USB-KM232

RS-232 Controlled USB Keyboard and Mouse Cable

User Manual

Thank you for purchasing the model USB-KM232 Cable

HAGSTROM ELECTRONICS, INC.

is pleased that you have selected this product for your application. This unit is may be used a variety of ways in order to meet your specific requirements. Please take a few minutes to read this manual before using your USB-KM232.

If you have any questions about the use of the USB-KM232 not covered in this manual, please contact us directly. We offer toll free technical product support from 8:00am to 5:00pm M-F Eastern Time ***888-690-9080***. You may also send an email to

sales@hagstromelectronics.com

We respond to all email requests within one business day.

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USB-KM232

Introduction to the USB-KM232

The USB-KM232 Keyboard and Mouse Emulator is a product designed to allow RS-232 serial communication to produce keystroke and mouse actions on a target PC.

The USB-KM232 receives and sends RS-232 serial data at 9600, 8, N, 1 protocol. Single byte serial commands are used to generate keyboard or mouse action on the PC where the USB connector of the cable is attached. Except for certain special commands, the USB-KM232 always returns a response for each byte received. This response is a one’s complement of the value received. The user’s program can use reception of the response byte as an indication that the code was received and a new command may be sent to the USB-KM232. The response byte is used as handshaking in lieu of hardware handshaking.

The USB-KM232 uses standard drivers for its functions. No special software on the USB end is required for the unit to work with the PC. The USB-KM232 can be used with any USB compatible operating system.

Quick Setup

1) Attach the USB connector of the USB-KM232 to the USB port of the target computer. Allow time for the standard drivers to load the first time the USB-KM232 is used with a particular PC. The USB-KM232 is powered directly from the USB port, no external power is required.

2) Connect the 9 pin serial connector of the USB-KM232 cable to the serial port of the computer or device which will send the serial data to the USB-KM232.

3) The USB-KM232 is now ready to be used. Send and receive serial data using the single byte commands outlined on the following pages.

Producing Mouse Action on the Target PC

Various mouse actions may be generated through the sending of special command bytes to the USB-KM232. The following are the values used for the commands and the action each value represents.

0x42 = Mouse Cursor Left	**0x43** = Mouse Cursor Right
0x44 = Mouse Cursor Up	**0x45** = Mouse Cursor Down

Note: For the cursor movement, the magnitude of the movement is set by the 0x6D and 0x6F commands shown below. The 0x6D command is the default setting.

0x6D = Set mouse cursor movement magnitude to the smallest movement for each of the Mouse Cursor Up, Down, Left, or Right commands. This is always the default value for the cursor movement upon power up. When the 0x6D command is used, the movement magnitude remains at this setting until a 0x6F command is given.

0x6F = Set mouse cursor movement magnitude to larger steps for each of the Mouse Cursor Up, Down, Left, or Right commands. When the 0x6F command is used, the movement magnitude remains at this setting until a 0x6D command is given, or the unit is unplugged or reset.

0x57 = Scroll Wheel Up	**0x58** = Scroll Wheel Down

0x49 = Left Button On	**0xC9** = Left Button Off
0x4A = Right Button On	**0xCA** = Right Button Off
0x4D = Middle Button On	**0xCD** = Middle Button Off

After each command is sent to the USB-KM232, a response code is returned by the USB-KM232, which is the one's complement of the command received. Use this response byte to indicate when the next command may be sent to the USB-KM232.

Serial Protocol = 9600, 8, N, 1

Producing Keystrokes on the Target PC

Generation of keystrokes on the target PC is done through the sending of special key code bytes. Each standard key of the PC keyboard is assigned a “make” code to emulate the press of the key, and a “break” code, which results in the release of the key. The Key Number Table on the following page lists each of the supported keys and their corresponding make and break codes.

From the keycode table, the value of 02 (0x02) can be sent to the unit to generate the “make” or press and hold of the “1” key. Sending a byte with a value of 130 (0x82) will result in the release of the “1” key. The USB-KM232 responds to each byte received with a byte which is a one’s complement of the byte received. Use this response as the indication that the next byte may be sent to the USB-KM232.

Important: For any key that you have previously sent a “make” code for, you must follow with a “break” code of that key at a later time. Failure to send the corresponding break code will leave the key in the down state on the target PC, which may result in unintended keystrokes when new commands are sent. The last key left in the make state without a break will repeat until the break code is sent. Never command more than 6 keys in the “make” state at the same time as this will exceed the standard USB protocol keyboard buffer length for this keyboard device.

The use of make and break codes allows the user to create virtually any keystroke combination. For example, if a sequence of CTRL+ALT+F1 was needed, the following codes would be sent, **58** (L Ctrl make), **60** (L Alt make), **112** (Make F1), **240** (Break F1), **188** (Break L Alt), **186** (Break L Ctrl).

The example above assumes that the response character from the USB-KM232 is received before sending the next command byte to the unit.

US Key Number Table (Decimal Values)

*An international key number table is available on the last page of this document.

Key	Make	Break
`~	01	129
1!	02	130
2@	03	131
3#	04	132
4$	05	133
5%	06	134
6^	07	135
7&	08	136
8*	09	137
9(	10	138
0)	11	139
-_	12	140
=+	13	141
BS	15	143
Tab	16	144
Q	17	145
W	18	146
E	19	147
R	20	148
T	21	149
Y	22	150
U	23	151
I	24	152
O	25	153
P	26	154
[{	27	155
]}	28	156
\\\|	29	157
Caps	30	158
A	31	159
S	32	160
D	33	161
F	34	162
G	35	163
H	36	164

Key	Make	Break
J	37	165
K	38	166
L	39	167
;:	40	168
'"	41	169
Enter	43	171
L Shift	44	172
Z	46	174
X	47	175
C	48	176
V	49	177
B	50	178
N	51	179
M	52	180
,<	53	181
.>	54	182
/?	55	183
R Shift	57	185
L Ctrl	58	186
L Alt	60	188
Space	61	189
R Alt	62	190
R Ctrl	64	192
L Win	70	198
R Win	71	199
Win APL	72	200
Insert	75	203
Delete	76	204
L Arrow	79	207
Home	80	208
End	81	209
Up Arrow	83	211
Dn Arrow	84	212
Page Up	85	213
Page Dn	86	214

Key	Make	Break
R Arrow	89	217
NumLock	90	218
7 (Num)	91	219
4 (Num)	92	220
1 (Num)	93	221
/ (Num)	95	223
8 (Num)	96	224
5 (Num)	97	225
2 (Num)	98	226
0 (Num)	99	227
* (Num)	100	228
9 (Num)	101	229
6 (Num)	102	230
3 (Num)	103	231
. (Num)	104	232
- (Num)	105	233
+ (Num)	106	234
Enter (Num)	108	236
Esc	110	238
F1	112	240
F2	113	241
F3	114	242
F4	115	243
F5	116	244
F6	117	245
F7	118	246
F8	119	247
F9	120	248
F10	121	249
F11	122	250
F12	123	251
Prt Scr	124	252
Scrl Lk	125	253
Pause/Break	126	254

When sending data to the USB-KM232 to generate keystrokes use the values shown to produce the “make” and “break” code for the corresponding key.

Serial Protocol = 9600, 8, N, 1

Additional Keyboard Control Commands

The USB-KM232 features two additional commands for keyboard action. The first command provides a way to clear the USB buffer and is useful for ensuring that no keys are in the “ON” state. The second command allows for the polling of the keyboard status LED states. This polling command is useful for checking shift case changes, or for making sure of the Num Lock state before using Num Lock affected keys.

0x38 - USB Buffer Clear Command. Sending 0x38 to the USB-KM232 serial port results in the device’s internal USB keyboard buffer being cleared. Use of this command ensures that all made keys currently in the USB buffer are released. The USB-KM232 will respond to this command with 0xC7, which is the one’s complement of the command.

Note: See the paragraph labeled “Important” under the section “Producing Keystrokes on the Target PC” found earlier in this manual for a complete explanation of the effect of sending a make code without sending the corresponding break code.

0x7F - Status LED Read Command. Sending 0x7F to the USB-KM232 serial port results in the return of a character in the range of ASCII “0” - “7”. The USB-KM232 response character reflects the current state of the Scroll Lock, Caps Lock, and Num Lock LEDs as listed in the chart below.

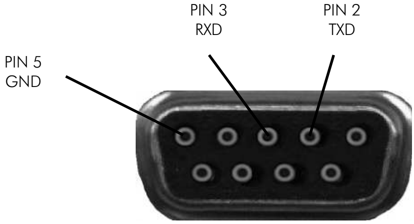
ASCII Response	Scroll Lock Status	Caps Lock Status	Num Lock Status
“0”	Off	Off	Off
“1”	Off	Off	On
“2”	Off	On	Off
“3’	Off	On	On
“4”	On	Off	Off
“5”	On	Off	On
“6”	On	On	Off
“7”	On	On	On

Serial Protocol = 9600, 8, N, 1

Serial Connector Pinout

The USB-KM232 serial connection is a 9 pin female D type connector. The pinout is designed such that it will attach directly to a standard PC com port.

Pin 1	=	Unused
Pin 2	=	Serial Data out of USB-KM232
Pin 3	=	Serial Data into USB-KM232
Pin 4	=	Unused
Pin 5	=	Logic Ground
Pin 6	=	Unused
Pin 7	=	Unused
Pin 8	=	Unused
Pin 9	=	Unused

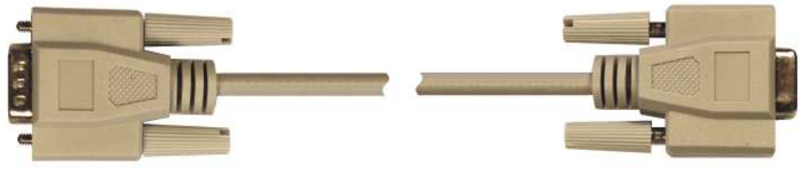


Looking into connector face

USB-KM232 Specifications

Operating Voltage	5 Volts DC +/- 5%
Operating Current	100 ma Maximum
Operating Temp.	0 to 70 Degrees C
PC Interface	USB - Target Computer RS-232 - Serial Source
Cable Length	6 feet
Serial Protocol	9600, 8, N, 1

Accessories



KE-DB9MF

9 pin serial DB9 cable. 6 ft., Male to Female configuration. Can be used with the USB-KM232 to extend the length of the serial connection.

Custom USB-KM232 Options

We offer custom and special modifications to our standard USB-KM232 unit to conform to your exact specifications. Potential modifications include, but are not limited to: special cable lengths, RS-422, etc. Please contact us if you have special requirements.

Questions or Comments?

Please give us a call!

Toll Free

888-690-9080

or visit us on the web

www.hagstromelectronics.com

email: **sales@hagstromelectronics.com**

Warranty

HAGSTROM ELECTRONICS, INC. warrants this product against defects in material or workmanship for a period of ONE YEAR from the original purchase date. We will repair or replace (at our option) the returned defective unit at no charge during this warranty period.

No responsibility is assumed for any special, incidental, or consequential damage resulting from the use of or inability to use this product. In no case is **HAGSTROM ELECTRONICS, INC.** to be liable for any amount which exceeds the purchase price of the unit, regardless of the claim.

No other warranty, written or verbal, is authorized. This warranty is applicable only to units sold in the United States. Units sold outside the United States are covered by a similar warranty.

Depending on the state in which you live, you may have additional rights.

Great care has been taken during the assembly, testing, and burn-in of your USB-KM232 to ensure its performance. If you have any questions, please send us an email or give us a call. Support is available Monday through Friday, 8:00 am to 5:00 pm (EST).

customer service email*:* ***sales@hagstromelectronics.com***

Call Toll Free **888-690-9080**, or **(540) 465-4677**

NOTICE: The USB-KM232 product is designed to be used by technically oriented computer users.

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V. 9.15

International Key Number Table (Decimal Values)

Make	Break	UK	Canadian French	German
01	129	`|¬	#\\|	^°
02	130	1!	1±!	1!
03	131	2″	2@″	2²″
04	132	3£	3£/	3³§
05	133	4$	4¢$	4$
06	134	5%	5¤%	5%
07	135	6^	6¬?	6&
08	136	7&	7|&	7{/
09	137	8*	8²*	8[(
10	138	9(	9³(	9])
11	139	0)	0¼)	0}=
12	140	-_	-½_	ß\?
13	141	=+	=¾+	´`
15	143	BS	BS	BS
16	144	TAB	TAB	TAB
17	145	Q	Q	Q@
18	146	W	W	W
19	147	E	E	E
20	148	R	R	R
21	149	T	T	T
22	150	Y	Y	Z
23	151	U	U	U
24	152	I	I	I
25	153	O	O§	O
26	154	P	P¶	P
27	155	[{	^[^	Ü
28	156	]}	¸]¨	+~*
30	158	Caps Lock	Fix Maj	⇩
31	159	A	A	A
32	160	S	S	S
33	161	D	D	D
34	162	F	F	F
35	163	G	G	G
36	164	H	H	H
37	165	J	J	J
38	166	K	K	K
39	167	L	L	L
40	168	;:	;~:	Ö
41	169	‘@	`{`	Ä
42	170	#~	<}>	#′
43	171	Enter	Entrée	Enter
44	172	L Shift	L Shift	L Shift
45	173	\\|	«°»	<|>
46	174	Z	Z	Y
47	175	X	X	X
48	176	C	C	C
49	177	V	V	V
50	178	B	B	B
51	179	N	N	N
52	180	M	Mµ	Mµ
53	181	,<	,¯´	,;
54	182	.>	.-.	.:

Make	Break	UK	Canadian French	German
55	183	/?	É´	-_
57	185	R Shift	R Shift	R Shift
58	186	L Ctrl	L Ctrl	L Strg
60	188	Alt	Alt	Alt
61	189	Space	Space	Space
62	190	Alt Gr	AltCar	Alt Gr
64	192	R Ctrl	R Ctrl	R Strg
70	198	L Win	L Win	L Win
71	199	R Win	R Win	R Win
72	200	Win APL	Win APL	Win APL
75	203	Insert	Inser	Einfg
76	204	Delete	Suppr	Entf
79	207	L Arrow	←	←
80	208	Home	↖	Pos1
81	209	End	Fin	Ende
83	211	Up Arrow	↑	↑
84	212	Dn Arrow	↓	↓
85	213	Page Up	Page Up	Bild ↑
86	214	Page Dn	Page Dn	Bild ↓
89	217	R Arrow	→	→
90	218	Num Lock	Num	Num
91	219	7 (Num)	7 (Num)	7 (Num)
92	220	4 (Num)	4 (Num)	4 (Num)
93	221	1 (Num)	1 (Num)	1 (Num)
95	223	/ (Num)	/ (Num)	/ (Num)
96	224	8 (Num)	8 (Num)	8 (Num)
97	225	5 (Num)	5 (Num)	5 (Num)
98	226	2 (Num)	2 (Num)	2 (Num)
99	227	0 (Num)	0 (Num)	0 (Num)
100	228	* (Num)	* (Num)	* (Num)
101	229	9 (Num)	9 (Num)	9 (Num)
102	230	6 (Num)	6 (Num)	6 (Num)
103	231	3 (Num)	3 (Num)	3 (Num)
104	232	. (Num)	. (Num)	, (Num)
105	233	- (Num)	- (Num)	- (Num)
106	234	+ (Num)	+ (Num)	+ (Num)
108	236	Enter (Num)	Entr (Num)	Enter (Num)
110	238	Esc	Échap	Esc
112	240	F1	F1	F1
113	241	F2	F2	F2
114	242	F3	F3	F3
115	243	F4	F4	F4
116	244	F5	F5	F5
117	245	F6	F6	F6
118	246	F7	F7	F7
119	247	F8	F8	F8
120	248	F9	F9	F9
121	249	F10	F10	F10
122	250	F11	F11	F11
123	251	F12	F12	F12
124	252	Print Screen	Imp Éc	Druck
125	253	Scroll Lock	Défil	Rollen ⇩
126	254	Pause/Break	Pause/Break	Pause/Break

Note: Keys numbers are established by key location on the keyboard. Therefore, it is possible to determine the proper key assignments for another country’s keyboard by comparing it’s layout to one of the keyboards listed in the table above.