

Command	Action			Comments
ADD	number	.		Add User Number
CALL	LIST	ANY	NONE	Call Handling
CLEARALL				Also clears MASTER
CHANNEL	#	*	Alt	Call Channel Select
CLOSE				Activate CLOSE Relay
CONNECT	NONE	CL	OP	Connect Call Condition
CSQ				Get RSSI
CTIME	<seconds>	.		Set Call Maximum Time Limit
CUSTOM				Custom input message
DIAL	number			Dial Number on Receipt
LIST				List All Numbers
MASTER	number	.		Add Master User
MUSER	DISABLE	ENABLE		Treat all users as Master
OFF				Deactivate [default] Relay
OFF#				Deactivate '#' Relay
OFF*				Deactivate '*' Relay
ON				Activate [default] Relay
ON*				Activate '*' Relay
ON#				Activate '#' Relay
ON	<seconds>			On for <seconds> seconds
ON	<minutes>m.			On for <minutes> minutes
OPEN				Activate OPEN Relay
PRGSIM				Purge Inbox
PSMS	Enable	Disable		Power Up Text Alert
QUERY/QNUM	number	.		Find Number in Memory
REJECT	ALL	NEVER	OPEN	Call Handling
REMOVE	number	.		Remove Number
RESET				Reset Settings to Defaults
RLYMODE	PULSE	TOGGLE	RING	Relay Mode Toggle/Pulse (default 3s)
RLYTIME	<seconds>			relay time in minutes
RLYTIME	<minutes>m	.		relay time in minutes
RSMS	Enable	Disable		Reset Text Alert (Network)
RTIME	<seconds>			Maximum Ring Time
SILENCE	<seconds>			Maximum Line Silence Time
SMS	number,	interval (days)	.	PAYG Keep Alive
SMS	OFF			(switch off KA Text)
STATUS				Get Relay and Input Status
TEXTRES	DIS	EN		Result Acknowledgement
TEXTNUM	number		.	Text Alert Numbers



QUAD Band GSM Twin Relay Board

Twin B2.05/Firmware 2.11



Open-on-Call Twin Output Access Control System

for GSM850MHz, GSM900MHz
DCS1800MHz & PCS1900MHz

www.adventcontrols.co.uk

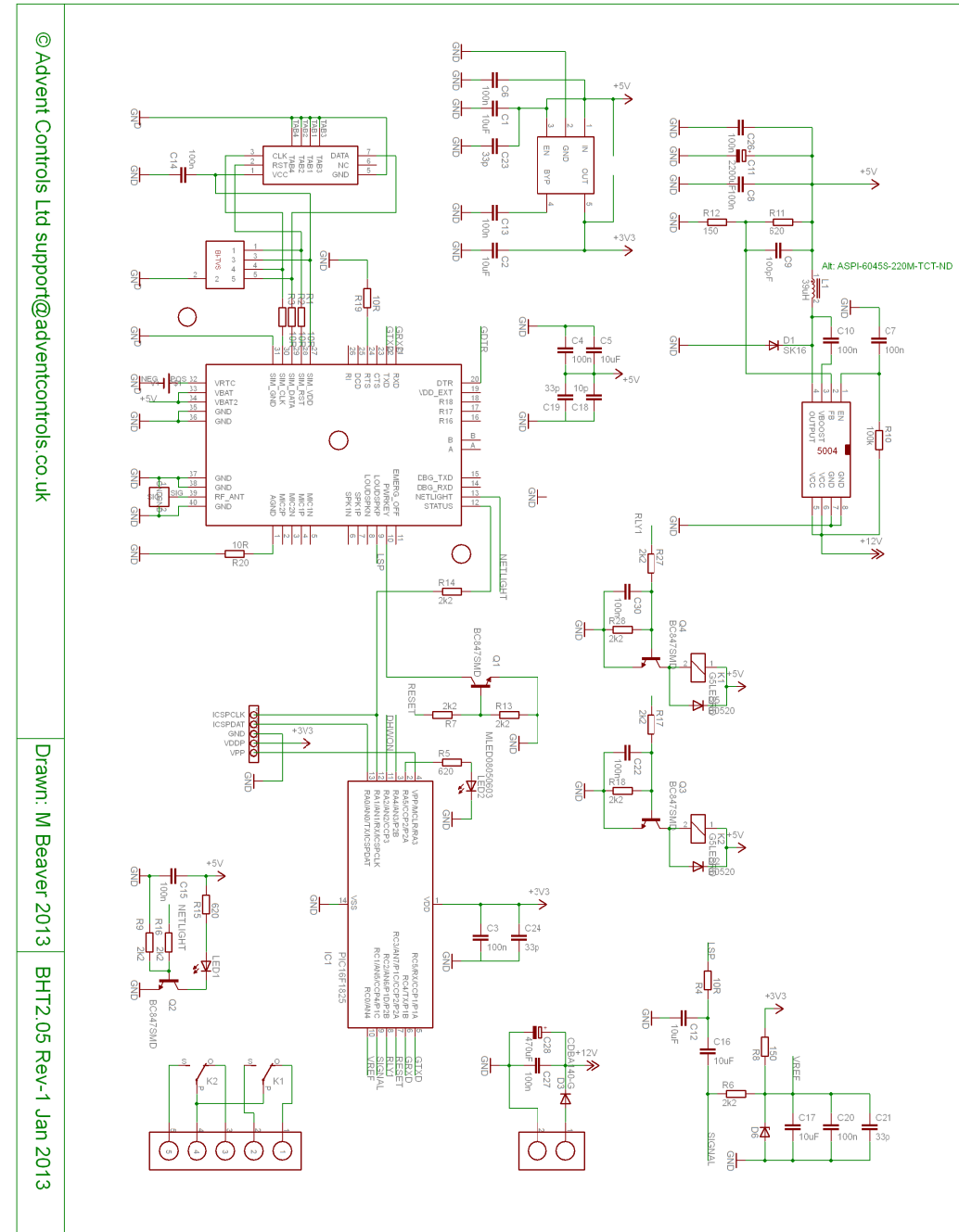


EMC/EMI Compliance Statement: CE Mark Declaration of Conformance

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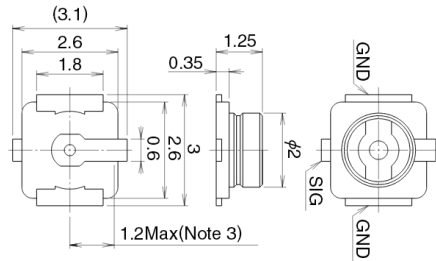
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6.5 Schematic Diagram

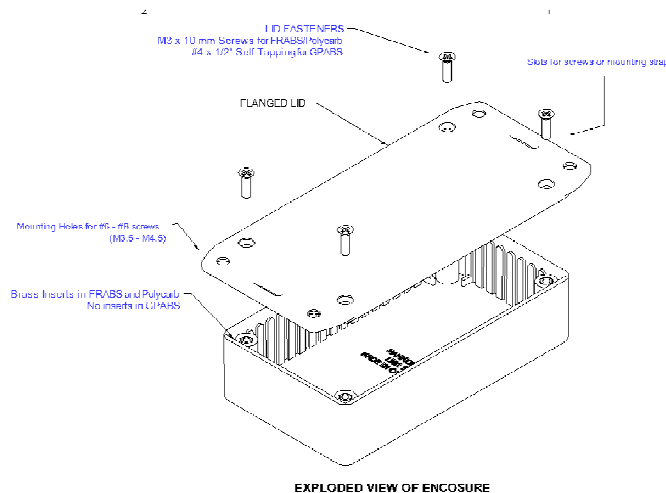
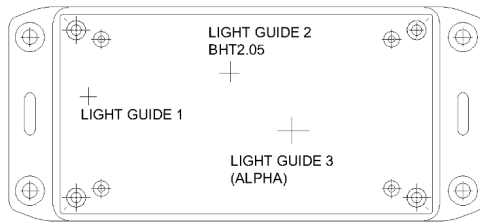
6.3 Antenna Connection

The standard antenna can be used where a good signal exists. In areas with a poor signal an external antenna is recommended connected via RG174 coaxial cable. The system antenna connection is a male Hirose U.FL connector. It is not recommended to use an extension greater than 3m in length.



6.4 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.



1. Introduction

The Advent Controls GSM B2.05 Relay Board has been primarily designed for security applications although can be used as a general purpose call/SMS activated relay. The twin output allows for the remote control of roller shutters and garage doors which require separate open and close control. The active whilst ringing and DTMF features allow control of 'deadman' inputs where the user must continuously activate the shutter until it is fully open or closed.

Both relays can be activated by a call or SMS text from up to 512 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 also be set to reject the call if desired or connect a call for DTMF keypad control of the relays.

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 displayed by the on-board LED and (if enabled—see **2.10 TEXTRES**) by SMS text message.

The output relays have 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 they can be set to toggle between calls. The relays can also be set to remain active whilst the line is ringing making the board suitable for deadman control. Either relay can be set to respond to calls or the system can be set to alternate which relay is activated by a call.

1.2 Technical Specification

Power Supply	12-24VDC 500mA Max. (10-15mA idle)
Relay Output	5A Max. CATII 220VAC
SIM	1.8/3.6V
Compliant with GSM Phase 2/2+	Class 4 (2W @850/900 MHz) Class 1 (1W @1800/1900 MHz)
Antenna	50Ω U.FL



1.3 Number Types

When adding a telephone number to the system it can be set up as either a master number or a user number. There is space for 512 numbers and each number can be set up as either type of number. For example you may wish to have 200 masters and 312 users. **Both number groups can operate the output relay by SMS text or by calling the board.**

Master Numbers

These numbers are used to make changes to board including adding other numbers. At least one master number must be set up when the board is first used (see **section 2.3**). Once one master number is set up it can then be used to set up other master numbers

Example Master Number setup command:

Master 07000000000.

User Numbers

User numbers are only able to operate the relay output. This can be via SMS text or by calling the board. Unless MUSER is enabled (this makes all numbers master numbers) user numbers cannot access any command functions.

Example User Number setup command:

Add 07000000000.

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 LED1 will change from flashing approximately once every second to a momentary flash once every two seconds. If the LED1 continues to flash once every second 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. Observe anti-static precautions when inserting the SIM.

The second LED, LED2 found by the 5 pin header, is used to display the result of a command. **The LED will flash twice to acknowledge the successful receipt of a command** and will light continuously for 2s to show the instruction has failed. It also illuminates during any call (valid or invalid) and lights continuously when a signal cannot be found (network dependent).

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 **Section 7**) 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

The system is controlled by the master GSM mobile phone numbers (see **2.2 Number Types**). The system must first be associated with at least one master 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. **Do not connect the jumper to any other pins or damage may result.**

The master phone number must then be sent via a SMS text message to the system phone number as follows:

MASTER<space>number

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

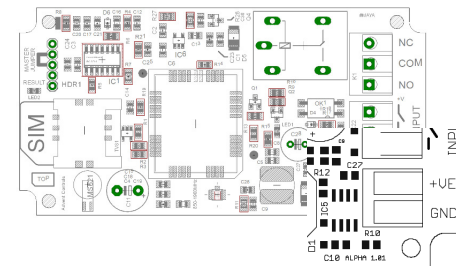
RSMS Enable
RSMS Disable
PSMS Enable
PSMS Disable

enables the reset text message
disables the reset text message
enables the power up text message
disables the power up text message

6 Installation

6.1 Power Connection

A fused DC power supply of between 12 and 24VDC should be used with this product. The power connection should be made to the terminals labelled +VE and GND.



5 Setup

5.1 SIM Keep Alive Text

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

SMS<space>number,frequency. enables periodic text message sending

e.g. **SMS 07000000000,10.** (text 07000000000 every 10 days)
SMS Off disables periodic text message sending

Frequency—number of days interval

Most UK networks require the equivalent spend of one one minute call per quarter. It is recommended a text is sent at least once per month (28 days).

5.2 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 number which sent the command 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:

$$\text{RSSI (dBm)} = -113 + 2 \times (\text{CSQ value})$$

It is recommended that the minimum signal level for the installation is 15 (-83dBm) 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.

5.3 Power Up/Reset Text Message

The system can send an message to all the text numbers when a system reset or power up has occurred. This can be due to network failure or power cycling (power off followed by power on). Note the system repeatedly resets during network outage. You will only receive 1-message after a network outage. For further information please view **page 12**: http://www.adventcontrols.co.uk/Alpha_v2_04_F2_11.pdf

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')

The result LED, LED2, will flash two times to indicate the master number has been successfully setup. Calling the board's telephone number with the master phone will now activate the relay. Once one master number has been setup further masters (up to 512) can be setup by this and subsequent master phones without the jumper fitted (using the same message).

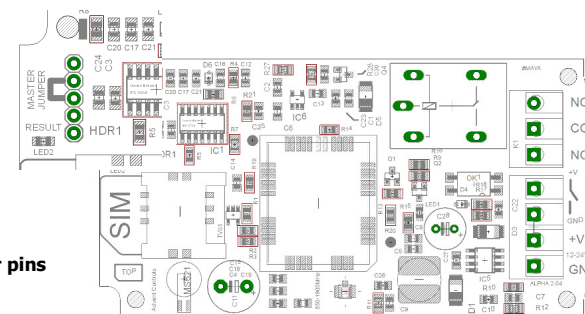


Figure 1. Jumper pins

Using the PIN for Master Setup

The Master Number can also be set up using the PIN. This is only possible for the first master number that is added to the system. Subsequent masters must be added by a master using the MASTER command. The PIN is the last 5 characters of the IMEI number written on the QUECTEL GSM module sticker. The command is sent as follows:

Master 07000000000,37212. for module with IMEI 355073034237212

2.4 Allowing Master Control for all Users

To enable any user to control master commands (such as adding and removing numbers) the MUSER command is sent to the board, by a master number, as follows:

MUSER ENABLE Allows any valid user number to modify settings
MUSER DISABLE Only master numbers can modify settings

By default MUSER is set to disable full access for all users. N.B. Only master numbers can add other master numbers despite this setting

2.5 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 (if present) 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 any master phone must send the following SMS text message to the system telephone number:

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

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

2.6 Removing a User Number

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

remove<space>*number*. e.g. **REMOVE 07000000000**.

If TEXTRES 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.

2.7 Viewing the Valid Number List

The system can send a SMS text message containing a complete list of valid user numbers to any master phone. 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 master will not appear in the list but will also be valid).

The numbers are in the reverse order to the order they were added with the primary master not displayed.

e.g. 33333333 22222222 11111111 00000000

2.8 Finding a Number in the Memory

When a large number of numbers are stored in the memory using the LIST command can be impractical. To find whether an individual number is stored in the memory the master user sends the following command to the board:

3.11 OPEN and CLOSE Commands

The OPEN 'star' relay and CLOSE 'hash' relay can be operated by SMS text message using the OPEN and CLOSE commands. When using these commands the system behaves like it has received a call and follows the RLYTIME and RLYMODE (not 'Ring Mode') configuration.

OPEN activates the 'hash' relay for RLYTIME# or indefinitely if RLYMODE TOGGLE
CLOSE activates the 'hash' relay for RLYTIME* or indefinitely if RLYMODE TOGGLE

The opposing relay is always deactivated i.e. when OPEN is sent the CLOSE relay is deactivated.

4 Dialling Commands

4.1 Dial Now

If necessary the system can make a call at any time. This is achieved using the DIAL command. The call observes the RTIME, CTIME and SILENCE time settings

DIAL<space>*number*. make an ad-hoc call to the specified number

e.g. dial 01517283167.

The call will end when the other party hangs up or the CTIME or SILENCE time limit is reached.

4.2 Changing the Maximum Ring Time

The maximum time for which the system will attempt dialling is set using the RTIME command. The default time limit is 60s. The RTIME command is specified in seconds and can be set from 1s to 255s. Most calls will require at least 15s for connection which is included in RTIME.

RTIME 45. sets the maximum ring time to 45 seconds

4.3 Changing the Maximum Call Time

The maximum time limit for an answered call is set using the CTIME command. The default time limit is 45s. The CTIME command is specified in seconds and can be set from 1s to 255s.

CTIME 45. sets the maximum call time to 45 seconds

4.4 Changing the Maximum Line Silence Time

The maximum time for which a silent call will remain connected is set using the SILENCE command. This is useful were a call may be redirected to voicemail. The silence during recording will cause the system to hang the call. The default silence time is 15s and can be set from 1s to 255s.

SILENCE 25. sets the maximum line silence time to 25 seconds

e.g. **ryltime 10.** 1 second activation time
ryltime# 250s 250 second activation time for 'hash' relay
Rlytime* 1m. 1 minute activation time for 'star' relay
RLYTIME 960m. 16 hour (16 x 60mins) activation time (both relays)

3.9 De-activating Voicemail

In order to fully control the relay action whilst using 'Ring Mode' it may be necessary to deactivate the SIM card voicemail call divert. The network command for deactivating voicemail is:

##004# (To deactivate all incoming divers: **##002#** - not recommended)

To use the code the code is entered like a telephone number and dialed. If the user is able to put the SIM in a mobile phone then we recommend doing this before it is used in the board. If this is not possible the user may use the DIAL command to send the code to the network. The MASTER user sends the following text to the board:

DIAL ##004#.

3.10 ON & OFF Commands

The ON command is used to activate the relay with a SMS text message. The OFF command deactivate the relay, whether activated by the ON command or a call. By default the ON command activates the opposite relay to that selected by the CHANNEL command (see **Section 3.2**). This allows calls to control one relay and texts to control the other. However, either relay can be operated at any time by the ON command by specifying the relay as follows:

ON operates the other relay to that set by the CHANNEL command
ON* operates the 'star' (CLOSE) relay
ON# operates the 'hash' (OPEN) relay

When the ON command is sent without any additional instructions the relay is activated indefinitely. When sent with a value and **m**(inutes) or **s**(econds) parameter the relay activates for a set period of time.

The maximum number length is three characters therefore the timer is limited to 999 seconds or 999 minutes. If the m or s parameter is not sent then the timer value is read as the number of seconds.

e.g. **on** activates relay indefinitely
ON 10. 10 second activation time (**s** parameter optional)
ON# 250s activates the 'hash' relay for 250 seconds
ON* 1m. activates the 'star' relay for 1 minute
ON 960m. 16 hour (16 x 60mins) activation time

OFF deactivates the default relay under all conditions
OFF# deactivates the 'hash' relay

If the system loses power the relay state is restored when the power is reconnected!

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

NB the number should be the full number (not the 8-digit truncated 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 TEXTRES is enabled an SMS text message will be sent with the result.

2.9 Clearing All Numbers and Settings

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 a master number:

CLEARALL

No response is sent by the system to acknowledge the command

2.10 Result Acknowledgement Message

The system can be setup to send a SMS text message to acknowledge a 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/disable the service the following text message is sent by the master number:

TEXTRES enable (or also valid: **TEXTRES e**)

TEXTRES DISABLE (or also valid: **TEXTRES d**)

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

3 Relay Operation/Access Control

3.1 Enabling Any Number and Disabling Open-on-Call

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

To disable activation of the relay by calling the following command is sent to the board (the relay can still be activated by SMS text; see ON/OFF and OPEN/CLOSE commands):

CALL NONE

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

3.2 Select the Call Output Relay

Where 'Open-on-Call' is enabled (see **Section 3.1**) an incoming call can be set to activate either the 'star' or 'hash' relays or the board can be set to alternate between each relay on every call. Alternating between each relay is useful for controlling an open and close input on a roller shutter or gate controller. One call opens the shutter and the next closes the shutter.

To select the 'star' relay output channel the following command is sent to the board:

CHANNEL * selects the 'star' or CLOSE relay output

To select the 'hash' relay output channel the following command is sent to the board:

CHANNEL # selects the 'hash' or OPEN relay output

To alternate which output a call activates the following command is sent to the board:

CHANNEL ALT alternate between '*' and '#' on each call

3.3 Call Reject

By default any call to the system will be allowed to ring indefinitely (or up to the host network time limit). This is to avoid calls being diverted to voicemail when rejected by the system. However the system can be instructed to reject (hang up) calls using the REJECT command:

REJECT ALL rejects all *valid* calls

The reject command can also be used to determine the status of the relay when in toggle mode by sending the following command:

REJECT OPEN rejects the call when the call is deactivating the relay

REJECT NONE disables all call rejection

3.4 Connecting a Call

By default, when called the system is set to ring indefinitely (or up to the host network time limit). However the system can be set to connect a call which allows the user to control the output relays using the telephone DTMF keypad.

e.g. **CONNECT Enable** connect when input high
connect disable disable call connection

3.5 DTMF Keypad Control

A caller may operate the output relays using the DTMF keypad on their telephone. Note most mobile phones will not allow the continuous transmission of DTMF tones and instead will just send a short tone burst. This makes control via mobile phone impossible. To enable DTMF control the call must be answered by the board. This is achieved by sending the **CONNECT ENABLE** command as described in **Section 3.4**. The 'star' relay is activated by pressing and holding the '*' key on the telephone keypad.

Similarly the 'hash' relay is activated by pressing and holding the '#' key on the keypad. Once finished the user hangs up the line.

3.6 Relay Status Message

To determine the current status of the output relays the STATUS command is sent to the system telephone number by a master phone as follows:

STATUS

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

STAR-RELAY OPEN GATE-RELAY CLOSED

The 'star-relay' is the relay operated by the DTMF '*' key under DTMF control—also known as the CLOSE relay. The '#' is the relay operated by the '#' key under DTMF control—also known as the OPEN relay.

3.7 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), to activate whilst the caller is ringing or to toggle between states on each call. By default the relay mode is set for timed (pulsed) activation. To switch to toggle mode the following message is sent to the system by the master number:

RLYMODE TOGGLE enables toggle mode

To activate the relay for however long the caller rings (n.b. turn off voicemail!)

RLYMODE RING relay active whilst phone rings—'Ring Mode'

To revert to timed (pulsed) mode the following message is sent:

RLYMODE PULSE relay Normally Open (NO) (time set by **RLYTIME—Section 3.8**)

3.8 Relay Activation Time

The RLYTIME command is used to adjust the time the relays are active following a call when RLYMODE is set to PULSE (or when using the OPEN and CLOSE commands—see section 3.x). Each relay can have it's own RLYTIME time set. If the relay is not specified the **RLYTIME** command set the pulse time for both relays. However if the relay is specified the pulse time for only the specified relay is set.

To specify the intended relay the command is modified as follows:

RLYTIME# sets the 'hash' relay pulse time
RLYTIME* sets the 'star' relay pulse time
RLYTIME sets the pulse time for both relays

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.
RLYTIME minutesm.