

CL5400 RS232 Serial Interface



Protocol: MICAL-CL5400
For firmware version 1.00 and greater
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The CL5400 includes an RS232 serial interface for remote control and query of the unit. This document describes the operation and interface of that port. The RS232 Port is provided standard on all CL5400 units. The CL5400 is compatible with the command set of the CL3400 which it replaces. The CL5400 is the basis for an expanded series of CrossLine generators offered by MicroImage Video Systems and many will use this command set (with extra or reduced features added as needed).

Physical Interface

The connections are made via a 9 pin female D-sub connector on the rear of the unit.

The cable used for a standard PC will be a "straight through" 9 pin to 9 pin, male-female wired cable (pin 2 to pin 2, pin 3 to pin 3 and pin 5 to pin 5). MicroImage Video Systems can provide standard cables to match 9 or 25 pin serial ports.

The specifications are:

Physical Interface:	RS232D/EIA232D
Baud rate:	9600
Data bits:	8
Parity:	None
Stop bits:	1
Handshaking:	None
Physical Connection:	9 pin D-sub female
Protocol:	MicroImage Control Format Version CL5400-100

Pinout:

- 1 - No Connection
- 2 - TXD (data transmitted from the CL5400)
- 3 - RXD (data received into the CL5400)
- 4 - No Connection
- 5 - Ground
- 6 - No Connection
- 7 - No Connection
- 8 - No Connection
- 9 - No Connection

Data Transmission

The CL5400 can receive a constant data stream. Data is pipelined in such a way within the unit that the result may not be visible for up to 70 milliseconds after the last data byte in a command sequence has been received. Normally, this is not a problem since it still appears to happen immediately to the user. Response to queries may not start until up to 70mS after the request has finished. Queries are queued but may not always be transmitted in the order requests are made.

Command Structure

The command structure is composed of simple ASCII characters and is fairly easy to implement. It can also be tested with a standard ASCII terminal or emulation program. The command sequence consists of a Start character, Command ID, Data byte(s) and a Stop character. The start and stop bytes are very important and should not be forgotten. Data is not processed internally until the stop character is received.

The basic command structure: [A # # # #]

The basic structure for queries is just a slight bit different with addition of a question mark:

Query structure: [? A #]

The start character is an open bracket “[“ (ASCII \$5B). Entering a “[“ character in the middle of any command sequence will reset it to the beginning and start a new command sequence.

The command ID can be any character. It must follow the start character. Some commands use an uppercase letter (“A” is not the same as “a” for example). In the CL741, only uppercase letters and some punctuation were used for commands. The CL741 did include query capability.

The data sequence can consist of 0 to 4 hex digits and have a different meaning for each command. All data is in hex format and letters (A-F) can be in uppercase or lowercase. Note that the CL741 only supported uppercase hex data.

The stop character consists of a closing bracket “]” (ASCII \$5D) or optionally a CR (ASCII \$0D). The bracket is recommended for programmed applications.

Commands

A Line Mode [A#]
[uppercase A]

where # = 0, 1 or 2

0 = Independent positioning mode (previously known as Absolute Mode)

1 = Tracking mode (previously known as relative mode)

2 = Mirrored movement mode

Examples: [A0] will set the unit to Independent positioning mode
 [A1] will set the unit to Tracking positioning mode
 [A2] will set the unit to Mirror positioning mode

Note: This command has no effect if the position is set strictly with serial commands since the serial commands set the independent position of each line. It only affects how the front panel encoder control is used for line movement.

CL741 Note: This command is not directly compatible with the CL741 “A” command. Modes 0 and 1 are reversed while mode 2 does not exist on the CL741 unit.

B Box Mode [B#]
[uppercase B]

where # = 0 or 1

0 = Lines

1 = Box

Examples: [B0] will set the display to full line mode
 [B1] will set the display to box mode

D Display [D#]
[uppercase D]

where # = 0 or 1
0 = Display Off
1 = Display On

Examples: [D0] will turn off the line display allowing the full picture to be seen.
[D1] will turn on the line display

Note: The CL5400 will remember this setting even after power down, the CL741 did not.

F Front Panel Enable [F#]
[uppercase F]

where # = 0 or 1
0 = Front Panel Disabled (controls do not function)
1 = Front Panel Enabled

Examples: [F0] will disable the front panel controls and switches
[F1] will allow the front panel controls and switches to operate

Note: The CL5400 will remember this setting even after power down. If the front panel is disabled and the computer or controller is removed, the only way to set it back to enabled is via the power on system restore. The CL741 did not remember this setting after power down.

Note: The power switch is NOT disabled with this function.

I Intensity [I#]
[uppercase I]

where # = 0 to 3F hex, may be one or two digits.
0 is black and 3F is bright white with gray shades in between.

Examples: [I0] will set the line brightness to black
[I20] will set the line brightness to a medium shade of gray
[I3F] will set the line brightness to bright white

Note: When the B/W button on the front of the unit is pressed, it will automatically change the brightness to black or white. The only way to render a grayscale is with the remote port. The value entered via the remote port is remembered in non-volatile memory and will be retained while the unit is off or unpowered.

The factory default is 38h for white level and 02h for black level.

CL741 Note: This command is changed from the CL741 in that the CL741 only had 16 shades of gray while the CL5400 is capable of 64 shades. Therefore the numerical range has been increased.

L Locks [L#*]
[uppercase L]

where # = 0 to 3 to select encoder 1 through 4, special modes 8 and 9
where * = 0 (unlocked) or 1 (locked)

Note: when specifying the encoder, 0 = line 1, 1 = line 2, 2 = line 3, 3 = line 4

Examples: [L00] will unlock line #1
[L21] will lock line #3
[L10] will unlock line #2
[L31] will lock line #4

The following modes were implemented for backward compatibility with the CL741, using the individual lock commands (listed above) is preferred.

Modes 8 and 9 (commands [L8#] and [L9#]):

Mode 8 will lock/unlock both lines in line group 0 (lines 0 and 1) at the same time.

Mode 9 will lock/unlock both lines in line group 1 (lines 2 and 3) at the same time

Examples: [L81] will lock lines #1 and #2
 [L90] will unlock lines #3 and #4

Note: The CL5400 will remember this setting even after power down, the CL741 did not.

CL741 Note: This command is not 100% compatible with the CL741 command. The CL741 did not have individual lock capabilities like the CL5400. CL741 functionality can be obtained by issuing this command twice, once for each line in a line group or using the new modes 8 and 9.

P Line Position [P*###]

[uppercase P]

where * = 0 to 3 to select which line to move

0 = vertical line (X) of group 0

1 = horizontal line (Y) of group 0

2 = vertical line (X) of group 1

3 = horizontal line (Y) of group 1

where # = 000 to 1DF for horizontal lines and 000 to 27F for vertical lines, must be all three characters

Examples: [P0000] will set line 0 to the left most position
 [P305F] will move line 3 to position 5F (95 in decimal)

Note: All values **MUST** be sent in hex format and all four numbers **MUST** be sent or this command will not function properly. For example, to set the position of line 2 to a position of 7, the command would be [P2007]. The extra two zeros must be present.

Note: Maximum values are 23F y / 2FF x for PAL and 1DF y / 27F x for NTSC in high resolution mode. Values that are transmitted higher will be truncated to the above maximum values. In medium resolution, the maximum values will be half of the high resolution values.

Note: All positions are absolute, the absolute/track/mirror settings do not affect this command.

S System Data [S]

[uppercase S]

Command S is reserved for future use.

T Line Type [T*#]

[uppercase T]

where * = 0 to 3 to select which line to set type

0 = vertical line of group 0

1 = horizontal line of group 0

2 = vertical line of group 1

3 = horizontal line of group 1

where # = 0 to 2 to select line type

0 = line off (not displayed)

1 through E (hex) = different levels of serrated (dashed) line

F (hex) = solid line

Examples: [T00] will turn off line 0
[T3F] will turn line 3 on as a solid line
[T1C] will turn line 1 on with a tight serration
[T23] will turn on line 2 with a wide serration

CL741 Note: This command is similar to the CL741 T command but provides many more options including being able to set different serration styles for each line. The major change is that the CL741 used data (#) of 0 to 2, the CL5400 uses 0 through F (15 decimal) to allow more choices.

+ Debug Mode Set [###]
[Addition Symbol]

where # = 0 to FF (hexadecimal, one or two digits) to select debug mode (see below)
0 = normal operation (system always defaults to this mode on power up)
1 = terminal debug mode. This will append a CR/LF pair after each query transmission

Examples: [+0] will set the unit to normal operation
[+1] will set the unit to terminal debug mode

Note: This function will return to 0 after power up.

CL741 Note: This function did not exist in the CL741.

Queries

The user or computer system can ask the CL5400 for information (data query). Virtually all settings can be transmitted from the CL5400. Below are the commands for queries. Query commands did not exist in the CL741.

! Test ! (does not use brackets)
[exclamation point]

when the unit receives the test character, it will return the same character to the sender within 70mS. This is a quick way to check communications with the unit and for a computer system to make sure the CL5400 is booted and available.

Examples: ! (hex \$21) (does not use brackets)

Returned Data: ! (hex \$21)

ID # (does not use brackets) {returns same character - !}
[number symbol]

Examples: # (hex \$23) (does not use brackets) {returns string data}

Returned Data: when the unit receives the ID character, it will return a string of comma delimited data about the product. An example string would look similar to the following:

[mCL5400,v0100,l0100,d20050518.]

Other fields may also be present as well as needs dictate.

Explanation of fields:

m = Model Number field.
v = firmware code version
l = logic/DSP code version
d = date of code base

?A Query Line Mode [**?A**]
[uppercase ?A]

Examples: [**?A**]

Returned Data: [**A#**]

where # = 0, 1 or 2

0 = Independent positioning mode (previously known as Absolute Mode)

1 = Tracking mode (previously known as relative mode)

2 = Mirrored movement mode

Note: This command only affects how the front panel controls move the lines. Lines set via the RS232 port are always in absolute pixels.

?B Query Box Mode [**?B**]
[uppercase ?B]

Examples: [**?B**]

Returned Data: [**B#**]

where # = 0 or 1

0 = Line mode

1 = Box mode

?D Query Display [**?D**]
[uppercase ?D]

Examples: [**?D**]

Returned Data: [**D#**]

where # = 0 or 1

0 = Display Off

1 = Display On

?F Query Front Panel Enable [**?F**]
[uppercase ?F]

Examples: [**?F**]

Returned Data: [**F#**]

where # = 0 or 1

0 = Front Panel Disabled (controls and switches do not function)

1 = Front Panel Enabled

?I Query Intensity [**?I**]
[uppercase ?I]

Examples: [**?I**]

Returned Data: [**I##**]

where # = 00 to 3F hex and will always be two digits.
0 is black and 3F is bright white with gray shades in between.

Note: This shows the last value transmitted from the remote unit but will not reflect changes made via the front panel B/W switch.

?L Query Locks [**?L**]
[uppercase ?L]

Examples: [**?L**]

Returned Data: [**L####**]

where # = 0 (unlocked) or 1 (locked), the first # after the L refers to control 1, the second to control 2 and so on up to control 4

?P Query Line Position [**?P#**]
[uppercase ?P]

Examples: [**?P#**]

where # = binary value, 0 to F (hex) of control data to be requested. See chart below

- 0 = null request, no data sent
- 1 = request position of line 1
- 2 = request position of line 2
- 3 = request position of lines 1 and 2
- 4 = request position of line 3
- 5 = request position of lines 1 and 3
- 6 = request position of lines 2 and 3
- 7 = request position of lines 1, 2 and 3
- 8 = request position of line 4
- 9 = request position of lines 1 and 4
- A = request position of lines 2 and 4
- B = request position of lines 1, 2 and 4
- C = request position of lines 3 and 4
- D = request position of lines 1, 3 and 4
- E = request position of lines 2, 3 and 4
- F = request position of all lines 1, 2, 3 and 4

Note: command data must be sent in hex format for numbers over 9.

Returned Data: [**P*###**]

where * = line number minus 1 (0 through 3).

#0 = line 1, 1 = line 2, 2 = line 3, 3 = line 4

where # = 000 to 2FF for horizontal lines and 000 to 23F for vertical lines, all three characters will be transmitted.

Note: Returned position data is in Hexadecimal format

Note: Maximum values are 27F (NTSC) or 2FF (PAL) for vertical lines and 1E2 (NTSC) or 23F (PAL) for horizontal lines in high resolution mode. In medium resolution, the maximum values will be half of the high resolution values.

Note: All positions are absolute, the absolute/track/mirror settings do not affect this command.

?S Query System Data [?S]

[uppercase ?S]

Examples: [?S]

The above command will return miscellaneous systems data.

Returned Data: [S###]

Where ### is:

The first number indicates whether the system is in NTSC or PAL mode.

0=NTSC

1=PAL

The second number indicates whether the system is in medium or high resolution mode.

0=Medium resolution

1=High resolution

The third number indicates the origin.

0=Upper left origin

1=Lower left origin

Note: NTSC/PAL is automatically detected and can not be set by the user.

Note: The Origin only affects which direction the horizontal lines move when the user rotates the control. With Upper Left origin, rotating the control clockwise will result in the line moving down the screen. With Lower Right origin, it will move up the screen when rotated clockwise.

Note that additional data may be returned by this command in the future but the order of the first three bytes will be kept the same for compatibility.

?T Query Line Type [?T]

[uppercase ?T]

Examples: [?T]

Returned Data: [T####]

where:

first number (after T) = vertical line of group 0 (line 1)

second number = horizontal line of group 0 (line 2)

third number = vertical line of group 1 (line 3)

fourth number = horizontal line of group 1 (line 4)

where each # = 0 to F (Hexadecimal)

0 = line off (not displayed)

1 through E (hex) = different levels of serrated (dashed) line

F (hex) = solid line

Other Settings

Note that resolution/line width can only be set by adjusting the rear panel dip switch.

Setting DIP switch 4 (rear panel) to ON (down position) will place the unit in high resolution mode. Setting the switch to OFF (up position) will place the unit into medium resolution mode. See the operation manual for additional information.

The origin can only be set by adjusting the rear panel DIP Switch. When switch #3 is set to OFF (up

position), the origin will be in the upper left corner. Moving a control clockwise will move the lines down the screen (horizontal lines only, vertical lines are unaffected). When switch #3 is set to ON (down position), the origin will be in the lower left corner. Moving the control clockwise will then move the lines up the screen.

NTSC and PAL modes are automatically detected by the CL5400. There is no user adjustment.

The above settings cannot be adjusted via software but they can be queried via software using the ?S (Query System Data) command.

Power can only be controlled through the front panel switch or by removing the power source. Due to the flexible design of the unit, power can be removed without first turning the unit off. It will remember the last state of the power switch and boot accordingly.

In the future, there will likely be additions to this command structure as we add new features to the CL5400. We will try to make it as backward compatible as possible.

Break Processing

The CL5400 includes extra processing to automatically detect a break command. After detecting a break state in the RS232 line, the CL5400 will reset its command queue after a short delay. This in effect will flush all characters sent for the current command. The unit will expect a start character ([]) before continuing.

In normal operation, this is not an issue and seldom occurs. The primary time that it happens is when powering up or down the computer or controller that is interacting with the CL5400. Many computers do not cause a problem but some will generate a break command on power up or power down, which could leave the CL5400 in an indeterminate state if not for this extra processing.

After a break is detected, there is a delay of between 250 to 400 milliseconds before the command queue is cleared and ready for new data. All pending serial data is completely flushed and the serial port will be awaiting a start command or a single character command.

For most users, this function will be totally invisible.

Assistance

If you have any questions regarding this document or product, please call:

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