FF-AUTOMATION

AutoLog® GSM-PLC

SETUP, INSTALLATION
&
SERVICE MANUAL

1. Installation and connection to personal computer.

1.2. Open cover, power connection, PC connection cable

Pic.1 AutoLog GSM4 Unit with power supply

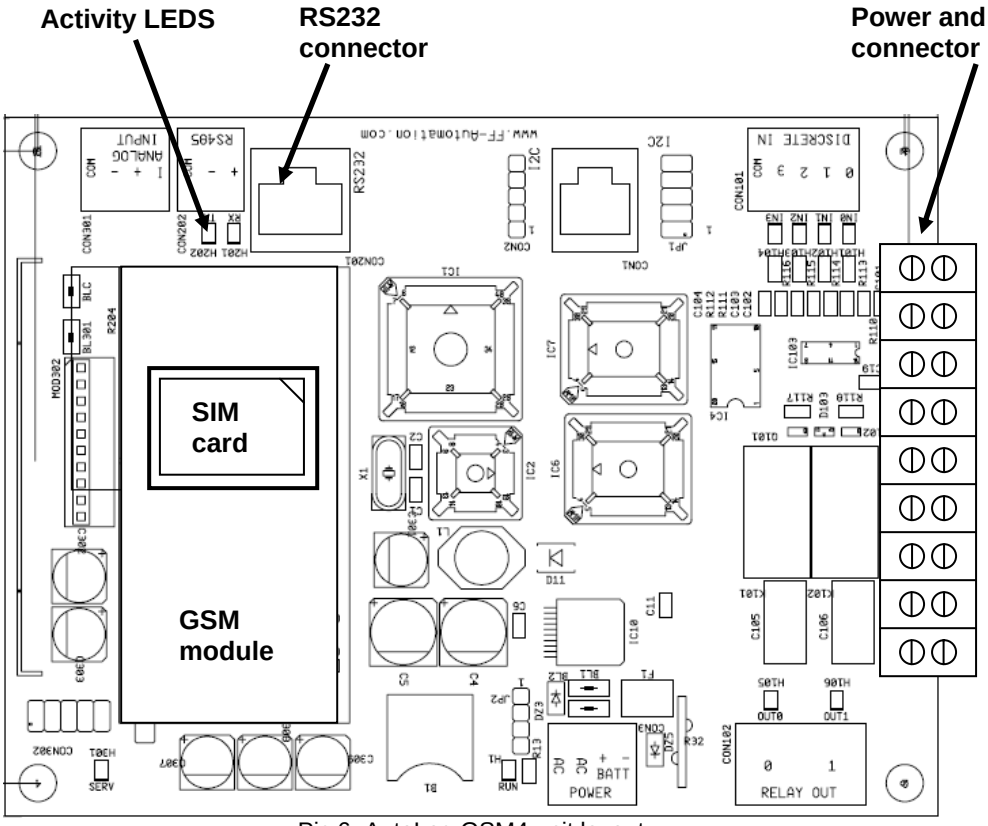
Pic.2 Open the cover with screwdriver (GSM4 Unit on picture)

Pic.3 Open the cover with screwdriver (GSM14 Unit in picture)

Pic.4 AutoLog GSM4 Unit with IP65 enclosure

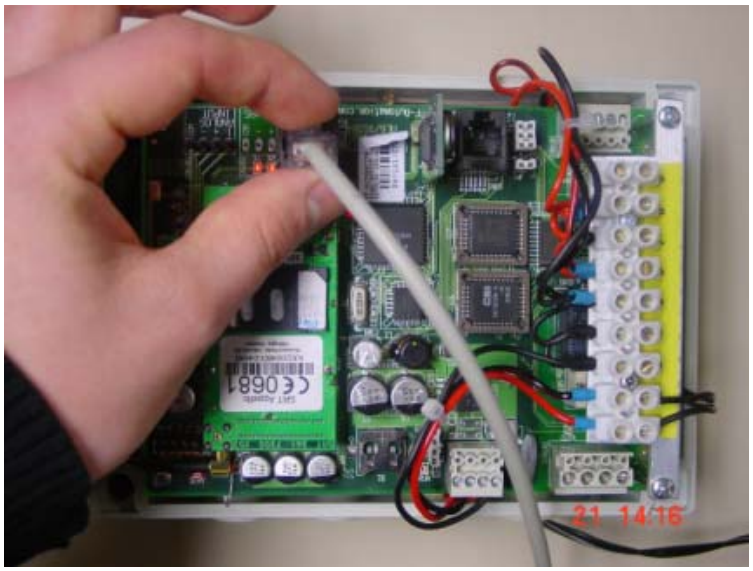
Pic.5 Programming cable for GSM-PLCs

1.2. PLC layout

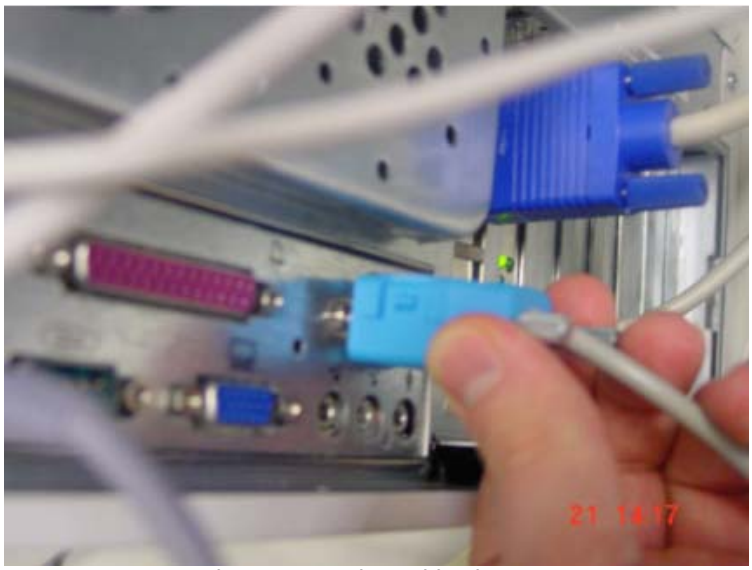


Pic.6 AutoLog GSM4 unit layout

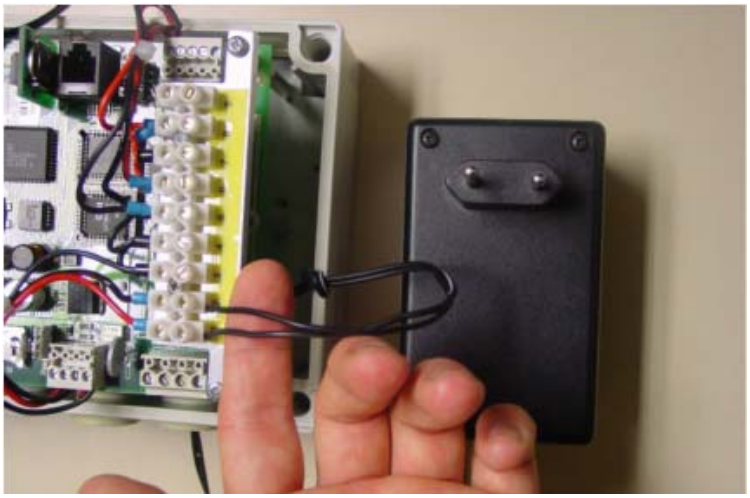
1.3. Connections



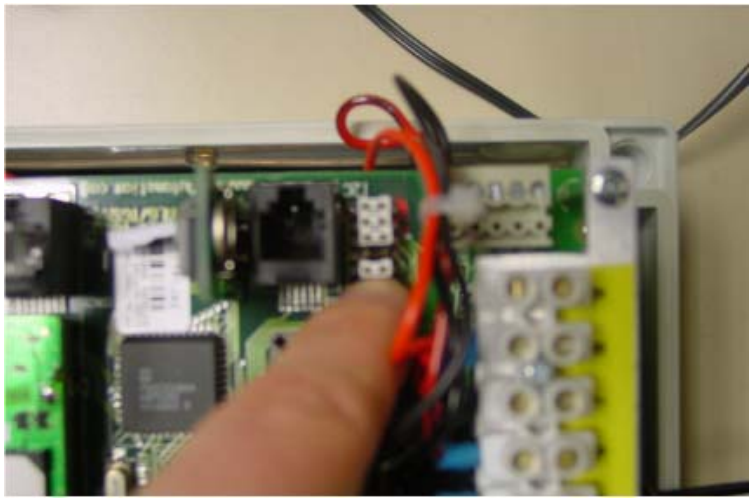
Connect the programming cable (the narrow part of the cable) to GSM-PLC, RS-232 connector (GSM4 Unit in picture):



Connect the programming cable also to computer
(to COM port 1 or 2):



Check that power supply (12-24 VDC) has been connected to GSM-PLC
(GSM4 Unit in picture):



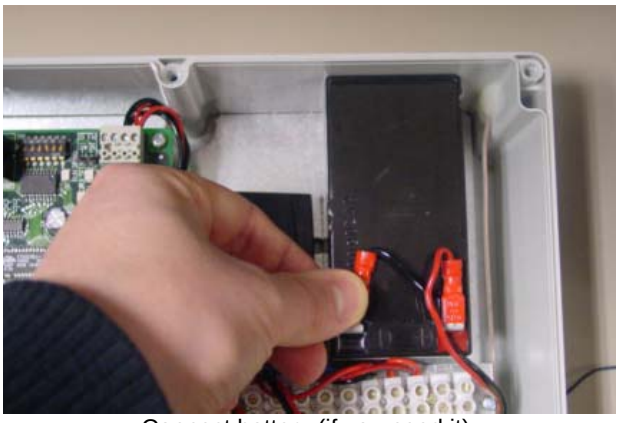
GSM4: Check jumpers / DIP switch settings
Programming setting for GSM4: JP1_3 >> OFF
(GSM4 Unit in picture and table for GSM4)

DIP switch table for GSM14 and GSM20:

JP1	ON	OFF
1	Enable calibration	Disable calibration
2		
3	**Connection to modem**	**Connection to RS232**
4	Data memory cleared when controller is switched on	Data memory retained during power failure
5	EEPROM not write protected	EEPROM write protected

DIP switch table for GSM14 and GSM20:

DIP	ON	OFF
1	EEPROM not write protected	EEPROM write protected
2	Enable calibration	Disable calibration
5	Data memory cleared when controller is switched on	Data memory retained during power failure



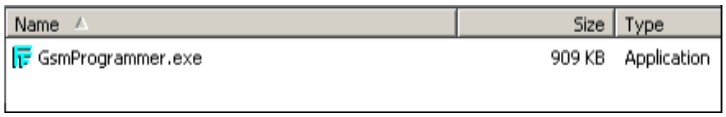
Connect battery (if you need it).

NOTICE !: GSM-PLC does not start only with battery.

Connect power supply to electrical network

1.4. Software installation

Setup GsmProgrammer from CD to computer



Create directory for GsmProgrammer (E.g. C:\program files\GsmProgrammer).

Copy GsmProgrammer.exe into this directory.

Start GsmProgrammer.exe

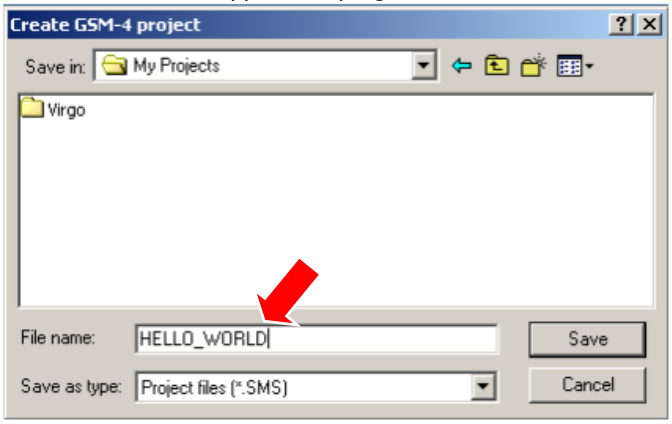
Connect Programming cable between PC (COM-port 1 or 2) and GSM-PLC (RS-232 / GSM-modem-connector).

Connect power supply (10…30 V) to GSM-PLC.

Now you can program the application program.

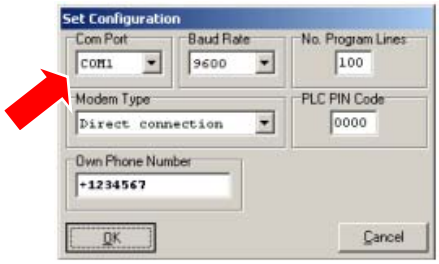
1.4.1. Creating new project

Create new application program. File >> New:



Give name: HELLO_WORLD >> Save:

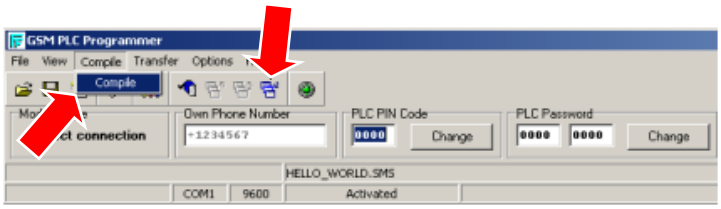
Define configuration settings: Transfer >> Config



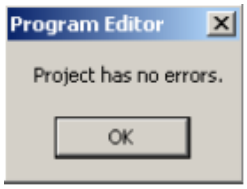
COM port selection:

- Com Port 1 or 2 (The programming cable plug)
- Baud Rate (always 9600)
- No. Program Lines (Set always maximum=100/255 depending of PLC type)
- PLC PIN Code **(HAVE TO BE ALWAYS SIMILAR WITH SIM CARD) = DO NOT INSERT SIM CARD BEFORE THAT SETTING IS O.K. (Default is 0000).**
- Own Phone number is needed if programming performs through GSM network. Put any number to this place.
- Select Modem Type: Direct connection (or GSM Modem)
- Press OK

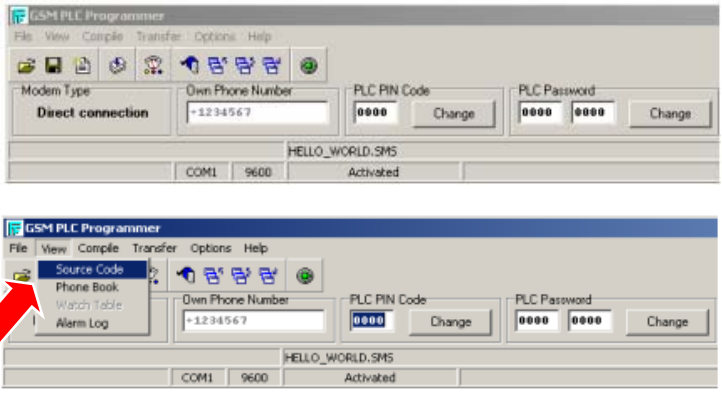
After making correct configuration, this button (Read Back button) should be active



Select Compile >> Compile and you get this little window:



Press OK >>> Now all buttons are active it means that connection from computer to GSM-PLC is active:

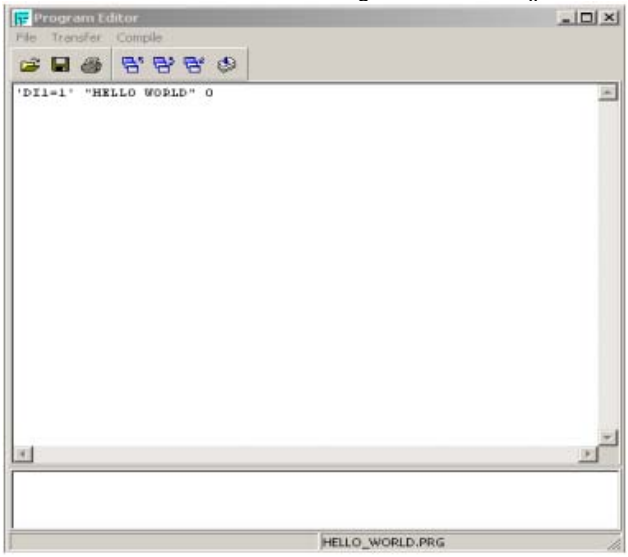


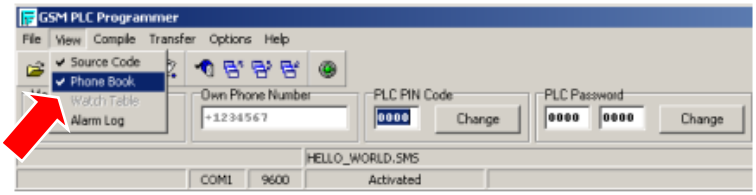
Open View >> Source Code

You will get Program Editor. Program your first application to this editor:

'DI1=1' "HELLO WORLD" 0

When digital input 1 is true, send HELLO WORLD message to number 0 (place 0 in Phone Book):



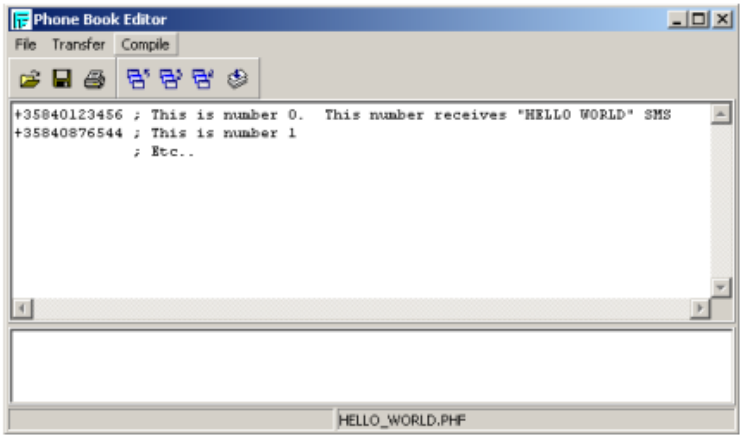


Open View >> Phone Book

You get Phone Book Editor:

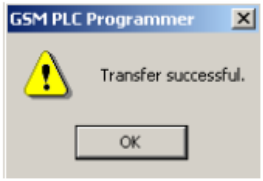
- First row is telephone number 0 = place 0.
- Second row is telephone number 1 = place 1. Etc...

Put your mobile phone number to place 0.
You can put comments after ";" character in any line.



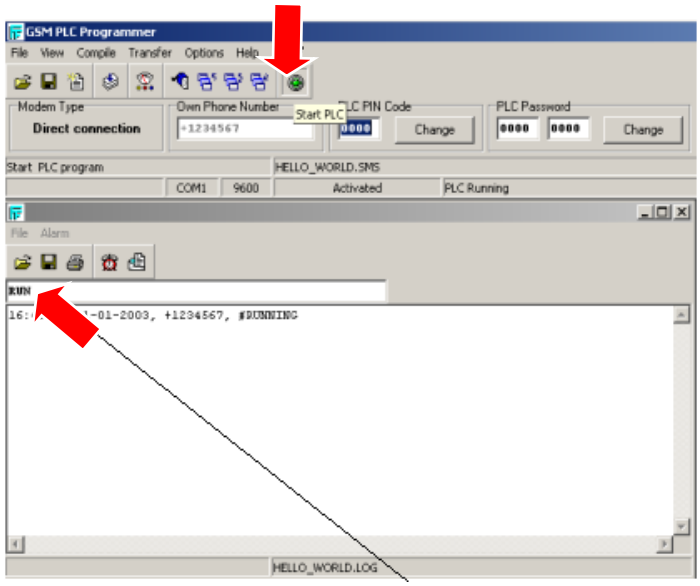
Transfer application program to GSM-PLC by pushing "Transfer >> Transfer Project"

You should get this window, press OK



Now you have to Start GSM-PLC. You have two choices:

First: Press green “Start PLC” button.



Second: Open View >> Alarm Log >> write: RUN >> Press Enter.

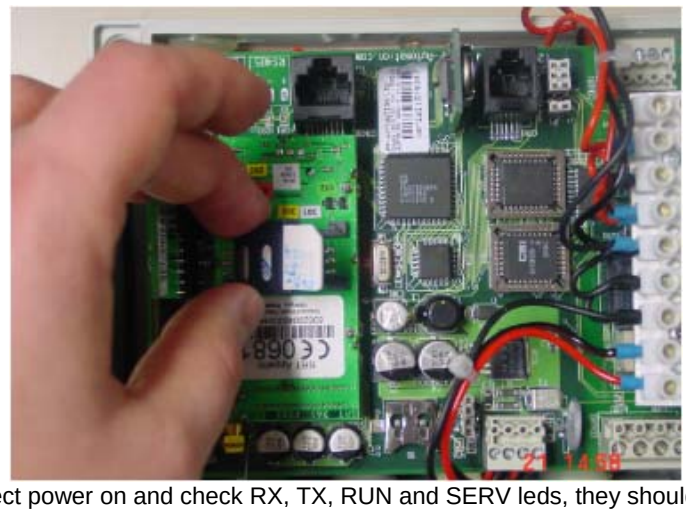
Than you will receive the message: #RUNNING in Alarm Log window
Also “RUN” LED of GSM-PLC start blinking.

You can test this “HELLO_WORLD” application with Alarm Log window:
Activate digital input 1, after that HELLO WORLD message should appear in Alarm Log window.

Now you can do this test also via GSM network.

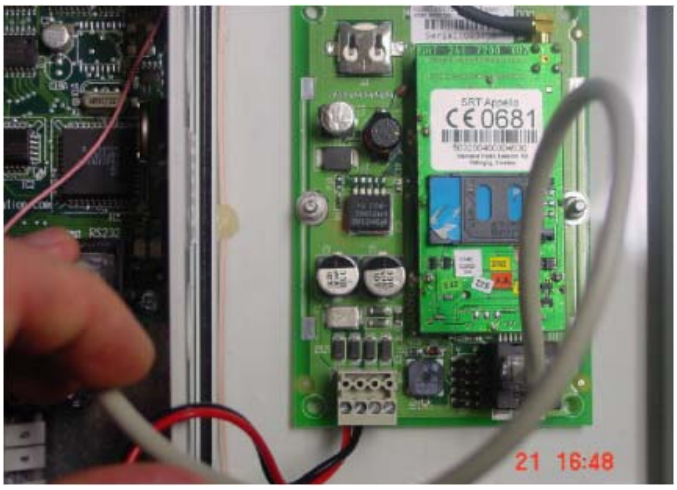
1.5. Project testing

GSM4 Unit: Switch power off and insert SIM card (see layout picture). Remember that PIN code must be similar in SIM card and in GSM-PLC (default PIN code setting = 0000).
Check again also jumper settings, JP1 3 must be ON.



Connect power on and check RX, TX, RUN and SERV leds, they should blink.

GSM14/GSM20: Switch power off and insert SIM cart. Remember that PIN code have to be similar in SIM card and in GSM-PLC. Connect GSM modem back to PLC (short cable) :



Connect power, switch it on and check that “RX”, “TX”, “RUN” and “H1” LEDs will blink.

NOW YOU CAN TEST THE APPLICATION PROGRAM VIA GSM NETWORK.

If you have the control panel, connect it to I2C connector (GSM14 Unit in picture):

On this step hardware and software configuration of AutoLog GSM PLC is finished. You can proceed to programming application specified instructions.

2. AutoLog® GsmProgrammer description

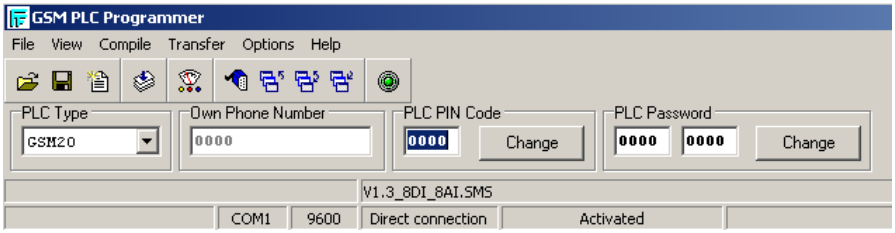
2.1. General description

GsmProgrammer is Windows 95, 98, NT, 2000, XP compatible configuration program for Autolog® GSM - PLCs. Configuration program is used to write, transfer and debug application programs for GSM-PLC. GsmProgrammer allows all data in GSM-PLC to be monitored through the debug monitor.
In the following sections we describe main features of GsmProgrammer.

2.2. Main window

After GsmProgrammer is started, you will see the following kind of view. In the main window you can define password for GSM-PLC, PIN-code for SIM-card used in GSM-PLC and also PC's own phone number (This is needed if you need to transfer application to GSM-PLC via GSM network).

In case if most icons are inactive (gray), there is no connection to GSM-PLC or file transfer is in progress. Programmer status is visible at the bottom of the main window. If there is no connection to GSM-PLC, check the serial channel settings, serial cable connection and PIN-code. From the Serial channel settings you can also select what kind of connection is used between PC and GSM-PLC; Direct cable connection or GSM-network. If you are using GSM network, you will need GSM-modem also connected to PC.

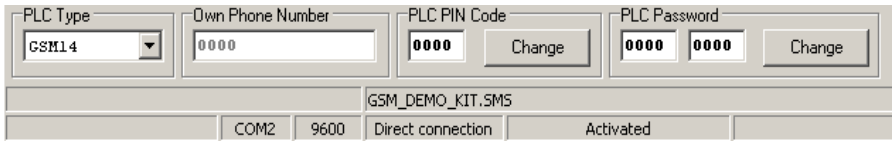


There are following main parts of GSM-PLC "Main Window"

Menu Bar:

Toolbar:

Main page:



2.3. How to create new GSM-PLC project

To start new GSM-PLC project user can use command menu of GSM-PLC: Select **File**, then **New**, after this a dialog box will open and user will be able to select the folder where the project data should be stored and which is the project name. After this the **Save**-button of the dialog box should be clicked.

The second possibility to create a new project is to click **New project**-button:

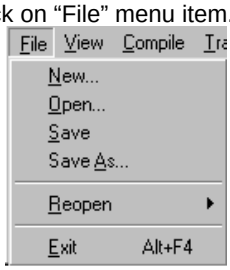

on the button set of GsmProgrammer.

Now user must click **Config** button:


Or in command menu select **Transfer**, then **Config,** to set correct configuration.

2.4. File

To access the “File” menu commands, click on “File” menu item.

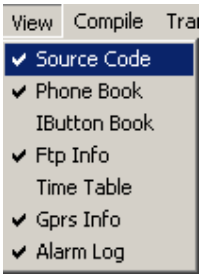


- “New” command is used to create the new GSM-PLC project.
- “Open” command is used to open the saved GSM-PLC project.
- “Save” command is used to save the GSM-PLC project.
- “Reopen” command is used to open one of the recently saved projects.

2.5. View

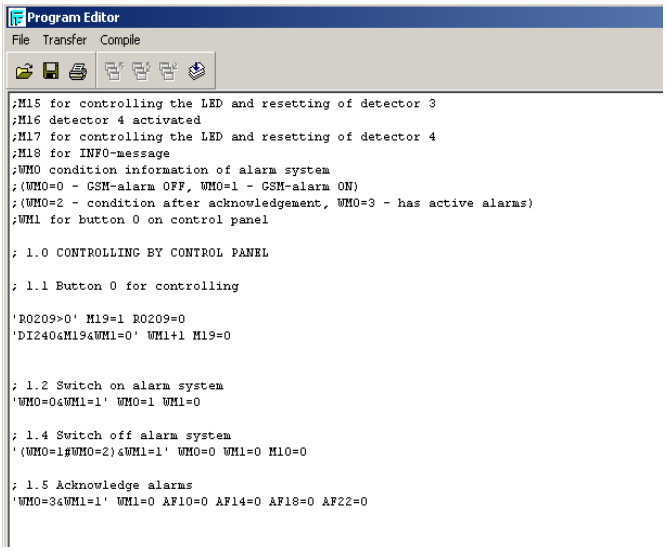
In the main window under the View menu you can select active editors.

- Source Code, Alarm Log and Phone Book.
- Selecting ”Source Code” you can activate Program Editor window.
- Selecting ”Alarm Log” you activate Alarm Log window (Debugger).
- Phone book editor activates by selecting ”Phone Book”.
- Also available: “IButton Book” Editor, “Ftp Info” Editor, “Time Table” Editor, “Gprs Info” Editor.



2.5.1. Program Editor

Program Editor window is used to write application programs. Program is written in instruction list format. Maximum program size is 100 lines (255 lines with AutoLog GSM-20). You can write remarks with “;” character.



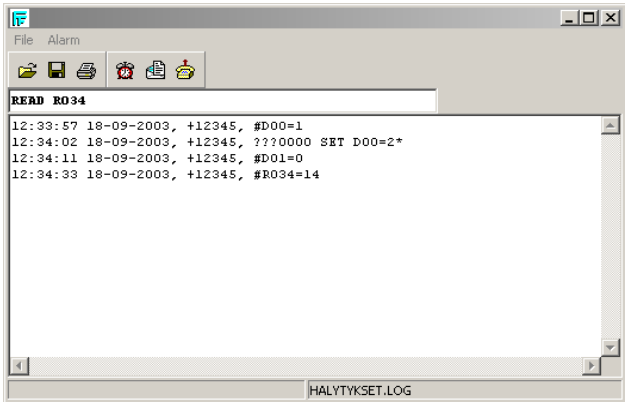
 User may use these buttons for transfer, verify and read back program file (*.PRG)

2.5.2. Alarm Log

Alarm Log window is used to check SMS-messages that GSM-PLC sends out. In case there is a notation error in application program, line with errors can be seen in this window. Also debugging the program is easy to do using Alarm Log.

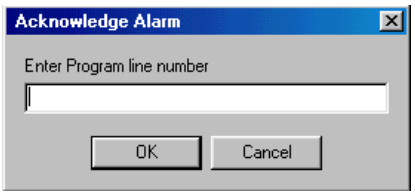
There is also window where you can send SMS messages or call to GSM-PLC. While testing the application program you can set/read any variable in GSM-PLC through this window.

It is also possible to program the GSM-PLC using Alarm Log. E.g. if there is one program line you wish to add or change, you can send that line using Alarm Log instead of transferring the whole program. Editing program stops the program execution. Remember to start new program by sending RUN command or pressing green RUN button in the main window.



If user wants to send command to GSM-PLC, user must manually enter message and press “Enter” or click on a Send-button.

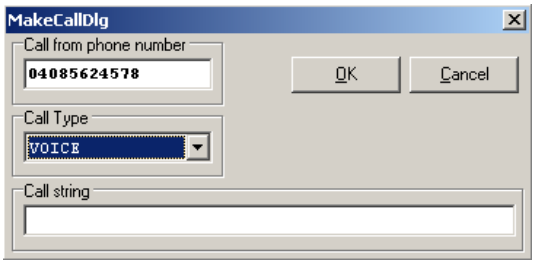
If user want to send ACK command to GSM-PLC, he must click on Ack button.
Message box will be displayed:



User can add the program line, which has to be acknowledged and then press OK button.

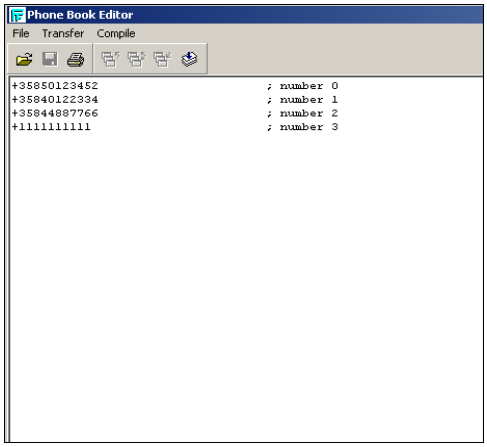
User may load or save Alarm file (*.LOG) using these buttons.

User can simulate calls (voice, data, fax) to GSM-PLC using this button.



2.5.3. Phone Book Editor

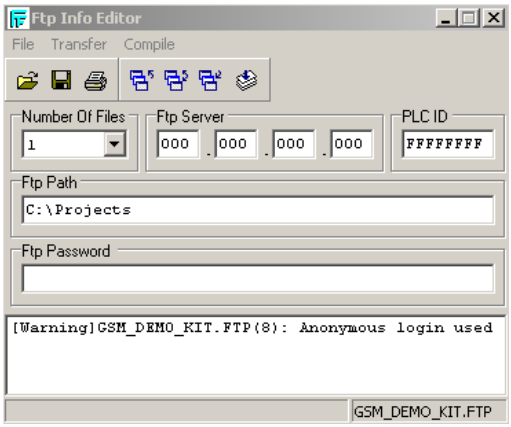
Phone Book Editor is used to define phone numbers to where GSM-PLC will send messages (Alarms, reports) or calls. There can be max. 100 phone numbers (255 phone numbers in AutoLog GSM-20). In application program these phone numbers are referred using line number. Try numbers with or without country code (some properties work only with country code and some without, but usually properties work with both, that depend on the used GSM operator / SIM card).



User may use next buttons for transfer, verify and read back phone book file (*.PHF).

2.5.4. Ftp Info Editor

The Ftp Info Editor can be used only with AutoLog GSM-20 + GPRS modem.



FTP Configuration settings:

Number Of Files	None/1/2/4/8 (None disables FTP supporting in PLC)
Ftp Server	Server IP address in dot form
PLC ID	8 HEX symbols
Ftp Path	Path on server to store files (128 characters max) (By default it is the application project folder)
Ftp Password	Password for Ftp login (98 characters max)

If password doesn't exists "anonymous" login will be used

When PLC sends file using iChip commands, programmer receives this file and stores it into current project directory. Notification of receiving file is adding to Alarm Log in following format:

21:15:35 17-07-2003, Received file, FFFFFFFF10307141804, 542 bytes

FFFFFFFF10307141804	File name
542 bytes	File length

Ftp file can be opened with FileModifcation_FTP.xls

2.5.5. IButton Book Editor

The IButton Book Editor can be used only with AutoLog GSM-20.
Amount of Ibuttons can be maximum 256.

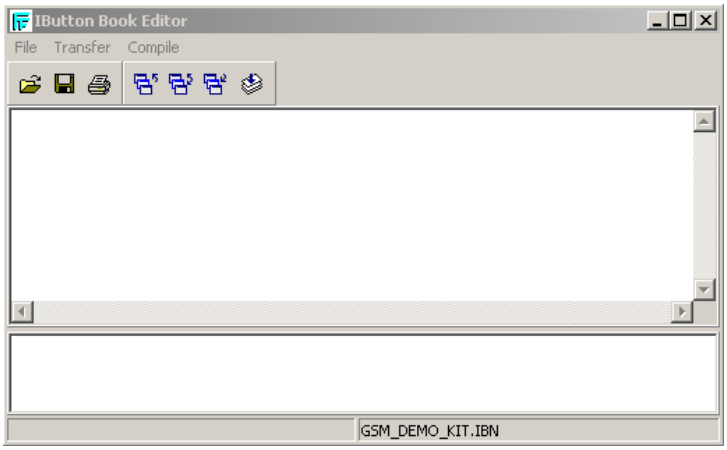
IButton representation format:

14 HEX symbols (MUST BE IN UPPER CASE!)

SSSSSSSSSSSFF

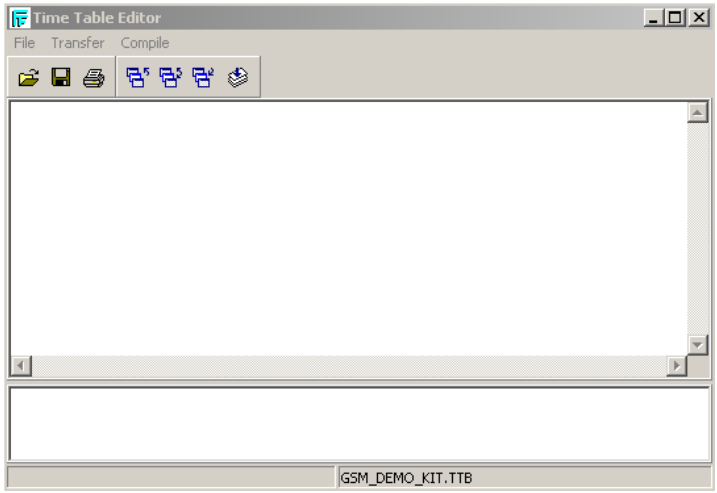
S -- Serial Number
F – Family Code

Ibutton can contain wildcards (“?”).



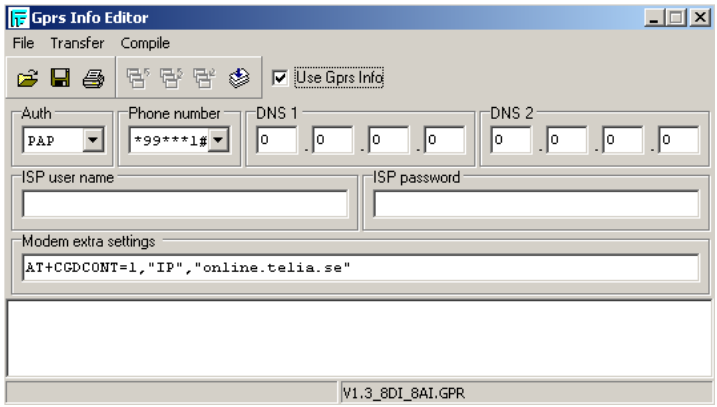
2.5.6. Time Table Editor

The Time Table Editor can be used only with AutoLog GSM-20.
Amount of times can be maximum 256.



2.5.7. Gprs Info Editor

Needed settings with the fixed IP address are:



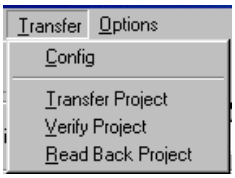
Modem extra settings depend on GSM/GPRS operator:

Examples:

Finland, Sonera/Elisa: AT+CGDCONT=1,”IP”,”internet”
Sweden, Telia: AT+CGDCONT=1,”IP”,”online.telia.se”

2.6. Transfer

In the main window under Transfer menu is located three file transfer options. These are Transfer Project, Verify Project and Read Back Project. Also “Program Editor” - and “Phone Book Editor” windows have Transfer menus.



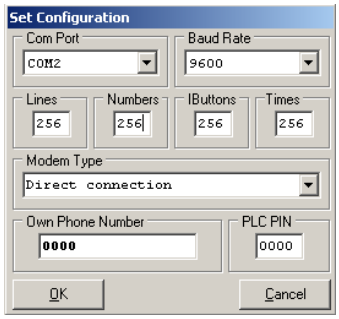
Transfer Project downloads the whole project (application program and phone book etc.) to GSM-PLC.

Verify Project uploads the project from GSM-PLC and compares project to one that is active in the programmer.

Read Back is used to upload project in GSM-PLC to GsmProgrammer.
Program Editor- and Phone Book Editor window ”transfer” options can be used when you need to transfer only either part of the project.

2.7. Configuration window

The Configuration window is used to set up communication and other features. These are COM port, Baud rate (9600bit/s), Program Lines (100/256), Numbers (100/256), IButtons (100/256), Times (100/256), Modem type, PC modem number, GSM-PLC PIN code and Own Phone Number. It is recommended that user use always the maximum amount (100/256) of Lines, Numbers, Ibuttons and Times.



2.8. Others

Button for Load GSM-PLC Project.

Button for Save GSM-PLC Project.

Button for Create New GSM-PLC Project.

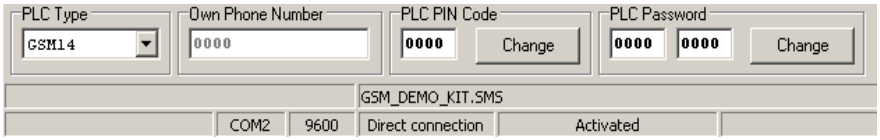
Button for Compile GSM-PLC Project.

Button for Set Configurations.

Transfer Project, Verify Project, Read Back Project

RUN button for start running GSM-PLC application.

2.9. PIN-code and password



The main page contains next fields:

PLC Type support:

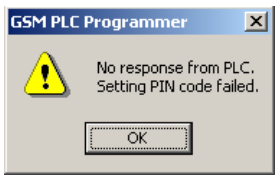
OLD (PLC ID RO39=0)
TGSM4 RO39=26
GSM14 RO39=20
GSM20 RO39=10

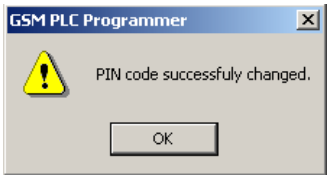
MODEM TYPE to inform user about the type of connection with GSM-PLC: “Direct connection” or “Gsm Modem”.

OWN PHONE NUMBER informs user about the current phone number.

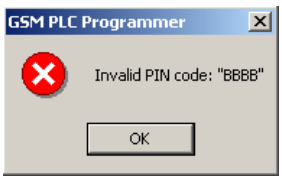
GSM-PLC PIN CODE allows user to edit PIN Code and change it in GSM-PLC after “Change” button is pressed.

There are 2 message boxes may be displayed after GSM-PLC PIN CODE is changed:





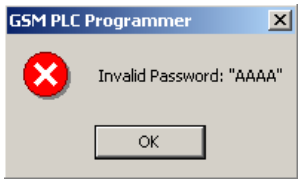
If PIN Code has not digits after editing, next message box will be displayed:



GSM-PLC PASSWORD allows user to edit Password code and change it in GSM-PLC after “Change”-button is pressed.

There are 2 message boxes may be displayed after it:

If Password code has no digits after editing, next message box will be displayed:



To change GSM-PLC Password user must change digits only in right field (1234 – new GSM-PLC password),

Left field contains the current PLC Password:

After “Change”-button is pressed and when GSM-PLC successfully changed password, will be displayed next:

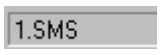
COM STATUS INFORMATION informs user about COM number, baud rate and state of communication.

If GSM-PLC or modem is not connected to PC, next status will be displayed (halted):

In the process of initialization, the status will be displayed as:

After completion of initialization the status will be displayed as:

FILE NAME informs user about the name of a current project file.



3. SMS Programming Protocol for GSM-20/16/8/6/4/GW

3.1. Specification

- This protocol is used to create an easy way to program PLC / Small I/O-device using SMS-messages.
- One SMS-message is max.115 characters long. There can be several commands in one SMS-message.
- Phone number is max. 16 characters.
- SMS-message must not end in the middle of command.
- When a command line is sent to GSM-PLC, it checks the incoming message format. If GSM-PLC found an error from message, it will send back the whole message, marking the error with “???”
- GSM-PLC stops program execution after receiving program modify command (INIT or DEL).
- GSM-PLC must be started with RUN instruction after program editing.
- Total amount of variables is defined by the hardware.
- Variable type ALL can be used, when user wants to point all inputs/outputs or symbolic links.
- Variable “ALL” can be referred as “A”.
- Start of SMS-message to GSM-PLC starts always with password and ends to *-character.
- Program line can contain condition and multiple actions but only one SMS-message sending.
- There can be only one timer function / program line.
- Action can be either SMS-message or PLC-operation.
- Field separation mark is a SPACE or multiple spaces or COMMA(‘,’).
- Text-field is separated with “ “
- Condition field is separated with ‘ ‘
- Response from GSM-PLC starts always with #-character.
- For alarm messages #-character + line number in the beginning of message means that ACKNOWLEDGEMENT is needed.
- Program line fields are separated by spaces (“ “) or comma sign (“,”)
- Transmission uses same format as received message.
- GSM-PLC will automatically initialise GSM after power-up.
- Length of password always 4 digits.
- Commands may be as full word or first letter:
  NUM = N
  INIT = I
- PSW = PSW because we also have PIN instruction (so we can not use P for both).

3.2. CONFIGURATION COMMANDS

3.2.1 GSM number (NUM)

Define GSM-number **NOTICE! This command stops the application program execution!**
PLC must be started with RUN-command
Delete GSM-number
Read GSM-number

Format:

Password NUM i=zzzzzzz*; define GSM number
Password NUM i=* ; delete GSM number
Password NUM i?* ; read GSM number

NUM	FCN
i	ID number
zzzzzzz	GSM number
?	Request
*	End of message
A	All

Examples:

Query: 1234 NUM 1=+358953063153* ; define phone number[1]
Response: #NUM 1=+358953063153

Query: 1234 NUM A=* ; remove all phone numbers
Response: #ALL NUM DELETED

Query: 1234 NUM 0?* ; read phone number[0]
Response: #NUM 0=+358953063153

Query: 1234 NUM A?* ; ask all phone numbers from PLC
Response: #NUM A=empty ; if no phone numbers or
#NUM 0=+358053063153 NUM 1=+358953063154*

3.2.2 BTN

- Define Ibutton serial number
- Delete Ibutton serial number
- Read Ibutton serial number

Format:

Password BTN i=zzzzzzz* ; Define GSM number
Password BTN i=* ; Delete GSM number
Password BTN i?* ; Read GSM number

Password BTN	FCN
i	ID number
zzzzzzz	Ibutton serial number
?	Request
*	End of message
A	All

Examples:

Query: 1234 BTN 1=0800446A * ; Define Serial number[1]
Response: #NUM 1=0800446A

Query: 1234 BTN A=* ; Remove all Serial numbers
Response: #ALL NUM DELETED

Query: 1234 BTN 0?* ; Read Serial number[0]
Response: #NUM 0=+358953063153

Query: 1234 BTN A?* ; Ask all Serial numbers from PLC
Response: #NUM A=empty ; If no phone numbers or
#NUM 0=0800446A NUM 1=045D6A88*

3.2.3. Password (PSW)

- Define password

Format: *Password* PSW MMMM MMMM*

PSW function
MMMM new password

Examples:

Query: 1234 PSW 4321 4321*
Response: # PSW OK ; password changed successfully
PSW BAD ; if password didn't change!

3.2.4. PIN-Code for GSM modem (PIN)

- Define PIN-code

Format: *Password* PIN NNNN NNNN*

PIN function
NNNN new PIN-code

Examples:

Query: 4321 PIN 3322 3322*
Response: # PIN OK ; PIN-code changed successfully
PIN BAD ; mistake in changing PIN code!

3.2.5. GPRS settings (FTP)

- Defines the GPRS system provider settings to MODEM

Format:

GPRS=M,P,[aaa.aaa.aaa.aaa],[bbb.bbb.bbb.bbb],[username],[Password],
["at+cgdcont=1,"IP","internet"]

[ ] - field may be empty

M - PPP Authentication Method
1 Use PAP authentication.
2 Use CHAP authentication.

P – Phone number:
1 - "*99***1#"
2 - "*99#"

aaa.aaa.aaa.aaa – DNS1
bbb.bbb.bbb.bbb – DNS2

Examples:

SONERA & Elisa uses following GPRS settings
AT+CGDCONT=1,"IP","internet"

So command in whole for Sonera SIM card:

GPRS =1,1,,,,,AT+CGDCONT=1,"IP","internet"

WaveCom modem WITHOUT Ichip:

GPRS =1,1,,,,, internet
for set APN parameters enter in GSM PLC Programmer GPRS info:

ISP User name/APN User name

ISP Password/APN Password
Modem extra settings/APN server name

3.2.6. FTP settings (FTP)

Note! For this feature you need GPRS modem and iChip unit or Wavecom GSM modem with TCP/IP stack support

- Define FTP settings

Format: *Password* FTP=n,IP,Path,PLC ID,<Password>

n	number of files (1, 2, 4, 8 ;1x256k, 2x128k, 4x64k, 8x32k)
IP	Server IP address xxx.xxx.xxx.xxx
Path	Path to server to store files (128 char max.)
PLC ID	8 Hex symbols
Password	Password for login. If password doesn't exist, "anonymous" login will be used (98 char max.)

Examples:

Set FTP parameters:	4321 FTP<sp>=8,123.123.123.123,root/ffa,00112233
Response:	#FTP=8,123.123.123.123,\ffa,00112233
Read FTP parameters:	4321 FTP ?
Response:	#FTP=8,123.123.123.123,\ffa,00112233 or #FTP = EMPTY
Delete FTP parameters:	4321 FTP =
Response:	#FTP=EMPTY

3.2.7. Launching FTP file transfer

There are two RO's used to control FTP file transfer

RO37 = FTP command / Status register
RO38 = File number

Command RO37 = 1- Request to send file defined in RO38

RO37 status:

2	file succesfully sent
128	invalid file number
129	file not used in application program
130	file empty
131	iChip not connected
132	can't open FTP session
133	wrong path
134	can't store file
135	can't delete File
136	can't send File
137	can't close File
139	modem doesn't support FTP

RO38 – file number:

0…7 or 8…15 for deleting file after succesful transmission

3.2.8. Time table definition (TTBL)

- Time table definition command

Format: *Password* TTBL n=m,s,t,d

n	Line number 0..255
m	TC variable address (0..127)
s	Status 0-OFF, 1-ON
t	Time hh:mm 00:00 to 23:45 (Table is checked every 15 minutes)
d	Date/weekday dd.mm/1(Monday)-7(Saturday). Can be left empty.

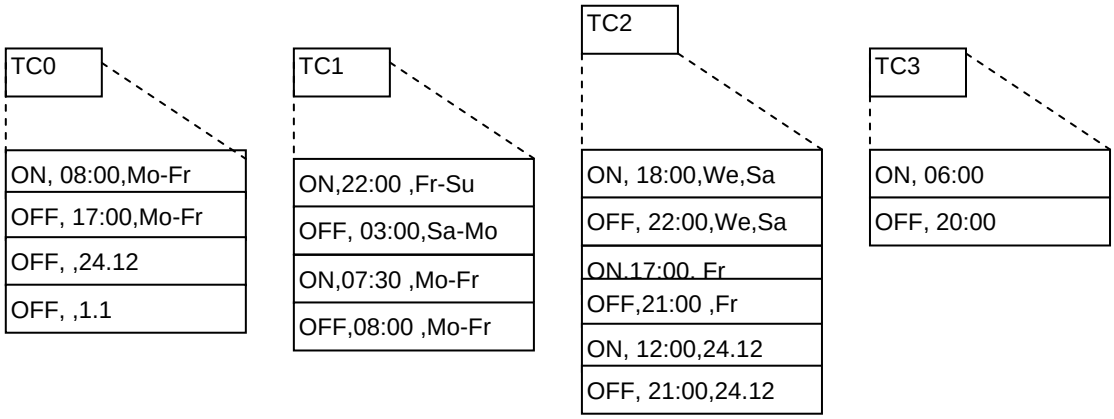
Conditions for weekday:
A-B = from day a to day B
A- = Day A only
A,B =
A=B is invalid
1-7, 4-1 are invalid definitions

Either t, d or both must be defined in control line

There can be tot. 256 definition lines for ON & OFF controls for different TC variables.
These lines can be freely used for as many as 256 TC variables.
The line order for TC is important. User should define first normal ON and OFF controls and after that the exceptions. The last active line defines the state of the TC.

E.g
TTBL 0= 5,1,08:30,1-5 ;TC5 is set to ON at 8:30 am from Monday to Friday
TTBL 1= 5,0,16:30,1-5 ;TC5 is set to OFF at 16:30 am from Monday to Friday
TTBL 2= 5,0,00:00,24.12;TC5 is set to OFF at 24.12 (if this line is the 1st line of the TC5 and 24.12 is Wednesday, lines to follow would over write this control)

Time control function is executed every 15 minutes.
Note! If PLC is not running when TTBL line should trigger TC to be active, control will not take place after power returns.



Examples:

Query: 1234 TTBL 0=10,1,08:00,1-5* ; define ON control for unit TC10
Response: #TTBL 0=10,1,08:00,1-5 ; to line 0 (out of 256)

Query: 1234 TTBL 0=* ; remove control line from time table
Response: #TTBL 0 DELETED

Query: 1234 TTBL 0?* ; read line 0
Response: #TTBL 0=10,1,08:00,1-5*

Query: 1234 TTBL A?* ; ask all TC definitions from PLC
Response: #TTBL A=empty ; if no TC's or
#TTBL 0=10,1,08:00,1-5 TTBL 1=10,0,16:00,1-5 TTBL 2=10,0,,24.12*

Notice! Time control tables can be at any order with in time table, so if you need to add new exception line for time control n, you can insert this line at the first available location AFTER normal ON/OFF control.

Timetable row TTBL	Time control block	Action 0-OFF 1-ON	Time	Date/Weekday
0	5	1	06:00	1-5 (Mo-Fr)

1	5	0	18:00	1-5 (Mo-Fr)
20	5	0		1.6
100	5	0		24.12
150	5	0		31.12

Eg. Using TC for changing the Summer / Winter time

TTBL 0 = 0,1,03:00,14.04 ;use table 0; set TC0 active at Spring
TTBL 0 = 0,0,04:00,25.09 ;reset TC0 at Autumn

In application program set device to send time correction message to itself

Line 0: TC0=1 "0000 TIME=0400,%RO250,%RO249%RO248*"*
;when TC0 goes active send new time to PLC

Line 1: TC0=0 "0000 TIME=0300,%RO250,%RO249%RO248*"*
;when TC0 goes inactive send new time to PLC

Q: When we change time back one hour, doesn't the unit send the same message after time gets four o'clock?
A: After one hour the the message is not resent because the TC0 is already 0 so negative derivation wont take place. The only place when TC0 is set active is one 15 minute window at Spring.

3.3. I/O-CONTROL COMMAND

3.3.1. SET

- Define output status

Format: *Password* SET var=0/1*

SET	function	
Var	DOn=x	digital output, where n defines output number
	CNn=xxx	counter n
	Mn=x	memory n
	WGn=xxxxx	PID controller variable n
	WMn=xxxxx	word memory n
	ROn=xxx	configuration register n

Examples:

Query: 4321 SET DO1=0*
Response: #DO1=0

Query: 4321 SET WM100=1300* ; set counters alarm level to 1300
Response: #WM100=1300 ; program could be: 'CN0>WM100' DO0=1

3.3.2. READ

- Read I/O-status

Format: *Password* READ var*

READ	function	
Var	DOn	Digital Output, where n defines output number
	DIn	Digital Input
	AIn	Analoque Input
	AOn	Analogue Output
	CNn	Counter n
	Mn	Memory n
	WGn	16-bit PID controller variable n
	WMn	16-bit variable n
	ROn	Special function register
	AFn	Alarm Flag n
	CSn	Call Status n

Examples:

Query: 4321 READ DO2*
Response: #DO2=0

Query: 4321 READ RO100*
Response: #RO100=14

Query: 4321 READ AI0*
Response: #AI0=3000

3.4. PROGRAMMING COMMANDS

3.4.1. INIT

- Define control lines
- **NOTICE! This command stops the application program execution! PLC must be started with RUN-command**

Format:
a) password INIT line 'Condition' Action*
b) password INIT line 'Condition' "text" num [alarm reset time]*

Examples:

; Send message "ALARM" to ph. number 1 when DI0 goes active
Query: 4321 INIT 3 'DI0=1' "ALARM" 1*
Response: #Line3:'DI0=1' "ALARM" 1

; Set output0 active when input 0 =1 and input 1 = 0
Query: 4321 INIT 7 'DI0&!DI1' DO0*
Response: #Line7: 'DI0&!DI1' DO0

; Turn output 0 off after it has been active for 5 seconds
Query: 4321 INIT 9 'DO1S5' DO1=0*
Response: #Line9: 'DO1S5' DO1=0

; If DI2 XOR DI3 = 1, set output 0; active for 3 seconds
Query: 4321 INIT 10 'DI2XDI3' DO0S3*
Response: #Line10: 'DI2XDI3' DO0S3

; When input 0 changes to 1, send counter value 2 to ph. number 1
Query: 4321 INIT 11 'DI0=1' "Counter:%CN2" 1*
Response: #Line11: 'DI0=1' "Counter %CN2"

; Display counter value to display once/minute
Query: 4321 INIT 'P2' "Counter: %CN0" 255*
Response: #Line12: 'P2' "Counter: %CN0"

; If incoming SMS message ="$STATUS*", set flag
Query: 4321 INIT '($STATUS)' M0*
Response: #Line12: '($STATUS)' M0

; If status request flag active, send input values to the last received ph. number
Query: 4321 INIT 'M0' "STATUS= %DI0,%DI1,%DI2,%DI3" 254*
Response: #Line12: 'M0' "STATUS=%DI0,%DI1,%DI2,%DI3" 254

3.4.2. Condition

Format: ' condition '

Variables:

DIn ; input
DOn ; output
Mn : memory
AIn ; analogue input
CNn ; counter
WMn ; word memory
WPn ; word pointer to WM area
ROn ; special function registers
Nn : SMS phone number
Tn ; clip phone number (without land code)
Pn ; pulse n=0:1sec,n=2:1min.
; pulse variable is active one program cycle every second/minute
AFn ; alarm ACK info
CSn ; call status
TCn ;Time control table

Operands:

& AND
# OR
X XOR
! NOT
<, =, > smaller,equal,bigger
( ) brackets
+ plus (with use of WM's)
- minus (with use of WM's)
. multiplication (with use of WM's)
/ divide (with use of WM's)
$ compare incoming SMS-message

Variables and operands in "condition" field

	WM	CN	AI	RO	M	WP	CS	AF	Constant
WM	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	&,#	&,#	=,<,>
CN	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	&,#	&,#	=,<,>
AI	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	&,#	&,#	=,<,>
RO	&,#	&,#	&,#	&,#	&,#	&,#	&,#	&,#	=,<,>
M	&,#	&,#	&,#	&,#	&,#	&,#	&,#	&,#	=
WP	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	=,<,>,&,#	&,#	&,#	=,<,>
CS	&,#	&,#	&,#	&,#	&,#	&,#	&,#	&,#	=,<,>
AF	&,#	&,#	&,#	&,#	&,#	&,#	&,#	&,#	=

Derivative operation is done using "=-" character after condition

Examples:

DI1=1 ; positive derivation (change from 0 to 1)
M9=0 ; negative derivation (change from 1 to 0)

Delay:

S seconds ; S5 = 5 seconds
M minutes ; M5 = delay of 4 to 5 min

Examples:

'DI0=1'	; Positive derivation for input 0
'DO1S180'	; When output 1 has been active for 3 minutes.
'RO247=7&CLK=1200'	; Every Sunday at 12 o'clock
'P1&DI0S2'	; Condition for time counter. Counting activates only if ; input has been active for two seconds.
'AI2S50>400'	; S50 defines delay of fifty seconds
'WP0<AI1'	; Set value in address defined by WM0 is less than analogue input 1.

3.4.3. Operation

Operation is either SMS-message or variable control

Format: "text" Num [alarm reset time] or var=x*, where "text" Text string

%-variable will insert defined variable value into SMS-message, e.g. %CN0 will insert value of CN0 into text.

Num Index number to GSM phone number table num 254 is the phone number of last received SMS-message
num 255, text goes to HMI display.

Alarm reset time. Any other number than zero defines that message requires acknowledgement.
If ACK is not received, alarm reset time defines the time in minutes when system resets alarm flag (AF).
If "alarm reset time" is not defined, no ACK is required.

Var	DOn	; digital output
	CNn	; counter
	WMn	; word memory
	ROn	; special function registers
	Mn	; memory
	AFn	; alarm flag
	WPx	; indexed memory
	@n	; Define array in SMS message. Works only with WM
	Tn	; voice call (see also variable CS)
	CSn	; call status

Variables and operands in "action" field

	WM	CN	AI	RO	M	WP	DI	CS	AF	Constant
WM	=,+,-,.,/	=,+,-,.,/	=,+,-,.,/	=,+,-,.,/	=,+,-,.,/	=,+,-,.,/-	=			=,+,-,.,/
CN	=,+,-	=,+,-	=,+,-	=,+,-	=,+,-	=,+,-				=,+,-
AI										
RO	=	=	=	=	=	=				=
M	=	=	=	=	=	=	=			=
WP	=,+,-,.,/	=,+,-,.,/	=,+,-,.,/	=,+,-,.,/	=,+,-,.,/	=,+,-,.,/-				=,+,-,.,/
CS										=
AF										=

SMS message examples:

”Tank level HIGH” 1	; Send text ”Tank level HIGH” to phone number ; [1], doesn’t wait for acknowledgement.
”Burglar” 1 2	; Send text ”burglar” to phone number [1] and wait for acknowledgement, new alarm is sent after 2 minutes if condition for this message = TRUE.
”Customers so far %CN0” 1	; Send counter value to phone number[1].
"Array: %WM4@7" 1	; Send 8 variables starting from WM4.

For each program line, there is a AF (alarm flag) bit. This bit is set when a SMS-message that requires an acknowledgement, is sent (alarm reset time>0). GSM-PLC will not send new alarm from this program line until corresponding AF bit is cleared, either by sending ACK to GSM-PLC or alarm reset time expires.

See also command ACK.

Variable control examples:

DO1S30	; 30 seconds pulse to output 1
CN0=0	; Reset counter
AF0=0	; Reset alarm flag from program
WM0+WM10	; Add variable WM10 to variable WM0. Save result to WM0.
	; There is no overflow information for plus and minus operations.
WM0+CN3	; Add counter 3 value to word memory 0.
WP4+WM10	; Add WM10 to value in address defined by WM4.

Variables WM and RO:

WMxx=ROyy	; WMxx=ROyy*256 + RO(y+1)	(in theory)
WM102=RO97	; WM102 = RO97 * 256 + RO98	(in practise)

Multiply: WMx . Var16 -> WM[x] bits 15..00, WM[x-1] bits 32..16

Division: WMx / Var16 -> WM[x] = integer, WM[x-1] = reminder

3.4.4. VIEW

- Read control line(s) from device

Format: password VIEW line*

Each 'INIT, Condition, Control' forms a line

Examples:

Query: 4321 VIEW 07*
Response: #Line7: ’DI0&!DI1’ DO0

Query: 4321 VIEW ALL*
Response: #Line1:’DO0S5’ ”ALARM” 1 0 #Line2:’DI2=0’ DO2=1 #Line3….etc.
#Line8:’CN1=7’ DO1=1 #Line9: ’DO1S8’ DO1=0

3.4.5. DEL

- Delete program line
- **NOTICE! This command stops the application program execution ! PLC must be started with RUN-command**

Format: *Password* DEL line*

Examples:

Query: 4321 DEL 07*
Response: #LINE 07 DELETED ; line deleted
#LINE 07 EMPTY ; if there is nothing to delete

Query: 4321 DEL ALL*
Response: #ALL DELETED

3.4.6. RUN

Start application program execution

Format: *Password* RUN*

Examples:

Query: 4321 RUN*
Response: #RUNNING ; application program is running
#FLASH FAILED ; flash failure

Query: 4321 RUN ?*
Response: #RUNNING
#STOPPED
#FLASH FAILED

3.5. ALARM CONTROL

3.5.1. ACK

Acknowledge alarm

Message needs to be acknowledged if the "Alarm reset time" is defined after phone number in program line. For each alarm message there is corresponding alarm flag. This flag is set every time a SMS-message that requires ACK, is sent. Message sending is allowed only if corresponding Alarm flag =0. There are three different way to reset Alarm flag; By sending ACK command, Alarm reset time expires or application program resets the alarm flag.

Format: password ACK ID-number*

ID-number = Program line number that created alarm message.
"ALL" clears all active alarms

Examples:

Message in: #02 Door opened
Query: 4321 ACK 02* ; acknowledge alarm ID 02

Messages in: #00 Tank 1 high level
#01 Tank 2 high level
Query: 4322 ACK ALL ; acknowledges all alarms

Note!
Alarm message needs not to be acknowledged only if message starts with “#xx” characters (xx = line number).

3.5.2. PRT

Print Command to HMI

Format: *Password* PRT "TEXT TO HMI" n*

n	is time in minutes that all other print commands are disabled.
RO240	shows the remaining disable time
0	= enable print immediately
1..254	= disable time in minutes
255	= disable prints

Example:

Query: 4321 PRT “Code is 6934” 2* ; Lock message to display for 1-2 minute.

3.6. Variables

3.6.1. Digital output

DOn Binary output, Boolean, quantity depends on hardware

DO248 controls LED1
DO249 controls LED2
DO250 controls LED3
DO251 controls LED4
DO252 controls LED5
DO253 controls LED6
DO254 controls LED7
DO255 controls LED8

3.6.2. Digital input

DIn Binary input, Boolean, quantity depends on hardware
DI240…DI255=KEYPAD

3.6.3. Analogue input

AIn Analog input, Word, quantity depends on hardware

3.6.4. Analogue output

Aon Analog output, Word, quantity depends on hardware

3.6.5. Counter

CNn Counter, 16-bit value, connected to DIn, byte, quantity depends on hardware.
DI's are read every 5ms, but updated to user between application program cycles

3.6.6. Binary memory

Mn Binary memory, n= 0..255

3.6.7. Register output

ROn Special function registers , n= 0..255

-	RO2	Connected DI expansion cards
-	RO3	Connecter DO expansion cards
-	RO4	Connected EXA8/4 expansion cards
-	RO9	Analog output voltage level (RO9=3 → 0…10V) Bit.0=AO0 Bit.1=AO1 0=0..5V 1=0..10V
-	RO10	EXA84 Adr0; output type bits 3..0; I/O addr. 32 –>
-	RO11	EXA84 Adr1; output type bits 3..0; I/O addr. 40 –>
-	RO12	EXA84 Adr2; output type bits 3..0; I/O addr. 48 –>
-	RO13	EXA84 Adr3; output type bits 3..0; I/O addr. 56 –>
-	RO14	EXA84 Adr4; output type bits 3..0; I/O addr. 64 –>
-	RO15	EXA84 Adr5; output type bits 3..0; I/O addr. 72 –>
-	RO16	EXA84 Adr6; output type bits 3..0; I/O addr. 80 –>
-	RO17	EXA84 Adr7; output type bits 3..0; I/O addr. 88 –>
-	RO30	Power control register bit 0 = 1; reset modem bit 2 = 1; reset Com1 +5V (pin 1) bit 3 = 1; reset Com2 +5V (pin 1)
-	RO33	Keypad/display type
-	RO34	System program version
-	RO35	Status of Jumpers/DIP switches 1-6
-	RO36	Power fail info (power fail is active=1)
-	RO37	FTP transfer status

-	RO38	File number
-	RO39	PLC ID
-	RO40	Flash error
-	RO45	Flash Manufacturer
-	RO46	Flash device code
-	RO56	Ser2 modbus timeout
-	RO58	Ser2 RTS/CTS control register it0=0 auto RTS control, Bit0=1 No RTS control
-	RO59	Ser2 modbus error counter
-	RO60	Exception status
-	RO80	Ser2 modbus Rejected messages counter
-	RO81	Ser2 modbus Accepted messages counter
-	RO82	Ser2 modbus master queue depth
-	RO84	Ser2 Modbus conditional message address, 255 sends all
-	RO88	Ser2 modbus Error slave ID
-	RO89	Ser2 modbus error type
-	RO92	Reserved (Modem's driver status)
-	RO93	Pick up time for incoming call - Don't pick up – hang up 0..255 - Hold line open for n seconds)
-	RO94	Incoming Call type; 1 = Voice, 2 = Data, 4 = Fax
-	RO95	Incoming phone number: last digit
-	RO96	Incoming phone number: 2nd last digit
-	RO97	Incoming phone number two last digits (RO97*10+RO96)
-	RO98	Modem Signal strength (0..30), 99 - communication error, 100 State after modem initialization (GSM20:update interval=96s)
-	RO99	1=iButton found
-	RO100-RO107	iButton serial number
-	RO128	PID group 1
-	RO129	PID group 2
-	RO130	PID group 3
-	RO131	PID group 4
-	RO132	PID pulse delay
-	RO136..RO143	PID
-	RO204	Control for LEDs on display unit
-	RO207	Bit information from keys 0-7.
-	RO208	Bit information from keys 8-F
-	RO209	Last character received from the keyboard,
-	RO211	PLC status; bit 0 1=running, 0 = Stopped bit1 1=Flash error, 0= Flash OK
-	RO215	Ser2 Mode (0=modbus slave, 1=modbus master)
-	RO219	Ser2 Data format
-	RO220	Analoque input calibration register
Error codes		#128 - if (x1>x2) #129 - if (y1>y2) #130 - dip switch disables calibration #132 - gain is too big
-	RO221	Scaling format register
-	RO222	Analoque input calibration channel
-	RO223	Calibration info
-	RO224	Analoque input Low calibration point Hi
-	RO225	Analoque input Low calibration point Lo
-	RO226	Analoque input High calibration point Hi
-	RO227	Analoque input High calibration point Lo
-	RO229	Serial channel 2 speed (
-	RO240	Disable display timer. While this register <>0, application program has no access to display.
-	RO241	Power failure counter
-	RO242	Clock control register
-	RO243	Ser2 baudrate
-	RO245	Wildcard digits 1&2
-	RO246	Wildcard digits 3&4
-	RO247	Date and time information: month,
-	RO248	Date and time information: date.
-	RO249	Date and time information: day of the week
-	RO250	Date and time information: hour

- RO251 Date and time information: minute
- RO252 Date and time information: second
- RO255 Date and time information: year

- DO246=1 Activate Transparent mode.
- DO247=1 Incoming number (Num253) recognized.
- DO248…DO255 Controls led of control panel, 1…6
- RO204 Controls led of control panel, 1…6

PhNum 245 FTP file 0
PhNum 246 FTP file 1
PhNum 247 FTP file 2
PhNum 248 FTP file 3
PhNum 249 FTP file 4
PhNum 250 FTP file 5
PhNum 251 FTP file 6
PhNum 252 FTP file 7
PhNum 253 Call number
PhNum 254 SMS number
PhNum 255 Display

RO95, RO96, RO97 are updated only if is used number comparison in condition field ('T0') and telephone number in phone book has wild cards symbols(?).

For example:

In phone book: N0=+781232292??

In program: 'T0' DO248 ; Led blink
'P1' "%RO95, %RO96, %RO97" 255

When user calls from phone +78123229252, user will see on display: 5,2,52

3.6.8. Word memory

WM n 16-bit variable, n= 0..255

3.6.9. Word pointer

WP n 8-bit variable n=0..255

Usage: WP4 uses WM4 as pointer to WM area.

3.6.10. Date

Date variable can be used in condition field only e.g. DATE=3112.
DATE is also included in RO 248 & RO249.

3.6.11. Time

CLK variable can be used in condition field only e.g. CLK=1200.
CLOCK is also included in RO250 & RO251.

3.6.12. Incoming SMS phone number

Incoming phone number is stored in phone book place 254.

This variable can be used to send SMS-messages by request.
E.g. '($WEATHER)' M0
'M0=1' "TEMP = %AI0 C, WIND %AI1 m/s, DIR %AI2 deg" 254

Everyone, who sends request WEATHER, gets current weather information to GSM phone. There are also possibilities to limit access only to those phone numbers that are defined in phone book.

'($WEATHER) & (N0 # N1)' ; $WEATHER message must come from phone numbers ; defined in phone book places 0 or 1.

3.6.13. Incoming Call type

SIM-card can hold three different phone numbers; Voice call, Data call and Fax number. In GSM-PLC it is possible to detect to what number has been called. Number info is located in RO94.

RO94 = 1 (VOICE)
RO94 = 2 (DATA)
RO94 = 4 (FAX).

This variable can be used to trigger event in GSM-PLC.

E.g. Check the incoming phone number & the dialed phone number
#LINE 97: 'T0&RO94=4' "FAX" 255 ; phone number 0 is calling to FAX number
#LINE 98: 'T0&RO94=1' "VOICE" 255
#LINE 99: 'T0&RO94=2' "DATA" 255

Or not to check call type:
#LINE 96: 'T0' "Any call" 255

3.6.14. $ Self defined messages

User is able define own control words.
E.g. '($OPEN DOOR)' DO0=1

Note1: Message sent from GSM-phone must be format **$OPEN DOOR***

There can be parameters after control word. Parameters are separated from control word with "=-" character. Parameters are located starting from WM0. If parameter is invalid (e.g. $TEMP=3A*), GSM PLC will send SMS-message back with "???" characters.

E.g. SMS-message $TEMP=25* will change the WM0 value to 2.5
After message $TEMPS=25=30=40=80* WM0=25, WM1=30, WM2=40 and WM3=80

Program example:

Setting room temperature:

'($TEMP)' M0=1	; Command received.
'M0=1&WM0>10 & WM9<30' M1 WM1=WM0	; If parameter is OK, set flag and ; save parameter.
'M0=1&!M1' M0=0 "Check parameter" 254	; Command received but ; parameter is out of range.
'M1=1' M1=0 "TEMP is set to %WM1" 254	; Send ACK back.

3.6.15. Pulse variable

P1= pulse every 1 second
P2= pulse every 1 minute
Pulse duration is one program cycle.

3.6.16. AF-variable (Alarm flag)

For each program line/SMS-message there is AF-bit (alarm flag).
This bit is set when SMS-message with alarm reset time>0 is generated.
This bit is cleared when ACK is received or alarm time has expired.

With this variable it is possible to create cycle alarms.

E.g. Line 0 'DI0S10' M0
Line 1 'M0=1' "PUMP 1 Relay alarm" 0 30
Line 2 'AF1M2' "PUMP 1 Relay alarm" 1 20
Line 3 'AF2M2' "Is anybody out there? PUMP 1 RELAY ALARM!!!" 2 10

When input 0 has been active for 10 seconds, GSM-PLC sends alarm message to phone number 0. If nobody acknowledges this message with in 2 minutes, another message is sent to phone number 1. Again if there is no ACK for second alarm message, 3rd message is sent to phone number 2.
After 30 minutes from first alarm message, all alarm flags are cleared.
There will be no new alarm message unless DI0 has been inactive.

Acknowledgement can be done either by clearing corresponding alarm flag or by clearing all alarms. It is also possible to clear alarm flags from application program.

'AF0=0#AF1=0#AF2=0' ; if one of the alarm flags changes from 1 to 0…

3.6.17. Nn SMS-message phone number in phonebook

Usage only in condition field.
See example in 6.11

3.6.18. Tn phone number for phone call

In condition field this allows triggering one operation per phone number.
GSM-PLC does not answer the call.

E.g. 'T0#T1' DOS5 ; If call comes from phone number 0 or 1, set 5 sec pulse to output.

Don't use any land code (etc. +358…).
In action field this triggers voice call to defined phone number.
See example in 6.17

3.6.19. CSn Call Status

CS0 to CS255 shows the status for outgoing call.

Possible values are:

0 idle (no active call)
1 request to call
2 call in progress
3 OK (destination phone pick up the tube)
4 NO ANSWER (if no hang-up is detected time-out 25 sec)
128 BUSY (if the called party is already in communication)
129 NO CARRIER (call setup failed or remote user release)
130 UNKNOWN

Conditions for CS:
CSxx>, CSxx<, CSxx= with and without hysteresis.

Action for CS:
CSxx=YY with one limitation: CS0 to CS99 can be set only to zero.

The number of the CS has to be similar with the program line, which call to the phone.

Examples:
#LINE 60: 'DI0' T10 ; CALL TO PHONE 10
#LINE 97: 'CS60=1' DO248 ; CALL STATE - REQUEST
#LINE 98: 'CS60=2' DO249 ; CALL STATE - PROGRESS
#LINE 99: 'CS60=4' CS60=0 DO250S5 ; CALL STATE - NO ANSWER Set state to idle

3.6.20. TCn Timed control

See also system command TTBL

TC0 to TC255 Table for timed control.

Shows the status of the selected time table

E.g.

#LINE 10: 'TC0' DO1 ;If timetable0 active, set output active
#LINE 11: 'TC1&!DI1' DO1; If TC1 control is active and device is in auto mode, set output active

3.7. Real time clock

3.7.1. Setting the clock

Send message

Password TIME =dd.mm.yy wd hh:mm

Where dd =1 to 31
mm = 1 to 12
yy = 00..99
wd = 1..7
hh = 00..23
mm = 00..59

Example:

0000 TIME =30.07.01 1 10:56*

Notice! There must be space between command TIME and Equal "=" character. Also date, weekday and time must be separated with space.

Message PSW TIME ? Returns date and time from real time clock.

Using the clock: See commands Date and Time.

3.8. iButton

3.8.1. Reading the iButton

GSM-PLC checks once/second if iButton device is connected to system.
If it founds iButton device, it sets the RO99=1 and reads the serial code from iButton to RO100…RO107.

Notice!
In this version only the "Read Serial code" function is supported.

3.9. FTP file system (Datalogging)

There are altogether 256kbytes of memory that can be used for datalogging.
This memory space can be divided in 4 different ways
1 file size of 256k
2 files sizes of 128k
4 files sizes of 64k
8 files sizes of 32k

Files are transferred from PLC using FTP file transfer (See sec. 2.5 FTP)

Values are saved to file similar way than sending an SMS

For each file there is a phone number location
Phone number 245: File number 0
Phone number 246: File number 1
Phone number 247: File number 2
Phone number 248: File number 3
Phone number 249: File number 4
Phone number 250: File number 5
Phone number 251: File number 6
Phone number 252: File number 7

Example:
saving a record into file 0
'P1&M8' "%AI0%AI1" 245 ; save record (AI0 & AI1) to file 0 once/sec if M8=1

3.9.1. FTP file structure

File contains header block & n*records.

Each file contains the header information that describes the record structure

File header:

PLC ID - 4 bytes
Variable count (length of header block= variable count*2)
Var 1 type – 1 byte
Var 1 addr – 1 byte
Var 2 type – 1 byte
Var 2 addr – 1 byte
…
Var n type – 1 byte
Var n addr – 1 byte

Record format:

Time stamp – 4 bytes
Var 1 value – 2 bytes
Var 1 value – 2 bytes
…
Var n value – 2 bytes

Time stamp format:

Byte 0: YYYY YYYM	YYYYYYY - Year 00..99
Byte 1: MMMD DDDD	MMMM – Month 1..12
Byte 2: 000H HHHH	DDDDD – Day 1..31
Byte 3: 00mm mmmm	HHHHH – Hour 00..23
	Mmmmmm – Minutes 00..59

Variable types:

DI = 0
DO = 1
M = 2
AI = 3
CN = 4
RO = 5
WM = 6
AO = 7
PhNum = 10

Example 1:

File: FADE123400020300030100270905060105FF00270906060305EF

Where
Header info:
FADE1234 = PLC ID
0002 = variable count
0300 = Var1 type & address (AI0)
0301 = Var2 type & address (AI1)
Record 1:
00270905 = timestamp Jan. 7 9:05
0601 = Var1 value
05FF = Var2 Value
Record 2:
00270906 = timestamp Jan. 7 9:06

0603 = Var1 value
05EF = Var2 value

Example 2:

PLC: CCBBCCBB, Number of records: 3

10-06-06 19:54,N253=+358407695459,AI0=0
10-06-06 19:54,N253=+79112354030,AI0=10
10-06-06 19:54,N253=+78129322281,AI0=3

Header info:
CC BB CC BB = PLCID
00 02 = Variable count
0A FD = Var 1 type & address (N253)
03 00 = Var 2 type & address (AI0)

Record 1:
0C CA 13 36 - Time stamp 10-06-06 19:54
0C 91 53 48 70 96 45 95 F9 48 - Phone number
(according GSM standard: 0c - length, 91 - international prefix, and number)
00 00 - Value ai0
Record 2:
0C CA 13 36
0B 91 97 11 32 45 30 F0 F9 48
00 0A
Record 3:
0C CA 13 36
0B 91 87 21 39 22 82 F1 F9 48
00 03

3.9.2. FTP file

Get file info

Format: Password FILE n?*

Response: #FILE n = <FileSize> <used> <record variables>

Examples:

Query: 4321 FILE 1?
Response: #FILE 1= 32768 180 AI0 AI1

Query: 4321 FILE 2?
Response: #FILE 1= 32768 16358 CN8 WM7 WM8 WM9

Query: 4321 FILE 0?
Response: #FILE 0= UNUSED

Clearing File:

Query: 4321 File 1=
Response:

Examples:

Query: 4321 FILE 1=
Response: #FILE 1= 32768 0 AI0 AI1
Or
Query: 4321 FILE 0=
Response: #FILE 0= UNUSED

3.10. Modbus Slave/Master (GSM Ver.1.38)

Added RO's (compatible with standard AL20 except RO215):

RO056	TIMEOUT MODBUS SER2
RO058	SER2 CTS/RTS CONTROL (ACC.0=1 NO RTS/CTS HANDSHAKE)
RO059	SER2 MODBUS ERRORS
RO060	EXCEPTION STATUS
RO080	SER2 MODBUS REJECTED MESSAGES
RO081	SER2 MODBUS RCEIVED MESSAGES
RO082	SER2 QUEUE DEPTH
RO084	Conditional message address
RO088	SER2 MODBUS NON ANSWERED ID
RO089	SER2 MODBUS MESSAGE ERROR TYPE
RO215	SER2 MODE (0=Modbus salve, 1=Modbus master)
RO219	SER2 DATA FORMAT (0=default=8 bit, parity none) (1= 7bit, parity even) (2= 7bit, parity odd) (3= 8bit, parity even) (4= 8bit, parity odd)
RO229	SER2 BAUD (0=300, 1=1200, 2=2400, 3= 4800, 4=9600, 5=19200)
RO243	MODBUS OWN SLAVE ID (1-254)

3.10.1- Modbus memory map

cmd 01/05,15	length, offset	
Binary output (DO)	0100h 0000h	
Binary memory (M)	0100h 0400h	
Binary memory (AF)	0100h 0800h	
cmd 02		
Binary input (DI)	0100h 0000h	DI
Time control (TC)	0100h 0400h	TC
cmd 04		
Register input (AI 8bit)	0100h 0000h	
Word input (AI 12bit)	0100h 0400h	AI
cmd 03/06,16		
Register output (RO)	0100h 0000h	
Register memory (CS)	0100h 0400h	
Word output 0 ->255 (AO)	0100h 0800h	
Word memory 0 ->255 (WM)	0100h 0C00h	
Word general memory 0 -> 255 (WG)	0100h 1400h	
Counter memory 0-> 1023 (CN)	0100h 6000h	

3.10.2. RO215 - SER2 MODE

Modbus Slave mode
Modbus Master mode
UCP
TAP
Transparent mode

DIP SW3 Overrides SER2 modes

When ON:

SER2 Mode	Modbus Slave
Baud	9600
Own ID	01

3.10.3. Modbus memory map for commands 09, 10

Block numbers	Descriptions
0000-01ff	(*) Program lines, phone numbers, I-Buttons
0400-0401	(*) PIN, PSW
0800-0815	Modbus Master configuration
0C00-0C01	(*) FTP Info
ffff	Status Block

(*) – for future development

3.10.4. Programming Modbus Master configuration via ALPROWIN

Messages must be defined only for SER1 in ALPROWIN programming tool.
Maximum 255 messages
(Note! Although Modbus master configurations are defined in Alprowin for SER1 (COM1), those will be used for SER2 (COM2) in GSM-PLC.

3.10.5. Launching Modbus Master conditional messages

RO84 is used to define the number of conditional message you need to send to slave unit.

RO84=255 triggers all conditional messages.
After command execution RO84=0.

3.10.6. Example of configuring SER2 as Modbus master

You need AlproWin programming software, so you can configure Modbus master to AL GSM PLCs. If you don't have this software ask it from FF-Automation.
Note that you can use only COM 2 (serial port 2) for Modbus master configuration. COM1 is for GSM modem. (You need to make configurations in COM1 in Alprowin, although the configuration is used in SER2 in AL GSM PLC!)
Write the following parameters (code) using GSM Programmer (not Alprowin):
R O 215 = 5 (SER2 mode, 1 = modbus master)
R O 229 = 4 (SER2 baud rate, 4= 9600bps, 5=19200bps)

Modbus master configuration can be transferred to AL GSM PLC only if the serial port 2 is in modbus slave mode, speed 9600, address 1. (DIP3=ON)

You can force the serial port 2 to modbus slave mode if you use on-board DIP switches:
DIP 3 = ON (forces serial port 2 to modbus slave mode, speed 9600, address 1)

You need also to set the alprowin serial port to same setting (port 2 to modbus mode, speed 9600, address 1)

Before you can transfer the modbus configuration you need to set STOP command to AL GSM PLC (Red STOP icon in the alprowin, stops the run led on-board)

After the modbus configuration is transferred you need to press green start button.
Note also that if you configure AL GSM PLC as modbus slave you don't need AlproWin.
Write the following parameters (code) using GSM Programmer (not alprowin) if you are using modbus slave in SER2:

RO 243 = slave adddress e.g. 1
RO 215 = 0 (modbus slave)
RO 229 = 4 (4 =9600, 5=19200)
Note that if DIP 3 = ON, it will override these parameters.

Look AlproWin User Handbook for more information!
Note also that if you need RS485 you need hardware module for that.

3.11. Transparent mode

This mode allows to connect to 3rd party device through GSM PLC.
GSM PLC can be set to transparent mode when it detects incoming call
In transparent modem PLC echoes the data coming in from

3.12. Principle of operation

GSM-PLC can be used as simple PLC and it can also send predefined SMS-messages to desired GSM-number or to I-net email address.
GSM-PLC can also make normal call to phone.

GSM-PLC can perform logical, Date/time based and SMS-message based operations. Operations can either be controlling outputs or sending SMS-messages (Alarms, Data logging messages, Info etc.).

If there is a display unit attached to PLC, display keys is seen in digital inputs 240..255.
Display LED's can be controlled through digital outputs 240..255.

GSM-PLC stops application program execution after it has received INIT or DEL command. GSM-PLC starts executing the application program after it receives RUN command.

3.12.1. Configuration

Before device is ready use, you need to configure device. This includes PIN code, Password and Phone number initializations.

How to change PIN-code?
Send following SMS-message from your GSM-phone:
0000 PIN 3322 3322*

GSM-PLC will response: **#PIN OK** or **#PIN BAD**

How to change password?
Send following SMS-message from your GSM-phone:
0000 PSW 8642 8642*

GSM-PLC will response: **#PSW OK** or **#PSW BAD**

How to set GSM-phone number (e.g.. 12345678) in location 0?

Send following SMS-message from your GSM-phone:
0000 NUM 0=+12345678*
(or 0000 NUM 0-+12345678 * - the old system program versions)

GSM-PLC will response:
#NUM 0=+12345678

3.12.2. RUN LED modes

Steady light (after power on) -	init GSM-PLC
Slow blink (period 2 sec) -	initialising GSM modem
Very slow blink (period 4 sec) -	normal work
Fast blink (period 0,5 sec) -	error, GSM-PLC does not execute logic program, but can receive and response to messages (commands SET, READ).
Vary fast blink (period 0,1 sec) -	Power fail state. All outputs are cleared.
Slow/fast blink -	Active alarm that needs acknowledging.

3.13. Important notes

3.13.1. Some notes of GSM-Programmer

Programmer can't put Å Ä Ö ; ` £ € ¤ § ½ * ¨ ” characters into SMS-messages. In such case GsmProgrammer gives information window: **Programs has errors**

Remarking with “;”-character

3.13.2. Trouble shooting

Program sends messages to Alarm viewer when PC is connected to GSM-PLC but when modem is connected, there is no SMS-message.

a) Check the green led located in GSM-modem. When led is blinking, modem has connection to network.
b) Check the phone number defined in phone list

If Modem's status led is not blinking:

a) Check PIN code setting from GSM-PLC. GSM-PLC tries to configure the modem twice, so if PIN code is wrong, you have one attempt left to set correct PIN code to SIM card.
b) Check that the SIM card supports 900MHz network

GSM-PLC run led blinks fast

a) Download program again
b) Send command DEL ALL from Alarm Viewer and download the whole project (program & phone book)

Led is blinking fast and outputs are always OFF

a) GSM-PLC is in power failure state. Check supply voltage.

3.13.3. PIN-code setting and SIM-card installing (read before installing)

PIN-code number has to be similar in SIM-card and in GSMUnit.
GSM-Unit tries two times set the PIN-code to SIM-card.
First choice: You can set PIN-code (0000) to the SIM-card of GSM-Unit by your GSM-phone.
Other choice: You set the PIN-code setting of your SIM-card (xxxx) to GSMPLC-Unit by GSMProgrammer.
If power is switched on GSM-Unit, you cannot install SIM-card to GSM-modem.
GSM-modem is either Wavecom or Ericsson GM-12.
If GSM-modem is Wavecom, install SIM-card to the little removable plastic box, which is found on the side of GSM-modem.
If GSM-modem is Ericsson, install SIM-card below the little plastic cover.
Check that SIM-card is installed right side up.

3.13.4. DIP-switches

(GSM-20 unit)

DIP switch	ON	OFF
1	**EEPROM NOT WRITE PROTECTED**	**EEPROM WRITE PROTECTED**
2	**ENABLE CALIBRATION**	**DISABLE CALIBRATION**
3	Ser2 mode: Modbus 9600bit/s, Slave address 1	Ser 2 mode: RO215 defines the mode
5	Data memory cleared after power reset	Data memory retained during power failure
6	US band selected	EU band selected

(GSM-8 unit)

DIP	ON	OFF
1	**EEPROM NOT WRITE PROTECTED**	**EEPROM WRITE PROTECTED**
2	**ENABLE CALIBRATION**	**DISABLE CALIBRATION**
3	Ser2 mode: Modbus 9600bit/s, Slave address 1	Ser 2 mode: RO215 defines the mode
4	Internal modem disabled (direct connection through RS232)	Internal modem activated
5	Data memory cleared after power reset	Data memory retained during power failure
6	US band selected	EU band selected

(GSM-6 unit)

DIP	ON	OFF
1	**EEPROM NOT WRITE PROTECTED**	**EEPROM WRITE PROTECTED**
2	**ENABLE CALIBRATION**	**DISABLE CALIBRATION**
3	Ser2 mode: Modbus 9600bit/s, Slave address 1	Ser 2 mode: RO215 defines the mode
4	Internal modem disabled (direct connection through RS232)	Internal modem activated
5	Data memory cleared after power reset	Data memory retained during power failure
6	US band selected	EU band selected

(GSM-16 unit)

DIP	ON	OFF
1	**EEPROM NOT WRITE PROTECTED**	**EEPROM WRITE PROTECTED**
2	**ENABLE CALIBRATION**	**DISABLE CALIBRATION**
3	Ser2 mode: Modbus 9600bit/s, Slave address 1	Ser 2 mode: RO215 defines the mode
4	Internal modem disabled (direct connection through RS232)	Internal modem activated
5	Data memory cleared after power reset	Data memory retained during power failure
6	US band selected	EU band selected

3.14. PID controllers (Notice! Use AlproWin.exe for PID simulation)

3.14.1. Register Variables of Controllers

The GSM-20's system software includes 32 12-bit direct digital controllers (DDC) with PID characteristics. The controller parameters are held in 16-bit WGx memories and in 8-bit register outputs (RO).
The number of used controllers per group is given in the register outputs (RO128 - RO131). This number also determines the group update interval depending on the number of controllers used.
If one controller in a group is updated, the update time is 100 ms. Similarly, if two controllers in a group are updated, the update time interval is 200 ms. Maximum update interval is 25500 ms, or 25.5 seconds.
If in PLC's application program the update interval is not defined the default update interval of 500 ms is used (RO128 - RO131=5).

	Controller number								RO number
Group 1	0	1	2	3	4	5	6	7	RO128
Group 2	8	9	10	11	12	13	14	15	RO129
Group 3	16	17	18	19	20	21	22	23	RO130
Group 4	24	25	26	27	28	29	30	31	RO131

Example: If it is desired that three controllers update interval is100 ms and two controllers 500 ms, parameters should be set as follows

Group 1 - desired update interval is 100 ms, then RO128 = 1
Group 2 - desired update interval is 100 ms, then RO129 = 1
Group 3 - desired update interval is 100 ms, then RO130 = 1
Group 4 - desired update interval is 500 ms, then RO131 = 5

Controllers operating mode is given in 16-bit variables (WGx 0, 8, 16 etc.). Every controller has the following individual operating modes.

0 Controller not in use
1 Controller is in normal automatic operate mode
2 Controller is in inverted automatic operate mode
3 Controller is in manual operate mode

3.14.2. Three point controllers

There are 8 PID controllers available in AL20AN PLC, and every one of these can operate also as a three points controller. The operating parameters are in 16-bit variables WGx 0-255.

Controllers	0 - 1	2 – 3	4 - 5	6 - 7
Control interval Pulse interval Valve closing bit Valve opening bit	RO 128 RO 132 RO 136 (0,1) RO 140 (0,1)	RO 129 RO 133 RO 136 (2,3) RO 140 (2,3)	RO 130 RO 134 RO 136 (4,5) RO 140 (4,5)	RO 131 RO 135 RO 136 (6,7) RO 140 (6,7)

The operating parameters are in 16-bit variables WGx 0-255.

Contoller	0	1	2	3	4	5	6	7
Mode	0	8	16	24	32	40	48	56
Actual value	1	9	17	25	33	41	49	57
Set value	2	10	18	26	34	42	50	58
D time/100ms	3	11	19	27	35	43	51	59
I time/100ms	4	12	20	28	36	44	52	60
Gain term	5	13	21	29	37	45	53	61
Output	6	14	22	30	38	46	54	62
Aux. variable	7	15	23	31	39	47	55	63

3.14.3. Control Algorithm

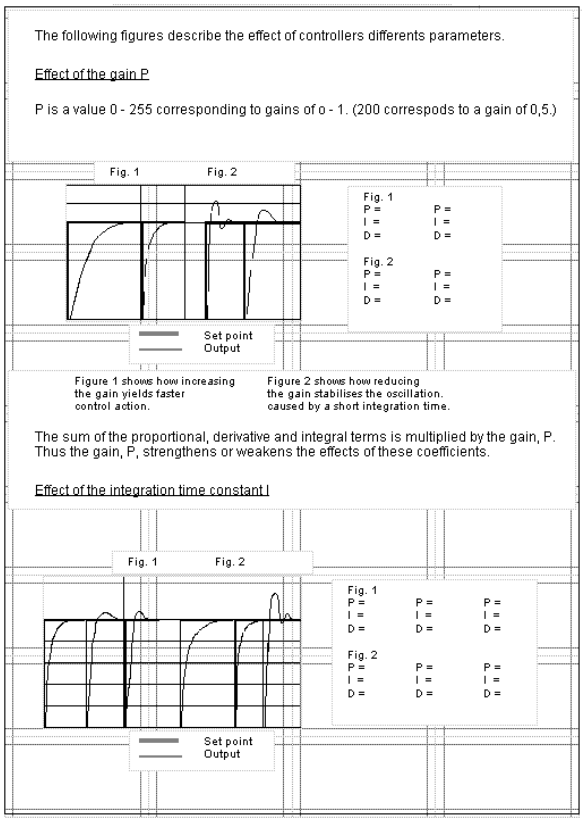
The control algorithm is as follows: DY=(100/gain)*{e(ti)-(e(ti-1)) +; P term e(tI)/integration time constant+; I term Derivation time*(e(ti)-2e(ti-1)+e(ti-2)}; D term

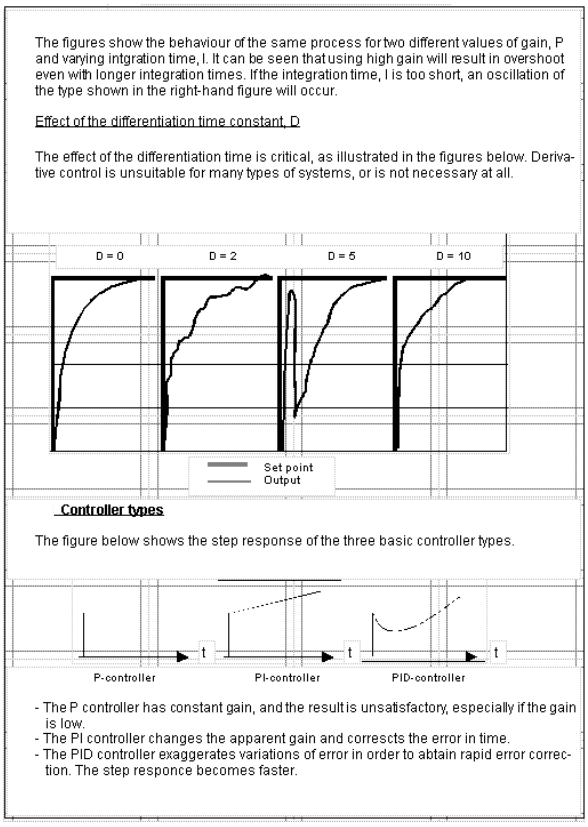
The D term controls how strongly the control process reacts to rapid changes in the input signal. The differentiation time constant is an 8-bit parameter and is given in hundreds of milliseconds (value 1 - 255 equals 0.1-25.5s). The larger time and the greater change to the output signal.
If the differentiation time constant is given as 0, the term is not used.

The I term controls how quickly the process reacts to stabilize offset error. The integration time constant is a 16-bit parameter and is given in hundreds of milliseconds (0.1-6553.5s). The larger integration time constant the slower process reacts to offset errors. If the integration time constant is given as 0, the term is not used.

The P term controls the gain such that: P=100/gain, where gain can be from 0.01 to 100.

Therefore	if gain = 0	P - TERM NOT USED
	if gain = 5	P = 20
	if gain = 0.5	P = 200
	if gain = 0.02	P = 5000
	if gain = 0.01	P = 10000





4. Program Examples for GSM-PLC

4.1. Variables and Operands

DI	Digital Input
DO	Digital Output
CN	Counter
M	Memory
RO	Register Output
WM	Word Memory
AI	Analogue Input
AF	Alarm Flag
CS	Call Status
WP	Word Pointer

4.2. Operands

&	AND
#	OR
X	XOR
!	NOT
<, =, >	smaller, equal, bigger
( )	brackets
+	plus (with use of WM's)
-	minus (with use of WM's)
.	multiplication (with use of WM's)
/	divide (with use of WM's)
$	compare incoming SMS-message

4.3. Programming formats

- One program line contains always Condition field and Action field.
  There can be several conditions in condition field.
- Action can be PLC-operations, text message or both.
- Field separation mark is SPACE or multiple spaces or COMMA (‘,’)
- Text-field is separated with “ “ and Condition field is separated with ‘ ‘

4.3.1. Programming by GSM-phone (basic programming format)

- Password is for example 1234 (Programming starts always with password).
- "INIT" define control lines (without the line number, control lines go to the end of program).
- “*” character is end mark for control line

Structure: Password INIT line ’Condition’ Action*
Or
Password INIT line ’Condition’ ”text” phone number*

4.3.2. Programming by GSM-Programmer

- Do not insert password and *-character (end of line) into program line. PC-program adds those automatically when you transfer your application program from Program Editor or from Alarm viewers control window to GSM-PLC.
- You can change GSM-PLC password from GSM-Programmer. In main window there is a password code box (default=0000).

4.3.2.1. Program Editor

- Do not insert INIT-command.

Structure: ’Condition’ Action
Or
’Condition’ ”SMS-message” phone number
Or
’Condition’ Action ”SMS-message” phone number

4.3.2.2. AlarmViewer

- When is changed the program from Alarm viewer, you must insert INIT-command and line number before program line.

Structure: INIT line ’Condition’ Action
Or
INIT line ’Condition’ ”text” phone number
Or
INIT line ’Condition’ Action ”text” phone number

4.4. Iniatialization of GSM-PLC

Define phone numbers

1234 NUM0=+35850123456*
[Password] [Number 0] [Phone number]

GSM4 response: #NUM0=+35850123456*

Define password

1234 PSW 4321 4321*
[Old Password] [Command] [New Password]

GSM4 response: #PSW OK

Define PIN-code

1234 PIN 4321 4321*
[Old Password] [Command] [New Password]

GSM4 response: #PIN OK

4.5. Principles of programming

Example #1

Send message when input 0 goes active.

4321 INIT ’DI0=1’ ”Tank level LOW” 0 0 *
[Password] [Function] [Condition] [Message] [Phone #] [no ack.]

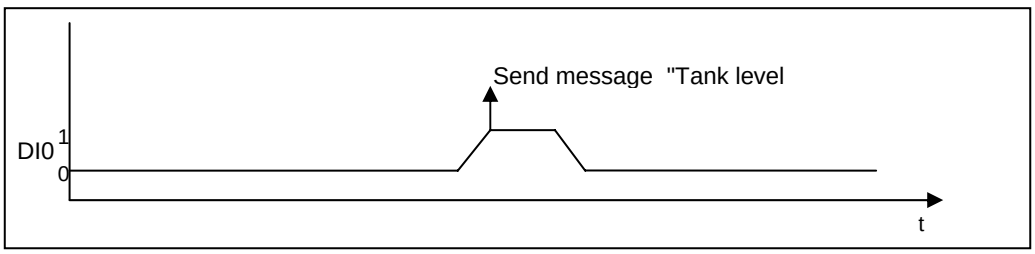


Figure 1: Timing waveform for Example #1

Example #2

Set output 0 active if input has been on for 5 seconds

4321	**INIT**	**'DI0S5'**	**DO0**	*****
[Password]	[Function]	[Condition]		[Action]

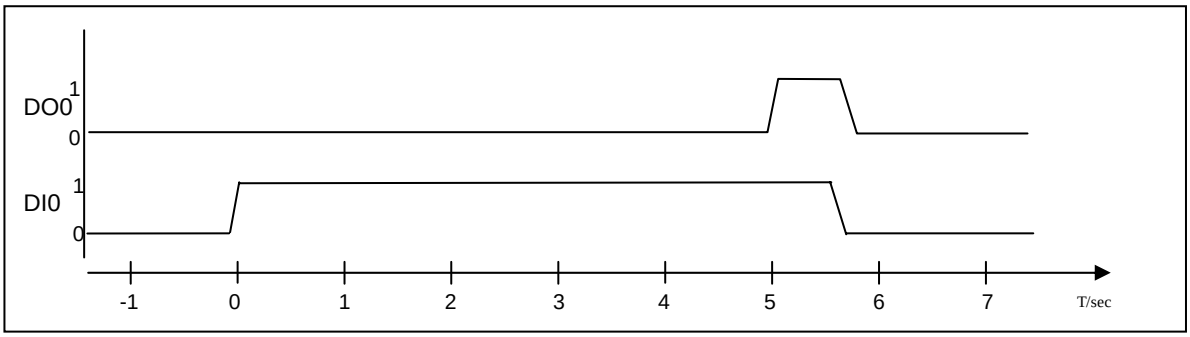


Figure 2: Timing waveforms for Example #2

Example #3

Set output 0 active for 5 seconds if input 0 has been on for 1 second

4321	**INIT**	**'DI0S1'**	**DO0-1**	*****
[Password]	[Function]	[Condition]	[Action]	
4321	**INIT**	**'DO0S5'**	**DO0-0**	*****
[Password]	[Function]	[Condition]	[Action]	

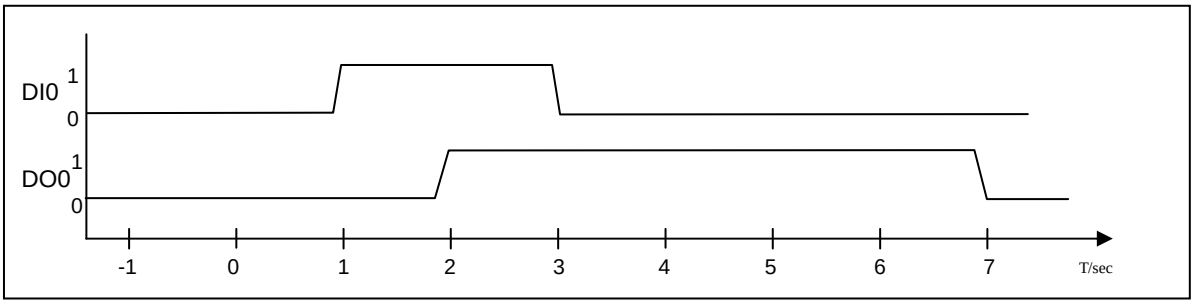


Figure 3: Timing waveforms for Example #3

Example #4

Logical operations
Send message out if inputs 0 and 1 are active or input 3 is not active

4321	**INIT**	**'(DI0&DI1)#!DI3'**	**"ALARM"**	**1**	**0**	*****
[Password]	[Function]	[Condition]	[Message]	[Phone #]	[no ack.]	

Example #5

Linking two PLC GSM4's together

1st GSM4 measures water level (Device 1)
2nd GSM4 controls pump (Device 2)

If water level drops below the set value, Device 1 sends a pumping request to device 2 at the pump station. After water level has increased enough, Device 1 send request to stop pumping.

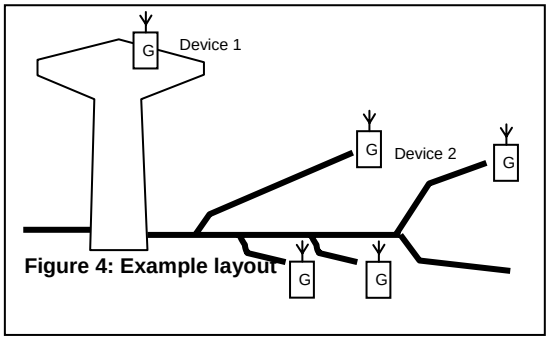


Figure 4: Example layout

Program on device 1 ”Water level control”

4321	**INIT**	**’(AI0<1000)’**	**"1111 SET DO0=1*"**	**1**	*****
[Password]	[Function]	[Condition]	[Message]	[Preset Phone #]	
	INIT	**’(AI0>1500)’**	**"1111 SET DO0=0*"**	**1**	*****
	[Function]	[Condition]	[Message]	[Preset Phone #]	

Password has to be set to 1111 on Device 2. There is no need for more programming on Device 2

Example #6

Counter unit
Send message after counter is enabled (DI1=1) and it reaches 150 pulses. After this, reset counter.

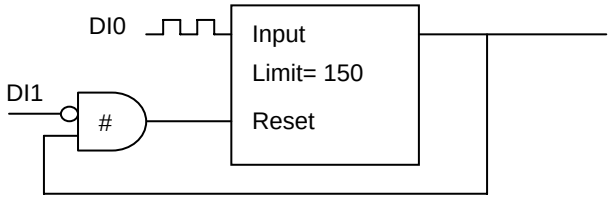


Figure 5: Counter Circuit

4321	**INIT**	**’!DI1#M0’**	**CN0=0**			
[Password]	[Function]	[Condition]	[Operation]			
	INIT	**’(CN0=150)’**	**M0**			
	[Function]	[Condition]	[Operation]			
	INIT	**’M0’**	**”Counter limit reached”**	**1**	**0**	*****
	[Function]	[Condition]	[Alarm]	[Phone #]	[Ack]	

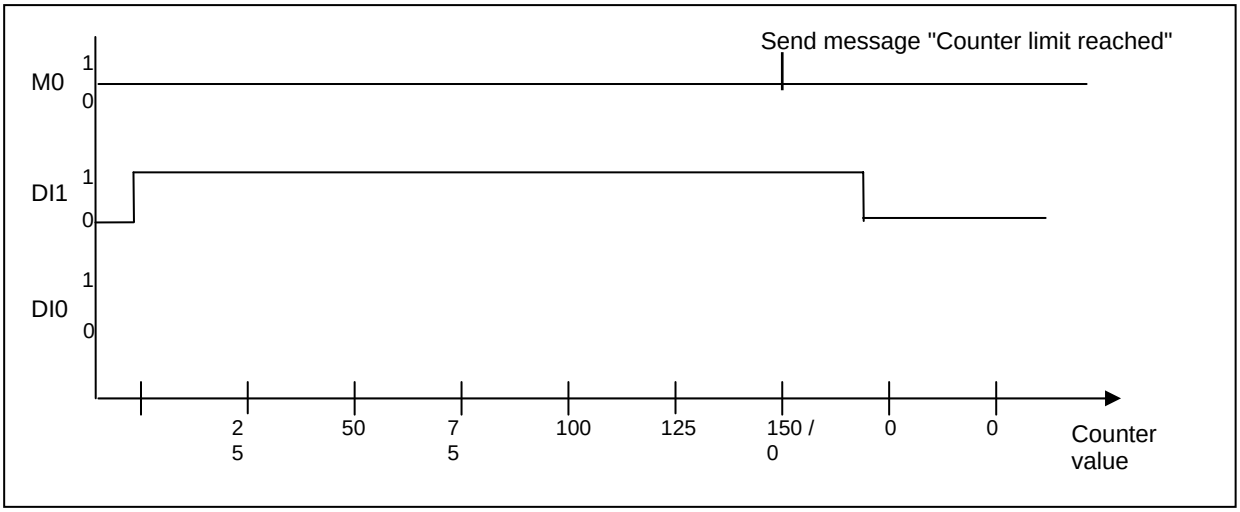
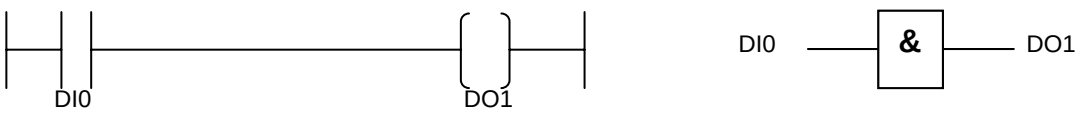


Figure 6: Counter circuit timing character

4.6. Basic program examples

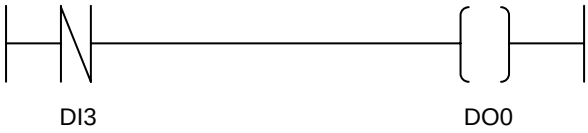
Example #1: Connect input 0 to output 1.

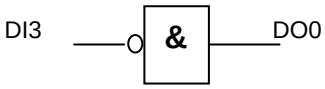


Program:

1234 INIT 0 **’DI0’ DO1*** ; If input 0 = true, control output 1 on.

Example #2: Connect inverse input 3 to output 0

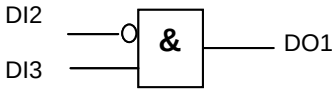




Program:

1234 INIT 1 **'!DI3' DO0*** ; If input 3 = false, control output 0 on.

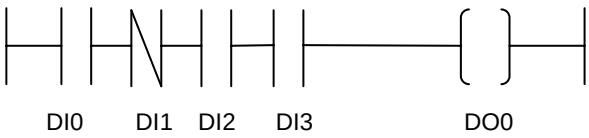
Example #3: Connect inverse input 2 and input 3 to output 1.

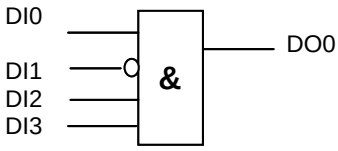


Program:

1234 INIT 2 **'!DI2&DI3' DO1*** ; If input 2 = false and input 3=true, ; control output 1 on.

Example #4: Several inputs to and block

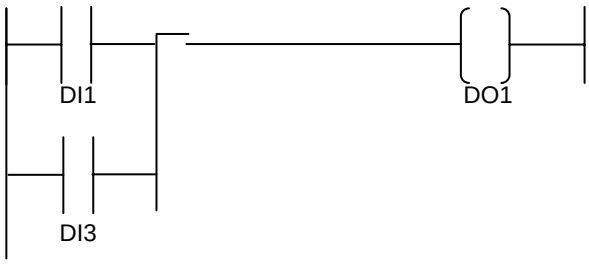


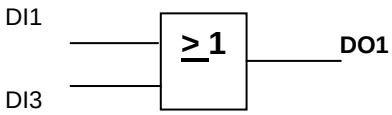


Program:

1234 **'DI0&!DI1&DI2&DI3' DO0*** ; If input 0 = true and input 1=false and ; input 2=true and input 3=true, control ; output 0 on.

Example #5: OR-block

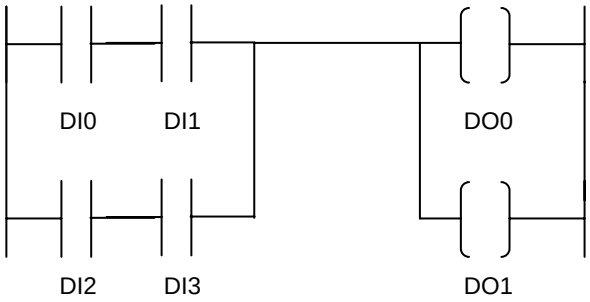


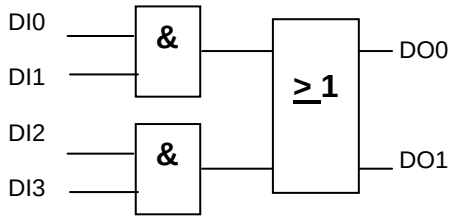


Program:

1234 INIT 4 **'DI1#DI3' DO1*** ; If input 1 = true or input 3=true control ; output 1 on.

Example #6: Combination of OR and AND blocks.

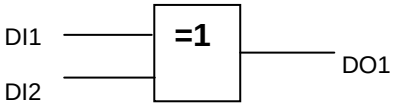




Program:

1234 INIT **'(DI0&DI1)#(DI2&DI3)' DO0 DO1*** ; If inputs 0 and 1 or 2 and 3 are
; true set output 0 on.

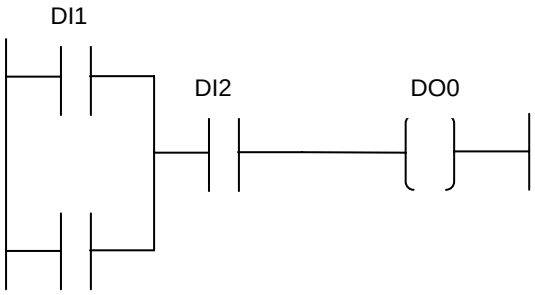
Example #7: XOR-blocks

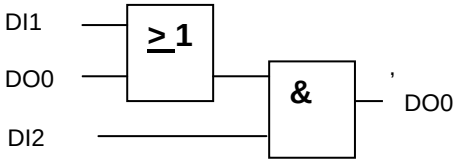


Program:

1234 INIT 7 **'DI1XDI2' DO1*** ; If only input 1=true or only input 2=true,
; set output 1 on.

Example #8: Set/Reset output

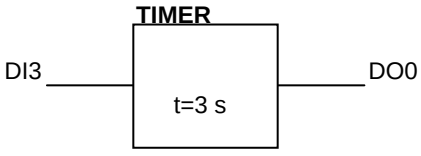


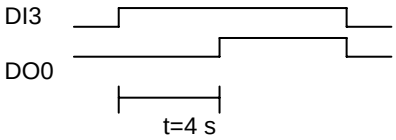


Program:

1234 INIT **'(DI1#DO0)&DI2' DO0*** ; If input 1=true or output 0=true and
; input 2=false, set output 0 on.

Example #9: Going on time delay

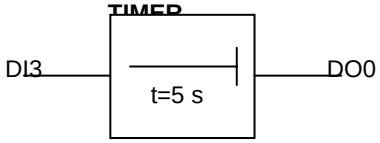


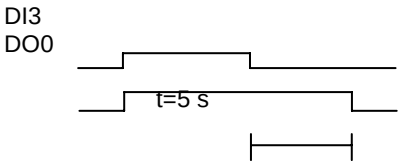


Program:

1234 INIT 8 **'DI3S4' DO0*** ; If input 3 has been true 4 seconds, control
; output 0 on.

Example #10: Going off time delay



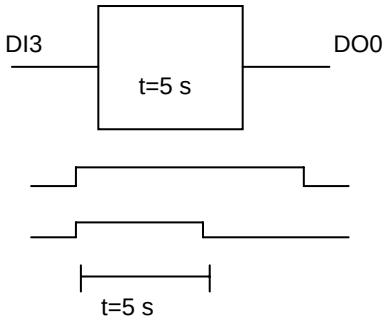


Program:

1234 INIT 9 **'DI3' DO0S5*** ; If input 3 =true, output 0 is 5 seconds on
; after input 3 =false.

Example #11: Pulse delay

TIMER



Program:

1234 INIT **'DI3=1' DO0S5*** ; If input 3=true, output 0 is 5 seconds on.
; (positive derivation)

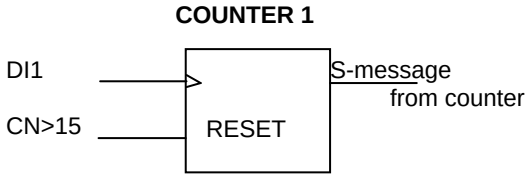
Example #12: Counter

COUNTER 2

Program:

1234 INIT **'CN2=5' DO1*** ; If the value of counter 2 is 5, control
; output 1 on. Counter 2 calculates from
; input 2. (counter 3 calculates from input 3,
; counter 1…etc.)

Example #13: Counter and message



Program:

```
1234 INIT 'CN1>15' CN1=0*                    ; If  the value of counter 1 more than
                                             ; 15, reset counter 1.

1234 INIT 'CN1>10' "In counter: %CN1" 1*     ; If the value of counter is more than
                                             ; 10, send message (witch contain the
                                             ; value of counter) to phone number1.
```

Example #14: Clock and calendar printing to keypad/phone

- 255 is the "phone number" of keypad (DI255)
- RO248: day of month
- RO247: month
- RO250: hours
- RO251: minutes
- RO252: seconds

Program:

```
1234 INIT 'DI1' "%RO248.%RO247" 255*         ; If input 1=true, print date.
1234 INIT 'DI2' "%RO250:%RO251.%RO252" 255*  ; If input 2=true, print time.
```

Example #15: Controls from clock and calendar

- RO249: day of the week
- RO250: hours
- RO251: minutes

Program:

```
1234 INIT 'RO249=3&CLK=2330' DO1=1*          ; When day of the week is 3
                                             ; and clock/time is 23:30, set
                                             ; output1 on.
1234 INIT 'RO249=4&CLK=1210' DO1=0*          ; When day of the week is 4
                                             ; and clock/time is 12:10, set
                                             ; output 1 off (reset).
```

Example #16: Circulation alarm for three cellular phones

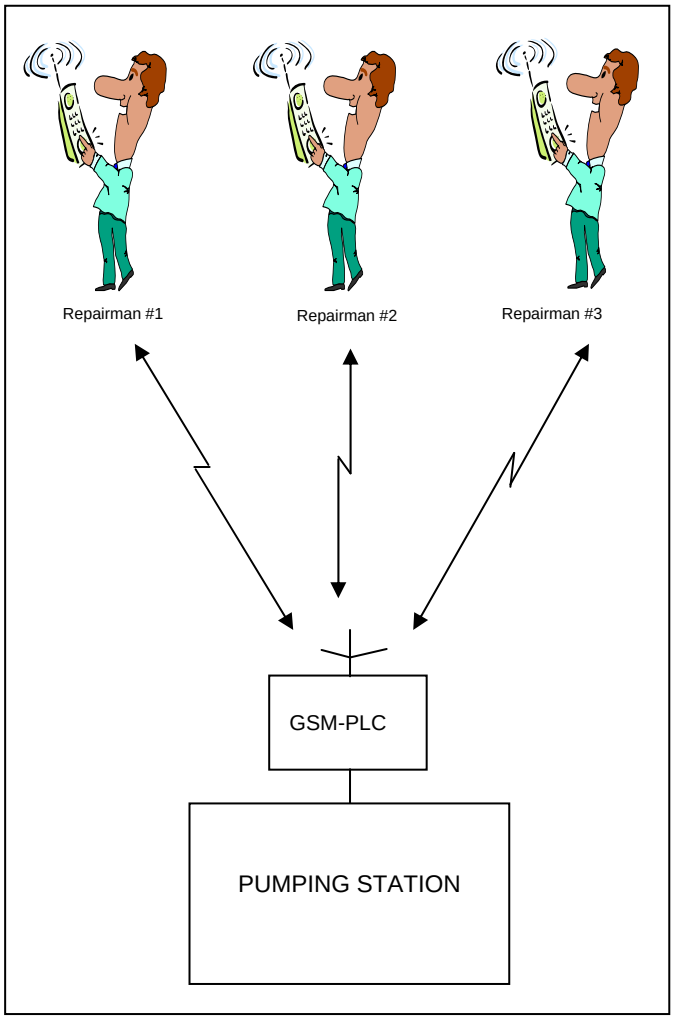
The operating principle of circulation alarm program:

When input 0 has been active for 30 seconds, GSM-PLC sends alarm message to repair man 1 (line 0 and 1). If nobody acknowledges this message with in 15 minutes, another message is sent to repair man 2 (line 2).

Again if there is no ACK from second repairman, 3rd message is sent to repair man 3 (line 3).

When any of AF-variables is acknowledged, new alarm sending is allowed but only after DI0 has been inactive (lines 4, 5 and 6).

If there has been no ACK from repair mans, after 60 minutes from the first alarm message, all alarm flags are cleared.



Program:

Line 0: 'DI0S30' M0=1
Line 1: 'M0=1' "ALARM 1" 0 60
Line 2: 'AF1M15&M0' "ALARM 2" 1 45

Line 3: 'AF2M15&M0' "ALARM 3" 2 30
Line 4: 'AF1=0#AF2=0#AF3=0' M1=0

Line 5: 'M0=1' M1=1
Line 6: '!DI0&!M1' M0=0

Acknowledge alarm:

Command: password ACK ALL*, clears all active alarms.

Example #17: Time counter using WM-variables

Time counter is build using WM-variables and pulse variable (P1). For each parameter (Hour, min, sec) there is reserved one WM variable.

If the input 3 has been true for one second, add one to 'second' memory (=WM30) [line 0].

If the value of the 'second' memory is more than 59, add one to the 'minute' memory (=WM31) [line 1].

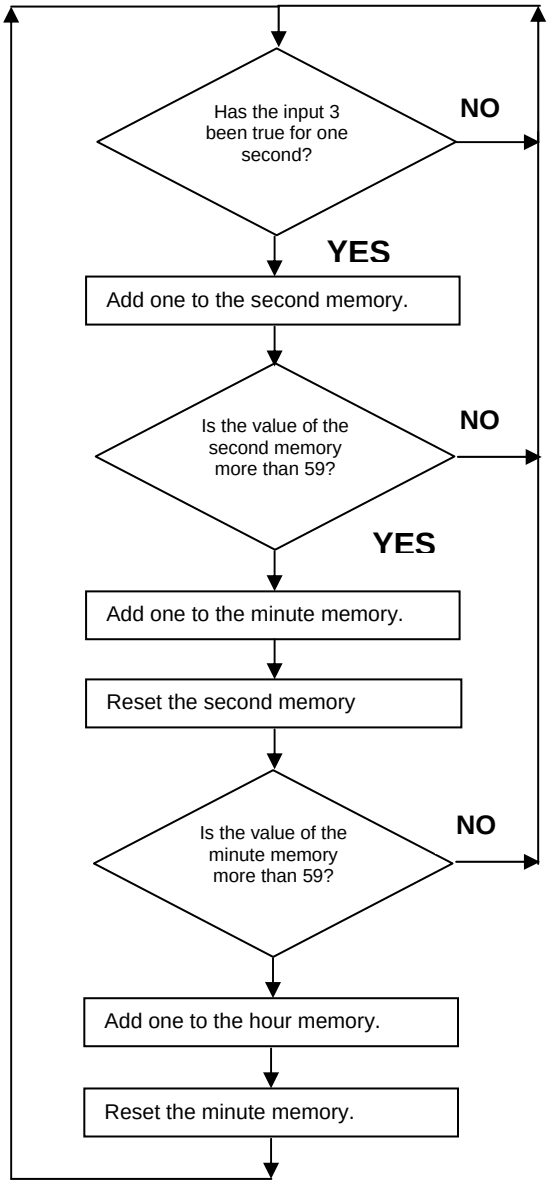
If the value of the WM31 is more than 59, add one to variable WM32 (=hour memory) [line 2].

If the value of the WM30 is more than 59, reset WM30 [line 3].

If the value of the WM31 is more than 59, reset WM31 [line 4].

When for example the machine has been used 1000 hours, GSM-PLC send "SERVICE SIGNAL" to repair man [line 5].

Line 0: 'DI3&P1' WM30+1
Line 1: 'WM30>59' WM31+1
Line 2: 'WM31>59' WM32+1
Line 3: 'WM30>59' WM30=0
Line 4: 'WM31>59' WM31=0
Line 5: 'WM32=1000' "SERVICE SIGNAL" 0



Example #18: Password recognition using Word Pointer(GSM-PLC+control panel)

Password recognition uses WP (Word pointer). Password verification takes place, when all part of the password is inserted. Password can be changed afterwards, if needed.

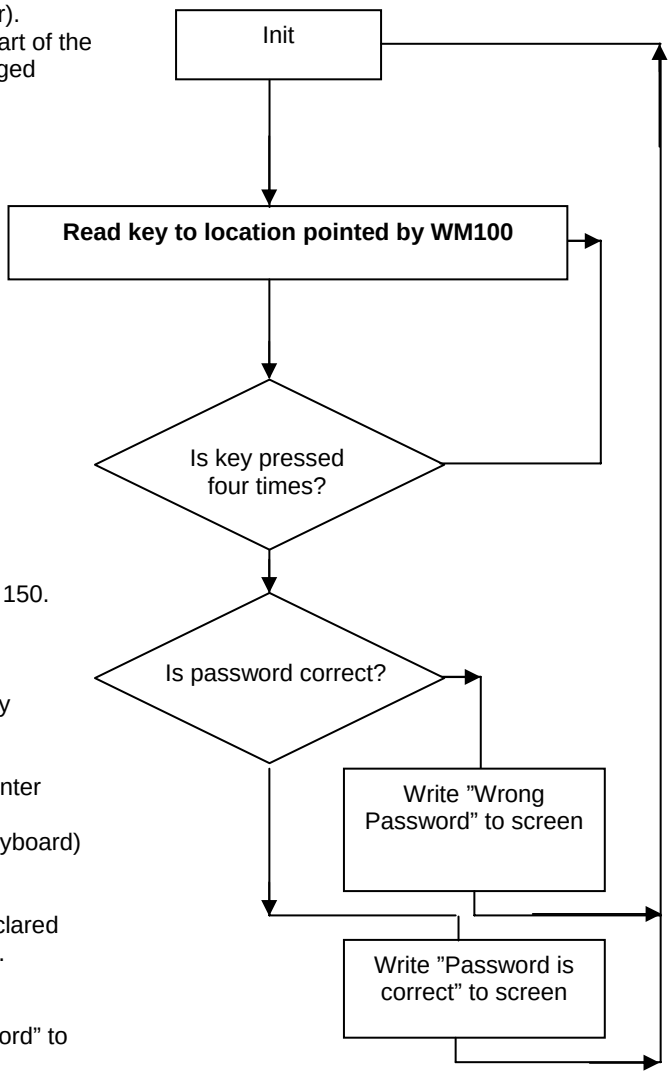


Table for password settings:

Character	Value of variable
0	12288 (3000H)
1	12544 (3100H)
2	12800 (3200H)
3	13056 (3300H)
4	13312 (3400H)
5	13568 (3500H)
6	13824 (3600H)
7	14080 (3700H)
8	14336 (3800H)
9	14592 (3900H)

Program:

Line 1:
Set password to 0123 and pointer WM100 to 150.
(RO207 – bit information from keys 0-7)

Line 2:
If key is pressed, write key number to memory location pointed
by WM100.
Increase key pressed counter by one and pointer WM100 by one.
(RO209 – last character received from the keyboard)

Line 3:
If first, second, 3rd and 4th number is like declared password, write “Wrong Password” to screen.

Line 4:
If password isn’t correct, send “Wrong password” to phone number 0 and initialise pointer.

Program:

Line 1: '!M0' WM50=12288 WM51=12544 WM52=12800 WM53=13056 WM100=150 M0=1 WM0=0 RO207=0

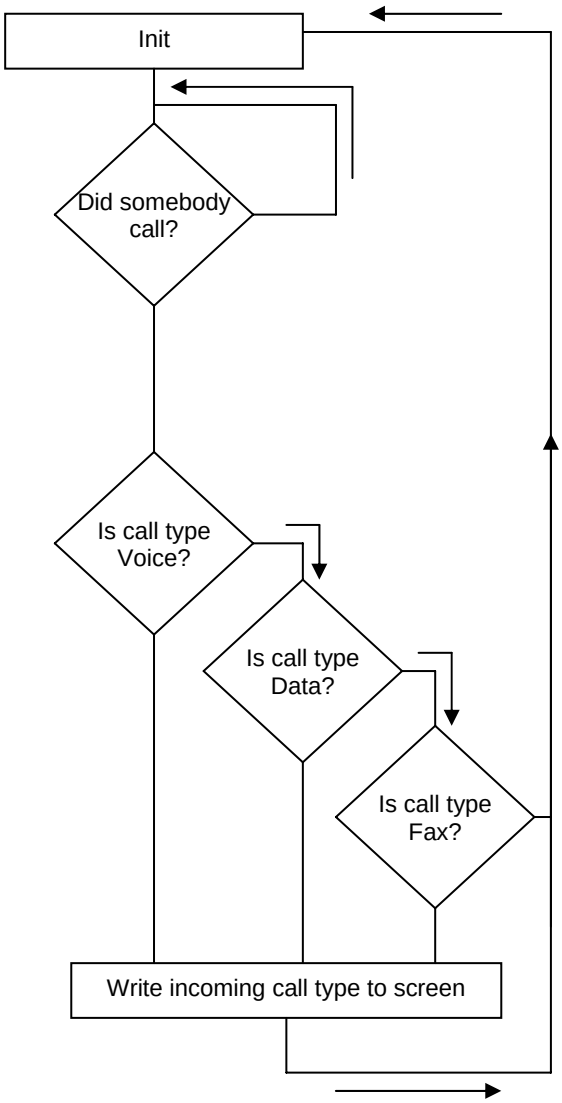
Line 2: 'RO209>0' WP100=RO209 RO209=0 WM0+1 WM100+1

Line 3: 'WM0=4&WM150=WM50&WM151=WM51&WM152=WM52&WM153=WM53' M0=0 WM0=0 "Password is correct" 255

Line 4: 'WM0=4' M0=0 "Wrong password!" 255

Example #19: Voice/Fax/Data call recognising

To recognise incoming call type, this example uses RO94. This register output recognises data, voice and fax calls. If this register output value is 1, the call type is voice, or if registry entry value is 2, call type is data and if registry entry value is 4, call type is fax.



Program:

Line 1:
Initialise incoming call type register (register output 94).

Line 2:
If RO94 is 4, writes FAX to screen.

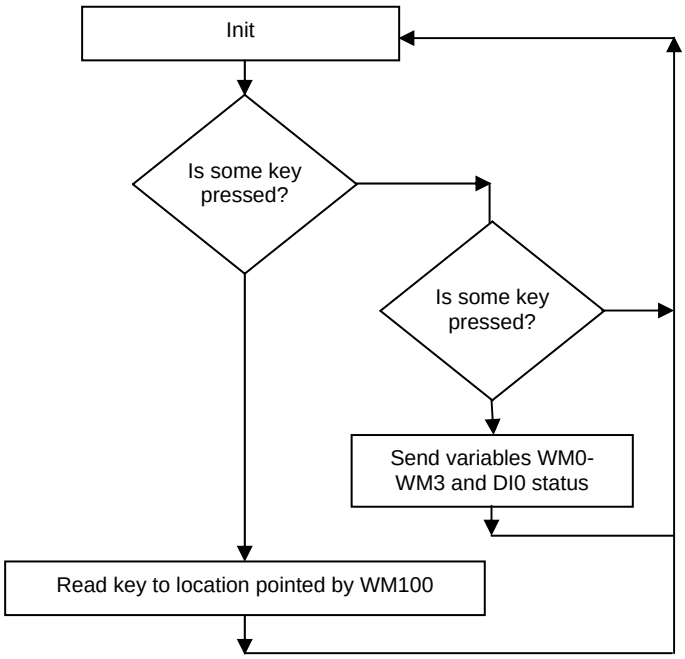
Line 3:
If RO94 is 1, writes VOICE to screen

Line 4:
If RO94 is 2, writes DATA to screen

```
Line 1:     '!M0' RO94=0 M0=1
Line 2:     'RO94=4' "FAX" 255
Line 3:     'RO94=1' "VOICE" 255
Line 4:     'RO94=2' "DATA" 255
```

Example #20: Sending the values of the variables

This program uses normal send command, to send variable value to GSM-phone.To send variable by SMS, put %-character before variable in normal send command (example "%WM0"). This example uses WP (Word Pointer) to read keys to variables (Read "Password recognition using Word Pointer" to more information about WP).



Program:

Line 1:
Initialise variables

Line 2:
If key is pressed, Read key to location pointed by WM100

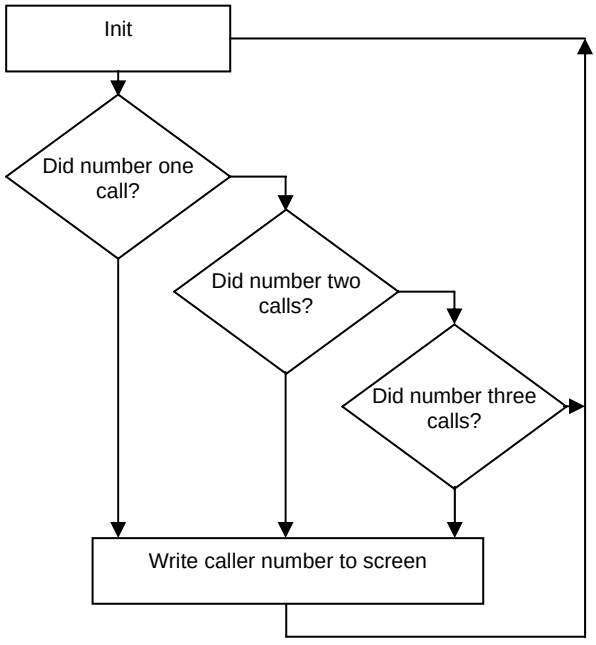
Line 3:
If GSM-PLC receive the SMS-message: $G, set memory 1.

Line 4:
If M1 is true send four first keys, that were pressed and the status of DI0.

```
Line 1:   '!M0' M0=1 WM100=0 WM0=0 WM1=0 WM2=0 WM3=0
Line 2:   'RO209>0' WP100=RO209 RO209=0 WM100+1
Line 3:   '($G)' M1=1
Line 4:   'M1' M1=0  M0=0 "YOU PRESS: %WM0@3 and the status of the digital input 0 is %DI0" 0
```

Example #21: Detect the phone number of the incoming call

Program can detect only those phone numbers, which are defined in the phone book. In example, T0 is 1st number in phone book, T1 is 2nd and T2 is 3rd.



Program:

Line 1:
If number 1 calls, write it to screen.

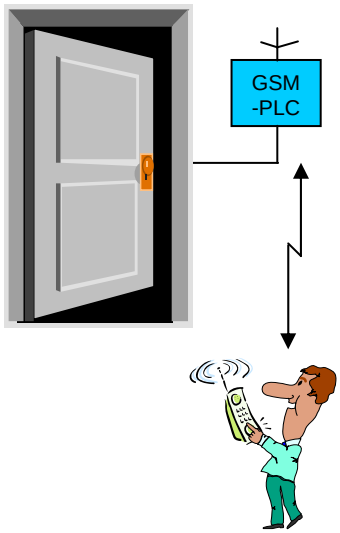
Line 2:
If number 2 calls, write it to screen.

Line 3:
If number 3 calls, write it to screen.

```
Line 1:          'T0' "Number 1 calling" 255
Line 2:          'T1' "Number 2 calling" 255
Line 3:          'T2' "Number 3 calling" 255
```

Example #22: Opening the door by calling (the door with electric lock)

This example calls to the predefined phone number.



Program:

Line 1:
If the telephone number 0 call, set memory 1.

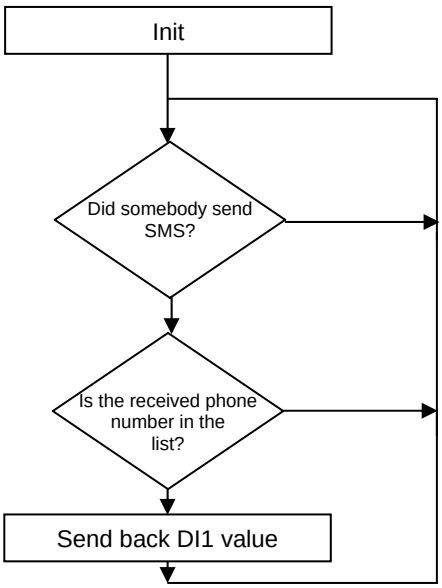
Line 2:
If the memory 1 is true, digital output 0 is true (=lock is open).

Line 3:
Reset memory 1 after 60 seconds (=lock is closed).

Line 1: 'T0' M1=1
Line 2: 'M1' DO0
Line 3: 'M1S60' M1=0

Example #23: Recognising incoming SMS number

This program recognises four phone numbers from phone book.
This example sends back the value of the DI0-variable,
if the phone book includes incoming phone number.



Program:

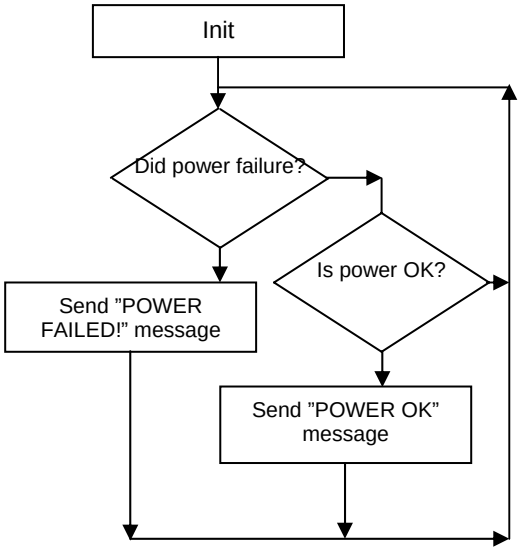
Line 1:
If PLC receives SMS "$INFO" from phone number 1-4…

Line 2:
… send back the value of the DI0-variable.

Line 1: '($INFO)&(N0#N1#N2#N3)' M1=1
Line 2: 'M1=1' M1=0 "DI0: %DI0" 254

Example #24: Detect power failure

Example uses Register Output 36, which will change to 1, when power failure is detected. Device will shut down automatically; two minutes after power fail detection. When somebody put power to GSM-PLC, this example sends message: "POWER OK" (if GSM-PLC has not power troubles). If troubles occurred, program sends SMS-message:
"POWER FAILED!".



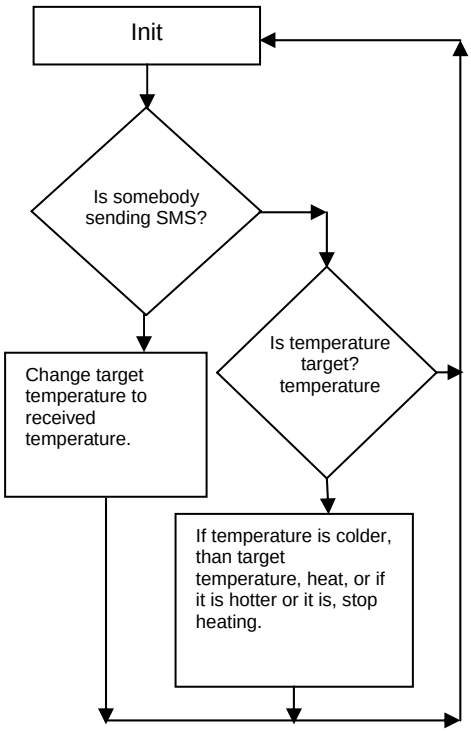
Program:

Line 1:
If power is OK or it is OK during the system start-up, send message to the phone number 0.

Line 2:
If power is failed or it fails during the system starts up, send SMS-message: "POWER FAIL!" to the phone number 0 .

Line 1: 'RO36=0' "POWER OK" 0
Line 2: 'RO36=1' "POWER FAIL!" 0

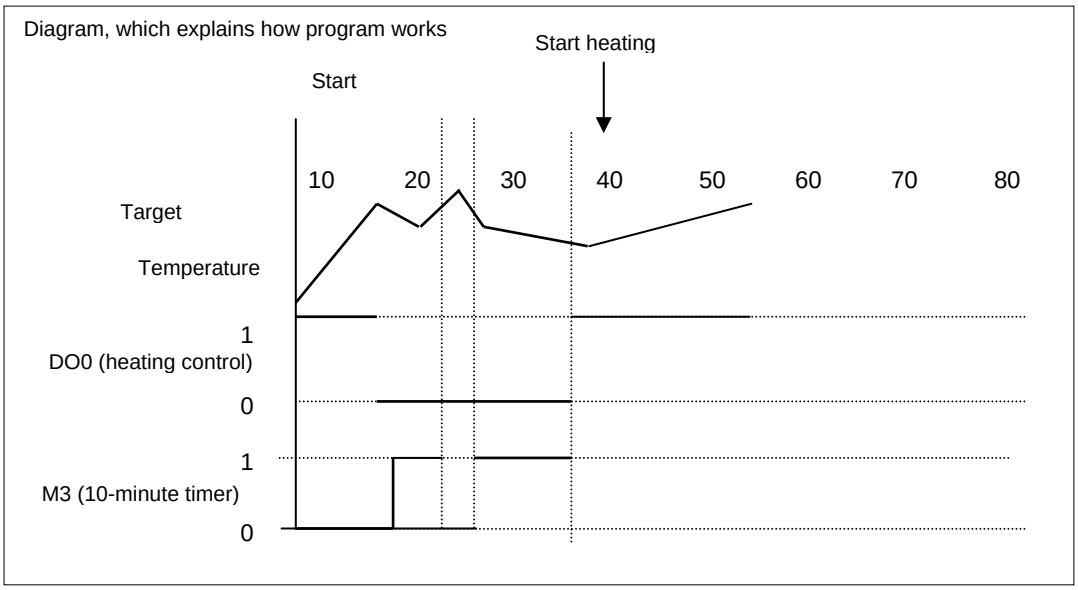
Example #25: Thermostat



This example compares room temperature to set temperature. if the room temperature is lower than the set temperature, puts heating on. If the room temperature is higher or equal to the set temperature, program puts off heating. If the room temperature is 1C° colder than the set temperature, the program starts ten-minute delay. If during this ten-minute delay temperature rises above the set value, counter stops.
If after 10 minutes delay temperature is still below the set value, turn heating ON.

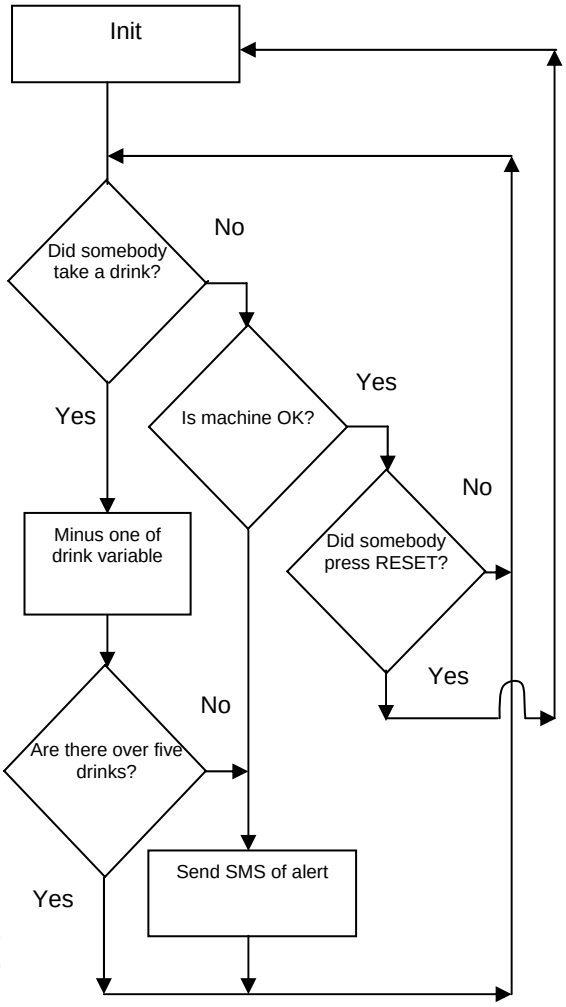
Line 1: When program starts, init variables.
Line2: If program gets message "$SET TEMP=xx", reset delay counter.
Line 3: If temperature is higher or equal to target temperature, close heating.
Line 4: If temperature is higher or it is the target temperature, set temperature, when ten-minute delay starts.
Line 5: If temperature is temperature, when "start ten-minute delay", starts delay.
Line 6: If ten minutes delay has started and program has got pulse, increment WM2.
Line 7: If program get minute pulse and temperature is higher than the setting ten minutes start delay, restart delay.
Line 8: If ten minutes is ago of temperature is lower or it is "start ten-minute delay", start heating.
Line 9: If temperature is lower than the target temperature, start heating.
Line 10: If GSM-PLC received "$SET TEMP" message, scale temperature parameter
to AD converter value (0..4000).

Line 1: '!M1' M1=1 WM0=20 WM0.20 WM0+1000 M2=0 WM2=0
Line 2: '($SET TEMP)' M0 M2=0 WM2=0
Line 3: '(AI1>WM0#AI1=WM0)' DO0=0
Line 4: 'AI1=WM0#AI1>WM0' M2=1 WM1=WM0 WM1-20
Line 5: 'M2&(AI1<WM1#AI1=WM1)' M3=1
Line 6: 'M3&P1' WM2+1
Line 7: 'M3&WM1<AI1&P2&!WM1=AI1' WM2=0 M3=0
Line 8: 'M3&WM2=600&(AI1=WM1#WM1>AI1)' M3=0 WM2=0 M2=0
Line 9: 'AI1<WM0&!M2' DO0=1
Line 10: 'M0=1' WM0.20 WM0+1000



Example #26: Vending machine

This example sends SMS-message to declared number, if there is less than five bottles left or there is some trouble in the vending machine. If the door of the vending machine is open, system doesn't send any alerts. SMS-message "$INFO" returns the "drinks left" information.



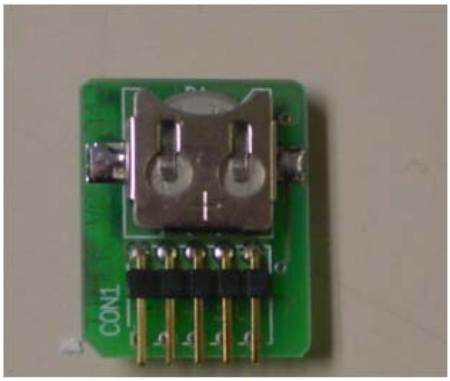
Program:

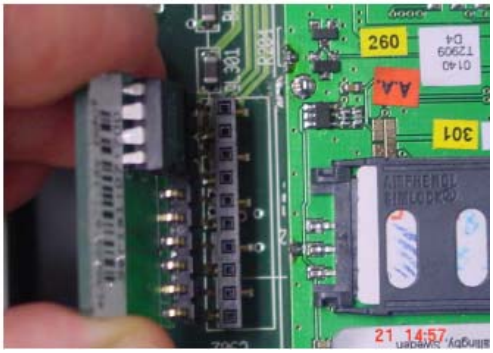
Line1: Initialise variables
Line 2: If drink 1, 2 or 3 was selected, remove one of WM0
Line 3: If drink 4 was selected, remove one of WM1
Line 4: If drink 5 was selected, remove one of WM2
Line 5: If GSM-PLC received SMS: "$INFO"
Line 6: Send back status SMS
Line 7: If there are five bottles of drink 1, send the warning SMS
Line 8: If there are five bottles of drink 2, send SMS
Line 9: If there are five bottles of drink 3, send SMS
Line 10: If there are no bottles of drink 1, send SMS
Line 11: If there are no bottles of drink 2, send SMS
Line 12: If there are no bottles of drink 3, send SMS
Line 13: If there are some troubles in the drink machine, send SMS

Line 1: '!M0#DI7' M0=1 WM0=60 WM1=20 WM2=20
Line 2: '(DI0=1#DI1=1#DI2=1)&WM0>0' WM0-1
Line 3: 'DI3=1&WM3>0' WM1-1
Line 4: 'DI4=1&WM4>0' WM2-1
Line 5: '($INFO)' M1=1
Line 6: 'M1=1' M1=0 "Drink 1: %WM0 Drink 2: %WM1 Drink 3: %WM2" 254
Line 7: WM0=5&!DI5' "There are five bottles left of drink 1, 2, 3" 0
Line 8: 'WM1=5&!DI5' "There are five bottles left of drink 4" 0
Line 9: 'WM2=5&!DI5' "There are five bottles left of drink 5" 0
Line 10: 'WM0=0&!DI5' "There are no bottles left of drink 1, 2, 3" 0
Line 11: 'WM1=0&!DI5' "There are no bottles left of drink 4" 0
Line 12: 'WM2=0&!DI5' "There are no bottles left of drink 5" 0
Line 13: 'DI6=1&!DI5' "Error detected" 0

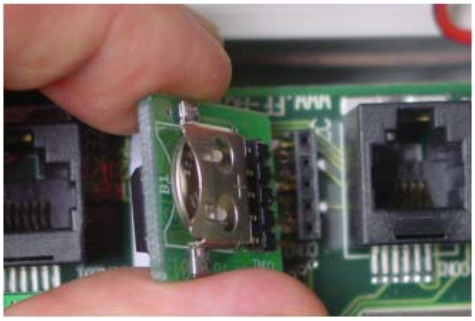
5. Additional modules

To provide functions, which are not included into standard PLC configuration, additional modules could be needed. Refer to product documentation to get additional information. Please follow common safety rules of static sensitive electronic devices when installing additional modules.





Analogue module (GSM4 unit in picture)



Time & date module to I2C bus (GSM4 in picture)