# CONTRIVE

## AL2+GSM.4

**GSM MODEM EXPANSION MODULE FOR MITSUBISHI ALPHA CONTROLLERS**



## EN USER GUIDE

| | | |
|---|---|---|
| 2310.00.91 | AL2+GSM.4 | BARE BOARD ENGINE |
| 2310.14.91 | AL2-14MR-D.GSM | ALPHA CONTROLLER WITH GSM MODULE |
| 2310.24.91 | AL2-24MR-D.GSM | ALPHA CONTROLLER WITH GSM MODULE |

### DECLARATION OF CONFORMITY
R&TTE Directive 1999/5/EC

**Company identification:** Manufacturer: Contrive, Srl
Via Enrico Fermi 18  24040 Suisio  Italy

**Product identification:** Brand: Contrive
Equipment name: AL2+GSM.4
Equipment type: GSM/GPRS modem

**We declare on our sole responsibility, that the product described above, equipped with Telit GE863-QUAD module is in compliance with the essential requirements of the 1999/5/CE Directive:**

**EN 301 511** Radio spectrum
**3GPP 51.010-1** Radio spectrum

- Health and safety requirements pursuant to clause 3.1a:
  **EN 60950-1** Low voltage Directive

- Protection requirements concerning EMC clause 3.1b:
  **EN 301 489-1** Electromagnetic compatibility
  **EN 301 489-7** ElectroMagnetic compatibility and Radio spectrum Matters
  Specific conditions for mobile and portable radio and ancillary equipments

This unit is FCC approved as module to be installed in other devices and conform to the following US Directives:

**FCC 47 Part 24** RF spectrum (GSM 1900)
**FCC 47 Part 15** Electromagnetic compatibility

NOTE: If the final product is intended for portable use, a new application and FCC is required. Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and to have their complete product tested and approved for FCC compliance.
Interference statement:
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Suisio, Italy August 28, 2006

CE 0168 ISSUE DATE: 13/12/2005 NUMBER: NC/12622 - 01

FC UNDER APPROVAL

## SAFETY INFORMATION

Do not install this unit near medical devices like pacemakers or hearing aids. This unit may interfere with the operation of these devices.

Switch off this unit when flying.
Secure it so that it cannot be switched on inadvertently.

Do not install this unit near petrol stations, fuel depots, chemical plants or blasting operations when this unit can disturb the operation of technical equipment.

Interference can occur if this unit is used near televisions, radios or personal computers.

If the device has been stored in a cold environment, then condensation can occur. Before starting operations, the device must be absolutely dry. Thus, an acclimatization period of at least three hours must be observed.

In order to avoid possible damage, we recommend that you only use the specified accessories.
These have been tested and shown to work well with this unit.

This device should be installed only by qualified personnel. Carefully read the instruction manual in its entirety and keep it safe for future reference.
It is essential to know the information and comply with the instructions given in the manual to ensure the fitting is installed, used and serviced correctly and safely.

This RF unit is not designed for and intended to be used in portable applications (within 20 cm or 8 inches of the body of the user) and such uses are strictly prohibited.

This unit is not authorised for use as critical component in life-support devices or systems unless a specific written agreement has been given.

If incorrectly installed in a vehicle, the operation of GSM device could interfere with the correct functioning of vehicle electronics. Verification of the protection of vehicle electronics should form a part of the installation.
Regulations must be considered to operate a vehicle's light or horn on public roads.
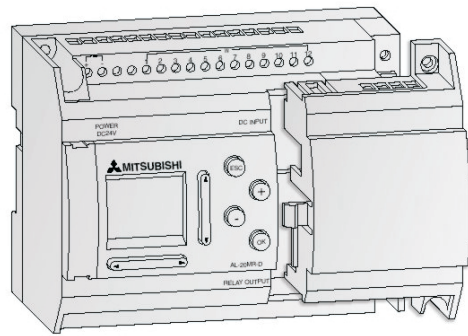
No complex software or hardware system is perfect.
Bugs are always present in a system of any size.

In order to prevent danger to life or property, it is the responsibility of the system designer to incorporate redundant protective mechanism appropriate to the risk involved.
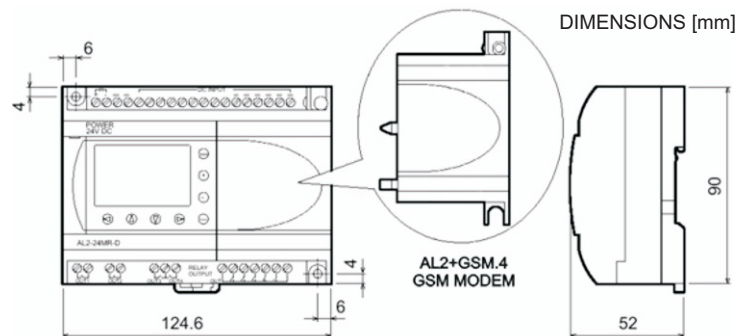
All units are 100% functionally tested. Specifications are based on characterisation of tested sample units rather than testing over temperature and voltage each unit.

Contrive disclaims all liability for damage to the fitting or to other property or persons deriving from installation, use and maintenance that have not been carried out in conformity with this instruction manual, which must always accompany the fitting.

## PRODUCT DESCRIPTION



**AL2+GSM.4** modem is an industrial GSM terminal installed into the simple application controller Mitsubishi Alpha XL enabling enhanced features:
SMS messages can be sent to mobile phones and e-mail accounts once 2 parameters are correctly configured.
SMR output changes on incoming SMS commands.
CD output changes on incoming call from recognised users.
Remote program editing, simulation and monitoring via data connection.
Industrial standard interface and an integrated SIM card reader mean it can be used rapidly, easily and universally as a GSM remote control for use in domestic and industrial environments.
Further information can be found in the 2 HARDWARE and PROGRAMMING MANUALS from MITSUBISHI.

DIMENSIONS [mm]



## CARE AND MAINTENANCE

Your AL2+GSM.4 is the product of advanced engineering, design and craftmanship and should be treated with care. The suggestion below will help you to enjoy this product for many years.

- Do not expose the unit to any extreme environment where the temperature or humidity are out of operating range.
- Do not use or store the unit in dusty or dirty areas. Its moving parts (SIM holder for example) can be damaged.
- Do not use chemical cleaning agent on the unit or the SIM card.
- Do not attempt to disassemble the unit or remove any part or label. There are no user serviceable parts inside.
- Do not expose the unit to water, rain or spilt beverages. It is not waterproof.
- Do not abuse the unit by dropping, knocking or violenty shaking it. Rough handling can damage it.
- Do not place the unit alongside computer discs, credit or travel cards or other magnetic media. The information contained on these devices may be affected.
- This unit is under your responsibility. Please treat it with care respecting all local regulations. It is not a toy. Therefore, keep it in a safe place at all times and out of the reach of children.
- Treat the SIM card with the same care as your credit card: do not bend or scratch or expose it to static electricity.
- Try to remember your unlock and PIN codes. Become familiar with and use the security features to block unautorised use and theft.

Both fixed and mobile applications are allowed, as defined below:

**Fixed** means that the device is physically secured at one location and is not able to be easily moved to another location.

**Mobile** means that the device is designed to be used in other than fixed locations and generally in such a way that a separation distance of at least 20 cm (8 inches) is normally maintained between the transmitter's antenna and the body of the user or nearby persons.

Do contact an authorized service center in the unlikely event of a fault in the unit.

## PRODUCT FEATURES

Quad band GSM850 / EGSM900 / DCS1800 / PCS1900 with automatic band selection for data, sms, fax and voice applications.
Full Type Approved and compliant with ETSI GSM Phase 2+.

| | |
|---|---|
| Output power: | Class 4 ( 2W @ 850 MHz & 900 MHz)<br>Class 1 ( 1W @ 1800 MHz & 1900 MHz) |
| Sensitivity: | -107 dBm @ 850 MHz & 900 MHz<br>-106 dBm @ 1800 MHz & 1900 MHz |
| Temperature: | operating -10 to 55°C [1]<br>storage and transport –30 to 85°C |
| Relative humidity: | operating 5 to 95% non-condensing<br>storage & transport 5 to 95% condensation allowed outside |
| Power supply: | 24VDC from Alpha controllers expansion connector |
| Power consumption: | < 40 mA (standby) < 100 mA (transmission) |
| Weight: | < 90 g |
| Degree of protection: | IP 40 (EN-60529 / IEC 529) properly fitted |
| Interface: | EIA-RS232 (5V level) |
| Control Inputs: | A01 - Modem Start / Stop<br>A02 - Modem Reset |
| Control Outputs: | E01 - Modem On<br>E02 - SIM card detected<br>E03 - Jammer detection |
| Logic Signals: | M12 - Data carrier detected<br>M13 - Registered<br>M14 - Remote access |

[1] The unit can operate from -30 to 80°C but sensitivity, performance and MTBF

## INSTALLATION

- This device should be operated only by qualified personnel.
- Disconnect all terminals from power supply before removing the cover.
- Turn off the power before performing any wiring operations.
- Do not operate the bare board unprotected by plastic enclosure.
- Do not pull on the antenna cord: the device may be damaged.
- Connect the external antenna before tu turn on the power supply.
- Leave a minimum of 10mm of space for ventilation between the top and bottom edeges of the controller and the enclosure walls.
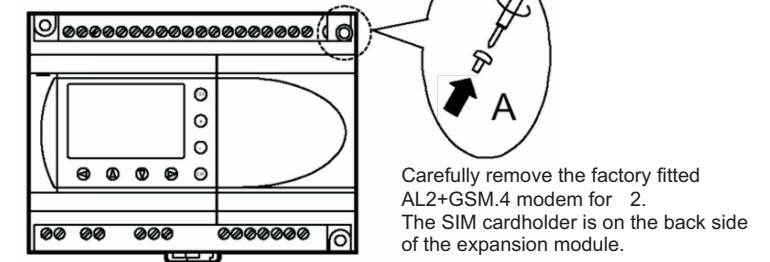
Read carefully the original technical literature provided by MITSUBISHI, available for download at: *http://www.mitsubishi-automation.com*

**WARNING**
Once an 2 controller is equipped with the AL2+GSM.4 modem module no other internal expansion module can be installed.
AL2+GSM.4 doesn't need the AL2-GSM-CAB cable to operate.
Once AL2+GSM.4 module has been installed the connection for the AL2-GSM-CAB cable is no longer available.
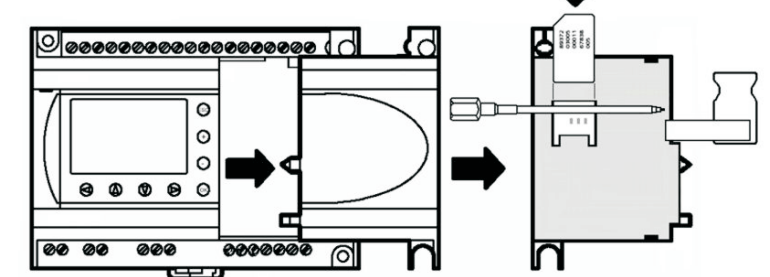
## SIM CARD

AL2+GSM.4 is already installed into expansion slot of Alpha controllers.
You must insert a 3V SIM card in the cardholder to put the unit into operation.
Make sure that there is no voltage applied to Alpha controller.
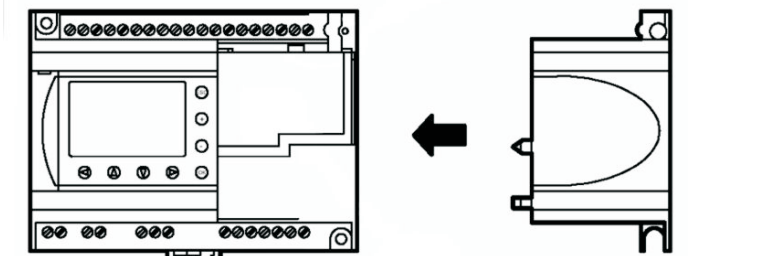
Release screw [A] and keep.



Carefully remove the factory fitted AL2+GSM.4 modem for 2.
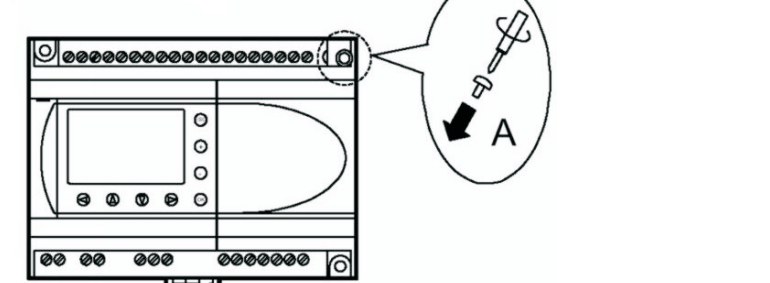The SIM cardholder is on the back side of the expansion module.

Insert the SIM card in the receptacle, contacts must be on the bottom (board) side.
To remove the SIM card gently pull the SIM card out.



Replace the 2 cover taking care that there is no interference with AL2+GSM.4 and all connector and cables are in the correct position.



Tighten screw [A] to a torque of 0.4 N/m.
Do not operate without top cover, once the SIM card has been inserted replace the top lid and then connect power supply.



## ANTENNA

A multi-band antenna must be connected to the RF interface, implemented as a 50Ω FME male coaxial jack at the end of a short RG174 cable stub exiting from the top right side of the device.
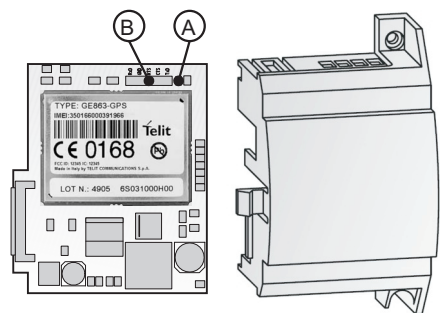The antenna must fulfil the requirements given below:

| Frequency Range | Standard Quad Band GSM/DCS/PCS frequency | |
|---|---|---|
| Bandwidth | 80 MHz GSM band<br>170 MHz DCS band<br>140 MHZ PCS band | |
| Impedance | 50 ohms | |
| VSWR | recommended | < 2 : 1 |
| | maximum | 10 : 1 |
| Gain | < 3 dBi | |
| Input power | > 2 W peak | |

**CAUTION !**
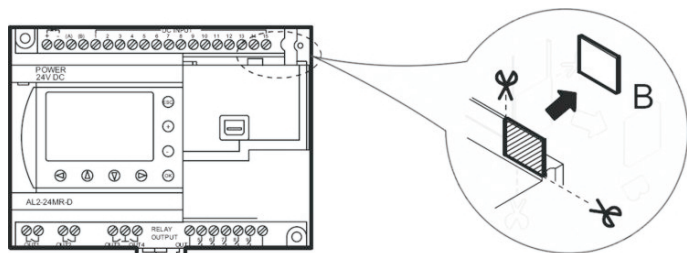Avoid excessive torque tightening the coaxial jack.

## INSIDE AL2+GSM.4

Although it's not necessary, the modem board can be removed from plastic cover.

A    LED indicator is located on the top right corner.
B    Communication socket is provided for service purposes only.



## OPERATING STATUS / INDICATOR

If you want the status LED indicator is visible from outside, remove the small plastic screen [B] shown in the figure above.



| LED | STATUS |
|---|---|
| OFF | Modem OFF |
| Fast blinking 0,5s ON - 0,7s OFF | Network search Not registered Turning off |
| Slow blinking 0,3s ON - 2,7s OFF | Standby Registered full service |
| ON | Call in progress |

**Network search**
In the network search state the AL2+GSM.4 searches for a GSM network in order to register to main operator or to the roaming service provider.
The network search takes few seconds until AL2+GSM.4 is registered.
If the LED indicator continues to flash rapidly, this means that no SIM card is inserted, an incorrect PIN number was provided or the antenna is missing.

**Standby**
In the Standby state, the AL2+GSM.4 is registered in the network.
Paging is performed with the GSM network in order to obtain synchronisation with the GSM network.
Power consumption in this state depends on the current network availability.

**Call in progress**
When an incoming call is detected or issuing a call, a connection on the network is established. If α2 is configured for REMOTE ACCESS AL2+GSM.4 will respond to incoming calls, establishing a data link.

⚠️ **WARNING**
If the GSM signal strength is less than -109dBm, AL2+GSM.4 could not operate, verify the signal quality from Alpha controller display.

## SIM PIN

The simplest way is to put your SIM card into a cellular phone and program it so it won't ask for the PIN. The SIM card is 'open' and someone could steal the SIM card, use it and read the information inside.

**Enable PIN Code**
Detailed instruction about PIN code can be found on *Communication Manual* provided by MITSUBISHI.

**Change default SIM PIN**
It's possible to change the default PIN code provided by your operator using any GSM mobile phone or SIM card reader/writer.
Insert the SIM card into the SIM card holder and follow the operating instructions provided by phone manufacturer.
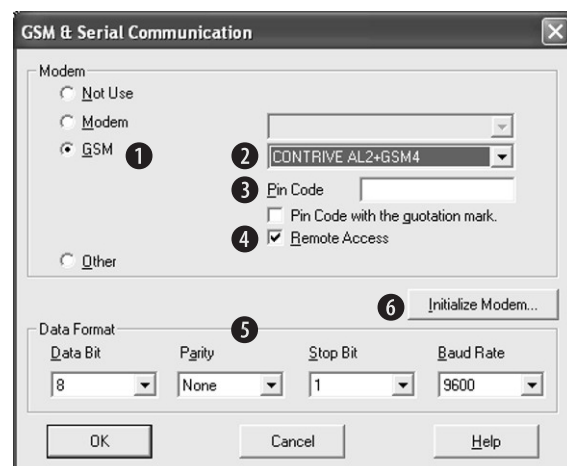
⚠️ **WARNING**
If you insert a SIM card that asks for a PIN number different from that stored into α2, the AL2+GSM.4 will not operate.
If you turn on α2 controller 3 times incorrectly, SIM card will lock up and you must provide the PUK (PIN Unblocking Key).

## CONFIGURATION

GSM Modem parameters can be entered from the front panel keys as described in α2 COMMUNICATION MANUAL.
Easy settings is available using the Visual Logic Software (VLS): choose *Option* from the menu bar and click *GSM and Serial Communication*, the following dialog box will be displayed:



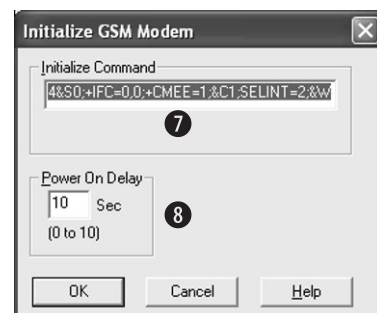Check **[1]** to enable the use of *GSM* Modem.

Select the appropriate modem type Contrive **AL2+GSM.4** from the list **[2]**. If the option isn't available, update the GSM.ini file located in the directory Program Files\Alvls\BIN downloading latest version from *www.gsm-control.biz*.

If your SIM card is protected by *PIN code* insert the correct PIN in the box **[3]**.

If you want to enable *Remote Access* through GSM connection for control and program upload, check **[4]**.
Leaving this option unchecked the modem can send and receive SMS and calls but no remote data connection is allowed.

Changing default communication parameters **[5]** the initialization string must be updated to new settings.

You may edit predefined initialization string, click *Initialize Modem...* **[6]** and the following dialog box will open:



You can enter AT commands **[7]** that will be sent from α2 to GSM modem (only once at α2 start-up).

It's possible to define a delay time **[8]** before α2 try to make a connection to GSM modem.
Since the modem must be turned-on within the user program, it's suitable to set 10 seconds for modem start-up.

## INPUTS / OUTPUTS

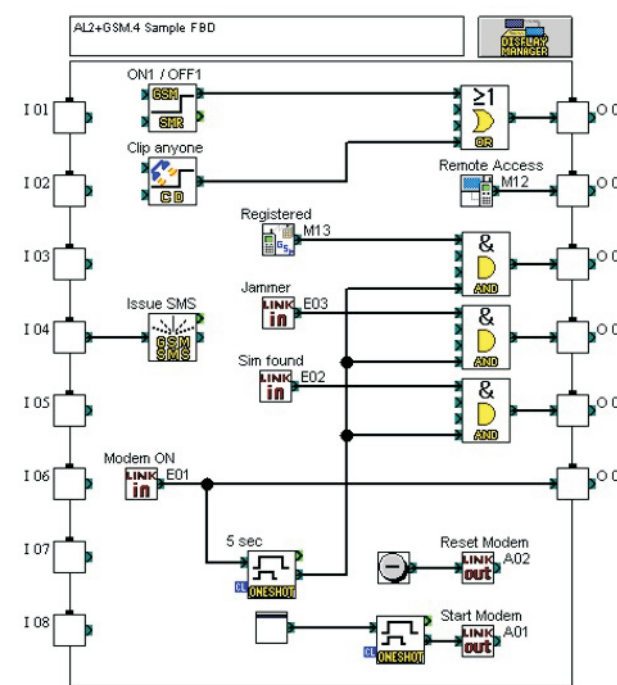Some specific inputs and outputs are used to control the **AL2+GSM.4** modem :

| SIGNAL | I/O | DESCRIPTION |
|---|---|---|
| A01 | OUTPUT | Turn ON/OFF GSM modem (pulse > 1s) |
| A02 | OUTPUT | Reset GSM modem |
| E01 | INPUT | Modem running |
| E02 | INPUT | Valid SIM card found |
| E03 | INPUT | Jammer detected |
| M12 | INPUT | Data carrier detected |
| M13 | INPUT | GSM network registration |
| M14 | INPUT | Remote access |

⚠️ **CAUTION**
To use both *Remote Access* **[4]** and Call Detect at same time, define the number of rings ' x ' in *ATS0=x* longer than *Number of RING before call detect* otherwise the controller try to establish a data connection with calling party before to serve the incoming control call.

## EXAMPLE



In the above simple Visual Logic Software (VLS) program example the controls available for GSM Modem **AL2+GSM.4** are shown.

At power on a 2 sec pulse generated by ONE SHOT function will turn on the modem activating the specific output [A01]. Instead of automatic start it's possible to use an input or a key to trigger the modem.

Specific input **[E02]** indicates that a valid SIM card is detected.

Once the GSM Modem is started the input **[E01]** becomes active turning on the linked output **[O06]**.

To avoid false indication while the GSM modem is OFF, logic signals generated by AL2+GSM.4 will be considered only after 5 sec from regular modem start.

After a predefined delay time **[8]** α2 try to establish a connection with the modem, once the modem is registered in the network the Special Function Input **[M13]** will turn on. The status of this special input will be updated periodically.

A special input **[E03]** is available to indicate the presence of a disturbing device such as a communication **JAMMER.** This feature can be very important in alarm, security and safety applications that rely on the module for communications. In these applications, the presence of a JAMMER device can compromise the whole system reliability and functionality and therefore shall be recognised and reported for countermeasure actions.
An example scenario could be an intrusion detection system that uses the module for sending the alarm indication to the system owner, and thief incomes using a Jammer to prevent any communication through the network.
In such a case, the module detects the JAMMER presence even before the break in and can trigger an alarm siren.

A special output **[A02]** is provided to reset the GSM modem. This feature can be used to recover from critical situation.

Using the front panel keys it's possible to verify the signal strength, the status of the modem and errors that could occur.

Refer to COMMUNICATION MANUAL for details.

## REMOTE CONTROL

In the example above output 1 **[O01]** is controlled using two special features:

When an incoming call is detected the output will be activated.
It's possible to leave this control option open to anyone or specify the authorised telephone number (Caller Line Identification Presentation must be enabled on the caller phone).

The output is activated or deactivated following the remote control command defined and received like SMS.
It's possible to leave this control option open to anyone or specify the authorised telephone number (Caller Line Identification Presentation must be enabled on the caller phone).

In the example above a message will be issued when input 4 **[I04]** is closing.
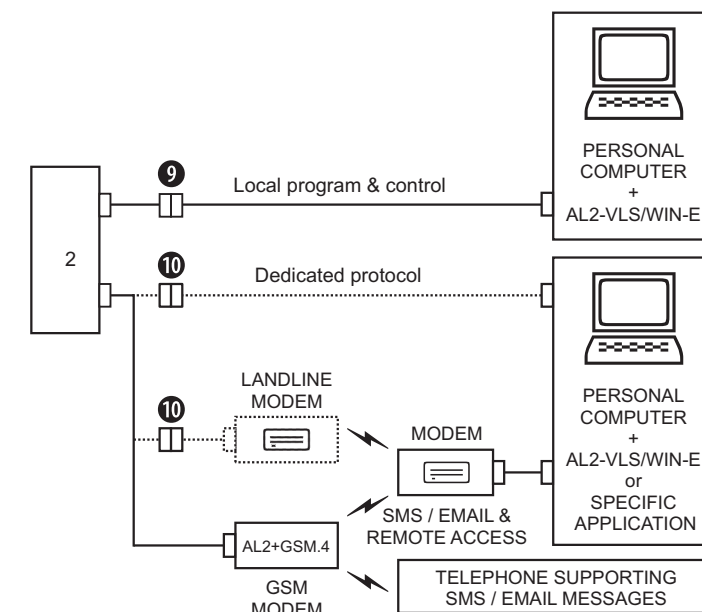
The text shown on the display will be sent to specified destination like SMS or Email, depending on specific configuration.

Refer to COMMUNICATION MANUAL for details.

## COMMUNICATION CAPABILITIES

The α2 Controller has a wide range of communication capabilities that include remote programming, sending SMS messages to telephones or Emails accounts.



The α2 Controller can be used to monitor and control machines in remote stations and notify maintenance personnel in case of machine error or emergency situations. Remote monitoring through the AL-VLS/WIN-E software (version 2.00 onwards) can provide machine production and status updates as well as enable programming or parameter updates without the necessity of local access.

While the AL2+GSM.4 is installed into α2 or an external device is linked through AL-232-GSM cable **[10]**, it will be possible to use left side com port to communicate with local Personal Computer through specific cable **[9]** AL2-232-CAB.

ℹ️ SMS delivery failure is usually less than 1% but you must keep in mind that a message could not arrive and you cannot complain with your operator for this.

🗑️ This product is subject to Directive 2002/96/EC of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE) and, in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste.
Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

CONTRIVE RESERVES THE RIGHT TO MODIFY THE CHARACTERISTICS STATED IN THIS INSTRUCTION MANUAL AT ANY TIME AND WITHOUT PRIOR NOTICE.

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