5 Technical Specification

Power Supply	12-24VDC 500mA Max. (26-15mA)
Relay Output	5A Max. CATII 120VAC
SIM	1.8/3.6V
GSM Frequency	900/1800MHz
Antenna	50Ω SMA

6 SMS Command Set Summary

Command	Action			Comments
MASTER	*number*	.		
ADD	*number*	.		
REM	*number*	.		
LIST				
CLEARALL				also clears MASTER
CALL	**LIST**	ANY		
TXTRES	**DIS**	EN		
CONN	**NONE**	CL	OP	
STAT				
INTXT	**DIS**	EN		
INLVL	**OP**	CL		
TXTNUM	***<master>***	*number*	.	set by MASTER
RLYMODE	**NO**	TOG		
RLYTIME	*<seconds>*			default 3s
RLYTIME	*<minutes>*m	.		relay time in minutes
CSQ				get RSSI
PRGSIM				clear SIM
DIAL	*number*	*interval (days)*	*time (s)*	PAYG Keep Alive
DIAL	**OFF**			(switch off DIAL)
OPEN				activate relay
OPEN	*<seconds>*			open for *<seconds>* seconds
OPEN	*<minutes>*m.			open for *<minutes>* minutes
CLOSE				reset relay
QUERY/QNUM	*number*	.		find number in memory

Developed and Manufactured by
Advent Controls Ltd, Liverpool, UK
Made in UK

GSM Relay Board

Alpha 1.02
Application Firmware 1.12

Open-on-Call Access Control with Text Alert

www.adventcontrols.co.uk

Contents

4.3   Output Connection

The relay output has Normally Open (NO) and Normally Closed (NC) relative to COMmon (COM) connections. These can be actuated in a momentary operation or can be toggled (see **3 Setup**).

The connections are 'voltage free' with no connection to +VE or GND. The relay connections have a minimum creepage distance of 2.5mm and are CATII rated to 150V.
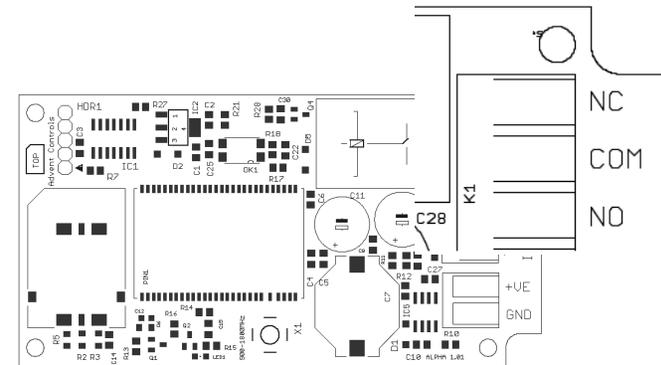
4.4   Antenna Connection

The standard antenna can be used where a strong signal exists. In areas with a poor signal an external antenna is recommended connected via RG174 coaxial cable. The system uses standard SMA connectors.

4.5   Mounting

The PCB has been designed to fit into a Hammond 1591B enclosure. When mounting the unit into such an enclosure the enclosure must be modified to allow for the antenna/coaxial cable to be connected.
When mounting in a metal cabinet, an external antenna must be used, connected using 50ohm impedance coaxial cable. If required, please contact support@adventcontrols.co.uk for assistance.

4   Installation

4.1   Power Connection

A fused DC power supply of between 12 and 24VDC should be used with this product. The maximum current the system will draw depends on the input voltage but should not exceed 500mA at 12V (26mA @idle).
The power connection should be made to the terminals labelled +VE and GND.

4.2   Input Connection

The input is optically isolated from the main circuitry and is shorted to ground (GND) to become active (LOW). The two terminals labelled 'INPUT' should be connected to an otherwise unused switch.

1.   Introduction

The Advent Controls Alpha relay board has been primarily designed for barrier access control applications although can be used as a general purpose call activated relay. The board also features an optically-isolated DC input which can be used to trigger the sending of a Short Message Service (SMS) status message.

The relay can be activated by a call from up to 55 stored telephone numbers or can be configured to activate when receiving a call from any number. By default the call will not be answered and hence costs the caller nothing. However, the system can be set to connect a call when either the input is open or closed. This allows the input status to be determined even when the SIM card does not have credit for SMS text messages.

Setup and operation is performed by simple SMS text messages including adding and removing user telephone numbers. A complete list of accepted telephone numbers can be viewed via SMS text message. The memory can also be scanned to see if it contains an individual number and the result is display by the on-board LED and (if enabled) by SMS text message.

The output relay has both Normally Open (NO) and Normally Closed (NC) with Common (COM) connections. The action of the relay can be a single timed actuation from either 1s to 999s or 1 to 999 minutes or the relay can be set to toggle between calls.

2.   Operation

2.1   Registration

A valid GSM Subscriber Identity Module (SIM) card must be present in the SIM holder for the system to operate. Immediately on power up the system will attempt to register on the SIM card on it's home network. Once registration has occurred the LED1 will change from flashing approximately once every second to a momentary flash once every three seconds. If the LED1 continues to flash for some time the system cannot register the SIM on the network. The system will restart should this occur. If the problem persists check the antenna and strength of signal in your area/validation of the SIM card.

The second LED, LED2 found by the 5 pin header, is used to display result of a command. The LED will flash twice to acknowledge the successful receipt of a command and will light continuously for 3s to show the instruction has failed. It also illuminates during any call (valid or invalid) and lights continuously when a signal cannot be found.

2.2   Command Message Format

To operate the system a master GSM phone is used to send SMS text messages to the system telephone number. All message follow a similar format as follows:

COMMAND<space>action. (eg. Master 07000000000.)

The command (see Table 1) is always written first followed by a space and the action required. Although not necessary, it is useful to include a full stop immediately after the action as some mobile phones can enter superfluous characters at the end of a message, which can invalidate the message. The message is **not** cAsE sensitive.

2.3 Master Number Setup

All functions are controlled via one master GSM mobile phone. The system must first be associated with this phone's number before it can be used. To do this the supplied 2.54mm jumper connector must be fitted to pins 3 & 4 on HDR1 as shown in red in Figure 1. A new Alpha PCB will be supplied with the jumper already fitted in this position. Do not connect the jumper to any other pins or damage may result.
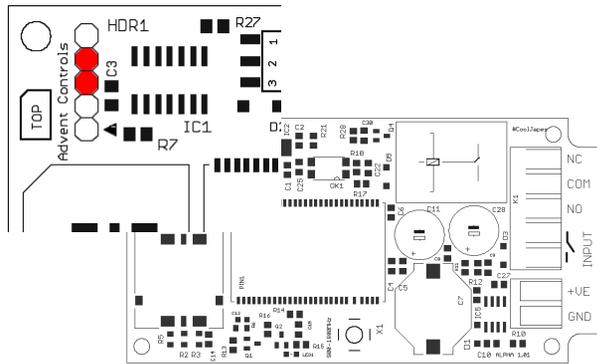
The master phone number must then send an SMS text message to the Alpha system phone number as follows:

MASTER *number*.

For example, if the master telephone number is 07000 000 000 the message should read:

MASTER 07000000000.

Also valid are the following:

Master 07000000000 and master 07000000000

The following messages are invalid:

master 07000 000 000. (spaces in the number)
master07000000000 (no space after 'master')

To test that the master number has been successfully set it is recommended that the system telephone number is now called. This will activate the output relay. Ensure some time has passed to allow your network operator to send the SMS text message. This can take several minutes when the network is busy. If the master number setup has failed the system MUST be powered down and restarted with the jumper in place before a second attempt is made.

RLYMODE NO   relay Normally Open (NO)

3.2 Relay Activation Time

The RLYTIME command is used to adjust the time the relay is active following a call when RLYMODE is set to NO. By default the relay time is set to 3s. The time can be set from 1s to 999 seconds or 1 to 999 minutes using this command.

To change the activation time the master number sends a SMS text message as follows:

RLYTIME *seconds*.

e.g.   **rlytime 1.**   1 second activation time
      rlytime 250s   250 second activation time
      Rlytime 1m.   1 minute activation time
      RLYTIME 960m.   16 hour (16 x 60mins) activation time

3.3 Signal Strength Indicator

When setting up the system it is important to know the strength of signal for reliable operation. To receive a message showing the Received Signal Strength Indicator (RSSI) the CSQ command is sent to the system as follows:

CSQ

When the system SIM card has sufficient credit a SMS text message is sent to the master/TXTNUM number displaying the current RSSI.

e.g. >RSSI 21

The RSSI can be converted to an approximate Signal to Noise Ratio (SNR) in decibels using the following formula:

RSSI (dBm) = -113 + 2x(CSQ value)

It is recommended that the minimum signal level for the installation is 20 (-73dBm) to ensure reliable operation. The system will operate below –100dBm but may become unresponsive at times.
To achieve an improved RSSI the standard antenna can be upgraded to a model with higher gain and/or the antenna should be positioned in an area with less physical obstruction. An extension lead can be attached to the SMA connector on the PCB to locate the antenna away from the control unit housing. It is not recommended to use an extension greater than 3m in length. LED2 will light continuously if the RSSI is indeterminate due to low signal integrity (CSQ value = 99).

3.4 Purging Messages from SIM

The PRGSIM command is used to remove any unwanted messages from the SIM card or to stop the system processing any messages sent when it was switched off. The master number send the following command to purge all messages from the SIM:

PRGSIM

When sent with additional time information the relay is activated for however many seconds or minutes specified.

e.g. **OPEN**   activates relay like a call as per RLYTIME/RLYMODE

open 1.   1 second activation time
Open 250s   250 second activation time
OPEN 1m.   1 minute activation time
open 960m.   16 hour (16 x 60mins) activation time

CLOSE   deactivates relay under all conditions

2.16 Response SMS Text Number

By default the system send any response text messages to the master number. However, the response number can be changed by using the TXTNUM command. This applies to all SMS text responses. To change the response number the following SMS text message is sent to the system by the master number:

TXTNUM<space>*number*.

e.g. **txtnum 07000000000.**

2.17 SIM Keep Alive Call

When using a Pay As You Go (PAYG) SIM card, to avoid SIM card deactivation, the system can periodically call a telephone number to keep the SIM active. Ensure the SIM card has sufficient credit to make a call even if the call goes un-answered. To setup the Keep Alive Call function the following SMS text message is sent to the system:

DIAL<space>*number,frequency,call-time*.

e.g. **DIAL 07000000000,10,25.** (dial 07000000000 every 10 days for 25 seconds)

Frequency—number of days interval
Call-time—total call time including dialling & conncetion

3 Setup

3.1 Relay Activation Mode

When a valid call is received the relay can be set to activate for a set period of time (set by the RLYTIME command) or to toggle between states on each call. By default the relay mode is set for timed activation. To switch to toggle mode the following message is sent to the system by the master number:

RLYMODE TOG   enables toggle mode

To revert to timed mode the following message is sent:

2.4 Adding a User Number

Any telephone number of at least 5 digits where caller ID is available is valid. The system only compares the last 8 digits of any calling number against the numbers stored in memory. Therefore it is not necessary to enter the international dialling code format of the telephone number.

i.e. for 070**00000000** only the characters shown in **BOLD** text are considered

The ADD command is used to add a new telephone number. To add a new number the master phone must send the following SMS text message to the system telephone number:

add<space>*number*.   e.g. **Add 07000000000.**

If TXTRES is enabled the system will respond with the 'Operation Successful' message.

2.5 Removing a User Number

The REM command is used to remove an existing telephone number. To remove an existing telephone number the master phone must send the following SMS text message:

rem<space>*number*.   e.g. **REM 07000000000.**

If TXTRES is enabled the system will respond with the 'Operation Successful' message. If the number is not found the 'Operation Failed' message will be sent by the system.

2.6 Viewing the Valid Number List

The system can send an SMS text message containing a complete list of valid user numbers to either the master telephone or the number set by the TXTNUM command.

To receive the list of numbers the LIST command is used. The master phone must send the following SMS text message to the system:

List

No further characters are required and are ignored if received.

The response format shows the last 8 digits of the stored number followed by a space and the next number and so on…(the mater will appear as a 6 digit number)

e.g. 00000000 11111111 22222222 33333333 etc…

2.7 Finding a Number in the Memory

To find whether a number is stored in the memory the user send the following command to the board:

QUERY<space>*number*.   or
QNUM<space>*number*

If the number is present the LED will flash 4 times and if not in the memory the LED will light twice for 2 seconds. If TXTRES is enabled an SMS text message will be sent with the result.

2.8 Clearing All Numbers

The CLEARALL command is used to erase all stored user and master numbers. To erase all numbers the following SMS text message is sent by the master number:

CLEARALL

No response is sent by the system to acknowledge the command

2.9 Enabling Any Number

The system can be setup to allow any number to operate the relay output. To enable any call the CALL command is used with the action ANY and is sent by the master phone in the following format:

Call any

To return the system to operate from only valid user numbers the LIST action is sent with the CALL command as follows:

call list

2.10 Result Acknowledgement Message

The system can be setup to send an SMS text message to either the master number or the number setup using the TXTNUM command. This acknowledges the result of the last command processed such as adding a new user number. The SIM card in the system must have sufficient credit for sending SMS text messages.

To enable the service the following text message is sent by the master number:

txtres enable   or also valid:

TXTRES en

To disable the service the following message is sent:

TXTRES DISABLE   or also valid:

txtres dis

The result message 'Operation Successful' is sent when the service is enabled

2.11 Connecting a Call

By default, when called the system is set to ring indefinitely or until the SIM card network operator transfers the call to voicemail. However the system can be set to connect a call when the input is **CL**osed (high/12V) or **OP**en (low/0V). This is done to allow the caller to know the state of the input even when the system has insufficient credit to send a status SMS text message.

To change the connect mode the CONN command is sent by the master phone with the action **CL** or **OP**. To disable connect on call the **NO**ne action is sent.

e.g.   **CONN CL**   connect when input high
CONN OP   connect when input low
CONN NO   do not connect call

2.12 Input/Output Status Message

To determine the current status of the input and output the STAT command is sent to the system telephone number in a SMS text message by the master phone as follows:

STAT

The system will respond with a SMS text message as follows:

RELAY OPEN INPUT LOW   relay not activated/input open (GND)
RELAY CLOSED INPUT HIGH   relay activated/input closed (+V)

2.13 Input Change State Message Enable

The system is able to send a SMS text message to the master number (or number specified by the TXTNUM command) when the input changes state. To enable this service the following command is sent via a SMS text message by the master telephone number:

INTXT En   enables the change state text message
INTXT Dis   disables the change state text message

2.14 Input Change State Level

The INLVL sets the active state of the input for sending the change state text message. For example, if the user requires a message to be sent when the input is closed (GND), then the following message is sent by the master number:

INLVL CL   ;send status message when input closed (GND)

If the user requires the system to send a status message when the input goes open (+5V) the following message is sent by the master number:

INLVL OP   text when open (+5V)

The change state service becomes inactive whilst the input remains in the active state (i.e. GND for INLVL CL/+V for INLVL OP) and remains inactive for 5 seconds after returning to the idle state.

If two messages are received for one event then this indicates that the INLVL settings are incorrect and should be reversed.

2.15 OPEN/CLOSE Commands

The OPEN command is used to activate the relay by sending the board a text message. The CLOSE command deactivates the relay, whether activated by the OPEN command or a call. When the OPEN command is sent without any additional instructions the message is handled as a call and follows the RLYTIME/RLYMODE settings.