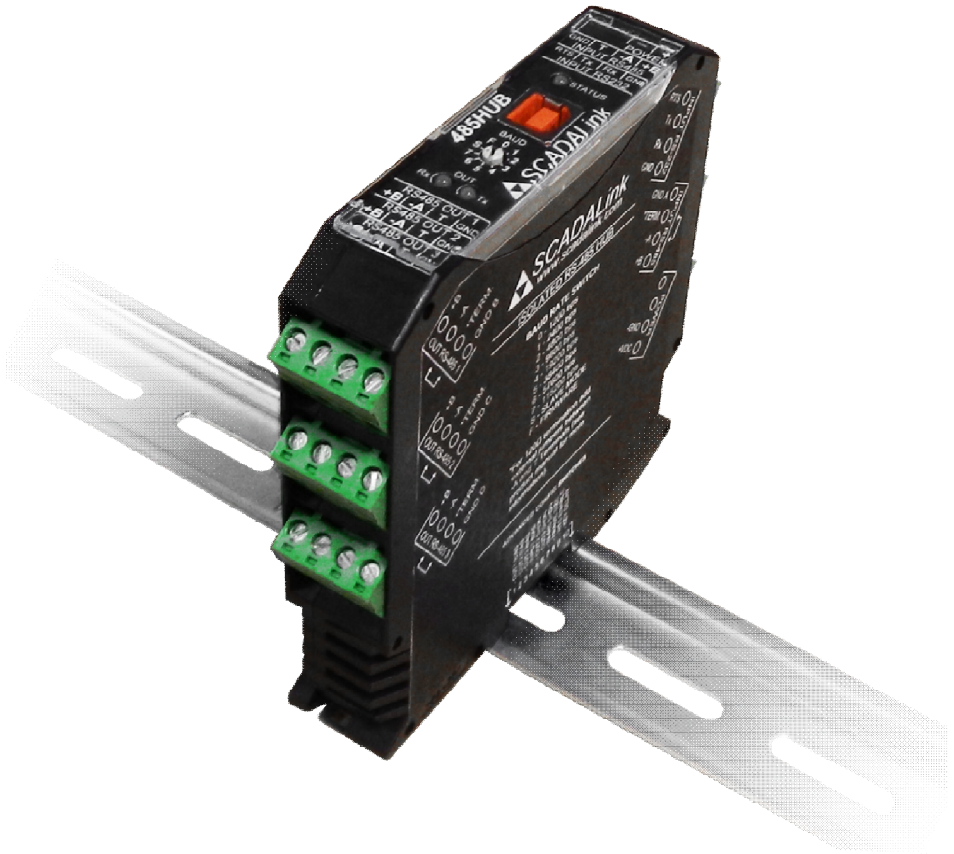
BENTEK SYSTEMS
SCADA & Telemetry Solutions

SCADALink 485HUB

Multi-Port RS-485 Isolator



User Manual

Revision 1.00

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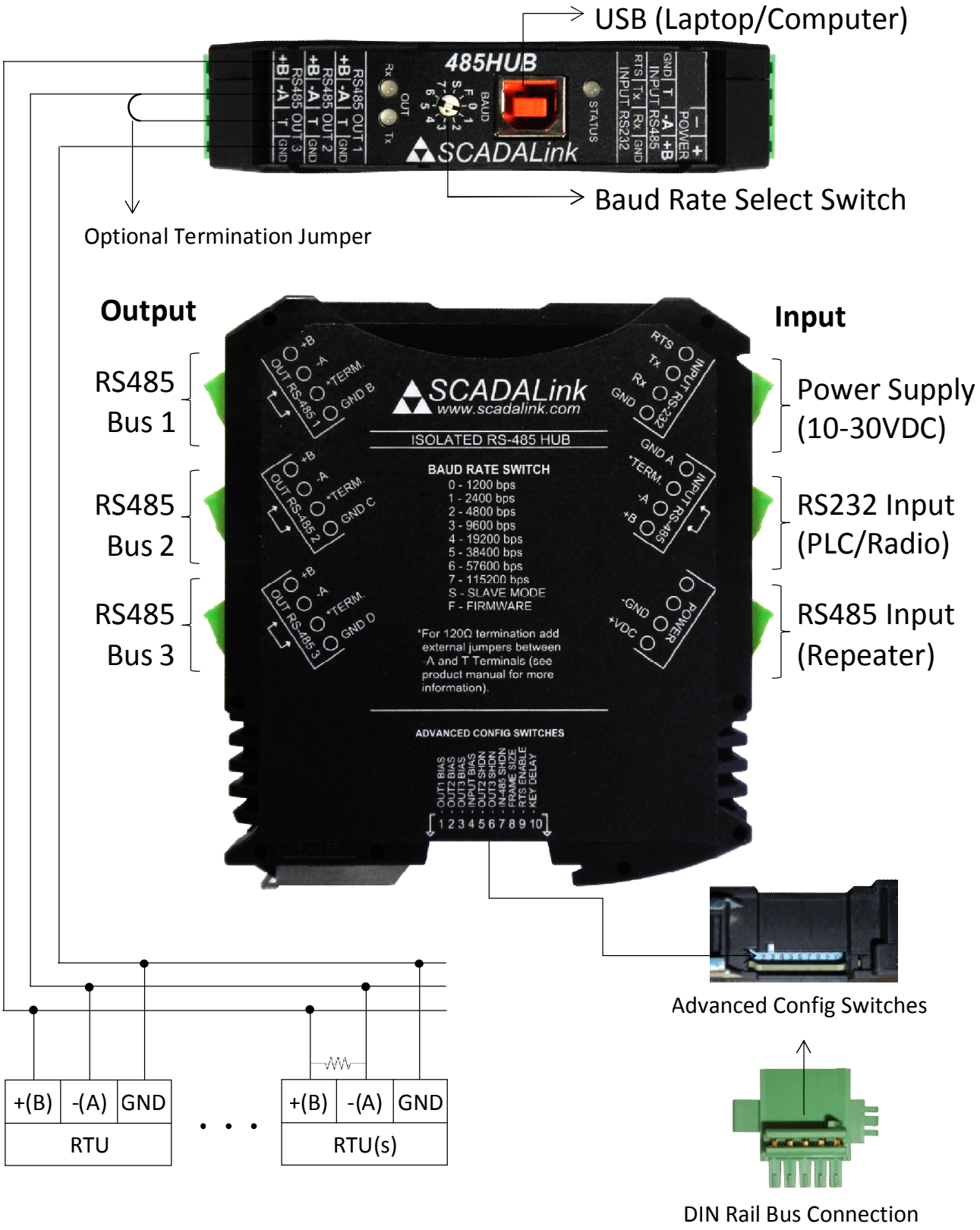
www.scadalink.com

OVERVIEW

This document summarizes the installation, operation and configuration of the SCADALink 485HUB.

The 485HUB allows multiple 2-wire RS-485 networks to be connected together on individually isolated connections. The RS-485 specification requires all devices on a network to be daisy-chained with termination resistors at the far ends of the bus. Often it is impractical to wire multiple devices in this fashion, rather it is common to wire all connected devices back to one central location. This creates a “star” type network that can easily cause problems with reflections, termination, line bias, grounding, and bus loading. The 485HUB eliminates these problems by providing separate galvanically isolated transmission lines for each “leg” of the star. It also acts as a RS232-RS485 converter, RS-485 Repeater/line driver, RS-485 isolator, and a Local operator interface to connected RS-485 devices.

1. WIRING


USB (Laptop/Computer)
485HUB
Baud Rate Select Switch
Optional Termination Jumper
Output
Input
RS485 Bus 1
RS485 Bus 2
RS485 Bus 3
Power Supply (10-30VDC)
RS232 Input (PLC/Radio)
RS485 Input (Repeater)
SCADALink
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ISOLATED RS-485 HUB
BAUD RATE SWITCH
0 - 1200 bps
1 - 2400 bps
2 - 4800 bps
3 - 9600 bps
4 - 19200 bps
5 - 38400 bps
6 - 57600 bps
7 - 115200 bps
S - SLAVE MODE
F - FIRMWARE
*For 120Ω termination add external jumpers between -A and T Terminals (see product manual for more information).
ADVANCED CONFIG SWITCHES
Advanced Config Switches
DIN Rail Bus Connection
+(B) -(A) GND
RTU
+(B) -(A) GND
RTU(s)

2. TERMINATION

120Ohm termination for each individual RS-485 connection is enabled by placing a jumper between the T and –A terminals on the corresponding terminal block. Termination is used to prevent reflections on the transmission line from corrupting the transmitted data. Generally termination is required for RS-485 busses that are long or high speed. Termination should only be placed at the first and last node on the transmission line. 120 Ohm termination resistors can increase current consumption for all drivers on the bus significantly and should only be used where required. The easiest way to determine if termination is required is to try it without termination and if data errors occur try adding termination to see if communications improve.

3. USB CONNECTION

The USB-B connection on the top face of the 485HUB is provided as a Local Operator interface to the attached RS-485 devices wired to any of the output ports on the 485HUB. This simplifies the programming and maintenance by allowing direct access to the attached devices on the RS-485 networks from a modern laptop computer without needing to remove or change any field wiring and without requiring USB-Serial or RS232-RS485 Converters. The USB interface functions as a virtual serial port with the included drivers and appears as standard serial com port to any third party software on PC or Mac. When a USB connection is detected data received at the input ports (RS-232 & RS-485) is bypassed giving sole communications to the local operator. When the USB cable is unplugged communications return to normal operation.

4. CONFIGURATION

All configuration of the 485HUB is done via hardware switches on the unit, no software is required. The hardware switches consist of a rotary baud rate switch on the top face of the unit and 10 advanced configuration DIP switches accessible through a slot in the bottom of the unit. The advanced configuration DIP switches are all OFF (UP) by default and typically will not need to be adjusted for the majority of applications except when interfacing to old legacy equipment or if power draw is a concern (for solar or battery powered applications).

Baud Rate Switch Settings

0. 1200 bps
1. 2400 bps
2. 4800 bps
3. 9600 bps
4. 19200 bps
5. 38400 bps
6. 57600 bps
7. 115200 bps
S. Slave mode
F. Firmware Bootloader

Advanced Switch Settings (UP = OFF, DOWN = ON)

1. Out1 Bias
2. Out2 Bias
3. Out3 Bias
4. Input Bias
5. Out2 SHDN
6. Out3 SHDN
7. IN-485 SHDN
8. Frame Size
9. RTS Enable
10. Key Delay

4.1 Switch Setting Details:

Baud Rate:

Set the baud rate switch to match the baud rate of the devices connected to the system (Note: the 485HUB does not do baud rate conversion, all devices connected to the 485HUB must use the same baud rate).

Slave Mode:

Multiple 485HUB devices can be attached together via the DIN rail Bus Connector to provide additional isolated RS485 outputs. The input ports on units in slave mode become output ports and can be used in the same way as the regular output ports. This means each additional 485HUB slave provides 4 more isolated RS485 connections to the system (the RS-232 input port can be used as a RS-232 output as well). When bussed together the first unit will have the input port and power connections wired and will act as the Master on the bus. Slave units will get their power and input connections through the bus and only the output wiring is required. Set the correct baud rate for the system on the Master unit's rotary switch. All additional 485HUB units on the bus should have their rotary switches set to "S" for slave mode. Units in Slave mode will get their baud rate and data formats from the Master automatically. The 485HUB slave mode can also be used to provide isolated ports to other devices such as the "SCADALink SS20 SCADASwitch" multiplexer through the DIN rail Bus connector.

Firmware Bootloader:
Use this setting to update firmware in the device using the "485HUB Firmware Utility" software or through HyperTerminal (Contact Bentek Systems Technical Support for details). Firmware should only need to be loaded if new or custom features and/or bug fixes have become available since the date of purchase and are required for the application. All units are shipped with the most recent available firmware.

BIAS:
Bias for all four RS-485 ports can be enabled individually via DIP switches 1-4. Enabling Bias on a RS-485 network connects pull up/down resistors on the differential lines to maintain an idle state voltage differential when no drivers are actively transmitting on the bus. Modern RS-485 drivers used in most current technology do not require bias and adding bias to the bus increases the current required from all drivers on the bus, limiting the length of the bus and number of drivers that can be connected therefore Bias is OFF (UP) by default. If connecting legacy devices, or spurious characters are being received by any of the devices on the bus when the bus is idle, or if the bus is in an electrically noisy environment (near motors, VFD's etc.) turning on bias for those networks may help to clean up the data. Only one node on each RS-485 bus should have bias enabled.

SHDN:
The transformer drivers used to provide galvanic isolation for the individual RS-485 connections can draw a significant percentage of the overall current drawn by the 485HUB. In power sensitive applications you can turn off any un-used RS-485 ports to save power. You can turn off OUT2, OUT3, and the INPUT RS485 ports by turning ON (Down) DIP switches 5-7 respectively.

FRAME SIZE:

DIP Switch #8 selects the Frame Size required by the data format used in the network. The available options are 10 Bit Frame or 11 Bit Frame size. The Frame size is the number of bits transmitted per character including 1 stop bit + n Data Bits + 1 parity bit (if used) + n Stop Bits. See the following table for common data formats and set DIP Switch #8 accordingly.

Frame Size	Data Format (Data Bits:Parity:Stop Bits)
10 Bit Frame (SW8 Up, *Default*)	8:N:1 7:E:1 7:O:1 7:N:2
11 Bit Frame (SW8 Down)*	8:E:1 8:O:1 8:N:2 7:E:2 7:O:2

*Data formats using 11Bit frames are rare; default setting is set to 10 bit frame size.

RTS ENABLE:

The 485HUB's RS-232 port has an optional RTS handshaking line available that can be used to key a radio or modem for transmission if required (typically old MDS4710B radio models or BELL202 leased line modems such as the Barnett 1474). When enabled the 485HUB will raise the RTS line and delay the start of transmission out the RS-232 port by the time selected by the KEY DELAY DIP Switch #10. Set the RTS ENABLE DIP switch #9 ON (Down) to enable RTS (OFF by default).

KEY DELAY:

DIP Switch #10 selects the RTS Delay used when RTS is enabled (SW9 = ON). Options are:

SW10 = OFF: 30ms RTS Delay. (*Default*)

SW10 = ON: 100ms RTS Delay.

5. ELECTRICAL SPECIFICATIONS

General Specifications	
Input Power	10-30VDC
Power Connector	4 position Removable Terminal Block
Input Current Max	2A including attached slave units
Quiescent Current (Q) Vin= 24V	11.7mA (one port enabled) +3.8mA per additional port enabled (up to 3+)
Output Receive Current* Vin = 24V	12.6mA (Input RS-485 disabled) 24.3mA (Input RS-485 enabled) +4.6mA with input term. † +2mA with input bias enabled
Output Transmit Current* Vin = 24V	20.8mA (one port enabled no term, no bias) +3.9mA per additional port enabled +4.8mA per port with termination† +2mA per port with bias enabled
Operating Temp	-40 to +70 °C
ESD Protection	+/-15KV on all ports
Approvals	CSA Class I Div 2, Suitable for use in Class I Zone 2, IIB T3C

*measured streaming random data at 9600baud.

†Assumes 120Ω Termination at both ends of transmission line.

Serial Specifications	
Configuration	Hardware Switches (Rotary/DIP)
Data Rate	1200 to 115200 bps
RS-232 Connections	Tx, Rx, GND, RTS
RS-232 Connector	4 position Removable Terminal Block
RS-485 Type (x4)	2-wire Half Duplex
RS-485 Connections (x4)	Data A(-), Data B(+), Isolated GND
RS-485 Connector (x4)	4 position Removable Terminal Block
RS-485 Isolation (x4)	>2000V / port
RS-485 Bus Loading	up to 256 devices / port (1/8 UL)
RS-485 Bias	560Ω x2 Internal, switchable / port
RS-485 Termination	120Ω Internal Switchable / port
USB Connector	High retention force industrial USB-B
USB Driver	VCP (FTDI) provided
LED Indication	STATUS, Tx, Rx

Mechanical Specifications	
Enclosure	DIN Rail mount vertical vented plastic
Dimensions	
Height:	4.5in (114mm)
Width:	4.25in (108mm)
Thickness:	0.9in (23mm)
Terminal Blocks	
Type:	4 position pluggable/removable
Wire Size Accepted:	24AWG to 12AWG
Connection Method:	Screw

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