

ABB Drives

User's Manual RS-485 Adapter Board FRSA-00

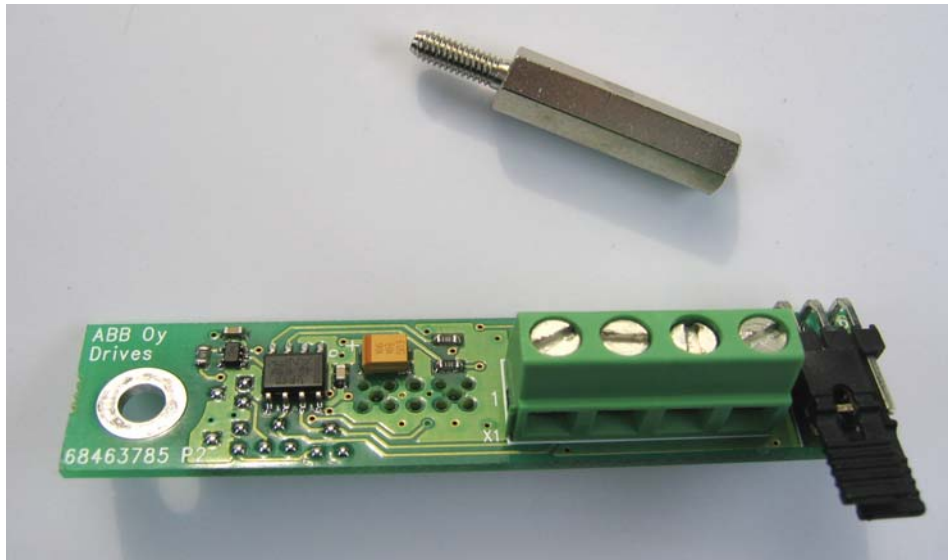


Table of Contents

1	INTRODUCTION	2
1.1	Overview.....	2
1.2	Technical Data of RS-485 Link	2
1.3	RS-485 Bus Topology.....	2
2	INSTALLATION	2
2.1	Mechanical Installation.....	2
2.2	Electrical Installation	3
2.3	Bus Termination.....	3
2.4	Drive Parameter Settings	4
2.5	RS-485 Network Configuration.....	4
3	APPLICATION GUIDELINES.....	5
3.1	Overview.....	5
3.2	RS-485 Network Topology.....	5
3.3	Application Guideline Summary	8

1 INTRODUCTION

1.1 Overview

This section contains a description of RS-485 adapter board. The FRSA-00 RS-485 Adapter Board and the FMBA-01 Modbus RTU Adapter Module are both used to support the ACS350 Modbus-RTU communication protocol.

1.2 Technical Data of RS-485 Link

Medium: Shielded twisted pair cable, impedance 100 to 150 ohms

Termination: 120 ohms (FRSA built in)

Topology: Trunk line, drop lines allowed

Transfer Rate: 115.2 kb/s maximum

Serial Communication Type: Asynchronous, half-duplex RS-485

Protocol: Modbus-RTU

1.3 RS-485 Bus Topology

RS-485 is a physical layer of a two-wire, half-duplex, multipoint serial connection. The FRSA-00 and the FMBA-01 both support two-wire + ground RS-485 networks. A RS-485 networks requires an applied voltage between -7 to +12 volts DC for proper operation. The purpose of the ground wire is to connect the RS-485 signal ground of each node to one common ground potential. As the total distance of the network increases, there can be significant differences in the voltage level of ground. If the sum of the ground-voltage difference and the differential-data signal is greater than the specified applied voltage, network data could be lost; and/or damage to the RS-485 communication port and/or the drive I/O could result.

The proper method to install an RS-485 network can be found in the industry standard Publication TSB89, Application Guidelines for TIA-EIA-485-A. This standard can be ordered online at <http://www.tiaonline.org/standards/catalog/> See Figures 2 & 3 for the basic guidelines for wiring an RS-485 network, with recommendations for shielded twisted-pair cabling and correct location of termination resistors. Figures 4 – 6 are examples of various RS-485 network configurations.

2 INSTALLATION

2.1 Mechanical Installation (Refer to Figure 1)

- 1) Remove the drive's terminal cover.
- 2) Remove the option board fastening screw from the drive.
- 3) Use the standoff supplied with the FRSA kit and the screw removed in step 2 to mount the FRSA board.
- 4) Tighten the FRSA fastening screw.
- 5) Install the clamping plates
- 6) Replace the drive's terminal cover.

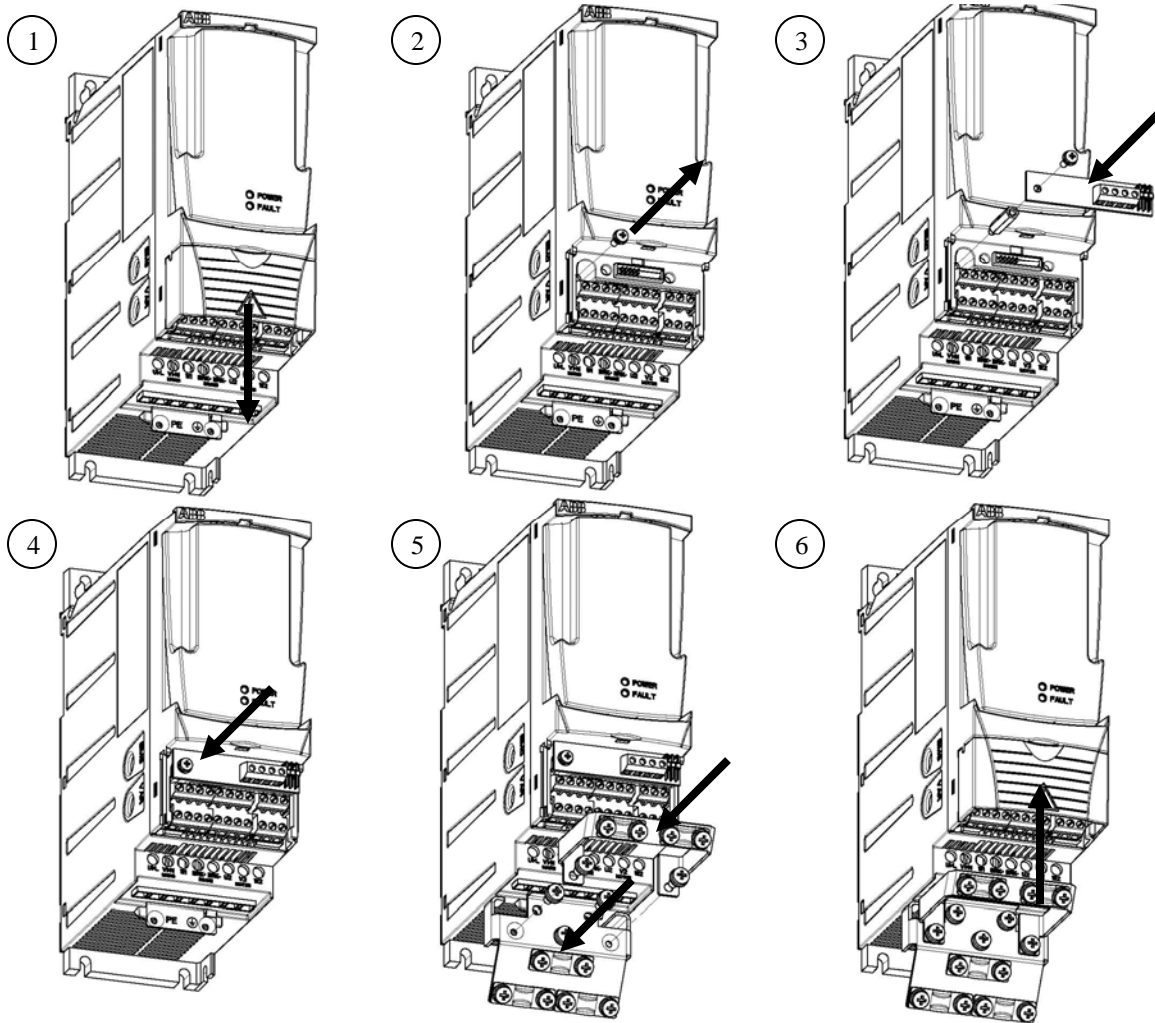


Figure 1

2.2 Electrical Installation

FRSA CONNECTION (Table 1)		
	X1	DESCRIPTION
1	SHLD	Bus cable shield
2	DATA_B	Data positive
3	DATA_A	Data negative
4	GND_B	Signal Ground ¹

Note 1: GND_B terminal does not provide galvanic isolation from the drive I/O. Terminal 4, GND_B is at the same potential as the drive I/O ground. . This difference makes the FMBA-01 the ACS350 Modbus solution for applications requiring long network cable distances with possible ground potential differences between the serial connection and other drive I/O. A ground potential difference outside of the allowable applied voltage of -7 to +12 VDC can damage both the FRSA-00 communication port and the drive's I/O terminals.

2.3 Bus Termination

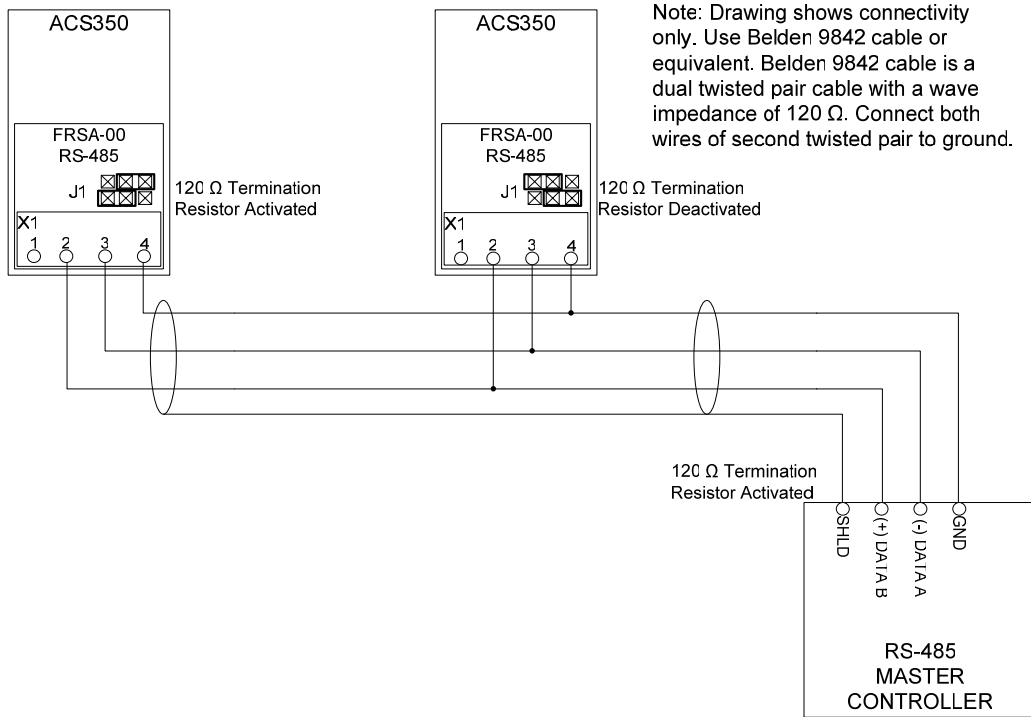
Bus termination is required to prevent signal reflections from the bus cable ends. The FRSA board is equipped with the internal bus termination, which is configurable with jumper J1 pins. Termination should be activated on devices located at bus ends and deactivated on other devices. See the Figures below.

2.4 Drive Parameter Settings

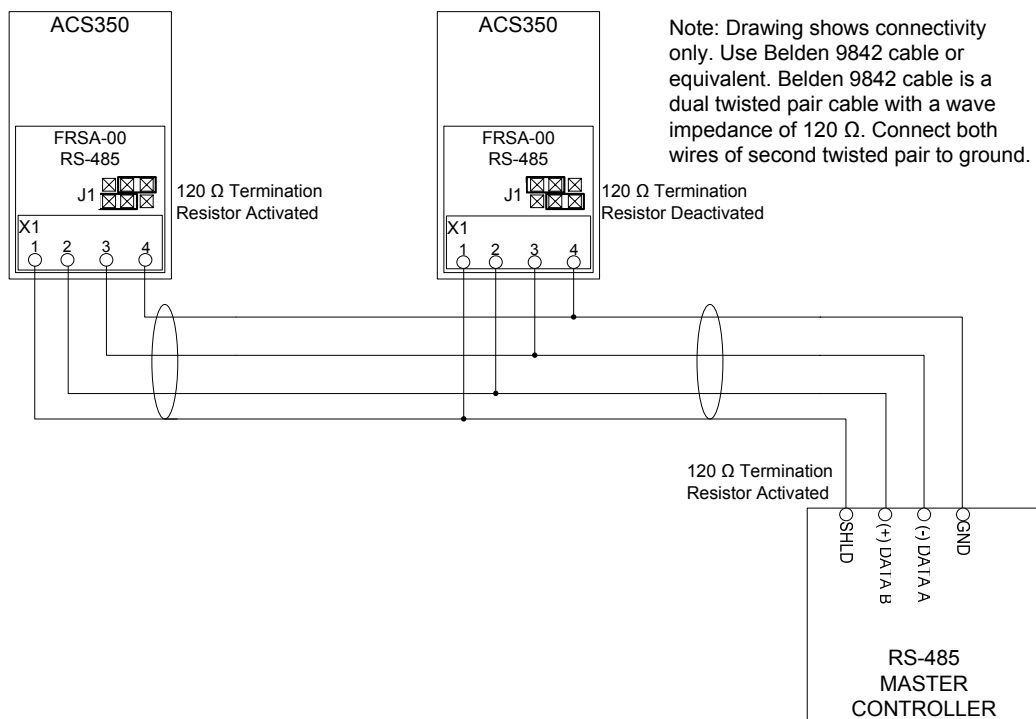
See the drive manual for the serial communication settings.

2.5 RS-485 Network Configuration

**Figure 2
RECOMMENDED RS-485 WIRING WITH CONTINUOUS
SHIELD TERMINATED AT SOURCE ONLY**



**Figure 3
ALTERNATIVE RS-485 WIRING WITH
SHIELD TERMINATED AT EACH NODE**



3 APPLICATION GUIDELINES

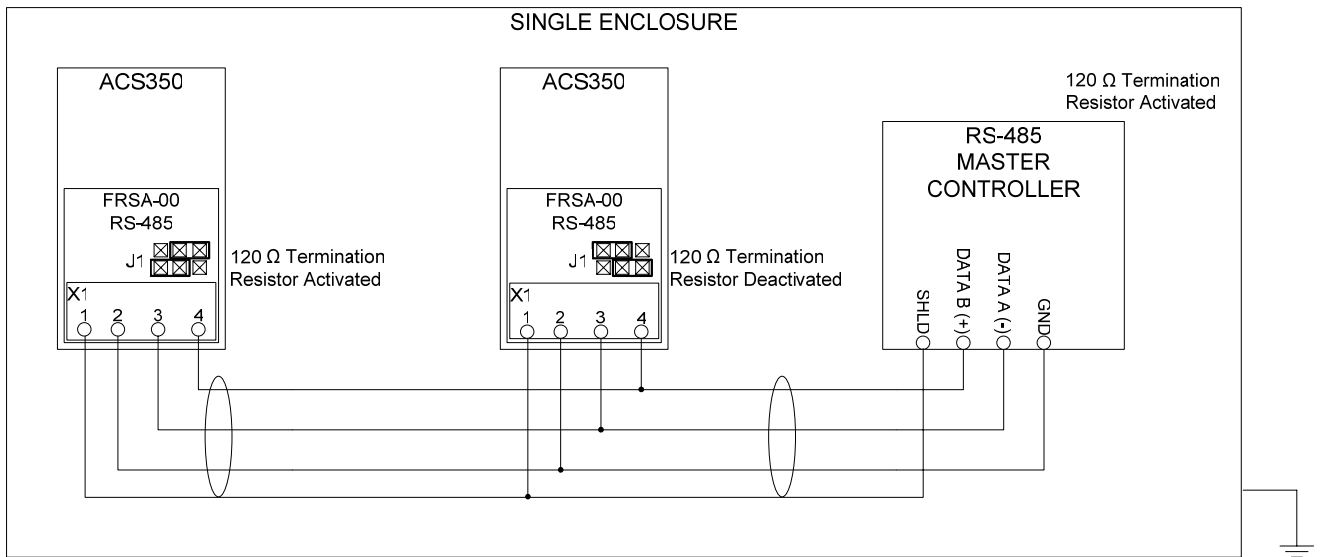
3.1 Overview

This section provides examples of different network topologies and provides suggestions to apply the best ABB Modbus RS-485 solution for the ACS350. Since, the FRSA-00 is not galvanically isolated from the ACS350 I/O terminal ground. Special considerations need to be made when applying the FRSA-00. In comparison, the FMBA-01 adapter module provides galvanic isolation from the drive I/O, isolating the serial communication ground from the I/O ground. This difference makes the FMBA-01 the ACS350 Modbus solution for applications requiring long network cable distances with possible ground potential differences between the serial connection and other drive I/O.

3.2 RS-485 Network Topology

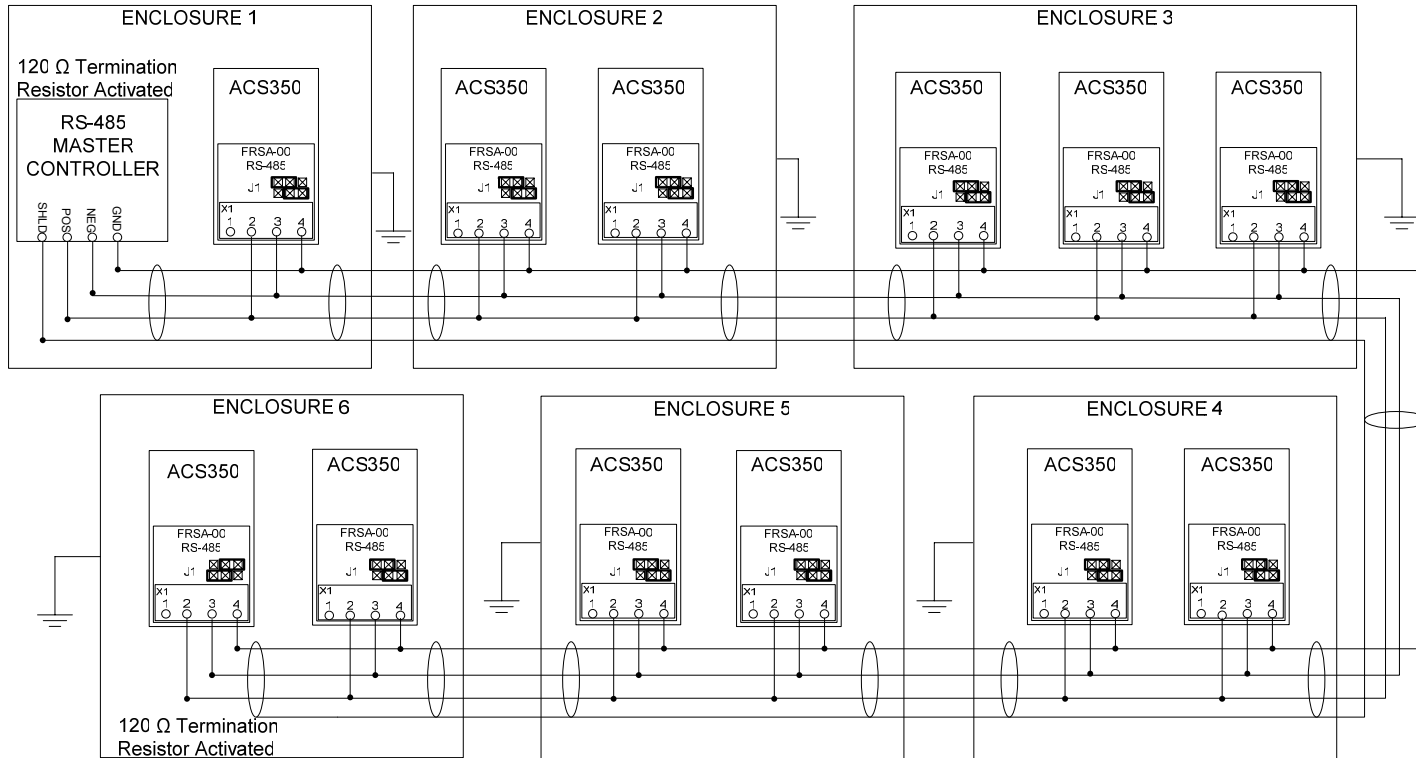
Figure 4: Is an example of a single enclosure network configuration with a common ground point and all network nodes are in close proximity to one another. This is an example of a network configuration where the FRSA-00 or the FMBA-01 could be applied.

Figure 4
RS-485 Network Guideline Diagram



Note: Drawing shows connectivity only. Use Belden 9842 cable or equivalent. Belden 9842 cable is a dual twisted pair cable with a wave impedance of 120 Ω. Connect both wires of the second twisted pair to ground.

Figure 5
RS-485 Network Guideline Diagram

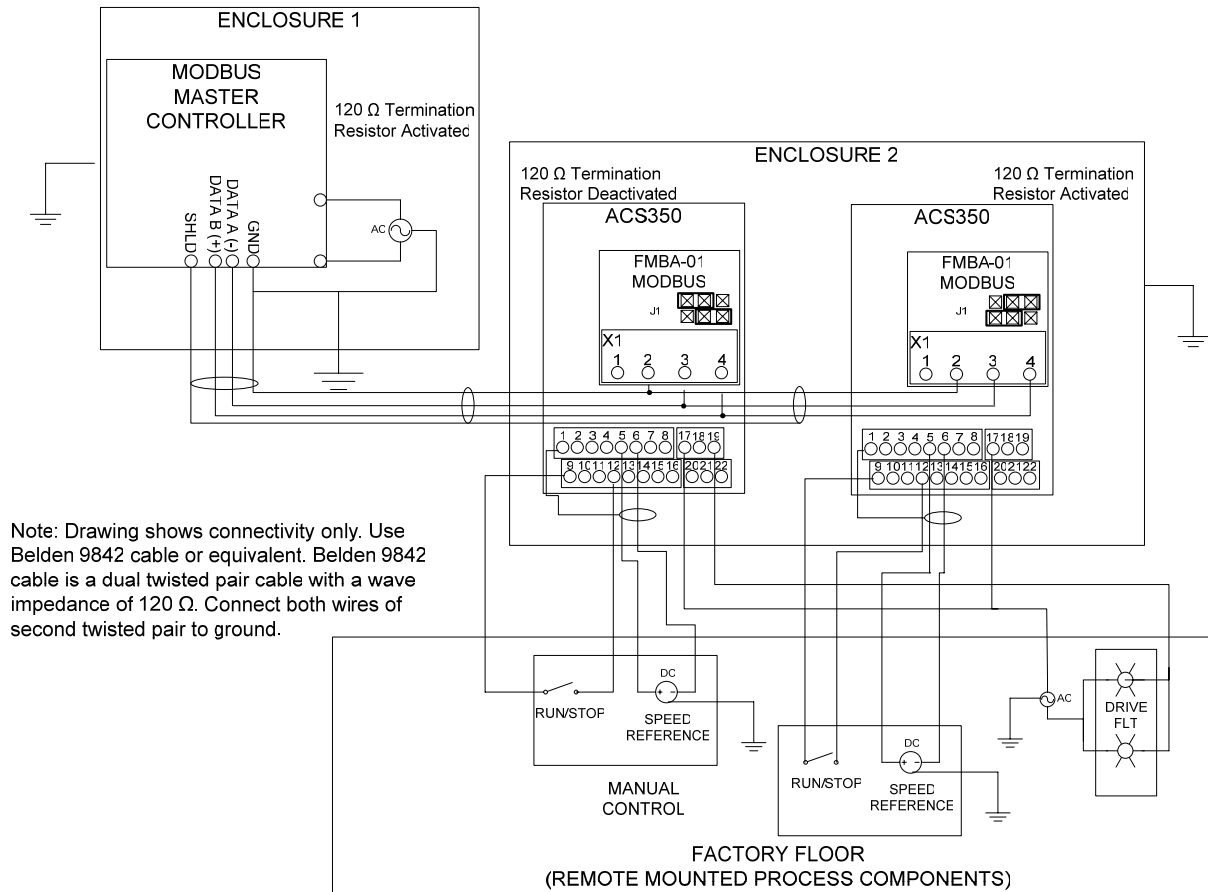


Note: Drawing shows connectivity only. Use Belden 9842 cable or equivalent. Belden 9842 cable is a dual twisted pair cable with a wave impedance of 120 Ω. Connect both non-data twisted pair to ground.

Figure 5: Is an example of a multiple enclosure network configuration. Each enclosure has a unique connection point to ground. If the maximum ground voltage difference is within the allowable range of -7 to +12VDC the **FRSA-00** or the **FMBA-01** could be applied. If the ground voltage difference may deviate outside of the allowable range the **FMBA-01** should be used.

FRSA-00 RS-485 ADAPTER BOARD USER'S MANUAL

Figure 6
RS-485 Network Guideline Diagram



Note: Drawing shows connectivity only. Use Belden 9842 cable or equivalent. Belden 9842 cable is a dual twisted pair cable with a wave impedance of 120 Ω. Connect both wires of second twisted pair to ground.

Figure 6: Is an example of a multiple enclosure network configuration utilizing both the RS-485 port and drive I/O. Each enclosure has a unique connection point to ground and multiple power sources. This is an example of a network configuration where the **FMBA-01** should be applied.

3.3 Application Guideline Summary

This section is a summary of Figures 4 – 6 and can also be used as a guideline to determine the best ACS350 Modbus solution for a specific network configuration. This table should only be used as a guide. Each installation needs to be evaluated and tested.

Table 2

RS485 Network Guidelines: Selecting FRSA or FMBA		
Installation	FRSA-00	FMBA-00
Application requires both drive I/O and communication port	NO	YES
Application requires no drive I/O	YES	YES
Communication network is compact. (see system drawings for examples)	YES	YES

These application guidelines should be used as a guide to determine the best ACS350 Modbus solution for your specific network configuration. Following these guidelines and implementing reliable engineering and installation practices will significantly improve the reliability of the network. However, the suggestions in this manual do not guarantee a reliable and robust network.

Notes:

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