

# SoMachine Basic Software V1.2

## Release Notes

Software Version: 1.2

Firmware version: 1.2.1.8

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# 1. SYSTEM REQUIREMENTS

This software can be installed on a personal computer having the following hardware:

Processor	Core 2 duo or higher
RAM Memory	2 GBytes recommended or higher
Hard Disk	500 MBytes
Drive	CD player
Display	1280 x 768 pixels resolution or higher
Peripherals	Mouse or compatible pointing device
Peripherals	USB interface
Web access	Web registration requires Internet access

Having the following operating systems:

- Microsoft Windows XP Professional SP3 32 Bit & 64 Bit
- Microsoft Windows 7 Professional Edition 32 Bit & 64 Bit

SoMachine Basic has to be installed with Administrator rights.

Remove any USB connection to a M221 controller when installing or uninstalling SoMachine Basic.

For further information contact your Schneider Electric support center.

## 2. IMPORTANT INFORMATION

### 2.1. Provided templates and project examples

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## 2.2. New features in V1.2

Functional level management: your system could include logic controllers with different firmware versions, and therefore with different capability levels. SoMachine Basic supports functional level management to allow you to control the differences between your application and the target controller.

PTO (Pulse Train Output) function blocks controls the positioning or speed of one or two independent linear single-axis stepper or servo drives.

%S49 (output rearming) enables automatic rearming of embedded outputs following a short-circuit.

## 2.3. Main features

### 2.3.1. Software features

8 languages are available: English, French, German, Italian, Spanish, simplified Chinese, Portuguese and Turkish

Automatic conversion of Twido project (TwidoSoft projects, TwidoSuite projects and archives)

Several sessions can be opened at the same time

Copy/Paste of rungs or POUs in the same or different sessions (see restrictions below)

Symbols, comments, animation tables are downloaded to the controller with the application (see restrictions below)

Limited protection of project file or controller application

Instruction List and Ladder programming languages (including Grafset List)

Ladder program animation

Online modifications in RUN are supported, however the backup of these modifications can be performed only in STOP mode and when logging out

Save / Restore backup data by SoMachine Basic, Backup firmware and backup user program with SD card

### **2.3.2. Simulator Features**

The following features can be simulated: all Booleans and complex instructions, Grafcet instructions, Function Blocks like Drum, Counter, FIFO/LIFO, Shift Bit Register, Step Counter, Timer, and Schedule, Mast and Fast tasks and subroutines, Events for Inputs %I0.2, %I0.3, %I0.4, %I0.5, TM3 and TM2 expansion modules, Cartridges, RTC, LEDs, Embedded I/Os and Online Modification.

Two Ethernet server connections are available: one of them is dedicated for SoMachine Basic link.

Output trace screen.

Time management screen.



### **2.3.3. Controller features**

USB communication (application download, firmware update, Monitoring)

Ethernet communication (application download, monitoring, Modbus TCP/IP client & server, DHCP BOOTP client)

Serial line communication (application download, Modbus and ASCII protocols)

RTC (Real Time Clock)

Firmware update with M221 Firmware Update tool

SD card management: Firmware update and Clone application (see details below)

Powerless download (firmware and application)

Digital and analog output fallback management

PLS, PWM, PTO

Event tasks

Fast Counters and High Speed Counters

PID with Autotuning

## 2.4. Limitations and Restrictions

### 2.4.1. SoMachine Basic Software

When updating M221 firmware with "Firmware Update" tool, ensure to be offline in SoMachine Basic

Avoid having more than 500 rungs in one POU: separate rungs between different POUs to increase performances and to help assure the proper functioning of SoMachine Basic

Avoid doing online modifications when the controller scan time is close to the configured watchdog value: you may trigger a watchdog timeout and bring your controller to the HALT state, losing synchronization between the software and the firmware.

The following online modifications will require you to download your application after disconnection:

- Change or create symbol or comment on objects
- Add/change/remove objects in animation table
- Add/remove a line in Instruction List

Updating your .NET Framework version may require you to download your application after disconnection.

When an output is reserved by an IO function block (HSC reflex output, PLS, PWM or PTO):

- Its on-screen animation value is not refreshed (neither in the program editor nor animation table)
- A force action has no effect

Configurable software objects types (Drums, Scheduler, PID) have the following restrictions:

- They do not appear in search/replace results

- They are not automatically updated when moving expansion modules

Programming messages prefixed with "Compiler Message" are only refreshed when doing a new compilation at login time or by launching the simulator

Avoid downloading an empty Rung to the controller as it may have adverse effects on SoMachine Basic

When you copy/paste a part of your user logic in another session of SoMachine Basic, only the code is copied. The symbols and comments associated to software objects are not copied.

In powerless mode, the values in animation tables may not be valid.

### 2.4.2. M221 Simulator

It is not possible to launch two simulator instances on the same PC.

If M221 simulator is being used with the Vijeo Designer Simulator, the M221 Simulator must be launched first.

The minimum time base for the simulator is **50ms**; all tasks with a period lower than 50 ms will be configured at 50ms.

Down-counters (%SW76-%SW79) have 50 ms resolution.

Event tasks priorities are not been taken into account (tasks are executed in the order in which they were activated).

It is not possible to simulate hardware features like Fast Counter, PID, EXCH, PWM, PLS, PTO, HSC, filters and latches.

Serial Lines are not simulated.

SD card functionality is not simulated.

Security parameter settings are not simulated.

### 2.4.3. M221 Controller

During a controller reset when the controller first enters an EMPTY state, all outputs are set to zero for the first cycle of the controller. If you set the default (fallback) value of an output to one in the configuration, it will not take effect until after this first cycle, the duration of which is dependent on your application (size, communications, etc.). You may, given you intend a default (fallback) value of 1 for any or all outputs, take this into consideration. Thoroughly test your application and ascertain whether a reset of the controller, followed by an EMPTY state and the setting of outputs to zero, would cause your machine or process to react in ways that would have adverse consequences.

#### **WARNING**

##### **UNINTENDED EQUIPMENT OPERATION**

- Be sure your machine is brought to a known, safe state before initiating a reset of the controller.
- Account for an EMPTY state as you would for the interruption of power to your outputs, such as in the case of a power outage.

**Failure to follow these instructions can result in death, serious injury or equipment damage.**

Force states are maintained in case of a warm start and cleared in case of a cold start.

Some controller input LEDs are ON in power less mode.

When the PLC is in HALT and configured in "START in RUN", after the first power cycle, it starts in STOP (correct behavior), however after the second power cycle the M221 also starts in STOP (it should start in RUN).

On overloaded networks (more than 300 frames per second received by the controller), the error led may not be ON to signal a duplicate IP address.

When there is mismatch between the physical configuration and the SoMachine Basic software configuration, the bit 13 of %SW118 is set to 0, indicating an "I/O expansion configuration error" is detected. In this case, the expansion bus is not started. The bit in %SW120 corresponding to the modules which do not match are set to 1.

If there are more modules in the physical configuration than in the SoMachine Basic software configuration, only the bit corresponding to the first module missing is set to 1.

When at least one module does not answer correctly to the M221 during runtime (meaning the configuration step succeeded) the corresponding bit in %SW120 is set to 1 and the bit 13 of the %SW118 is set to 0. Even if it is the same error information as it is for a configuration mismatch (see above), the behavior is different as the expansion bus is still refreshed by the M221.

The INIT command may disconnect the Ethernet connection with SoMachine Basic.

If you make a connection with a defective or otherwise non-standard USB cable, and power cycle the controller, it may stay locked in boot phase. This is usually because there is a short circuit between pins 4 & 5. Replace the USB cable or at least disconnect it in case of a power cycle.

Serial line speed 115200 baud cannot be set by a Post Configuration file.

When using a M221 controller with I/O cartridges, the values of the I/Os from the cartridges cannot be directly accessed by the HMI. To access these values, write them

programmatically to controller memory addresses so that they can be used by the HMI.

When using an M221 controller as a slave behind an IO scanner, configure a timeout greater than 2.5 seconds.

When using an M221 controller as a Modbus TCP client, configure the timeout of the remote slaves to be less than 10 seconds (value default).

#### 2.4.4. System objects

Refer to the online help for more information on system objects definitions.

%S9 is not operational in this release<sup>1</sup>.

%SW33 to %SW36 may be incorrect when the M221 is configured in BOOTP or DHCP and the BOOTP/DHCP server does not answer during the IP address assignment.

%SW59: Bits 0 and 8 (day of week) and bits 7 and 15 (Centuries) cannot be used.

%SW70 to %SW72 provide the microsecond part of the last scan time of the master task.

%SW130 to %SW138 provide the microsecond part of the last execution time of the periodic and event tasks.

%SW148 to %SW156 provide the millisecond part of the last execution time of the periodic and event tasks.

%SW39 to %SW47 provide the microsecond part of the average execution time of the periodic and event tasks.

%SW158 to %SW166 provide the millisecond part of the average execution time of the periodic and event tasks.

<sup>1</sup>The %S9 bit was intended to put all outputs to a steady, known state. In the case of the re-arming of outputs during a short circuit, which may be disadvantageous in certain applications, it cannot be relied upon in this version to override the re-arming mechanism. If the otherwise automatic re-arming of the outputs would have unintended consequences for your application, use instead %S49. This system bit allows you to enable and disable the automatic re-



arming of embedded outputs. Use system bit %S10 to determine the diagnostic state of your outputs.

In addition, if you convert a Twido application to a M221 application, consider the impact of the non-implementation of the system bit %S9 if it is applied in your original Twido application for whatever reason. If necessary, modify the converted application to take this into account.

## **WARNING**

### **UNINTENDED EQUIPMENT OPERATION**

- Do not rely upon system bit %S9 to set outputs in a de-terminate state; instead, use alternated methods.
- Inspect and modify any converted Twido application that uses system bit %S9.

**Failure to follow these instructions can result in death, serious injury or equipment damage.**

### **2.4.5. Compatibility with the Schneider Electric legacy controller offer**

Quantum DHCP server is not compatible with M221 and cannot be used.

Quantum BOOTP server could cause a disconnection of SoMachine Basic at configuration time when it is connected via Ethernet.

### **2.4.6. Clone management**

The clone feature allows you to duplicate a controller:

- Firmware
- User application

- Post Configuration

The clone process is done by the following actions:

- Insert an empty SD card in the controller (can be in run or stop mode)
- Wait the end of copy to the SD card (SD card led is OFF if OK, blinking in case an error is detected)
- Put the 'master' SD card in another controller
- Make a power cycle in order to put the cloned application in the new controller

#### 2.4.7. Post configuration management

The user can manage a post configuration using an SD card, by using the following script commands.

An example with an SD card image is provided in your SoMachine Basic installation folder:

```
"\Firmware\PostConfiguration"
```

```
Download "/usr/cfg/"
```

The **Download** command sets the post configuration parameters written in the Machine.cfg.

```
Upload "/usr/cfg/"
```

The **Upload** command reads the post configuration of the controller and save it in a Machine.cfg file in the folder "/usr/cfg".

```
Delete "/usr/cfg/"
```

The **Delete** command deletes the post configuration inside the controller.

#### 2.4.8. Twido conversion

I/O assignment between Twido and M221 has changed for high speed counting:

- Main pulse input on Twido is %I0.1 and %I0.7
- Main pulse input on M221 is %I0.0 and %I0.6

When an I/O is used for such hardware function, it cannot be used in the user program. Therefore, your application may need some adjustment. If inputs in the user logic that were originally available are used as regular inputs, they would now be considered as used by the hardware function. This conflict is indicated in the converted program as a logical error and colored red.

When converting your Twido application to a M221 that has less inputs or outputs than the original Twido controller, verify that the extra IOs of the original configuration are not configured on special functions ("run/stop" input or "status alarm" output), as this case will have no indication upon conversion.

Verify the system objects on the M221 as some of them may not be supported as they are with Twido.

Verify your serial line configuration after conversion such that it will operate as intended relative to the original application.

#### **2.4.9. Simulation between SoMachine Basic and Vijeo Designer on the same PC**

In order to operate both the SoMachine Basic simulation together with Vijeo Designer simulation, start the SoMachine Basic simulation first and then launch Vijeo Designer simulation. Vijeo Designer simulation execution is limited in time, so you may want to re-launch it if you face any issues.

#### **2.4.10. Upgrading applications**

User updating firmware from V1.0.1.1 should reconfigure any existing Post Configuration file.

When updating project from SoMachine Basic V1.1, verify that the Modbus TCP remote server table properties are still valid.

## **2.5. Documentation addendum**

### **2.5.1. Additional information on movement control**

Movement is controlled by an internal system task that executes every 4 ms.

The effect of this is that any necessary parameter modifications that are made by the system task controlling an ongoing movement, such as, for example, those required of Acceleration / Deceleration during the course of the S-Curve feature, is made in a step-wise fashion.

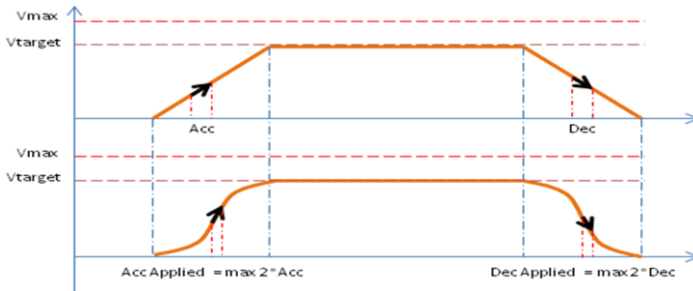
### **2.5.2. Additional information on JerkRatio**

The goal of the S-curve feature is to provide a smooth Acceleration / Deceleration.

This type of ramp provided by the S-curve is used in applications controlling high inertia, or in those that manipulate fragile objects or liquids.

The duration for the Acceleration / Deceleration is maintained, with or without using the JerkRatio parameter.

A side effect of maintaining the duration of the Acceleration / Deceleration is that the Acceleration or Deceleration will be different than the configured Acceleration or Deceleration parameter, as demonstrated in the following graphic.



As can be seen in the graph, without the application of the JerkRatio, the Acceleration / Deceleration is at the configured Acceleration / Deceleration. When the JerkRatio is applied however, the Acceleration / Deceleration may be affected by as much as two times that of the configured Acceleration / Deceleration value.