MULTI-LINE 2

Backup tool

- Bootloader update
- Backup of controller settings
- Battery change
- Restoring after battery failure

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1. Delimitation

1.1 Scope of Application Notes Backup tool

Scope for Backup tool

For the backup tool, this document covers the following:

Controller	Software versions
AFC Plant Management	SW version 1.00.0+
AGC Plant Management	SW version 3.50.1 to 5.02.2*
AGC-2	SW version 2.00.0+
AGC-3	SW version 3.00.0+
AGC-4	SW version 4.00.0 to 4.56.0*
ASC Plant Management	SW version 5.00.0 to 5.02.0*
BGC-2	SW version 1.00.0+
GPC-2	SW version 1.26+
GPC-3	SW version 3.00.0 to 3.20.0*
GPU-2	SW version 1.26+
GPU-3	SW version 3.00.0 to 3.10.0*
MDR-2	SW version 1.00.0+
PPM-3	SW version 3.00.0+
PPU Power Management (PPM-2)	SW version 2.50.5+
PPU-2	SW version 1.26+
PPU-3	SW version 3.00.0 to 3.09.0*

*Note: You cannot use the *Backup tool* software for controllers with later software.

Using the internal memory backup

As an alternative to the *Backup tool* software, after commissioning, you can use the internal memory backup in jump menu 9230 (menu 9080 in older software) to save the controller configuration, as well as the controller options. This backup can be used to restore the controller configuration and options if the internal battery fails.

INFO
Do not make an internal memory backup after you get *Selfcheck error 48* (the internal battery failure error). Making an internal memory backup after this error deletes the previously saved controller configuration and options.

Using the utility software

As an alternative to the *Backup tool* software, you can use the batch read and write functions in the utility software to save the controller configuration.

The utility software will NOT save the controller options. Use the internal memory backup to ensure that the options are saved.

Scope for battery replacement

The internal battery change procedure is valid for all ML-2 controllers and software versions.

Use DEIF support for internal battery replacement

As an alternative to the battery replacement procedure, you can send your controller(s) to DEIF for battery replacement. As part of this service, DEIF ensures that the controller options are restored.

2. General information

2.1 Warnings, legal information and safety

2.1.1 Warnings and notes

Throughout this document, a number of warnings and notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

Warnings

DANGER!
Warnings indicate a potentially dangerous situation, which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

Notes

INFO
Notes provide general information, which will be helpful for the reader to bear in mind.

2.1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator controlled by the Multi-line 2 unit, the company responsible for the installation or the operation of the set must be contacted.

INFO
The Multi-line 2 unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

2.1.3 Safety issues

Installing and operating the Multi-line 2 unit may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

DANGER!
Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

2.1.4 Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

2.1.5 Factory settings

The Multi-line 2 unit is delivered from the factory with default settings. These are not necessarily correct for the engine/generator set. Check all the settings before running the engine/generator set.

2.2 About the Application Notes

2.2.1 General purpose

This document includes application notes for DEIF's Multi-line 2 unit. It mainly includes examples of different applications suitable for the unit.

INFO
For functional descriptions, the procedure for parameter setup, parameter lists, and so on, see the Designer's Reference Handbook.

The general purpose of the application notes is to offer the designer information about suitable applications for the Multi-line 2 unit.

DANGER!
Make sure to read this document before starting to work with the Multi-line 2 unit and the genset to be controlled. Failure to do this could result in human injury or damage to the equipment.

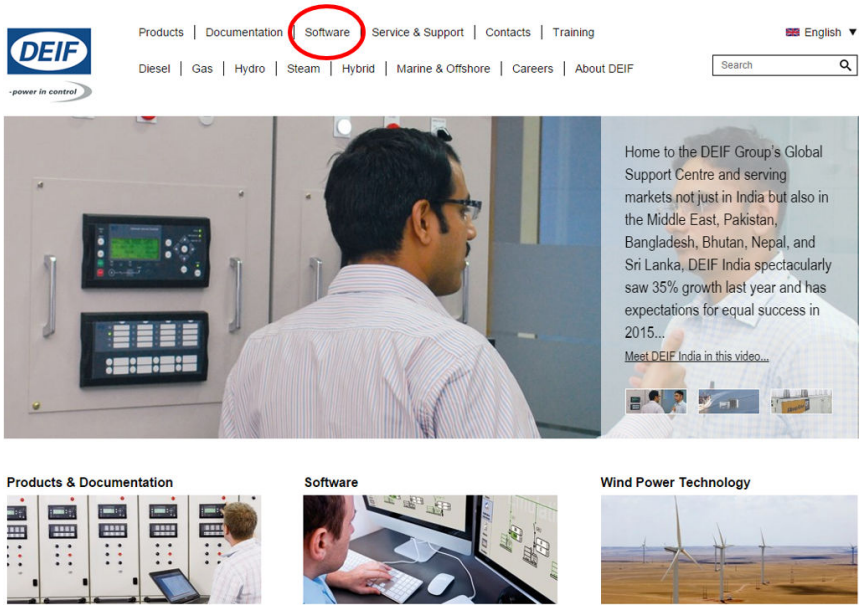
2.2.2 Intended users

The Application Notes are mainly intended for the person responsible for designing Multi-line 2 systems. In most cases, this would be a panel builder designer. Naturally, other users might also find useful information in this document.

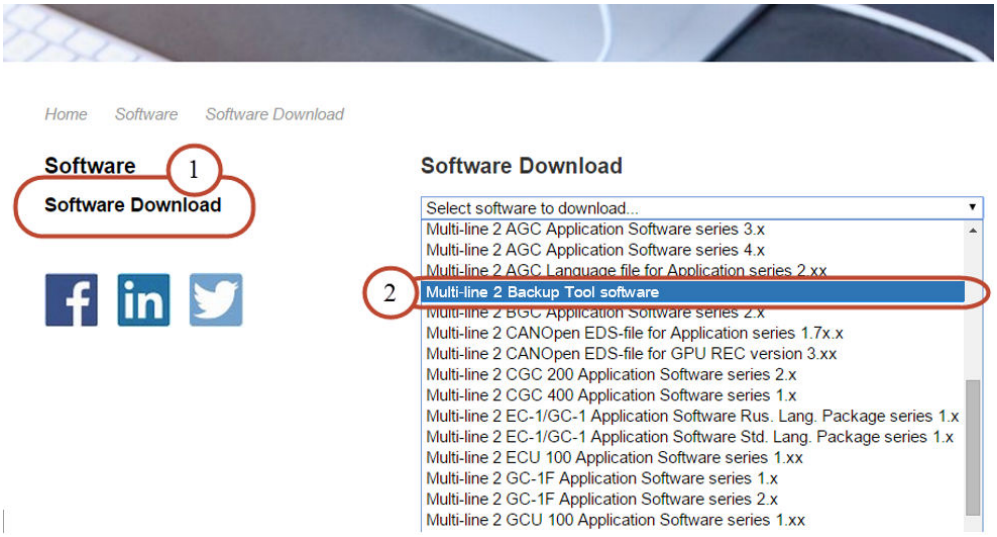
3. Getting the backup tool

3.1 Downloading software

Go to http://www.deif.com and select **Software** in the top menu.



Select **Software Download** in the left menu bar. Scroll and select **Multi-line 2 Backup Tool software** in the dropdown menu.



Type in your email address and press the **Submit** button. You will receive an email with a link to the backup tool software. Click the link and install the software.

If you wish to download the recent version of this software please fill in your e-mail address having submitted your request.

E-mail:

E-mail notification on future releases:

Submit

<< Back to software selection

4. ML-2 backup tool software

4.1 General information on the backup tool

The ML-2 backup tool provides the opportunity to create a backup file of a controller's setup. A backup file supplies a safety net in case of an internal battery failure in the controller. Until now there have only been two ways of handling a battery failure. But with the backup tool, a third and better way is now available. The three options are described below.

1. Controller without the latest bootloader software

A controller without the latest bootloader software will **not** notify the operator of an internal battery failure, and if the controller is rebooted all parameters will be back to factory settings, which means that the system may act differently (alarms appearing, a slow regulation, and so on) - but it is not given.

In this situation, the controller's internal battery needs to be changed, and unless a batch file is available, all parameters must be adjusted manually to restore them as they were before the battery failure.

2. Controller with the latest bootloader software

In case of a battery failure and a reboot, a controller with the latest bootloader software will be in boot mode (self-check: Error 48), as the image below shows. In this way, the operator is notified of the battery failure in the controller. However, in this state, the controller is not operational - it will **not** react on commands given, and all protections will be deactivated.

In this situation, the controller's internal battery must be replaced. Furthermore, the controller must be flashed with new application software (same version as the controller has already) and a batch file must be downloaded, if available. Otherwise, all parameters must be adjusted manually to restore them as they were before the battery failure.

3. Backup made with the ML-2 backup tool

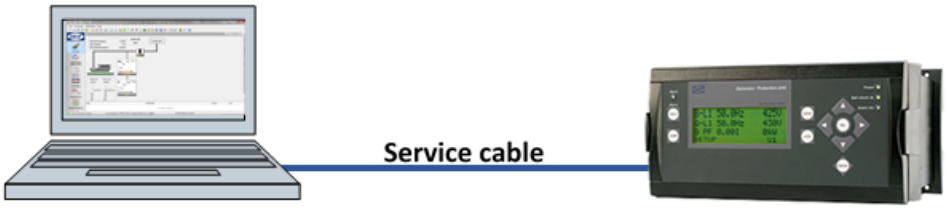
In controllers that have the backup tool connected in order to make a backup file, the latest bootloader software is installed at the same time. This means that in case of a battery failure and reboot of the controller, the situation is the same as described in paragraph **2. Controller with the latest bootloader software** above (unit in boot mode).

From boot mode, using the PC backup tool, the controller can be restored back to the same condition and setup as when the backup was made. An easy and fast recovery of the controller. The battery must still be replaced.

When the latest bootloader software is installed, the operator is notified via the display if an internal battery failure occurs.

4.2 Getting connected

4.2.1 PC connection to ML-2 products



When a backup file is to be created, the connection between PC and Multi-line 2 controller must always be established by means of the service cable that is made for the specific Multi-line 2 product. It is **not** possible to create a backup file using *Modbus TCP/IP* (option N). The table below shows the required service cables for the individual Multi-line 2 products.

Product	TTL service port cable: Option J9	USB service port cable: Option J7	RS-232 DP9 service port cable: Option J3
AFC Plant Management		x	
AGC Plant Management		x	
AGC-2			x
AGC-3		x	
AGC-4		x	
ASC Plant Management		x	
BGC-2	x		
GPC-2			x
GPC-3		x	
GPU-2			x
GPU-3		x	
MDR-2			x
PPM-3		x	
PPU Power Management (PPM-2)		x	
PPU-2			x
PPU-3		x	

See **Backup of the ML-2 controller** in this document for more information about interface setup between the ML-2 backup tool and the controller, or enter the **Help** menu in the software.

5. Backup of the ML-2 controller

5.1 Bootloader update

The old bootloader software does not detect a battery failure. When a backup of a controller is made, the latest bootloader software for the specific product is installed at the same time. However, the battery failure will not be detected by the controller until a reboot has been made. In case of a battery failure, the parameter settings in the controller are not lost immediately, but they will be if a reboot is made.

When a battery failure is detected, the new bootloader software keeps the controller in boot mode, and the "normal" screen will not appear until the controller has been restored. If the genset is running when a battery failure is detected by the controller, the protections will no longer be active .

CAUTION
In boot mode all I/Os and protections are deactivated! The controller will **NOT** react if commands are given, and it is not able to trip breakers or stop the genset!

5.2 Making a backup file

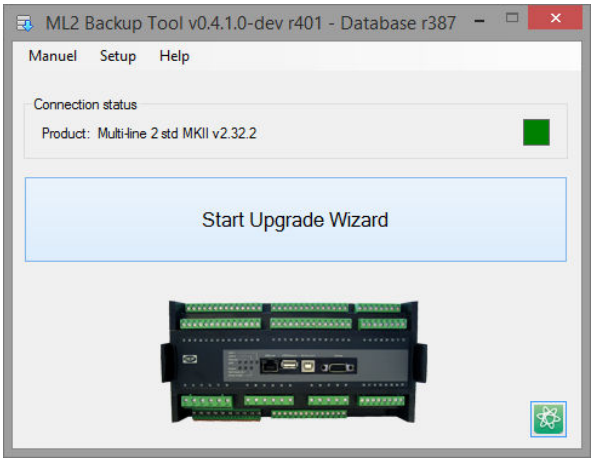
A backup file can be stored *automatically* or *manually*. Both options are described in the following.

5.2.1 Automatically storing backup

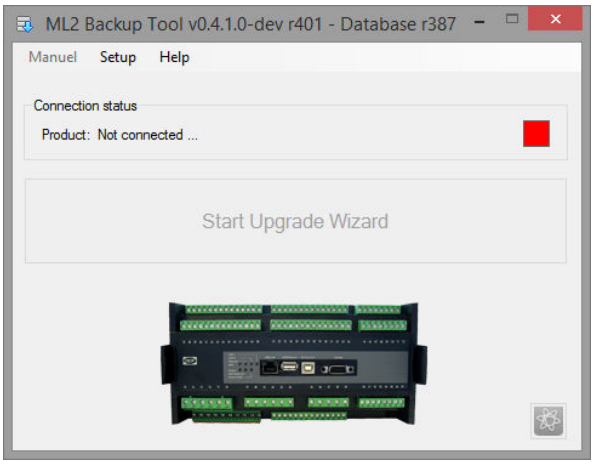
It is recommended to store backups automatically. Follow the steps below to make and store a backup on the PC.

CAUTION
Make sure that the controller is in SWBD/manual mode in order to avoid unintended start/stop of the genset or any other unwanted actions while working with the controller.

When the service cable is mounted between the controller and PC, the backup tool auto-connects and the software version that is installed on the controller is detected (see **Connection status** line in the software).

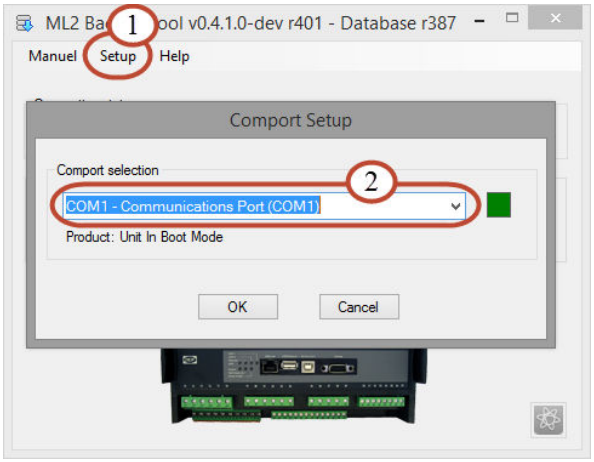


If the backup tool does not auto-connect, the **Connection status** line will indicate **Not connected...**, and the connection will have to be made manually.



Press **Setup** in the top menu and select comport in the dropdown menu used for controller connection.

Press the **OK** button to establish the connection.

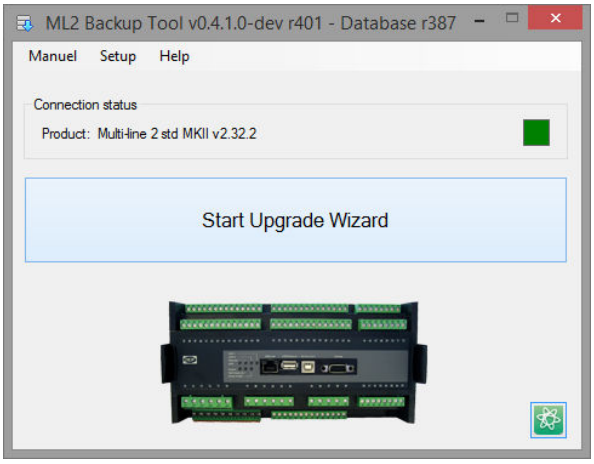


The product and firmware version that is present in the controller is indicated in the **Connection status** line. The controller is ready for making a backup.

Make backup

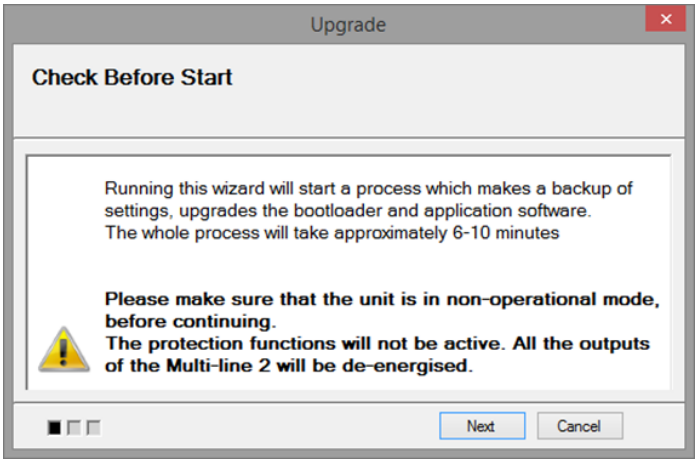
Step 1:

Press the **Start Upgrade Wizard** button.



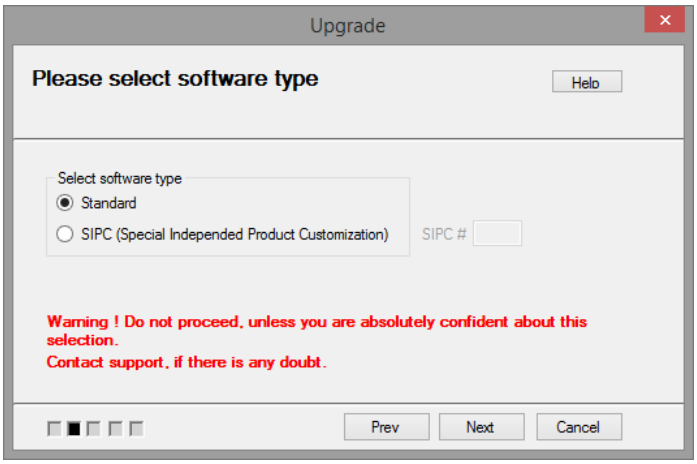
The check window that appears informs about the backup process and provides directions on unit operational mode during the process.

Press **Next**.



Step 2:

If more than one software type matches the controller, a selection must be made. The controller is installed with either a standard (STD) Multi-line or an SIPC (Special Independent Product Customization) software.

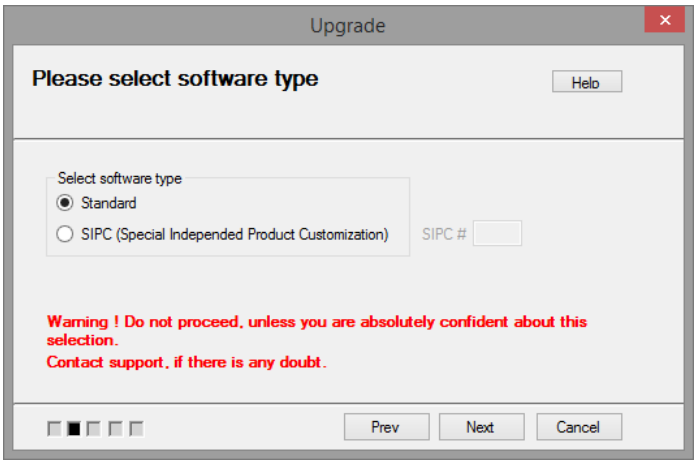


In the following, **Step 2** is explained for *STD* software and for *SIPC* software respectively.

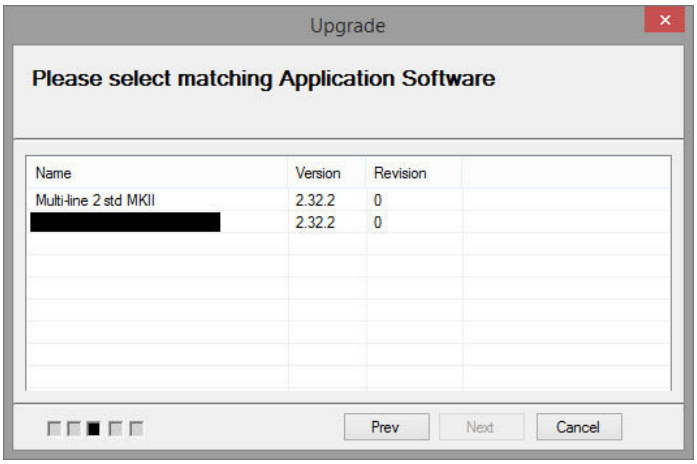
STD software

To determine which software version that is installed in the controller, move the cursor in the display to the **Setup** menu. The software version is displayed in the top of the screen.

Select **Standard** and press **Next**.

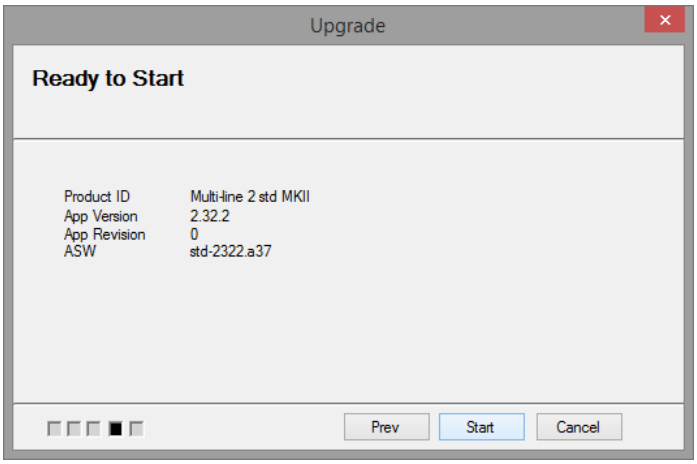


There are different STD softwares with the same version and revision number, so the backup tool needs information as to which one it should make the backup of. If customers have their own STD software, their name will be in the list. (Usually they also have their own logo on the display folio). If it is a folio with DEIF logo and the display indicates that it is a STD software, then select **Multi-line 2 std** and press **Next**.



Now the backup tool is ready to make a backup of the controller.

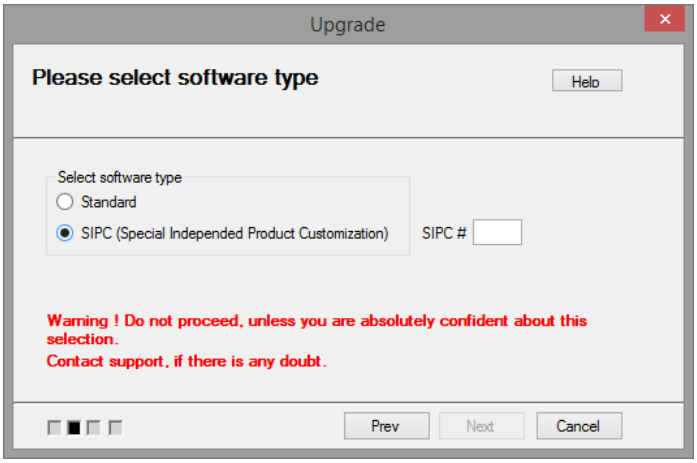
Press **Start**.



SIPC software

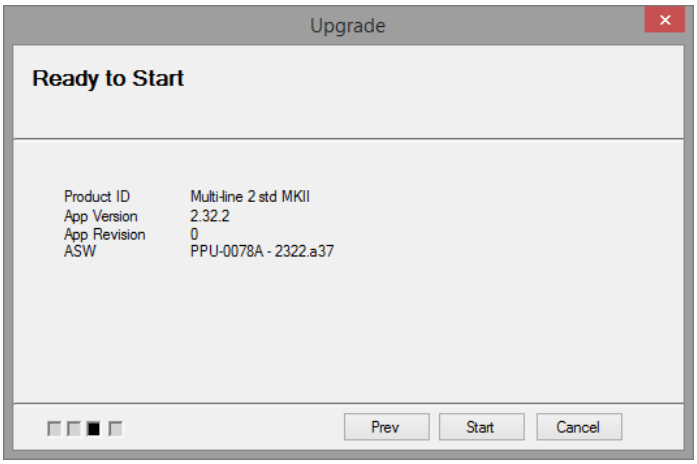
To determine which type of software that is installed in the controller, move the cursor in the display to the **Setup** menu. The software type is displayed in the top of the screen.

Select **SIPC**, type in the SIPC number from the display in the **SIPC #** box and press **Next**.



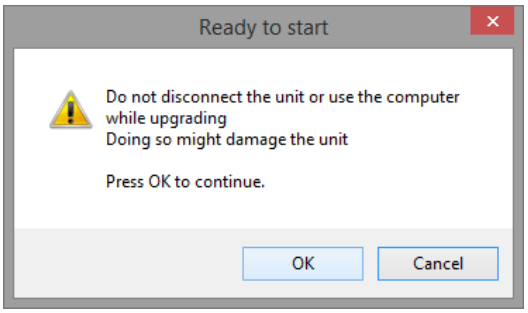
Now the backup tool is ready to make a backup file of the controller.

Press **Start**.

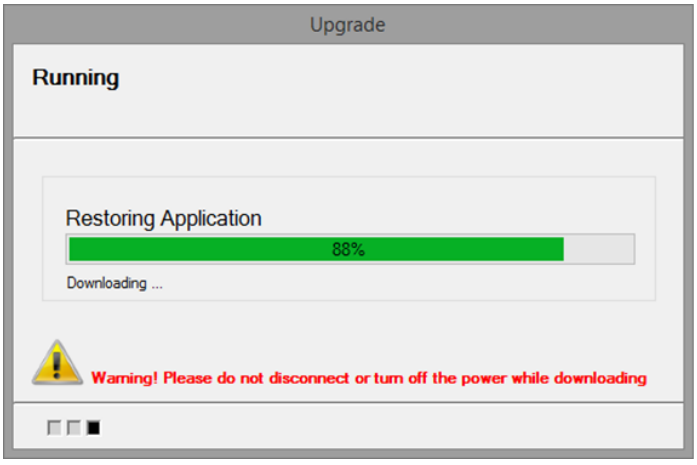


No matter which software you have selected, **STD** or **SIPC**, the warning below will appear when you have pressed **Start**.

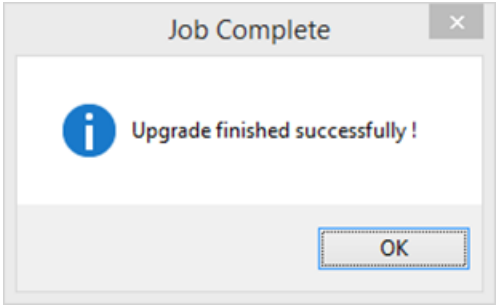
Press **OK**.



The **Restoring Application** bar informs the operator of the progress in the backup procedure.



The backup is completed and stored on the PC and thus makes it possible to restore the controller in case of battery failure.



CAUTION
Always make a new backup if you have made changes on the controller, like for example firmware update, change of parameter settings, creation/removal of M-Logic lines.

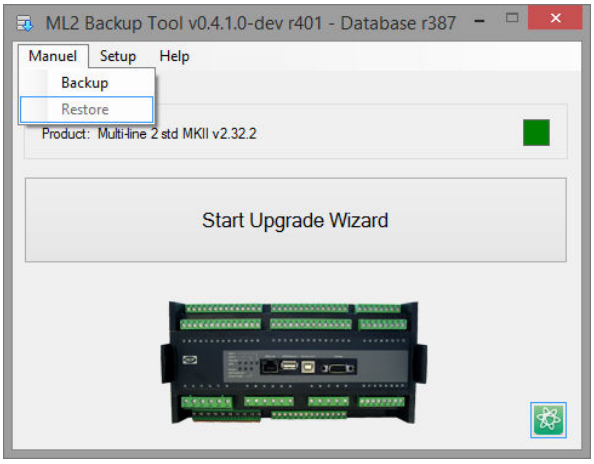
5.2.2 Manually storing backup

The backup tool makes a backup file in the exact same way as when the backup is stored automatically on the PC. The difference is that when you select **Manual**, it is possible to name the backup file and choose where to store it on the PC.

Make backup

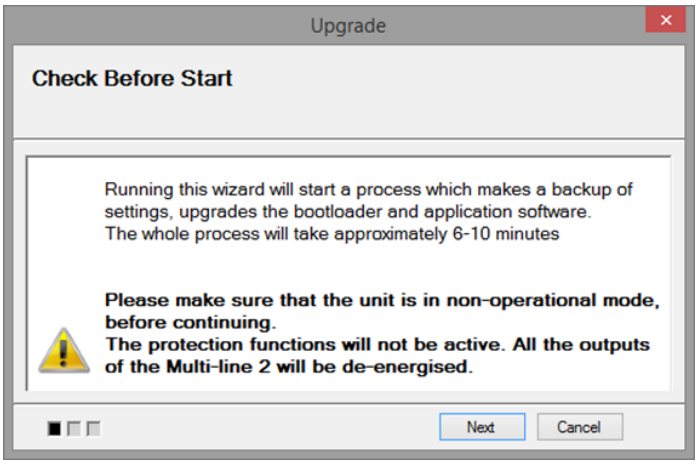
Step 1:

Press the **Manual** tab in the top menu and select **Backup**.



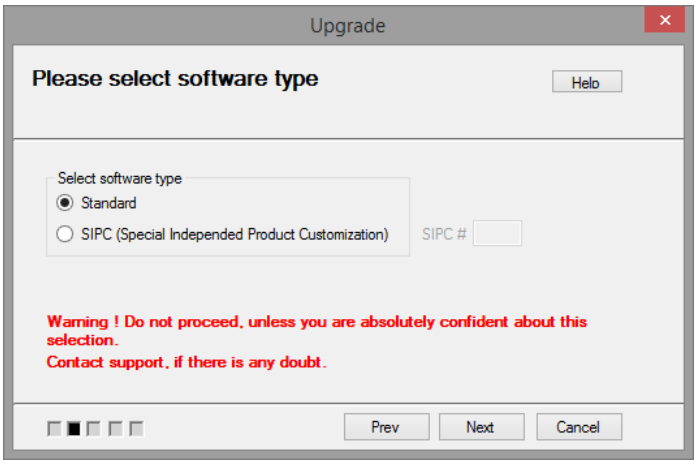
The check window that appears informs about the backup process and provides directions on unit operational mode during the process.

Press **Next**.



Step 2:

If more than one software type matches the controller, a selection must be made. The controller is installed with either a standard (STD) Multi-line or an SIPC (Special Independent Product Customization) software.

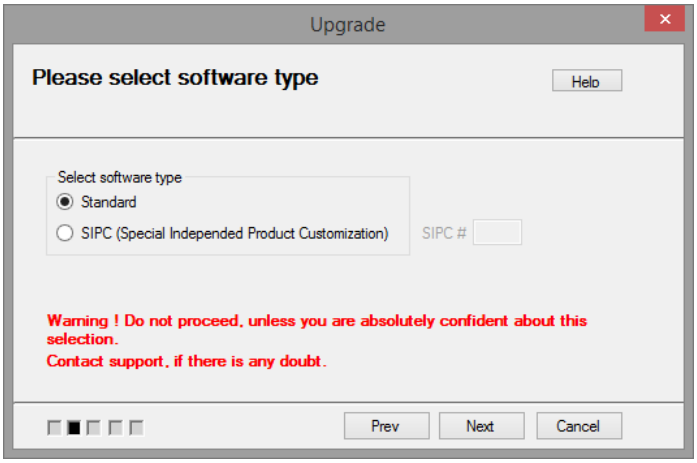


In the following, **Step 2** is explained for *STD* software and for *SIPC* software respectively.

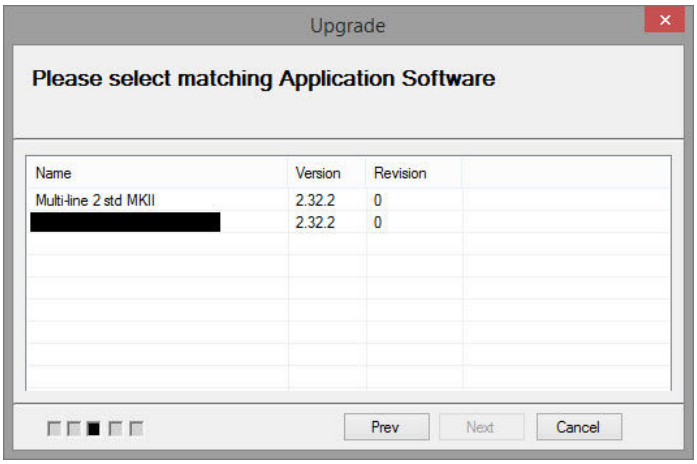
STD software

To determine which software version that is installed in the controller, move the cursor in the display to the **Setup** menu. The software version is displayed in the top of the screen.

Select **Standard** and press **Next**.



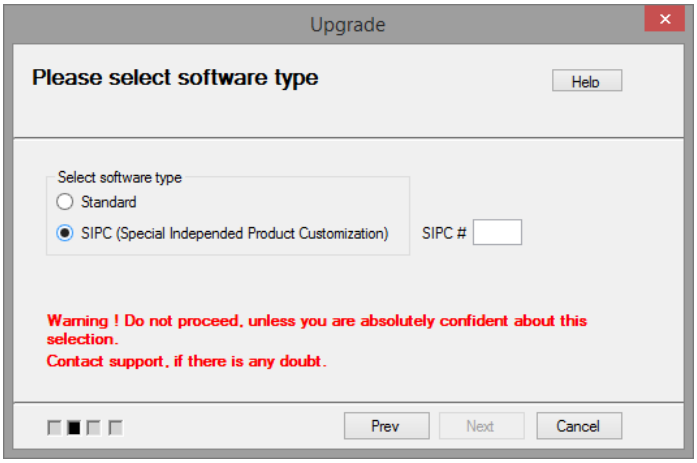
There are different STD softwares with the same version and revision number, so the backup tool needs information as to which one it should make the backup of. If customers have their own STD software, their name will be in the list. (Usually they also have their own logo on the display folio). If it is a folio with DEIF logo and the display indicates that it is a STD software, then select **Multi-line 2 std** and press **Next**.



SIPC software

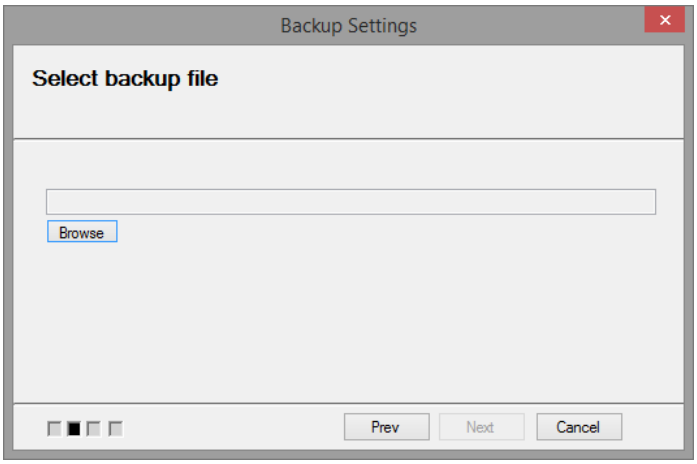
To determine which type of software that is installed in the controller, move the cursor in the display to the **Setup** menu. The software type is displayed in the top of the screen.

Select **SIPC**, type in the SIPC number from the display in the **SIPC #** box and press **Next**.

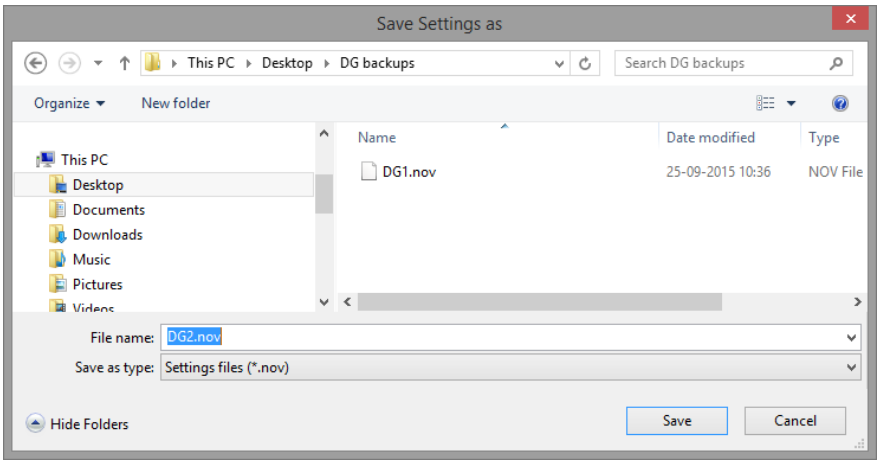


Step 3:

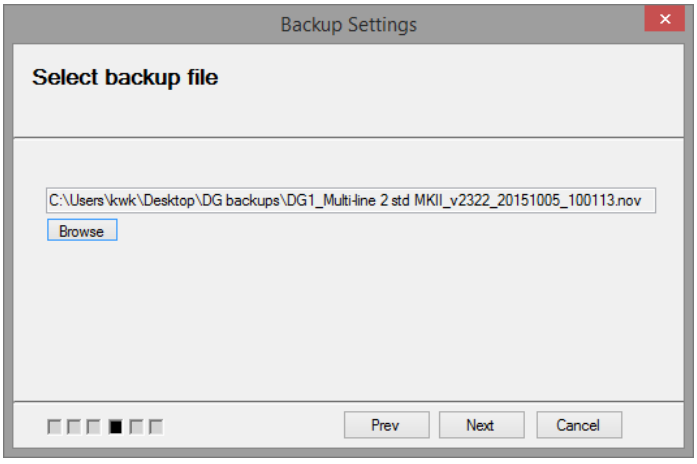
Press **Browse** to select a location for the backup file.



When you have selected a location and named the backup file, press the **Save** button.



The name and location of the backup file is shown in the **Browse** line. If both are correct, press **Next**.

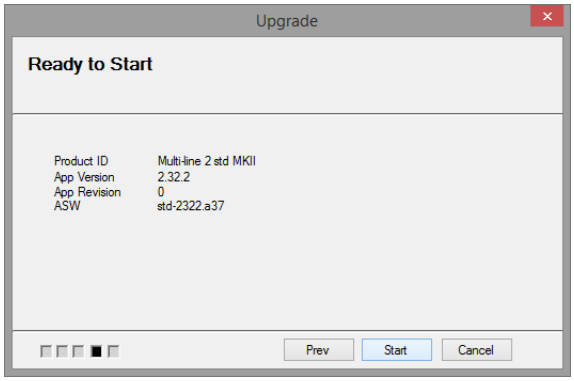


Step 4:

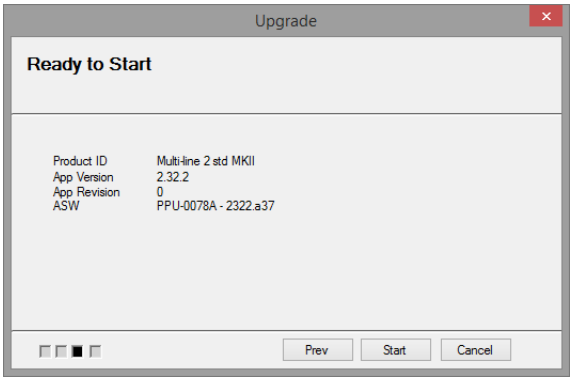
Now the backup tool is ready to make a backup file of controller.

Press **Start**.

STD software

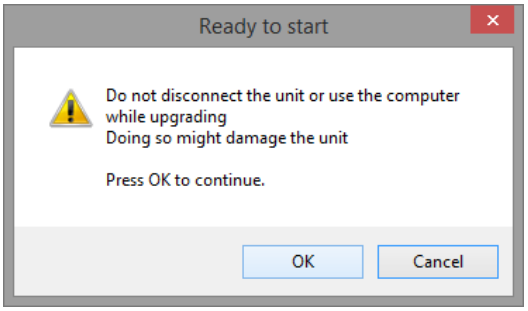


SIPC software

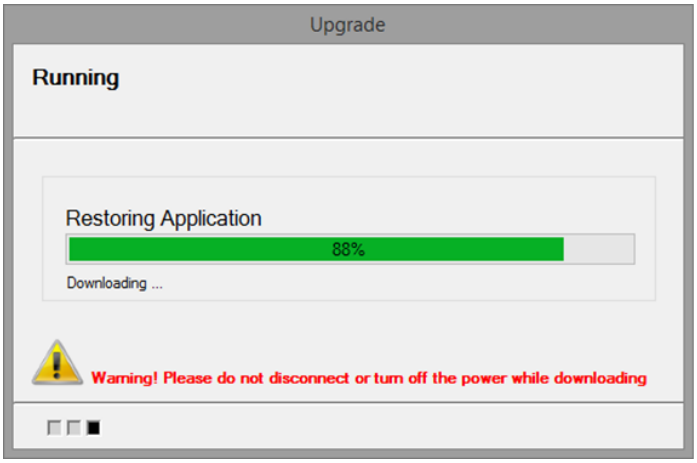


The warning below will appear when you have pressed **Start**.

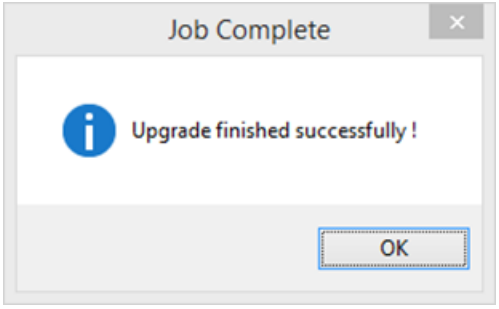
Press **OK**.



The **Restoring Application** bar informs the operator of the progress in the backup procedure.



The backup is completed and stored on the PC and thus makes it possible to restore the controller in case of battery failure.



CAUTION
Always make a new backup if you have made changes on the controller, like for example firmware update, change of parameter settings, creation/removal of M-Logic lines.

6. Internal battery change

6.1 Warnings and safety

Changing the battery may require work with dangerous currents and voltages. The battery maintenance must only be carried out by authorised personnel who understand the risks involved in working with electrical equipment and the necessary precautions to be taken with electrostatic discharge.

6.1.1 Hazardous live currents and voltages

CAUTION
Hazardous live currents and voltages may be present in a rack that is already installed. Contact with these could kill you. Only authorised personnel, who understand the precautions needed and the risks involved in working with live electrical equipment, may do this work.

6.1.2 Disrupting control

CAUTION
Working on the unit may disrupt the control of the generator, busbar or connection. Take the necessary precautions.

6.1.3 Protecting equipment: No hot swapping

CAUTION
Disconnect all power supplies before replacing the battery.

6.1.4 Electrostatic precautions

CAUTION
Protect the hardware boards against static discharge during the battery replacement.

6.1.5 Electrostatic discharge (ESD)

You must protect the equipment terminals and hardware boards from static discharge during the entire battery replacement, including dismounting and remounting.

6.2 Tools and equipment

Tool	Attachment	Torque	Used to
Safety equipment	-	-	Personal protection, according to local standards and requirements.
Conducting wrist strap	-	-	Prevent electrostatic discharge damage to the boards during removal and remounting.
Torque screwdriver	TX10 bit	0.2 Nm (1.8 lb-in)	Removal and remounting of the unit top housing (lid).
Two ESD bags	-	-	Safely store the *LED and Ethernet board*, and to provide ESD protection to the *Processor board* during the replacement.

6.3 Preparations before replacement

Before replacing the battery, prepare a clear flat working area, located in a safe workshop environment.

CAUTION
DEIF recommends removing the entire unit from the installation location to a safe workshop area.

The wrist strap must be used throughout the entire replacement procedure. Test the resistance of the wrist strap and the resistance of the wrist strap connection. Do not continue if the wrist strap connection is faulty.

Use the wrist strap at all times while removing and remounting the hardware boards to protect them against static discharge.

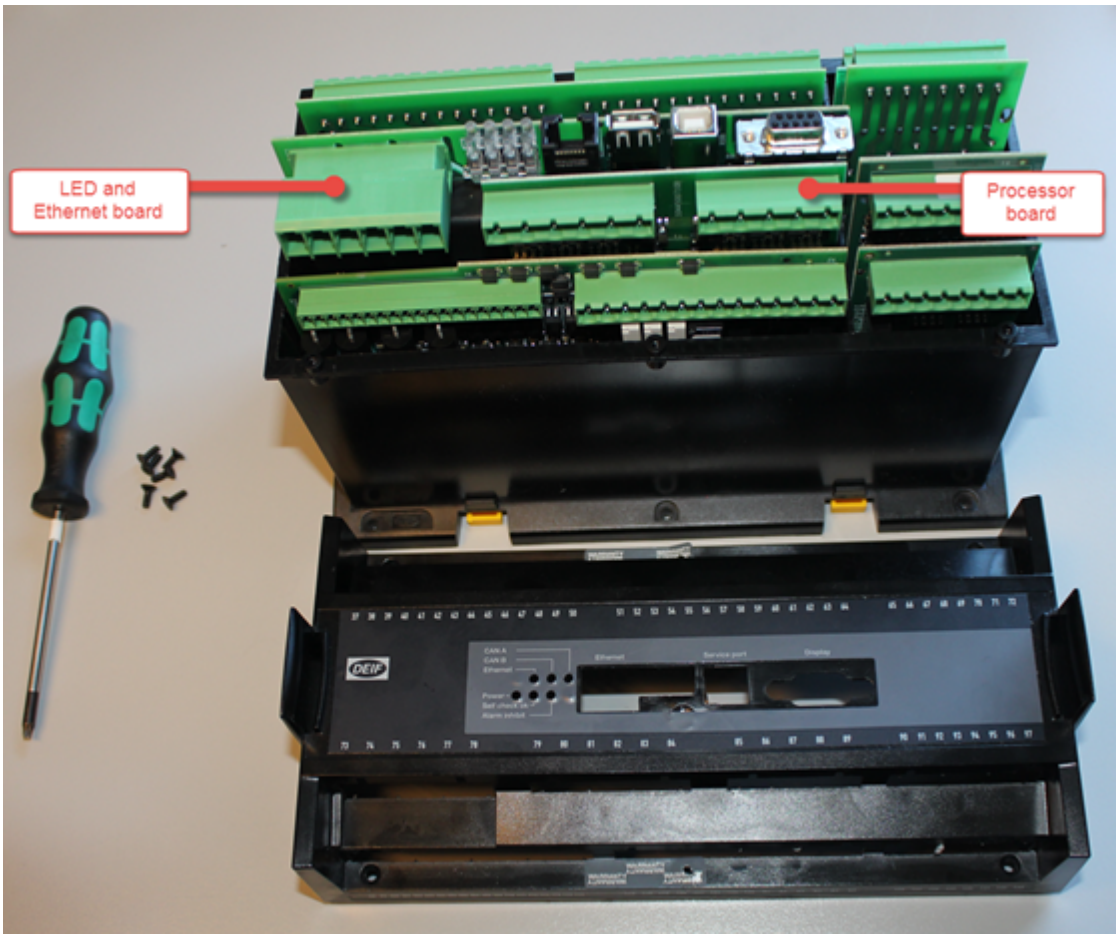
With the wrist strap correctly connected and tested, ensure you handle both of the ESD bags before using them. This ensures that they have the same ground.

6.4 Battery replacement

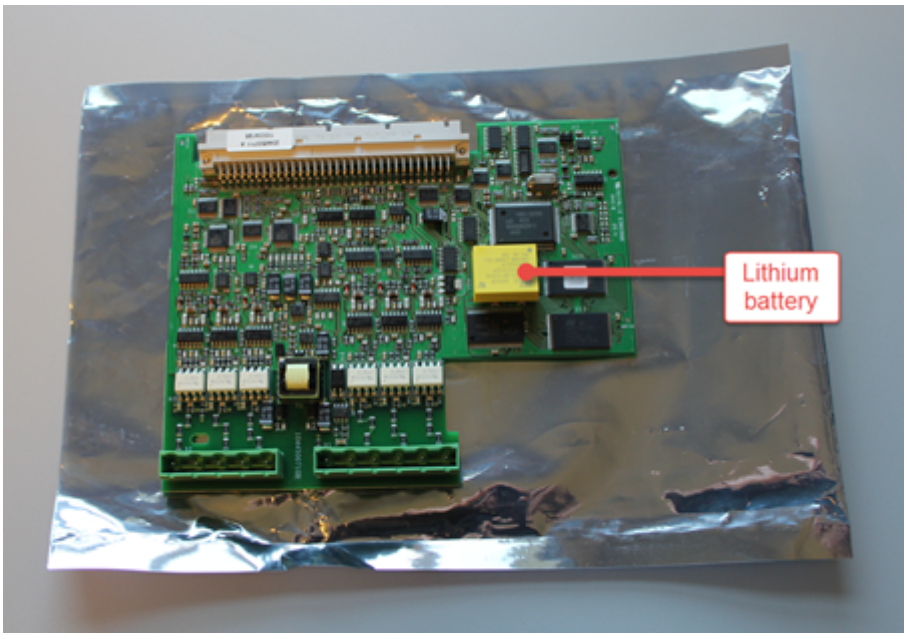
CAUTION
Make a backup before you replace the battery (see **Backup of ML-2 controller** in this document).

1. Make sure that the genset is **not** running and that the controller is in SWBD/manual mode.
2. Isolate supply power to the unit.
3. Remove all the connector terminals from the unit.
4. Remove the unit from the installation location to the safe workshop area.

5. Unscrew the six TX10 screws from the unit top housing, and keep the screws in a safe place.



6. Identify both the *LED and Ethernet board* and the *Processor board*. Take note of their installed positions.
7. Carefully remove the *LED and Ethernet board* by pulling on the large connector block (shown at the left in the above photograph).
8. Put the *LED and Ethernet board* into one of the ESD bags for safe storage.
9. Carefully remove the *Processor board* (shown in the middle in the above photograph) by pulling on the connector blocks.
10. Place the *Processor board* down on the flat surface on top of the ESD bag.



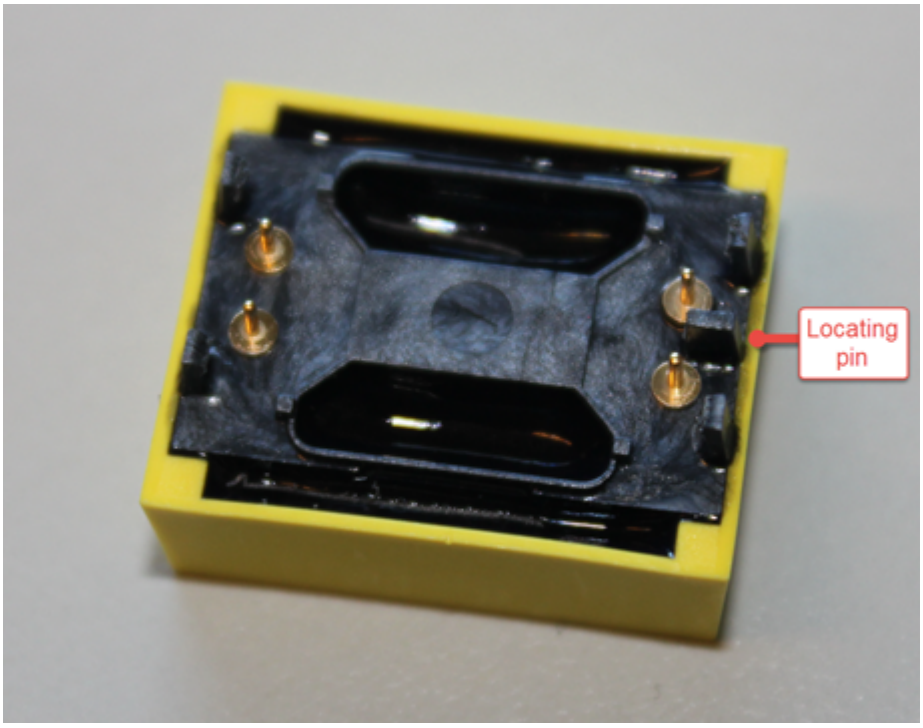
11. Identify the Lithium battery (as shown in the above photograph).
12. With the board remaining flat on the surface, carefully pull the battery out from the board.

CAUTION
Do not use any tool or screwdriver to remove the battery.

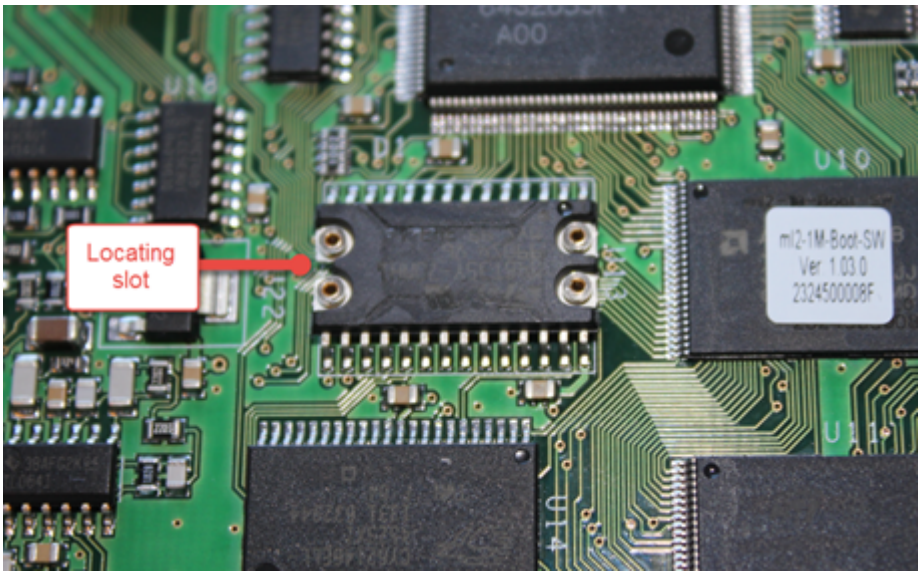
13. Mark the old battery clearly with a marker, so you do not confuse the new and old batteries.
14. Remove the new battery from the transport channel, and place the old battery into the transport channel.

INFO
It is recommended to reuse the transport channel for the old battery during safe disposal. Refer to the disposal of WEEE material and dispose of the battery in accordance with local laws and requirements.

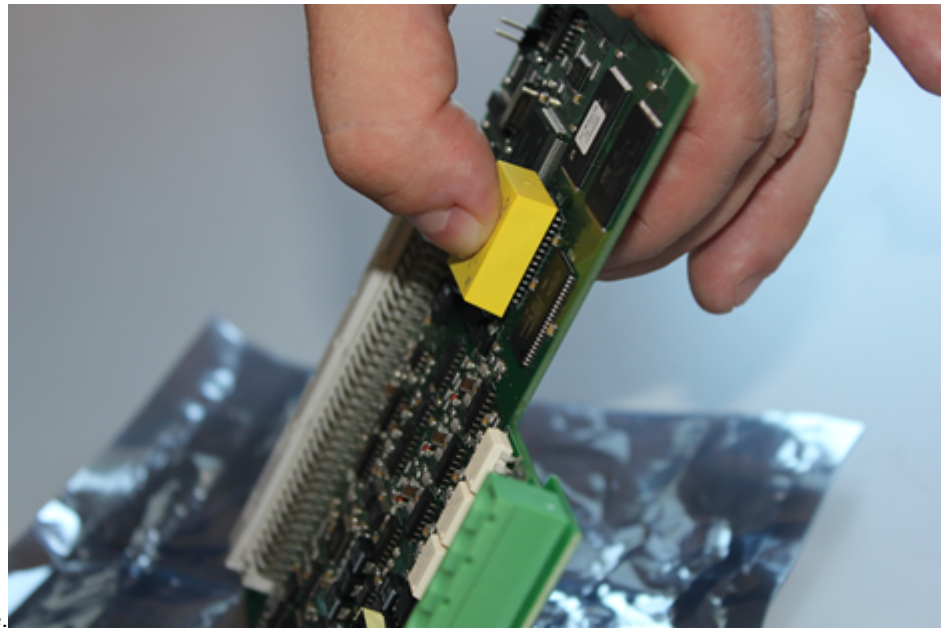
15. The battery can only be inserted into the *Processor board* in one direction.
16. Identify the middle locating pin on the underside of the new battery.



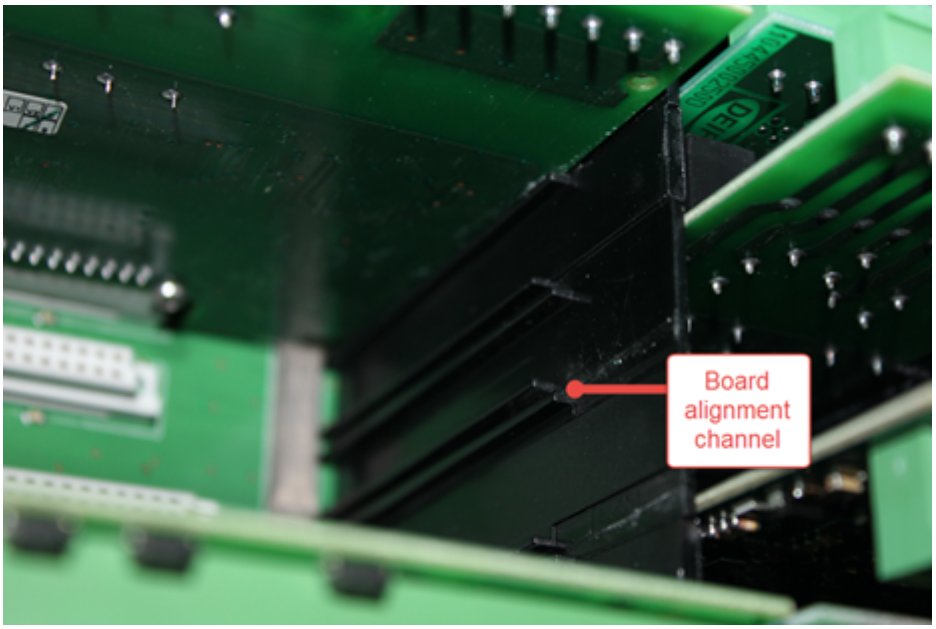
17. Identify the matching locating slot on the *Processor board*.



18. With the new battery aligned correctly with the locating pin and slot, gently push the battery into position.
19. Hold the *Processor board* as shown, using thumb and finger, gently press the battery and board together. The battery should "click" into place.

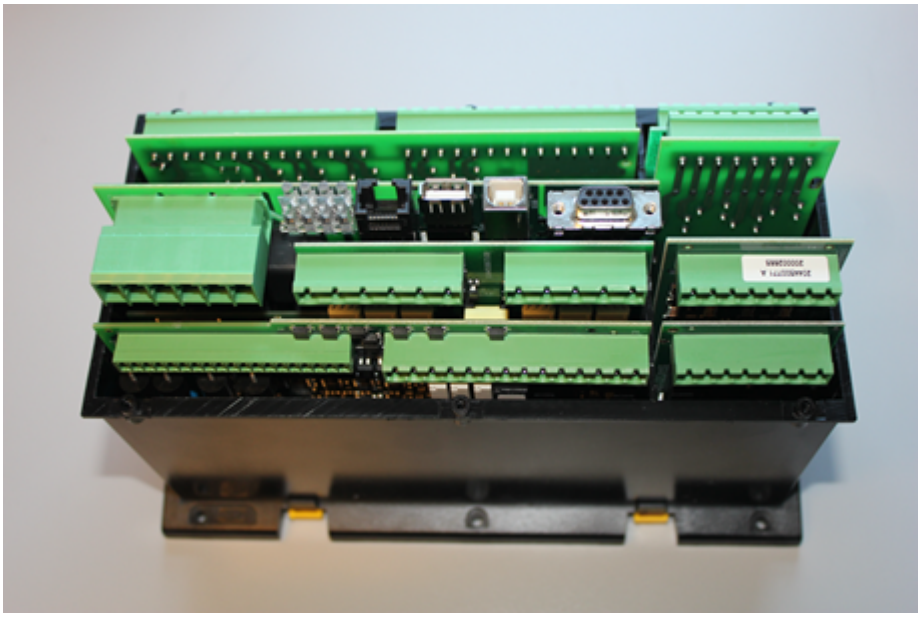


20. Identify the board alignment channels in the unit.



21. Remount the *Processor board*, ensure you align the board in the correct direction and use the alignment channels to safely align the board. Press the board into the slot with the palm of your hand. Do not use excessive force.
22. Remount the *LED and Ethernet board*, ensure you align the board in the correct direction and use the alignment channels to safely align the board. Press the board into the slot with the palm of your hand. Do not use excessive force.
23. Before remounting the unit top housing, check all boards are correctly positioned in their original positions.
24. Remount the unit top housing with care and ensure it sits flush to the unit case

INFO
During the removal of the top housing, some boards may have moved slightly, check and reposition any boards as necessary. Do not force the top housing unit.



25. Replace and tighten the six TX 10 screws using a torque of no more than 0.2 Nm (1.8 lb-in).

CAUTION
Do not use excessive force or the top housing can be broken.

26. Re-install the unit back in the original installation location and reconnect all of the cables and connectors.
27. Recommission the unit in accordance with the design of your system.

6.5 Disposal of WEEE

All products that are marked with the crossed-out wheeled bin (the WEEE symbol) are electrical and electronic equipment (EEE). EEE contains materials, components and substances that can be dangerous and harmful to people's health and to the environment. Waste electrical and electronic equipment (WEEE) must therefore be disposed of properly. In Europe, the disposal of WEEE is governed by the WEEE directive issued by the European Parliament. DEIF complies with this directive.

You must not dispose of WEEE as unsorted municipal waste. Instead, WEEE must be collected separately, to minimise the load on the environment, and to improve the opportunities to recycle, reuse and/or recover the WEEE. In Europe, local governments are responsible for facilities to receive WEEE. If you need more information on how to dispose of DEIF WEEE, please contact DEIF.

7. Restoring after battery failure

7.1 Restoring before receiving new battery

Restoring of a controller must always be done after a faulty internal battery has been replaced with a new battery. But you should be aware that if a battery failure occurs and the controller is rebooted at some point, the controller will then be in boot mode. When the controller is in boot mode it is not operational, which means that the generator protections are not active and the controller does not react on commands. So it is advisable to make a temporary restoring of the controller in this situation.

The photograph above shows a controller in boot mode. In this situation, restore the controller with either the *automatically* or the *manually* stored backup. Restoring the controller without battery replacement is done in the exact same way as if the battery had been replaced. See **Restore with automatically stored backup** and **Restore with manually stored backup** in this document for more information on how to restore the controller.

CAUTION
This is a temporary solution. It is important that you change the faulty battery as soon as possible. The controller will be back in boot mode if a reboot is made!

7.2 Restoring with automatically stored backup

When the battery has been changed and the controller reassembled and powered up, the controller will be "standing" in boot mode, and the display will show the following screen:

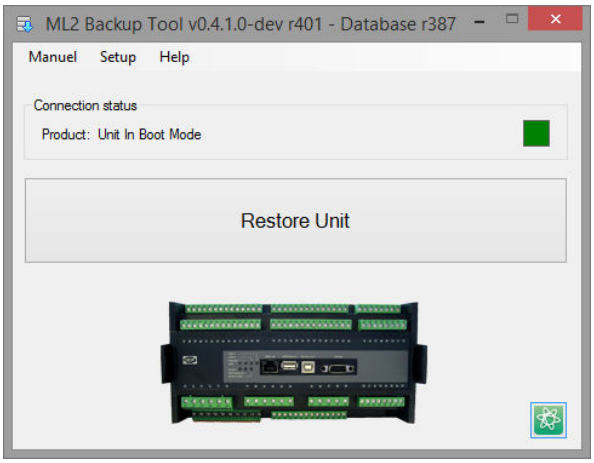
Step 1:

Start the backup tool program and connect PC and controller.

Step 2:

When the backup tool detects a controller in boot mode, the **Restore Unit** button appears.

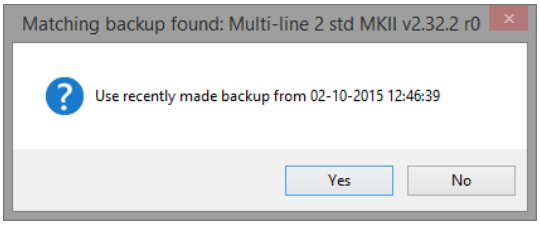
Press **Restore Unit.**



Step 3:

Every backup file is locked to the specific controller on which it is made. This means that even if several backups have been made on different controllers, the backup tool will detect the latest backup made on this specific controller. This also means that it is not possible to restore a controller with a backup file that is made on another controller.

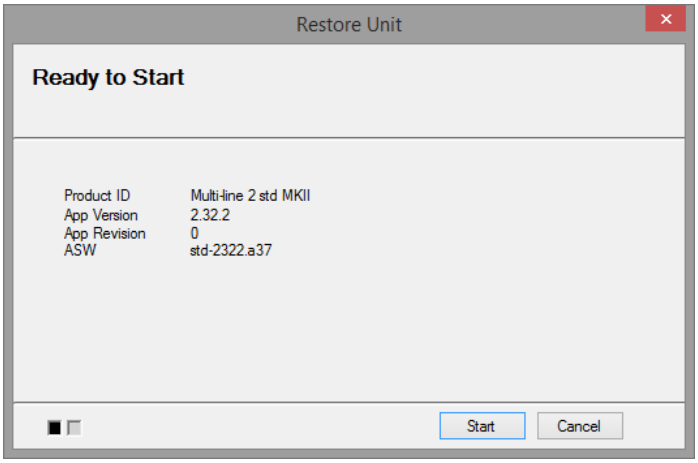
Press **Yes**.



Step 4:

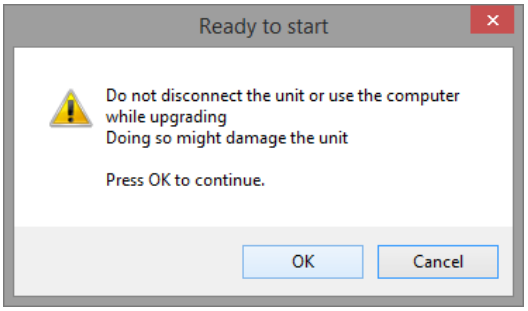
The backup tool is ready to restore the controller to the same condition and setup as when the backup was made.

Press **Start**.

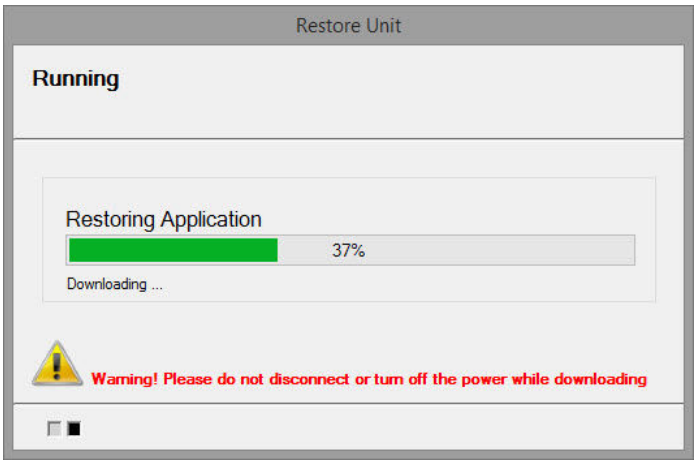


A warning pops up to inform you **not** to disconnect while making the backup.

Press **OK**.

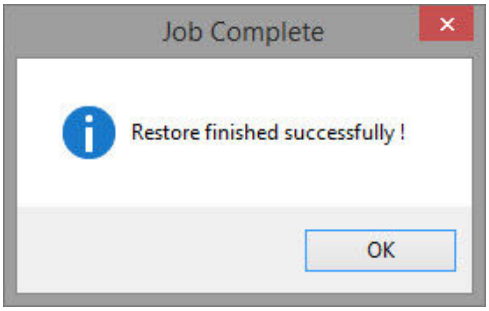


The **Restoring Application** bar informs the operator of the progress in the restoring procedure.



The controller is now restored.

Press **OK**.



CAUTION
Before you start using the restored system, DEIF recommends that you check a selection of parameters to verify that the restoring was successful.

7.3 Restoring with manually stored backup

When the battery has been changed and the controller reassembled and powered up, the controller will be "standing" in boot mode, and the display will show the following screen:

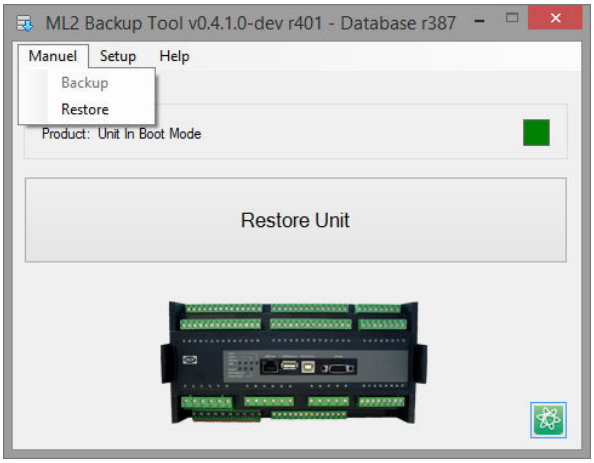
Step 1:

Start the backup tool program and connect PC and controller.

Step 2:

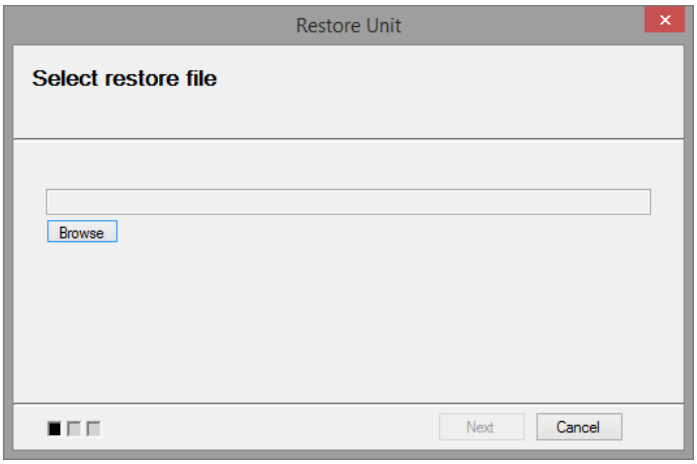
When the backup tool detects a controller in boot mode, the **Restore Unit** button appears.

Press the **Restore Unit** button, or press the **Manual** tab in the top menu and select **Restore**.



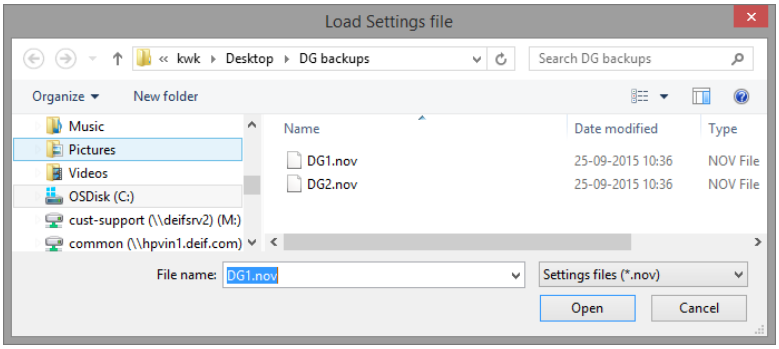
Step 3:

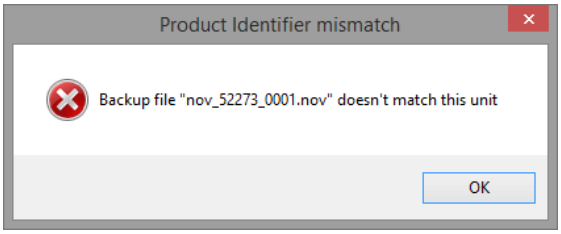
Press the **Browse** button and select your backup file.



Every backup file is locked to the specific controller on which it is made. This means that it is not possible to restore a controller with a backup file that is made on another controller. If you select a backup file that is made on another controller, a **Product Identifier mismatch** dialogue box will pop up (second image below).

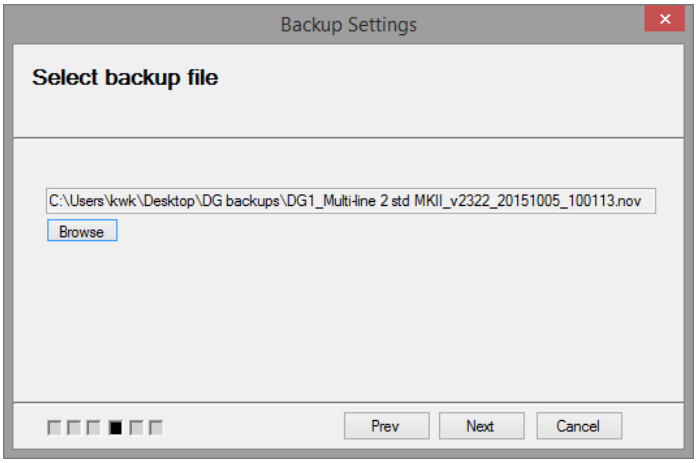
If that happens, press **OK**, and then select the correct backup file and press **Open**.





The selected backup file is displayed.

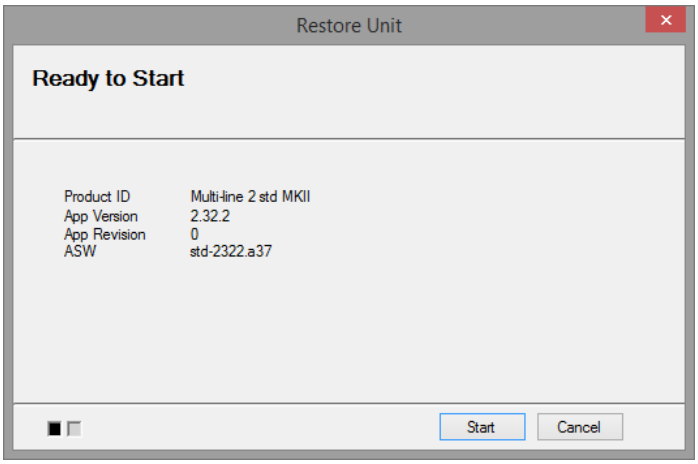
Check that it is the correct file and then press **Next**.



Step 4:

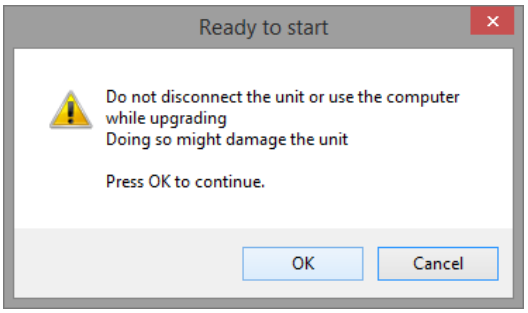
The backup tool is ready to restore the controller to the same condition and setup as when the backup was made.

Press **Start**.

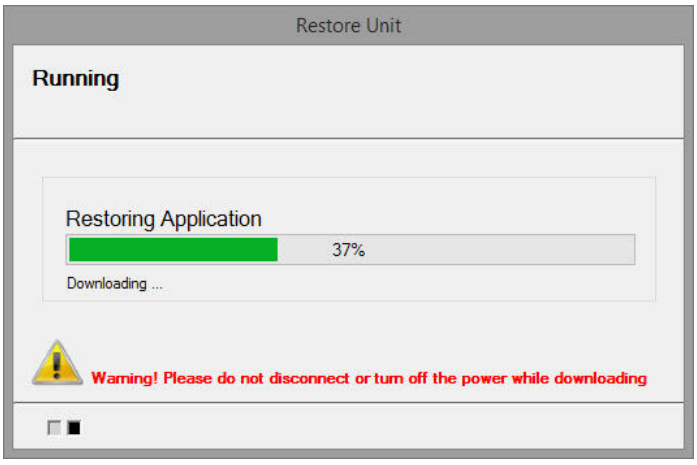


A warning pops up to inform you **not** to disconnect while making the backup.

Press **OK**.

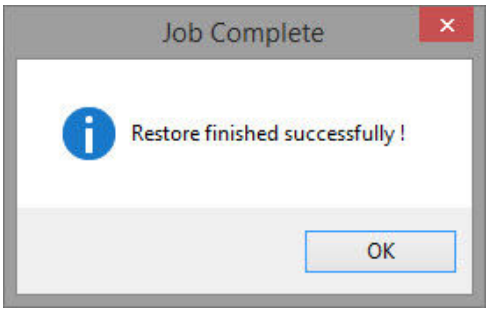


The **Restoring Application** bar informs the operator of the progress in the restoring procedure.



The controller is now restored.

Press **OK**.



CAUTION
Before you start using the restored system, DEIF recommends that you check a selection of parameters to verify that the restoring was successful.