TECHNICAL FAX # 010102

To: **All Fire Alarm Technicians**
From: **EST Technical Support**
Date: **January, 2001**
Subject: **Oscilloscope Tips for RS485**

Oscilloscope Tips…

When investigating intermittent communications, the use of an oscilloscope can save time and help to identify the root cause of instabilities. Below is a reference waveform that represents good RS485 communications at 19.2K baud. This waveform was captured from an EST-3 system. RS485 from other systems will look similar in amplitude and vary in duration with the baud rate of the communications. Oscilloscope settings are provided in the diagram. Digital storage scopes are preferred but not necessary when investigating continuous communications. Note the following characteristics:
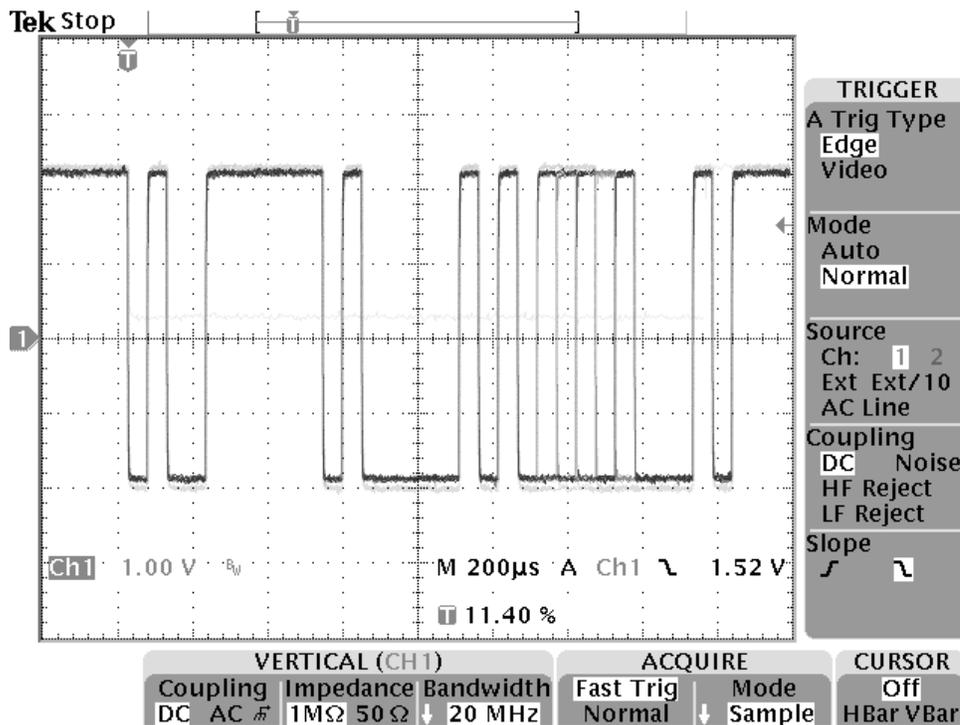
The reference waveform is very square and about 4 volts peak to peak. Driver outputs will vary in amplitude from two to four volts peak to peak, four being the strongest. Input thresholds are +/-200mv with 60mv hysteresis. Line resistance will reduce the amplitude of the waveform. Excessive capacitance will round the square corners of the waveform. The combination of resistance and capacitance in the communication lines will reduce amplitude <u>and</u> round the corners.

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Generally, instabilities that cause intermittent communications are fairly obvious when inspected with an oscilloscope. RS485 is very forgiving and will tolerate a fair amount of degradation and distortion before failing communication. The next waveform provides a sample of the affects of line impedance. Resistors and capacitors were used to simulate line impedance. This sample was captured from an EST-3 system operating at 38.4K baud. This sample was captured with a digital
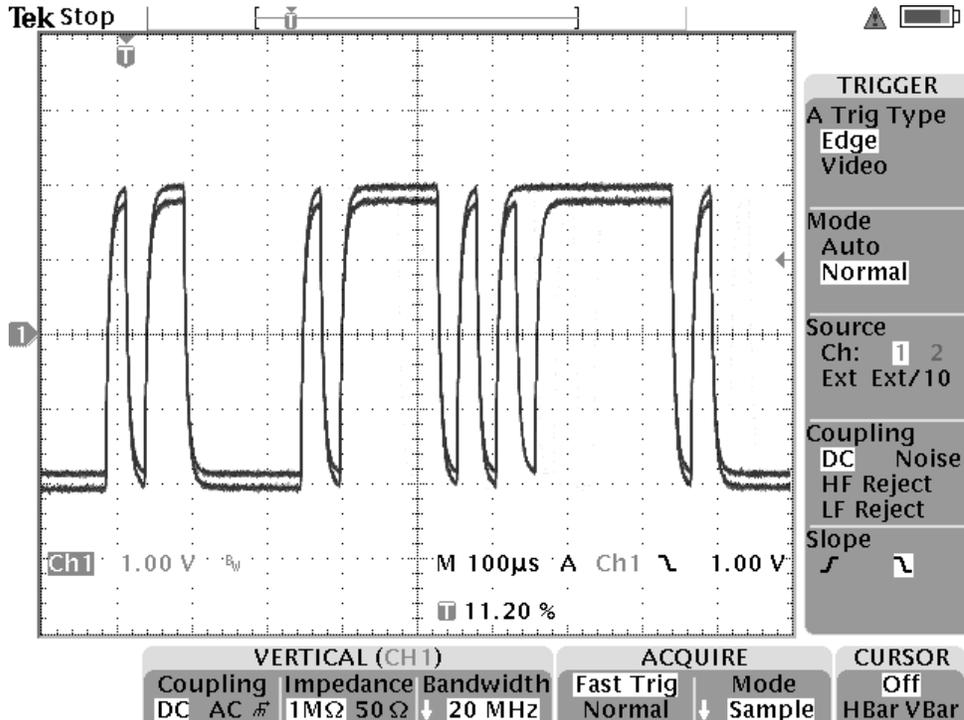
storage scope in an analog scope mode. The dual image is the result of two panels communicating. One image is a panel query while the other is a query response. Note that the amplitudes are slightly different due to line resistance and the corners of the waveform are rounded due to capacitance. This waveform closely resembles an image that might be viewed when using an analog scope that does not offer storage capability.

If you have any questions regarding this document please contact EST Technical Services in Sarasota, Florida at (800) 655-4497 or (941) 755-4811. Email us at *'EST.Techsupport@Edwards.spx.com'*