# Example Programs for PLC Fatek equipped with FBs-CMGSM

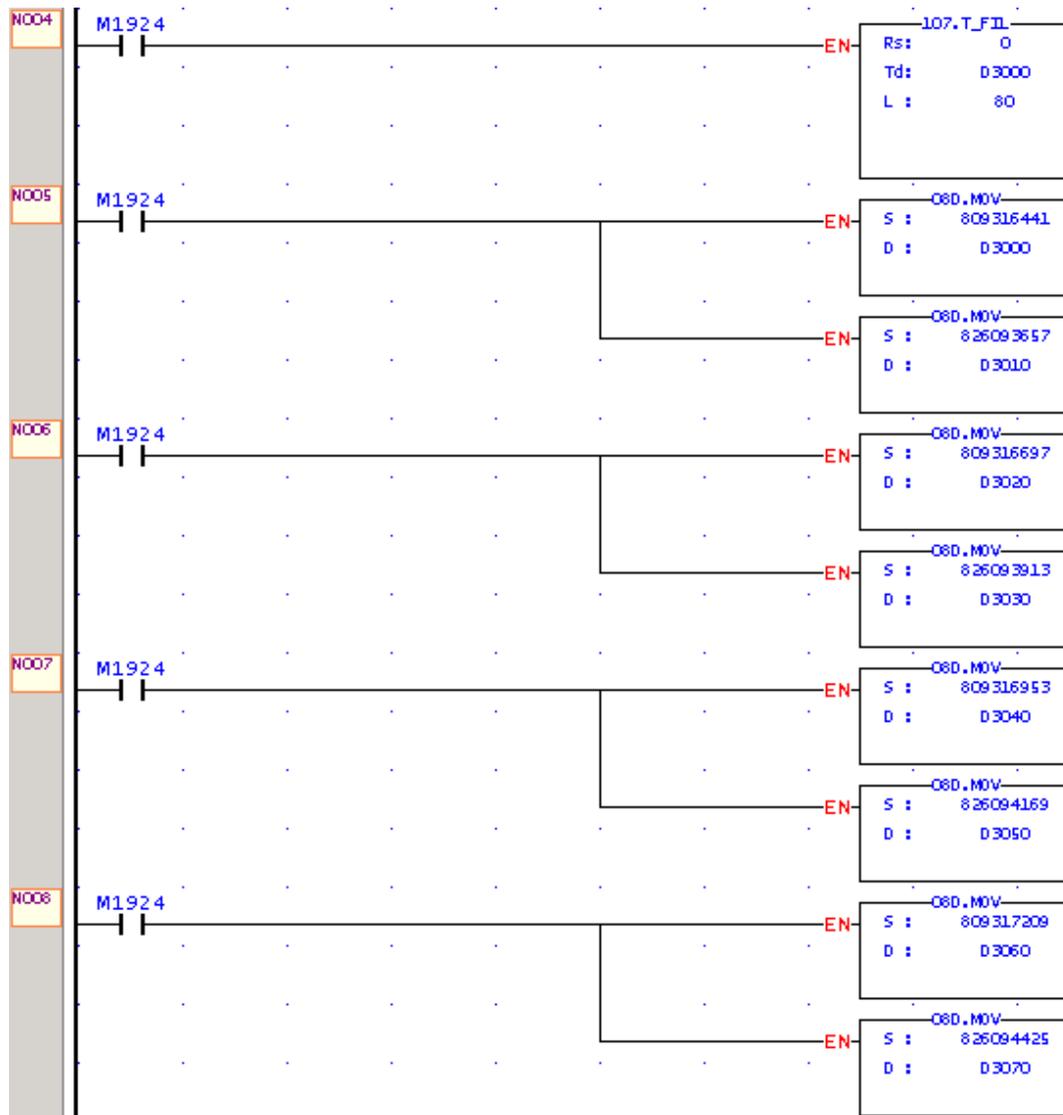### Example 1 – example_cmgsm_01

This very simple example shows how to process incoming SMS with command for Y0 –Y3 outputs in PLC Fatek. SMS command has to have following format: Yn=m, where the output number *n* is 0 to 3 and the requested output value *m* is 0 or 1. SMS examples: "Y0=1" or "Y2=0". The SMS has a fixed text format. Command SMS is accepted from any phone number.

First of all the configuration ASCII table for FBs-CMGSM has to be defined on address D3900. This table called "cmgsm3" is a part of the example_cmgsm_01 program. The table contains a text string with parameters (e.g. the definition of registers for incoming (D3700) and outgoing (D3800) SMS messages). See the FBs-CMGSM User's manual for details.
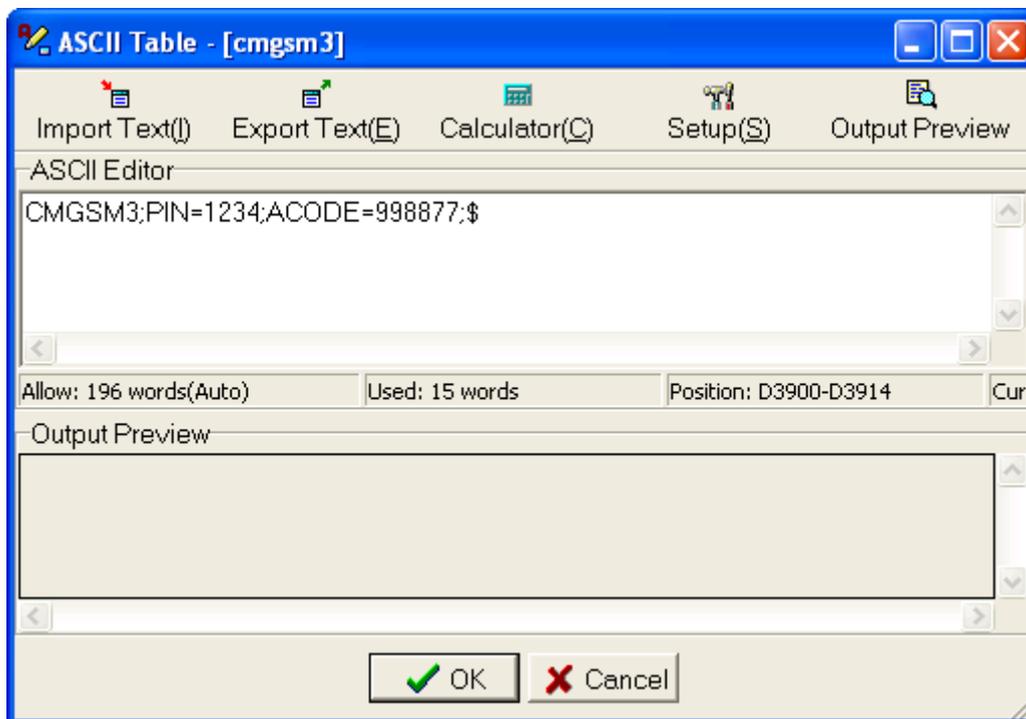
The table can be defined using Winprollader program in menu *Project / ASCII Table*. The table has to begin on address D3900, where it is expected by FBs-CMGSM. Use a selection *Non Output Format* in menu *Output Preview* when preparing the table.

The program is very simple. At the beginning of the program the 4 characters SMS texts are written into the registers DD3000 – DD3070 in networks N4 – N8 in form of double word number constants. The network N4 nulls (clears) the whole text area and in networks N5-N8 the texts are written.
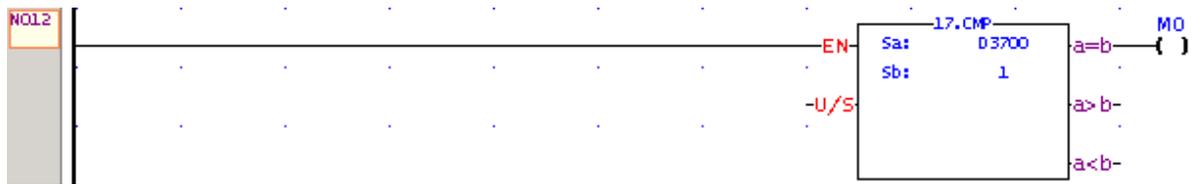
N004	M1924									107.T_FIL

```
N004   M1924                                          ┌──107.T_FIL──┐
       ─┤ ├─────────────────────────────────────EN─┤ Rs:      0  │
                                                     │ Td:   D3000 │
                                                     │ L :     80  │
                                                     └─────────────┘

N005   M1924                                          ┌───08D.MOV───┐
       ─┤ ├─────────────────────────────────────EN─┤ S: 809316441 │
                                                     │ D:    D3000  │
                                                     └──────────────┘
                                                      ┌───08D.MOV───┐
                                              ────────EN─┤ S: 826093657 │
                                                     │ D:    D3010  │
                                                     └──────────────┘

N006   M1924                                          ┌───08D.MOV───┐
       ─┤ ├─────────────────────────────────────EN─┤ S: 809316697 │
                                                     │ D:    D3020  │
                                                     └──────────────┘
                                                      ┌───08D.MOV───┐
                                              ────────EN─┤ S: 826093913 │
                                                     │ D:    D3030  │
                                                     └──────────────┘

N007   M1924                                          ┌───08D.MOV───┐
       ─┤ ├─────────────────────────────────────EN─┤ S: 809316953 │
                                                     │ D:    D3040  │
                                                     └──────────────┘
                                                      ┌───08D.MOV───┐
                                              ────────EN─┤ S: 826094169 │
                                                     │ D:    D3050  │
                                                     └──────────────┘

N008   M1924                                          ┌───08D.MOV───┐
       ─┤ ├─────────────────────────────────────EN─┤ S: 809317209 │
                                                     │ D:    D3060  │
                                                     └──────────────┘
                                                      ┌───08D.MOV───┐
                                              ────────EN─┤ S: 826094425 │
                                                     │ D:    D3070  │
                                                     └──────────────┘
```

Each text has fixed length of 4 characters (double word). This is a very important point because the rest of the program relies on it.

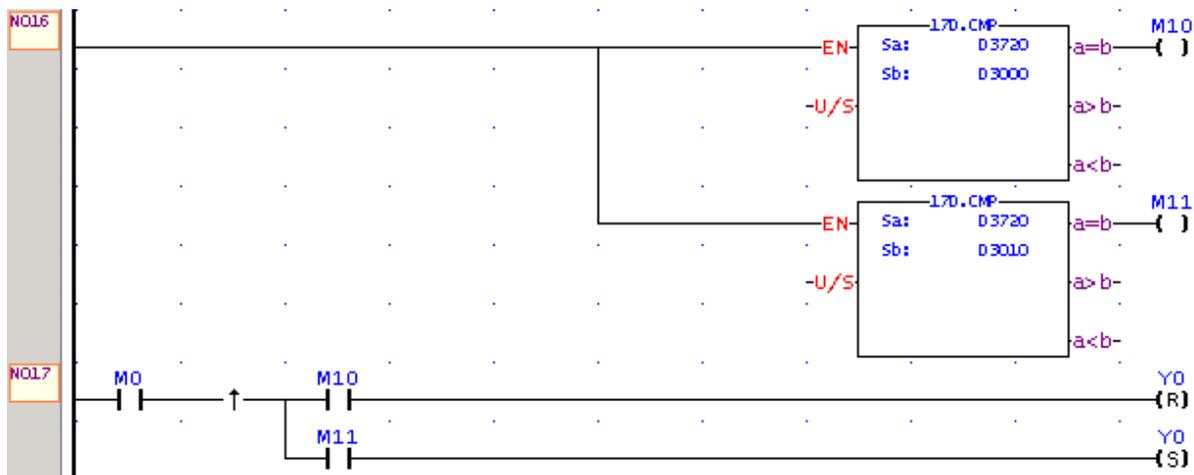| reg.	HEX	DEC	ASCII	Meaning
DD3000	303D3059H	809316441	Y0=0	Y0 off
DD3010	313D3059H	826093657	Y0=1	Y0 on
DD3020	303D3159H	809316697	Y1=0	Y1 off
DD3030	313D3159H	826093913	Y1=1	Y1 on
DD3040	303D3259H	809316953	Y2=0	Y2 off
DD3050	313D3259H	826094169	Y2=1	Y2 on
DD3060	303D3359H	809317209	Y3=0	Y3 off
DD3070	313D3359H	826094425	Y3=1	Y3 on

The table with registers and the explanation of their meaning

The information flag indicating received SMS with command is saved into the bit M0 in the network N12. When the bit D3700.0 and then M0 are in log. 1, it means that the modem has received a SMS message which is available in the field beginning from register D3720 and the sender's phone number is in the field beginning from register D3710.

```
NO12                                                      ┌───17.CMP───┐       MO
    │──────────────────────────────────────────────EN─│Sa:   D3700│a=b─( )
    │                                                   │Sb:       1│
    │                                              ─U/S─│           │a>b─
    │                                                   │           │a<b─
    │                                                   └───────────┘
```
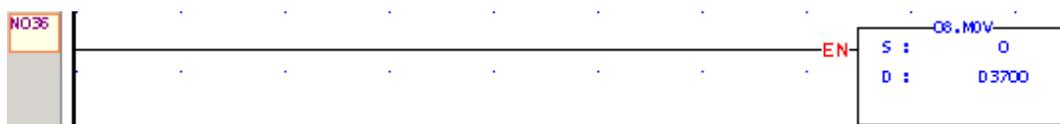
Comparison of the beginning of the received SMS with the predefined text constants follows. In case they are the same the output is changed. In the network N16 the first 4 characters of the message are compared (double word) with registers DD3000 and DD3010 which contains the text "Y0=0" and "Y0=1". The result of comparison is saved into bits M10 or. M11. The network N17: in the first cycle of the program which follows the reception of SMS by modem (rising edge M0) and in case of match of the text in the SMS the change of the Y0 output is performed.

```
NO16                                                      ┌──17D.CMP───┐      M10
    │                                          ┌─────EN─│Sa:   D3720│a=b─( )
    │                                          │        │Sb:   D3000│
    │                                          │    ─U/S─│           │a>b─
    │                                          │        │           │a<b─
    │                                          │        └────────────┘
    │                                          │         ┌──17D.CMP───┐      M11
    │                                          └─────EN─│Sa:   D3720│a=b─( )
    │                                                   │Sb:   D3010│
    │                                              ─U/S─│           │a>b─
    │                                                   │           │a<b─
    │                                                   └────────────┘
NO17   MO            M10                                                       YO
    │──┤ ├────↑────┬──┤ ├───────────────────────────────────────────────────(R)
    │            │ M11                                                         YO
    │            └──┤ ├───────────────────────────────────────────────────(S)
```

Similar networks are used for processing of commands for outputs Y1 (N21 and N22), Y2 (N26 and N27) and Y3 (N31 and N32).

In the last network N36 the reception flag D3700.0 is cleared after received SMS is processed.

```
NO36                                                      ┌───08.MOV───┐
    │──────────────────────────────────────────────EN─│S :       0│
    │                                                   │D :   D3700│
    │                                                   └────────────┘
```

In the example_cmgsm01 program the StatusPage0 is defined. You can see the definitions of message strings in registers DD3000 – DD3070 and incoming buffer, starting from register D3700, where the modem writes the incoming SMS message. (D3700 – status, D3710 – field for the sender's phone number and D3720 – field with the text of SMS).

Status Monitoring

Ref. No.	Status	Data	Ref. No.	Status	Data	Ref. No.	Status	Data
D3700	Hexdecim	0000H	DD3000	String	'0=0X'	DD3000	Hexdecim	303D3058H
DD3710	Hexdecim	00000000H	DD3010	String	'1=0X'	DD3010	Hexdecim	313D3058H
DD3712	Hexdecim	00000000H	DD3020	String	'0=1X'	DD3020	Hexdecim	303D3158H
DD3714	Hexdecim	00000000H	DD3030	String	'1=1X'	DD3030	Hexdecim	313D3158H
DD3716	Hexdecim	00000000H	DD3040	String	'0=2X'	DD3040	Hexdecim	303D3258H
			DD3050	String	'1=2X'	DD3050	Hexdecim	313D3258H
DD3720	String	' '	DD3060	String	'0=3X'	DD3060	Hexdecim	303D3358H
DD3722	String	' '	DD3070	String	'1=3X'	DD3070	Hexdecim	313D3358H
DD3724	String	' '						
DD3726	String	' '						
DD3728	String	' '						

StatusPage0

Example 2 – example_cmgsm_02

This example shows how to send SMS with every change of any input X0 – X3 of the PLC. SMS are sent with text "X$n=m$", where n is index of the input 0 – 3 and m is new state of the input. Texts are set in project. Destination phone number is only one.

In order to work correctly an ACSII table "cmgsm" with device configuration has to be placed at address D3900. The table can be defined in menu *Project / ASCII Table*. Starting address of the table must be D3900, where CMGSM will try to find it. It is necessary to select *Non Output* Format in menu *Output* Preview before finishing the dialog.
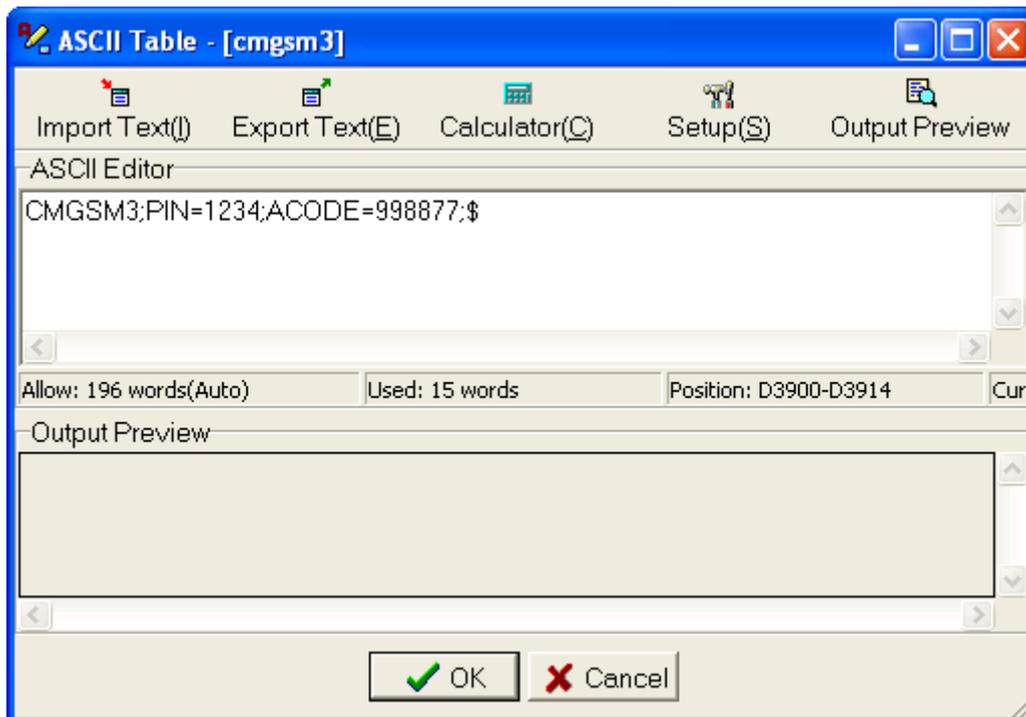
Phone number of the person who will receive all messages has to be set into ASCII table "tlfnum" starting at the address D3100. The table can be made the same way as above.
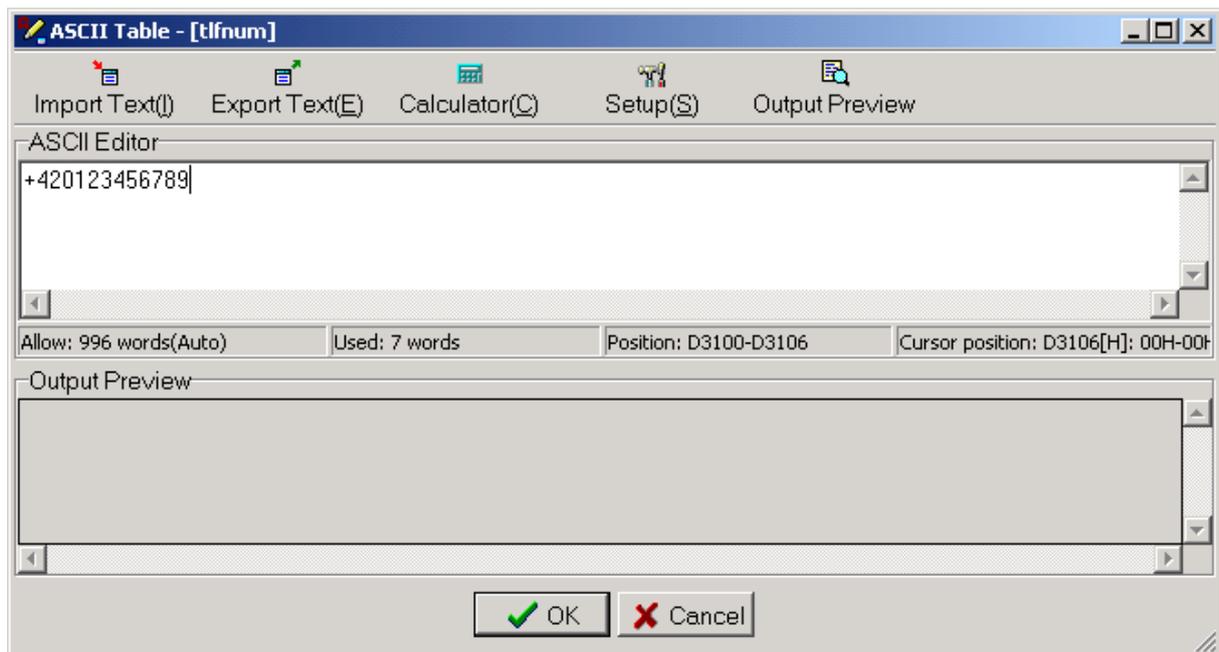
Program starts with definition of texts for every SMS. Network N4 will clear whole area of texts and in networks N5 – N8 are loaded the proper texts of events into registers DD3000 – DD3070. Message has constant length of 4 characters and every message takes DOUBLE WORD register.

N004   M1924   —EN— 107.T_FI1   Rs: 0   Td: D3000   L: 80

N005   M1924   —EN— 08D.MOV   S: 809316440   D: D3000

—EN— 08D.MOV   S: 826093656   D: D3010

N006   M1924   —EN— 08D.MOV   S: 809316696   D: D3020

—EN— 08D.MOV   S: 826093912   D: D3030

N007   M1924   —EN— 08D.MOV   S: 809316952   D: D3040

—EN— 08D.MOV   S: 826094168   D: D3050

N008   M1924   —EN— 08D.MOV   S: 809317208   D: D3060

—EN— 08D.MOV   S: 826094424   D: D3070
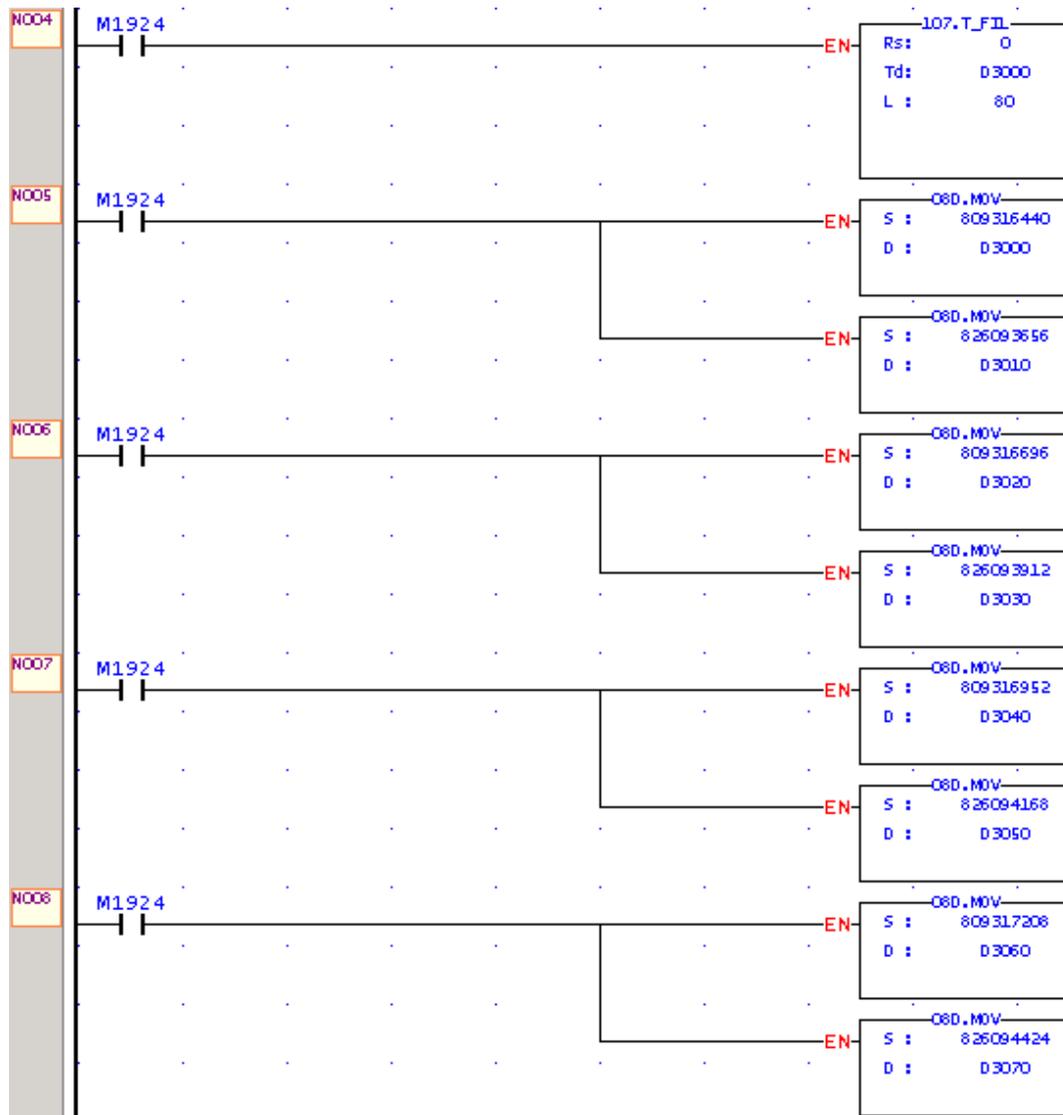
List of used registers is shown in following table

reg.	HEX	DEC	ASCII	význam
DD3000	303D3058H	809316440	X0=0	falling edge X0, X0 is in log. 0
DD3010	313D3058H	826093656	X0=1	rising edge X0, X0 is in log. 1
DD3020	303D3158H	809316696	X1=0	falling edge X1, X1 is in log. 0
DD3030	313D3158H	826093912	X1=1	rising edge X1, X1 is in log. 1
DD3040	303D3258H	809316952	X2=0	falling edge X2, X2 is in log. 0
DD3050	313D3258H	826094168	X2=1	rising edge X2, X2 is in log. 1
DD3060	303D3358H	809317208	X3=0	falling edge X3, X3 is in log. 0
DD3070	313D3358H	826094424	X3=1	rising edge X3, X3 is in log. 1

In networks N12 and N13 are read bits from status word: D3800.0 – command to send SMS and D3800.1 – status of sending. These bits are copied into working registers M0 a M1.

```
N012 ┤                                            ┌───40.BITRD───┐         M0
     │                                       EN───┤ S :   D3800  ├OTB───( )
     │                                            │ N :      0   │
     │                                            │              ERR─
     │
N013 ┤                                            ┌───40.BITRD───┐         M1
     │                                       EN───┤ S :   D3800  ├OTB───( )
     │                                            │ N :      1   │
     │                                            │              ERR─
```
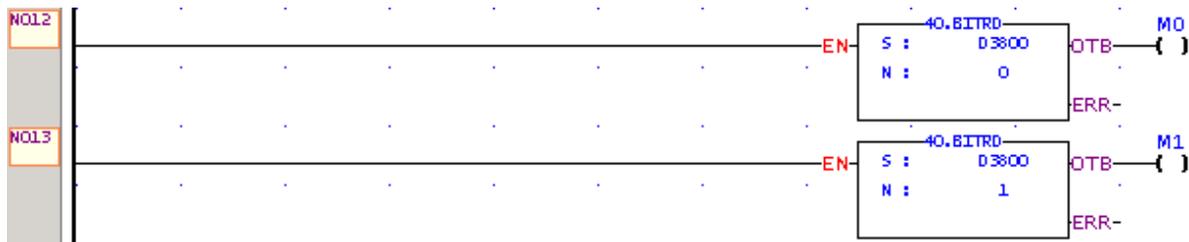
Filters of inputs X0 – X3 are made in networks N17 – N29. There filters will discard changes on inputs shorter than 0.5 second. Filtered signals are saved to bits M100 – M103. In network N17 is started timer T0 or T1 according to state of X0 (log. 0 will start T0, log. 1 will start T1). If state on X0 is stable for at least 0.5 second an output of appropriate timer (T0 or T1) is set. In network N22 or N23 is set state of bit M100 whenever T0 or T1 is finished. If only short pulse is present on X0, timer T0 or T1 is started but will not be able to finish counting and state of M100 will remain unchanged. Filters for X1 – X3 are similar.

```
N017   X0                                               ┌──.01S──┐
     ──┤ ├──────────────────────────────────────┬──EN───┤ T0  50 ├TUP─
                                                 │       └────────┘
                                                 │       ┌──.01S──┐
                                                 └─/──EN──┤ T1  50 ├TUP─
                                                         └────────┘
N018   X1                                               ┌──.01S──┐
     ──┤ ├──────────────────────────────────────┬──EN───┤ T2  50 ├TUP─
                                                 │       └────────┘
                                                 │       ┌──.01S──┐
                                                 └─/──EN──┤ T3  50 ├TUP─
                                                         └────────┘
N019   X2                                               ┌──.01S──┐
     ──┤ ├──────────────────────────────────────┬──EN───┤ T4  50 ├TUP─
                                                 │       └────────┘
                                                 │       ┌──.01S──┐
                                                 └─/──EN──┤ T5  50 ├TUP─
                                                         └────────┘
N020   X3                                               ┌──.01S──┐
     ──┤ ├──────────────────────────────────────┬──EN───┤ T6  50 ├TUP─
                                                 │       └────────┘
                                                 │       ┌──.01S──┐
                                                 └─/──EN──┤ T7  50 ├TUP─
                                                         └────────┘

N022   T0                                                            M100
     ──┤ ├────↑─────────────────────────────────────────────────────(S)
N023   T1                                                            M100
     ──┤ ├────↑─────────────────────────────────────────────────────(R)
N024   T2                                                            M101
     ──┤ ├────↑─────────────────────────────────────────────────────(S)
N025   T3                                                            M101
     ──┤ ├────↑─────────────────────────────────────────────────────(R)
N026   T4                                                            M102
     ──┤ ├────↑─────────────────────────────────────────────────────(S)
N027   T5                                                            M102
     ──┤ ├────↑─────────────────────────────────────────────────────(R)
N028   T6                                                            M103
     ──┤ ├────↑─────────────────────────────────────────────────────(S)
N029   T7                                                            M103
     ──┤ ├────↑─────────────────────────────────────────────────────(R)
```
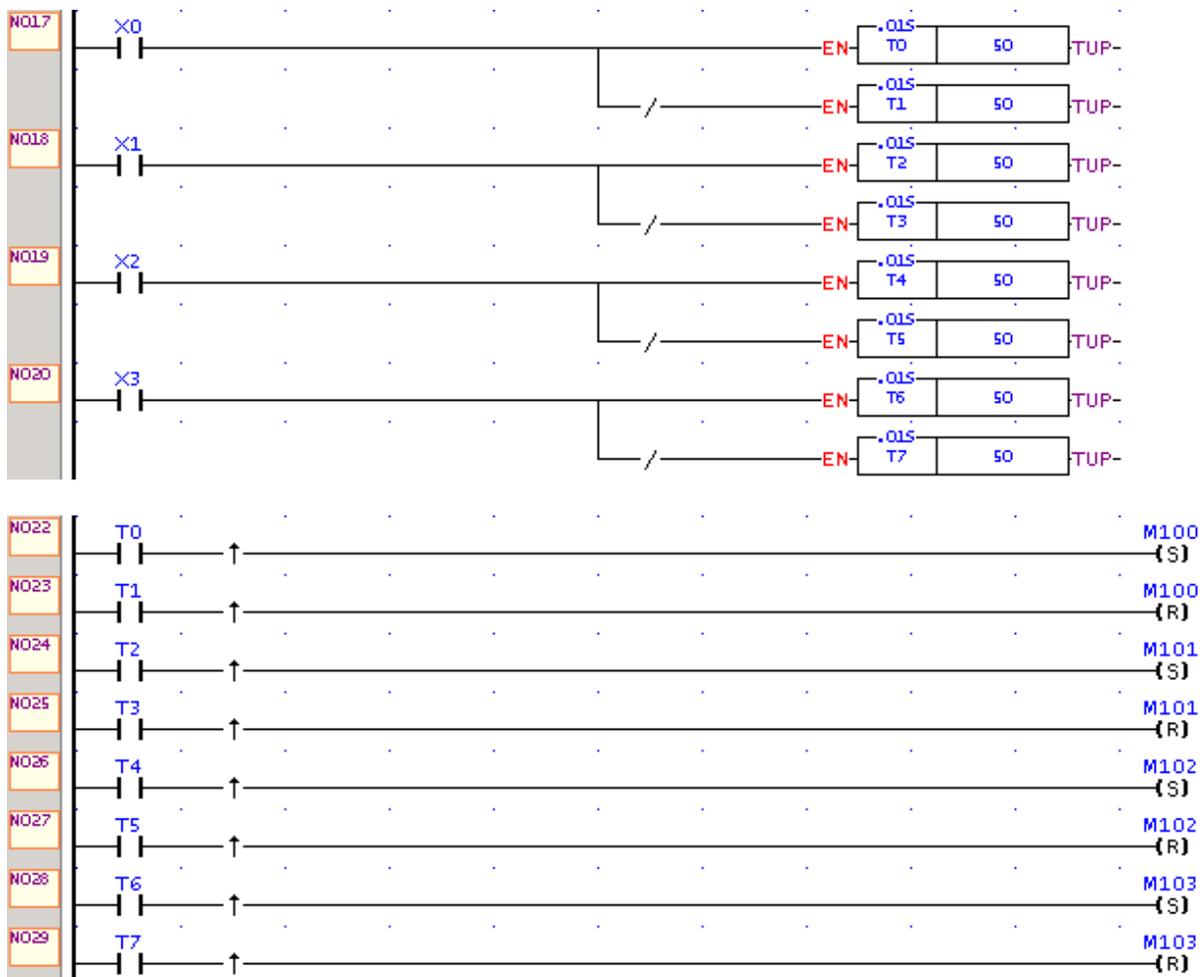
When change on an input X0 – X3 is detected and no SMS is sending, than new message is prepared. In network N33 a phone number of receiver is copied from table "tlfnum" from address D3100 to address D3710 (where FBs-CMGSM expects it) and registers D3820 – D3899 are cleared for future text of the message.

NO33

```
M100                    M0      M1                                      ┌─103.BT_M─┐
─┤├─────↑──┐           ─┤/├────┤/├────────────────────────────┬──EN─┤ Ts:  D3100 │
M100       │                                                  │     │ Td:  D3810 │
─┤├─────↓──┤                                                  │     │ L :    10  │
M101       │                                                  │     └────────────┘
─┤├─────↑──┤                                                  │     ┌─107.T_FIL─┐
M101       │                                                  └──EN─┤ Rs:    0   │
─┤├─────↓──┤                                                        │ Td:  D3820 │
M102       │                                                        │ L :    80  │
─┤├─────↑──┤                                                        └────────────┘
M102       │
─┤├─────↓──┤
M103       │
─┤├─────↑──┤
M103       │
─┤├─────↓──┘
```
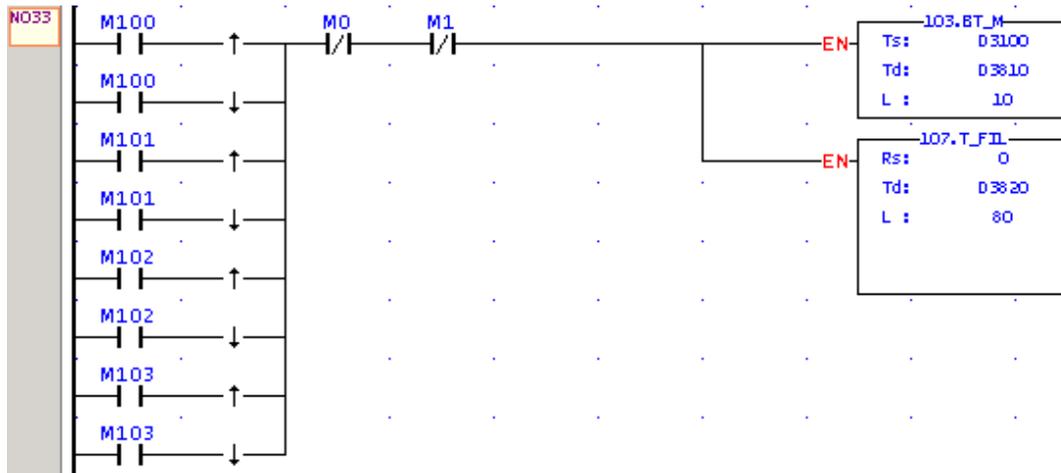
In networks N37 – N44 is selected appropriate text of message. It depends on event which occurred. Length of text is always 4 characters.

NO37
```
M100          M0      M1                              ┌─08D.MOV─┐
─┤├───↓──────┤/├─────┤/├───────────────────────EN─┤ S :  D3000 │
                                                     │ D :  D3820 │
                                                     └────────────┘
```

NO38
```
M100          M0      M1                              ┌─08D.MOV─┐
─┤├───↑──────┤/├─────┤/├───────────────────────EN─┤ S :  D3010 │
                                                     │ D :  D3820 │
                                                     └────────────┘
```

NO39
```
M101          M0      M1                              ┌─08D.MOV─┐
─┤├───↓──────┤/├─────┤/├───────────────────────EN─┤ S :  D3020 │
                                                     │ D :  D3820 │
                                                     └────────────┘
```

NO40
```
M101          M0      M1                              ┌─08D.MOV─┐
─┤├───↑──────┤/├─────┤/├───────────────────────EN─┤ S :  D3030 │
                                                     │ D :  D3820 │
                                                     └────────────┘
```

NO41
```
M102          M0      M1                              ┌─08D.MOV─┐
─┤├───↓──────┤/├─────┤/├───────────────────────EN─┤ S :  D3040 │
                                                     │ D :  D3820 │
                                                     └────────────┘
```

NO42
```
M102          M0      M1                              ┌─08D.MOV─┐
─┤├───↑──────┤/├─────┤/├───────────────────────EN─┤ S :  D3050 │
                                                     │ D :  D3820 │
                                                     └────────────┘
```

NO43
```
M103          M0      M1                              ┌─08D.MOV─┐
─┤├───↓──────┤/├─────┤/├───────────────────────EN─┤ S :  D3060 │
                                                     │ D :  D3820 │
                                                     └────────────┘
```

NO44
```
M103          M0      M1                              ┌─08D.MOV─┐
─┤├───↑──────┤/├─────┤/├───────────────────────EN─┤ S :  D3070 │
                                                     │ D :  D3820 │
                                                     └────────────┘
```
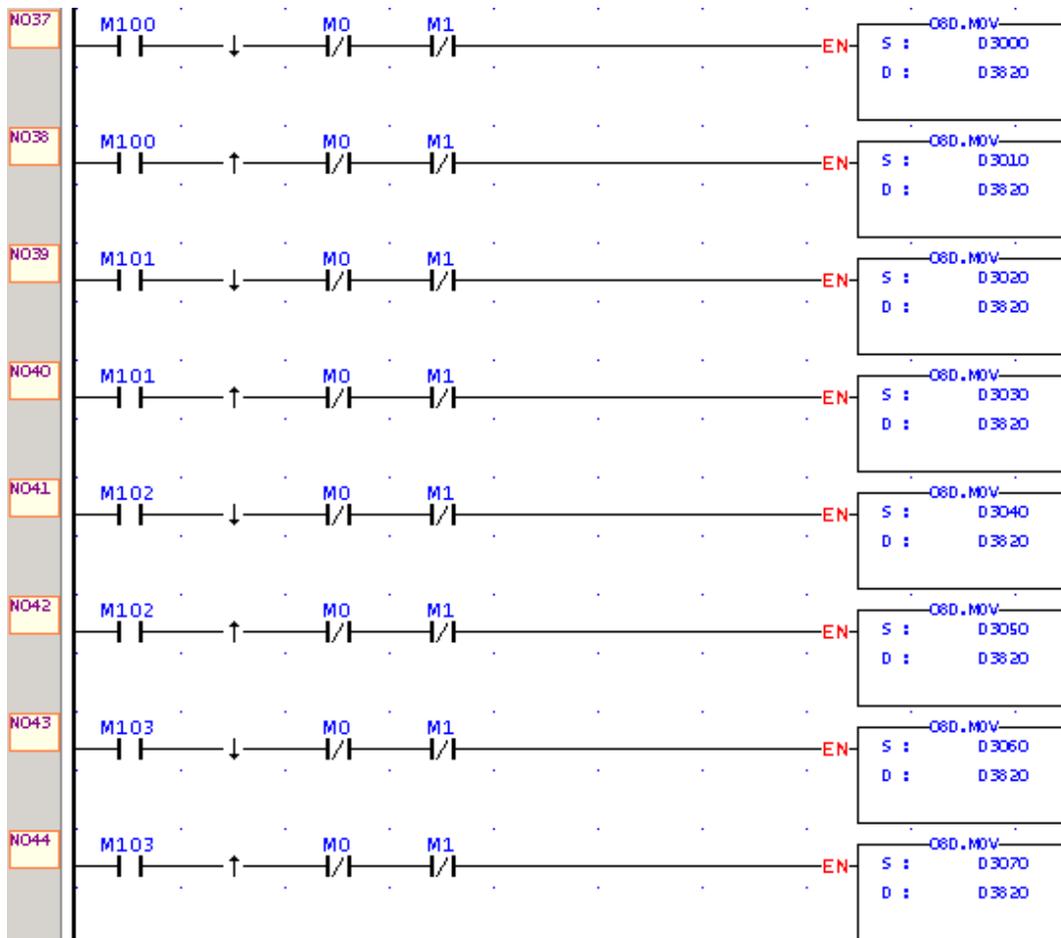
The whole process is finished by settings to 1 bit D3800.0 in the last network N48. It will happen only if modem is ready to send prepared message.

In this example a status page with name "StatusPage0" is prepared. You can see definitions of texts in registers DD3000 – DD3070 and buffer for sending SMS from D3800 (D3800 – commands and states, D3810 – phone number, D3820-D3899 – text of the message).

Ref. No.	Status	Data	Ref. No.	Status	Data	Ref. No.	Status	Data
D3800	Hexdecim	0000H	DD3000	String	'0=0X'	DD3000	Hexdecim	303D3058H
DD3810	Hexdecim	00000000H	DD3010	String	'1=0X'	DD3010	Hexdecim	313D3058H
DD3812	Hexdecim	00000000H	DD3020	String	'0=1X'	DD3020	Hexdecim	303D3158H
DD3814	Hexdecim	00000000H	DD3030	String	'1=1X'	DD3030	Hexdecim	313D3158H
DD3816	Hexdecim	00000000H	DD3040	String	'0=2X'	DD3040	Hexdecim	303D3258H
			DD3050	String	'1=2X'	DD3050	Hexdecim	313D3258H
DD3820	Decimal	0	DD3060	String	'0=3X'	DD3060	Hexdecim	303D3358H
DD3822	Decimal	0	DD3070	String	'1=3X'	DD3070	Hexdecim	313D3358H
DD3824	Decimal	0						
DD3826	Decimal	0						
DD3828	Decimal	0						

StatusPage0

Examle 3 – example_cmgsm_03

This example is combination of the previous examples (example 1 and example 2) with the state SMS added.