



**SMART MOTOR DEVICES**

*<http://www.steppmotor.biz>*

SMC-Program

Manual

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## 1. Program assignment

SMC-Program is intended for controlling SMSD controllers operation. Program uses COM-Port of personal computer to load commands to the controller (RS-232 interface).

There is an ability to save executing programs on personal computer or load ready programs. Files of saved executing programs have "\*.smc" and "\*.\_smc" extension. SMC-Program also provide reading program that have already been written in SMSD controller.

## 2. Driver installation

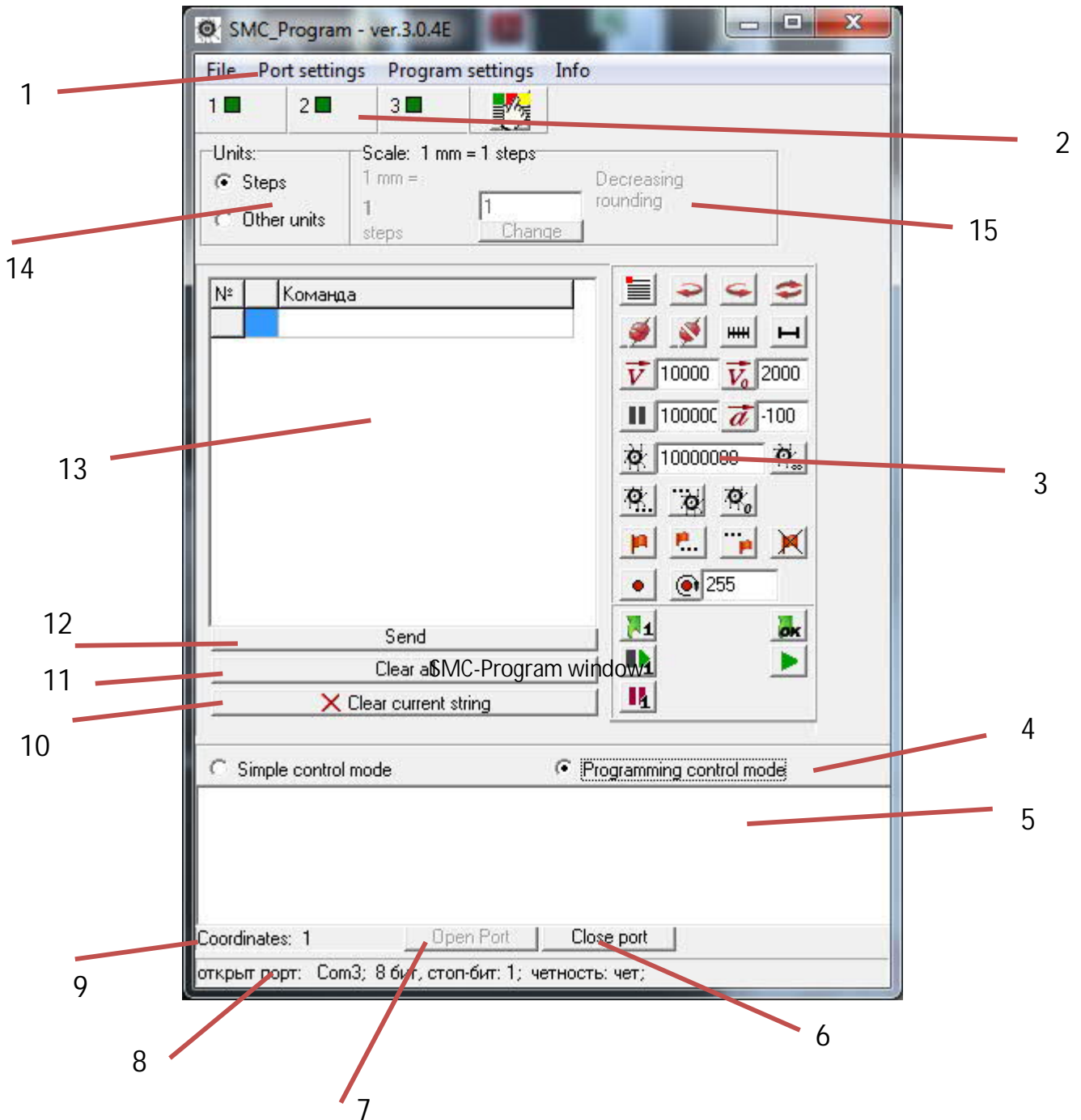
For successful usage of SMSD controllers with SMC-Program or any other communication software it is needed to install USB-COM driver. After installation of the driver SMC-Program or any other using software could connect SMSD controller via RS-232 interface.

Please, follow the next steps:

- a) Extract files from the archive. (Archive could be downloaded from our web-site <http://stepmotor.biz/downloads.htm> or required by e-mail <http://stepmotor.biz/contacts.htm>).
- b) Launch install file CP210x\_VCP\_Win\_XP\_S2K3\_Vista\_7.exe (smc\_program\driver-usb-com\CP210x\_VCP\_Windows).
- c) Follow the installation steps. Please, see the help file "Manual for Silicon Laboratories CP210x USB to UART Bridge.pdf" (please, find it at the package in folder smc\_program\driver-usb-com).

Important! The driver should be installed just once at the same computer. Don't install the driver few times – it will lead to disability of all copies of driver. In case the driver was installed more than once, please, uninstall all copies using Windows program manager and install the driver from scratch.

### 3. User interface



Picture 1. SMC-Program window

Main menu - 1:

- "File" – save and load file
- "Port settings" – Com-port operation settings
- "Program settings" – SMC-Program operation settings
- "Info" – information about program and ability to load file from device

Panel of status indicator group - 2: shows status of channels and enable to change this status manually.

Command panel - 3: means for writing commands and sending them into controller or saving them in file (section 7). Each command is shown in window 13. Clicking "Send" button(12) provide loading the list of commands (13) to the controller memory. "Clear all" button deletes all commands from the list in window 13. "Clear current string" button deletes only current command from the list of commands 13.

Radiobox 4 realize switching between operation modes: simple control mode and programming control mode (in the picture 1 programming control mode is selected).

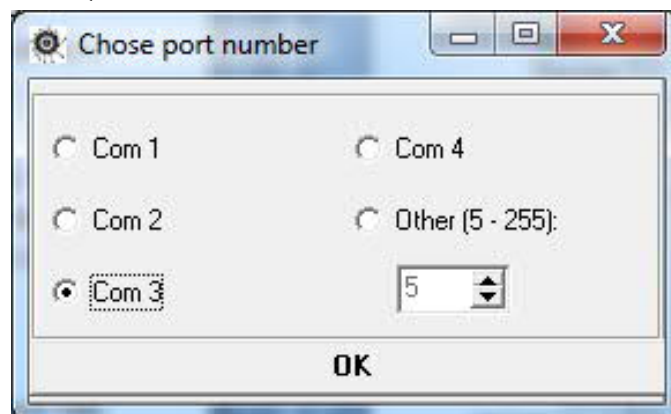
Window 5 shows operation process – controller alarm list.

"Open port" button (7) and "close port" button (6) realize COM-port opening and closing. While loading SMC-Program COM-port opens automatically. Status bar 8 shows settings of opened port. Status bar 9 shows number of channel, for which commands will be addressed during simple control mode operation.

## 4. Port selection and setup

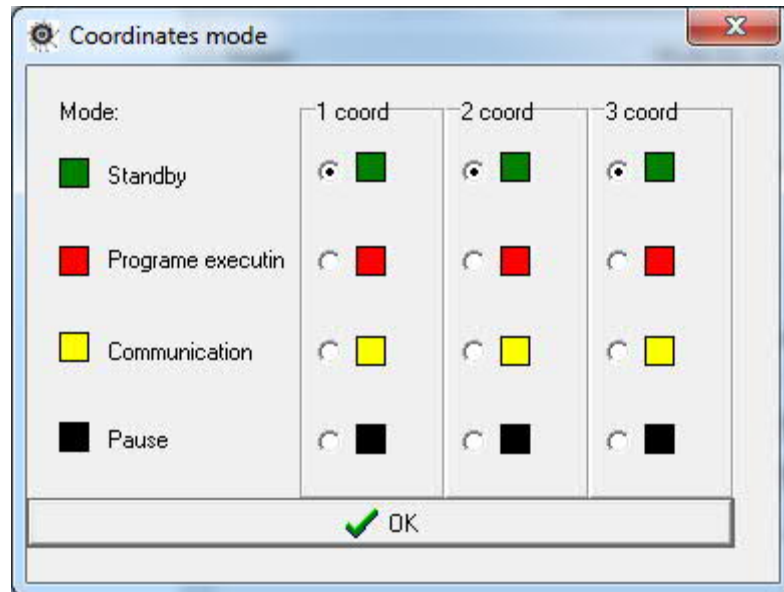
Port settings in program are set in accordance with communications protocol of controller (baud rate: 9600 bps; parity: even; stop-bit: 1; 8 bits in byte). For normal work of SMC-Program this settings shouldn't be changed.

It's necessary to set the number of COM-Port that is used by controller. Select in main menu (1) page "Port settings" -> "Chose port". In appeared window it's necessary to select correct number of port (picture 2).



Picture 2. "Chose port number" window

## 5. Panel of status indicator group



Picture 3. Controller channel mode setting

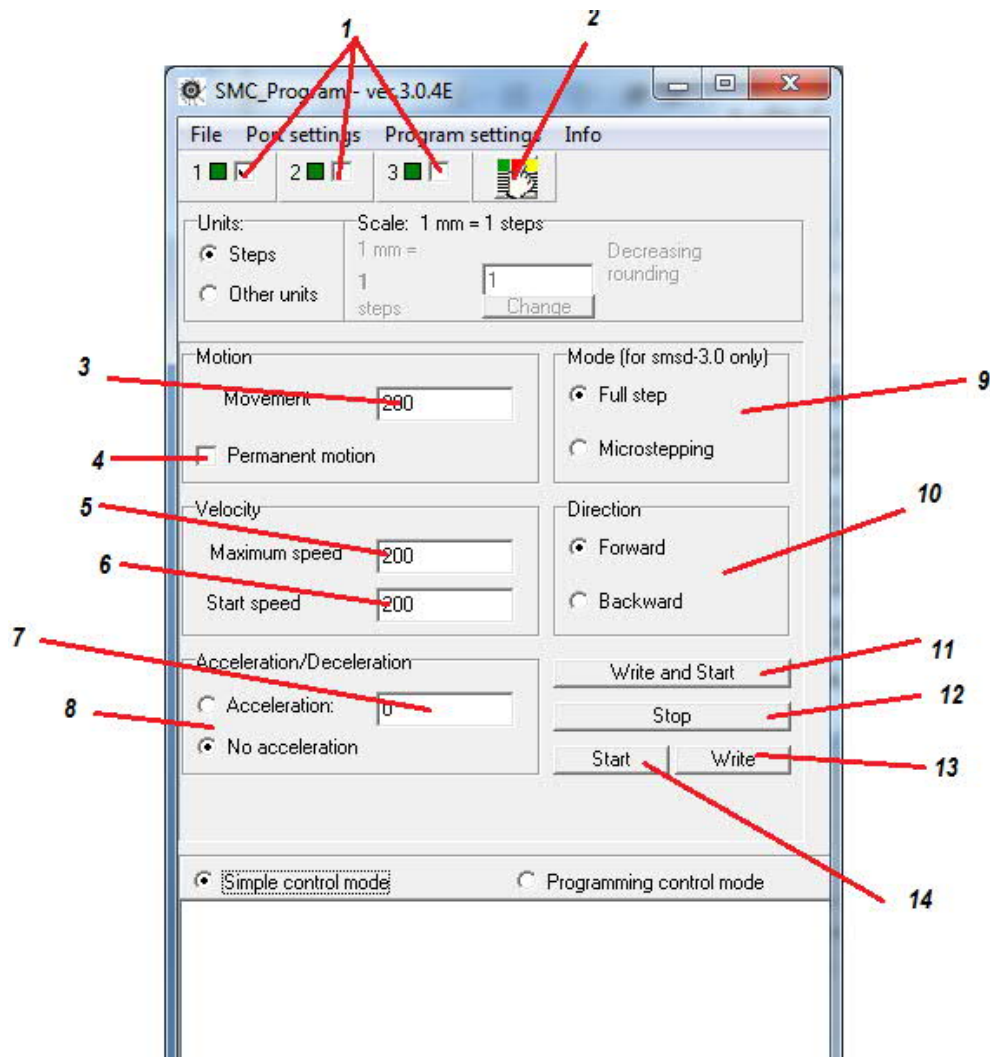
Panel of status indicator group (2 – picture1) shows controller channel mode. If SMSD controller is connected to a PC only 1<sup>st</sup> channel can be used. Each channel can operate in one of the following modes:

- Standby mode – indicator color on the panel is green. The channel of controller is waiting for commands.
- Commands loading to the controller memory – indicator color on the panel is yellow. The program is loading to the controller memory.
- Executing program mode – color indicator on the panel is red. Controller is executing loading program.
- Pause mode/emergency state – color indicator on the panel is black. Program execution is stopped by external signal from sensor or by command from personal computer.

Channel status on the panel and real controller channel status must be the same for normal work of the program. If this condition is not satisfied controller channel status on the panel should be set manually (chose correct status on the panel and click "OK" button). Such a situation may occur while pressing "Reset" button or "Start" button, or due to disconnection of the communication cable.

In case of sending any commands to the controller while controller channel status on the panel and real controller channel status are not the same incorrect operation or some errors may occur (section 11).

## 6. Simple control mode



Picture 4. Simple control mode

Simple control mode provides faster and easier step motor control.

For SMSD controllers only checkbox number 1 (1) should be checked.

“Write and start”, “Start”, “Write” buttons can be used only when controller is in standby mode – send “write and start”, “start”, “write” commands.

“Write” button is used for loading parameters of motion to the controller. “Start” button starts program execution. “Write and start” button loads parameters of motion to the controller and automatically starts program execution.

“Stop” button is used only when controller is in program executing mode – send “stop” command.

In input box 3 (picture 4) number of steps should be written. If checkbox 4 (picture 4) is checked – permanent motion is set. The value of maximum speed should be written in input box 5. The value of start speed should be written in input box 6 (is used in motion with acceleration). Switch 8 sets motion with acceleration, or motion with no acceleration. In input box 7 the value of necessary acceleration should be set.

Switch 9 is used for setting micro stepping or full step mode, is ignored by SMSD controllers (micro stepping mode of operation is set by micro switches placed on the controller).

Switch 10 is used for setting forward or backward motion direction.

## 7. Programming control mode

It is possible to choose programming control mode with the switch 4 (picture 1). The window of SMC-Program in this operation mode is shown in the picture 2.

In this mode the main elements are the list of commands (picture 5) and the panel of commands (picture 6).





1	Start commands
2	Program begin
3	Set "Enable"
4	Forward motion
5	Start speed 200 :
6	Acceleration 200
7	Speed 5000 step

Picture 5. The list of commands




















Picture 6. Commands panel





The list of programs is compounded with the help of buttons placed on the commands panel (picture 6). Clicking on the buttons of the commands panel adds appropriate commands at the end of the list. If it is necessary to change the position of the command in the list, click on it and while pressing the left button of the computer mouse move the command to the necessary row in the list. If it is necessary to delete one command from the list click on it and then click the button "Clear current string". "Clear all" button deletes all commands from the list. "Send" button sends command from list to the controller memory sequentially as they are placed in the list of commands.

## 8. Command panel

1		Start commands recording in first channel; Program begin Set "Enable"	Sets channel in program loading status, sets the program begin and enables energize motor wires.
2		Start/stop program executing	This command starts program executing if controller is in standby mode or stops program executing if controller is in program executing mode
3		Stop commands recording	This command record program in the controller memory and transfer controller into standby mode
4		Set/take off pause	This command set pause in program executing if con-

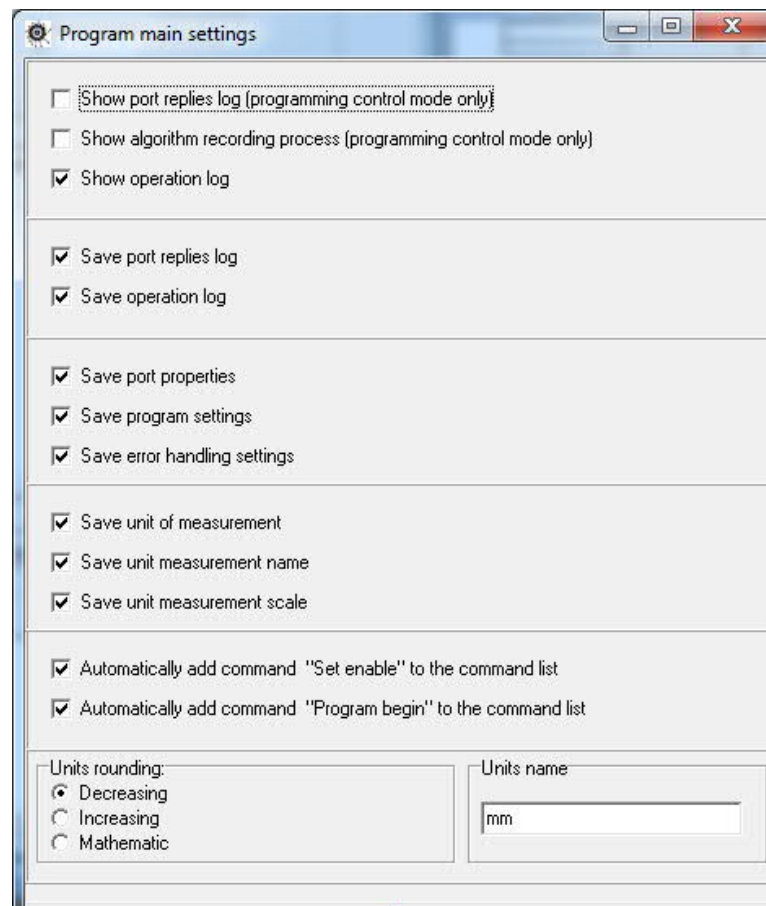


			troller is in program executing mode, or take off pause if controller is in "pause" mode
5		Program begin	Sets the program begin
6		Forward motion	After receiving this command all other commands will be assumed in corresponding direction
7		Backward motion	
8		Reverse	After receiving this command all other commands will be assumed in opposite direction
9		Set "enable"	After this command step motor is powered
10		Set "disable"	After this command step motor wires are not energized
11		Micro stepping	This command sets micro stepping mode of operation. This command is ignored by SMSD-1.5, SMSD-4.2, SMSD-9.0 (micro stepping mode of operation is set by micro switches placed on the controller)
12		Full Step	This command sets full step mode of operation. This command is ignored by SMSD-1.5, SMSD-4.2, SMSD-9.0 (full step mode of operation is set by micro switches placed on the controller)
13		Set speed	This command sets speed value (in the input box placed on the right side of the button it is necessary to write the value of speed : 1 – 10 000 steps per second). If motion with acceleration is used this speed is the end speed of motion
14		Start speed	This command sets start speed value if motion with acceleration is used. In the input box placed on the right side of the button it is necessary to write the value of start speed: 0 – 2 000 steps per second
15		Acceleration	This command sets the value of acceleration. After receiving this command next commands (17,18,25,26,27) will be executed with this acceleration. In the input box placed on the right side of the button it is necessary to write the value of acceleration: -500 / +500 step/sec <sup>2</sup>
16		Pause	This command sets pause in step motor operation. The next command will be executed after this pause. In the input box on the right side of this button it is necessary to write the value of delay time: 1 – 99999999 ms
17		Execute steps	This command sets the number of steps that step motor should execute: 1 – 10000000 steps
18		Permanent move	This command sets permanent move of the step motor
19		Close relay	This command sets synchronization flag, (this command in SMSD-controllers closes relay).
20		Wait signal 1	This command stops command execution, and controller is waiting for signal 1 (input "BX1")
21		Wait signal 2	This command stops command execution, and controller is waiting for signal 2 (input "BX2")
22		Open relay	This command deselects synchronization flag. (This command in SMSD controllers opens relay).
23		Set label	This command sets label. It is used with the command "repeat from the label".

24		Repeat from the label	Part of the program placed between the nearest label and this command will be executed for written number of times: 1 - 255
25		Move till signal 1	This command sets permanent motion till external signal 1 (input "BX1") will be received
26		Move till signal 2	This command sets permanent motion till external signal 2 (input "BX2") will be received
27		Move till zero limit switch	This command sets permanent motion till zero switch limit (external signal at the input "0")

## 9. Operation and application control

Program main settings window can be opened in menu "Program settings" -> "Program settings".



Picture7. Program main settings window

### 9.1 Units name

SMC-Program provides an ability to convert steps into linear motion with the help of transfer coefficient. Switch 14 on the picture 1 sets if "speed", "start speed", "acceleration", "quantity of steps" (13, 14, 15, 17 commands in table 1) will be measured in steps (micro steps) or other units. If "Steps" switch (14 in the picture 1) is checked all commands are sending to the controller memory without any changes (speed = [steps/s], acceleration = [steps/s<sup>2</sup>]).

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Example1: in the picture 4 "Steps" switch is chosen. After clicking "Start" button step motor will do 200 steps (micro steps) with the speed 200 steps/s.

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If "Other units" switch is chosen (picture 8) all values of commands "speed", "start speed", "acceleration", "number of steps" (13, 14, 15, 17 commands in table 1) are written in new units, SMC-Program counts necessary number of steps automatically in accordance with the coefficient.

### Picture 8. Unit coefficient setting window

For changing the coefficient it's necessary to write it in the input box and click "Change" button.

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Example 2: if screw with the pitch 1 mm is used, and controller is operating in full mode step then 1 revolution of the step motor is equaled to 1 pitch of the screw (200 steps of the step motor = linear motion on 1 mm). It is necessary to set "Other units" switch, and set the coefficient equaled 200, then click "Change" button. Now the value of "speed", "start speed", "acceleration", "steps" should be set in mm. Program will convert mm in steps automatically and will send necessary command to controller.

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In Program main settings window units name can be changed – the new name can be written in the "Units name" input box. After clicking "OK" button new units will be shown in the program window.

If the convert coefficient is fractional, the number of executing steps, speed and acceleration can be not whole number. If this occurs the value will be rounded in increasing or decreasing side or using mathematic rules. Rounding method can be set in the program main settings window.

- "Decreasing rounding" means that all fractional parameters in commands will be reduced to the next whole number.
- "Increasing rounding" means that all fractional parameters in commands will be increased to the next whole number.
- "Rounding by mathematic rules" means that all fractional parameters with fractional part < 0.5 will be reduced and with fractional part > 0.5 will be decreased to the next whole number.

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#### Example 3:

The coefficient is set 1mm = 400.5 steps of the motor.

It is necessary to move on 15 mm – step motor should make 6007,5 steps.

If "decreasing rounding" is chosen the command "execute 6007 steps" will be sent to the controller (for example, it can be used when executive mechanism mustn't go out the work space).

If "increasing rounding" is chosen the command "execute 6008 steps" will be sent to the controller (for example, it can be used when the instrument must recover the work space).

If "rounding by mathematic rules" is chosen the command "execute 6008 steps" will be sent to the controller (for example, when it doesn't mean if more or less steps will be executed and more accurate motion is required).

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## 9.2 Operation log

The window of operation log (5 in the picture 1) shows the process of operation. Here information about the beginning and end of each channel operation, the beginning and end of loading program is shown, and errors are registered – incorrect command, incorrect parameters of command, communication errors.

If it is necessary operation log can be saved. For operation log saving select menu "Program settings" -> "Program settings". In the "Program main settings window" select "Save operation log" checkbox. If it is chosen after program closing file "work.log" is formed in the "Log" folder. This file can be opened with the help of any text editor.

In the programming control mode all the port replies can be looked through – port operation log. Here commands code and port replies are shown in accordance with the communication protocol. For showing the port operation log select "Show port replies log (programming control mode only)" checkbox in "Program main settings window". If it is necessary port operation log also can be saved in a file: check the "Save port replies log" in the "Program main settings window". After closing the program "port.log" file in the "Log" folder will be formed. This file can be opened with the help of any text editor.

Also if it is necessary there is an opportunity to look through commands code of the executing program and the result of their loading: choose "Show algorithm recording process (programming control mode only)". This function can be useful if executing program is formed in the list of commands for loading them in the controller.

"Save port properties" defines if it is necessary to save Com-port properties when the program is closed. For version v.3.0 of SMC-Program only the number of Com-Port can be saved (in all next versions baud rate, stop-bits, word length, parity can be saved).

"Save error handling settings" defines if error handlings settings will be saved (section 9).

There is an opportunity to save program settings when program is closed. It is necessary to choose "Save program settings" in the "Program main settings window": all program settings will be saved while program closing, and when the program will be opened the next time it will be the same as in the previous working session.

"Save unit of measurements" defines if while program closing the value of units (steps or other units of measurements) will be saved.


"Save unit measurement name" defines if the new name of unit measurement will be saved.

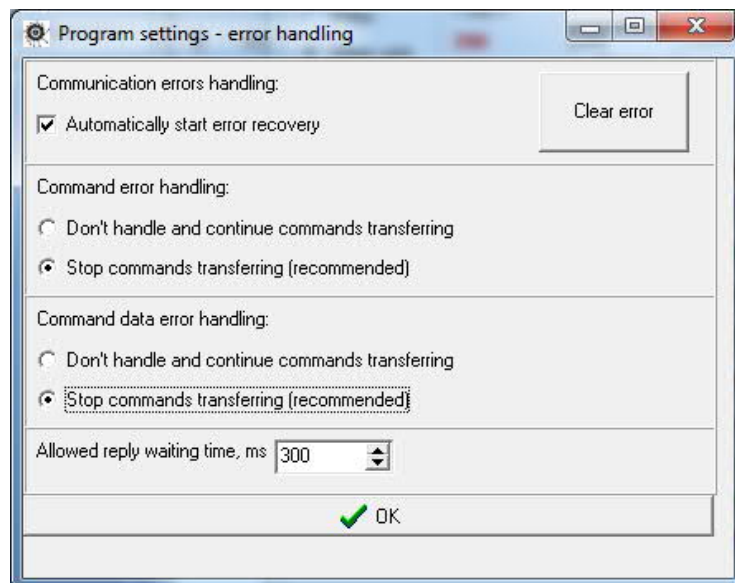
“Save unit measurement scale” defines if the value of transfer coefficient will be saved after program closing.

## 10. Error handling

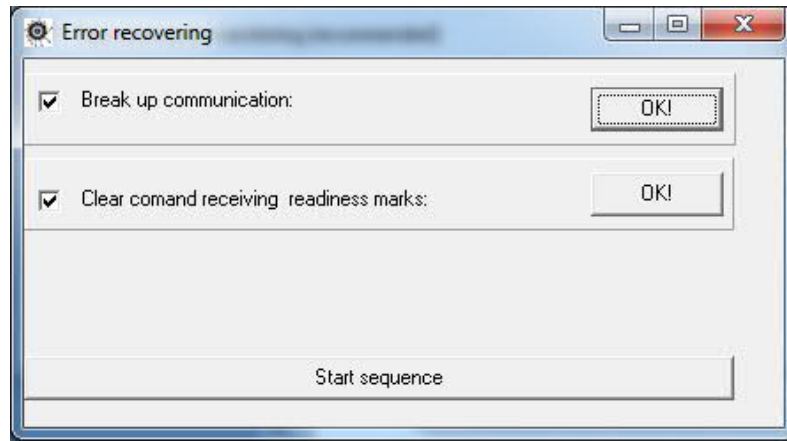
While program operation errors can occur. It can be command error, command parameters error, data transfer error.

Command error may occur if command has been sent from wrong operation mode. In simple control mode this situation occurs if “Write”, “Start”, “Write and start” commands are sent while controller is in “Program loading” mode. Operation mode of controller can be learnt by the LED color placed on the controller and by the color of the panel of status indicator group. As all sending commands in this operation mode are detected by the controller as executing program commands, so “Start”, “Write”, “Write and start” commands are incorrect. There are two methods to output the controller from “Program loading” mode with two methods.

1. To load the “Error handling” utility: “Program settings” -> “Error handling” -> “Clear error” (picture9) -> “Break up communication” (picture 10) -> click “OK” button.
2. Set programming control mode and send only one command: “Stop commands recording”  – number 3 in the table 1



Picture 9. Error handling window



Picture 10. Error recovering window

In programming control mode command error can occur because of wrong command sequence. All programs (command sequence) should start with the command " Start commands recording" and end with the command " Stop commands recording" .

Command parameter error can occur if incorrect value of speed or acceleration, etc. has been set. In the following table correct values are written (in steps)

Table 2

Parameter	Min.value	Max.value
Speed	1	10 000
Start speed	0	2 000
Acceleration	-500	+500
Number o steps	1	10 000 000
Pause time	1	99 999 999
Number of cycles	1	255

If this error has been detected in simple control mode it is necessary to check if the value of start speed, speed, acceleration and number of steps is correct.

If other units are used (not steps) it is necessary to check that real steps quantity (= command parameter\*coefficient) are in the tolerance range (in accordance with table 2).

Data transferring error can occur if the command has been sent when the controller isn't ready to accept it, or some failures have occurred while data transferring. Such a situation can take place if the indicator on the panel of status indicator group and real operation mode are different. To correct such a mistake it is necessary to load the " Error recovering " utility: "Program settings" -> "Error handling" -> "Clear error" -> in the "Error recovering" window it is necessary to select all points and click " Start sequence " button. "Start sequence" button clicking is equal to all "OK" buttons clicking. If the error repeats and color of indicator placed on the panel of status indicator group corresponds to real operation mode of the controller it is necessary to check if port settings have been changed (" Port settings " -> "Port settings").

Program user has an opportunity to select how program will operate in case errors occurrence.

For commands error and command parameter error there are two variants:

1. Don't do anything if these errors occur and continue loading next command to the controller memory.

2. To interrupt commands transferring if these errors occur .

To choose one of these two variants it is necessary to choose corresponding points in " Error handling" window ("Program settings" -> "Error handling"). It is recommended to leave settings by default (to stop commands transferring). But in simple control mode sometimes it is more accessible to use first variant - don't do anything if these errors occur and continue transferring next command to the controller memory. In this case there is no assurance that all commands have been transferred successfully and all values correspond to setting values.

For data transferring error there is an opportunity to load " Error recovering" utility automatically. In "Error handling" window ("Program settings" -> "Error handling") it is necessary to choose "Automatically start error recovery" point. If this point is chosen in case of error occurrence "Error recovering" utility will load automatically. The utility will do all checked points in sequence (from top to down).

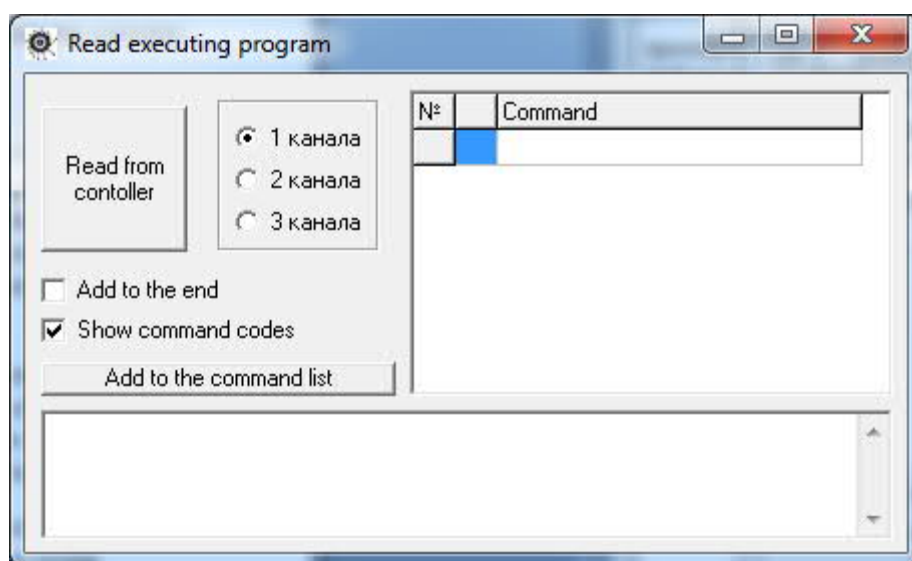
"Now reply from the controller" error occurs if there is no communication between the program and controller. The reason can disconnection of the communication cable connection, turned off power supply of the controller, wrong communication port number (section 3).

## 11. Program version

The information about SMC-Program version can be learnt from menu: " Information" -> "Program version".

## 12. Load program from device

To learn what program is stored in the controller memory at this moment it is necessary to select point in menu: " Information" -> "Load from device". In the window it is necessary to choose the memory of which channel should be read (for SMSD controllers always 1<sup>st</sup> channel must be chosen), then click " Read from the controller" button.



Picture 11. Read executing program

If it is necessary to learn program from more than one channel " Add to the end" point should be chosen and for all channels serially "Read from the controller" button should be

clicked. If it is necessary to look through command codes " Show command codes" point should be checked.

SMC-Program provides an opportunity to edit, save and write commands in the controller memory: click "Add to the command list" button – all commands from the list in " Read executing program" window will be removed to the command list of "Programming control mode".