

- Control Serial VFD Modules from a USB2.0 Port
- USB Powered Option Drives 5V Displays up to 450mA
- Bi-directional SPI Master <1MHz Clock
- Async 9600, 19200 and 38400 Baud
- USB 2.0 HID Keyboard & Mouse, Generic Printer and CDC Com Port Interfaces to Host
- User Setup Stored in EEPROM
- Infra-Red Receive and Decode of KBC56A Keyboard

This compact USB interface module has been designed to interface to 7806A, KTW200 and K610A suffix VFD modules. It can be used for other applications where a CMOS asynchronous serial or SPI interface is required using appropriate wired connections or an adaptor PCB.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Condition
Power Supply Voltage	VCC	5.0VDC +/- 5%	GND=0V
Power Supply Current	ICC	20 mADC (typ) without Display	VCC=5VDC
Logic High Input	VIH	0.8VDC min. / VCC max.	VCC=5VDC
Logic Low Input	VIL	0VDC min. / 0.6VDC max.	VCC=5VDC
Logic High Output	VOH	3.5VDC min. / VCC max.	IOH=-10µA
Logic Low Output	VOL	0VDC min. / 0.6VDC max.	IOL=4mA

ENVIRONMENTAL SPECIFICATION

Parameter	Value
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Operating Humidity	20 to 85% RH @ 25°C non condensing

CONFIGURATION COMMANDS

Display Interface - Press CTRL then ALT then SHIFT then Key	Key
Asynchronous Serial 9600 Baud - Idle high - CMOS (TXD & RXD)	A
Asynchronous Serial 19200 Baud - Idle high - CMOS (TXD & RXD)	B
Asynchronous Serial 38400 Baud - Idle high - CMOS (TXD & RXD)	C
Asynchronous Serial 9600 Baud - Idle low - pseudo RS232 (TXD)	D
Asynchronous Serial 19200 Baud - Idle low - pseudo RS232 (TXD)	E
Asynchronous Serial 38400 Baud - Idle low - pseudo RS232 (TXD)	F
Asynchronous Serial 9600 Baud - Differential - RS485 (TXA & TXB)	J
Asynchronous Serial 19200 Baud - Differential - RS485 (TXA & TXB)	K
Asynchronous Serial 38400 Baud - Differential - RS485 (TXA & TXB)	L
SPI Synchronous Master Clock Output - Data Clocked on Rising Edge [Default]	M
SPI Synchronous Master Clock Output - Data Clocked on Falling Edge	N
Enable Host Busy Handshaking or set /SS in SPI Master ⁴	P
Disable Host Busy Handshaking or set /STB in SPI Master ⁴	Q
Enable Read. Sends byte from SPI/Async interface to USB in Serial COM Port mode ⁵	R
8-Bit Port Toggle (Defaults to Output 00h) (P7-P0)	S
Enable /RST Control. (Send 05h 03h 0Bh 02h to toggle /RST low for 50us)	X
Disable /RST Control [Default]	Y
KBC56A Decode Options - Press CTRL then ALT then SHIFT then Key³	Key
KBC56A Keyboard ASCII Decoding [Default]	T
KBC56A Keyboard Offset Raw Code	U
Enable Keyboard data to be sent direct to the selected interface port as well as the USB ⁵	I
Miscellaneous - Press CTRL then ALT then SHIFT then Key	Key
Get KBR38A-USB2 Software Version String	?
USB Device Mode - Press CTRL then ALT then SHIFT then Key	Key
Power Only - USB interface	0
Serial COM Port (32-Byte Tx and Rx Buffers) [Default]	1
HID Keyboard and Mouse	2
HID Keyboard and Mouse + Generic Printer	3

CN1 - SERIAL INTERFACE PIN DESIGNATION

Pin	Async	RS485	SPI	Port
1	VCC	VCC	VCC	VCC
2	-	-	SCK _{OUT}	P0 _{OUT}
3	TXD _{OUT}	TXA _{OUT}	/STB+/SS	P7 _{OUT}
4	-	-	DATA _{OUT}	P1 _{OUT}
5	GND	GND	GND	GND
6	-	-	DATA _{IN}	P2 _{OUT}
7	RXD _{IN}	TXB _{OUT}	-	P6 _{OUT}
8	-	-	/RST _{OUT}	P3 _{OUT}
9	MB _{IN}	-	MB _{IN}	P5 _{OUT}
10	HB _{OUT}	-	HB _{OUT}	P4 _{OUT}

CN2 - USB MINI B

Pin	Signal
1	VCC
2	D-
3	D+
4	N/C
5	GND

CN3 - USB

Pin	Signal
1	VCC
2	D-
3	D+
4	GND

JUMPER SETTINGS

Jumper	Connect	Function
J1 ¹	Open	External PSU
	Link	USB Powered (default)

IMPORTANT NOTES

1. Maximum total current is 450mA when USB powered.
2. The asynchronous serial interface RXD and MB operate between 0V and 5V. Do not connect to signals on an RS232 interface which exceed these values.
3. Keyboard Decode options only applicable when USB is configured as a serial port. CN1 pin 3 functions as /SS or /STB in SPI Master. /STB is toggled for 1us after 8 bits of data are sent if option selected.
4. Pin 1 on the connectors CN1 / CN3 are indicated by a square pad. The pin out on CN1 follows IDC convention.
5. Enable Read and Enable Keyboard commands are disabled when a different interface is selected.

OPERATING MODES

When the CTRL, ALT and SHIFT keys are pressed in sequence, or the string 'CTRLALTSHIFT' is sent on the USB serial port, the next key sets the mode as shown in the above table. The configuration settings are stored in EEPROM. All other functions of the KBC56A keyboard are described on the next pages.

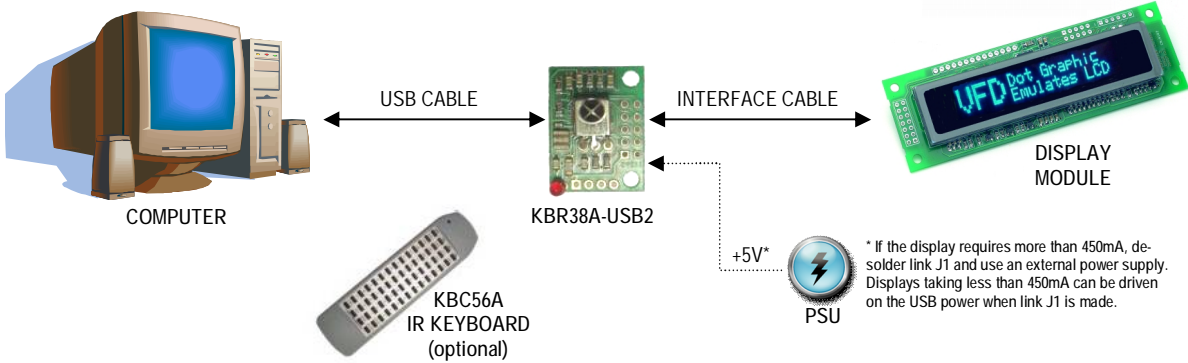
INSTALLATION

When first plugged into the PC, the KBR38A-USB2 defaults to a Serial COM Port so the operating system will request a driver 'inf' file. This can be downloaded from: www.noritake-iron.com/usb. It also uses an operating system file included with Windows called usbser.sys which should be updated if problems occur. If the device mode is changed to HID Keyboard & Mouse and Generic Printer, the KBR38A-USB2 uses drivers that are automatically installed from the operating system. These modes require the use of the KBC56A keyboard to change back to a COM Port.

LED and TOGGLE FUNCTIONALITY

The LED indicates Caps Lock and flashes on key pressed. In 8 bit toggle mode the KBC56A keyboard can set and clear each bit using keys 1-8 for set high and keys C-J to clear low. Data from the PC will set the bits according to the 8 bit value sent such that 1 = port high and 0 = port low.

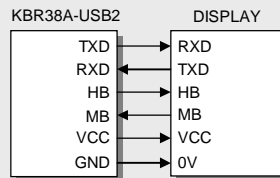
TYPICAL SYSTEM CONFIGURATION



INTERFACING TO KBR38A-USB2

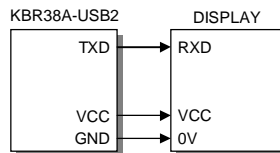
Async serial (CMOS, idle high) – A, B, C

Data is sent asynchronously from TXD and received asynchronously on RXD. Transfers at 9600, 19200 or 38400 Baud are supported. Module Busy (MB) must be low to enable transmission.



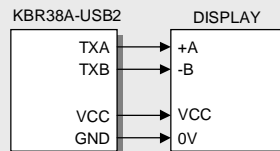
Async serial (pseudo RS232, idle low) – D, E, F

Data is sent asynchronously from TXD. Transfers at 9600, 19200 or 38400 Baud are supported. Do not connect to a serial port where higher output voltages than 5V or lower than 0V are present.



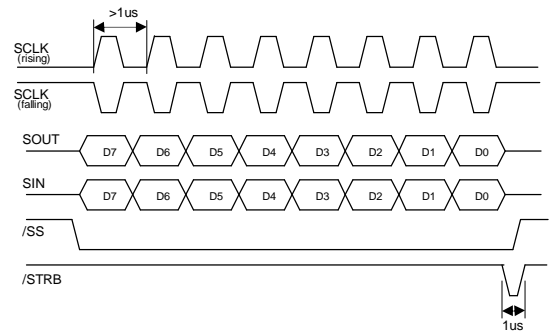
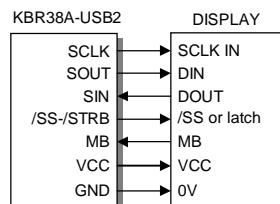
Asynchronous serial (RS485, differential) – J, K, L

Data is sent asynchronously from TXA and TXB. Transfers at 9600, 19200 or 38400 Baud are supported.



SPI master – M, N, P, Q

Data is clocked out on the rising or falling edge of SCLK. Data is sent MSB first. If /SS is enabled (P), the /SS-/STRB line will be idle high and go low while clocking data. If /STRB is enabled (Q), the /SS-/STRB line will idle high and will go low for approximately 1us after the byte is clocked out. Module Busy (MB) has to be low before the last bit of data is clocked out. It is recommended to reset the system after changing SPI mode as an extra clock pulse can be generated.



USB SERIAL COM PORT MODE

DATA DECODE TABLE FOR KBC56A (Hex)

Key	STD	Shift	Lock	ALT	CTRL	Raw
ESC	1B	01	1B	02	80	00
TAB	03	04	03	05	81	01
INS	06	0E	06	0F	83	03
DEL	7F	10	7F	11	82	02
▲PUp	0B	12	0B	13	84	04
◀HME	08	14	08	15	85	05
▶END	09	16	09	17	86	06
▼PDn	0A	18	0A	19	87	07
? ¥ /	3F	9C	3F	2F	88	08
* € \	2A	9D	2A	5C	89	09
(£ [28	9B	28	5B	8A	0A
) \$]	29	24	29	5D	8B	0B
1 @	31	40	31	Hex	8C	0C
2 &	32	26	32	Hex	8D	0D
3 <	33	3C	33	Hex	8E	0E
4 >	34	3E	34	Hex	8F	0F
5 %	35	25	35	Hex	90	10
6 +	36	2B	36	Hex	91	11
7 -	37	2D	37	Hex	92	12
8 =	38	3D	38	Hex	93	13
9 ~	39	7E	39	Hex	94	14
0 #	30	23	30	Hex	95	15
a A	61	41	41	Hex	96	16
b B	62	42	42	Hex	97	17
c C	63	43	43	Hex	98	18
d D	64	44	44	Hex	99	19
e E	65	45	45	Hex	9A	1A
f F	66	46	46	Hex	9B	1B
g G	67	47	47	1C	9C	1C
h H	68	48	48	1D	9D	1D
i I	69	49	49	1E	9F	1F
j J	6A	4A	4A	1F	A0	20
k K	6B	4B	4B	E0	A1	21
l L	6C	4C	4C	E1	A2	22
m M	6D	4D	4D	E2	A3	23
n N	6E	4E	4E	E3	A4	24
o O	6F	4F	4F	E4	A5	25
p P	70	50	50	E5	A6	26
q Q	71	51	51	E6	A7	27
r R	72	52	52	E7	A8	28
s S	73	53	53	F0	A9	29
t T	74	54	54	F1	AA	2A
u U	75	55	55	F2	AB	2B
v V	76	56	56	F3	AC	2C
w W	77	57	57	F4	AD	2D
x X	78	58	58	F5	AE	2E
y Y	79	59	59	F6	AF	2F
z Z	7A	5A	5A	F7	B0	30
' ! "	27	21	27	22	B1	31
. :	2C	3B	2C	B2	B2	32
. : °	2E	3A	2E	F8	B3	33
Space	20	5F	20	07	B4	34
Ctrl	See 'CTRL ALT SHIFT TABLE' for specific functionality when these keys are pressed.					35
Alt						36
Shift						37
Enter	0D	0D	0C	00	B8	38

Functions of CTRL, ALT and SHIFT Keys for KBC56A Keyboard in Serial Port Mode.

CTRL, ALT and SHIFT are pressed before a single alternate character. CTRL then ALT or CTRL then SHIFT enable ALT or SHIFT (Caps) Lock which is cancelled using CTRL. When lock is on, ALT or SHIFT can be used to input a related alternate character. Refer to the following table:

CTRL ALT SHIFT TABLE FOR KBC56A KEYBOARD

Current State	Key Press	Action	Key Sent
NORMAL (ALT, CTRL, SHIFT OFF)	CTRL	Set CTRL ON	None
	ALT	Set ALT ON	None
	SHIFT	Set SHIFT ON	None
	Other	Send Standard Character / Lower Case	STD Key / a-z
CTRL ON	CTRL	Set CTRL OFF	None
	ALT	Set ALT LOCK ON	None
	SHIFT	Set SHIFT LOCK ON	None
	Other	Send Raw RC5 code with top bit set	RC5 + 80h
ALT ON	CTRL	Set ALT OFF	None
	ALT	No Action	None
	SHIFT	Set ALT OFF, SHIFT ON	None
	0-9, A-F	Store HEX High Nibble	None
SHIFT ON	Other	Send Blue Character on Keyboard	Blue Key
	CTRL	Set SHIFT OFF	None
	ALT	Set SHIFT OFF, ALT ON	None
	SHIFT	No Action	None
ALT LOCK ON	Other	Send Red Characters / Upper Case	Red Key / A-Z
	CTRL	Set ALT LOCK OFF	None
	ALT	Set NORMAL once only	None
	SHIFT	Set SHIFT ON once only	None
SHIFT LOCK ON	0-9, A-F	Store HEX High Nibble	None
	Other	Send Blue Character on Keyboard	Blue Key
	CTRL	Set SHIFT LOCK OFF	None
	ALT	Set ALT ON once only	None
HEX	SHIFT	Set NORMAL once only	None
	Other	Send Red Characters / Upper Case	Red Key / A-Z
	0-9, A-F	HEX Low Nibble. Send HEX	HEX Byte
	Other	No Action	None

HEX entry can be used to send any value from 00H to FFH by pressing the ALT key followed by the 2 HEX digits. In all modes a key starts to auto repeat after holding it down for 1 second and CTRL is used to cancel previous CTRL, ALT or SHIFT modes.

GENERIC PRINTER MODE

Generic Printer mode includes a text filter to remove headers, footers and margin spacing. This allows emails or documents to be sent and printed with selected text stored in a display. The example below shows how data and hex commands are embedded in quote marks.

STARTTEXT

```
"Welcome to Noritake"
"You use a back slash to embed hex code"
"\1DThis will scroll from left to right"
"You can use two \\ to display a back slash and \" to display a quote"
""
```

The key word STARTTEXT enables the generic printer mode and "" disables it. The data transmitted between quote marks will be converted to ASCII. Special and non printable characters should be sent as hex values preceded by a \ To display a \ send \\ and to display a " send \" Multiple STARTTEXT operations can be contained in a document.

KEYBOARD OPERATION IN HID KEYBOARD AND MOUSE MODE

NORMAL			
ESC	TAB	INS	DEL
ESC	TAB	INS	DEL
UP	LEFT	RIGHT	DOWN
UP	LEFT	RIGHT	DOWN
? *	()	()	()
? *	()	()	()
1	2	3	4
1	2	3	4
5	6	7	8
5	6	7	8
9	0	A	B
9	0	a	b
C	D	E	F
c	d	e	f
G	H	I	J
g	h	i	j
K	L	M	N
k	l	m	n
O	P	Q	R
o	p	q	r
S	T	U	V
s	t	u	v
W	X	Y	Z
w	x	y	z
'	'	'	SPACE
'	'	'	SPACE
CTRL	ALT	SHIFT	ENTER
CTRL	ALT	SHIFT	ENTER
NORMAL			

SHIFT			
ESC	TAB	INS	DEL
ESC	Back TAB	INS	Back Space
UP	LEFT	RIGHT	DOWN
Page Up	Home	End	Page Down
? *	()	()	()
Y	€	£	\$
1	2	3	4
@	&	<	>
5	6	7	8
%	+	-	=
9	0	A	B
-	#	A	B
C	D	E	F
C	D	E	F
G	H	I	J
G	H	I	J
K	L	M	N
K	L	M	N
O	P	Q	R
O	P	Q	R
S	T	U	V
S	T	U	V
W	X	Y	Z
W	X	Y	Z
'	'	'	SPACE
'	'	'	SPACE
CTRL	ALT	SHIFT	ENTER
CTRL	ALT	SHIFT	ENTER
SHIFT			

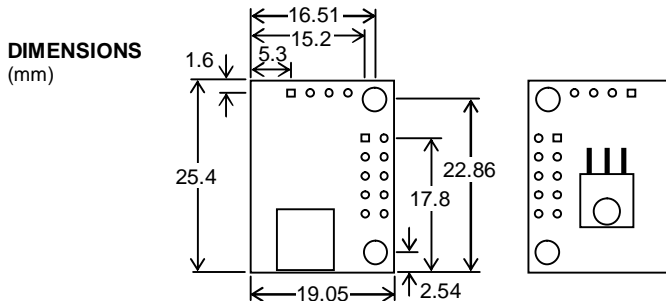
ALT			
ESC	TAB	INS	DEL
ESC	ALT+TAB prog switch	ALT+INS	CTRL+ALT+DEL
UP	LEFT	RIGHT	DOWN
ALT+UP	ALT+LEFT	ALT+RIGHT	ALT+DOWN
? *	()	()	()
/	\	[]
1	2	3	4
F1	F2	F3	F4
5	6	7	8
F5	F6	F7	F8
9	0	A	B
F9	F10	F11	F12
C	D	E	F
Caps Lock	WIN+D Desktop	WIN+E Explorer	WIN+F Find
G	H	I	J
Mouse Up Left	Mouse Up	Mouse Up Right	Mouse Scroll Up
K	L	M	N
Mouse Left	Mouse Left Btn	Mouse Right	Mouse Right Btn
O	P	Q	R
Mouse Down Left	Mouse Down	Mouse Down Right	Mouse Scroll Down
S	T	U	V
ALT+F6 Switch	Print Screen	WIN+U Utility Mgr	WIN+M Minimise
W	X	Y	Z
WIN+R Run	ALT+F4 Close	WIN+L Lock PC	SHIFT+WIN+M Unminimise
'	'	'	SPACE
'	'	'	ALT+SPACE Sys Menu
CTRL	ALT	SHIFT	ENTER
CTRL	ALT	SHIFT	ALT+ENTER Properties
ALT			

CTRL			
ESC	TAB	INS	DEL
CTRL+ESC start menu	CTRL+TAB	CTRL+INS	CTRL+DEL
UP	LEFT	RIGHT	DOWN
CTRL+UP	CTRL+LEFT	CTRL+RIGHT	CTRL+DOWN
? *	()	()	()
1	2	3	4
CTRL+1	CTRL+2	CTRL+3	CTRL+4
5	6	7	8
CTRL+5	CTRL+6	CTRL+7	CTRL+8
9	0	A	B
CTRL+9	CTRL+0	CTRL+A Select All	CTRL+B Bold
C	D	E	F
CTRL+C Copy	CTRL+D	CTRL+E	CTRL+F Find
G	H	I	J
CTRL+G	CTRL+H Replace	CTRL+I Italic	CTRL+J
K	L	M	N
CTRL+K	CTRL+L	CTRL+M Minimise	CTRL+N New
O	P	Q	R
CTRL+O Open	CTRL+P Print	CTRL+Q	CTRL+R
S	T	U	V
CTRL+S Save	CTRL+T	CTRL+U Underline	CTRL+V Paste
W	X	Y	Z
CTRL+W	CTRL+X Cut	CTRL+Y	CTRL+Z Undo
'	'	'	SPACE
'	'	'	CTRL+SPACE
CTRL	ALT	SHIFT	ENTER
CTRL	ALT	SHIFT+LOCK	CTRL+ENTER
CTRL			

The mouse is activated by pressing ALT then appropriate keys G-R. Deactivating the mouse is achieved by pressing a key other than G-R. Function keys F1-F12 are achieved by pressing ALT then 1-9, 0, A, B. CTRL then SHIFT enables SHIFT lock and DEL as Back Space. The Ctrl-Alt-Delete sequence is achieved by pressing ALT then DEL.

WARRANTY & UPDATES

This product is fully tested prior to shipment. EMC precautions must be undertaken when handling the device. Connecting while power is applied (hot plugging) is not recommended. Device failure due to CPU or port damage is not covered by the warranty. This device is not designed for critical applications. Software updates, drivers and examples can be found at www.noritake-iron.com/usb.



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