

Application examples
Mitsubishi Alarm Modem
MAM-GM6
MAM-GM20
MAM-GM24
with
Mitsubishi ALPHA2
V 1.0

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1 Alarm Modems At A Glance

Mitsubishi Alarm Modems are new automatic modems with a large data memory, several functions and integrated Internet technology. They are designed as intelligent communication computers with a 32-bit power CPU and a 2 MB non-volatile Flash memory. This can now be expanded by up to 64 MB, thus providing enough space for your data requirements now and in the future.

Mitsubishi Alarm Modems are fully automatic and can

- ~send alarm and status messages via SMS or Express E-Mail,
- ~receive switch commands via SMS or e-mail and forward them to a PLC,
- ~send the data of a connected PLC/system,
- ~exchange data between PLC/systems

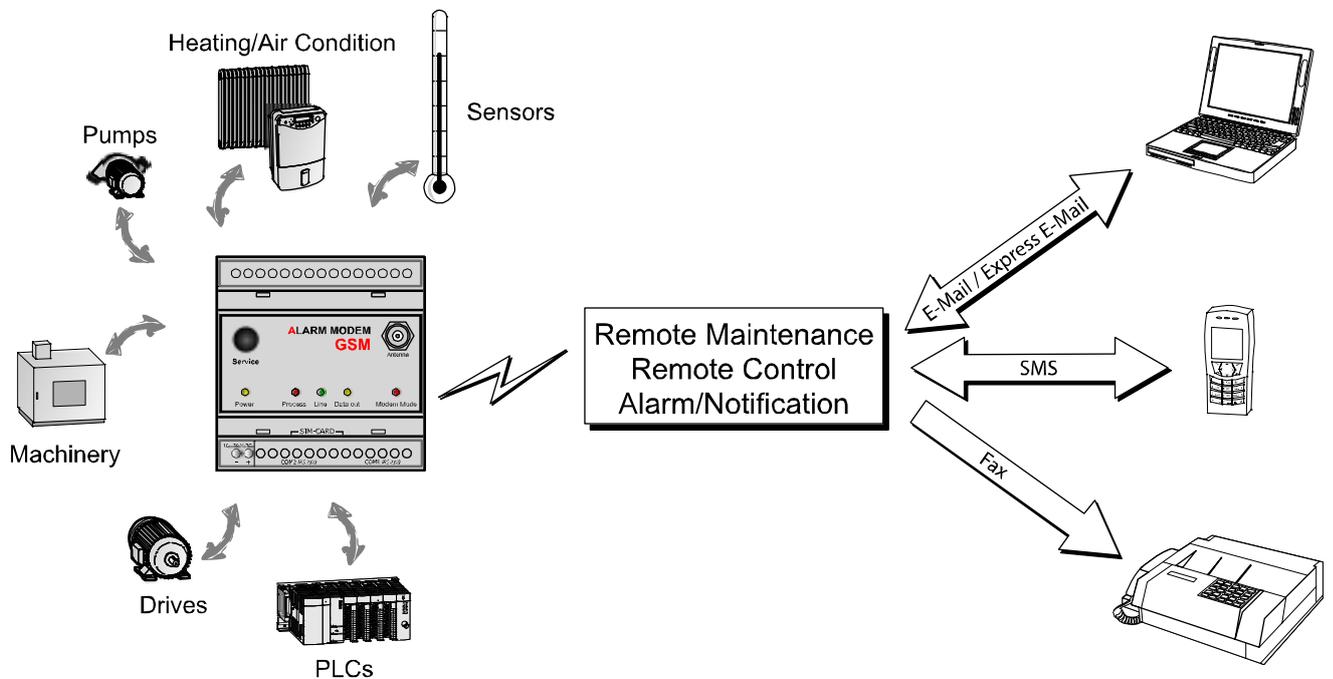
What's more:

- ~You can use them as "normal" modems for the remote access of PLCs or systems, and the programming software of the PLC can generally be used for this.

1.1 State-Of-The-Art Communication

The Mitsubishi Alarm Modem can communicate directly with the PLCs of several manufacturers using the relevant PLC protocol. Different bus systems are also supported. User-friendly XML-based software programs enable the required functions to be configured easily. The over twenty year history of modems being controlled by primitive AT commands can now be forgotten at last.

The wide range of functions available on the Mitsubishi Alarm Modems provide solutions for a number of applications such as the monitoring of temperature, pressures, levels, or the activation of motors, fans, pumps slide valves and flaps.



1.2 Easy To Retrofit

Mitsubishi Alarm Modems can be integrated in existing systems with a minimum of effort. The communication protocols of commonly used PLCs are already implemented and so modifications to the PLC program are normally not required.

2 Function overview

2.1 Integrated PLC protocols

Mitsubishi Alarm Modems can communicate directly with the PLCs of leading manufacturers using the relevant PLC protocol, and access PLC variables, markers and ports via the PLC programming interface. This can be achieved without having to adapt the PLC program or load a special function block for communication.

These protocols are supported:

- Alpha XL
- MELSEC FX1S/1N
- MELSEC FX2N//FX2NC

2.2 Alarming with acknowledgment

Mitsubishi Alarm Modems are fully automatic and can send status and fault messages to any recipient via SMS, fax, e-mail or Express E-Mail. Messages can be triggered by PLC variables.

Address book:

The SMS, fax and e-mail addresses (max. 100) are managed in an address book.

Messages:

The message texts (max. 100) can contain up to 100 actual values from the PLC and can be of any required length when used with faxes and e-mails.

Alarms:

Up to 100 alarms and actions such as switching commands can be defined.

Alarm cascade and acknowledgments:

Any number of freely definable alarm levels can be set up if message acknowledgment is required. If a message is not acknowledged within a specified time, other recipients can be notified. This can be cascaded as required.

2.3 Remote switching via SMS and Express-E-Mail

A short command via SMS or Express E-Mail can switch the optional outputs of the Mitsubishi Alarm Modem and those of a connected PLC. PLC variables can also be set in this way.

The execution of the command can also be acknowledged. 100 SMS switch commands with up to 10 parameters each can be defined as required. PLC variables can be queried simply and quickly by SMS command without the need for a PC.

2.4 Teleservice via PC

A Mitsubishi Alarm Modem can be used to handle the remote maintenance of several controllers via a telephone line. This is usually possible with the programming software in use. The variables and I/O ports of the PLC can also be read or written remotely online with the Mitsubishi Alarm Editor (MX-AME). The entire configuration of the Mitsubishi Alarm Modem can be carried out by remote dial-in and the logged data can be read "manually".

Secure

Optimum security is ensured since unauthorized dial-in attempts are prevented by means of a login procedure with user name and password. All dial-in and dial-in attempts are recorded.

Login

3 Application examples

This manual shows you the multi-purpose usage of the Mitsubishi Alarm Modem together with a ALPHA2 controller, especially if you have no experience with the Alarm Modem.

The already known ALPHA2 examples (available at <http://www.the-new-alpha.com>) are extended by alarm and switching facilities.

After reading this manual you will see what great advantage the Alarm Modem will be for your existing home, business or industrial applications.

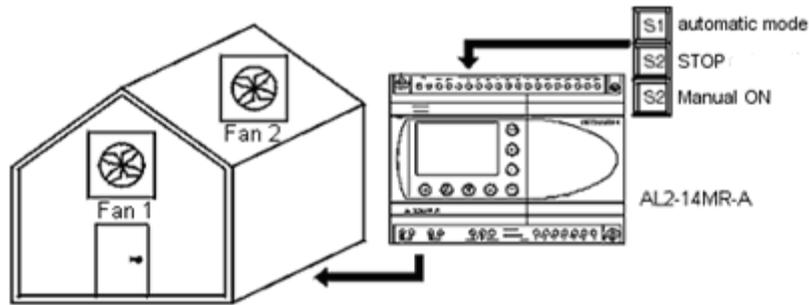
Where ever you are, you'll ever have the control of your system!

3.1 Ventilation Control of Greenhouse: Case 1

In this example ventilation fans are operated to regulate the density of carbon dioxide gas or warmth in a greenhouse. The ALPHA series' Hour Meter is used to control the ventilation fans in a long cycle period.

The second fan is controlled via a Delay Timer which sets a certain time difference between the starting time of the two fans.

3.1.1 Contents of Control



1. If the automatic mode button (S1) is pressed, the automatic operation of the ventilation fans starts. The cycle of one-hour operation and one-and-a-half-hour recess is repeated.
2. If the manual ON button (S3) is pressed, the fans start and the PLC switches to manual mode.
3. If the OFF button (S2) is pressed, the fans and the automatic mode stop.
4. Fan 2 starts 30 seconds after fan 1 has started.

3.1.2 Alarm Modem control extensions

The Mitsubishi Alarm Modem is used to monitor the system state and to control the fan operation mode.

1. A SMS with text "ALPHA STATUS" sends back a status report.
2. The automatic mode may be changed via SMS with text „ALPHA AUTO_OFF“ and „ALPHA AUTO_ON“. The sender will get a confirmation SMS.
3. In manual operation mode the fans may be controlled by SMS with text „ALPHA FAN_ON“ and „ALPHA FAN_OFF“. The sender will get a confirmation SMS.
4. With "ALPHA FAN_ON" the manual mode becomes active too.

3.1.5 Mitsubishi Alarm Modem Program

Read the software manual for further information about Alarm Modem programming tool MX-MAE.

At first register the variables to monitor and switch.

Name	Device	Type	Index	Access
✓ Alpha XL-DeviceState	Alpha XL	PLC Device State	0	Read
✓ automatic mode	Alpha XL	CB - Bit Operands Functions	1	Read/Write
✓ Fan 1	Alpha XL	O - Outputs	1	Read
✓ Fan 2	Alpha XL	O - Outputs	2	Read
✓ Fan control	Alpha XL	CB - Bit Operands Functions	2	Read/Write

Now create the message texts for status reports.

Message Name	Message Type	Message Text
✓ automatic mode	SMS	The automatic mode is {automatic mode} !
✓ Fan control	SMS	The fans are {Fan 1} ! Automatic mode: {automatic mode} !
✓ Status report	SMS	Automatic mode: {automatic mode}, Fan 1: {Fan 1}, Fan 2: {Fan 2}.

At last define the switching commands.

Type	Command	Switch	Variable	Switch To	Confirmation To	Type	Name of Message
✓ SMS Message	STATUS	Confirmation as status request			(Absender)	SMS	Status report
✓ SMS Message	AUTO_ON	to specified value	automatic mo...	1	(Absender)	SMS	automatic mode
✓ SMS Message	AUTO_OFF	to specified value	automatic mo...	0	(Absender)	SMS	automatic mode
✓ SMS Message	FAN_ON	to specified value	Fan control	1	(Absender)	SMS	Fan control
✓ SMS Message	FAN_OFF	to specified value	Fan control	0	(Absender)	SMS	Fan control

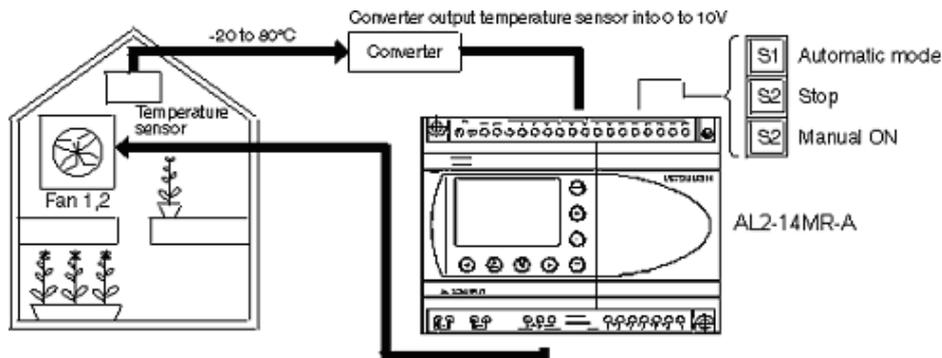
Note: All personal and modem specific details (PIN code etc.) and the PLC interface (COM1/COM2) has to be added/modified upon testing.

3.2 Ventilation Control of Greenhouse: Case 2

In this example ventilation fans are operated to lower the indoor temperature when it exceeds the specified ranges. A temperature sensor (thermocouple or Pt100) and the ALPHA series' analog input (0 to 10 V), Offset Gain, and Schmitt Trigger are used to control the ventilation fans.

The second fan is controlled via a Delay Timer which sets a certain time difference between the starting time of the two fans.

3.2.1 Contents of Control



1. If the automatic mode button (S1) is pressed, the automatic operation of the ventilation fans starts. If the indoor temperature exceeds 40 °C, the fans rotate until the temperature falls below 30 °C.
2. If the manual ON button (S3) is pressed, the fans start and the PLC switches to manual mode.
3. If the OFF button (S2) is pressed, the fans and the automatic mode stop.
4. Fan 2 starts 30 seconds after fan 1 has started.

3.2.2 Alarm Modem control extensions

The Mitsubishi Alarm Modem is used to control the humidifier and to monitor the system.

1. With a free phone call (depends on the country) the gardener will get a status report of the system.
2. The automatic mode may be controlled by SMS with text „ALPHA AUTO_OFF“ and „ALPHA AUTO_ON“. The sender will get a confirmation SMS.
3. In manual operation mode the fans may be controlled by SMS with text „ALPHA FAN_ON“ and „ALPHA FAN_OFF“. The sender will get a confirmation SMS.
4. With „ALPHA FAN_ON“ the manual mode becomes active too.
5. If the temperature exceeds 40°C for 10 minutes, the gardener will get a SMS.

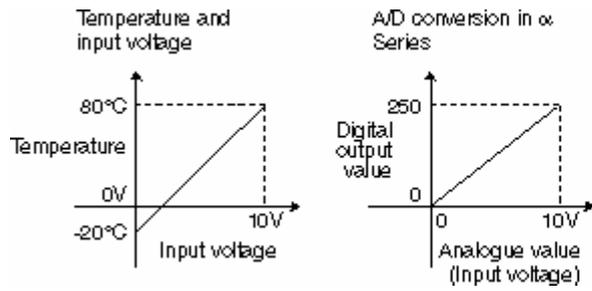
3.2.3 How to use a temperature sensor (thermocouple or Pt100) with the ALPHA series and how to convert a value into degrees [°C]

a) Using a temperature sensor (thermocouple) with the ALPHA series

The electromotive force is too small. Therefore, it needs to be converted into 0 to 10 V using a dedicated signal converter (available from specialist suppliers).

b) Converting the value into degrees [°C]

In this example -20 to 80 °C have to be converted into 0 to 10 V. Set the following linear function calculation in the Offset Gain function block to convert the input voltage into an analog value.

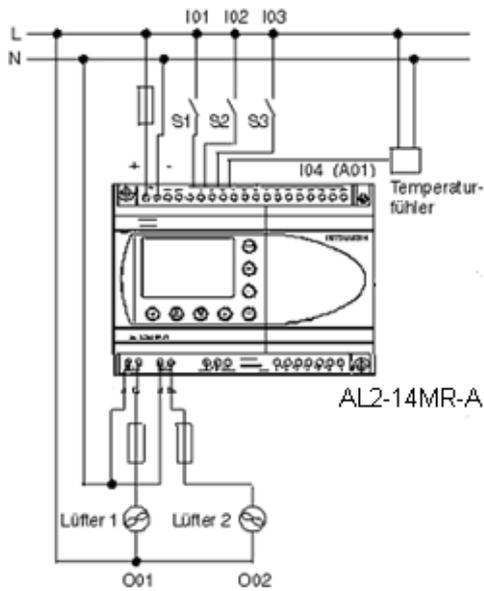


Operational expression for Offset Gain

$$\text{Temperature} (^{\circ}\text{C}) = \frac{2}{5} \times (\text{Digital value for input voltage}) - 20$$

3.2.4 Installing and Wiring

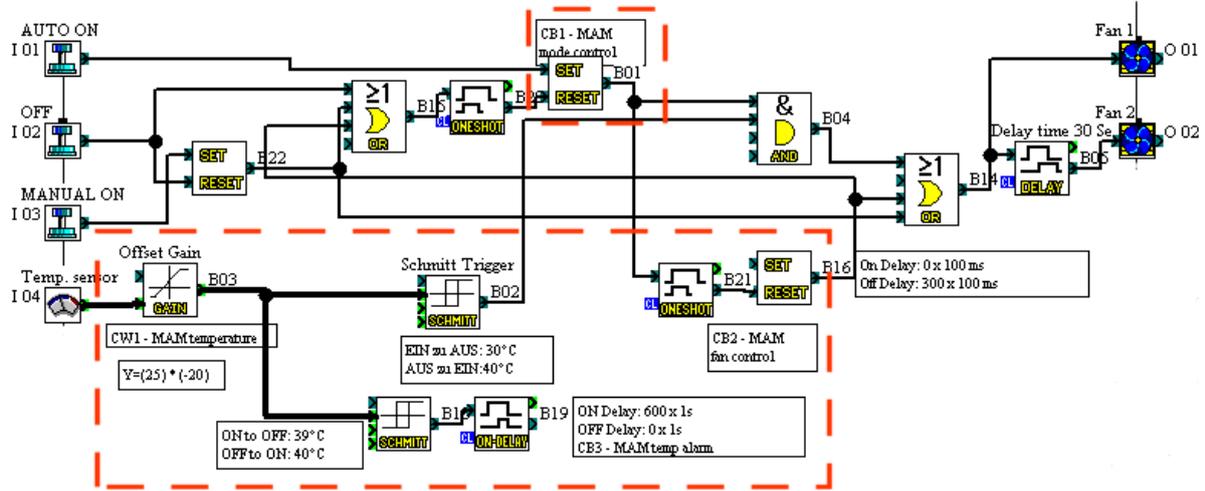
Refer to the ALPHA2 and Alarm Modem Hardware Manuals for correct installation and wiring procedures.



3.2.5 ALPHA2 Programm

The function blocks used by the Alarm Modem are marked. ALPHA2 „GSM and serial communication“ has to be set to option „Other“.

Refer to the ALPHA2 Programming Manuals for explanations concerning function blocks and program input. Refer to the a Software Manual when using the AL-PCS/WIN-E programming software.



3.2.6 Mitsubishi Alarm Modem Programm

Read the software manual for further information about Alarm Modem programming tool MX-MAE.

At first register the variables to monitor and switch.

Variables

Variables, Inputs and Outputs

	Name	Device	Type	Index	Access	Formatting
✓	Alpha XL-DeviceState	Alpha XL	PLC Device State	0	Read	(None)
✓	automatic mode	Alpha XL	CB - Bit Operands Functions	1	Read/Write	?
✓	Fan 1	Alpha XL	O - Outputs	1	Read	?
✓	Fan 2	Alpha XL	O - Outputs	2	Read	?
✓	Fan control	Alpha XL	CB - Bit Operands Functions	2	Read/Write	?
✓	Temperature	Alpha XL	CW - Word Operands Functions	1	Read	Fixed Point
✓	Temperature Alarm	Alpha XL	CB - Bit Operands Functions	3	Read	?

Now create the message texts for status reports.

Messages

Prepare Message Texts Not connected

	Message Name	Message Type	Message Text
✓	Automatic mode	SMS	The automatic mode is {automatic mode} !
✓	Fan control	SMS	The fans are {Fan 1} ! Automatic mode: {automatic mode} !
✓	Status report	SMS	Automatic mode: {automatic mode}, Temperature: {Temperature}, Fan 1: {Fan 1}, Fan 2: {...
✓	Temperature Alarm	SMS	Alarm: The temperature exceeded 40 degree celsius since 10 minutes. Current temperature:...

Next create the switching event.

Remote switching										
Remote Switching of Variables or Outputs via Messages (SMS, Express E-Mail)										
Not connected										
Settings	Type	Phone ...	Command	Switch	Variable	Switch To	Confirm...	Type	Name of Message	
✓ Call (caller ID)		+49172...		Confirmation as status ...				Gardener	SMS	Status report
✓ SMS Message			AUTO_ON	to specified value	automatic mode	1	(Sender)	SMS	Automatic mode	
✓ SMS Message			AUTO_OFF	to specified value	automatic mode	0	(Sender)	SMS	Automatic mode	
✓ SMS Message			FAN_ON	to specified value	Fan control	1	(Sender)	SMS	Fan control	
✓ SMS Message			FAN_OFF	to specified value	Fan control	0	(Sender)	SMS	Fan control	

For the temperature alarm a recipient is added to the address book (change number!).

Address Book		
Create Recipients & Manage Contacts		
Contact	Name	SMS Number
✓	Gardener	+49-172-1234567

At last define the alarm.

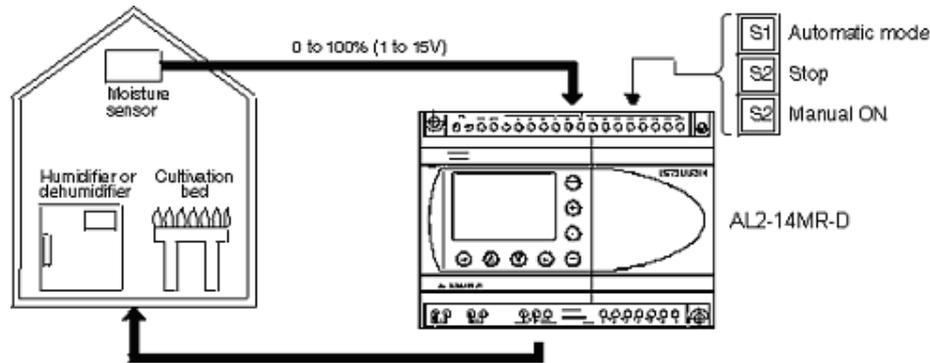
Alarms							
Link events, contacts and messages to alarms and cascade these alarms.							
Not connected							
Alarm	Name	Event	Variable	Trigger	Contact	Communication...	Message
✓	Temperature Alarm	Variable Change	Temperature Alarm	On Reac...	Gardener	SMS	Temperature Alarm

Note: All personal and modem specific details (PIN code etc.) and the PLC interface (COM1/COM2) has to be added/modified upon testing.

3.3 Humidity Control in Greenhouse

In this example a humidifier is operated to increase the humidity in a greenhouse when it falls below the specified percentage. A humidity sensor and the ALPHA series' analog input (0 to 10 V), Offset Gain, and Schmitt Trigger are used to control the humidifier.

3.3.1 Contents of Control



1. If the automatic mode button (S1) is pressed, the automatic operation of the humidifier starts. The humidifier is operated when the indoor humidity falls below 50% until it reaches at least 70%.
2. If the manual ON button (S3) is pressed, the humidifier starts and the PLC switches to manual mode.
3. If the OFF button (S2) is pressed, the humidifier and the automatic mode stops.

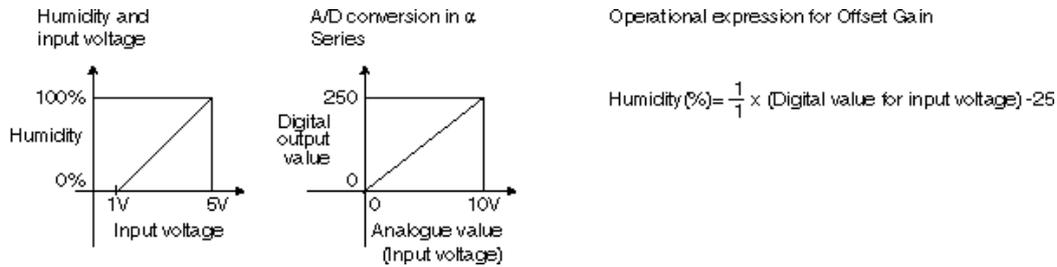
3.3.2 Alarm Modem control extensions

The Mitsubishi Alarm Modem is used to control the humidifier and to monitor the system.

1. With a free phone call (depends on the country) the gardener will get a status report of the system.
2. The automatic mode may be controlled by SMS with text „ALPHA AUTOMATIC X“. To switch the automatic mode ON use X=0, to switch it OFF use X=1. The gardener will get a confirmation SMS.
3. In manual operation mode, the humidifier may be controlled by SMS with text „ALPHA HUMIDIFIER X“. Use X=1 to activate and X=0 to deactivate the humidifier. The gardener will get a confirmation SMS.
4. With “ALPHA HUMIDIFIER 1” the manual mode becomes active too.
5. If humidity is below 30% , the gardener will get an SMS.

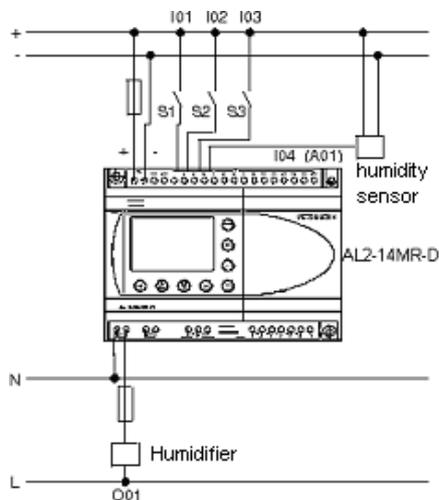
3.3.3 How to convert output of humidity sensor (1 to 5 V) into humidity percentage (%)

In this example 0 to 100 % have to be converted into 1 to 5 V. Set the following linear function calculation in the function block Offset Gain to convert the input voltage into an analog value.



3.3.4 Installing and Wiring

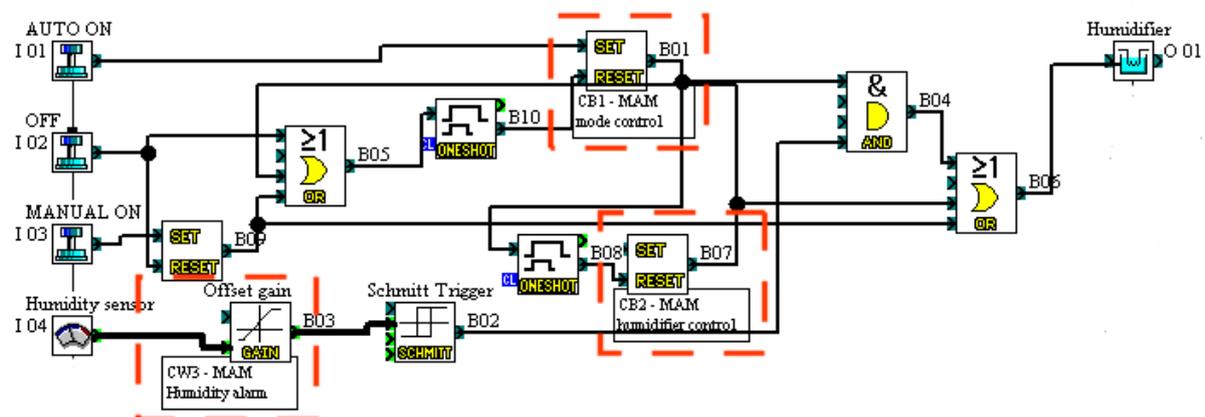
Refer to the ALPHA2 and Alarm Modem Hardware Manuals for correct installation and wiring procedures.



3.3.5 ALPHA2 Programm

The function blocks used by the Alarm Modem are marked. ALPHA2 „GSM and serial communication“ has to be set to option „other“.

Refer to the ALPHA2 Programming Manuals for explanations concerning function blocks and program input. Refer to the a Software Manual when using the AL-PCS/WIN-E programming software.



3.3.6 Mitsubishi Alarm Modem Program

Read the software manual for further information about Alarm Modem programming tool MX-MAE.

At first register the variables to monitor and switch.

Name	Device	Type	Index	Access	Formatting
✓ Alpha XL-DeviceState	Alpha XL	PLC Device State	0	Read	(None)
✓ automatic mode	Alpha XL	CB - Bit Operands Functions	1	Read/Write	?
✓ Humidifier	Alpha XL	O - Outputs	1	Read	?
✓ Humidifier control	Alpha XL	CB - Bit Operands Functions	2	Read/Write	?
✓ Humidity	Alpha XL	CW - Word Operands Functions	1	Read	Fixed Point

Now create the message texts for status reports.

Message Name	Message Type	Message Text
✓ Automatic mode	SMS	The automatic mode is {automatic mode} !
✓ Humidifier control	SMS	The Humidifier is {Humidifier} ! Automatic mode: {automatic mode} !
✓ Humidity Alarm	SMS	Alarm: Humidity below {Humidity}!
✓ Status report	SMS	Automatic mode: {automatic mode}, Humidity: {Humidity}, Humidifier: {Humidifier}.

Next create the switching events.

Type	Phone Number	Command	Switch	Parameter P1	Confirmation To	Type	Name of Message
✓ Call (caller ID)	+491721234567		Confirmation as stat...		Gardener	SMS	Status report
✓ SMS Message		AUTOMATIC	Via parameters	automatic mode	Gardener	SMS	Automatic mode
✓ SMS Message		HUMIDIFIER	Via parameters	Humidifier control	Gardener	SMS	Humidifier control

For the temperature alarm a recipient is added to the address book (change number!).

Name	SMS Number
✓ Gardener	+49-172-1234567

At last define the alarm.

Name	Event	Variable	Lower Limit	Upper Limit	Trigger	Contact	Com...	Message
✓ Humidity Alarm	Variable Change	Humidity	0	30	On Reaching	Gardener	SMS	Humidity Alarm

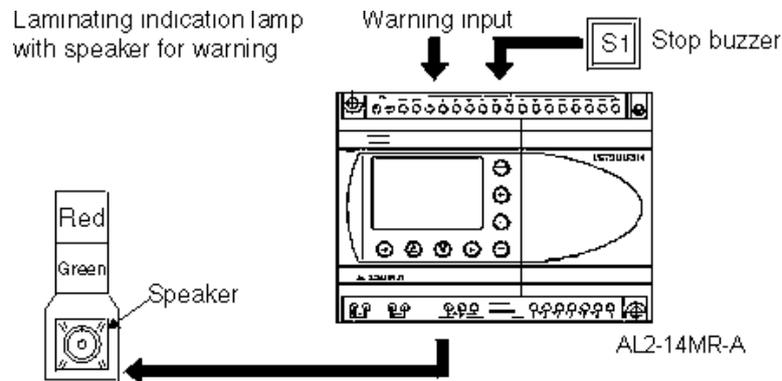
Note: All personal and modem specific details (PIN code etc.) and the PLC interface (COM1/COM2) has to be added/modified upon testing.

3.3.7 Control of Laminating Indication Lamp

In this example a laminating indication lamp and a buzzer are controlled according to the alarm output of a machine. The ALPHA series' Flicker is used to turn on or flash the laminating signal lamp.

The ALPHA series can be used for an annunciator.

3.3.8 Contents of Control



1. If the alarm input is switched ON, the red lamp is lit and the buzzer sounds. When the stop buzzer switch is switched to ON, the buzzer stops and the red lamp starts to flash until the alarm input switches it OFF (ON: 5 s, OFF: 10 s).
2. If the alarm input is set to OFF the green lamp is lit.

3.3.9 Alarm Modem control extensions

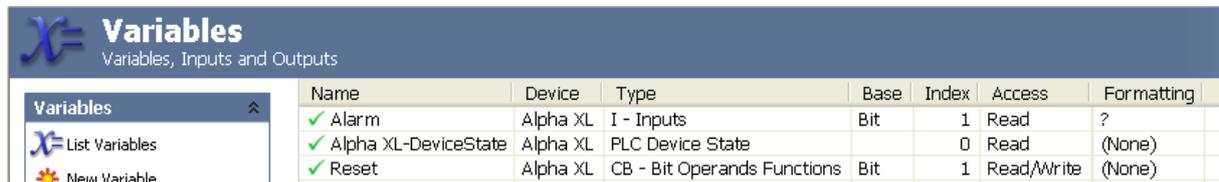
The Mitsubishi Alarm Modem is used to send alarm messages with several alarm levels (cascading).

1. Upon an alarm, the service technician will get a SMS with acknowledge request. If the sms is not acknowledged within 5 minutes, the technician will get a second SMS with acknowledge request. After additional 5 minutes the office will get a fax message.
2. The alarm signal may be reset via SMS text "ALARM RESET".
3. If the communication between Alarm Modem and ALPHA2 is broken, the service technician will get an SMS.

3.3.12 Mitsubishi Alarm Modem Program

Read the software manual for further information about Alarm Modem programming tool MX-MAE.

At first register the variables to monitor and switch.



Name	Device	Type	Base	Index	Access	Formatting
✓ Alarm	Alpha XL	I - Inputs	Bit	1	Read	?
✓ Alpha XL-DeviceState	Alpha XL	PLC Device State		0	Read	(None)
✓ Reset	Alpha XL	CB - Bit Operands Functions	Bit	1	Read/Write	(None)

Now create the message texts for status reports.



Message Name	Message Type	Subject	Message Text
✓ Alarm	SMS		Alarm occurred ! Please send back to acknowledge. Reset alarm signal ! Ack...
✓ Alarm, Level 2	SMS		2nd Level Alarm ! Attention: Acknowledge alarm by sending back this mess...
✓ Alarm, Level 3	E-mail, Express ...	Alarm occurred !	Alarm occurred ! Service technician not available ! Reset the alarm signal.
✓ Alarm-Reset	SMS		Alarm successfully reset.
✓ PLC-Failure	SMS		The Alarm Modem does not get any data from the PLC. Check cables !

Next create the switching event.



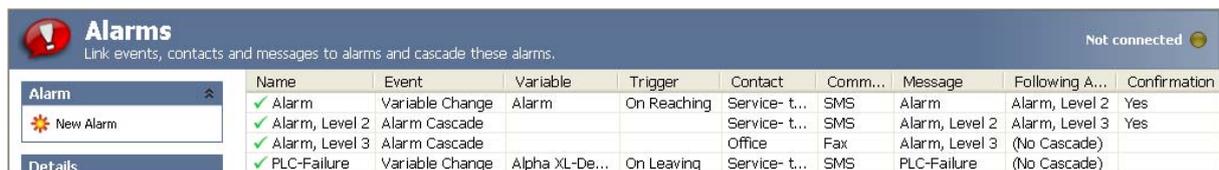
Type	Command	Switch	Variable	Switch To	Confirmation To	Type	Name of Message
✓ SMS Message	RESET	to specified value	Reset	1	(Sender)	SMS	Alarm-Reset

Add the recipient "Gardener" to the address book (change number!).



Name	SMS Number	Fax Number
✓ Service- technician	+49-172-1111111	
✓ Office		+49-30-1234567

At last define the alarms.



Name	Event	Variable	Trigger	Contact	Comm...	Message	Following A...	Confirmation
✓ Alarm	Variable Change	Alarm	On Reaching	Service- t...	SMS	Alarm	Alarm, Level 2	Yes
✓ Alarm, Level 2	Alarm Cascade			Service- t...	SMS	Alarm, Level 2	Alarm, Level 3	Yes
✓ Alarm, Level 3	Alarm Cascade			Office	Fax	Alarm, Level 3	(No Cascade)	
✓ PLC-Failure	Variable Change	Alpha XL-De...	On Leaving	Service- t...	SMS	PLC-Failure	(No Cascade)	

Note: All personal and modem specific details (PIN code etc.) and the PLC interface (COM1/COM2) has to be added/modified upon testing.