



REFLOW-KIT[®]
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Reflow-Controller Instruction Manual



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1. General Advice

Please read this instruction manual completely before installation. It contains important information about the function operation and care of the Reflow-Controller.

Notice:

This document is based on the available knowledge at the time of going to print. We accept no liability for the inaccuracy or incompleteness of the information contained within this document. We reserve the right to make technical changes as progress demands. This documentation and the information contained within it are subject to copyright and may not be reproduced, or made accessible to a third party, in part or in whole, without the written consent of the authors.

1.1. Warranty and Liability

In principle our general sales and delivery conditions apply. Beta LAYOUT Ltd. denies any liability, jointly or severally, for damages to property or persons caused by any of the following:

- usage other than that for which product is intended,
- inappropriate installation, operation or usage,
- neglect of the advice, requirements and prohibitions outlined in the manual,
- arbitrary structural changes to the product,
- self-made sub-standard repairs.

The warranty is deemed to have expired in the case of damages resulting from neglect of the operating instructions. We accept no liability for any damages so caused.

2. Safety Information

2.1. Intended use

This product may only be used in the control of a Reflow Oven.

Any usage of this product other than that described above is likely to lead to damage including short-circuits, fire, electric shocks etc. It is forbidden to alter and/or convert the entire product in any way.

This product fulfills the legal, national and European requirements. All company names and product designs are registered trademarks of the respective owners.
All rights reserved.

Acquaint yourself with the operating instructions of the Controller, which you will find on the CD supplied with the Reflow oven.



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2.2. Safety Instructions

Any damage caused by neglect of the operating instructions renders any guarantee/warranty null and void. We accept no liability for any damages so caused.

We accept no liability for any special or personal injuries caused by inappropriate handling or neglect of the safety instructions. In such cases the warranty/guarantee is invalid.

- Due to European security & licensing reasons it is not permitted to re-configure and/or modify the product. Never disassemble the unit.
- The product is designed for operation through the mains supply only (230V~/50Hz). Must be properly earthed. Connect the Controller to a socket using the supplied protected plug only.
- This product is not a toy and is not intended for use by children. Operate and store the product out of the reach of children. Children may attempt to insert items into the openings on the unit, risking a lethal electric shock.
- The product is suitable for dry conditions only, do not allow it to become damp or wet. Never operate the product outdoors or in humid conditions, never touch it with damp or wet hands. Danger of lethal electric shock.
- The product should not be operated unsupervised.
- Do not operate the product in environments in which flammable gases, steams or types of dust are present or could be present. Risk of fire and explosion.
- The product is intended for private use only and is not intended for commercial use.
- The product is suitable only for the regulation of an integrated Reflow Oven. Never attach different devices.
- The product must only be connected to the mains via the unipolar socket at the front. Even if the product is switched off, mains voltage can remain in the plug socket and the attached equipment.
- Do not use the product with a "circuit breaker" for the attached equipment.
- Before the connection of the product to a PC it should be unplugged from the mains.
- Handle the product with care, any impact can damage it.
- Desist from using the unit if the housing of the product becomes damaged. If it is still connected to the mains then you should not touch either the product or the attached devices. Firstly break the electric circuit to which the product is attached (switch automatic circuit breaker off). Only then should the attached equipment be unplugged; then unplug the controller from the socket. Bring the product to a suitable place of repair or dispose of it in an environmentally friendly manner, or under regulations governing disposal of such equipment.
- Dispose of all packaging carefully, it can be hazardous for children.
- If you have doubts over the function, operation or security of the product, then contact a specialist, do not attempt to work on the unit yourself.



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3. Introduction

The Reflow Oven Controller regulates the Reflow-Kit oven. In order to achieve an optimal soldering result, determined times and temperatures must be kept when soldering SMD components with flux.

The Reflow-Kit Controller regulates your oven in such a way that the times and temperatures are adhered to and an optimal soldering result can be achieved.

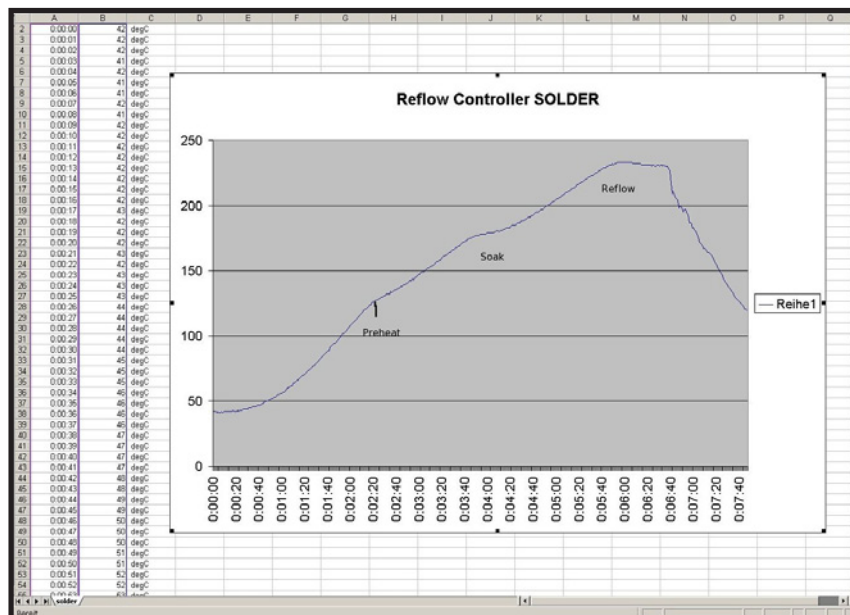
The boards and components are slowly heated in a preheating phase.

Thus mechanical stresses in the board and in the components are avoided.

After the preliminary heating the temperature is increased to just under the soldering temperature. This allows the volatile components of the flux to escape, avoiding blistering.

Heat then increases up to soldering temperature. The flux will become liquid and the components will form a connection to the board. The soldering temperature is accurately adhered to during the soldering phase, so that the board is not damaged due to overheating.

The controller will beep to signal the conclusion of the soldering phase. The finished soldered board can now be taken from the oven.





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4. Overview

The reflow controller is housed in a plastic case with plug connections for power, sensor, computer and the controlled oven. It features 3 control keys, 6 LEDs for status and error indication and an audible alarm.

5. Technical data

Operating voltage:	230 V ~/50 Hz
Maximum power consumption:	1,500 W
PC connection:	RS232 (via 1:1 extension) Pin 2 = TxD, Pin 3 = RxD, Pin 5 = GND 9600 baud, 8 Bit, no Parity, 1 stop bit, no handshake An optional USB converter (RK-10185) is available.

6. Command buttons



Off	Controller switched off. Socket plug is switched off, current programs interrupted.
Solder	Start the automatic soldering cycle.
Learn	An automatic alignment and systems check begins. The Controller learns the characteristics of the oven in use.



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- **LED "On/Off"**

enabled:

An oven connected to the controller is supplied with power.

- **LED "Learn"**

enabled:

The controller is in a learning phase for learning the oven characteristics.

flashing:

No oven characteristics learned.

- **LED "Dwell"**

enabled:

The controller is in the holding phase of the soldering process.

flashing:

The maximum soldering temperature is being learned. Please note that at this stage the oven is permanently supplied with power.

- **LED "Reflow"**

enabled:

The controller is in the reflow phase of the soldering process.

flashing:

Due to high oven temperatures (> 50 °C), no new soldering process can be started.

- **LED "Soak"**

enabled:

The controller is in the soak phase of the soldering process.

flashing:

A fault on the connected sensor was registered.

- **LED "Preheat"**

enabled:

The controller is in the preheat phase of the soldering process.

flashing:

An error on the connected oven was registered. This error message is displayed only when the corresponding parameter "mta" is set ≥ 0 .

The error may be deleted by a single press of the "Learn" key. When supplied, this function is not activated.

- **"Dwell" and "Preheat" LEDs**

flashing:

The controller is in "Manual" mode

7. Operation

7.1. Soldering procedure

- The learning phase will be run once before first use (see Chapter 7.2), or whenever the connected type of oven has changed.
- Switch your Reflow oven on to the highest performance level.



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- Switch on the upper and lower heating elements and place the grill onto the middle rail.
- Place the temperature regulator of the oven on highest setting.
- Set the oven timer to > 30 min. The oven does not have to be pre-heated. The soldering procedure can only start once the oven has a temperature of < 50 °C. If you are soldering several boards in rapid succession, the oven must be allowed to cool to under 50°C between the individual soldering procedures.
- The board should be placed on the middle of the grid for soldering. Place the temperature sensor on a spare board of similar specification (single- or double-sided, with or without soldermask, etc.) ensuring it makes contact with this control board. This ensures that the temperature sensor measures the temperature of the board and not the temperature of the surrounding air. This control-board should be positioned as close to the board to be soldered as possible.
- Close the oven door and check again that the temperature sensor did not slip from the board.
- Press the solder button to commence automatic soldering procedure.

The LEDs indicate the current status of the procedure:

Preheating Phase	Slowly warms up and keeps the board heated for a time.
Soaking Phase	Flux activates. Continues to heat slowly to just under the melting point of the flux.
Reflow Phase	Heat increases quickly up to melting point of flux.
Retaining Phase	Temperature is maintained slightly above the melting point of the flux.



If the soldering procedure is finished all LEDs will switch off and an audio signal sounds. Open the door of the oven immediately for fast cooling.

Warning: The board is still hot.

ADVICE

The automatic soldering process can only begin once the controller has learned the oven characteristics.

TIP

Fasten the temperature sensor to a piece of unused board with a wire and put this directly beside the board being soldered. The control-board should be in the same condition as the board to be soldered.





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7.2. Learning Mode

Before the oven can be used for soldering, the controller must firstly learn the heating and temperature settings of the closed oven.

The LED will blink to indicate the Learning Mode is underway. This process must be allowed to finish or the controller will not allow the soldering phase to be selected.

For the best learning mode you should place a board in the oven and the temperature sensor under or on the board, so ensure they are in contact. Thereby ensuring that the temperature sensor measures the board temperature - and not the air temperature.

Now close the oven and press the learning button. The learning mode LED shines or flashes during the entire learning mode. The oven is then heated up to 100 °C.

The on/off LED lights up. Once 100 °C is reached, the heating is switched off. The controller now measures how far the oven continues to warm up despite being switched off. Once all LEDs are switched off the learning mode is finished and the door can again be opened. Now the controller calculates and stores the characteristics of the oven. It is now ready for the Reflow soldering process.

7.3. System Self-test

After switching on the controller runs a system test.

Sensor test

The temperature sensor is checked. The preheating phase LED will flash until it recognizes the temperature sensor.

Please check the temperature sensor if this LED continues to flash after switching on the controller.

LED Test

In a 1-second pulse all LEDs are successively switched on and off.

Buzzer Test

The audio alarm will sound for 1 second.

7.4. Temperature calibration

The temperature sensor of the Reflow Controller is preset and does not have to be calibrated normally. However, if necessary the Reflow Controller can be adjusted to the sensor.



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The temperature calibration should be done via a connected PC with the function "tempoffset" selected. (Siehe Kapitel 78.)

7.5. Computer interface

The Reflow Controller is equipped with a RS232 interface for connection to a PC (optional).

The controller is connected with a standard commercial cable for serial interfaces with the PC. If your pc is not equipped with a serial RS232 Interface, we offer a USB-Adapter with extension cable in our shop (Rk-10185)

7.6. Settings

Adjust the serial interface of the attached computer to the following parameters:

9600 Baud, 8-bit, NO parity, 1 stop bit, no handshake

On activating the controller the following messages will appear:

```
# PCBP-Reflow Controller
# Software Date : Apr 17 2006
# Software Time : 12:20:16
# start selftest
# selftest ready
Type "help" for command list.
```

The Reflow Controller can be operated using a terminal software such as Miniterm (Linux) or Hyperterminal (Windows). A special software is not required.

7.7. Commands

The Reflow Controller recognizes the following commands:

help	Lists all commands
tempshow	<p>Temperature displayed each second [from parameter 0 to desired frequency in seconds] tempshow 5<ENTER> The current temperature is displayed every 5 seconds. tempshow 0<ENTER> Current temperature will not be displayed.</p> <p>Temperature will be displayed in the format; seconds, +xxx, degC. e.g. 31, +058, 52°C.</p> <p>Data is separated by a comma.</p>



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This data, if stored on the operating system, can later be uploaded to a spreadsheet e.g. Excel *.csv format.

If a command is given without parameters then the current temperature is only displayed once.

temptrace	Like tempshow, except the temperature is only displayed if the controller is in a soldering phase
debug	Show Debug information [parameter 0 or 1] Internal status information is displayed debug 0 <ENTER> Debug mode off debug 1 <ENTER> Debug mode on
trace	Internal status information [Parameter 0 or 1] Program's internal status is displayed. Trace 0 <ENTER> Status messages off trace 1 <ENTER> Status messages on
showall	Displays all set parameters of the active profile.
settings	Selects a parameter set as active. All soldering operations are performed with these parameters.
sold	Equivalent to pressing the "Solder" key.
learn	Equivalent to pressing the "Learn" key.
stop	Equivalent to pressing the "Stop" key.
shot	sends a heating pulse in manual mode with the output in % [0..100]. The temperature is then output. Example: shot100<ENTER> sends a heating pulse with 100% heat output.

7.8. Settings and Calibrations

The Reflow Controller can be adjusted to suit different solder pastes, different temperature sensors and different oven types. The necessary settings are entered using the computer interface.

phttemp	Temperature of the preheating phase [0 to 254 degrees]. phttemp<ENTER> indicates the current value.
----------------	--



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	phttemp 120<ENTER> adjusts the temperature to 120°C
phttime	Duration of the preheating phase [0 to 254 sec]. phttime<ENTER> indicates the current value. phttime 240<ENTER> adjusts the duration to 240 seconds.
phtpwr	Amount of heat of the preheating phase [0 to 100%] phtpwr<ENTER> indicates the current value. phtpwr 80<ENTER> the oven will heat to 80% of capacity.
soaktemp	Temperature of soaking phase [0 to 254 degrees] soaktemp<ENTER> indicates the current value. soaktemp 165<ENTER> adjusts the temperature to 165°C.
soaktime	Duration of soak phase [0 to 254 seconds] soaktime<ENTER> indicates the current value. soaktime 240<ENTER> adjusts the duration to 240 seconds.
soakpwr	Amount of heat of soak phase [0 to 100 %] soakpwr<ENTER> indicates the current value. soakpwr 80<ENTER> oven heats to 80% capacity
reflowtemp	Reflow temperature [0 to 254 degrees] reflowtemp<ENTER> indicates the current value. reflowtemp 232<ENTER> the temperature adjusts to 232°C.
reflowtime	Reflow Zeit [0..254] Sec: reflowtime<ENTER> indicates the current value. reflowtime 240<ENTER> adjusts the duration to 240 seconds.
reflowpwr	Reflow capacity [0 to 100 %] reflowpwr<ENTER> indicates the current value. reflowpwr 100<ENTER> the oven heats to 100% capacity.
dweltemp	Temperature of the retaining phase [0 to 254 degrees] dweltemp<ENTER> indicates the current value. dweltemp 232<ENTER> the temperature adjusts to 232°C.



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This temperature is normally equal to the Reflow temperature.

dweltime

Duration of the retaining phase [0 to 254 sec].

dweltime<ENTER> indicates the current value.

dweltime 40<ENTER> adjusts duration to 40 seconds.

dwelppwr

Capacity of the retaining phase [0 to 100%]

dwelppwr<ENTER> indicates the current value.

dwelppwr 100<ENTER> the oven operates at 100% capacity.

tempoffset

Temperature sensor adjustment [- 30 to 30degrees].

tempoffset<ENTER> indicates the current value in °C.

tempoffset -3<ENTER> the measured temperature is reduced by 3°C.
3 degrees less are indicated.

tempoffset 5<ENTER> the measured temperature is
increased by 5°C. 5 degrees more are indicated.

autoextend

If this parameter is set to 1, the soldering phase will be automatically
extended until the pre-set temperature has been reached.

If the parameter is set to 0, the soldering phase is finished after the
set time, even if the oven was not able to reach the set temperature.

The parameter is globally effective on any set soldering curve.

mta

Sets the minimum increase of the oven temperature within 15
seconds of uninterrupted heating.

The width of a step is 0.25 °C.

The controller generates an oven error if this value is not reached
(e. g. because the oven is not properly connected to the controller).

The soldering process is aborted and an error message is displayed.
A value of 10 has shown to be most effective.

Turn off the control by entering a negative value.

manual

Switches from automatic to manual control.

manual 0<ENTER> switches to automatic mode



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manual ↵ENTER> switches to manual mode
The Dwell and Preheat LEDs on the controller flash in this mode.
The controller then functions solely as a temperature sensor & relay for the oven.

7.9. Manual function

The Dwell and Preheat LEDs flash in manual mode.

The "shot X" command can be used to send individual heating pulses.
X stands for the output in % [0..100]. The current temperature is not output until the pulse has been sent.

In this configuration, the controller functions solely as a temperature sensor & relay for the oven.

Operation in this mode relies on the coupling with a PC. This function makes it possible to programme a controller on the PC. A command must always be sent from the PC controller to the controller when the controller is to heat.

It then sends a single heating pulse and subsequently measures the temperature. The PC controller reacts to this pulse in turn.

Only single pulses are sent to prevent the oven from further heating in the case of a programme crash or connection loss.

8. Maintenance and disposal

The Reflow Controller is maintenance-free.

The mains fuse should only be changed by a specialist. A safety fuse with the same technical specs must be used.

The use of repaired safety fuses or bypassing of the safety fuse is not permitted.

Repairs are to be carried out exclusively by an authorized specialist. Obsolete electronic devices are recyclable materials and do not belong in domestic refuse.

Dispose of the equipment at the end of its life span according to the national laws of disposal.

This instruction manual corresponds to the technical conditions at the time of going to print. The right to change technology and equipment is reserved.



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9. Guarantee

This equipment comes with a 1 year warranty. The warranty covers the free recovery of the defective equipment, due to the use of imperfect material or factory defect. Large requirements are impossible.

We give neither a guarantee nor accept any liability for damage or consequential loss in connection with this product. We reserve the right to repair, rework, supply spare parts or offer a reimbursement of the purchase price.

In the following cases no repair will be offered and the warranty claim expires:

- Alteration and repair attempts to the equipment including arbitrary alteration of the circuitry
- Unspecified construction, improper storage of components, incorrect wiring of components such as switch, potentiometer, sockets etc.
- Use of non-original components, not originally part of the kit
- Overload of the circuit
- In case of damage by other persons
- In case of damage from failure to follow instructions or wiring diagram
- In case of connecting to the wrong voltage or current
- In case of improper operation or damage caused by careless use or abuse
- In case of defects caused by bridged fuses or the use of incorrect fuses

In all these cases returns are made at your own cost.

10. Instructions for software update

The software can be updated via the serial interface of the controller. You will need:

- a PC with a serial interface and Windows operating system
If your PC is not equipped with the required RS232 interface, our shop offers an appropriate USB adapter.
- a standard serial extension cable (1:1)
- the Megaload software (available for download on our website). The software was kindly provided by Sylvain Bissonnette (www.microsylv.com).

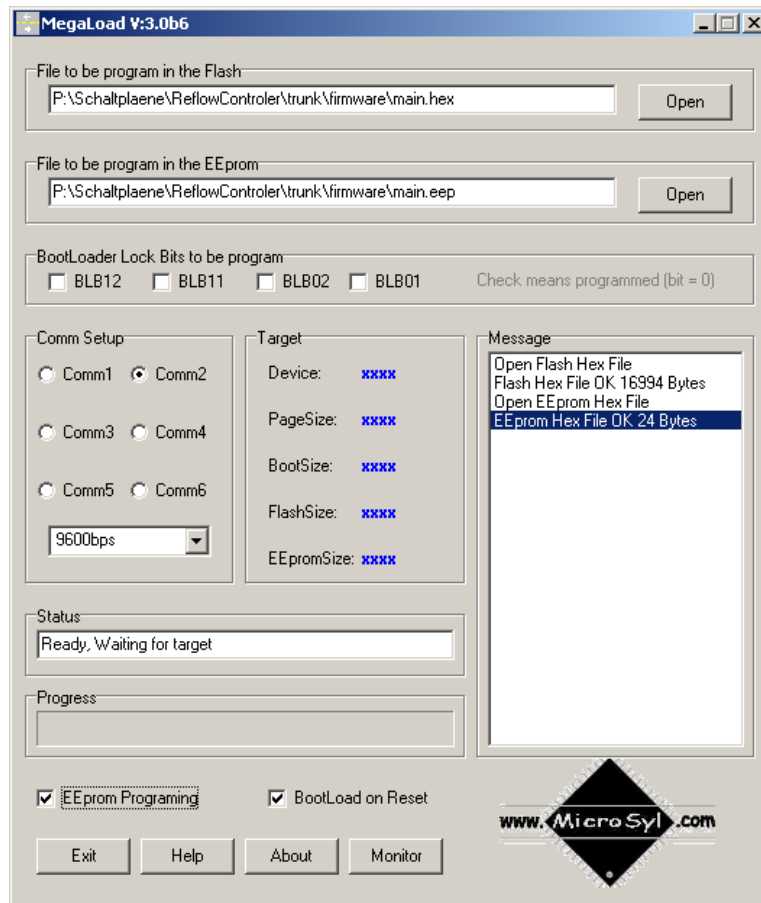


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For preparation, first unzip the ZIP archive into a directory of your choice. The software also runs on removable media, no installation is required.

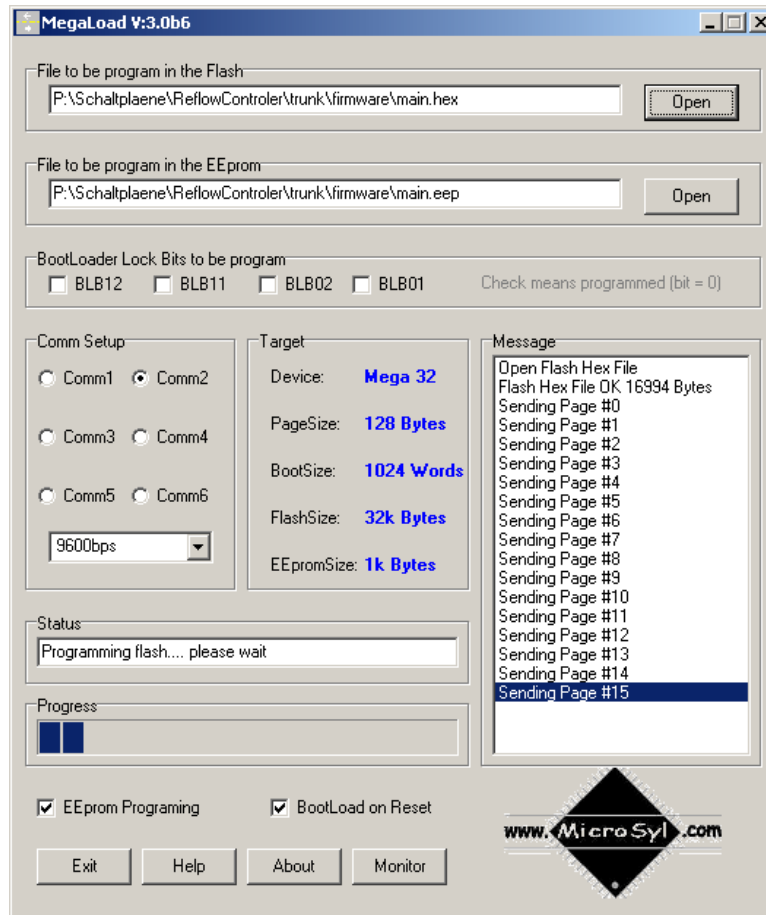
- Start Megaload.exe. The following window will open:



- Set the parameters as shown in the figure.
- Make sure you use only source files provided by us
- Please make sure that data and program files are always belonging to the same version.
- Disconnect the controller from the mains, and serially connect your computer to the controller.
- Check again if you noted all your personal parameter settings. All parameter settings are overwritten.
- Check again if you have selected the correct files for the programming.
- Turn on power supply to the controller. The controller immediately begins the programming. Do not interrupt this process.



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- After programming, the controller performs a self-test. The software update is now complete.
- NOTE: Please make sure to have selected the proper source files for the controller. The boot loader program will notice if, for example, no file was selected, but only after deleting the software in the controller.
- Enter again your specific settings, if necessary.

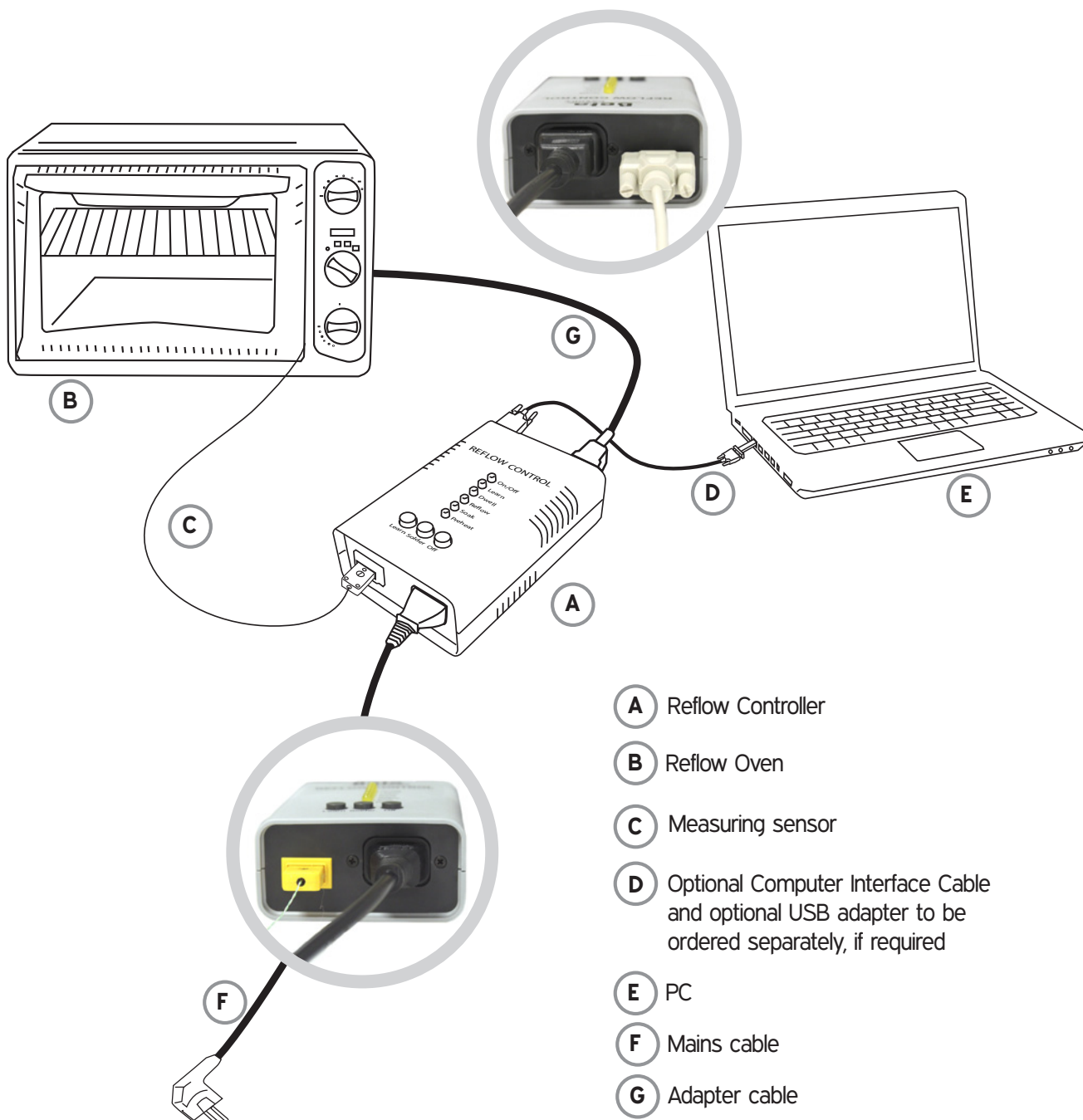


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11. Connect the reflow controller to the reflow oven and to the PC

The reflow controller (A) is connected to the reflow oven (B) via a measuring sensor (C) and optionally with a computer interface cable (D) to the PC (E). The electricity is supplied via the electric cable (F) at the front side. The oven will be connected with the adapter cable (G).



- A** Reflow Controller
- B** Reflow Oven
- C** Measuring sensor
- D** Optional Computer Interface Cable and optional USB adapter to be ordered separately, if required
- E** PC
- F** Mains cable
- G** Adapter cable