RS-485 Repeater Communications Kit (BA/RPTR-KIT)

Installation and Operation Instructions

Overview

RS-485 is the most common communications standard for DDC controllers; however, it is limited to 32 unit loads and 4,000 feet. Extending the network beyond 32 unit loads or 4,000 feet requires repeaters.

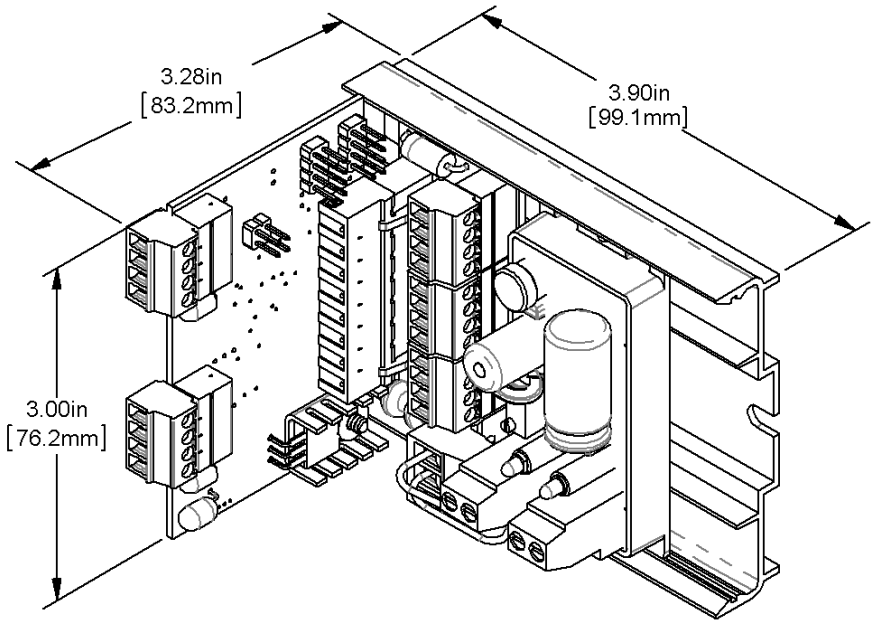
The RS-485 Repeater Communication Kit provides all the functions for one repeater and remote RS-485 network, plus it comes in a self-contained, easy-to-apply and cost effective assembly. The kit also aids in troubleshooting because LEDs indicate when power is applied and communications are present.

The RS-485 Repeater Communication Kit includes:

- One RS-485 Repeater (BA/RPTR) module which connects two RS-485 segments together. Data from one segment repeats to the other segment and vice versa. Each Repeater Module allows an additional 32 unit loads and 4,000 feet;
- A 350 mA voltage converter (BA/VC350A) to provide the higher current necessary for flawless communications;
- A Single Repeater Back Plane (BA/SRBP) to mount the Repeater module and provide pluggable connectors for power and three RS-485 cables;
- A four inch long piece of 2.75” snaptrack to easily mount the entire assembly.

Product Identification

Fig 1: RS-485 Repeater Kit



Tools & Materials

Drill, Drill Bits, 2-#8 screws, Large Screw Driver, Small Screw Driver (BA/116W), Wire, 24VAC Class 2 Transformer, and Optional Wall Anchors

Notes on RS-485

RS485 defines a half duplex bidirectional data network. Many transmitters and receivers can be connected to the RS-485 network, but only one transmitter can operate at any given time.

A frequent question is “How many RS485 devices can I put on the network at one time?” The RS485 standard does not answer this question directly; it says that each transceiver must be able to drive 32 Unit Loads. Most folks come to the natural conclusion that the network can only support 32 devices.

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Notes on RS-485 continued...

RS485 devices may have one unit load or a fractional unit load. Typical numbers are 1, 1/4 and 1/8. The number of RS485 Unit Loads for any RS485 device will be available from the device manufacturer. Total all the unit loads on an RS485 network and be sure to stay under 32.

Example: For an RS485 network you need a Repeater Module, a Fiber Optic Transceiver Module (BA/FOX) and a bunch of other devices. After investigating you find out that: BAPI's Repeater and FOX Modules each have a unit load of 1, and 20 devices have a 1/4 unit load each and 56 devices have a 1/8 unit load each. The number of Unit Loads on the network is:

1 + 1 + (20 x 1/4) + (45 x 1/8) = 1+ 1+ 5 + 7 = 14 Unit Loads. Since 14 is less than 32, the network is not overloaded.

Mounting

The Repeater Kit mounts in the Snaptrack provided.

Hold the Repeater Kit against the surface you want to mount on. Mark the mounting slots on each end of the snap track. Drill holes for your mounting screws or wall anchors. If you are using wall anchors insert them into the holes. Start one of the mounting screws leaving enough of the screw protruding to slip the snap track under it. Slip the Repeater Kit under the screw and line up with the hole for the second mounting screw. Insert the second screw into its hole and screw all the way down. Screw the first screw all the way down.

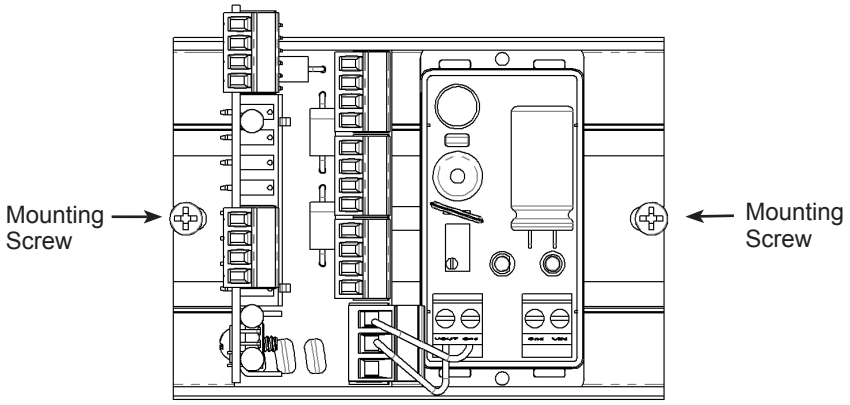

Fig 2: Repeater Kit Mounting

Termination

Note: The male connectors that plug into the jacks on the board use a rising block screw terminal to hold the wires. If the block is in a partially up position the wire may be inserted under the block and the wire will not be held when the screw is tightened. To avoid improper wiring, turn the male connector screws counterclockwise until the block is below the wire opening before inserting the wire. Lightly tug on each wire after tightening to verify proper termination.

Connect the RS-485 Communication Links on the Repeater Module as shown in Table 1

Fig 3: Repeater Module

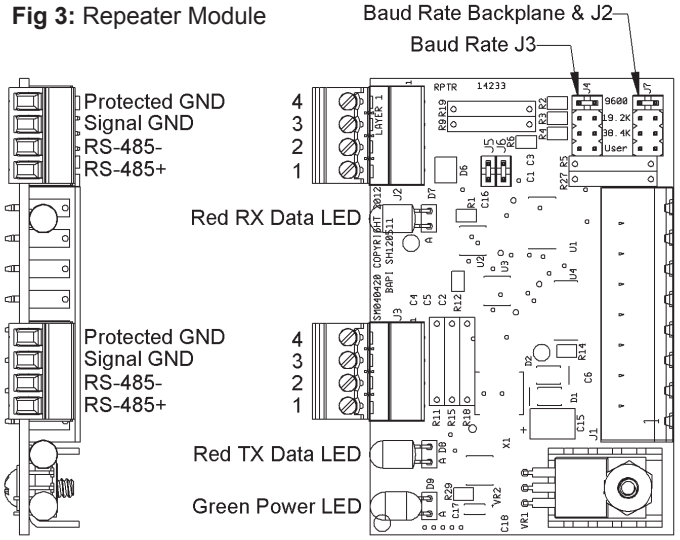

Table 1: Repeater Module RS-485 Connection List	
J2 and Backplane (repeated bus)	
Pin Number	Connection
Pin 4	Protected Ground
Pin 3	Signal Ground
Pin 2	RS-485 -
Pin 1	RS-485 +
J3 (input from bus that needs repeating)	
Pin 4	Protected Ground
Pin 3	Signal Ground
Pin 2	RS-485 -
Pin 1	RS-485 +

Termination continued on next page...

Termination Continued...

SIngle Repeater Backplane (BA/SRBP) Termination

Connector J1 is used to mount the Repeater.

Connectors J2, J3 and J4 terminate the local RS-485 bus (J2 and Backplane connector on the Repeater Kit)

Connector J5 is used for power (prewired at BAPI factory)

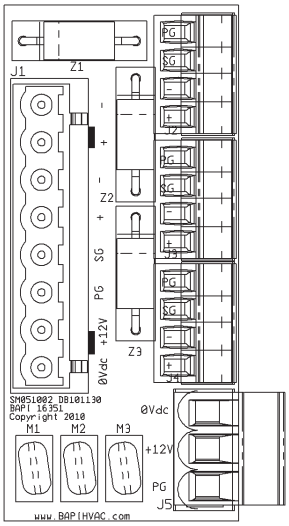

Fig 4: Single Repeater Backplane (BA/SRBP)

VC350A Voltage Converter (BA/VC350A) Termination

Connect ground and power terminals to a National Electric Code Class 2 transformer or DC power. The VC350A Voltage Converter is half wave rectified. The VAC neutral input and the VDC GND outputs are common.

VC350 Terminal	VC350A Terminal		Function
Prior to 7/25/2011	Prior to 1/23/2013	After 1/23/2013	
2	1	VOUT	VDC out to peripheral devices
1	2	GND	VDC out ground or common
3	3	GND	VAC or VDC input ground or common
4	4	VIN	VAC or VDC input from transformer or other power supply

Note: The terminals use a rising block screw terminal to hold the wires. It is possible for the block to be in a partially up position allowing the wire to be inserted under the block. Be sure that the connector screws are turned fully counterclockwise before inserting the wire. Lightly tug on each wire after tightening to verify proper termination.

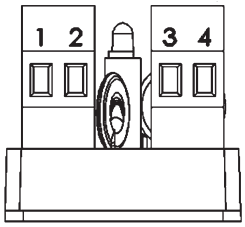

Fig 5: VC350A Voltage Converter Terminations prior to 1/23/2013 (includes terminations of the VC350 unit prior to 7/25/2011)

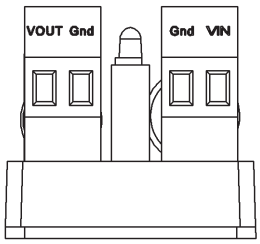

Fig 6: VC350A Voltage Converter Terminations after 1/23/2013

Operation

Set both baud rate jumpers to the network communications speed. Both jumpers must be set to the same data rate. RS-485 communication networks are limited to 32 unit loads and 4000 feet of twisted pair cable at data rates of 100,000 BAUD or less. Each Repeater Module uses up one unit load on the network to which it is connected. Many RS-485 devices operate at half or quarter load; this information should be available from the device manufacturer.

Total the unit loads and do not exceed 32 for any RS-485 network. If your network totals more than 32, use another repeater.

Diagnostics

Possible Problems:	**Possible Solutions:**
Repeater will not plug into backplane	- Make sure that the backplane is inserted into the snaptrack in the proper orientation
Green LED on VC350A does not light	- Check to see if the power to the VC350A Voltage Converter is turned on
Green LED on VC350A is dim and output is ~1.5VDC	- Load is too great, check Repeater Module for proper operation.
Power LED L1 on the Repeater does not light	- Check to see that the Repeater is firmly inserted into the Backplane - Check to see if the power connector is firmly inserted into the Backplane - Check to see if the VC350A Voltage Converter is working correctly - Check to see if the power to the VC350A Voltage Converter is turned on
Data LEDs do not blink	- Check RS-485 communications link for proper termination - Check to see if Baud rate jumpers are properly set - Check RS-485 communications link for number of unit loads. Must be below 32.

Specifications

Communication Rates	9600, 19.2K and 38.4K Baud
Network Load	1 unit load each network
Network Length	4,000 ft (1.2Km)
Input Voltage	18 to 30 VAC, 24 VDC
Input Current Maximum	760 mA AC (18.25 VA), 400 mA DC

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