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RS-232, 422 or 485 Buffered Asynchronous Modem Handshake Controller
Model BAMHC

B&B ELECTRONICS

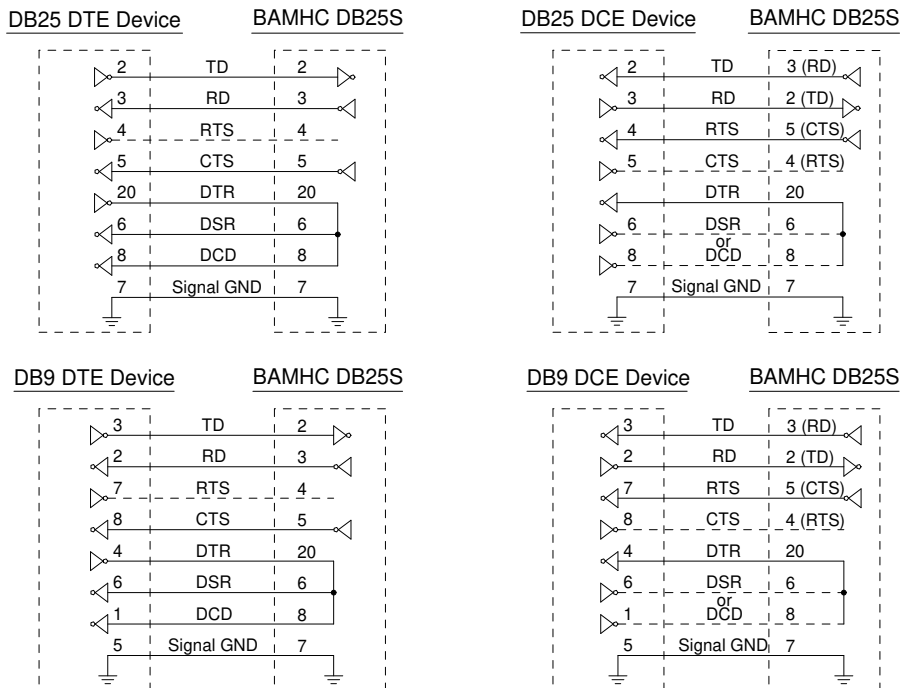**PRODUCT INFORMATION**

Description

The BAMHC provides hardware handshake control for Radio Frequency and other modems requiring the RTS line to control the transmitter. RS-232, RS-422, or RS-485 data signals at up to 19.2K bps are supported. The BAMHC raises RTS and buffers up to 160 characters while waiting for the modem to be ready to transmit. The amount of time data is buffered is user-selectable for 5, 10, or 50 ms. Alternatively, the modem's CTS line can be used to indicate ready to transmit.

The BAMHC supports both the Transmit and Receive data lines, and the built-in microprocessor provides hardware control of the RS-422/485 driver. The BAMHC enables the driver when it first sees data from the modem. It waits 10 bits after transmission is complete, then disables the RS-422/485 driver. All connections to the host device are provided on the same DB-25 female connector, while RS-232 modem connections are to a DB25 male. The unit is powered by 12 VDC and requires a maximum of 65 mA.

RS-232 Host Connections

Connection of the BAMHC is simple and straightforward. The DB-25 female serial connector is used for connecting to either RS-232, RS-422 or RS-485. The RS-232 signals are pinned as a DCE device (input on Pin 2 and output on Pin 3.) This means that a straight through cable can be used from your DB-25 port from any DTE device such as a PC or terminal. A standard 9 to 25 pin adapter can be used in cases where the serial port on the DTE device is a DB-9. For connecting to modems or other DCE devices, a null modem cable or adapter that swaps pins 2 & 3 is needed. See Figure 1 for connection diagrams to 9 pin and 25 pin DTE and DCE devices. Note that because RS-422 and RS-485 signals are also available on the same connector, special care should be taken not to hook any external signals to these pins. This should not be a problem for most serial devices, but if your device has power or special non-standard outputs, a custom cable should be made that does not connect to the extra pins on the DB-25 connector. CTS is provided as an output on pin 5 to tell the host device when buffer space is available in the BAMHC.

Figure 1: RS-232 Host Connection Diagrams

DB25 DTE Device — BAMHC DB25S

DB25 DTE Device	Signal	BAMHC DB25S
2	TD	2
3	RD	3
4	RTS	4
5	CTS	5
20	DTR	20
6	DSR	6
8	DCD	8
7	Signal GND	7

DB25 DCE Device — BAMHC DB25S

DB25 DCE Device	Signal	BAMHC DB25S
2	TD	3 (RD)
3	RD	2 (TD)
4	RTS	5 (CTS)
5	CTS	4 (RTS)
	DTR	20
6	DSR or DCD	6
8		8
7	Signal GND	7

DB9 DTE Device — BAMHC DB25S

DB9 DTE Device	Signal	BAMHC DB25S
3	TD	2
2	RD	3
7	RTS	4
8	CTS	5
4	DTR	20
6	DSR	6
1	DCD	8
5	Signal GND	7

DB9 DCE Device — BAMHC DB25S

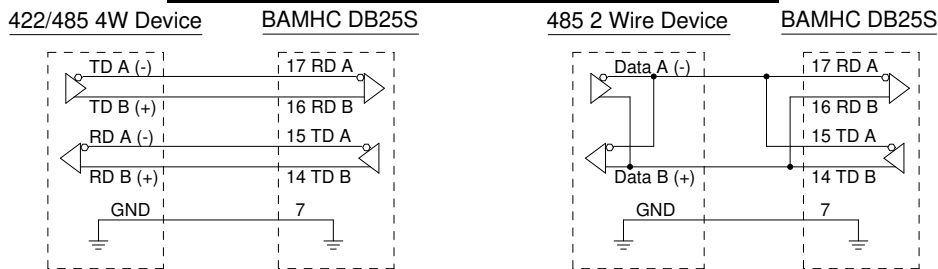| DB9 DCE Device	Signal	BAMHC DB25S
3	TD	3 (RD)
2	RD	2 (TD)
7	RTS	5 (CTS)
8	CTS	4 (RTS)
4	DTR	20
6	DSR or DCD	6
1		8
5	Signal GND	7

RS-422 & RS-485 Host Connections

The RS-422/485 driver and receiver are connected to 4 pins on the DB-25 female connector. Signal ground is still on Pin 7. When connecting to a four-wire RS-422/485 device or system, connect the output of your device to pins 16 (+) and 17 (-). Input to your device should be connected to pins 14 (+) and 15 (-). For two-wire RS-485 systems, the driver and receiver of the BAMHC must be connected together by tying pins 14 and 16 together and 15 and 17 together. This allows the BAMHC to communicate half-duplex over the same pair. Refer to Figure 2 for connection diagrams to RS-422 or RS-485 equipment.

If termination is needed, a space on the PC board of the BAMHC labeled R6 allows you to solder in a termination resistor across the RD(A) and RD(B) lines. The off-state bias resistor values can also be changed by removing R5 and R8 and replacing them with through-hole components. Before making modifications to the BAMHC, be sure to consult the B&B Electronics RS-422/485 Application Note or other sources of information to see if termination is necessary. The Application Note is available from our Web site, or call and we will be happy to send one at no charge.

Figure 2: RS-422/485 Host Connection Diagrams

422/485 4W Device	BAMHC DB25S
TD A (-)	17 RD A
TD B (+)	16 RD B
RD A (-)	15 TD A
RD B (+)	14 TD B
GND	7

485 2 Wire Device	BAMHC DB25S
Data A (-)	17 RD A
	16 RD B
	15 TD A
Data B (+)	14 TD B
GND	7

RS-232 Modem Connections

The BAMHC modem connector is pinned as a DTE device for direct connection to a modem with an RS-232 interface. A straight through DB-25 connector or standard 9 to 25 adapter should provide all connections needed. The BAMHC supports TD, RD, RTS, and CTS, with DTR tied to +5 V to provide this input to the modem if needed.

Setup and Operation

A dip-switch SW1 and jumper JP1 can be accessed by carefully prying open the hood with a small screwdriver. The dip-switch (SW1) defines the data format and transmit wait time. Positions 1 through 3 on the switch determine the baud rate. Position 4 sets the unit for 7 or 8 data bits. Position 5 enables/disables parity. Position 6 determines Even or Odd parity, and Positions 7 and 8 set the transmit wait time to 5 ms, 10 ms, 50 ms, or wait for CTS. See Table 1 for Dip-Switch settings. The unit must be powered down for dip-switch changes to take effect.

The BAMHC waits for a character from the host device. When it receives the first character, it turns on the RTS line to the modem and either waits a pre-determined time or until it sees CTS from the modem. It buffers up to 160 characters during this time, then begins to transmit to the modem while still receiving data from the host device. When all data has been transmitted, the BAMHC waits two character times before lowering RTS.

Table 1: Dip-Switch Settings

	Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Pos. 6	Pos. 7	Pos. 8
1200 bps.	OFF	OFF	OFF	X	X	X	X	X
2400 bps.	ON	OFF	OFF	X	X	X	X	X
4800 bps.	OFF	ON	OFF	X	X	X	X	X
9600 bps.	ON	ON	OFF	X	X	X	X	X
19.2K bps.	OFF	OFF	ON	X	X	X	X	X
8 Data Bits	X	X	X	OFF	X	X	X	X
7 Data Bits	X	X	X	ON	X	X	X	X
No Parity	X	X	X	X	OFF	X	X	X
Even Parity	X	X	X	X	ON	OFF	X	X
Odd Parity	X	X	X	X	ON	ON	X	X
CTS to send	X	X	X	X	X	X	OFF	OFF
5ms to send	X	X	X	X	X	X	ON	OFF
10ms to send	X	X	X	X	X	X	OFF	ON
50ms to send	X	X	X	X	X	X	ON	ON

X = Don't Care

JP1 sets the BAMHC to either full or half duplex when used with RS-422/485 host devices. With the jumper in place, the RS-422/485 receiver is disabled during transmission, preventing data from being echoed back to the modem in RS-485 two-wire configurations. Removing JP1 leaves the RS-422/485 receiver enabled at all times, allowing full duplex communications in four-wire systems.

Power Connections

The BAMHC runs off 10 to 16 VDC power. The unit itself draws approximately 15mA. This does not include external loading of receivers or termination. Each RS-232 driver may be loaded up to 4mA and termination on the RS-422/485 driver could bring the total to up to 65 mA. Power can be connected in one of three ways. The 2.5mm power jack provides an easy connection to an external supply such as B&B's model 232PS. The tip is positive. Power can also be brought into the unit on pins 25(+) and 12(-) of either DB25 connector. A protection diode inside the device protects against reverse polarity connections, but care should still be taken when connecting power.

Specifications

Transmission Mode:	Asynchronous, half or full duplex.
Host Interfaces:	RS-232, RS-422, or RS-485
Modem Interface:	RS-232
Data Rates:	1200, 2400, 4800, 9600 or 19.2K bps
Data Formats:	7 or 8 data bits, Even, Odd, or No parity (7-N-1 Not Supported)
Time to Transmit:	User-selectable for 5 ms, 10 ms, 50 ms or wait for CTS.
Host Handshaking:	RTS/CTS or None.
Connectors:	DB-25 Female for host connection, DB-25 Male for modem connection
Power Supply:	Requires 10 to 16 VDC @ 65 mA max.
Dimensions:	4.1"L x 2.3"W x 0.95"

Figure 3. Circuit Block Diagram