# CLOUD DCM1

# Serial Control Protocol

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## UPDATES

This document supersedes version 1.20. It has been updated to document the changes from version 1.04 to version 1.05 of the DCM-1 software.

V1.05 Software has the following changes:-

- New functions to set and query microphone gates by RS232.
- Line priority function now applies to groups.
- Label query functions not documented.
- Correction to Label query functions. They now return the label.
- Correction of a fault where numeric values with mid digits of '0' where not returned by the DCM-1 correctly. E.g. a value of 104 is returned as 14.
- Corrected the page microphone query function which had been returning values of 255 for attenuation, hold, and release.

## INTRODUCTION

The rear panel RS232 SERIAL INTERFACE provides serial control of almost every DCM-1 function, parameter and setting. The serial control protocol can not be used to change settings to the serial communications.

Details for configuring the Serial Interface are in the DCM-1 installation and user guide.

Throughout this document all message text is shown in a mono spaced font.

## MESSAGE STRUCTURE

There are three types of messages in the DCM-1 control protocol;

- Control messages.
- Response messages.
- Error messages.

Control messages are sent to the DCM-1. Response and error messages are transmitted from the DCM-1 in reply to a control message.

All control messages use upper case letters, all response messages are in lower case with two exceptions; a response to a system reset command returns `"<DCM-1 RESET/>"`, and a response to a label query returns the string of the label which may have upper or lower case characters. Error messages may be a mixture of upper or lower case.

The message body is enclosed within a header character (`"<"`) and a terminator sequence (`"/>"`). The DCM-1 will reset its message decoding software upon reception of a header character, discarding any previously un-decoded partial messages. The DCM-1 will start to decode a message upon reception of the terminator sequence. If the decoded message is valid it is executed and a response message returned. An error message is returned if the message cannot be decoded or if the command cannot be executed.

## THE CONTROL MESSAGE

Control messages are sent to the DCM-1 in order to perform a function. The control message has two fields separated by a comma. They are called the destination field and the command field.

```
<DESTINATION,COMMAND/>
```

## DESTINATION FIELD

The destination field is an abbreviated description of the mixer section the command is intended to affect. The field consists of a two character **main destination** and an optional two character **sub destination**. The sub destination is separated from the main destination by a full stop (period).

- **MAIN DESTINATION.** The DCM-1 has seven possible main destinations;
  1. Line inputs.
  2. Microphone.
  3. Paging microphone.
  4. Zones.
  5. Groups.
  6. CDR system.
  7. DCM-1 system.

- **SUB DESTINATION.** The sub destination is used to address the message to a particular part of a main destination. Only group, zone and system destinations have sub destinations.

Examples
- `<PM,PR/>` PM is the main destination.
- `<Z1.MU,L23/>` Z1 is the main destination, MU is the sub destination.

There are two types of destination identifiers; **absolute** and **indexed**.
- **ABSOLUTE DESTINATION IDENTIFIER.** This is used when the destination has only one member such as the paging microphone, or when the destination has members but the message is for all members. EG the microphone section is an absolute destination for changing global parameters such as hold time; however individual microphones are not absolute destinations. An absolute destination's identifier is two alphabetic characters.
- **INDEXED DESTINATION IDENTIFIER**. This is used when the destination has multiple members and the message is intended for an individual member. Zones, groups and line inputs are destinations which have multiple members. Indexing allows addressing members such as zone 1 or zone 2. An indexed destination identifier consists of an alphabetic character to identify the destination type and a numeric index for the member. Indexes out of range are not allowed, EG Z9, G5 and L0 are invalid.

Examples
- `<PM,PR/>` PM, is an absolute destination identifier for the paging microphone.
- `<Z1.MU,L23/>` Z1 is an indexed destination identifier for zone 1. MU is an absolute destination identifier for the music sub destination in zone 1.

# COMMAND FIELD

A command field identifies the command to be performed on the destination. The command field may have up to three parts; the **command identifier**, the **command modifier** and the **command value**. No white space is permitted between these parts.

- **COMMAND IDENTIFIER**. This part is always required. It has a single alphabetic character to identify the command type.
- **COMMAND MODIFIER.** This part is optional depending on the command type. Some commands take no modifier, some commands always take a modifier and some commands can have the option of a modifier or none. The modifier is a single alphabetic character.
- **COMMAND VALUE**. This part is optional depending on the command type and modifier. The value part can be any sequence of characters as required by the command type. In cases where a value can contain alphabetic characters it is preceded by an equals character (`"="`) to prevent the first character of the value being confused with a command modifier.

# DESTINATIONS IN DETAIL

## MAIN DESTINATIONS

### LINE INPUT
Line input does not take a sub destination. Its use is to set the gain and change line input labels. Line inputs are available as a sub destination of zones and groups in order that they can be enabled or disabled within that zone or group.  Valid main destination identifiers are: `LI`, `L1`, `L2`, `L3`, `L4`, `L5`, `L6`, `L7` and `L8`.

### MICROPHONE
 Microphone does not take a sub destination. The microphone main destination is used to change the microphone system's global parameters. It is not possible to address individual microphones as a main destination. Individual microphones are addressed as sub destinations of zones, groups or system.
The identifier is: `MI`.

## PAGING MICROPHONE

Paging microphone does not take a sub destination. It is used to open and close the paging microphone and to set global priority parameters. Paging microphone is available as a sub destination of zones and groups to allow setting of the priority trigger type in that zone or group.
The identifier is: `PM`.

## ZONE

As a main destination zone allows access to the labels of the zones. Zone can take sub destinations of music, microphone, line and paging microphone in order to access all functions of a zone.
Valid identifiers are: `ZO, Z1, Z2, Z3, Z4, Z5, Z6, Z7` and `Z8`.

## GROUP

Group has all the functionality of zone destination with the additional functions of editing group member assignments and enabling and disabling groups.
Valid identifiers are: `GR, G1, G2, G3` and `G4`.

## REMOTES

The remotes destination's only use is to set the remote offset in a DCM-1.
The identifier is: `RM`.

## SYSTEM

System is used to set system wide parameters of the DCM-1. It has the option of two possible sub destinations; the emergency mute and zones 1 and 2's stereo mono switching.
The identifier is: `SY`.

# SUB DESTINATIONS

There are two types of sub destinations; those that are sub destinations of the system destination and those that are sub destinations of zone and group destinations.

## EMERGENCY MUTE

This is a system sub destination.
This sub destination allows commands to be performed on the emergency mute system.
Its only valid main destination and sub destination identifier combination is `SY.EM`.

## ZONES 1 AND 2 STEREO SWITCH

This is a system sub destination.
This sub destination accesses the stereo/ mono switches of zones 1 and 2.
Its only valid main destination and sub destination identifier combinations are `SY.Z1` and `SY.Z2`.

**MUSIC**

This is a zone and group type sub destination.

The music sub destination allows access to all the parameters that control the music section of a zone. Note that the EQ section, the limit minimum and the limit maximum parameters are not available to groups.

Valid main destination and sub destination identifier combinations are `Z1.MU`, `Z2.MU, Z3.MU, Z4.MU, Z5.MU, Z6.MU, Z7.MU, Z8.MU, G1.MU,` `G2.MU, G3.MU` and `G4.MU`.

**MICROPHONES**

This is a zone and group type sub destination.

This sub destination allows access to individual microphone enables in each group or zone destination or to the system destination to access each microphone's gate.

Example valid main destination and sub destination identifier combinations are `Z1.M1, Z1.M2, SY.M2 and G2.M4.`

**LINE INPUTS**

This is a zone and group type sub destination.

This sub destination allows access to the line input enables on each group or zone.

Example valid main destination and sub destination identifier combinations are `Z1.L1, G2.L3.`

**PAGING MICROPHONE**

This is a zone and group type sub destination.

This sub destination is used to access the paging microphone priority trigger in each group or zone.

Example valid main destination and sub destination identifier combinations are `Z1.PM, G2.PM.`

## COMMANDS IN DETAIL

Please see the examples table.

### QUERY "Q"

This command allows the querying of the status of a set of values of a destination. E.g. the microphone priority hold, release and level values are a set.
Valid destinations are MICROPHONE, PAGING MICROPHONE and LINE INPUT to obtain priority information, and GROUP to obtain member information.
It takes no command modifiers. Its only valid form is ("Q").
The response message varies according to the destination being queried but general is a lower case version of the control message followed by a comma separated list of the destination's parameters,
Note that query is available as a command modifier for most commands.

### LEVEL "L"

This command is only available to the music sub destinations of zones and groups and to the emergency mute sub destination of system. The command has limitations when used with emergency mute and so this version of the command is listed separately as the emergency mute level command.
The command is used to set the level of the line input selection (music) of a zone or group.
The standard level command as applied to music destinations can take a modifier for up ("U"), down ("D") or query ("Q"). All forms except for query take a numeric value. With no modifier the value is the absolute value of attenuation to be set in dB; values can be in the range 0 to 255. Any attempt to set a value greater than the maximum attenuation of 61dB will set the mute state. If a minimum level has been set any attempt to set attenuation greater than this will limit at the minimum. With up or down modifiers the value is the increment or decrement step in dB; values can be in the range 1 to 12. For the purpose of calculation of increment, mute is considered to have the numeric value of 62 though the actual attenuation is considerably higher. The response message is a lower case version of the control message before any value, an equals character ("=") followed by the current (modified) value of the level or the word "mute" if the value of attenuation is below 61dB. The value represents the attenuation in dB.

### MUTE "M"

This command is only available to the music sub destinations of zones and groups. The command takes no modifier or value (which distinguishes it from the limit command, see below). The response message is a lower case version of the control message with the mute command character expanded to say "mute".

**LIMIT "M"**

This command can only be applied to the music sub destination of a zone. Its sets the minimum and maximum attenuation of the music level in the zone. The command always takes a modifier (this distinguishes it from the mute command which has no modifier). Valid modifiers are minimum ("N"), maximum ("X") and query ("Q"). The minimum and maximum modified also take a value to set the minimum and maximum values. Values are in the range 0 to 255 however note that a value higher than 61 is considered mute so setting the minimum above 61 is effectively turning the minimum off. It is not possible to set the maximum limit at a greater attenuation than the minimum limit. It is not possible to set the minimum limit to a lower attenuation than the maximum limit. The response message is a lower case version of the control message before the modifier, the lower case maximum modifier ("x") an equals character ("=") followed by the current value of the maximum limit, the lower case minimum modifier ("n") an equals character ("=") followed by the current value of the minimum limit.

**GAIN "G"**

This command is only available to a line input destination. Its purpose is to set the input gain. The command can take up ("U"), down ("D"), positive ("+") negative ("-") and query ("Q") modifiers. The command with positive or negative modifiers takes a value in the range 1 to 12 to represent a gain range of -12dB to +12dB. NB no modifier is used when the value is 0; setting gain at 0dB is the only use of the unmodified command. Up and down modifiers do not require a value as the step size is set at 1dB. The response message is a lower case version of the control message before any value, an equals character ("=") followed by the current (modified) value of the input gain. The value represents the gain value in dB.

**SOURCE "S"**

This command is only available to the music sub destinations of zones and groups and to the emergency mute sub destination of system. The command has different behaviour when used with emergency mute and so this version of the command is fully detailed as the emergency mute source command.
The standard source command as applied to music destinations can take a modifier for up ("U"), down ("D") or query ("Q"). Only the form with no modifier takes a numeric value which is the line number to select; values can be in the range 1 to 8. With up or down modifiers the no value is required; the increment or decrement step is always 1. The response message is a lower case version of the control message before any value, an equals character ("=") followed by the current (modified) value of the line source selection.

**EQ BASS "B"**
**EQ MID "M"**
**EQ TREBLE "T"**
These three commands are used to set one of three bands of the EQ of a zone; they can only be applied to the music sub destination of a zone.  EQ does not affect microphone or paging microphone signals. The command can take up ("U"), down ("D"), positive (boost) ("+") and negative (cut) ("-") modifiers. The command with positive or negative modifiers takes a value in the range 2 to 14 in steps of 2dB to represent a cut boost range of -14dB to +14dB; odd values will be rounded down. NB no modifier is used when the value is 0; setting the EQ band's cut boost at 0dB is the only use of the unmodified command. Up and down modifiers do not require a value as the step size is set at 2dB. The response message is a lower case version of the control message before any value, an equals character ("=") followed by the current (modified) value of the EQ. The value represents the EQ band's cut boost in dB.
There is no query modifier with this command. Use the EQ query command to return information about the EQ settings.

**EQ QUERY "EQ"**
This command is used to query the EQ settings of a zone. It is applied to the music sub destination of a zone. The response message is a lower case version of the control message followed by a comma separated list of the cut boost values for the treble, mid and bass bands for that zone.

**ENABLE "E"**
**DISABLE "D"**
These two commands are used to either enable/ disable the groups or to enable/ disable routing of line inputs or microphones to a zone or group. The commands take no modifiers or values. To query the enable/ disable state issue the query command.

**GROUP**
When used to enable/ disable a group the command is sent to a group destination. When enabled the group member zones act together. When disabled the group members zones act independently. The response message is a lower case version of the control message, an equals character ("=") followed by a comma separated list of the member zones and a character for the enable/ disable state ("e" OR "d"). If the group is empty the list will be replaced by the word "empty" and no character for the enable/ disable state.

**LINE INPUT**
When used to enable/ disable a line input the command is sent to the line input sub destination of the group or zone destination. A line input that is disabled in a zone or group will not be selectable by that zone or group. The response message is a lower case version of the control message, an equals character ("=") followed by a character for the enable/ disable state ("e" OR "d"), a comma the text "pri = " followed by text to show the priority type ("off" OR "vox") for that line input in that zone or group.

### MICROPHONE

When used to enable/ disable a microphone the command is sent to the microphone sub destination of the group or zone destination. A microphone enabled in a zone or group is routed to that zone or group. The response message is a lower case version of the control message, an equals character ("=") followed by a character for the enable/ disable state ("e" OR "d"), a comma the text "pri = " followed by text to show the priority type ("off" OR "vox") for microphones in that zone or group.

### PAGE MICROPHONE ACCESS "P"

This command is only available to the paging microphone destination. It is used to set the access state of zones. The command always takes a modifier. Modifiers are access ("A"), release ("R") and query ("Q"). The release modifier releases all accessed zones, no value is required. The access modifier can access or release zones. The access modifier requires a value in the form of a character list. The list is 1 to 8 characters long. The position of each character represents the zone that the character is acting on. IE the first character represents zone 1, the second character represents zone 2 etc. An "X" character sets the zone as accessed; an "O" character sets the zone as released. Note that the list can be truncated after the highest value zone asserted; any subsequent zones are considered released. IE if only zone 2 is to be accessed then the list can be "OX", zones 3 to 8 are considered released regardless of their state before the command. The response message is a lower case version of the control message before any modifier, an equals character ("=") followed by a list of access states of the zones.

### PAGE MICROPHONE INPUT "I"
### PAGE MICROPHONE OUTPUT "O"

These commands are only available to the paging microphone destination. They are used to set the access contacts as all inputs or all outputs. If either command is followed by the query modifier ("Q") the input or output state of access contacts will not be modified. The response message is a lower case version of the control message followed by the text "acc = " followed by the either the text "in" or "out".

### GROUP MEMBER "Z"

This command is only available to group destinations. It adds or removes zones as members of a group. The command always takes a modifier, either add ("A") or remove ("R"). The value is a sequence of 1 to 8 numeric characters as a list of zones added or removed from the group. Characters of 0 and 9 are not allowed. The response message is a lower case version of the control message before the modifier followed by an equals character ("=") then either a comma separated list of members zones followed by the enable state ("e" OR "d") or if the group has no members the text "empty". There is no query modifier. Performing the query command ("Q") on the group destination will return the group details.

## SYSTEM RESET "R"

This command is only available to the system destination ("SY"). It has no modifiers and takes no value. The command causes the DCM-1 to reset. The DCM-1 will reboot according to the boot mode. The response message is always "<DCM-1 RESET/>."

## SYSTEM SAVE DEFAULT "SD"

This command is only available to the system destination ("SY"). The command is used to save the current parameter set of the DCM-1 as the default i.e. the parameters to use when boot mode is set to default. The command is comprised of the save command with the default modifier. NB the default modifier is the only allowable use of the save command. The response message is a lower case version of the control message.

## SYSTEM BOOT MODE "I"

This command is only available to the system destination ("SY"). The command is used to set the boot mode (Initialisation) of the DCM-1.

The command must have a modifier to either set the boot mode or to query the boot mode. Valid modifiers are; default mode ("D"), factory mode ("F") or last configuration mode ("P" for previous). The response message is a lower case version of the control message followed by an equals character ("=") and the lower case version of the modifier that is set.

## SYSTEM KEY "K"

This command is only available to the system destination ("SY"). The command is used to set the key that is used when entering install mode from the DCM-1's front panel. It has no modifiers. The value has a fixed format of eight numeric characters. The characters 0 and 9 are not allowed as these are not available from the buttons on the DCM-1's front panel. The first four characters are the existing key. The second four characters are the new key. The response message is a lower case version of the control message before the value, an equals character ("=") followed by the four digit value of the new key.

## SYSTEM VERSION "VQ"

This command is only available to the system destination ("SY"). The command is used to query the software and hardware versions of the DCM-1. The command is unable to set a value so it always has the query modifier. The response message is a lower case version of the control message followed by the character sequence "sw" for software, an equals character and the value of the software version, the character sequence "hw" for hardware, an equals character and the value of the hardware version.

### EMERGENCY MUTE NORMAL  "N"

This command is only available to the emergency mute sub destination of system. It sets the emergency mute contacts behaviour as "normally open" or "normally closed". The command always takes a modifier. Modifiers are closed ("C") and open ("O"). The response message is a lower case version of the control message, followed by the set of values for the emergency mute. The set comprises of an equals character ("=")  followed by the normal mode ("no" OR "nc"), a comma and the source character ("s") followed by the source value, a comma and the level character ("l") followed by the level value. NB the level will read 0 if a line input is not selected as the source.

### EMERGENCY MUTE SOURCE "S"

This version of source command has limited functionality and is only applied to the emergency mute sub destination of system. The command sets the source of the emergency mute as a microphone input, line input or off.
The emergency mute level command always takes a modifier. The modifiers are off ("O"), line ("L") and microphone ("M"). The microphone modifier and line modifier take a numeric value for the microphone or line to use. The line modifier's value can be in the range 1 to 8; the microphone modifier's value can be in the range 1 to 4. The response message is a lower case version of the control message, followed by the set of values for the emergency mute. The set comprises of an equals character ("=")  followed by the normal mode ("no" OR "nc"), a comma and the source character ("s") followed by the source value, a comma and the level character ("l") followed by the level value. NB the level will read 0 if a line input is not selected as the source.

### EMERGENCY MUTE LEVEL "L"

This version of the level command has limited functionality and is only applied to the emergency mute sub destination of system. The command only sets the level of the emergency mute if a line input is used as the emergency mute source. The emergency mute level command takes no modifier; it takes a numeric value which is the absolute value to be set; values can be in the range 0 to 255 however the actual value set will limit at 79. The response message is a lower case version of the control message, followed by the set of values for the emergency mute. The set comprises of an equals character ("=")  followed by the normal mode ("no" OR "nc"), a comma and the source character ("s") followed by the source value, a comma and the level character ("l") followed by the level value. NB the level will read 0 if a line input is not selected as the source. The value represents the attenuation in dB.

### MICROPHONE GATE "N"

This command is only available to microphone as sub destinations of system. E.G. "SY.M1". The command always takes one of three modifiers; enable ('E') to set the gate on, disable ('D') to set the gate off, or query ('Q') to query the gate setting. The response message of this command or query is a lower case copy of the control message followed by an equals character  ("=") sign and the text ("off") or ("on") to indicate the state of that microphone's gate.

### MONO "M"

This command is only available to zone 1 or 2 as sub destinations of system. E.G. "SY.Z1". The command sets the zone to mono. The command takes no modifiers. The query command sent to zone 1 or 2 as a sub destination of system will return the mono or stereo state of that zone. The response message of this command or query is a lower case copy of the control message followed by an equals character ("=") sign and a character to indicate the mono or stereo state of the zone ("m" or "s").

### STEREO "S"

This command is only available to zone 1 or 2 as sub destinations of system. E.G. "SY.Z2". The command sets the zone to stereo. The command takes no modifiers. The query command sent to zone 1 or 2 as a sub destination of system will return the mono or stereo state of that zone. The response message of this command or query is a lower case copy of the control message followed by an equals sign ("=") and a character to indicate the mono or stereo state of the zone ("m" or "s").

### OFFSET "Z"

This command is only available for the paging microphone ("PM") and CDR ("RM") destinations. It is used to offset addressing of zones in the DCM-1 from the paging microphones or CDRs. The command takes a numeric value of the offset or the query modifier ("Q"). Valid values are 0 to 15 for the paging microphone and 0 to 120 in increments of 8 for the CDRs. The response message of this command is a lower case copy of the control message followed by an equals character ("=") and the numeric value of the offset.

### LABEL "L"

This command is used to set the label on line input, zone and group destinations. The command can take the query modifier. Only DCM-1 software V1.05 and above will return a value to a query. The unmodified command is followed by an equals character ("=") and an alphanumeric sequence. The alphanumeric sequence can contain any sequence of characters except "/>" which is interpreted as the terminator. Only the first sixteen characters are used to generate the label. The response message of this command is a lower case copy of the control message before the value followed by an equals character ("=") and then the character sequence set as the label.

## PRIORITY TRIGGER "T"

This command affects the priority trigger type in each zone or group for microphones, line input and paging microphone.  The command always takes a modifier; it never takes a value. The command's form and behaviour is slightly different for each type of device.

### LINE INPUT

The command applied to a line input sub destination of a zone or group can take two modifiers; vox ("V") and off ("O"). To query the trigger status of a line input in a zone issue the query command. When a trigger vox command is issued to a line input in a group or zone then that line input has priority on in that group or zone; any previous line input with its priority on in that group or zone is set to off. IE only one line input can be set to priority on in a group or zone.  A group or zone with a line input set to priority on will switch source to that line input when a signal is detected and restore the original source after the signal as ended on the priority line input. The response message is a lower case copy of the control message followed by an equals character ("=") then a character to indicate if the line input is enabled or disabled in this group or zone ("e" OR "d") a comma, the text "pri = " then text to indicate "on" or "off".
NB Due to a bug it is not possible to set or query Line Input priority from a group using DCM-1 software V1.04 or below.

### MICROPHONE

The command applied to a microphone sub destination of a group or zone takes the modifiers vox ("V"), off ("O") and query ("Q"). When a trigger vox command is issued to a microphone in a group or zone then that microphone has its priority turned on in that group or zone; any combination of the four microphones can have priority on in a group or zone. The response message is a lower case copy of the control message followed by an equals character ("=") then a character to indicate if the line input is enabled or disabled in this group or zone ("e" OR "d") a comma, the text "pri = " then text to indicate "on" or "off".

### PAGING MICROPHONE

The command applied to the paging microphone sub destination of a zone takes the modifiers access ("A"), vox ("V"), off ("O") and query ("Q"). The modifiers access and vox turn on priority for paging microphone in a zone. Access priority is activated when the zone is accessed for paging; vox priority is activated when the zone is accessed and an audio signal is detected. There is no priority trigger for the paging microphone available in groups. The response message is a lower case copy of the control message followed by an equals character ("=")  then text to indicate "access", "vox" or "off".

### PRIORITY ATTENUATION "A"

This command is sent to the microphone or paging microphone destination. It sets the attenuation level of the music when priority is triggered. NB the attenuation level is global to all zones. The command takes no modifiers but always takes a value in the range 0 to 46 representing the attenuation level in dB. To request the attenuation level in the microphone or paging microphone perform the query command on the destination; this will return the set of attenuation, hold and release for the destination, The response message is a lower case copy of the control message before the value followed by the set of attenuation, hold and release. Note that there are minor differences in the text of the response message from the microphone destination and paging microphone destination.

### PRIORITY HOLD "H"

This command is sent to the microphone, paging microphone or line input destination. It sets the hold time of attenuation of the music after priority has stopped being triggered. NB the hold time is global to all zones. The command takes no modifiers but always takes a value in the range 1 to 12 representing the hold time in seconds. To request the hold time in the microphone, paging microphone or line input perform the query command on the destination; this will return the set of attenuation (not for line input), hold and release for the destination, The response message is a lower case copy of the control message before the value followed by the set of attenuation (not for line input), hold and release. Note that there are minor differences in the text of the response message from the microphone destination and paging microphone destination.

### PRIORITY RELEASE "R"

This command is sent to the microphone, paging microphone or line input destination. It sets the release time of attenuation of the music after the priority hold has ended. NB the release time is global to all zones. The command takes no modifiers but always takes a value in the range 1 to 12 representing the release time in seconds. To request the release time in the microphone, paging microphone or line input perform the query command on the destination; this will return the set of attenuation (not for line input), hold and release for the destination, The response message is a lower case copy of the control message before the value followed by the set of attenuation (not for line input), hold and release. Note that there are minor differences in the text of the response message from the microphone destination and paging microphone destination.

## THE RESPONSE MESSAGE

The response message is the DCM-1's reply to a valid message. The message body contains a lower case version of the destination field and the command identifier followed by an equals character ("=") and then one or more values.

Examples
- `<Z1.MU,L12/>`          Set the music level in zone 1 to 12.
- `<z1.mu,l=12/>`     Response returns the new value of level in zone 1.
- `<Z1.MU,LU3/>`          Increment the music level in zone 1 by 3.
- `<z1.mu,l=9/>`          Response returns the new value of level in zone 1.

## THE ERROR MESSAGE

The error message is the DCM-1's reply to an invalid message. The error message can have two parts, the **error identifier** and the **returned message**.

- **ERROR IDENTIFIER**. The error identifier has two characters; the first is an exclamation mark (`"!"`), the second is an upper case alphabetic character to identify the type of error.
- **RETURNED MESSAGE.** Not all error types use a returned message. When present the returned message is a copy of the sent message, either upper or lower case depending on how far the message has been decoded before the error is detected. Some error types will place a caret character (`"^"`) in the returned message at the position the error has been detected.

## ERRORS IN DETAIL

There are six error types.

### INTERRUPTED ERROR

This error is generated when a header character (`"<"`) is detected in the middle of a message. It is identified by the sequence (`"!I"`). It is used to indicate that the interrupted message has been abandoned and that the DCM-1 has started to receive a new message.  It has no return message, however it returns a header character (`"<"`)  to indicate that it is waiting for the first character of the destination field and to make the message stream easier to read.

Example

```
<Z1.MU<<!I/><
```

### BUFFER OVERFLOW ERROR

This error is generated when a message has overflowed the DCM-1's receive buffer. It is identified by the sequence (`"!B"`). It is used to indicate that the current message has been abandoned. It has no return message. All characters received by the DCM-1 are ignored until it receives a header character (`"<"`) to start a new message.

Example

```
<Z1,L=AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA<!B/>
```

### TOKENISE ERROR

This error is generated when the message format is wrong. EG the destination field is too short or the command field is not separated by a comma. It is identified by the sequence (`"!T"`). Its return message is an upper case copy of the sent message. A caret character (`"^"`) is used to indicate where the tokenisation error occurred.  NB the return message may be omitted if the sent message was abnormally short.

Example

```
<Z1MU,L23/><!TZ1^MU,L23/>
```
NB no period between the main destination and the sub destination.

## PARSE ERROR

This error is generated when a destination or command field cannot be decoded as valid. It is identified by the sequence (`"!P"`). Its return message is an upper case copy of the sent message. A caret character (`"^"`) is used to indicate where the parse error occurred.

Example

`<Z2.MK,L3/><!PZ2.^MK,L3/>` NB `MK` is not a valid sub destination.

## EXECUTION ERROR

This error is generated when a command has failed to execute. IE the message looks valid but has tried to perform a command that is not available on the destination. It is identified by the sequence (`"!E"`). Its return message is a lower case copy of the sent message.

Example

`<Z1,M/><!Ez1,m/>` NB `M` is a valid command but not allowed on Z1.

## OVERRUN ERROR

This error is generated when an unexpected end of message is detected whilst decoding. This should not occur in normal operation. It is identified by the sequence (`"!A"`). It has no return message.

# EXAMPLES

Each example has a typical DCM-1 reply in red.

### Zone/ Group Level
Set the music level in a zone or group. NB the command structure is identical for groups and zones.
```
<Z1.MU,L12/><z1.mu,l=12/>      (* zone 1 music level to 12
<Z1.MU,LU7/><z1.mu,l=5/>       (* zone 1 music level up by 7
<Z1.MU,LD3/><z1.mu,l=8/>       (* zone 1 music level down by 3
<Z1.MU,LQ/><z1.mu,l=8/>        (* zone 1 music level query
<Z1.MU,M/><z1.mu,mute/>
<G1.MU,L12/><g1.mu,l=12/>      (* group 1 music level to 12
```

### Zone/ Group Source
Set the music source of a zone or group. NB the command structure is identical for groups and zones.
```
<Z1.MU,S2/><z1.mu,s=2/>        (* zone 1 source to 2
<Z1.MU,SD/><z1.mu,s=1/>        (* zone 1 source down
<Z1.MU,SU/><z1.mu,s=2/>        (* zone 1 source up
<Z1.MU,SQ/><z1.mu,s=2/>        (* zone 1 source query
<G1.MU,S2/><g1.mu,s=2/>        (* group 1 source to 2
```

### EQ
Set the EQ treble, mid and bass for a zone
NB full examples are only shown for treble but they can apply to mid and bass.
#### Treble
```
<Z1.MU,T0/><z1.mu,t=0/>        (* zone 1 music treble to 0dB
<Z1.MU,T+8/><z1.mu,t=+8/>      (* zone 1 music treble to +8dB
<Z1.MU,T-6/><z1.mu,t=-6/>      (* zone 1 music treble to -6dB
<Z1.MU,TD/><z1.mu,t=-8/>       (* zone 1 music treble down (2dB step)
<Z1.MU,TU/><z1.mu,t=-6/>       (* zone 1 music treble up (2dB step)
```
#### Mid
```
<Z1.MU,M+6/><z1.mu,m=+6/>      (* zone 1 music mid to +6dB
```
...
#### Bass
```
<Z1.MU,B+2/><z1.mu,b=+2/>      (* zone 1 music bass to +2dB
```
...
#### Query NB it is only possible to query the full eq set of a zone (treble mid bass)
```
<Z1.MU,EQ/><z1.mu,eq, t = -6, m = +6, b = -2/>   (* zone 1 music eq query
```

### Gain
Set the gain of a line input
```
<L1,G+2/><l1,g=+2/>            (* Line input 1 gain to +2dB
<L1,G0/><l1,g=0/>             (* Line input 1 gain to 0dB
<L1,G-7/><l1,g=-7/>            (* Line input 1 gain to -7dB
<L1,GD/><l1,g=-8/>            (* Line input 1 gain down
<L1,GU/><l1,g=-7/>            (* Line input 1 gain up
<L1,GQ/><l1,g=-7/>            (* Line input 1 gain query
```

### Min and Max
Set the minimum and maximum music level on a zone.
```
<Z1.MU,MX12/><z1.mu,mx=12, n=mute/>  (* Zone 1 music level max to -12 db
<Z1.MU,MN56/><z1.mu,mx=12, n=56/>    (* Zone 1 music level min to -56 db
<Z1.MU,MQ/><z1.mu,mx=12, n=56/>      (* Zone 1 music level max and min query
```

**Groups**
Set up group members, enable and disable a group.
```
<G1,ZA34/><g1,z=3,4d/>          (* Group 1 add zones 3 and 4
<G1,ZA8/><g1,z=3,4,8d/>          (* Group 1 add zone 8
<G1,ZR4/><g1,z=3,8d/>          (* Group 1 remove zone 4
<G1,E/><g1,e=3,8e/>          (* Group 1 enable
<G1,D/><g1,d=3,8d/>          (* Group 1 disable
<G1,Q/><g1,q=3,8d/>          (* Group 1 query
```

**Mic Enables**
Enable and disable a microphone in a zone or group.
NB response message returns enable/ disable state followed by priority state
```
<Z1.M1,E/><z1.m1,e=e, pri = on/>     (* Zone 1 enable mic1
<Z1.M2,D/><z1.m2,d=d, pri = off/>     (* Zone 1 disable mic2
<Z1.M4,Q/><z1.m4,q=d, pri = off/>     (* Zone 1 query enabled state of mic4
<G1.M3,E/><g1.m3,e=e, pri = off/>     (* Group 1 enable mic3
```

**Input Locks**
Enable or disable a line input to a zone or a group
```
<Z1.L1,D/><z1.l1,d=d, pri = off/>     (* Zone 1 disable line input 1
<Z1.L1,E/><z1.l1,e=e, pri = off/>     (* Zone 1 enable line input 1
<Z1.L1,Q/><z1.l1,q=e, pri = off/>     (* zone 1 query enabled state of line input 1
<G1.L1,E/><g1.l1,e=e, pri = off/>     (* Group 1 enable line input 1
```

**Paging Microphone**
Set or release paging access
```
<PM,PAOXOXO/><pm,p=OXOXOOOO/>     (* Paging mic access zone 2 and 4
<PM,PQ/><pm,p=OXOXOOOO/>     (* Paging mic query access
<PM,PR/><pm,p=OOOOOOOO/>     (* paging mic release access
```

Set access contacts as input or output
```
<PM,O/><pm,o acc = out/>     (* paging mic set access contacts as outputs
<PM,I/><pm,i acc = in/>     (* paging mic set access contacts as inputs
```

Query access input or output status NB both commands give the same result
```
<PM,OQ/><pm,oq acc = in/>     (* paging mic query access contacts
<PM,IQ/><pm,iq acc = in/>     (* paging mic query access contacts
```

Set the offset of the DCM-1's paging zones
```
<PM,Z3/><pm,z offset = 3/>     (* paging mic set offset to 3 NB DCM-1 zone 1
                               (* becomes CDPM zone 4 (1+3)
<PM,ZQ/><pm,zq offset = 3/>     (* paging mic query offset
```

Set the priority trigger for the paging microphone
```
<Z1.PM,TV/><z1.pm,tv= vox/>     (* Zone 1 Paging mic priority trigger to vox
<Z1.PM,TO/><z1.pm,to= off/>     (* Zone 1 Paging mic priority trigger to off
<Z1.PM,TA/><z1.pm,ta= access/>     (* Zone 1 Paging mic priority trigger to access
<Z1.PM,TQ/><z1.pm,tq= access/>     (* Zone 1 Paging mic priority trigger query
```

Set the priority parameters for the paging microphone
```
<PM,A23/><pm,a att = 23, hold = 7, rel = 12/>     (* Paging priority attenuation -23dB
<PM,H8/><pm,h att = 23, hold = 8, rel = 12/>     (* Paging priority hold to 8s
<PM,R10/><pm,r att = 23, hold = 8, rel = 10/>     (* Paging priority release to 10s
<PM,Q/><pm,q att = 23, hold = 8, rel = 10/>     (* Paging priority query
                                                  (* Due to a bug DCM-1 software
                                                  (* version 1.04 returns 255 for all
                                                  (* values
```

**Microphone Inputs**
Set the priority trigger for a microphone input
NB response message returns enable/ disable state followed by priority state
```
<Z1.M1,TV/><z1.m1,tv=e, pri = on/>   (* Zone 1 mic 1 priority trigger on (NB. V for VOX)
<Z1.M1,TO/><z1.m1,to=e, pri = off/> (* Zone 1 mic 1 priority trigger off
<Z1.M1,TQ/><z1.m1,tq=e, pri = off/> (* Zone 1 mic 1 priority trigger query
```

Set the system wide priority parameters for a microphone input
```
<MI,A34/><mi,a attn = 34dB, hold = 3s, rel = 1s/>      (* Mic priority attenuation
                                                        (* 34dB
<MI,H4/><mi,h attn = 34dB, hold = 4s, rel = 1s/>       (* Mic priority hold 4s
<MI,R12/><mi,r attn = 34dB, hold = 4s, rel = 12s/>     (* Mic priority release 12s
<MI,Q/><mi,q attn = 34dB, hold = 4s, rel = 12s/>       (* Mic priority query
```

**Line priority**
Set/ unset a line as priority on a zone
```
<Z1.L1,TV/><z1.l1,tv=e, pri = on/>   (* Zone 1 line 1 priority trigger on
<Z1.L2,TV/><z1.l2,tv=e, pri = on/>   (* Zone 1 line 2 priority trigger on
<Z1.L1,Q/><z1.l1,q=e, pri = off/>    (* Zone 1 line 1 priority trigger query. NB l1 pri off
```
because line 2 pri on
```
<Z1.L2,TO/><z1.l2,to=e, pri = off/> (* Zone 1 line 2 priority trigger off
<G1.L1,TV/><g1.l1,tv=e, pri = on/>   (* Group 1 line 1 priority trigger on
                                      (* DCM-1 Software V1.05 only
```
Set the system wide line priority settings
```
<LI,H5/><li,h hold = 5s, rel = 1s/>         (* Line priority hold 5s
<LI,R12/><li,r hold = 5s, rel = 12s/>       (* Line priority release 12s
<LI,Q/><li,q hold = 5s, rel = 12s/>         (* Line priority query
```

**CDR**
```
<RM,Z16/><rm,z, offset = 16/> (* CDR set offset to 16
<RM,ZQ/><rm,zq, offset = 16/> (* CDR query offset
```

**Stereo Mono**
Set stereo/ mono state NB only zones 1 and 2 can be set to stereo
```
<SY.Z1,S/><sy.z1,s=s/>           (* Zone 1 set to Stereo
<SY.Z2,M/><sy.z2,m=m/>           (* Zone 2 set to mono
<SY.Z1,Q/><sy.z1,q=s/>           (* query Zone 1's mono stereo state
```

**Edit Labels**
```
<L1,L=DVD/><l1,l=DVD/>                                  (* set Line 1's label to DVD
<Z1,L=JAZZBAR/><z1,l=JAZZBAR/>                          (* set Zone 1's label to JAZZBAR
<G1,L=FUNCTION ROOM A/><g1,l=FUNCTION ROOM A/>         (* Set group 1's label to FUNCTION
                                                        (* ROOM A
<L1,LQ/><l1,l=DVD/                                      (* Query Line 1's label. NB only
                                                        (* V1.05 SW and above
```

# System Commands

**Installer Key**

Change the installer key

NB first four digits are the existing key; the second four digits are the new key

Can only use digits 1 to 8.

```
<SY,K12345678/><sy,k=5678/>     (* set installer key from 1234 to 5678
<SY,K56784567/><sy,k=4567/>     (* set installer key from 5678 to 4567
```

**Power up Mode (initialisation)**

```
<SY,ID/><sy,id=d/>              (* set power up mode to default
<SY,IF/><sy,if=f/>              (* set power up mode to factory
<SY,IP/><sy,ip=p/>              (* set power up mode to last (previous hence the 'P' )
<SY,IQ/><sy,iq=p/>              (* query power up mode
```

**Save Defaults**

```
<SY,SD/><sy,sd/>                (* save the current settings as the default set
```

**Reset**

```
<SY,R/><DCM-1 RESET/>           (* Reset
```

**Version**

```
<SY,VQ/><sy,vq sw=1.04 hw=1.03/>
```

**Microphone Gates (Only available to DCM-1 software V1.05 and above)**

```
<SY.M1,ND/><sy.m1,nd= off/>     (* Microphone 1 gate off
<SY.M3,NE/><sy.m3,ne= on/>      (* Microphone 3 gate on
<SY.M1,NQ/><sy.m1,nq= off/>     (* Microphone 1 gate query
```

**Emergency Mute**

Set emergency mute parameters

```
<SY.EM,SO/><sy.em,so=no, s=off, l=0/>      (* emergency mute source off
<SY.EM,SL3/><sy.em,sl=no, s=l3, l=2/>      (* emergency mute source line 3
<SY.EM,L12/><sy.em,l=no, s=l3, l=12/>      (* emergency mute level -3dB
<SY.EM,SM3/><sy.em,sm=no, s=m3, l=0/>      (* emergency mute source microphone 3
                                           (* NB level switch to 0dB
<SY.EM,SO/><sy.em,so=no, s=off, l=0/>      (* emergency mute source off
<SY.EM,Q/><sy.em,q=no, s=off, l=0/>        (* emergency mute query
<SY.EM,NO/><sy.em,no=no, s=off, l=0/>      (* emergency mute (Music mute) set to
```
Normally Open
```
<SY.EM,NC/><sy.em,nc=nc, s=off, l=0/>      (* emergency mute (Music mute) set to
                                           (* Normally closed
```