ADVANTECH *Enabling an Intelligent Planet*

Date	2015/08/27	SR#	1-2215466211
Category	■FAQ □SOP	Related OS	N/A
Abstract	How to Clarify Communication Issue Between Controller and Advantech ADAM RS-485 Device		
Keyword	RS-485, Communication Issue		
Related Product	ADAM-4000 & ADAM-4100 Series		

■ **Problem Description:**

This document describes what troubleshooting steps users can carry out while encountering communication issue between controller and Advantech RS-485 device, such as ADAM-4000 & ADAM-4100 series remote IO modules.

■ **Brief Solution - Step by Step:**

Communication issue over RS-485 is being most likely cause by unknown noisy source (such as EMI, EFT etc…).

To identify whether any unknown noisy source existed, below is summary of information and test we normally need for further clarification:

1. What is the actual wiring look like between the "Power Line" and "Signal Line"? Are those signal lines being isolated or closely installed? If possible, please take some photo of their actual installation and wiring structure.

2. There are a number of potential EMI/EFT sources at field site, such as electric motors, winches, pumps and anything else that can cause a spark. Re-check the environment for eliminating this possibility.

3. How Many RS-485 devices being connected together with Advantech ADAM modules. Please providing an complete application diagram as well as wiring diagram, so that technical support can have a better understanding about how ADAM module interact with their other RS-485 device and controller.

4. Will adding underline termination resistor at the far end of the RS-485 cable improve the signal level?

# RS-485 Termination Resistor(TR)
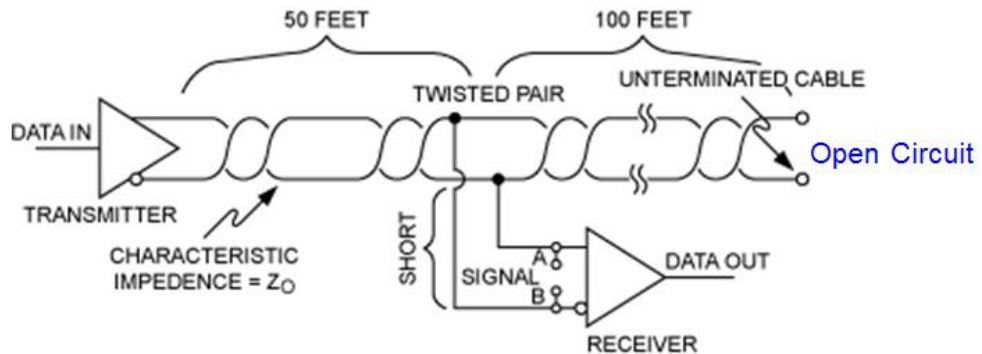
Note: The value of the terminating resistor is ideally the same value as the characteristic impedance of the cable, typically, using 120 ohms for twisted pairs copper cable.
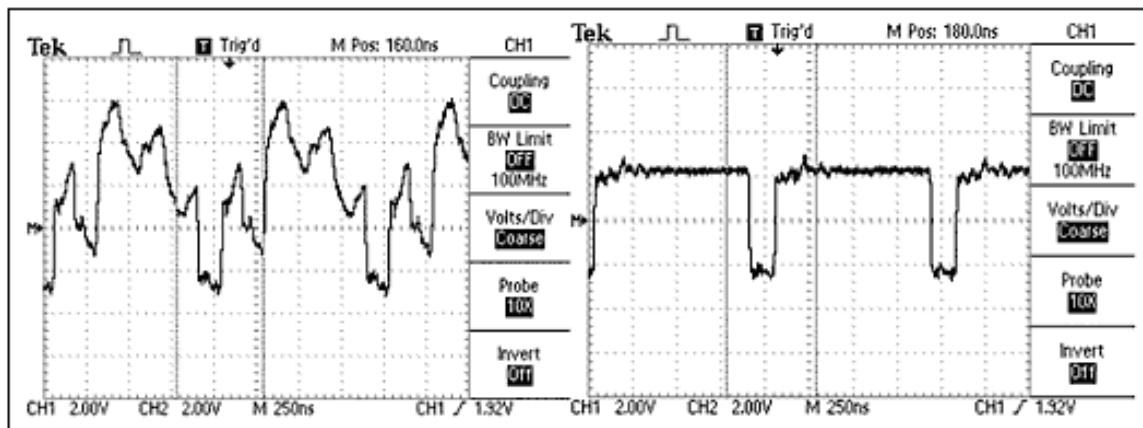
On the left figure with open circuit, all the energy is reflected back to the source, causing the waveform to become very disorder.

On the right figure, a waveform obtained from a correctly terminated RS-485 network

5. What is the distance between the "ADAM Device" and "Controller"? Have customer twisted the Data+ and Data- over the RS-485 network to reduce the EMI interference?
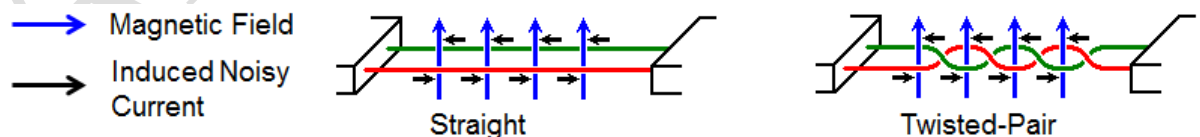
6. Logic state of RS-485 is determine by comparing the voltage difference between the two signal lines.

Logic 0(Space): (Data–) – (Data+) >   200mV

Logic 1(Mark):   (Data–) – (Data+) <   –200mV

Below illustrate RS-485 signal waveform with & without EMI interference for reference.

With EMI Interference:

The differentiate signal voltage has been rapidly fluctuated between +1V(logic 1) and -1V(logic 0) even when RS-485 signal line is idle, fluctuating at this range(i.e. which we so called the "Grey Area" of undetermined logic status) also suggesting that the logic 1s and 0s is being shifting all the time, unknown behavior would be expected.
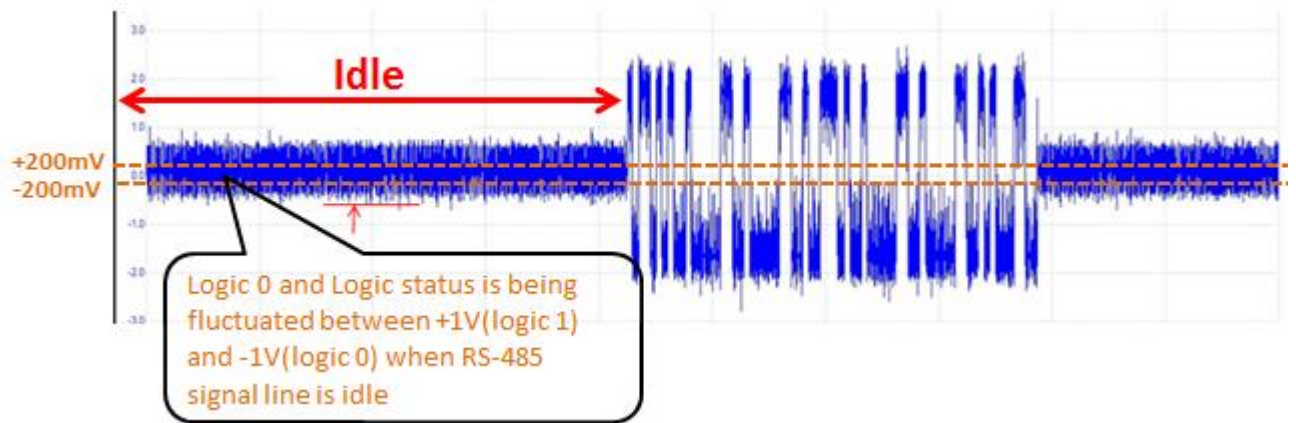
Without EMI Interference:

In comparison to oscillograph without EMI Interference: (as attached below), as you can see, the differentiate signal voltage has been constantly moving between 3.75V and 4.50V with correct logic status equal to 1 when RS-485 line is idle.

This kind of waveform with clear signal pattern would be something we expected when RS-485 line is idle from preventing data signal interference.

User may use this oscillograph as the reference to cross-check their differentiate signal voltage again after they making the adjustment.