



## ST7MC three-phase AC induction motor control software library Release 2.0

### About these release notes

This is Version 2.0 of the release notes for Release 2.0 of the ST7MC three-phase AC induction motor control software library.

These release notes are updated periodically in order to keep you abreast of any problems or limitations found in this release. Check the ST Internet website at [www.st.com/mcu](http://www.st.com/mcu) to ensure that this is the latest version of these release notes.

### Changes in this version of the Release Notes...

New Features	<ul style="list-style-type: none"><li>– The library is compatible with the header files generated with release 2.0 of the ST7MC AK Control Panel.</li><li>– The motor's rotating direction can be selected for the demo programs, either constant (CW or CCW) or alternatively changing (<a href="#">Section 3.1</a>).</li></ul>
Corrections	<ul style="list-style-type: none"><li>– The clockwise and counterclockwise directions have been swapped to be in line with Softec Microsystems' induction motors wiring. These motors can be ordered with the ST7MC starter kits.</li><li>– At the end of the start-up routine, the values averaged are not consistent, due to a software bug. The fix is described in <a href="#">Section 4.1</a>.</li><li>– The array in which tacho informations are stored is not properly initialized. The correct code is described in <a href="#">Section 4.2</a>.</li></ul>
Limitations	<ul style="list-style-type: none"><li>– The description of the control/status bits of the Operational amplifier is not correct (cf <a href="#">Section 4.3</a>).</li><li>– When working with PWM frequencies different from 12.5 kHz, the brake intensity must be manually modified (<a href="#">Section 4.4</a>) to avoid over-current triggering.</li><li>– Warning message when using STVD7 3.x with metrowerks compiler (<a href="#">Section 4.5</a>) due to the ELF/Dwarf 2.0 debug format.</li></ul>

# 1 Customer support

For more information or help concerning this software, please contact the nearest sales office (see [Contact list](#)).

## 1.1 Software updates

You can get software updates from the ST Internet web site [mcu.st.com](http://mcu.st.com). For information on firmware and hardware revisions, call your distributor or ST using the contact list provided below.

## 1.2 Contact list

<b>North America</b>	
Canada and East Coast STMicroelectronics Lexington Corporate Center 10 Maguire Road, Building 1, 3rd floor Lexington, MA 02421 Phone: (781) 402-2650	Mid West STMicroelectronics 1300 East Woodfield Road, Suite 410 Schaumburg, IL 60173 Phone: (847) 585-3000
West coast STMicroelectronics, Inc. 1060 E. Brokaw Road San Jose, CA 95131 Phone: (408) 452-8585	
<i>Note: For American and Canadian customers seeking technical support the US/Canada is split in 3 territories. According to your area, contact the appropriate sales office from the list above and ask to be transferred to an 8-bit microcontroller Field Applications Engineer.</i>	
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## 2 Read Me First

This chapter provides important information about this release.

### 2.1 Host PC system requirements

Not relevant for the library. Refer to STVD7 (or other selected IDE) user manuals for development tools requirements.

### 2.2 Software Installation

AC\_3PH\_SR\_2.0.zip must be unzipped completely in your working folder (recommended, providing the previous library source files were not modified), or few selected source files can be extracted according to application needs and current development state. See AN1904 for details.

### 2.3 Hardware support

The demo programs included in the main.c file has been written to work on the Softec Microsystems ST7MC starter Kit. The rest of the library has been designed to be modular and easily customized for any kind of hardware.

### 2.4 ST7MC AK Control Panel support

This library is compatible with the header files generated with release 2.0 of the ST7MC AK Control Panel.

## 3 What's new in ST7MC three-phase AC induction motor control software library?

### 3.1 Summary of changes in Release 2.0

#### 3.1.1 MTC module (mtc.c, mtc.h, MTCparam.h<sup>(1)</sup>)

##### Corrections

- Reverse 120° phase shift in MTC\_Set\_ClockWise\_Direction and MTC\_Set\_CounterClockWise\_Direction functions to be in line with the wiring of the SELNI motor delivered by Softec Microsystems (phase shift is now negative for ClockWise direction). Consequently previously rotating direction will be reversed vs previous release of the library.

#### 3.1.2 Demo program (main.c mainparam.h)

##### New Features

- To comply with the new functionalities of the version 2.0 of the ST7MC Control Panel the rotating direction can be chosen for the demo program:
  - Clockwise
  - Counterclockwise
  - “toggle mode”: the direction will change everytime the motor is stopped and re-started.

This is done by modifying the #define DIRECTION parameter in mainparam.h (that can be generated by the Control Panel V2.0 directly).

#### 3.1.3 Acmotor module (acmotor.c, acmotor.h<sup>(2)</sup>, ACMparam.h)

##### New Features

- The #define SLEW\_LIMIT, which set the variation rate of the statoric voltage and frequency in open loop has been removed from acmotor.c and placed in ACMparam.h for better flexibility.

#### 3.1.4 ST7\_Misc module (ST7\_Misc.c, ST7\_Misc.h<sup>(3)</sup>)

##### Corrections

- In ST7\_IntPrioritySetUp, the ISPR3 register initialization is cleaner (not significant bits b[7:4] are masked).

---

1. mtc.h and MTCparam.h left unchanged

2. acmotor.h is left unchanged

3. ST7\_Misc.h is left unchanged

## 4 Known problems/limitations

### 4.1 Speed reading error when enabling rolling average

When calling the function `MTC_StartTachoFiltering`, the flag “`DO_ROLLING_AVERAGE`” is immediately set, while it must actually be set in the `MTC_C_D_IT` interrupt service routine, after the effective initialization of the FIFO, that occurs on the next coming capture interrupt. If the rotor frequency is read before this initialization, the average value is not correct.

Here is how to fix this problem. In `MTC_StartTachoFiltering`, the following line must be deleted:

```
MTCStatus |= DO_ROLLING_AVRG;
```

Here is the new function:

```
void MTC_StartTachoFiltering( void )
{
    // Initialize FIFO stack where tacho periods are stored
    MTCStatus |= INIT_ROLLING_AVRG;
}
```

In the `MTC_C_D_IT` interrupt service routine, the deleted line must be added at the end of the FIFO initialization block. Here is the modified part of the interrupt routine (additional lines in bold):

```
if ( MTCStatus & INIT_ROLLING_AVRG )
{
    u8 BufMzprv, BufMzreg, BufMprsr;
    BufMzreg = MZREG; // Bufferize the values in case
    BufMprsr = MPRSR; // ... a tacho capture occurs
    BufMzprv = MZPRV; // ... during tacho FIFO initialization
    SpeedFIFO_Index = (PSpeedMeas_s)SensorPeriod;
    while ( SpeedFIFO_Index <
&SensorPeriod[SPEED_FIFO_SIZE] )
    {
        BufMzreg;
        SpeedFIFO_Index->Capture.b_form.high =
        BufMzprv;
        SpeedFIFO_Index->Capture.b_form.low =
        BufMzprv;
        SpeedFIFO_Index->Prsc_Reg = BufMprsr;
        SpeedFIFO_Index++;
    }
    SpeedFIFO_Index = (PSpeedMeas_s)SensorPeriod;
```

```

MTCStatus &= (u8) (~INIT_ROLLING_AVRG);
    // Starting from now, the values returned by MTC_GetRotorFreq
are averaged
MTCStatus |= DO_ROLLING_AVRG;
} else { // Store the latest speed acquisition
...

```

## 4.2 Incorrect initialization of the array holding tacho period values

In MTC\_InitTachoMeasure, the element of the structure where clock prescaler value is stored is not properly initialized. Here is the original line:

```
SpeedFIFO_Index->Prsc_Reg = 0x15;
```

It must be replaced by the following:

```
SpeedFIFO_Index->Prsc_Reg = 0x0F;
```

## 4.3 Bad description of the control/status bits of the Operational amplifier

In the st7fmc2n6.h file, the description of the control/status bits of the Operational amplifier is not correct. Here is the current file:

```

#define OACSR_HIGHGAIN 7 /* Gain range selection */
#define OACSR_HIGHGAIN_OR(1 << OACSR_HIGHGAIN)
#define OACSR_OAON 6 /* Amplifier On */
#define OACSR_OAON_OR (1 << OACSR_OAON)
#define OACSR_AVGCMP 5 /* Average Compensation */
#define OACSR_AVGCMP_OR (1 << OACSR_AVGCMP)
#define OACSR_OFFCMP 4 /* Offset Compensation */
#define OACSR_OFFCMP_OR (1 << OACSR_OFFCMP)
#define OACSR_CMPOVR 3 /* Compensation Completed */
#define OACSR_CMPOVR_OR (1 << OACSR_CMPOVR)

```

Here is the corrected version (modified lines in bold):

```

#define OACSR_HIGHGAIN 3 /* Gain range selection */
#define OACSR_HIGHGAIN_OR(1 << OACSR_HIGHGAIN)
#define OACSR_OAON 4 /* Amplifier On */
#define OACSR_OAON_OR (1 << OACSR_OAON)
#define OACSR_AVGCMP 5 /* Average Compensation */
#define OACSR_AVGCMP_OR (1 << OACSR_AVGCMP)
#define OACSR_OFFCMP 6 /* Offset Compensation */

```

```
#define OACSR_OFFCMP_OR (1 << OACSR_OFFCMP)
#define OACSR_CMPOVR 7 /* Compensation Completed */
#define OACSR_CMPOVR_OR (1 << OACSR_CMPOVR)
```

*Note:* This applies to all include files provided with the ST7 toolset (*st7fmc1k2.h, st7fmc1k4.h, st7fmc1k6.h, st7fmc2m9.h, st7fmc2r6.h, st7fmc2r7.h, st7fmc2s4.h, st7fmc2s6.h*).

## 4.4 Known limitations for Brake intensity during demo programs

### Description

When using a PWM frequency different from 12.5 kHz, the default brake current set in Mainparam.h:

```
#define BRAKE_DUTY_CYCLE((u16)64)
```

is too high and will cause the current protection to shut-down the power stage.

### Workaround

This #define must be edited manually to decrease the duty cycle to a value giving less than 12Amps, for instance:

```
#define BRAKE_DUTY_CYCLE((u16)51)
```

## 4.5 Warning message when using Metrowerks compiler

### Description

When using STVD7 3.1.1, compiling the library with the Metrowerks compiler, the following warning messages will be displayed in the Build output window at link time:

```
WARNING L1912: Object PDDDR overlaps with another (last addr: 0xB,
object addr: 0xA)
```

```
WARNING L1912: Object PDOR overlaps with another (last addr: 0xC,
object addr: 0xB)
```

```
WARNING L1912: Object ...
```

These warnings come from the ELF/Dwarf 2.0 Object file format, which produces more detailed debug information than the HIWARE format previously used with STVD7 2.5.4.

The warning message L1912 comes from link error L1818 due to paginated registers. The `-wmsgsi1818` user-defined option converts the error to a warning message only.

This is documented in the ST Visual Develop release notes.

## 5 Information for major previous releases

### 5.1 Release 1.0.1 (October 2004)

- Library delivered with STVD7 3.x workspace including two projects for Cosmic and Metrowerks compilers.
- Library can be compiled with the free 4K compiler version from Cosmic.
- The SCI based serial communication is now interrupt driven by default.
- The sine wave generation related CPU load is easily adjustable using the repetition counter and has been decreased to 21% by default.
- The speed read on the trimmer is now adjusted to be within the min-max range defined in MTCparam.h, for both open and closed loop demos.
- A \utilities folder has been added including sine wave look-up-table spreadsheet and Hyperterminal settings file.
- This library is compatible with the header files generated with release 1.1 of the ST7MC AK Control Panel.

### 5.2 Release 1.0.0 (May 2004)

- First release
- This library is compatible with the header files generated with release 1.0 of the ST7MC AK Control Panel.



## 6 Revision history

Table 1. Document revision history

Date	Revision	Changes
24-Jan-2006	1	Initial release.
29-Aug-2006	2	Added <a href="#">Section 4.1</a> thru <a href="#">Section 4.3</a>

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