User Instructions for the VETRA Systems
USB-331 & USB-335 "SmartPipe"™ Protocol Converters

Congratulations on your purchase of a VETRA ASCII to USB Keyboard Protocol Converter! This quality product is designed and built in the USA and is backed by a VETRA Three-year Warranty and unlimited free technical support. You are welcome to comment, please email us at sales@vetra.com or call us at the numbers given at the end**.**

INTRODUCTION

The USB-331 and USB-335 "SmartPipe"™ protocol converters change ASCII RS-232 data to standard USB keyboard signals allowing it to be fed into any USB port, either directly or via a hub supplied by you. You can connect additional standard keyboards if the PC is has spare USB or PS/2 keyboard ports. The data from the additional keyboard will be merged with the RS-232 data. The connection of another keyboard is optional and not necessary for the USB-331 and USB-335 to operate. The USB-331 and USB335 are powered from the USB port and do not need an external power supply. The Converters can be used with any computer with an available USB port, such as PC's and iMAC's.

The USB-335 "SmartPipe"™ protocol converters perform the same operations as the USB-331 but also include an on-board 2-port hub allowing you to plug in other USB devices. If the additional devices use more than 400 mA, the USB-335 requires a +5 VDC power supply, which is not included. It can be purchased from Vetra separately.

Both models have standard speed and Extra Speed Options. When the Extra Speed Option is selected, The USB-331 and USB-335 convert incoming ASCII data four times faster than at standard speed.

PREPARE FOR OPERATION

There are four steps to prepare the USB-331 Converters for operation and five steps for the USB-335.

CONNECTIONS CAN BE MADE WITH THE PC POWER ON OR OFF (Plug 'n Play)!!

1. Selection Of Baud Rate: Set the baud rate using DIP switch "SW1", which is located at one end of the converter, next to the DB-9 pin connector. A selection of six different baud rates is available, namely 19200, 9600 (factory setting), 4800, 2400, 1200, and 300. To change the factory setting of 9600 baud, use switches 1, 2, and 3 of SW1 as shown in the Table. For a new baud rate to take effect, the Converter must be powered off (unplugged from the USB port and, if an external power supply is used, powered off) and then powered on again. Only switches 1, 2 and 3 are used for baud rate selection. Switch 4 is used for Conversion Speed Selection (see below).

BAUD RATE	UP	DOWN
19200	1,2,3	
9600		1,2,3
4800	2	1,3
2400	1	2,3
1200	1,2	3
300	3	1,2

2. Selection of Conversion Rate: Use switch 4 of SW1 to select standard speed or Extra Speed:

Switch 4 DOWN is standard speed.
Switch 4 UP is Extra Speed Option.

Factory setting is standard speed (switch 4 Down). For a new speed selection to take effect, the Converter must be powered off, then powered on again.

3. Connection to the Computer: Use the Type A-B USB cable supplied with the Converter to connect it to an USB port. The Converter is powered from the USB port via this cable.

4. Connection of the RS-232 device: Use an appropriate cable to make this connection. A female DB-9 connector on the cable is needed to connect to the Converter. The Converter accepts (receives) RS-232 data on pin 2. The table below shows the pins used by the Converter. See **Data Throughput** discussion below to determine if you need to connect and use the CTS (Clear To Send) signal.

5. Connection of additional devices (Model USB-335 only): Two additional devices, such as keyboards or mice, can be connected to the two Type A USB inputs of the USB-335.

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RS-232 PIN UTILIZATION

Pin	Function
2	Converter receives data on this pin
5	Ground
7	CTS - Clear To Send. The Converter controls this pin to indicate when RS-232 data can be sent to it. No data should be sent to the Converter unless this pin is active. Data may be lost otherwise. See **"Data Throughput"** below for additional details.

The RS-232 DATA FORMAT accepted by the Converters is one start bit, eight (8) data bits, least significant bit first, one stop bit, no parity.

OPERATION

The Converters accept ASCII codes on their RS-232 input, which is a male DB-9 connector. The Converters then change these codes into equivalent USB keyboard scan codes and output the USB keyboard codes on the USB connector. In this fashion, ASCII-coded RS-232 devices can be used to input keyboard data to any computer equipped with an USB port. The conversion of ASCII codes to equivalent USB keyboard keystrokes is shown in the ASCII to Keyboard Conversion Table, using standard US keyboard keycap symbols.

Data Throughput

USB protocol limits keyboard data input rate to about 750 characters/sec. The Extra Speed Option quadruples this rate to 3000 characters/sec. These rates can be achieved if the characters are not identical and are of the same case (shifted or unshifted). A sequence of identical characters or mixed shifted (upper case) and unshifted (lower case) characters will reduce the input rate. If the incoming character rate is faster than the conversion rate, a certain number of characters are stored in an internal buffer in the Converters. The number varies with the rates and with the data pattern. If the incoming data stream is longer than the number that can be stored, the sending data source must obey the Clear-To-Send signal. “LARGEST BURST” is for all different or all of the same shift case characters. “SMALLEST BURST” is for 12 or more identical characters in sequence, or for 11 or more changes in shift case in a row. Burst size limits for other patterns will fall in between.

Incoming character rate at which burst size has no limit is 62.5 characters/sec at standard speed, and 250 characters/sec, or slower, at Extra Speed.

Caution is needed in using the data from the table, since certain PC applications can be quite slow in accepting keyboard data. In such cases, the burst sizes will be less than given in the table. The table should be used only as a guide in estimating whether CTS is needed to assure data integrity.

Notes: (1) Burst size unlimited for no more than three identical characters or no more than two shift changes.
(2) Burst size unlimited for no more than seven identical characters or no more than six shift changes.
(3) Burst size unlimited for no more than one identical character or no shift changes.

	EXTRA SPEED OPTION		STANDARD SPEED OPTION	
BAUD RATE	LARGEST BURST	SMALLEST BURST	LARGEST BURST	SMALLEST BURST
19200	320	80	114	72
9600	Unlimited (1)	94	320	74
4800	Unlimited (2)	146	Unlimited (3)	80
2400	Unlimited	Unlimited	Unlimited (1)	94
1200	Unlimited	Unlimited	Unlimited (2)	146
300	Unlimited	Unlimited	Unlimited	Unlimited

INCOMING ASCII CODE TO USB PC KEYBOARD KEY TRANSLATION TABLE

MOST SIGNIFICANT HEX DIGIT

	0	1	2	3	4	5	6	7
0			SPACE	0	@	P	'	p
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			`	7	G	W	g	w
8	BS		(	8	H	X	h	x
9	TAB		)	9	I	Y	i	y
A			*	:	J	Z	j	z
B		ESC	+	;	K	[	k	{
C			,	<	L	\	l	|
D	ENTER		-	=	M	]	m	}
E			.	>	N	^	n	~
F			/	?	O	_	o	

MOST SIGNIFICANT HEX DIGIT

	8	9	A	B	C	D	E	F
0			F1	NUM LK	NUM ENT	INS	LFTWIN	
1	M LCTL	B LCTL	F2	CAP LK	NUM /	HOME	RTWIN	
2	M LSHF	B LSHF	F3	SCROLL LK	NUM *	END	WINAPP	
3	M LALT	B LALT	F4		NUM 9	PGUP		
4	M RCTL	B RCTL	F5		NUM 8	PGDN		
5	M RSHF	B RSHF	F6		NUM 7	UP ARROW		
6	M RALT	B RALT	F7		NUM 6	DN ARROW		
7	M SCLK	B SCLK	F8		NUM 5	LF ARROW		
8	M LFTWIN	B LFTWIN	F9		NUM 4	RT ARROW		
9	M RTWIN	B RTWIN	F10		NUM 3	PRT SCR		
A			F11		NUM 2	PAUSE/BRK		
B			F12		NUM 1	DEL		
C					NUM 0			
D					NUM -			
E					NUM +			
F					NUM .			

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NOTES to Translation Table:

1. No Translation is made for blank Table entries. 2. M - Make code only (simulates "stuck" key); B - Break code only (releases "stuck" key). 3. LCTL/RCTL - left/right Control keys; LSHF/RSHF - left/right Shift keys: LALT/RALT - left/right Alt keys: NUM LK - Num Lock key; CAP LK - Caps Lock key; SCROLL LK - Scroll Lock key. 4. Mk/Brk Scroll Lock, codes 0x87 and 0x97 are intended to be used with VETRA "MegaSwitch"™ KVM switches only, providing hot-key PC selection support. For "normal" Scroll Lock use, code 0xb2 should be used. 5. NUM prefix denotes keys from NUM pad. 6. PRT SCR is Print Screen key. 7. LFTWIN, RTWIN, WINAPP are the Windows keys. 8. Keys are specified by US English keyboard keycap legends.

FEDERAL COMMUNICATIONS COMMISSION

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

CE

This equipment has been tested and found to conform to the directives and standards for a Class A Information Technology Equipment type and for the Commercial and Light Industrial equipment class.

The Vetra USB-331 and USB-335 Protocol Converters use technology covered by US Patent 7,299,309

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