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

Congratulations on your purchase of a VETRA USB 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 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. If the PC is equipped with a standard PS/2 keyboard port, you can connect a PS/2 keyboard to the PC and it will be merged with the RS-232 data. Similarly, an USB keyboard can be connected to any USB port. The connection of a keyboard is optional and not necessary for the USB-331 and USB-335 to operate. The USB-331 is powered from the USB port and does not need an external power supply. The Converters can be used with any computer with an available USB port, such as PC's and MAC'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 into it.

PREPARE FOR OPERATION

There are three steps to prepare the Converters for operation.

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

1. **Selection of baud rate:** Set the baud rate using configuration 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 – 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 Baud Rate Selection diagram to set a new baud rate. For a new baud rate to take effect, the converter must be unplugged from the USB port and then plugged in again.

2. **Connect 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.

3. **Connect 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.

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.

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BAUD RATE SELECTION DIAGRAM - SW1 SETTINGS (NOTE: SW1-4 is not used)

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

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 scan 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 600 characters/sec. This rate can be achieved if the characters are not identical and are of the same case (shifted or unshifted). Mixed shifted (upper case) and unshifted (lower case) characters will reduce the input rate. These USB input rates are slower than possible RS-232 ASCII character input rates, especially at higher baud rates. At 9600 baud, it is possible to send 960 character/sec, and at 19,200, 1920 characters/sec, clearly faster than the USB input rate. The converter provides a 64-byte buffer, but unless CTS is obeyed, the maximum number of characters that can be sent continuously without loss is limited. In addition, some ASCII characters that require a PC shift for proper representation, the @ sign for example, require the simulation of the Shift key, introducing additional delay. The table below gives maximum character burst sizes that can be sent without loss under the best of conditions. 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.

BAUD RATE	MAX. BURST SIZE ALL UNSHIFTED	MAX. BURST SIZE ALL SHIFHTED
19200	**64**	**64**
9600	**65**	**65**
4800	**66**	**65**
2400	**68**	**66**
1200	**72**	**69**
300	**117**	**91**

INCOMING ASCII CODE TO USB PC 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 RCNT	B RCNT	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			F9		NUM 4	RT ARROW		
9			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. LCNT/RCNT - 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" (tm) 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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