daughter positions A and B are fitted with the MUX and EQCM modules, respectively. For both of these modules, no analog connection is required.

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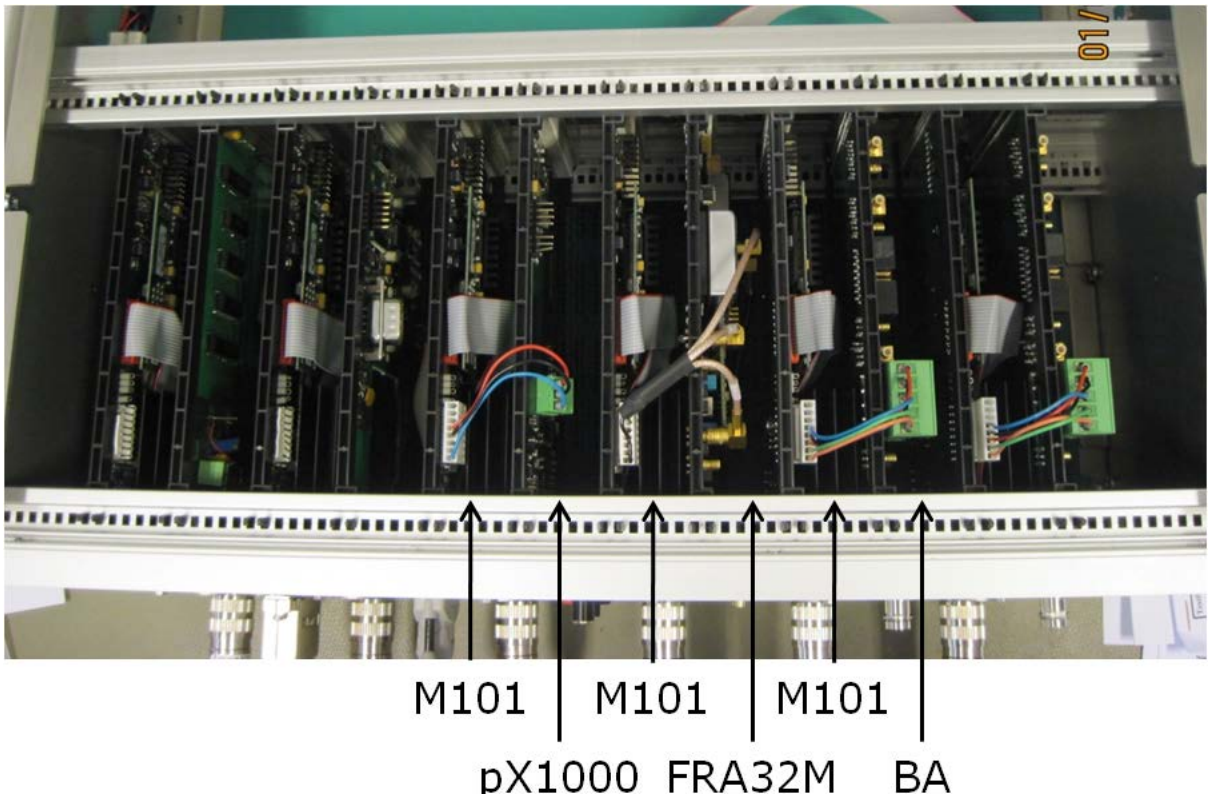


Figure 24 – Example of analog bus connections to the M101 modules installed in Parent positions

5 – Multi Autolab M101 programming

When M101 modules[1] are installed into an existing Multi Autolab Cabinet, two situations can be encountered:

1. The M101 module was ordered for a known Multi Autolab Cabinet and for a known position in the cabinet (1-6 for the Parent positions or A-F for the Daughter positions). In this case, the module has been programmed by Metrohm Autolab and it will be recognized properly by the software. The module will be identified by the serial number of the cabinet and the location in the cabinet. For example, module MAC80002#A will indicate a M101 module located in module bay A in the Multi Autolab Cabinet with serial number MAC80002.
2. The M101 module was taken from stock and is installed into an unknown position of an unknown Multi Autolab Cabinet. In this case, the module needs to be programmed in order to be recognized properly. If the module is not programmed, it will not be recognized by its position but by its native serial number which is not recommended[2]. Programming of the M101 module is done through the Edit Serial Number application.

[1] Only M101 modules need to be programmed. This is not required for optional modules installed in Daughter module bays.
[2] Unprogrammed M101 modules will work according to specifications, however it will not be possible to identify these modules based on their positions in the Multi Autolab Cabinet.

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Note: it is always possible to reprogram M101 modules using the Edit Serial Number application.

5.1 – The Edit Serial Number application

The Edit Serial Number application can be downloaded from the Metrohm Autolab website[3]. This application needs to be installed on the host computer. During installation, a shortcut is created in the Start menu (All programs – Autolab – Tools – Edit serial number).

Note: before starting the Edit Serial Number application, connect the Multi Autolab Cabinet to the computer using the main USB connector on the back panel. When prompted, install the USB drivers as indicated in the NOVA Getting Started manual.

When the application is started it will connect to all available Autolab instruments connected to the host computer.

Note: while the software connects to the available instruments, no user interaction is possible. This idle time increases with the number of instruments.

When all instruments are connected, the Edit Serial Number application will display a list of available devices, identified by serial number (see Figure 25).

[3] http://www.metrohm-autolab.com/export/Homepages/Autolab/download/Servicedocs/Edit_Serial_Number.zip

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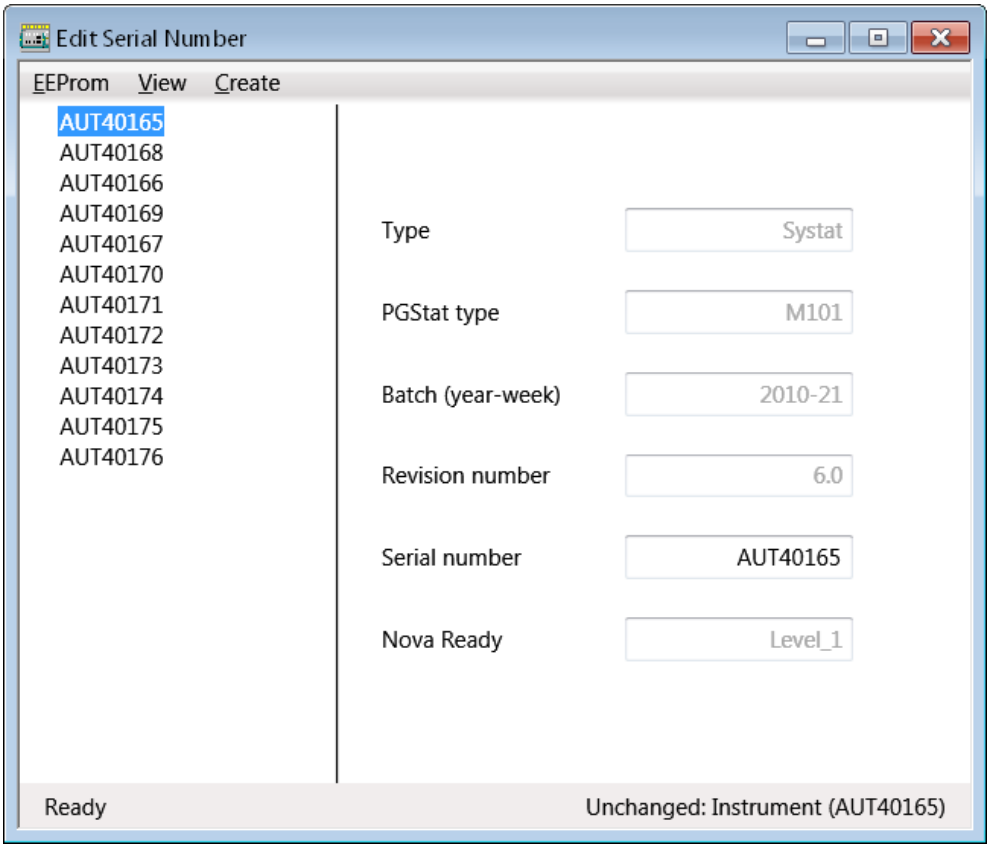


Figure 25 – The Edit Serial Number application lists the available Autolab devices, identified by serial number

Note: the maximum number of devices that can be controlled by the Edit Serial Number application is 16!

The frame on the right-hand side of the Edit Serial Number application provides a number of fields displaying information on the highlighted device. Only the Serial number field can be edited (the other fields are read-only).

For the Multi Autolab instrument to work properly, the following information needs to be encoded into **each** M101 module installed in the Multi Autolab Cabinet, using the Edit Serial Number application:

- The serial number of the Multi Autolab Cabinet (printed on the back plane of the device). This number is the same for all the M101 modules installed in the cabinet.
- The specific module position of each M101 module (1-6 for parent positions, A-F for daughter positions).

For the Multi Autolab with M101, three different situations fall in the scope of use of the Edit Serial Number application:

1. M101 modules are to be installed in a completely empty Multi Autolab Cabinet.
2. M101 modules are to be installed in an existing Multi Autolab Cabinet, fitted with at least one M101 module.

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3. M101 modules installed in an existing Multi Autolab Cabinet need to be removed from the cabinet in order to be installed in another Multi Autolab Cabinet.

All three situations will be described in the following sections.

5.1.1 – Installation of M101 modules into an empty Multi Autolab Cabinet

When the M101 modules are installed into a completely empty Multi Autolab Cabinet, both the serial number and the position of each M101 module needs to be encoded in each module.

The serial number of the Multi Autolab Cabinet can be found on the back panel of the instrument (MAC8XXXX).

The position of the M101 modules is defined by the module bays in which they are installed (Parent or Daughter).

5.1.1.1 – Create a new Multi Autolab Cabinet

Using the application menu, select the Multi Autolab Cabinet option from the Create menu (see Figure 26).

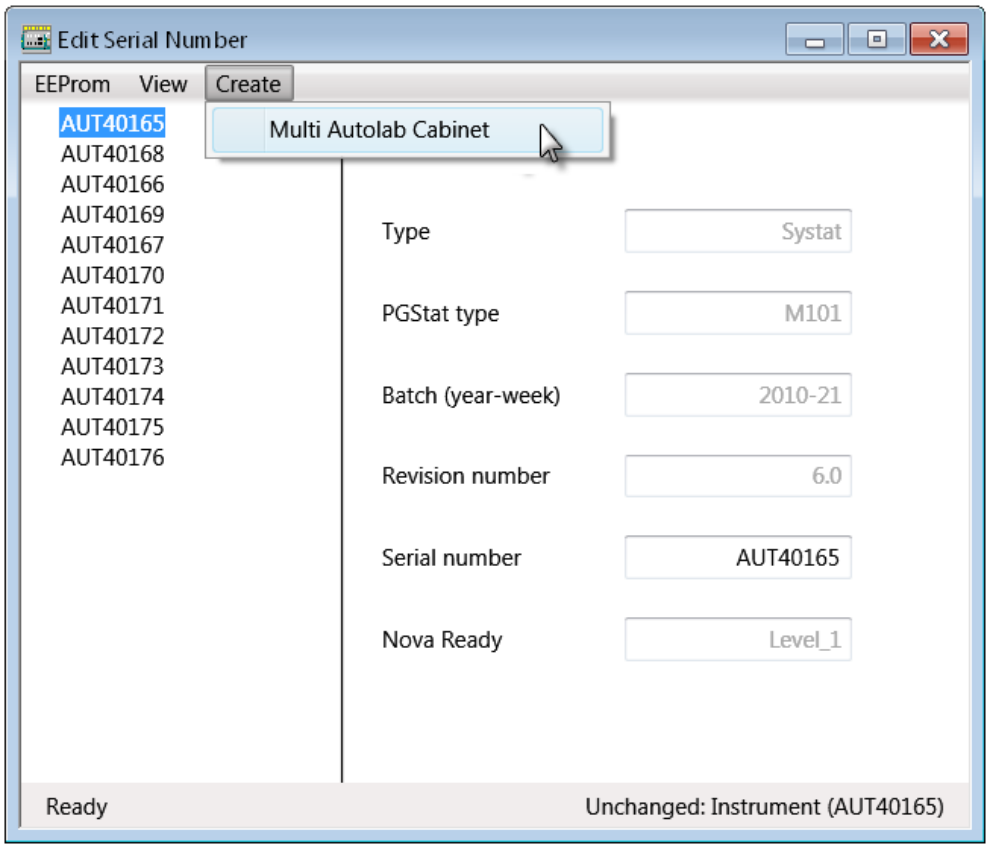


Figure 26 – Creating a Multi Autolab Cabinet

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A software instance of the Multi Autolab Cabinet will be added to the list of available devices in the frame on the left-hand side (see Figure 27). The default serial number of the Multi Autolab Cabinet is MAC80000. Click the Multi Autolab Cabinet in the list and edit the serial number of the cabinet in the frame on the right (see Figure 27).

Note: make sure that the serial number provided in the Edit Serial Number application corresponds to the number provided on the back panel of the instrument.

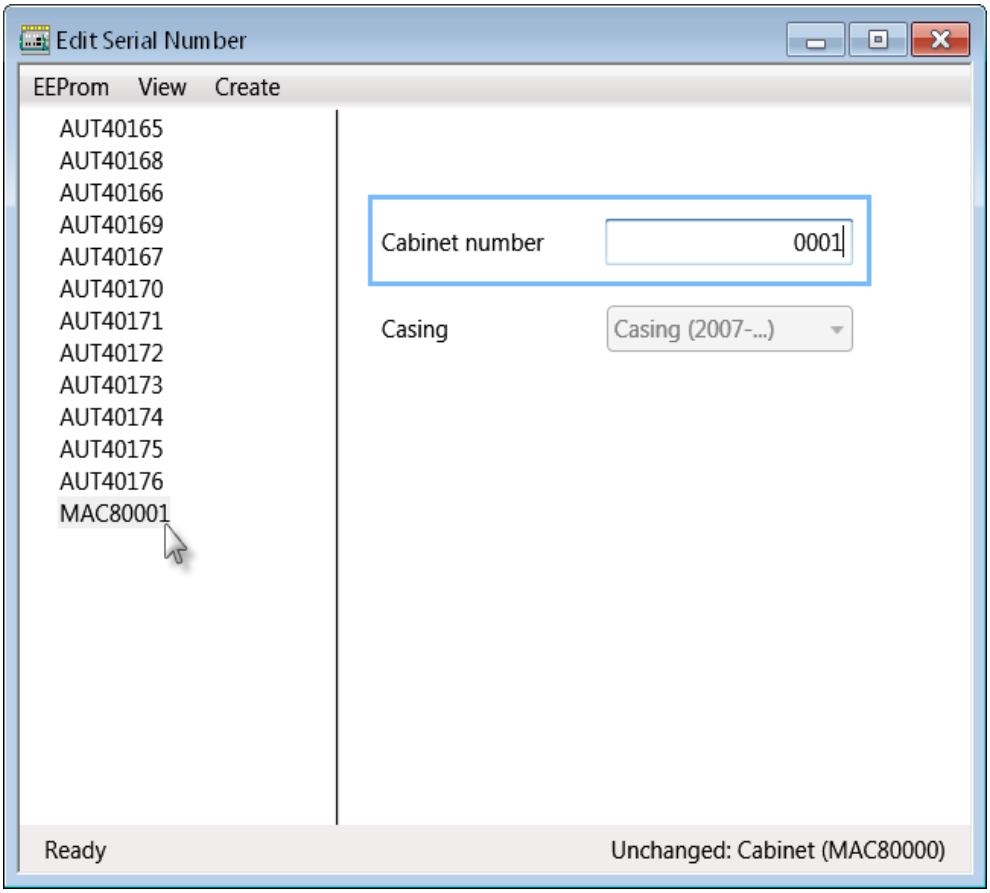


Figure 27 – Editing the serial number of the Multi Autolab Cabinet

5.1.1.2 – Add the M101 modules to the new Multi Autolab Cabinet

Once the Multi Autolab Cabinet has been identified in the software with its correct serial number, it is possible to start adding M101 modules to this cabinet. Using the **drag and drop** method, select the AUT4XXXX modules available in the list on the left-hand side and add them to the Multi Autolab Cabinet (see Figure 28).

Left click a M101 module and while holding the mouse button, drag it onto the MAC8XXXX item in the list. Release the mouse button to add it to the cabinet.

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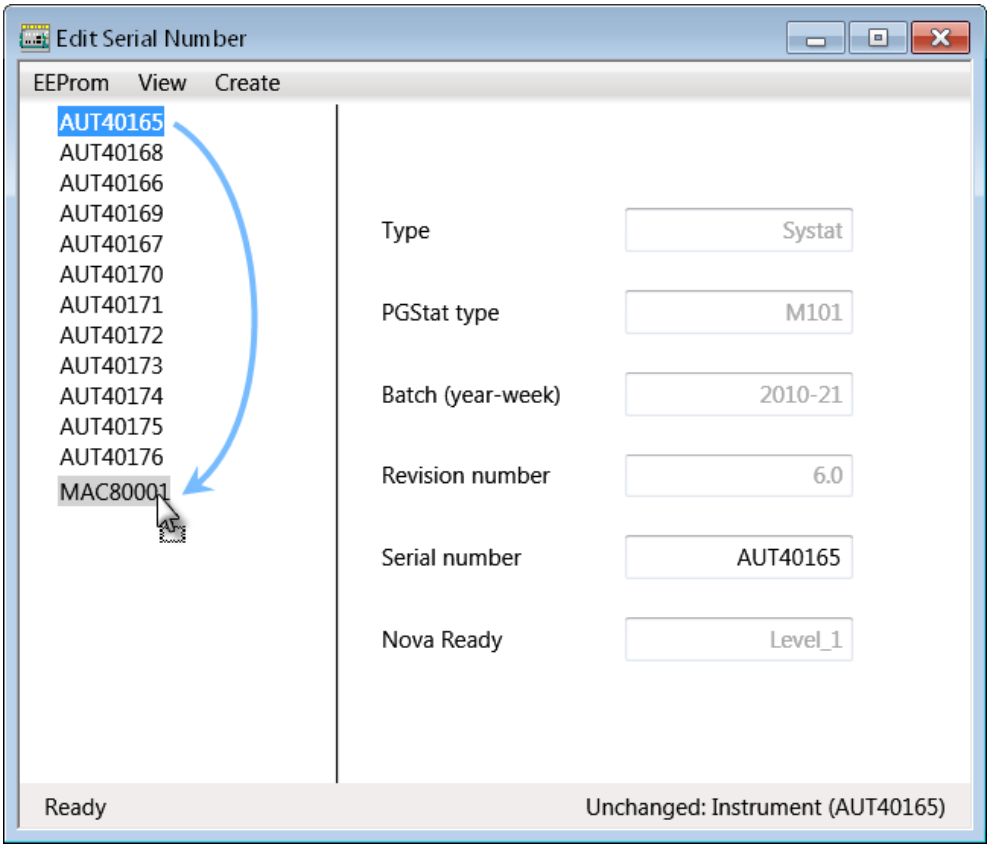


Figure 28 – Adding a M101 modules to the Multi Autolab Cabinet (1/2)

The M101 module dragged into the Multi Autolab Cabinet will be listed below the MAC8XXXX serial number (see Figure 29).

Note: an asterisk symbol (*) in the Edit Serial Number application indicates an unchanged status of the hardware configuration.

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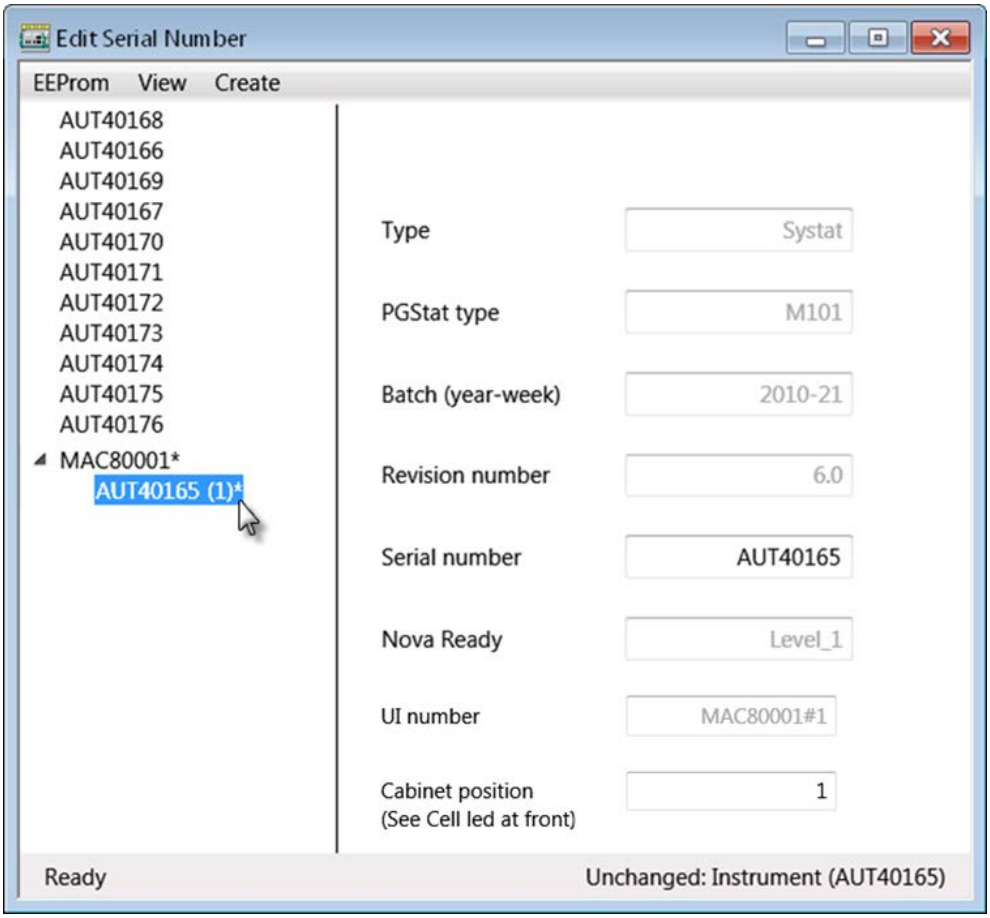


Figure 29 – Adding a M101 module to the Multi Autolab Cabinet (1/2)

This step can be repeated for all the M101 modules to be added to the Multi Autolab Cabinet (see Figure 30).

Note: the (1) listed next to each M101 module in the Multi Autolab Cabinet indicates the module position in the instrument. Since no position has been assigned yet, all the M101 modules are listed as installed in position (1).

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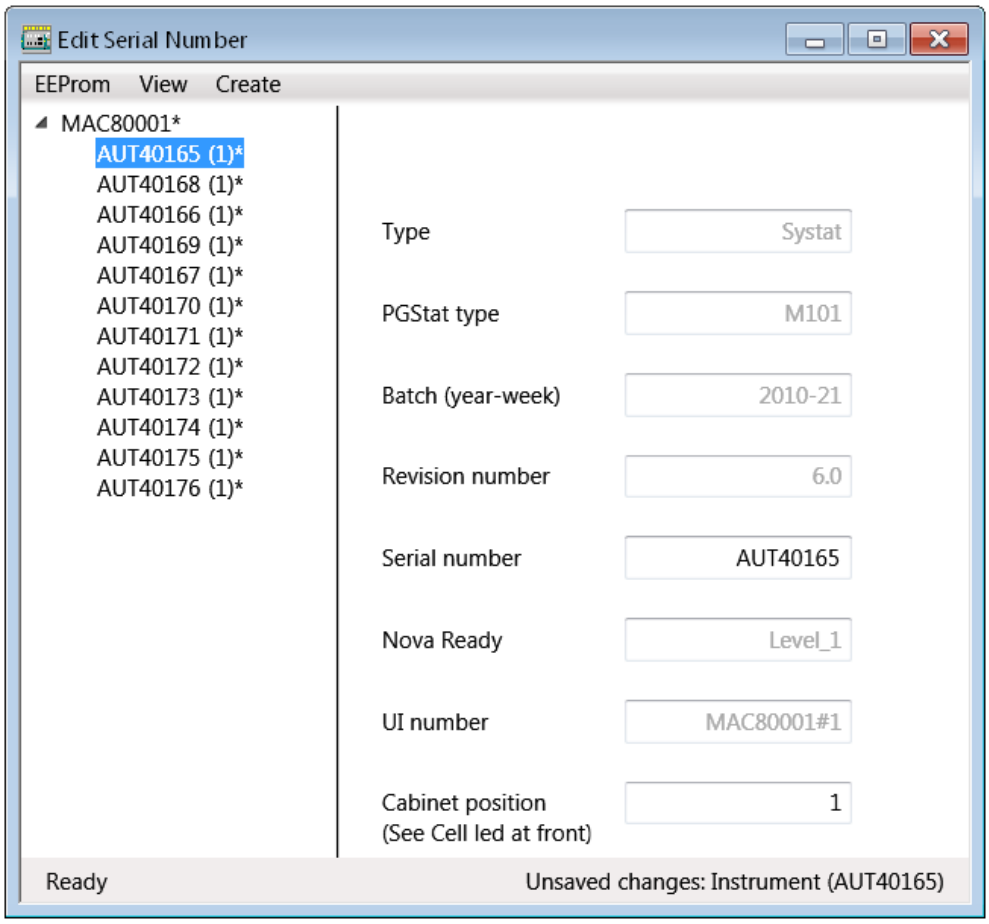


Figure 30 – Adding all the M101 modules to the Multi Autolab Cabinet

5.1.2 – Installation of M101 modules into an existing Multi Autolab Cabinet

When the M101 modules are installed into an existing Multi Autolab Cabinet with at least one M101 module already installed and configured, the new modules need to be added to the existing Multi Autolab Cabinet.

After starting the Edit Serial Number application, the existing Multi Autolab Cabinet as well as the new M101 modules will be listed in the frame on the left-hand side (see Figure 31).

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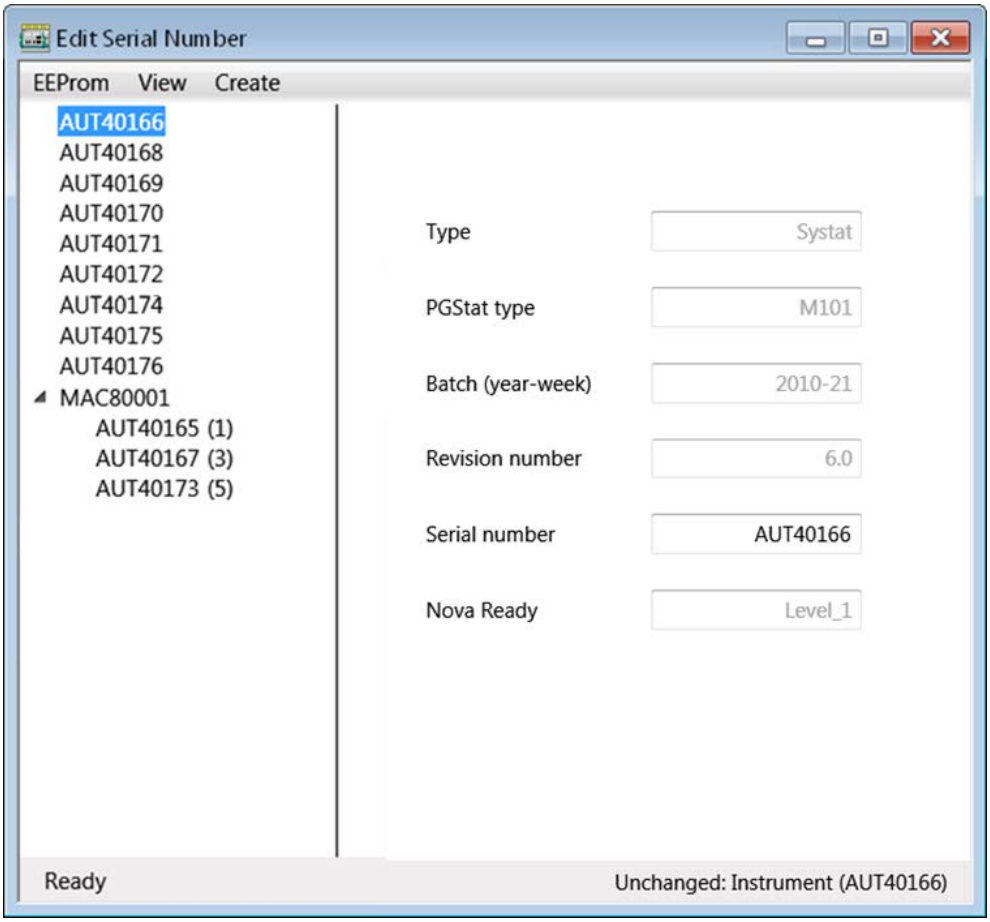


Figure 31 – The new M101 modules are listed alongside the existing M101 modules installed in the Multi Autolab Cabinet

5.1.2.1 – Add the M101 modules to the existing Multi Autolab Cabinet

Using the procedure described in Section 5.1.1.2, drag and drop the new M101 modules into the existing Multi Autolab Cabinet (see Figure 32).

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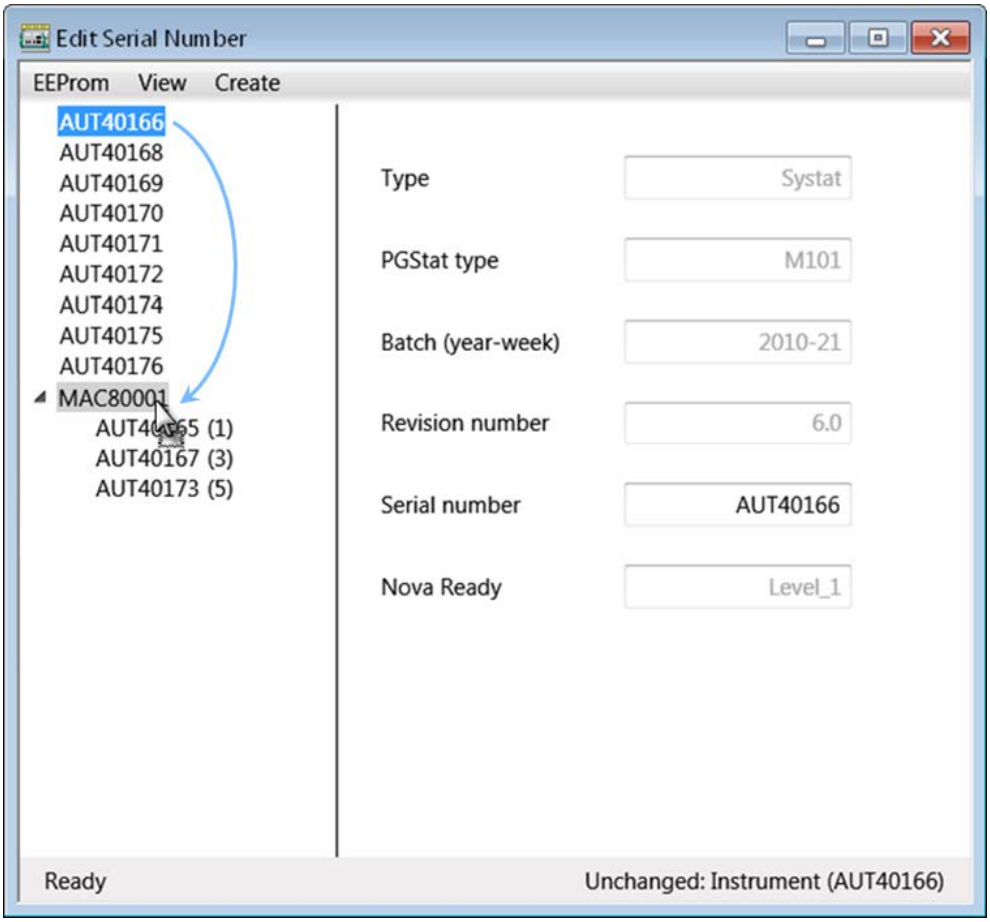


Figure 32 – Adding M101 modules to an existing Multi Autolab Cabinet (1/2)

The M101 module dragged into the Multi Autolab Cabinet will be listed below the MAC8XXXX serial number (see Figure 33).

Note: an asterisk symbol (*) in the Edit Serial Number application indicates an unchanged status of the hardware configuration.

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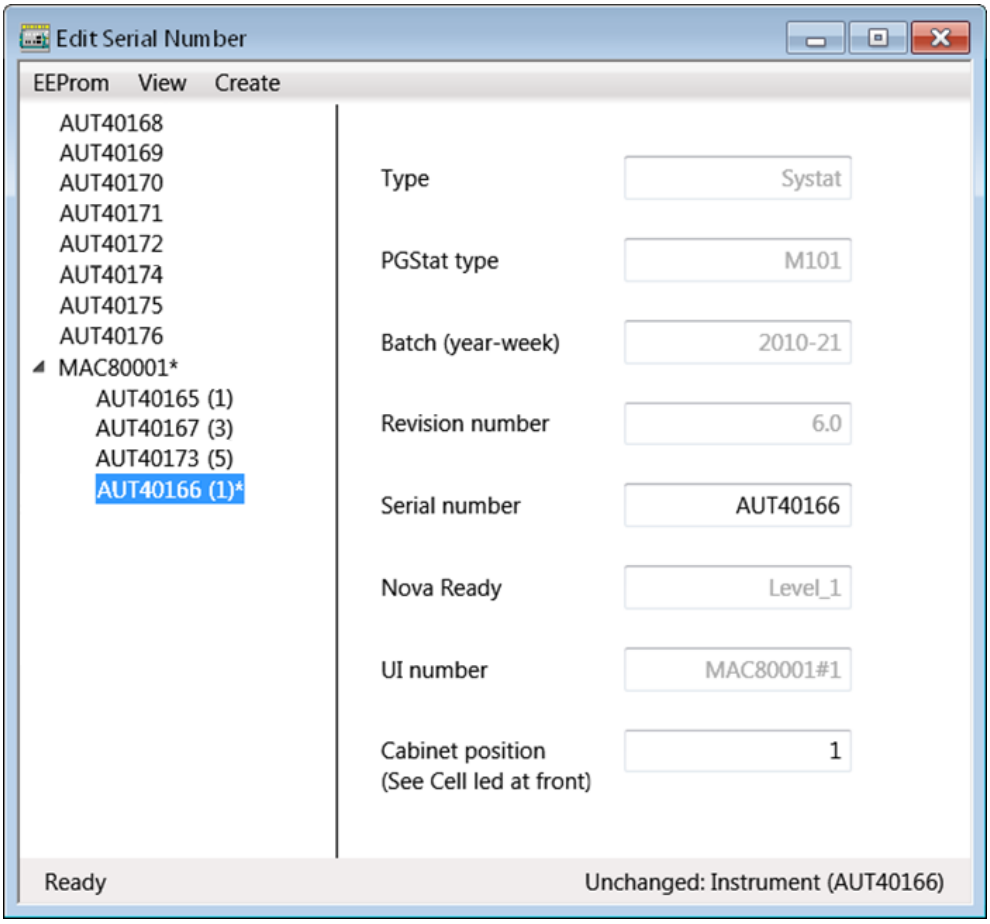


Figure 33 – Adding a M101 module to the Multi Autolab Cabinet (2/2)

This step can be repeated for all the M101 modules to be added to the existing Multi Autolab Cabinet (see Figure 34).

Note: the (1) listed next to each new M101 module added to the existing Multi Autolab Cabinet indicates the module position in the instrument. Since no position has been assigned yet, these M101 modules are listed as installed in position (1).

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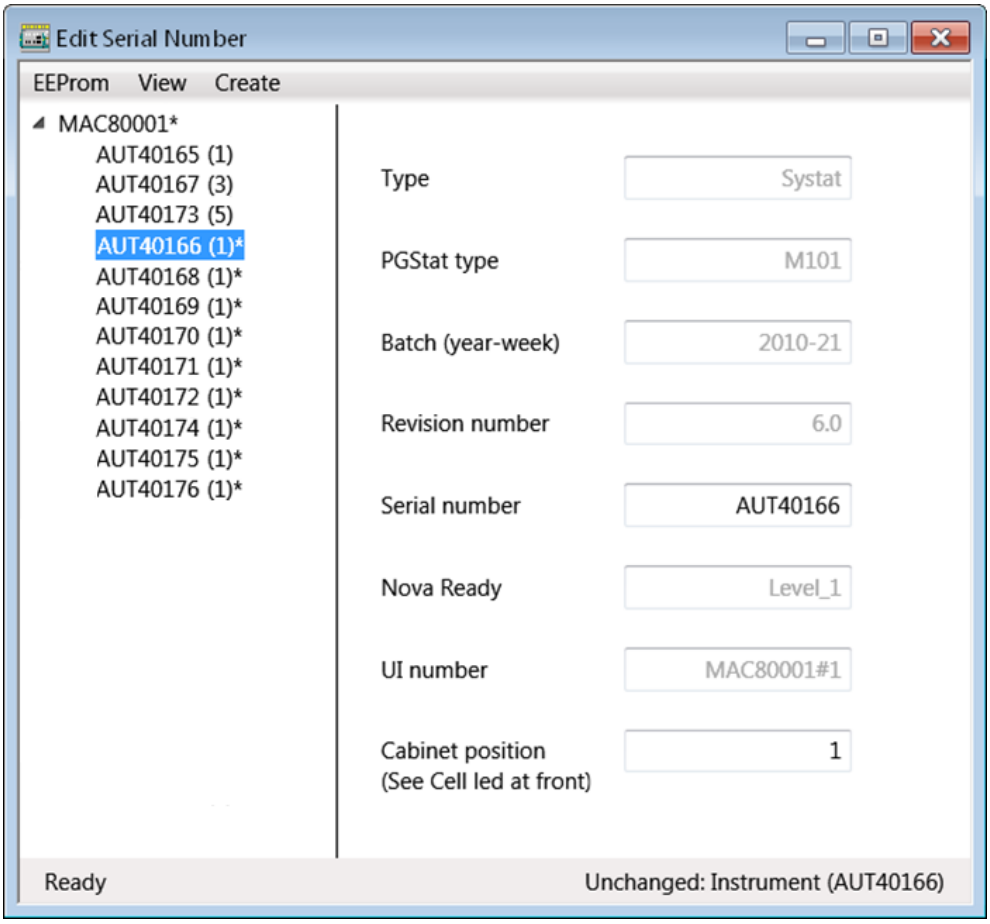


Figure 34 – Adding all the M101 modules to the Multi Autolab Cabinet

5.1.3 – Assign the position number for each M101 module

Requirement: connect the M101 cell cable to each M101 module in the Multi Autolab Cabinet before continuing. Short circuit the RE and CE plugs and the S and WE plugs for each cell cable, as indicated in Figure 35 before continuing with this section.

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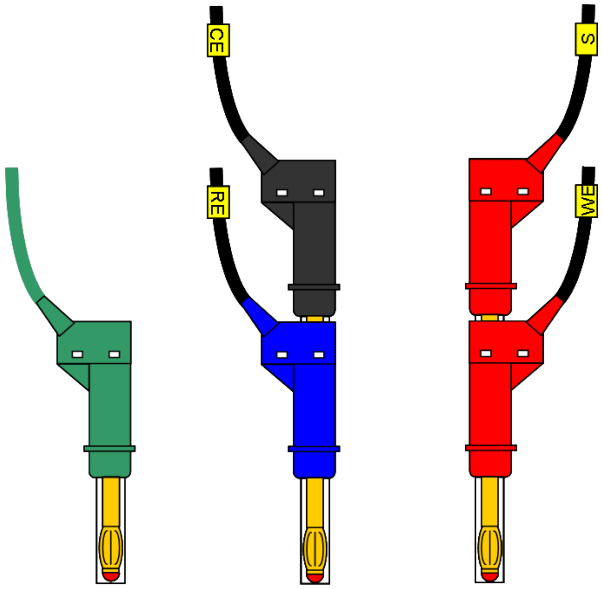


Figure 35 – Connect the cell cable to each M101 module and short circuit the CE and RE and S and WE on each cell cable

Select one of the M101 modules added to the Multi Autolab Cabinet. When the M101 module is selected, the cell will be switched on, with the internal dummy cell active. The status LED located on the front panel of the M101 module will be lit green (see Figure 36).

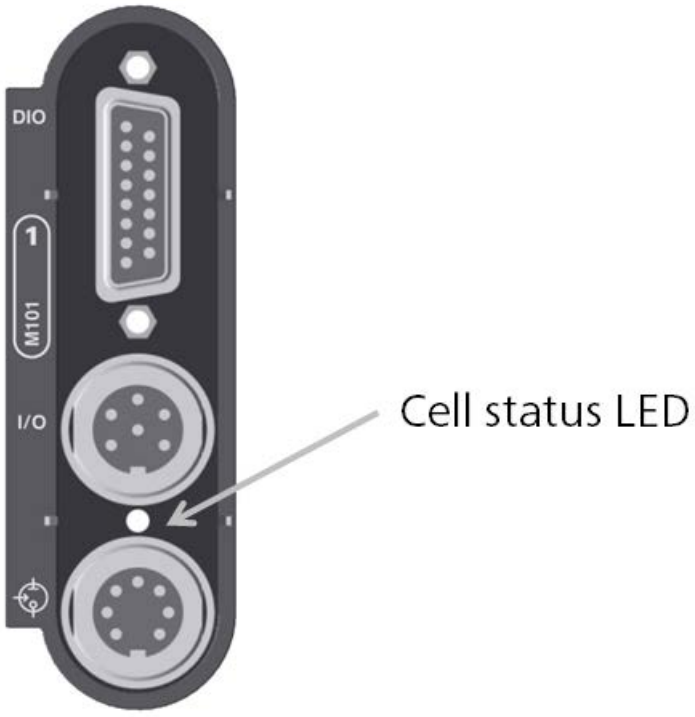


Figure 36 – The Cell status LED is lit green when a M101 module is selected in the Edit Serial Number application

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Since only one LED is lit, the position of the M101 module inside the Multi Autolab Cabinet can be easily identified (see Figure 37).



Figure 37 – The cell status LED of the selected M101 module (position 1) is lit green

Write the identified position number in the frame on the right-hand side of the application, the Cabinet position field (see Figure 38).

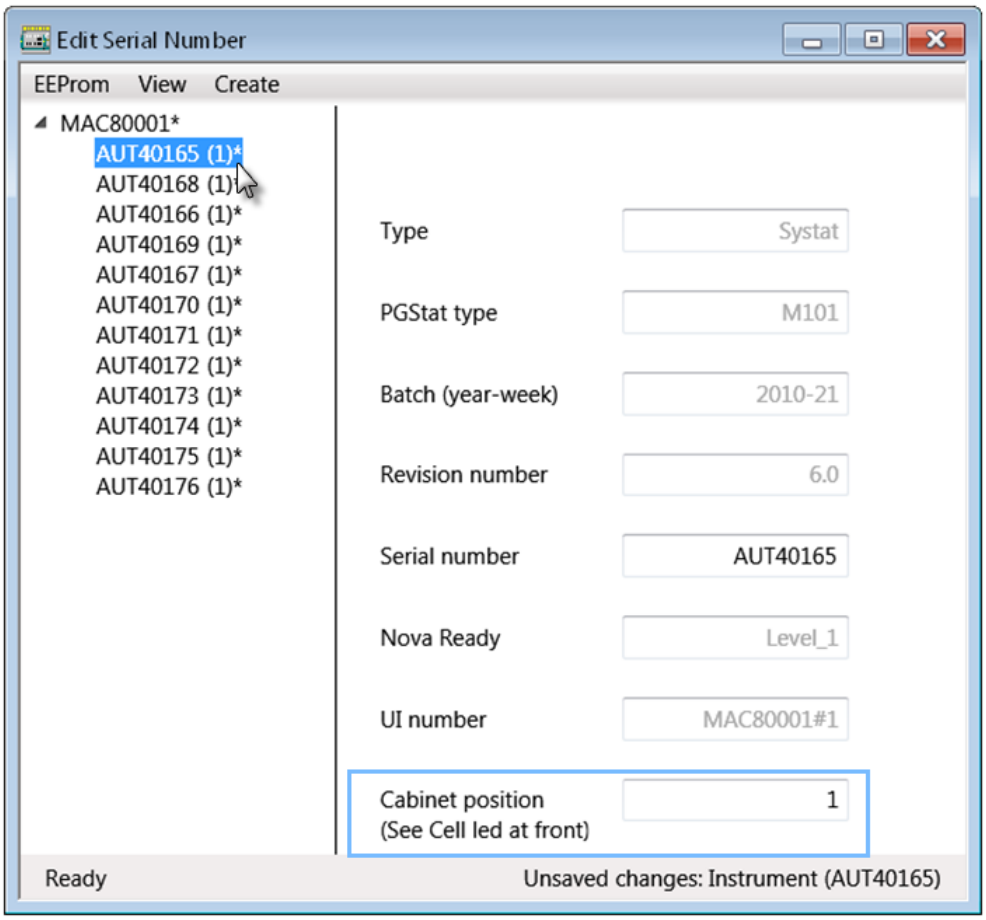


Figure 38 – Write the location of the M101 module in the Cabinet position field

Note: the value indicated in the Cabinet position field must be valid (1-6 for Parent positions or A-F for Daughter positions).

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Repeat this for all the M101 modules installed in the Multi Autolab Cabinet. The new position of the M101 modules will be indicated between round brackets (X) (see Figure 39).

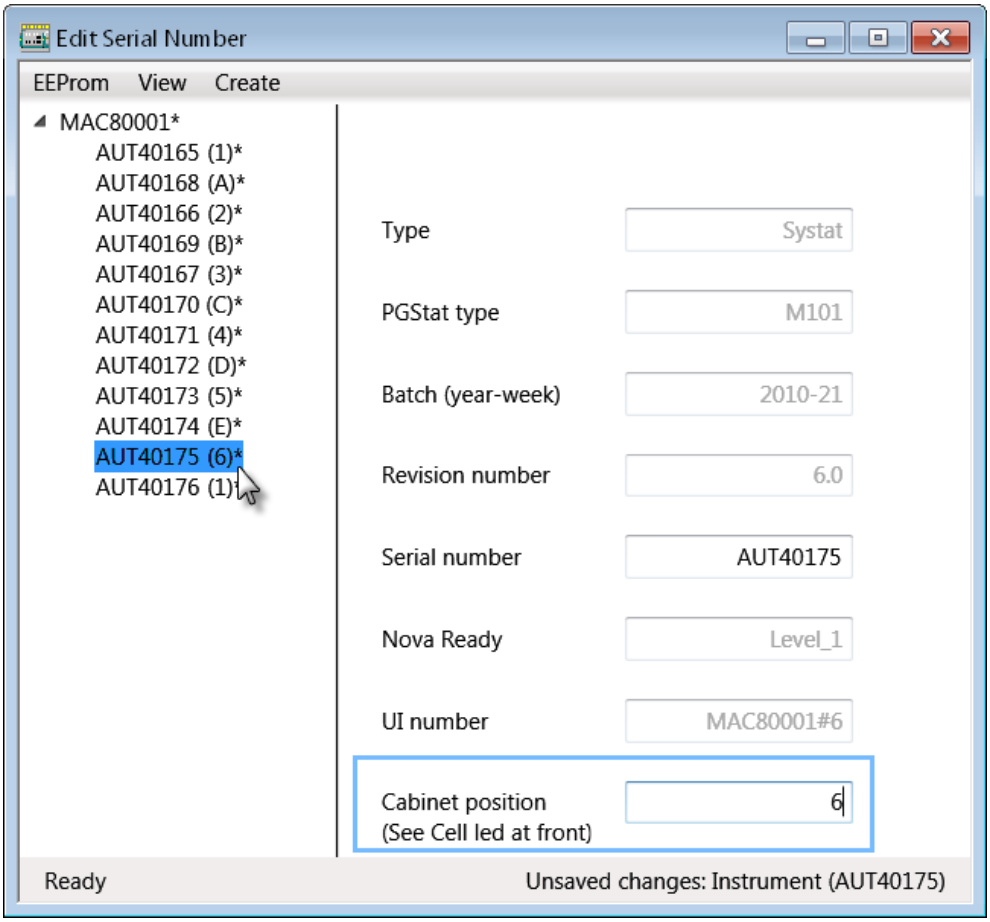


Figure 39 – The new position of each M101 module is indicated between round brackets (X)

5.1.4 – Save the changes

When all the M101 modules installed in the Multi Autolab Cabinet have been assigned a correct and unique position, the changes can be permanently saved to the on-board EEPROMS.

Right-click the MAC8XXXX item in the frame on the right-hand side and select the Write to EEPROM option from the context menu (see Figure 40).

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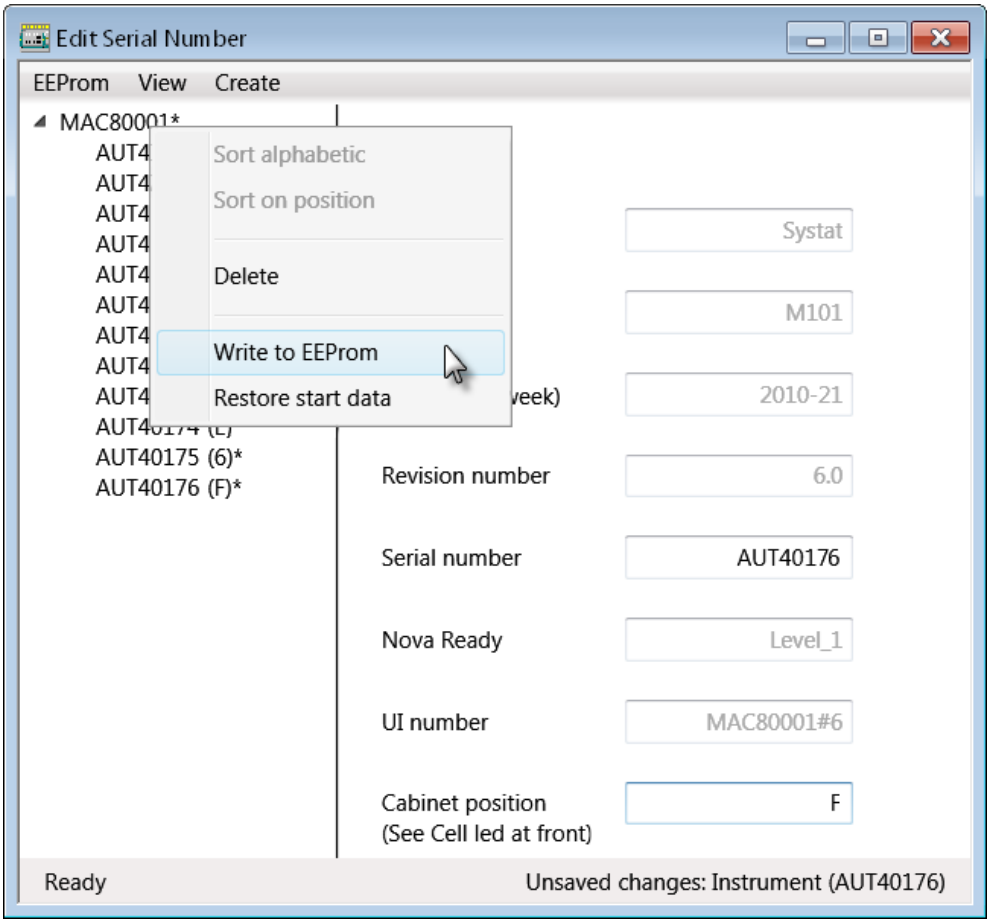


Figure 40 – Saving all the information to the on-board EEPROM

The information specified for each module will be saved in the on-board EEPROM of each M101 module. Once the information has been successfully uploaded, the (*) symbol indicating the unsaved status will be removed (see Figure 41).

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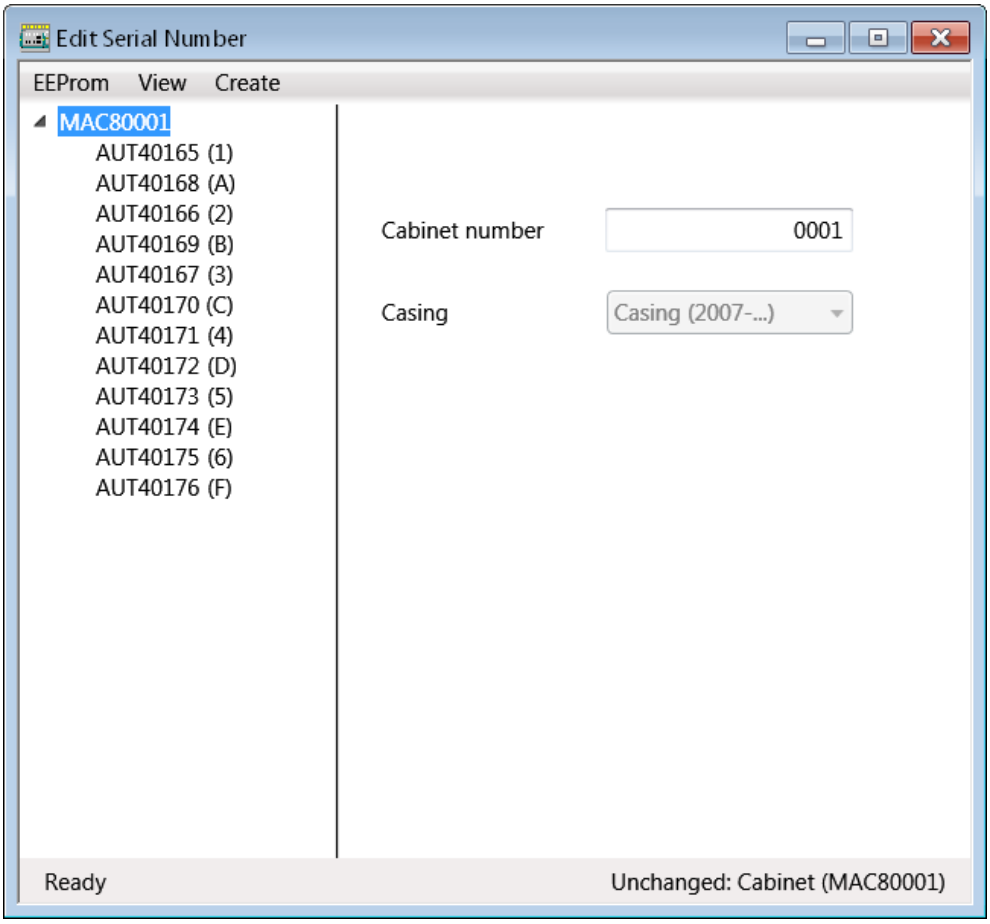


Figure 41 – The (*) symbols are removed when the all the information has been saved

5.1.5 – Verification

After programming the instrument using the instructions provided in this section, the device can be tested. To verify that the modules are correctly identified, close the Edit Serial Number application, switch the Multi Autolab Cabinet off, start the NOVA software and switch the Multi Autolab Cabinet on. After initialisation of the M101 modules, the Hardware setup menu of Nova should display the list of available modules, identified by serial number of the Multi Autolab Cabinet and position inside the cabinet (see Figure 42).

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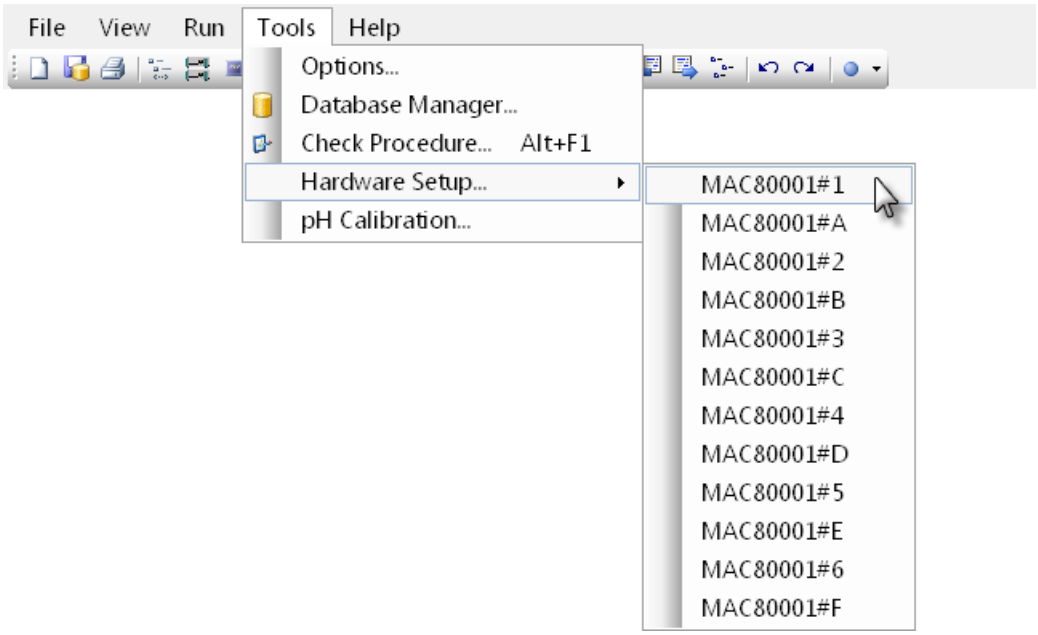


Figure 42 – The Hardware setup menu in Nova displays the list of available M101 modules located in the Multi Autolab Cabinet

5.1.6 – Removing an existing M101 module from a Multi Autolab Cabinet configuration

When an existing M101 module installed into a specific Multi Autolab Cabinet needs to be uninstalled and reinstalled into another Multi Autolab Cabinet it must be reprogrammed to match the serial number and position in the new instrument.

The module can be simply removed from the old cabinet and installed into the new cabinet.

Note: the M101 modules are firmly held in place in the instrument. If the module is difficult to remove, connect the cell cable to the front panel of the module and gently pull on the cell cable connector to extract the module from the Multi Autolab.

The Edit Serial Number displays the configuration for the connected Multi Autolab Cabinet (see Figure 43). Since at least two different serial numbers of Multi Autolab Cabinets are encoded in the detected modules, more than one Multi Autolab Cabinet is displayed in the frame on the left-hand side.

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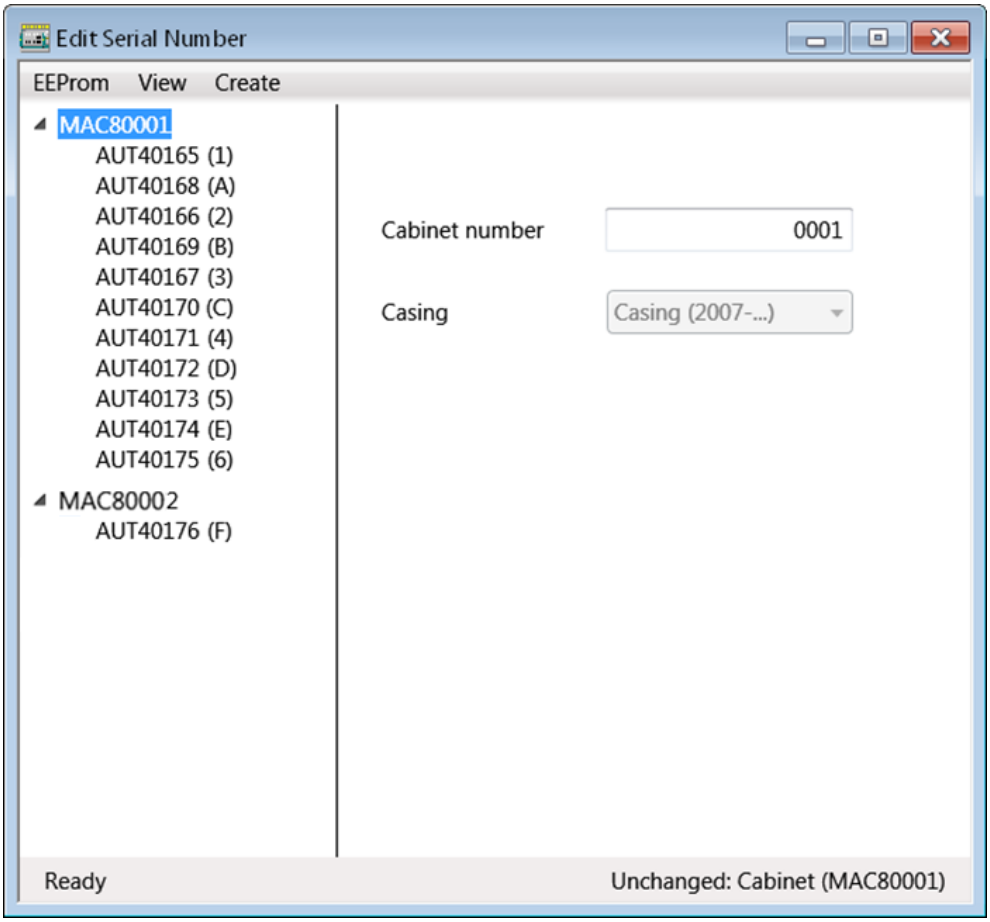


Figure 43 – The Multi Autolab Cabinet configurations are displayed in the frame on the left-hand side

Click the M101 module coming from the original cabinet and, using the drag and drop method, move it to the new Multi Autolab Cabinet (see Figure 44).

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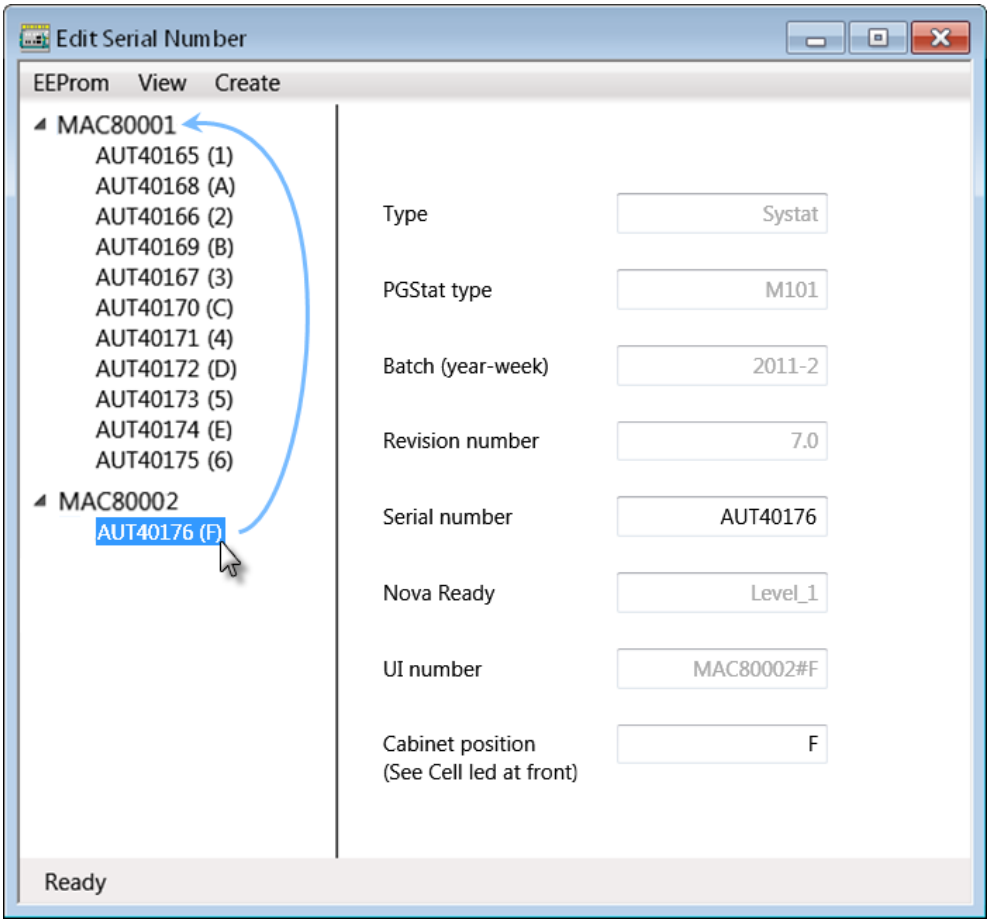


Figure 44 – Moving a M101 module from one cabinet to another (1/2)

After moving the M101 module from the original cabinet to the new cabinet, it will be displayed as being part of the new cabinet configuration, with the default position 1 indicated between brackets (see Figure 45).

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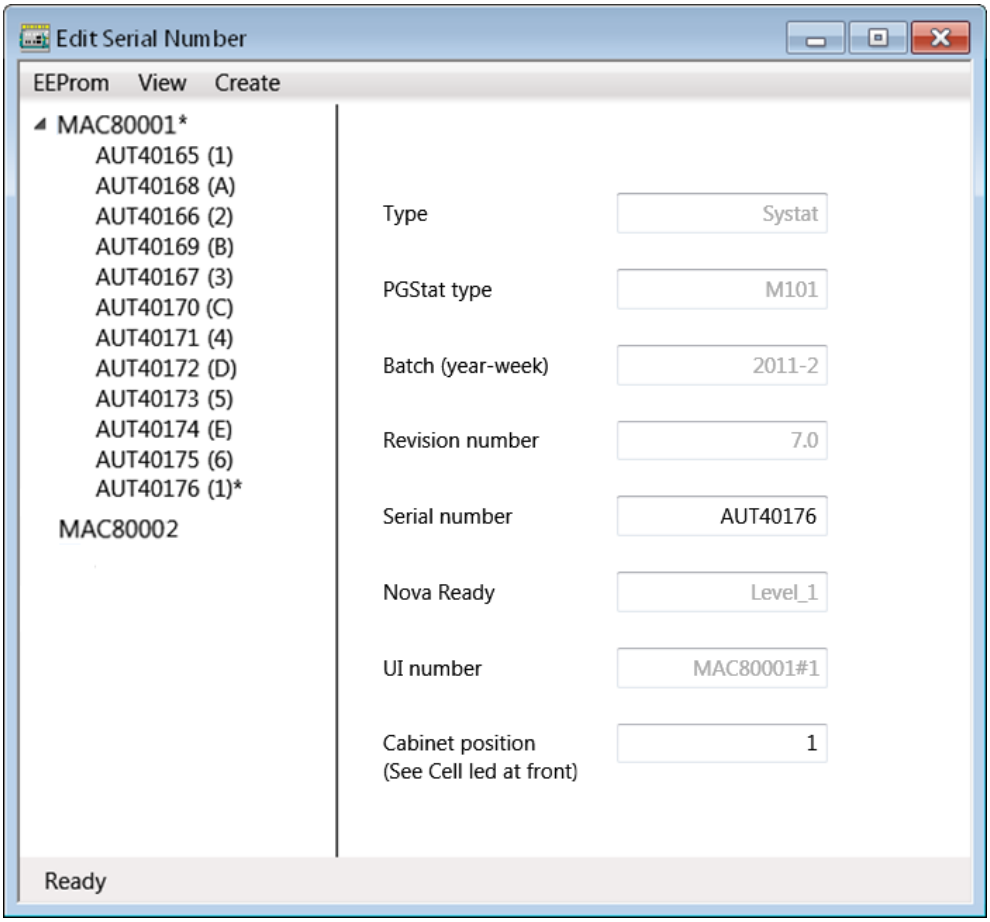


Figure 45 – Moving a M101 module from one cabinet to another (2/2)

The newly added M101 module can now be reconfigured according to the instructions provided in Sections 5.1.3 to 5.1.5.

6 – Module test

After installation of the module, the following tests should be performed to verify that the module is working as expected:

1. Connect mains power.
2. Switch Autolab on.
3. Install the delivered software (Nova 1.7 or later) if necessary.
4. Select Hardware setup and activate inserted module.
5. For **NOVA** module tests, please refer to the module tests described in the Nova Getting Started manual or in the Module test in Nova, available from the Help menu.

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