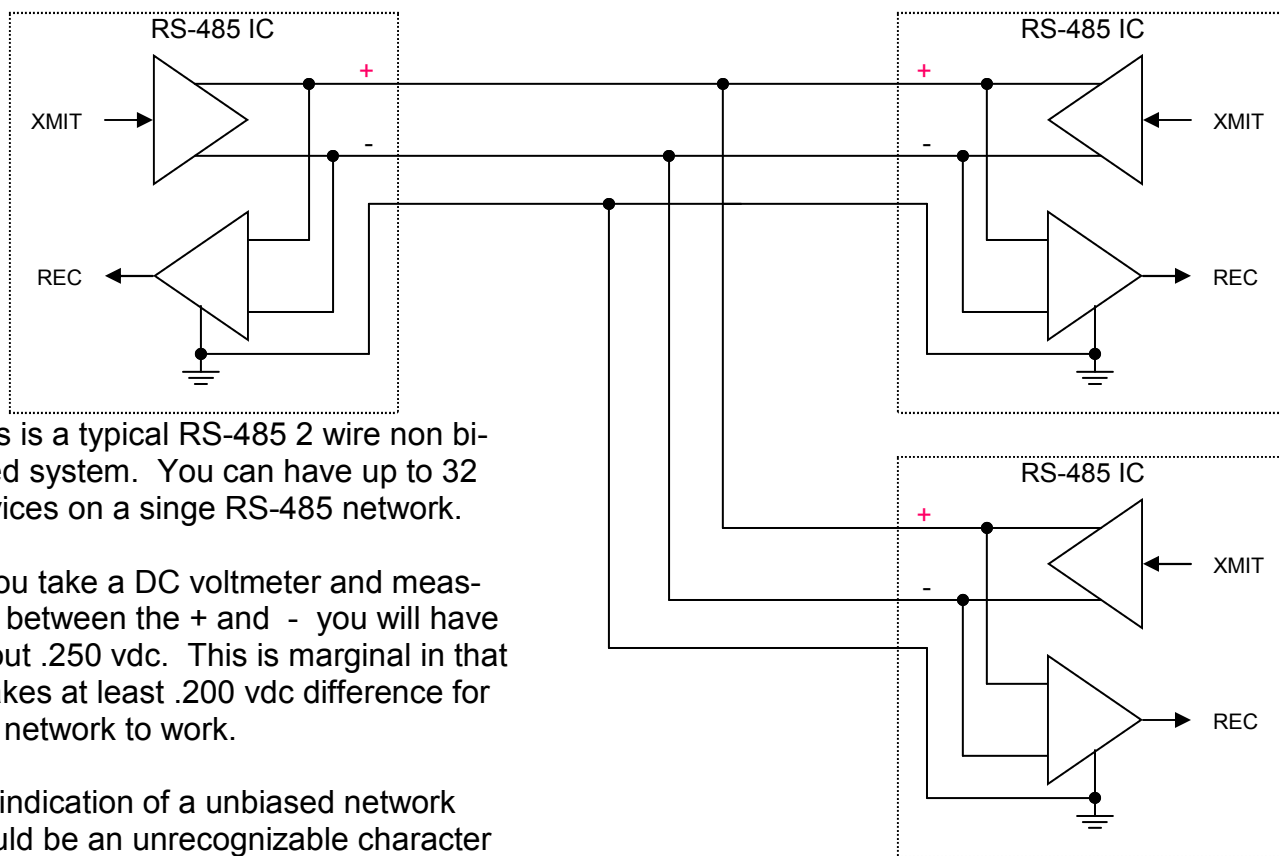


**RS-485 Communications Network
APP- 017**

This application note will explain RS-485 communications and field applications. RS-485 comes in two forms, 4-wire and 2 wire. This application will deal with the 2 wire only, as there are very few of the 4-wire systems left. Some of the early Galaxy systems used a 4 wire RS-485 system. The RS-485 2 wire is actually a 3 wire using a plus, minus and a signal ground. The ground is not used for communications, but will limit the potential difference between the two devices communicating. Under normal conditions the RS-485 is in a idle state with all the receivers active. Only one transmitter can be active at a time, so typically there is a master and all other are slaves. The CR-110 is an exception in that card # 1 will transmit a short string of information every six seconds. The rabbit on the XT card is the main master and the CR # 1 just looks for an open spot to transmit its data. RS-485 is considered half duplex, you can either transmit or receive, but not at the same time.

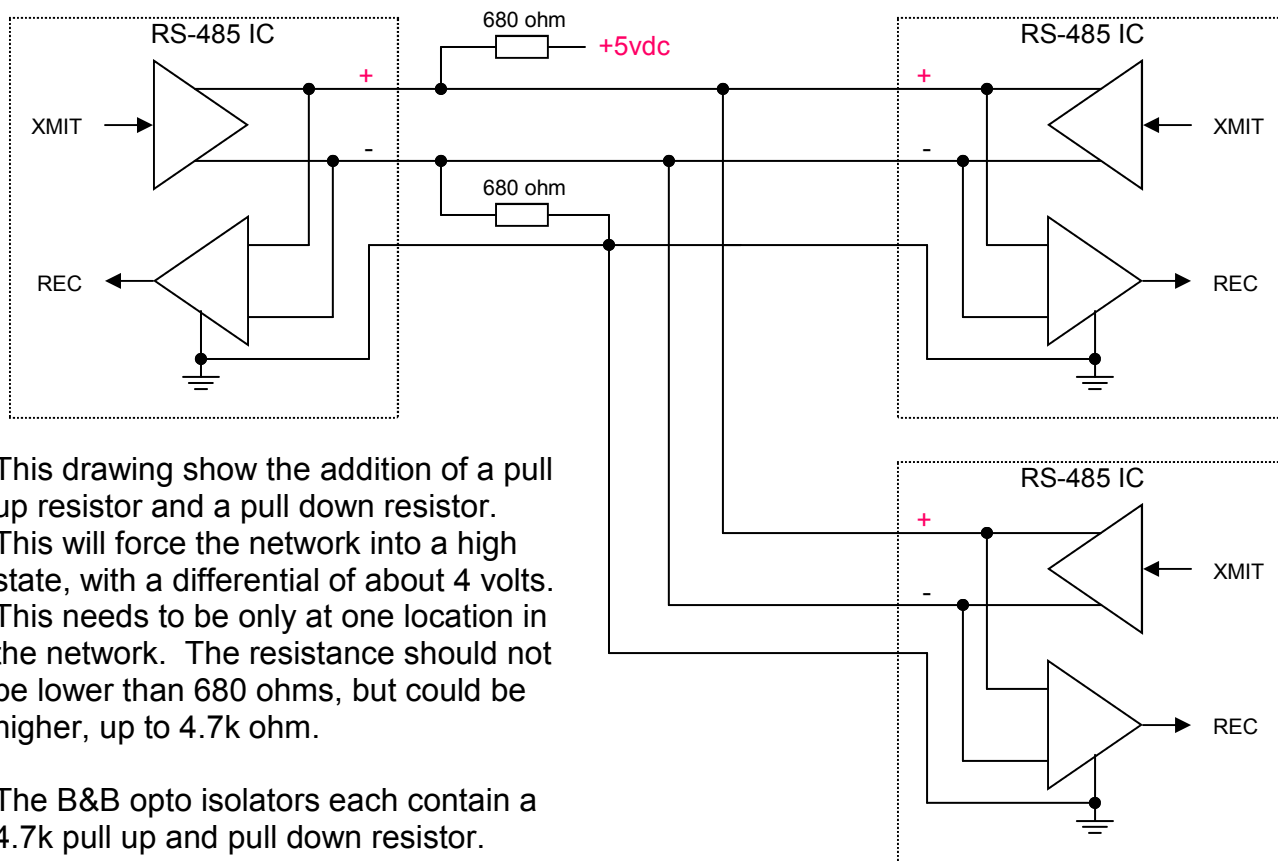
The main purpose of this application note is to address the issue of how to Bias a RS-485 network.



This is a typical RS-485 2 wire non biased system. You can have up to 32 devices on a single RS-485 network.

If you take a DC voltmeter and measure between the + and - you will have about .250 vdc. This is marginal in that it takes at least .200 vdc difference for the network to work.

An indication of a unbiased network would be an unrecognizable character when using terminal. The strings should be clean and contain no garbage.



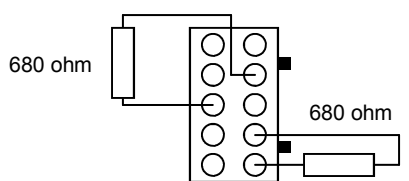
This drawing show the addition of a pull up resistor and a pull down resistor. This will force the network into a high state, with a differential of about 4 volts. This needs to be only at one location in the network. The resistance should not be lower than 680 ohms, but could be higher, up to 4.7k ohm.

The B&B opto isolators each contain a 4.7k pull up and pull down resistor.

If you have a Galaxy network with the B&B opto's, then you should not have a problem. Measuring the difference between the plus and minus will tell you if it is biased ok. You should have a minimum of .45 vdc, anything less should have additional bias resistors.

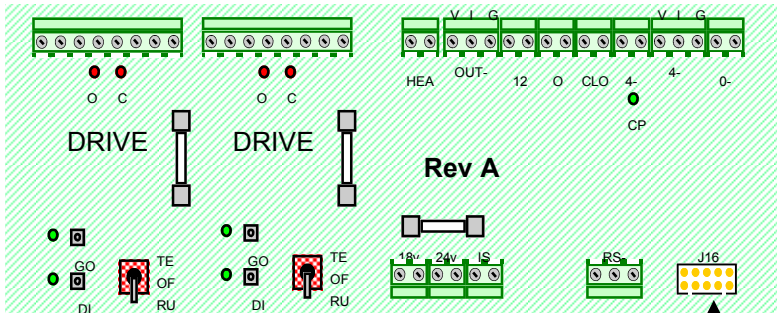
We will now deal with the CR-110's, ER-110, SDX and the XT panel. The XT panel has two dedicated RS-485 ports and one that can be either RS-485 or RS-232.

The Main RS-485 port on the XT board J52 is used for the SDX door card. The Aux RS-485 port J50 is used for the CR-110 and ER-110 cards. Both of these ports should have the pull up and pull down resistors. There are several option in how you can accomplish this:



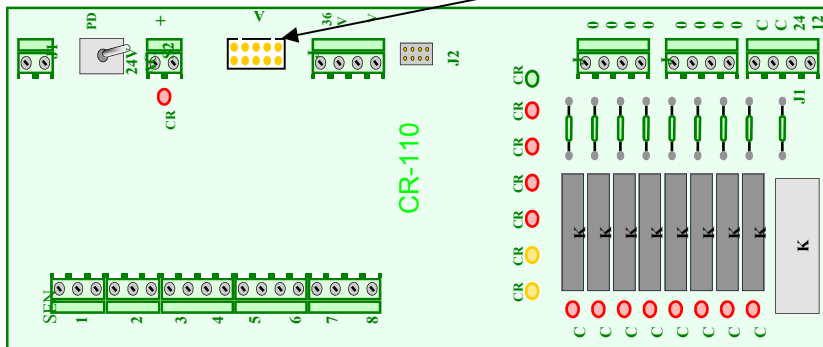
Top View
White female 10 pin bias plug.

The SDX, CR-110 and ER-110 all have a matching male 10 pin plug. BTU has these plugs made up and you simply plug one into one of the devices. Remember it only takes one plug on each network. The location of the plug does not matter. Note - we are not using a termination resistor in these applications. Termination resistors should only be used at much higher baud rates and long transmission cables.

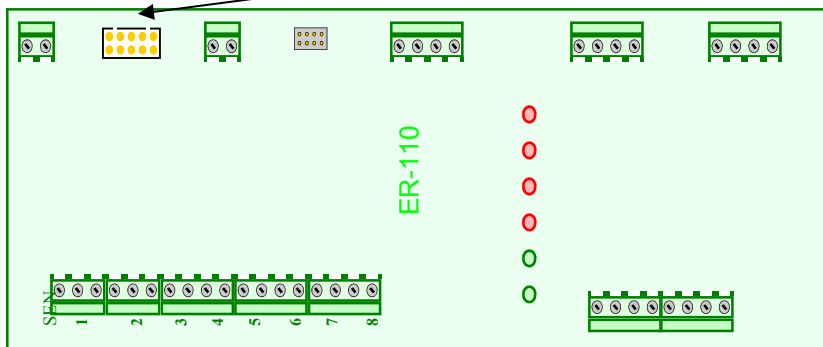


SDX door drive card. Plug the bias plug into the J16 socket on the SDX card. You need only one of the plugs for the network.

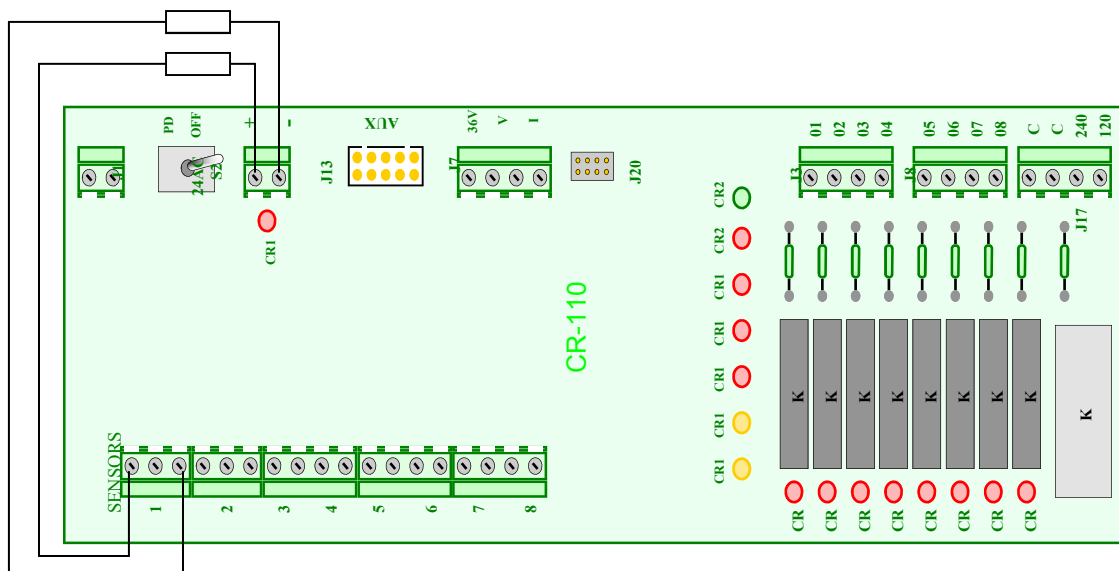
CR-110 refrigeration control card. Plug the bias plug into the J13 socket on the CR-110 card. You need only one of the plugs for the network.



ER-110 refrigeration control card. Plug the bias plug into the J1 socket on the ER-110 card. If you have ER and CR cards on one network, you only need one Bias Plug.



If you are having communications issues and do not have a bias plug, you can use two resistors, between 680 ohm and 4.7k ohm. The closer to 680 ohm the better. Connect a resistor to each of the + and - terminals on the RS-485 connector. Solder a small wire on to the other end of the resistor and terminate on channel 1 with the discharge sensor. Connect the plus resistor with the red wire on terminal 1. Connect the minus resistor on the back wire on terminal 3.



G55 & G70 local HMI interfaces. There are some applications where a local HMI interface is used with the CR-110's and the ER-110's. It will greatly improve the communications if a bias plug is used.

The bias plugs can be ordered from BTU, part # 755-10020.

If you want to make your own plugs, you can order the following parts from Digi Key.

- | | |
|--------------|-------------|
| Blank Plugs | H3813-ND |
| Pins | H3832-ND |
| 680 resistor | P680BACT-ND |

A special set of crimp pliers are needed to crimp the pins on the resistors. The only part number I have is for Mouser 538-63811-1000

RS-485 interface for PC or Laptop:

B& B Electronics <http://www.bb-elec.com> makes a USB opto isolated RS-485 converter that works very well for monitoring and running Xbase programs on the different products. You can make up a cable using the same plug as the bias and be able to plug directly into the XT, CR-110, SDX and ER-110.

B&B part number USOTL4

