PS232

RS-232 to PS/2
Keyboard Port Adapter
Part # SA0009
(Version 4.0)

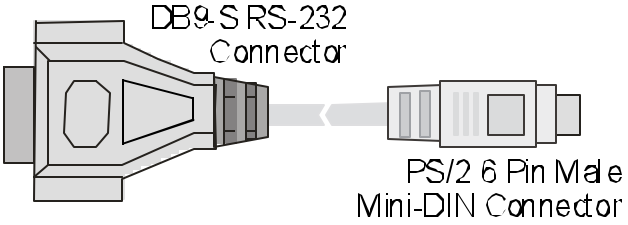
L3 Systems, Inc.
Redmond

Quick Reference

Command	Description	Pg
~H Help Screen	Displays short command reference	4
~V Version	Displays version Information	4
~I Indicator status	Indicator status: 0=None, 1=Scroll 2=Num. 3=Num & Scroll 4=Caps 5=Caps & Num, 6=Num & Caps, 7=All	5
~Znn Delay	Delay nn tenths of a second	4
~C Show Configuration	Displays Configuration String, Ex: 9600,NoPar,YesCmd,NoCR,0D,7E	6
~CW<string> Configuration Write	~CW9600,NoPar,YesCmd,NoCR,0D,FE **Baud: 9600**, 1200, 2400, 4800,9600 **Parity: NoPar**, Even, Odd, NoPar **YesCmd**, YesCmd, NoCmd **NoCR**, NoCR, YesCR **OD** – End of Line character (Hex) **FE** – Command prefix character (Hex)	6
~D Set Default	Sets Configuration to default setting.	7
~Lkk=aa,bb… Load codes	Loads custom key codes: Example: ~L40=79,F0,79	7
~P Print codes	Prints table of custom codes	8
~E Erase codes	Clears custom code table	8
~:nn Scan Code	Sends scan code nn	5
~+nn Scan down	Sends key down, scan code nn	5
~-nn Scan up	Sends key up, scan code nn	5
~Knn Key code	Send raw keyboard scan code nn	8
ASCII Byte	Data interpreted as ASCII byte nn,	4
~^C Control Char	Control shifted ASCII.	4

Introduction

The PS232 keyboard port adapter allows key codes to be sent to a computer by translating RS-232 to PS/2 type keyboard interface signals.



Typical uses for the PS232 Keyboard Port Adapter are:

- **Attaching input devices** – Allows you to attach RS-232 devices to the keyboard port such as bar code readers, scales, and credit card readers.
- **Controlling KVM switches** – The PS232 Adapter can be used to control KVM switches.
- **Controlling Legacy Equipment** – Legacy equipment often has limited capability for external control**.**
- **Testing software** - With the help of a PS232, you can develop a sequence of keys and send them to the keyboard port of a computer running the software that you want to test.

- **Keyboard Dongle** – Can be attached to computers that require a keyboard to boot, since the PS232 simulates a keyboard.

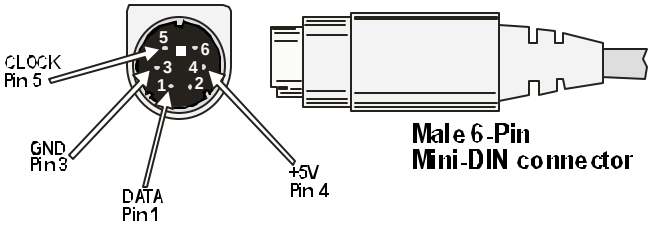
Note of Caution

Improper grounding can cause damage to equipment!!! Before connecting two computers, make sure that they share a common system ground and always stay connected to the same ground during the use of the PS232 Keyboard Port Adapter. If you are anyway unsure that two computers share the same ground, do not connect them in any way using the PS232 Keyboard Port Adapter. L3 systems does not warranty damage to the PS232 Keyboard Port Adapter due to improper grounding, and does not warranty damage to connected equipment for any reason.

Connections

PS232 Mini-DIN Connector

The 6 Pin Mini-DIN PS/2 style connector pins are:



DB9-S Serial Port Connector

The standard DB9-S connector is a "DCE" pin-out and plugs directly in a PC's RS-232 port.

Pin	Signal	Pin	Signal
1	DCD (not used)	6	DSR (not used)
2	RX from PS232	7	RTS (not used)
3	TX to PS232	8	CTS (not used)
4	DTR (not used)	9	RI (not used)
5	Signal Gnd		

Sending Data

The main job of a PS232 is to transfer data from the RS-232 or RS-485 port and send it through to the computer's keyboard port. Data can be sent using ASCII, ASCII control codes, DOS scan codes, keyboard scan codes or ASCII hex. A line can have a maximum length of 35 characters and should end with an <ENTER> (CR, hex 0D). The <ENTER> is not sent through to the computer unless the "CR Pass-through Mode" is enabled (see configuration section, page 6). The following example sends the characters A, B and C to the computer.

Example:

```
PS232 PS232, V4.0x0, [C] L3 Systems, Inc. 2003
:ABC<ENTER>
:
```

Special Characters

ASCII Hex (~$nn) - ASCII hex characters can be formed by sending the hex code preceded by a ~(tilde, hex 7E) and a dollar sign($).. For example, to send an M character in hex, send a ~$4D.

Control Characters – Control Characters can be specified with a ~^ prefix. For example, to send a Control-C, you can send ~^C. Of course, you can also send a Control-C with an ASCII hex prefix of ~$03.

Command prefix character - To send through the command prefix character (the default being a tilde "~", hex 7E), send the character twice. For example a ~~ will send the key codes for one ~ key. Note that you can change the command character with the configuration string. If you do this, only the command prefix character that you define needs to be sent twice.

Commands

Commands are instructions to the PS232 to do something other than just pass data through to the computer. All commands begin with a ~ (tilde, hex 7E) character followed by a command character and then in some cases some data.

Display Version Information

~V **Display Version** – Displays version information regarding the PS232 Adapter that you have.

Example: :~V<ENTER>
PS232, V4.0x0, [C] L3 Systems, Inc. 2003
:

Help Information

The H command displays a short help message.

~H **Help Display** – Display a short help message.

Example: :~H<ENTER>
```
~H Help
~V Version
~I LED Status
~Znn Delay nn
~C Show Config
~CW<string> Load Config
~D Set Default
~Lkk=aa,bb... Load code
~P Print Codes
~E Erase Codes
~Snn Scancode nn
~-nn Make Scancode nn
~+nn Break Scancode nn
~Knn Send Keycode nn
~$nn ASCII byte
~^C Control-C
:
```

Sleep

~Znn Delay nn tenths of Second – Use this command to insert delays. The value nn is in tenths of a second (approximate). This can be helpful when doing scripting, allowing the PS232 to help you pace keystrokes, to avoid out-running the application. :

```
*~Z15<ENTER>  (delays 1.5 seconds)
*
```

Display LED Indicator Status

The ~L command Read the status of the Caps-Lock, Num-Lock and Scroll-Lock LED indicators.

~I Read LED Indicator Status

Example:
```
:~I<ENTER>      (Display Indicator Status)
LEDs: 4         (Caps-Lock On)
:
```

0 = None, 1 = Scroll Lock, 2 = Num Lock, 3 = Scroll & Num Lock, 4 = Caps Lock, 5 = Scroll & Caps Lock, 6 = Num & Caps Lock, 7 = Scroll, Num & Caps Lock

Send a scan code

Use the ~:nn command if you want to send a scan code. This is useful for the occasional function key, arrow key or any other keys that don't have an ASCII equivalent. See the scan code table later on for a list of valid scan codes.

~:nn **Send Scan Code** – This scan code nn.

Example: :~:73<ENTER> *(sends PgUp)*

Up/Down Scan Codes

Use these two commands to send a key down or a key up to the computer. A common use is for Shift, Alt and Cntl keys, which vary the meaning of successive scan codes. See the scan code table later on for a list of valid scan codes.

~+nn **Key down Scan Code** – This sends just the key down (make) sequence for scan code nn.

~-nn **Key up Scan Code** – This sends just the key up (break) sequence for scan code nn.

Example::~+56~:62~-56<ENTER> *(sends <Alt>F4)*

where: **~+56** *Sends Alt down sequence*
~:62 *Sends F4 scan code*
~-56 *Sends Alt up sequence*

Displaying Configuration

The PS232 stores operating parameters in it's non-volatile memory. To display these parameters, do the following command. (Note that the results shown below are the default settings.)

~C **Display Configuration** – This scan code nn.

Example: :~C<ENTER> *(Displays Configuration Data)*
9600,NoPar,YesCmd,NoCR,0D,7E
:

The configuration settings are defined as follows. The underlined characters represent the minimum required entry in each field:

9600 – *Baud Rate*: 1200, 2400, 4800, and 9600 are valid parameters. 9600 is the default setting.

NoPar – *RS-232 Parity*: Valid settings are NoPar for no parity, Even for even parity, and Odd for odd parity. The default is NoPar.

YesCmd – *Command mode*: YesCmd enables PS232 commands and NoCmd disables these commands. The default is YesCmd.

NoCR – *CR Pass through mode*: NoCR does not send through the <CR> or <ENTER> at end of the line. YesCR will send it through.

0D – *End of Line character*: Default is 0D, (<CR> or <ENTER> character)

FE – *Command prefix character*: Default is FE, tilde (~) character.

Changing Configuration

You can change operating parameters of the PS232 adapter with the ~CW command. The following example shows the baud rate changed to 4800 from default, and enabling the "CR pass-through mode.

~CW<*string*> Change Configuration

Example:

:~CW4800,NoPar,YesCmd,YesCR,0D,7E<ENTER>

The following shows the minimal entry for the same setting:

:~CW48,N,Y,Y,0D,7E<ENTER>

Powering on to Default Settings

Should you make a mistake in configuring the settings of the PS232 configuration string, you can force it to use the default settings if you send an RS-232 "Break" condition to the when applying power, This will cause the PS232 to return to the following settings:

9600,NoPar,YesCmd,NoCR,0D,7E

Specifically, this will force it operate at 9600 baud with no parity.

Restoring Configuration Default Settings

You can restore the PS232 configuration to default settings with the ~D command.

~D Restore Configuration Defaults

Example: :~D<ENTER> *(Restores default settings)*

Loading Custom Codes

The PS232 allows you to define custom keyboard scan codes for any ASCII character.

~Lkk=aa,bb... Loading Custom Codes

Example: :~L2A=79,F0,79<ENTER> *(* maps to a "+" key)*

In the above example, an entry is made to define what happens when the ASCII asterisk character "*" is sent via the RS-232 port to the computer. Normal mappings are shown in the ASCII Scan Code table at the end of this manual. The custom scan code table can be used to map keys to any ASCII character.

The key code "79" defines the pressing of the "+" key, and the key codes "F0" and "79" define the removal of the "+" key. Refer to the right column of the scan code tables at the end of this manual for examples of different keyboard key codes that can be assigned.

Displaying Code Table

The code table can be displayed to review entries:

~P Example: :~P<ENTER> *(Displays Code Table)*

```
AS Codes
-- ------
2A 79 F0 79   ← Shows data of example above
62 35 F0 35
63 1A F0 1A
:
```

Erasing the Code Table

The "~E" command allows you to delete all entries in the code table. If you want to change existing entries in the custom code table, you must clear the table with the "~E" command and re-enter the codes with the "~L" command.

~E Erase Code Table

Example: :~E<ENTER> *(Erase Code Table)*

```
:
```

Send a keyboard scan code

Use the ~Knn command to send raw key codes. Note that at least 3 key codes are required to send one key.

~Knn Send Key Code

Example: :~K1C~KF0~K1C<ENTER> *(sends "A" key)*

This command is normally not used, and we recommend using the scan code commands "~:nn", "~+nn" and "~-:nn" instead.

Examples:

:~:59<ENTER>	*Send F1 Key*
:~+42~:59~-42<ENTER>	*Send Shift-F1 Key*
:~+29~+42~:59~-42~-29<ENTER>	*Send Ctrl-Shift-F1 Key*
:DIR~^M<ENTER>	*Send DIR<ENTER> Keys*
:~L21=05,F0,F5<ENTER>	*Map ASCII ! to F1 Key*
:~+29~+42~:83~-42~-29<ENTER>	*Send Ctrl-Alt-DEL Key*

Scan Code Definitions

AT SCAN CODE	PS232 SCAN CODE	KEY	KEYBOARD SCAN CODES
01	01	ESC	76 - F0 76
02	02	1 / !	16 - F0 16
03	03	2 / @	1E - F0 1E
04	04	3 / #	26 - F0 26
05	05	4 / $	25 - F0 25
06	06	5 / %	2E - F0 2E
07	07	6 / ^	36 - F0 36
08	08	7 / &	3D - F0 3D
09	09	8 / *	3E - F0 3E
10	10	9 / (	46 - F0 46
11	11	0 /)	45 - F0 45
12	12	**- / _**	4E - F0 4E
13	13	**= / +**	55 - F0 55
14	14	Backspace	66 - F0 66
15	15	Tab	0D - F0 0D
16	16	Q	15 - F0 15
17	17	W	1D - F0 1D
18	18	E	24 - F0 24
19	19	R	2D - F0 2D
20	20	T	2C - F0 2C
21	21	Y	35 - F0 35
22	22	U	3C - F0 3C

Note: Dash separates “make” and “break keyboard scan codes

Scan Code Definitions (Cont.)

AT SCAN CODE	PS232 SCAN CODE	KEY	KEYBOARD SCAN CODES
23	23	I	43 - F0 43
24	24	O	44 - F0 44
25	25	P	4D - F0 4D
26	26	**[/ {**	54 - F0 54
27	27	**] / }**	5B - F0 5B
28	28	Enter	5A - F0 5A
28	A0	Keypad Enter	E0 5A - E0 F0 5A
29	29	Left Ctrl	14 - F0 14
29	A1	Right Ctrl	E0 14 - E0 F0 14
29+69	A2	PAUSE	E1 14 77 - E1 F0 14 F0 77
30	30	A	1C - F0 1C
31	31	S	1B - F0 1B
32	32	D	23 - F0 23
33	33	F	2B - F0 2B
34	34	G	34 - F0 34
35	35	H	33 - F0 33
36	36	J	3B - F0 3B
37	37	K	42 - F0 42
38	38	L	4B - F0 4B
39	39	**; / :**	4C - F0 4C

Note: Dash separates “make” and “break keyboard scan codes

Scan Code Definitions (Cont.)

AT SCAN CODE	PS232 SCAN CODE	KEY	KEYBOARD SCAN CODES
40	40	' / "	52 - F0 52
41	41	` / ~	0E - F0 0E
42	42	Left Shift	12 - F0 12
43	43	\ / |	5D - F0 5D
44	44	Z	1A - F0 1A
45	45	X	22 - F0 22
46	46	C	21 - F0 21
47	47	V	2A - F0 2A
48	48	B	32 - F0 32
49	49	N	31 - F0 31
50	50	M	3A - F0 3A
51	51	**, / <**	41 - F0 41
52	52	**. / >**	49 - F0 49
53	53	**/ / ?**	4A - F0 4A
53	93	**/**	E0 4A -E0 F0 4A
54	54	Right Shift	59 - F0 59
55	55	*****	7C - F0 7C
55	A4	PRT SCRN	E0 12 E0 7C - E0 F0 7C E0 F0 12
56	56	Left Alt	11 - F0 11
56	A5	Right Alt	E0 11 - E0 F0 11

Note: Dash separates "make" and "break keyboard scan codes

Scan Code Definitions (Cont.)

AT SCAN CODE	PS232 SCAN CODE	KEY	KEYBOARD SCAN CODES
57	57	Space	29 - F0 29
58	58	Caps Lock	58 - F0 58
59	59	F1	05 - F0 05
60	60	F2	06 - F0 06
61	61	F3	04 - F0 04
62	62	F4	0C - F0 0C
63	63	F5	03 - F0 03
64	64	F6	0B - F0 0B
65	65	F7	83 - F0 83
66	66	F8	0A - F0 0A
67	67	F9	01 - F0 01
68	68	F10	09 - F0 09
69	69	NUM LOCK	77 - F0 77
70	70	SCROLL LOCK	7E - F0 7E
71	71	Home	E0 6C - E0 F0 6C
71	A6	Keypad Home / 7	6C - F0 6C
72	72	Up Arrow	E0 12 E0 75 - E0 F0 75 E0 F0 12
72	A7	Keypad Up Arrow / 8	75 - F0 75

Note: Dash separates “make” and “break keyboard scan codes

Scan Code Definitions (Cont.)

AT SCAN CODE	PS232 SCAN CODE	KEY	KEYBOARD SCAN CODES
73	73	Page Up	E0 7D - E0 F0 7D
73	A8	Keypad PageUp / 9	7D - F0 7D
74	74	-	7B - F0 7B
75	75	Left Arrow	E0 12 E0 6B - E0 F0 6B E0 F0 12
75	A9	Keypad Left Arrow / 4	6B - F0 6B
76	76	5	73 - F0 73
77	77	Rt Arrow	E0 12 E0 74 - E0 F0 74 E0 F0 12
77	B0	Keypad Rt Arrow / 6	74 - F0 74
78	78	+	79 - F0 79
79	79	End	E0 12 E0 69 - E0 F0 69 E0 F0 12
79	B1	End/1	69 - F0 69
80	80	Down Arrow	E0 12 E0 72 - E0 F0 72 E0 F0 12
80	B2	Keypad Dn Arrow / 2	72 - F0 72

Note: Dash separates “make” and “break keyboard scan codes

Scan Code Definitions (Cont.)

AT SCAN CODE	PS232 SCAN CODE	KEY	KEYBOARD SCAN CODES
81	81	Page Down	E0 12 E0 7A - E0 F0 7A E0 F0 12
81	B3	Keypad PgDn / 3	7A - F0 7A
82	82	Insert	E0 70 - E0 F0 70
82	B4	Ins/0	70 - F0 70
83	83	Delete	E0 12 E0 71 - E0 F0 71 E0 F0 12
83	B5	Keypad Del / .	71 - F0 71
84		Undefined	
85		Undefined	
86		Undefined	
87	87	F11	78 - F0 78
88	88	F12	07 - F0 07
89		Undefined	
90	90	Left Window	E0 1F - E0 F0 1F
91	91	Right Window	E0 27 - E0 F0 27
92	92	Menu	E0 2F - E0 F0 2F

ASCII Hexadecimal Chart

Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex
NUL ^@	00	SUB ^Z	1A	4	34	N	4E	h	68
SOH ^A	01	ESC ^[	1B	5	35	O	4F	i	69
STX ^B	02	FS ^\	1C	6	36	P	50	j	6A
ETX ^C	03	GS ^]	1D	7	37	Q	51	k	6B
EOT ^D	04	RS ^^	1E	8	38	R	52	l	6C
ENQ ^E	05	US ^_	1F	9	39	S	53	m	6D
ACK ^F	06	SP	20	:	3A	T	54	n	6E
BEL ^G	07	!	21	;	3B	U	55	o	6F
BS ^H	08	"	22	<	3C	V	56	p	70
TAB ^I	09	#	23	=	3D	W	57	q	71
LF ^J	0A	$	24	>	3E	X	58	r	72
VT ^K	0B	%	25	?	3F	Y	59	s	73
FF ^L	0C	&	26	@	40	Z	5A	t	74
CR ^M	0D	'	27	A	41	[	5B	u	75
SO ^N	0E	(	28	B	42	\	5C	v	76
SI ^O	0F	)	29	C	43	]	5D	w	77
DLE ^P	10	*	2A	D	44	^	5E	x	78
DC1 ^Q	11	+	2B	E	45	_	5F	y	79
DC2 ^R	12	,	2C	F	46	`	60	z	7A
DC3 ^S	13	-	2D	G	47	a	61	{	7B
DC4 ^T	14	.	2E	H	48	b	62	|	7C
NAK ^U	15	/	2F	I	49	c	63	}	7D
SYN ^V	16	0	30	J	4A	d	64	~	7E
ETB ^W	17	1	31	K	4B	e	65	Del	7F
EM ^X	18	2	32	L	4C	f	66		
SUB ^Y	19	3	33	M	4D	g	67		

SPECIFICATIONS

Connector: RS-232	DB9-S
Connector: PS/2 Keyboard	6-Pin Mini-DIN, Female
Cable Length	5 inches
Power: w/o Keyboard	10ma Max, .7-12VDC
FCC Approval	Class B
Temperature	0-50°C (32-120°F)

Warranty: *L3 Systems guarantees this product to be free of defects in material and workmanship for 180 days from date of shipment to the end user. L3 Systems will repair or replace (at our option) products within the warranty period at no charge for parts and labor. All returns must obtain a Return of Merchandise Authorization number (RMA) available on request from L3 Systems. Shipping costs (plus customs and duty, if any) to and from L3 Systems must be paid by the user. Damage or defect caused by accident, misuse or neglect is not covered. Damage or defect caused by shipping is excluded. L3 Systems shall not be liable for any consequential damage or losses from the use of, or inability to use its products. Any unauthorized repair or modification of the product voids the warranty. L3 Systems makes no other warranty, express or implied, nor have we authorized anyone to make representations to the contrary.*

PS232 RS-232 to PS/2 Adapter

The PS232 Adapter allows you to adapt an RS-232 device to a computer's keyboard port. Typical uses are:

- **Attaching input devices** – Allows you to attach RS-232 devices to the keyboard port such as bar code readers, scales, and credit card readers.
- **Controlling Legacy Equipment** – Legacy systems often have limited control capability**.**
- **Testing software** - With the help of a PS232, you can sequence keys to test software.

Some advanced features of the PS232 Adapter are:

- **Accepts a Variety of Keyboard Data** - Accepts printable ASCII and encoded ASCII Hex, DOS scan codes, and direct keyboard key codes.
- **Flash Memory Setup Storage** – Stores setup information in non-volatile memory,
- **Map ASCII characters to any Key** – You can map any ASCII character to emulate any ASCII key.

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