

PXD510 (v1.1) Remote Interface

(Enhanced V3 interface)



Protocol: RS-232/EIA-232
Firmware version: 1.10
For board revision: PCB15076: All
Standard on serial number 10000 and above.
Document Revision 1.010
Created: based on PXD310E interface from September 09, 2003
Revised: November 12, 2010
Applies to products: PXD510E (firmware 1.10 and higher)
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Overview

The PXD510 includes a standard RS232 serial interface for remote control of the unit. This document describes the operation and interface of that port. This allows the PXD510E to be controlled by a computer, industrial controller or custom control device.

Revisions

Many times MicroImage Video Systems will add new features at a customer's request. If we deem these features to be offered as standard on each unit, they will be added to this document. Following is a list of versions for this product:

Version 1.10 - May 05, 2009 - Adds the command "O" and the Query "O" to the control set.

Version 1.00 - baseline initial version

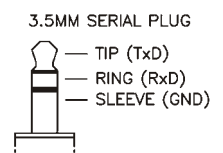
Physical Interface

The connections are made via a 3.5mm rear panel connector (an internal header connector is also available on the PC board). MicroImage Video Systems can provide standard cables to match standard serial ports. Customized cables are also available. The remote port specifications are:

Connection:	3.5mm Phone Jack (in addition to a 2mm Header Connector on the PC Board)
Physical Interface:	EIA232D (RS232)
Baud rate:	9600
Data bits:	8
Parity:	None
Stop bits:	1
Hardware Handshaking:	None
Protocol:	MicroImage PXD Control Format Version 3 (MCL3-PXD510)

Connections

The PXD510E uses a small 3.5mm stereo phone jack for the serial connection. The connections are shown to the lower right.



BL-PXD510 board level units all use a small 3 pin Hirose 2mm male connector for the serial connection. Some board level PXD510 units may also have the 3.5mm phone jack as well. The Hirose 2mm pin connections are Pin 1 = Ground, Pin 2 = Tx/D and Pin 3 = Rx/D.

Data Transmission

This unit can receive a constant data stream from the host. 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 (] - ASCII \$5D hex) is received.

The 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 hex). Transmitting a “[“ character in the middle of any command sequence will cancel (reset) the previous sequence and start a new one. Transmitting a sequence of [] (open bracket, close bracket) will cancel any pending command.

The command ID can be any valid character from the list in the “commands” section of this document. It must follow the start character. In the PXD510, only uppercase letters and some punctuation are used to initiate commands. If an invalid ID character is sent, the unit will respond with a question mark (? , ASCII \$3F hex) as an acknowledgment. This will be sent regardless of the setting of the acknowledge level set by the [A] command. The acknowledge level may add additional characters as well.

The data sequence can consist of 0 to 4 numeric digits and has a different meaning for each command. Data can be in decimal or hexadecimal format and the hex letters (A-F) may be in uppercase (A-F) or lowercase (a-f).

Leading zeros may be used ahead of the number. If a command requires the number 1, this may be entered as 1, 01, 001 or 0001 - all will be interpreted correctly. As an example, to set the unit to Input B, you could enter:

```
[M1]
[M01]
[M001]
[M0001]
```

and all will produce the correct result. If more than four numbers are entered (i.e. M98760001) the last four entered are used, (0001 in the recent example).

If the command is entered without the data argument (i.e. [M]), the data will be interpreted as 0000 (Zero). In this case, it would set the system to the Input A mode, the same as if the command [M0] would have been entered.

All characters in the data sequence are hexadecimal formatted (except for the position command [P], which is selectable to be decimal or hexadecimal formatted). Since none of the other commands (except P) used in the PXD510 have more than nine functions, the data can be hexadecimal or decimal with the same results.

The stop byte consists of a closing bracket (] - ASCII \$5D hex). Upon reception of the stop character, the command is sent to a buffer which holds the full command until the proper process can parse and execute the command. This may take up to 70mS to complete after the reception of the stop byte. A second command can be started while the first one is executing but the stop byte for the second command should not be sent until the first one has completed.

Data Reception

Data is received in the unit by an interrupt routine but is not parsed until the entire string has been sent. The data is

double buffered and the parsing occurs within a separate task. The acknowledgment codes (if used) are also generated by a separate task. Due to this multitasking within the unit, the programmed action may not occur for up to 70mS after the stop byte (]) is received. If the acknowledge command is set to send an acknowledgment, it will be sent after the command operation has completed.

Commands

A Acknowledge Level [A##] where # = 0 through 99 as defined below

[uppercase A]

Command Examples:

[A0] = Quiet mode. Only errors will be acknowledged with a “?” (Power on default).

[A1] = Simple Acknowledge - will return a semicolon (“;” ASCII \$3B hex) only, except when there is a command error, then it will only return a question mark (?).

[A2] = Command Acknowledge - will return the sent command character and the semicolon except when there is a command error, then it will only return question mark (?).

[A3] = Command and Data Acknowledge - will return the command character, four data characters and the semicolon terminator. Note that regardless of the number of data characters sent, four will always be returned. The leading characters will be all zeros if not used. The exception is when there is a command error, then only the question mark (?) Will be returned.

[A99] = Debug Mode - Will return all the data as in [A3] above plus add a carriage return (CR) and line feed (LF) (ASCII \$0D and \$0A hex respectfully). The CRLF WILL be appended to the command error acknowledge (?). Debug mode should NOT be used in system. It is designed only for testing and the format could change in the future.

C Color Bars [C#] where # = 0 or 1

[uppercase C]

Command Examples:

[C0] = Color Bars Off (power up default)

[C1] = Color Bars On

At power up, this setting is set to 0, color bars off

This command will turn the internally generated color bars off or on. The color bar signal overrides all other input signals and functions. The color bar function can only be controlled via the RS232 port.

E Exchange [E#] where # = 0 or 1

[uppercase E]

Command Examples:

[E0] = Exchange disabled

[E1] = Exchange enabled

At power up, the last setting used is restored from EEPROM.

The indicator on the front panel will illuminate when this command is enabled.

The exchange command switches the order of the input signals in split mode. When this command is enabled [E1], the A input will be displayed on the right or bottom while input B is on the left or top of the screen. This operates the

same as the exchange switch on the front panel. See the operation manual for additional information.

F Freeze [F#] where # = 0 or 1
[uppercase F]

Command Examples: [F0] = Un-Freeze input signal B (power up default)
[F1] = Freeze input signal B

At power up, this defaults to 0, or un-frozen.
The front panel indicator will illuminate when the input is frozen.

The Freeze command allows input signal B to be frozen in the on board memory. A full frame will be stored. This command operates the same as the freeze switch on the front panel. Please see the operators manual for additional information.

H Hex mode [H#] where # = 0 or 1
[uppercase H]

Command Examples: [H0] = Decimal Mode (power up default)
[H1] = Hexadecimal Mode

At power up, this defaults to 0 (Decimal mode).
This command will affect the data sent using the P command.

I Input Select [I#] where # = 0 through 4 (inclusive)
[uppercase I]

Reserved function.
Not implemented in present version. Use the rear panel DIP switches to set the inputs.

M Mode [M#] where # = 0 through 5 (inclusive)
[uppercase M]

Command Examples: [M0] = Input A full screen display
[M1] = Input B full screen display
[M2] = Left/Right Split Screen (input A on left unless Exchange is enabled)
[M3] = Top/Bottom Split Screen (input A on top unless Exchange is enabled)
[M4] = Fade Mode (camera signals are added together ratiometrically)
[M5] = Difference Mode (camera signals are mixed to show differences)

At power up, the last setting used is restored from EEPROM.
The indicators on the front panel will illuminate to indicate which mode is set.

The mode command operates the same as the six mode command switches on the front panel. See the operators manual for additional information.

O Offset [O*###] plus Offset save and load commands
[uppercase O]

NOTE: requires firmware version 1.10 or higher. Introduced May 2009

where * = 0,1,2, 3 or 9 to select which image and direction to move
0 = moves image A horizontally
1 = moves image A vertically
2 = moves image B horizontally
3 = moves image B vertically

9 = implies that the following digits are a control code for this command where # = 000 to 1FF for horizontal lines and 080 to 17F for vertical lines, and 001 through 003 for the control codes. All three characters must be present. While the offset values are numeric values, the control commands will be defined below.

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 image B to a horizontal position of 9, the command would be [O2009]. The extra zeros must be present.

At power up, the unit will default to have each image centered. This position can be changed for each image via this command. The Offset command will allow each image (A or B) to be shifted horizontally or vertically in either direction. Horizontal movement is in two luminance pixel increments and vertical movement is in scan line increments.

Default Values:

The default values at power up are as follows:

Image A horizontal (command 0) = 100 hex (256 decimal)
Image A vertical (command 1) = 100 hex (256 decimal)
Image B horizontal (command 2) = 100 hex (256 decimal)
Image B vertical (command 3) = 100 hex (256 decimal)

Lower numbers will move the image left or up while higher numbers will move the image right or down.

Please note that the vertical ranges are limited to 80 to 17f (hex). Higher and lower values may be sent but the operation is undefined with out of range values.

Offset Control Commands:

There are three commands associated with the offset control. They are defined as follows below.

[O9001] will set the current position parameters into EEPROM for storage.

[O9002] will retrieve the position parameters from EEPROM and restore the positions to those set values.

[O9003] will restore the position to the factory default (both images centered). This will NOT alter the EEPROM settings. If you wish to clear the EEPROM and set it back to factory standards, execute the [O9003] command followed by the [O9001] command.

Note: the unit will power up with the images centered to their default value. The positions either need to be set through the serial port or the EEPROM stored offsets can be restored via a serial command [O9002]. The EEPROM values are initially the same as the default values (centered image).

Examples: [O0100] will set image A to the default (centered horizontal) position.
[O3120] will move image B 32 (20 hex) scan lines lower than centered.
[O1080] will move image B left by 128 pixel sets (256 luminance pixels).
[O9001] stores the current values into EEPROM

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 image B to a horizontal position of 9, the command would be [O2009]. The extra zeros must be present.

Note: Maximum values are 1FF for horizontal and 17F for vertical. Values that are transmitted higher may produce undesirable results.

P Position/Fade Ratio [P##] or [P###] where ## = 0 to FF hex or ### = 0 to 255 decimal (inclusive)
[uppercase P]

At power up, the unit will default to the position/fade set by the front panel potentiometer. See command X1 to enable

this command. Once switched to remote, the unit will set the position/fade from it's last setting stored in the EEPROM memory.

Command Examples: [P##] or [P###]
where ## = 0 to FF hex or ### = 0 to 255 decimal (inclusive)

See command X to enable/disable this function.

See command H to set the decimal or hexadecimal mode of operation.

This function sets the position of the split or the ratio of the fade. A number of 0 will display the A input fully (unless Exchange is enabled in split mode). A number of 255 (FF hex) will display the B camera fully (unless Exchange is enabled in split mode). All numbers in between will provide a ratiometric split or fade value. There are 256 steps total.

X System Settings [X#]
[uppercase X]

Command Examples: [X0] = Sets position control to front panel, remote position not enabled (power up default)
[X1] = Sets position control to remote, Front Panel disabled
[X2] = Enables Front Panel switches (power up default)
[X3] = Disables Front Panel switches

Note: The X0/X1 and X2/X3 function as independent command pairs of commands and must be set separately. Commands X0 and X1 will not affect X2 and X3 and commands X2 and X3 will not affect commands X0 and X1, they are independent functions.

The power up default settings for this command are noted above. This command is used to set system interface parameters. There will likely be additional functions added to this command in the future.

The "set position control" (function [X1]) MUST be set to 1 in order to use the remote positioning capability (via the P command).

At power up, or after the X2 command is issued, functions can be controlled by both the remote port and by the front panel switches. They can be used concurrently. Setting function [X3] will disable the front panel switches allowing only remote control until power is cycled or the [X2] command is issued.

Query Commands

The user or computer system can ask the unit for information (data query). Virtually all settings can be transmitted from the unit. Below are the commands for queries.

! Test ! (hex \$21, does not use brackets)
[exclamation point]

Command Example: ! (hex \$21) (single character, does not use brackets)

Returned Data: ! (hex \$21) (single character, returns same character)

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 unit is booted and available.

ID # (does not use brackets)
[number symbol]

Command Example: # (hex \$23, single character, does not use brackets)

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:

[mCL3400,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

^ **Send All** ^ (hex \$5E, single character, does not use brackets)
[caret]

Command Example: ^ (hex \$5E, single character, does not use brackets)

Returned Data: when the unit receives the Send All character (^), it will return a string of data that is the same as issuing most query commands:

[A##][C#][E#][F#][H#][I##][M#][P####][X#]

Please see the individual query commands for the exact formats and options associated with each.

This command is the same as issuing all of the following commands: [?A][?C][?E][?F][?H][?I][?M][?P][?X].

The Send All command is an easy way to query the unit for it's current settings, such as on power up so a remote system can synchronize with it.

Note: In the future, more commands are likely to be added to this sequence.

Note: Commands may not always be sent in the same order or sequence. Decode the commands based on the start character and the following command letter, never by the byte position in the sequence.

?A **Query Acknowledge Level** [?A]
[uppercase ?A]

Command Example: [?A]

Returned Data: [A##]

where # = 00 through FFh (see Acknowledge Level command for above for details)

?C **Query Color Bars On/Off** [?C]
[uppercase ?C]

Command Example: [?C]

Returned Data: [C0] = color bars off (power up default)
[C1] = color bars on

Note: The color bar signal overrides all other input signals and functions. The color bar function can only be controlled via the RS232 port.

?E Query Exchange **[?E]**
[uppercase ?E]

Command Example: [?E]

Returned Data: [E0] = Exchange disabled
 [E1] = Exchange enabled

At power up, the last setting used is restored from EEPROM.

This command will display changes made via the EXCH switch on the front panel or via the serial E command. The EXCH indicator on the front panel will also indicate the state of this setting - illuminated when on.

When the E command is enabled [E1], the A input will be displayed on the right or bottom while input B is on the left or top of the screen. See the operation manual for additional information.

?F Query Freeze **[?F]**
[uppercase ?F]

Command Example: [?F]

Returned Data: [F0] = Un-Freeze input signal B (power up default)
 [F1] = Freeze input signal B

The front panel FREEZE indicator will illuminate when the input is frozen.

This command will display changes made via the serial port or from the front panel FREEZE switch. the same as the freeze switch on the front panel. The EXCH indicator on the front panel will also indicate the state of this setting - illuminated when on. Please see the operators manual for additional information.

?H Query Hex mode **[?H]**
[uppercase ?H]

Command Example: [?H]

Returned Data: [H0] = Decimal Mode (power up default)
 [H1] = Hexadecimal Mode

This command returns whether the unit is set in decimal or hex mode for position/fade data entry. Please note that in decimal mode, three numeric digits are returned from the Query Position [?P] command while in hex mode only two numeric digits are returned. See the Query Position [?P] command for additional information.

?I Query Input Select **[?I]**
[uppercase ?I]

Command Example: [?I]

Returned Data: [I00] = Both inputs are set to S-Video
 [I01] = Input A is S-Video, input B is Composite Video
 [I10] = Input A is Composite Video, input B is S-Video
 [I11] = Both inputs are set to Composite Video

This command returns input settings from rear panel DIP switch. The inputs cannot be set via the remote port.

?M Query Mode **[?M]**

[uppercase ?M]

Command Example: [?M]

Returns Data: [M0] = Input A full screen display
 [M1] = Input B full screen display
 [M2] = Left/Right Split Screen (input A on left unless Exchange is on)
 [M3] = Top/Bottom Split Screen (input A on top unless Exchange is on)
 [M4] = Fade Mode (camera signals are added together ratiometrically)
 [M5] = Difference Mode (camera signals are mixed to show differences)

At power up, the last setting used is restored from EEPROM.

The indicators on the front panel will illuminate to also indicate which mode is set.

The command returns the current mode as set by the front panel switches or via the remote mode command.

?O Query Offset Values [?O#]

[uppercase ?O]

Where # = 0 to F (hex) which selects the channels to request in coded form as follows:

- 1 = request channel A horizontal data
- 2 = request channel A vertical data
- 4 = request channel B horizontal data
- 8 = request channel B vertical data

Numbers can be added together (in hex) to request multiple responses. Such as the command [?OF] will request that data is sent for all channels.

Command Example: [?O#]

Returned Data: [O*xxx] where:

Where:

* = the image channel and direction number as defined in the "O" command:

- 0 = image A horizontal
- 1 = image A vertical
- 2 = image B horizontal
- 3 = image B vertical

xxx = a three digit hex number from 0 to 1FF indicating the relative position of the image
xx = a two digit hex number from 0 to FFh indicating the relative position from the top or left side of the screen or fade value.

Example: Sending the command [?OF] will return the entire following sequence (the "F" value selects all four channels for sending):

[O0###][O1###][O2###][O3###]

At power-up, the unit will be set to the default offset positions with the pictures centered. Serial commands must be used to move the image after power-up.

?P Query Position/Fade Ratio [?P]

[uppercase ?P]

Command Example: [?P]

Returns Data: [Pxxx] when H command is set to 0
 [Pxx] when H command is set to 1

Where:

xxx = a three digit number from 0 to 255 indicating the relative position from the top or left side of the screen or the fade value.

xx = a two digit number from 0 to FFh indicating the relative position from the top or left side of the screen or fade value.

The value returned will be based on the position of the front panel mix control (X command =0) or the value sent via the remote P command (X command set to 1)

At power up, the unit will default to the position/fade set by the front panel potentiometer. See command X to enable this command. Once switched to remote, the unit will set the position/fade from its last setting stored in the EEPROM memory.

See commands H and X which will both affect how this command returns data.

This function returns the position of the split or the ratio of the fade. A number of 0 will display the A input fully (unless Exchange is enabled in split mode). A number of 255 (FF hex) will display the B camera fully (unless Exchange is enabled in split mode). All numbers in between will provide a ratiometric split or fade value. There are 256 steps total.

?X Query System Settings **[?X]**
[uppercase ?X]

Command Example: **[?X]**

Returned Data: **[X--0]** = position control to Front Panel, No Remote (power up default)
 [X--1] = position control to Remote, Front Panel disabled
 [X--0-] = Front Panel switches enabled (power up default)
 [X--1-] = Front Panel switches disabled

This command returns four characters of data after the X. The first two (left most) characters are undefined and can be 0 or 1. The third data character indicates if the front panel is enabled or not and the fourth data character represents the position control source. The dash (-) indicates another character that is not relevant to the item listed.

The power up default settings for this command are noted above.

This returns the system interface parameters. There may be additional functions added to this command in the future.

The “set position control” (function [X1]) MUST be set to 1 in order to use the remote positioning capability (via the P command).

At power up, or after the X2 command is issued, functions can be controlled by both the remote port and by the front panel switches. They can be used concurrently. Setting function [X3] will disable the front panel switches allowing only remote control until power is cycled or the [X2] command is issued.

Changes

In the future, there will likely be additions to this command structure. We will strive to keep all new functions backward compatible to minimize any problems. Do not send any commands that are not currently implemented, as this could cause future incompatibilities.

The latest version of this document will be on the MicroImage Video Systems web site at www.mivs.com. Look in the Technical (Support)/Manuals section or at the PXD510 page(s).

Assistance

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

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