Recommended Cable for RS485 OSDP Readers

1. Standard 18 gauge wire bundle:
Although RS-485 wire recommendations typically do not "call-out" 18 gauge wire, it does not preclude an all 18 gauge wire bindle, which has cost benefits and addresses power issues as well.

2. For 12V DC Reader power and RS485 in the same cable:
Use Belden 1502SB 0101000 Multi-Conductor Cables 22/18AWG 2C SHIELD. The max length you can power a 900W2030 Stealth Bio @12VDC at 400mA is 216 ft. The maximum length for the rest of the Stealth Non-Bio readers family @12V DC at 300mA reader power is 289 ft.

3. Another multiconductor cable:
Belden 538AFS, 18/3PR+18/2C+18/4C+16/4C, Banana Peel, Access Control Composite Cable, Shielded. Heavier gauge wire results in longer distances.

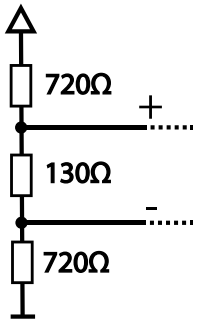
4. Longer runs with 12V DC supplied locally:
Use Belden 9842 - RS-485, (2 pr) 24 AWG (7x32) TC, PE/PVC, Foil+TC Braid Shld. For maximum baud rate the cable length is 1600 ft.

Notes:

1. Recommendation 2 & 3 address maximum lengths of cabling. There is no minimum length is applicable for either power or RS-485 cables.

2. The Shield is connected to earth/ground at the panel end only and provides shielding against induced noise.

3. Terminate of RS-485 lines only at the reader.



4. OSDP Wiring of Tamper Switch
For OSDP applications, connect the Tamper Switch signal, orange wire Pin 9, to the INPUT 1 signal, Gray wire on pin 8. DO NOT connect the Tamper switch signal to a control panel. The state of this switch is reported as a response to an osdp_LSTAT command.

5. OSDP Baud rate - The default baud rate is 9600. The default reader ID is 1. The baud rate is changed via the osdp_COMSET command but will not be saved if the reader ID is not changed. So, a reader with the default ID value of 1 will always initialize at 9600 baud. The reader service raises the Baud rate to the maximum reliable Baud rate.

Using Other Cable Guidelines

If you decide not to use the recommended cables above, these are the consideration you need to use a guideline.

1. Power – Refer to Table 1 below. This will tell you what the maximum power cable length is for a certain wire gauge and reader cable length

2. RS-485 cable length – Refer to Table 2 for the maximum baud rate versus cable length.

Power Cable Length

The left column is the amount of reader power required and the columns to its right are the maximum cable lengths for the wire gauge listed in the top row. For example, using a reader thatrequires 300 mA and 18 guage power cable, the cable can be no longer than 289 feet

Table 1 • Power Requirements and Cable Lengths

Power Req.	24 AWG	22 AWG	20 AWG	18 AWG	16 AWG	14 AWG	12 AWG
DC 100 mA	216 feet	342 feet	594 feet	867 feet	1,379 feet	2,197 feet	3,505 feet
DC 200 mA	108 feet	171 feet	297 feet	433 feet	689 feet	1,098 feet	1,755 feet
DC 300 mA	72 feet	113 feet	198 feet	289 feet	459 feet	732 feet	1,169 feet
DC 400 mA	54 feet	85 feet	148 feet	216 feet	344 feet	549 feet	877 feet
DC 500 mA	43 feet	68 feet	119 feet	173 feet	275 feet	439 feet	701 feet
DC 750 mA	28 feet	45 feet	79 feet	115 feet	183 feet	293 feet	467 feet
DC 1000 mA	21 feet	34 feet	59 feet	86 feet	137 feet	219 feet	350 feet

Maximum RS485 length versus Baud rate for 24 AWG twisted shielded pair, , 0.026 Ohm/ft (0.085 Ohm/m), 13 pF/ft (41pF/m)conductor to conductor, 22 Pf/ft (72pF/m) conductor to shield

Table 2 • Typical Maximum RS-485 Drive Distance

Baud Rate	150 - 9600	19200	38400	57600	11520
Distance ft (meters)	4000 (1220)	3200 (975)	3000 (914)	2300 (701)	1600 (488)

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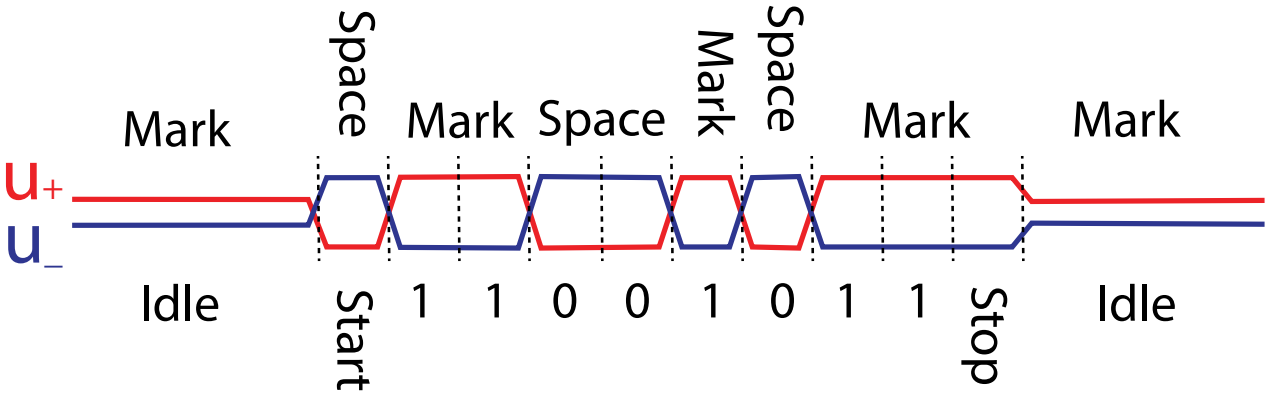
References Used To Develop The Guidelines Above

If you decide not to use the recommended cables above, these are the consideration you need to use a guideline.

1. General Reference for RS485 https://en.wikipedia.org/wiki/RS485

2. EIA485 (formerly RS485 or RS485) is a specification for the physical layer of a network that uses the difference in voltages between two wires (Three wire) to conveys data. One polarity of voltage indicates a logic 1, the reverse polarity indicates logic 0. The difference of potential must be at least 0.2 volts for valid operation, but any applied voltages between +12 V and 7 volts will allow correct operation of the receiver.



https://store.chipkin.com/articles/rs485-what-is-rs485-eia-485

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Based on 24 AWG twisted shielded pair, 0.026 Ohm/ft (0.085 Ohm/m), 13 pF/ft (41pF/m) conductor to conductor, 22 Pf/ft (72pF/m) conductor to shield.
https://kb.unavco.org/kb/assets/629/max_cable.pdf

For RS-485 cable:

1. It can be difficult to quantify whether shielding is required in a particular system or not, until problems arise. We recommend erring on the safe side and using shielded cable. Shielded cable is only slightly more expensive than unshielded.
https://arcelect.com/RS485_info_Tutorial.htm

2. RS-485 needs 3 conductors and a shield. Many people say it's a two-wire network but it is not. Two conductors are used to carry the RS-485 Differential voltage signal. The Shield is connected to earth/ground at one end only and provides shielding against induced noise.

So why the 3rd conductor?

The driver sends data by modulating the differential voltage. The receiver must sense and decode the differential. There are limits to the voltages the transmitters and receivers can work with. These limits are specified by the code. They are -7Volts to +12Volts. What happens if you have two devices and a ground potential exists between the two devices of 24 volts? You can see that one of the devices will be operating outside the specified voltage range. While you might expect that all the electrical equipment in an installation is ultimately connected to the same ground in practice this is rare especially in cold climates where building architecture and frozen ground can conspire against you. That why you need the 3rd conductor - to connect the ground (of each RS485 driver) to the same reference. Now we do not care about ground potentials
https://store.chipkin.com/articles/rs485-rs485 -cables-why-you-need-3-wires-for-2-twowire-rs485

Termination:

Ideally, the two ends of the cable will have a termination resistor connected across the two wires. Without termination resistors, signal reflections off the unterminated end of the cable can cause data corruption. Termination resistors also reduce electrical noise sensitivity due to the lower impedance. The value of each termination resistor should be equal to the cable characteristic impedance (typically, 120 ohms for twisted pairs). The termination also includes pull up and pull down resistors to establish fail-safe bias for each data wire for the case when the lines are not being driven by any device. This way, the lines will be biased to known voltages and nodes will not interpret the noise from undriven lines as actual data; without biasing resistors, the data lines float in such a way that electrical noise sensitivity is greatest when all device stations are silent or unpowered.[5]
https://en..wikipedia.org/wiki/RS-485