

SmartSensor V

Cable Length Recommendations

0273

The following recommendations allow you to provide reliable power and communication to the SmartSensor V.

Understanding SmartSensor 8-conductor Cable length limits

The 8-conductor cable has conductors for one power and two communication channels, each with its own requirements and length limitations:

- **DC power** – These two conductors (red and black) are 20 AWG wires. Based on DC power limitations and the power drawn by the SmartSensor V, this means that power can travel up to 1400 ft. (426.7 m) along these conductors.
- **RS-485 communication** – This twisted pair (blue and striped blue/white) are 22 AWG wires. Based on RS-485 limitations, and the specifications of the twisted pair, this means that communication can travel up to 1400 ft. (426.7 m) along these conductors.
- **RS-232 communication** – These four conductors (orange, brown, violet, and yellow) are 22 AWG wires. Based on RS-232 limitations, this means that communication can travel up to 200 ft. (61 m) along these conductors.

Proper sensor functionality requires DC power and one communication line. Having a second communication channel allows for sensor configuration without detection data interruption.

This document discusses power and communication requirements for SmartSensor V in more detail and provides recommendations on how to achieve sensor functionality in various applications based on voltage, needed cable length, and desired number of communication channels.

DC Power and the SmartSensor V

The operating voltage for the SmartSensor V is 10–28 VDC. The recommended power supply voltage is 12–24 VDC, with a 5% voltage tolerance.

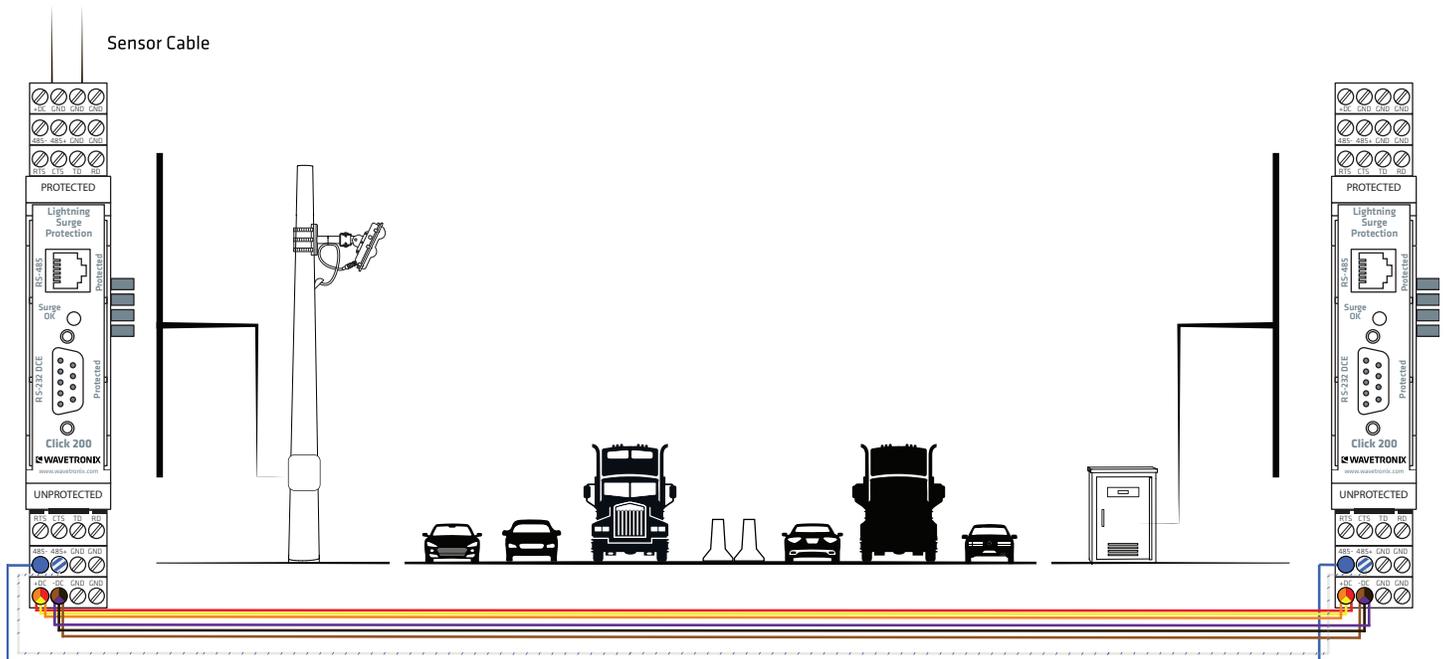
Due to V power consumption, 24 VDC can travel a maximum of 1400 ft. (426.7 m) along the 8-conductor cable. However, 12 VDC can only travel up to 200 ft. (61 m) along the 8-conductor cable. To extend 12 VDC to 650 ft. (198 m), sacrifice RS-232 conductors in the cable and combine them with the power conductors when terminating the cable into the Click 200.

Extending 12 VDC up to 650 ft. (198.1 m)

Since the 8-conductor cable's RS-232 capability is lost after 200 ft. (61 m), those conductors can be easily sacrificed to extend DC power up to 600 ft. (198.1 m) at 12 VDC.

Follow the steps below to correctly terminate the 8-conductor cable into a Click 200 and achieve a maximum cable length of 600 ft. (198.1 m) at 12 VDC:

1. Terminate the orange conductor (normally RTS) and the yellow conductor (normally TD) into the same terminals as the red (+DC) conductor.
2. Terminate the brown conductor (normally CTS) and the violet conductor (normally RD) to the same terminals as the black (-DC/GND) conductor.



650 ft. max cable length at 24 Volts

Communication and the SmartSensor V

As mentioned above, while only one communication channel is needed for sensor functionality, a second communication channel allows you to connect to the sensor for configuration without interrupting the data being sent from the sensor.

RS-232

While the 8-conductor cable contains four conductors for RS-232 communication, cable runs over 200 ft. (61 m) will lose RS-232 capability. If you wish to use RS-232 at a distance of more than 200 ft. (61 m) from the sensor, RS-232 must be converted to RS-485.

Note. *The SmartSensor 8-conductor Cable is not suitable for this type of conversion; you will need to use the SmartSensor 6-conductor Cable. For detailed information on how to convert RS-232 to RS-485 using a Click 304, see knowledge base article 0532 Using the Click 304, available at www.wavetronix.com.*

RS-485

The 8-conductor cable contains a twisted pair for RS-485 communication. Cable runs over 1400 ft. (426.7 m) will begin to lose RS-485 capability.

Recommendations

The following tables give recommendations for various applications based on power, cable length, and number of communication channels. For more information or support, contact your Wavetronix representative.

SmartSensor 8-conductor Cable

The table below shows applications based on power voltage, and the conductors needed to achieve maximum cable length.

Application	Power	Conductors	Max Length
Power RS-485	12 VDC	Power/Ground: Red/Black, Orange/Brown RS-485: Blue/Striped twisted pair	400 ft. (122 m)
Power RS-485	12 VDC	Power/Ground: Red/Black, Orange/Brown, Yellow/Violet RS-485: Blue/Striped twisted pair	650 ft. (198 m)
Power RS-485	24 VDC	Power/Ground: Red/Black RS-485: Blue/Striped twisted pair	1400 ft. (426.7 m)

Note. For RS-232 conversion, or for applications with two RS-485 channels under 1400 ft. (426.7 m), we recommend using the SmartSensor 6-conductor Cable.

Using an alternative cable

Below are Wavetronix recommendations for alternative communication cables. If you need an alternative power cable, any 2-conductor copper wire at the proper gauge will achieve the desired result.

Note. For cable runs up to 1400 ft. (426.7 m), we recommend you use a Wavetronix cable; if you choose to use an alternative cable, it must meet or exceed Wavetronix cable specifications. For cable runs longer than 1400 ft. (426.7 m), ensure the alternative cable used meets specifications for the power and communication standards being used. Failure to do so could cause devices to function improperly.

Communication cables

- Belden 3105A — One twisted pair with 22 AWG conductors used for one RS-485 channel.
- Belden 3107A — Two twisted pairs with 22 AWG conductors used for two RS-485 channels.
- Alpha 6453 — One twisted pair with 22 AWG conductors used for one RS-485 channel.
- Alpha 6455 — Two twisted pairs with 22 AWG conductors used for two RS-485 channels.

Power cables

The table below shows the voltage and wire gauges needed to provide DC power up to 2000 ft. (609.6 m).

Power	AWG	Max Length
12 VDC	18	350 ft. (106.7 m)
12 VDC	16	600 ft. (182.9 m)
12 VDC	14	950 ft. (289.6 m)
12 VDC	12	1400 ft. (426.7 m)
24 VDC	18	2000 ft. (609.6 m)

Choosing a baud rate for wired communication

To achieve reliable wired communication, the selected baud rate must be compatible with the length of the cable run. The table below shows the cable length recommendations for wired communication.

Baud Rate (bps)	RS-232	RS-485
115200	40 ft. (12.2 m)	300 ft. (91.4 m)
57600	60 ft. (18.3 m)	600 ft. (182.9 m)
38400	100 ft. (30.5 m)	800 ft. (243.8 m)
19200	140 ft. (42.7 m)	1000 ft. (304.8 m)
9600	200 ft. (61 m)	1400 ft. (426.7 m)
*9600	N/A	2000 ft. (609.6 m)

**This is possible with an alternative cable.*