Belden

Access control systems & cables

Systems: Wiegand, RS-485, OSDP

Cables: Individual component, composite cables

Technical Bulletin

An access control system is an integration of hardware, software and management tools that electronically monitor and control access through doors, gates, elevators and many other entry points.

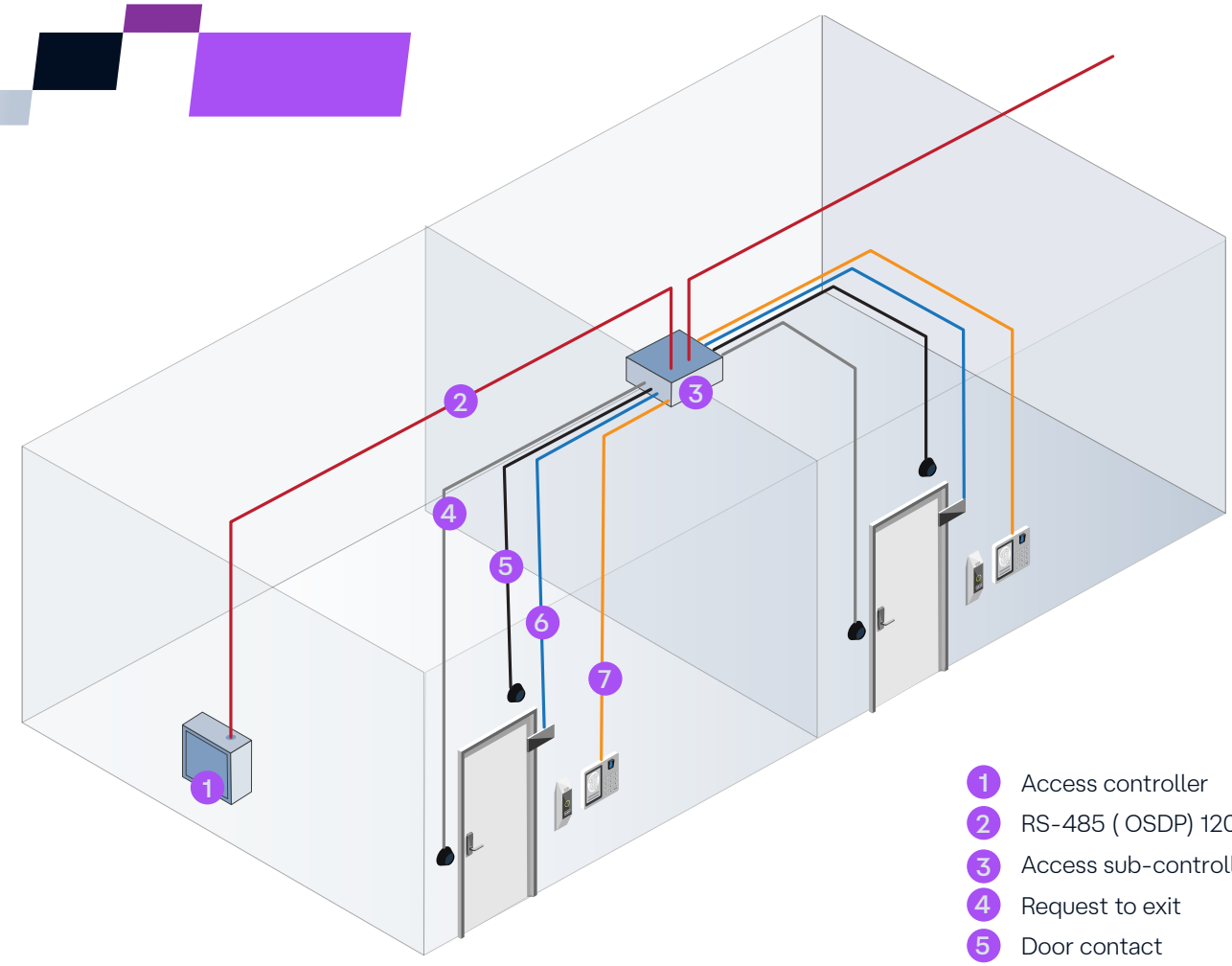
Access control systems are found virtually everywhere. They can be found in hotels, hospitals, airports, banks, prisons, military facilities, social clubs, factories, schools and other places where access security is essential.

Today's access control systems are becoming more sophisticated. Many other security applications are being integrated with access control systems to make them complete security systems. These integrated security systems include those involving CCTV, intrusion detection, HVAC, and time and attendance reporting.

Reader technologies

There are many choices in the reader technology space. The most common for card access are:

- **Barcode**
  Barcode is very common in non-security applications, but it's seldom used for security applications.
- **Magnetic stripe**
  Magnetic stripe is the most widely used technology worldwide for access control applications. Most people are familiar with the technology because of its widespread use via credit card and some hotel-room keys. This technology only provides a medium security level because it's possible to duplicate a card. But because of the cards' and readers' low cost, this technology is an attractive choice for many applications.
- **Wiegand**
  Wiegand was originally created to provide a permanently encoded card when magnetic stripe cards were sensitive to magnetic fields. This technology was the most common choice for high-security applications before the advent of lower-cost proximity technology and high-density magnetic stripe.
- **Proximity**
  Proximity is the fastest-growing technology for access control applications. The proximity technology reader constantly transmits a low-level fixed RF signal that provides energy to the card. When the card is held at a certain distance from the reader, the RF signal is absorbed by the card, which contains a unique identification code. The main advantage is there are no slots, no wear, no moving parts and no reader heads to maintain. Proximity technology is based on a frequency of 125kHz, which has a longer read range than smart-card technology.
- **OSDP (RS-485)**
  Open surpervised device protocol (OSDP) is the newest access control implementation. OSDP is more secure than all other types of reader transmission systems.



1. Access controller
2. RS-485 (OSDP) 120 Ohm
3. Access sub-controller
4. Request to exit
5. Door contact
6. Lock power
7. Reader

Access control systems and cables

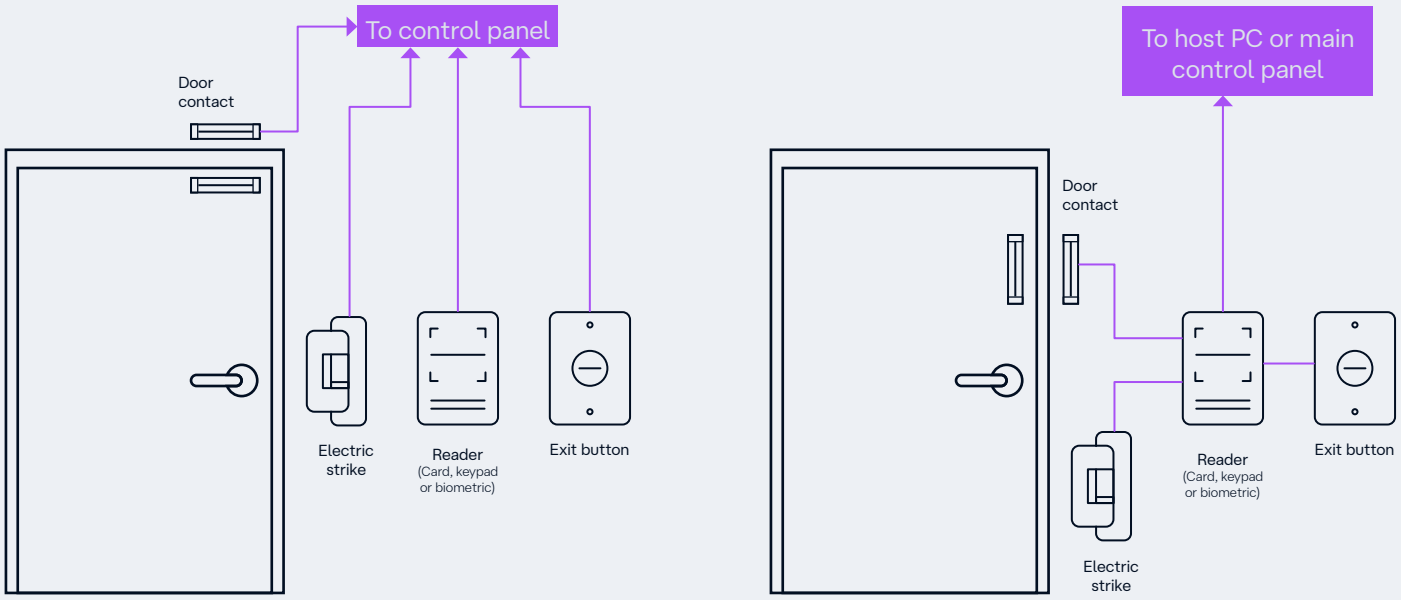
A conventional access control system can vary depending on the environment, the type of control and the security involved. All access control systems have a type of reader, card or fob, control panel, software and other peripheral devices.

Access control cables

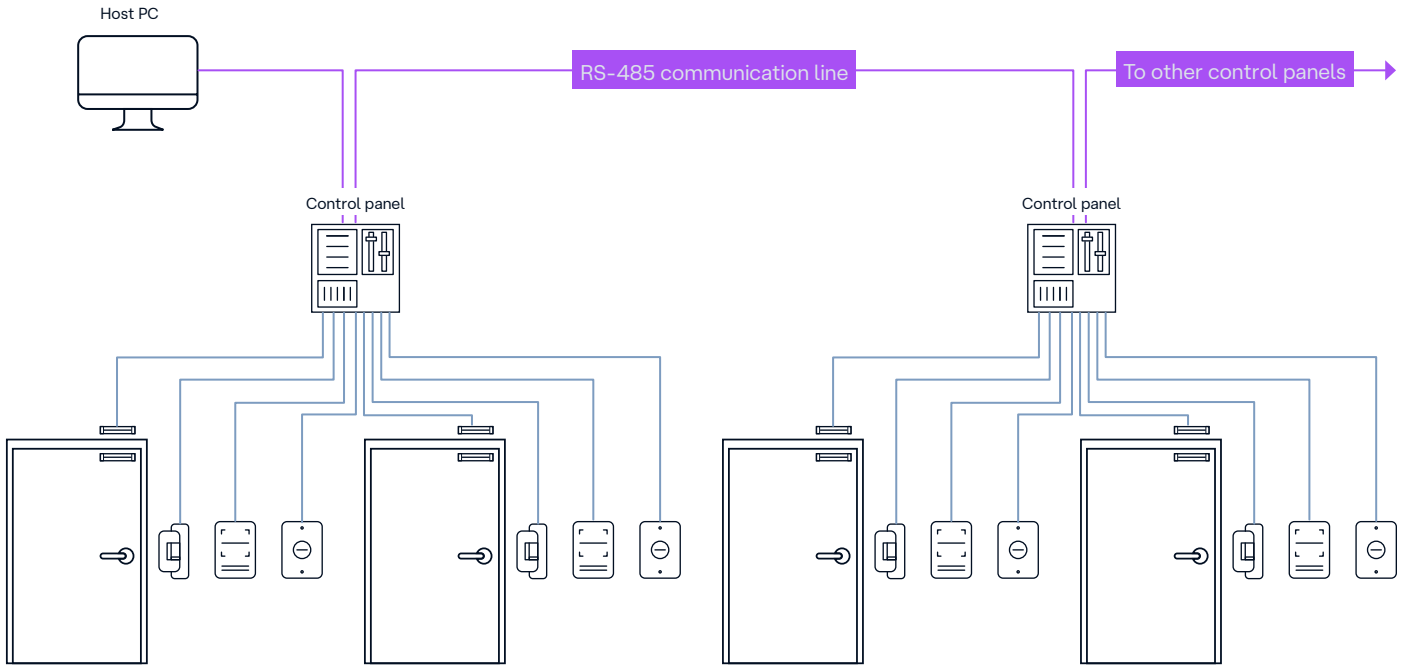
- **Reader cable:** The construction is dependent on the reader type, such as Wiegand or OSDP (RS-485).
- **Door contact cable:** This cable is normally a 2 conductor with or without a shield.
- **Lock power cable:** This cable allows the engagement or opening of a lock. It's normally a 2 or 4 conductor with or without a shield.
- **Request to exit (spare):** This cable allows an exit from a room. This cable is normally a 2 or 4 conductor with or without a shield.

Access control design

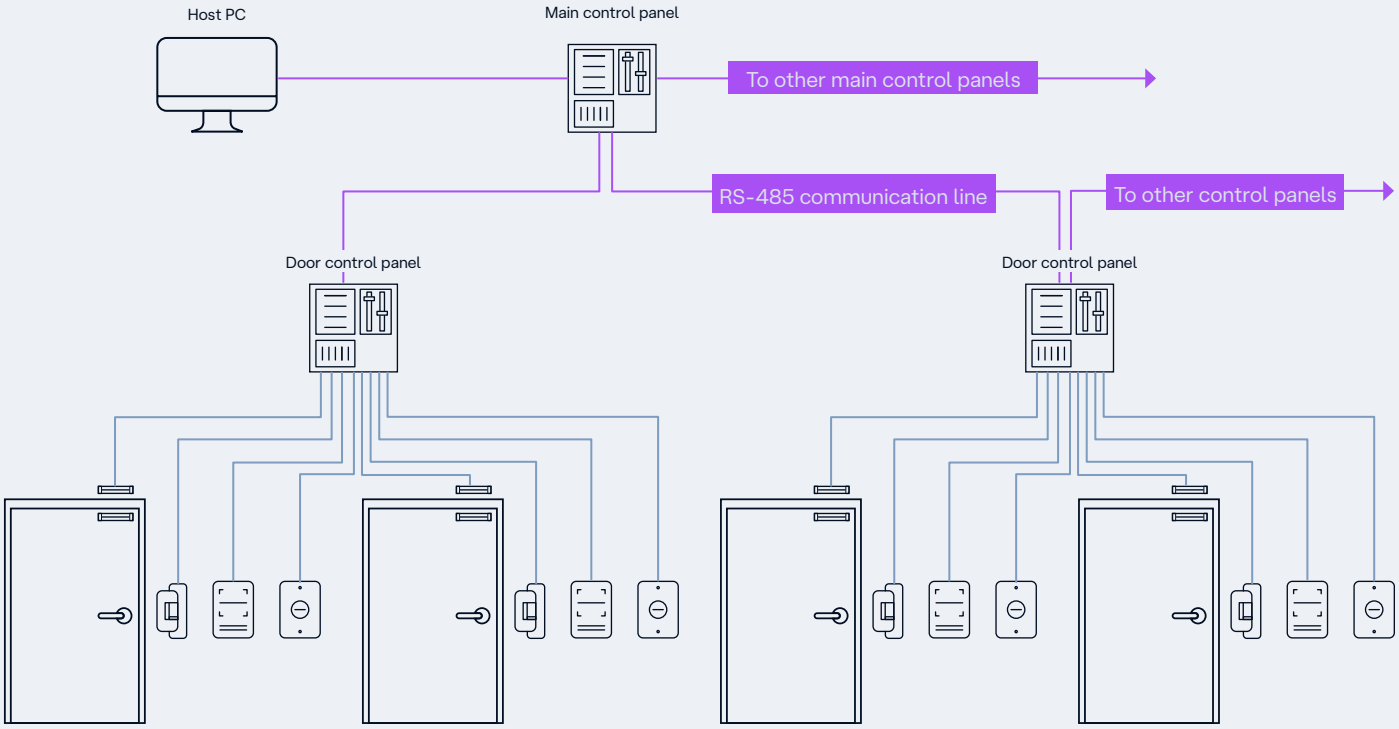
There are many tyes of access control design



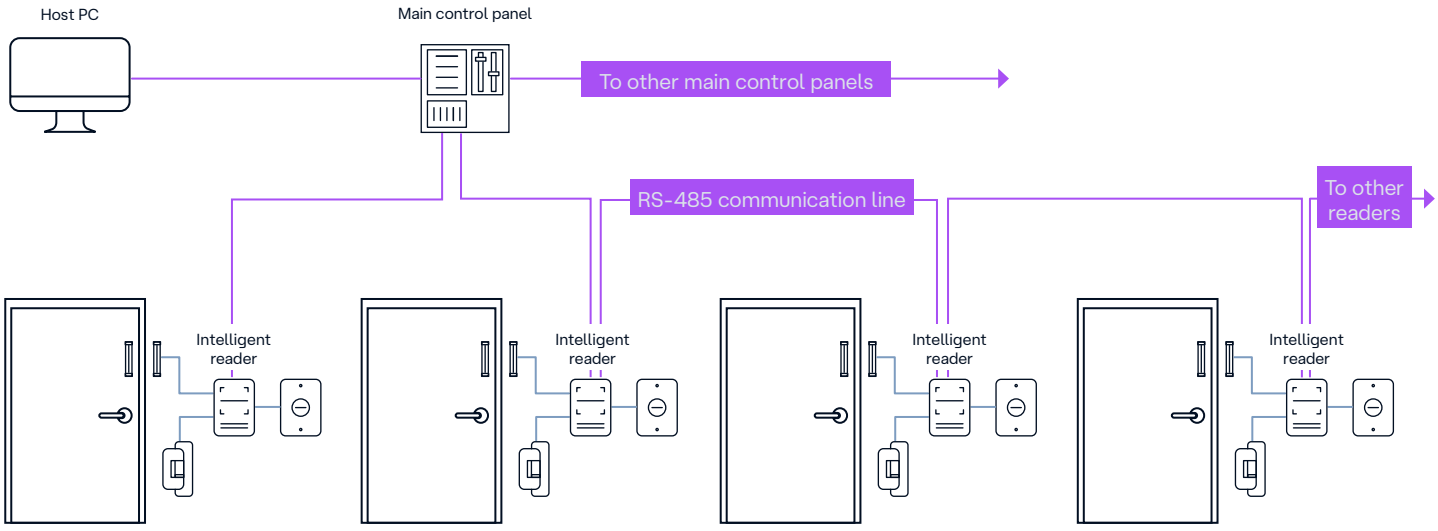
Access control system using serial controllers



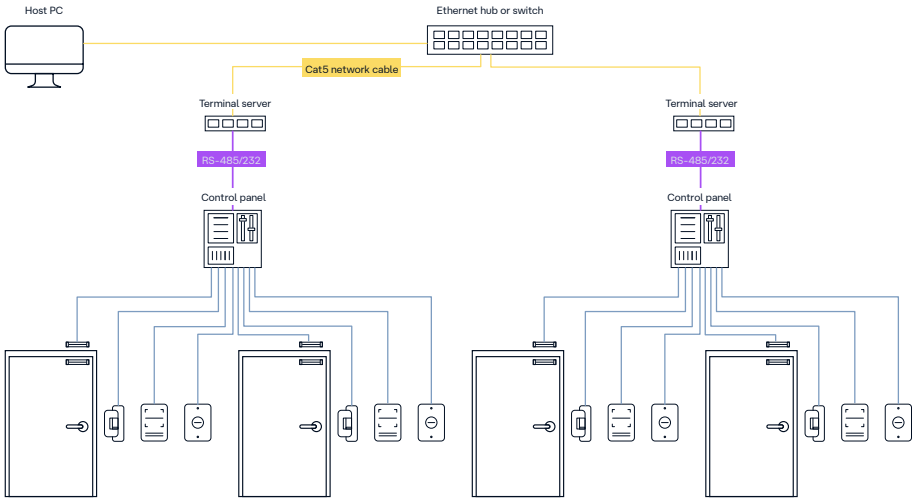
Access control system using serial main and sub controllers

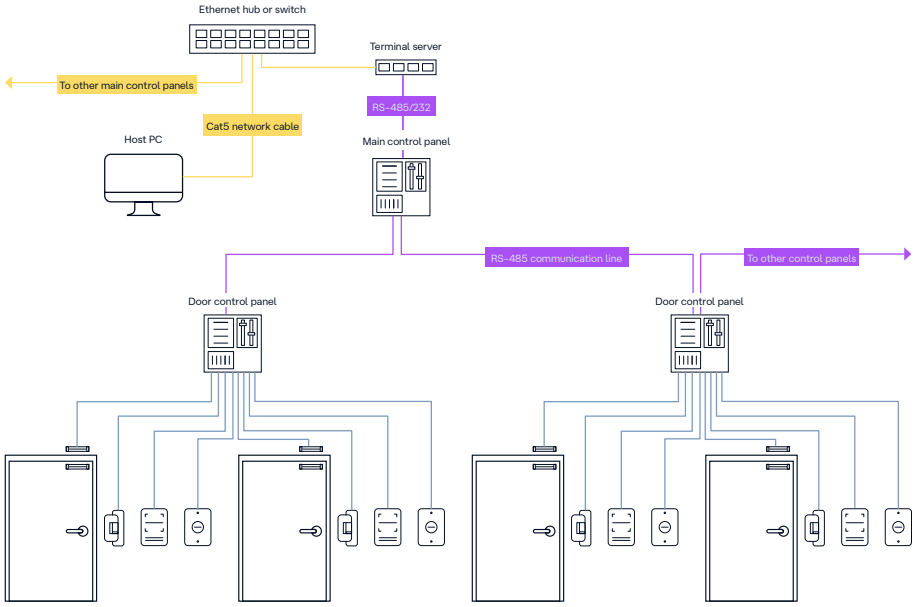


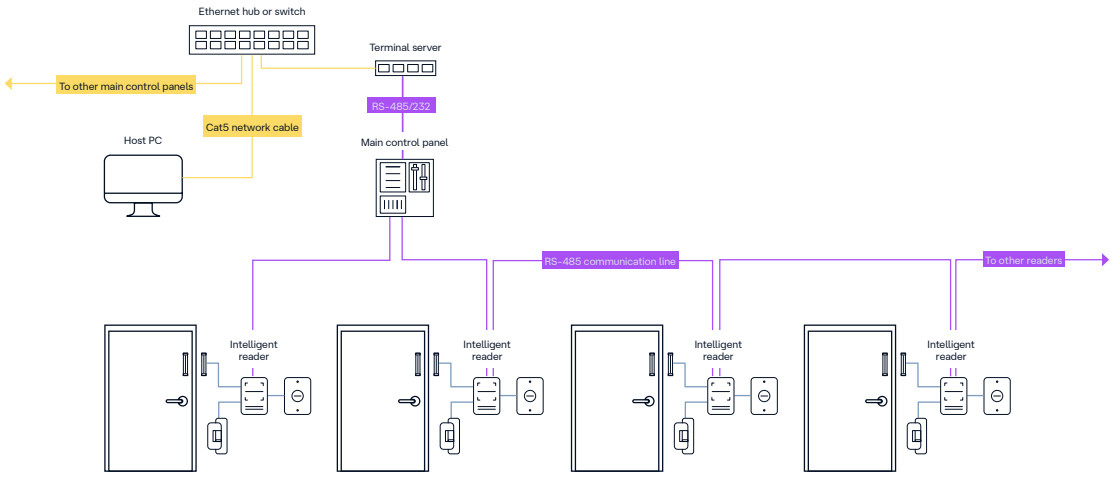
Access control systems using serial main controller and intelligent readers



Access control system using serial main and terminal servers







Wiegand - Proximity and OSDP access control composite

Wiegand access control is a lower-information reader for access points. These can include proximity readers and contact readers.

Belden offers composite designs with an overall jacket or our Banana Peel designs.

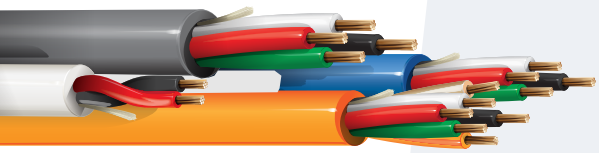
The overall jacketed version provides additional protection for the individual cables, but adds cost and overall larger O.D.

The Banana Peel composite has a 9% smaller OD. This improves bend radius by 11%, allowing for faster, easier installation. Smaller conduits can also be used.

Key features

- Patented Banana Peel® construction affixes the individual cables to a center spline, eliminating the need for an overall jacket.
- The individual cable components are color-coded by application and have the application printed on the jackets.
- All jackets have rip cords for easy removal.

For each leg of a composite cable (up to six), Banana Peel technology allows for full customization of:

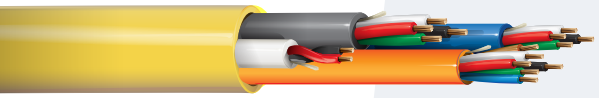


Banana Peel design:

Patent pending - no overall jacket

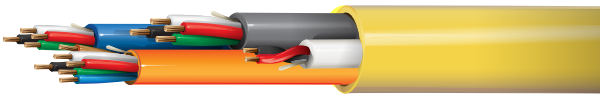
Installation note:

When pulling the cable into an area below 32 degrees F: The cable will need to be warmed to room temperature and the end of the cable before splitting the peel will need to be warmed to help the separation of the cables from the spline.



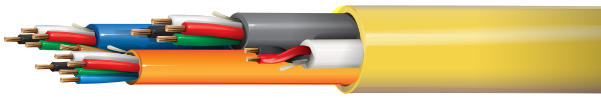
Overall jacketed design

Wiegand - Proximity & OSDP access control composite



Belden item	Flame rating	Lock power (gray)	Card reader (orange)	Door contact (white)	Request to exit/ spare (blue or yellow)	Assembly
Standard						
558AFS	CMR	4C18 AWG, Shielded	3 Pr. 22 AWG, OA shield	2C 22 AWG, shielded	4C 22 AWG, shielded (blue)	Banana Peel®
658AFS	CMP					
558ANH	CMG					
558ALW	CMG, Cca					
558ALY	CMG, Dca					
Standard w/ jacket						
558AFJ	CMR	4C 18 AWG, shielded	3 Pr. 22 AWG, OA shield	2C 22 AWG, shielded	4C 22 AWG, shielded (blue)	PVC yellow jacket
658AFJ	CMP					
Extended distance						
538AFS	CMR	4C 16 AWG, shielded	3 Pr.18 AWG, OA shield	2C 18 AWG, shielded	4C 18 AWG, shielded (blue)	Banana Peel®
638AFS	CMP					
Extended distance w/ jacket						
538AFJ	CMR	4C 16 AWG, shielded	3 Pr.18 AWG, OA shield	2C 18 AWG, shielded	4C 18 AWG, shielded (blue)	PVC yellow jacket
638AFJ	CMP					
Standard style 2						
558AMS	CMR	4C 18 AWG, unshielded	3 Pr.22 AWG, OA shield	2C 22 AWG, unshielded	4C 22 AWG, unshielded (blue)	Banana Peel®
658AMS	CMP					
Standard style 2 w/ jacket						
558AMJ	CMR	4C 18 AWG, unshielded	3 Pr.22 AWG, OA shield	2C 22 AWG, unshielded	4C 22 AWG, unshielded (blue)	PVC yellow jacket. Indoor/outdoor black jacket
658AMJ	CMP					
558AM1 New	CM Indoor/Outdoor		6C 22 AWG, shielded (558AM1)			
Extended distance style 2						
538AMS	CMR	4C 16 AWG, unshielded	3 Pr.18 AWG, OA shield	2C 18 AWG, unshielded	4C 18 AWG, unshielded (blue)	Banana Peel®
638AMS	CMP					
Extended distance 2 w/jacket						
538AMJ	CMR	4C 16 AWG, unshielded	3 Pr.18 AWG, OA shield	2C 18 AWG, unshielded	4C 18 AWG, unshielded (blue)	PVC yellow jacket
638AMS	CMP					

Wiegand - Proximity & OSDP access control composite



Belden item	Flame rating	Lock power (gray)	Card reader (orange)	Door contact (white)	Request to exit/ spare (blue or yellow)	Assembly
Standard style 3						
558GMS	CMR	4C 18 AWG, unshielded	6C 22 AWG, shielded	4C 22AWG, unshielded (Incl. spares)	4C 22 AWG, unshielded (blue)	Banana Peel®
658GMS	CMP					
Exit reader						
658GFS	CMP	4C 18 AWG, Shielded	3 Pr.22 AWG, OA shield	2C 22 AWG, shielded	3 Pr.22AWG, OA shield Yellow - additional reader	Banana Peel®
658BMJ	CMP	4C 18 AWG, unshielded	3 Pr.22 AWG, OA shield	4C 22 AWG, unshielded	3 Pr.22AWG, OA shield Yellow - additional reader	PVC yellow jacket
OSDP reader						
658HMS	CMP	4C 18 AWG, unshielded	1 Pr.24 AWG shielded reader + 18/2 unshielded power	2C 22 AWG, unshielded	4C 22 AWG, unshielded (blue)	Banana Peel®
658JMS	CMP	4C 18 AWG, unshielded	1 Pr.22 AWG shielded reader + 18/2 unshielded power	2C 22 AWG, unshielded	4C 22 AWG, unshielded	Banana Peel®
638JMDS	CMP	2C 16 AWG, unshielded	1 Pr.22 AWG shielded reader + 18/2 unshielded power	4C 22 AWG, unshielded	4C 18 AWG, unshielded	Banana Peel®
668AMD	CMP	4C 18 AWG, unshielded	2 Pr.24 AWG shielded dual OSDP reader	4C 22 AWG, unshielded	4C 18 AWG, unshielded	Banana Peel®
538HMD1	CM Indoor/outdoor	4C 18 AWG, unshielded Water-blocked	1 Pr.22 AWG shielded reader + 18/2 unshielded power	2C 22 AWG, unshielded Water-blocked	4C 18 AWG, unshielded	Indoor/outdoor black jacket

RS-485 design - OSDP

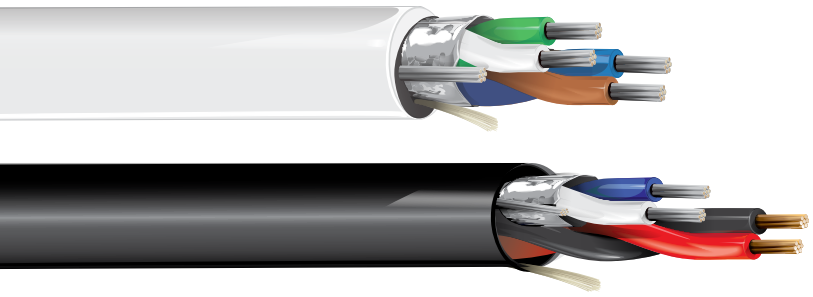
Belden's offering of OSDP Access Control Cables provides high-levels of security, flexibility, convenience and performance to connect security and access control systems. Remain TIA485-compliant at maximum supported baud rates and cable distances.

- >>> Enhanced security to protect data
- >>> Simple and quick implementation
- >>> Low maintenance and added functionality

Key features

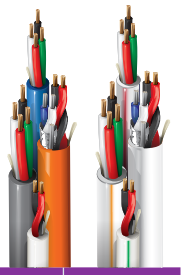
- Higher security levels against hacks and other threats
- Two-way communication
- Overall smaller cable with fewer conductors
- Advanced user interfaces
- Communication between different manufacturers
- Specification extendable to IP environments

Part no.	No. of cond	Cond. type	Insulation type & thickness	Shielding	Jacket type & thickness	Nom. Od	NEC type	Nom. capacitance and impedance	Jacket colors
6640FD	1 Pair	24AWG (7×32) TC 26Ohms/1000ft	Foam FEP .025"	Overall 100% foil shield	Flex plenum .015"	.166"	CMP	10.8 pf/ft 120 Ohms	Orange
6540FD	1 Pair	22 AWG (7×30) TC 16.3 Ohm/1000ft	Foam FEP .023"	Overall 100% foil shield	Flex plenum .016"	.177"	CMP	13.5 pf/ft 120 Ohms	Black, orange
6541FD	2 Pair	22 AWG (7×30) TC 16.3 Ohm/1000ft	Foam FEP .023"	Overall 100% foil shield	Flex plenum .016"	.292"	CMP	13.5 pf/ft 120 Ohms	White, black
6641FD	2 Pair	24AWG (7×32) TC 26Ohms/1000ft	Foam FEP .021"	Overall 100% foil shield	Flex plenum .016"	.252"	CMP	13.5 pf/ft 120 Ohms	Black, orange
6381MD	1 Pair	24AWG (7×32) TC 26Ohms/1000ft	Foam FEP .025"	Overall 100% foil shield	Flex plenum .020"	.215"	CMP	13.5 pf/ft 120 Ohms	Black, orange and gray
	2 Cond	18AWG (7×26) BC 6.2Ohms/1000ft	PVC .010"	None					
6281MD	1 Pair	22 AWG (7×30) TC 16.3 Ohm/1000ft	Foam FEP .030"	Overall 100% foil shield	Flex plenum .020"	.246"	CMP	13.5 pf/ft 120 Ohms	Black
	2 Cond	16AWG (19×29) BC 4.2Ohms/1000ft	PVC .010"	None					
5381M1	1 Pair	22 AWG (7×30) TC 16.3 Ohm/1000ft	Foam PE Polyethylene .025"	Overall 100% foil shield	Waterblocking tape UV-resistant PVC .032"	.272"	Indoor/ outdoor CM	13.5 pf/ft 120 Ohms	Black
	2 Cond	18AWG (7×26) BC 6.2Ohms/1000ft	PVC .010"	None					



Color code		
Part no.	**Data pair**	**Power**
6381MD 6281MD 5381MD	Blue, white	Black, red
6640FD 6640FD	Blue, white Black, white	
6541FD 6641FD	White, green Brown, blue	

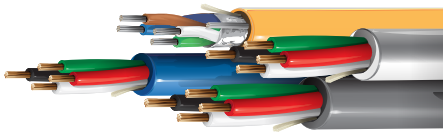
OSDP - composite cables



OSDP reader w/power

Part no.	Element type	No. of cond/ pairs	Cond. type	Insulation type and thickness	Shielding	Jacket type & thickness	Nom. Od	NEC Type	Nom. capacitance & impedance	Jacket colors
658HMS	OSDP reader	1 Pair	24AWG (7×32) TC	Foam PE .025”	Overall 100% foil shield	Flex plenum .020”	.244”	CMP	12.8 pF/ft 120 Oms	Orange
		2 Cond	18AWG (7×26) BC	PVC .010”	None					
	Door contact	2 Cond	22AWG (7×30) BC	PVC .008”	None	UV-resistant PVC	.116”		34 pF/ft	White
	Lock power	4 Cond	18AWG (7×26) BC	PVC .008”	None	UV-resistant PVC	.182”		27 pF/ft	Gray
	REX/ spare	4 Cond	22AWG (7×30) BC	PVC .008”	None	UV-resistant PVC	.136”		34 pF/ft	Blue
658JMS	OSDP reader	1 Pair	22AWG (7×30) TC	Foam PE .025”	Overall 100% foil shield	Flex plenum .020”	.249”	CMP	12.8 pF/ft 120 Oms	White
		2 Cond	18AWG (7×26) BC	PVC .010”	None					
	Door contact	2 Cond	22AWG (7×30) BC	PVC .008”	None	UV-resistant PVC	.116”		34 pF/ft	White/GN
	Lock power	4 Cond	18AWG (7×26) BC	PVC .008”	None	UV-resistant PVC	.182”		27 pF/ft	White/OR
	REX/ spare	4 Cond	22AWG (7×30) BC	PVC .008”	None	UV-resistant PVC	.136”		34 pF/ft	White/RD

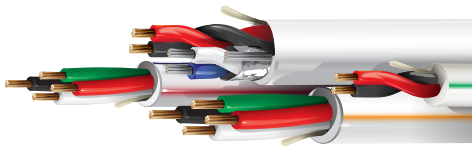
Overall jacket: None - Banana Peel
Overall cable O.D. .455”



Dual OSDP reader

Part no.	Element type	No. of cond/ pairs	Cond. type	Insulation type and thickness	Shielding	Jacket type & thickness	Nom. Od	NEC type	Nom capacitance & impedance	Jacket colors
668AMD	OSDP reader	2 Pair	24AWG (7×32) TC	Foam FEP .021	Overall 100% foil shield	Flex plenum .018”	.252”	CMP	13 pF/ft 120 Oms	Orange
	Door contact	4 Cond	22AWG (7×30) BC	Plenum PVC .008”	None	Flex plenum	.141”			White
	Lock power	4 Cond	18AWG (7×26) BC	Plenum PVC .010”	None	Flex plenum	.182”			Gray
	REX/ spare	4 Cond	18AWG (7×26) BC	Plenum PVC .010”	None	Flex plenum	.182”			Blue

Overall jacket: None - Banana Peel
Overall cable O.D. .472”



OSDP reader w/power extended distance

Part no.	Element type	No. of cond/ pairs	Cond. type	Insulation type and thickness	Shielding	Jacket type & thickness	Nom. Od	NEC type	Nom. capacitance & impedance	Jacket colors
638JMDS	OSDP reader	1 Pair	22AWG (7×30) TC	Foam PE .025”	Overall 100% foil shield	Flex plenum .020”	.222”	CMP	12.8 pF/ft 120 Oms	White
		2 Cond	18AWG (7×26) BC	PVC .010”	None					
	Door contact	4 Cond	22AWG (7×30) BC	PVC .008”	None	UV-resistant PVC	.139”		34 pF/ft	White/BN
	Lock power	2 Cond	16AWG (19×27) BC	PVC .008”	None	UV-resistant PVC	.189”		27 pF/ft	White/GN
	REX/ spare	4 Cond	18AWG (7×26) BC	PVC .008”	None	UV-resistant PVC	.176”		34 pF/ft	White/YE

Overall jacket: Banana Peel
Overall cable O.D. .468”

OSDP reader w/power indoor/outdoor

Part no.	Element type	No. of cond/ pairs	Cond type	Insulation type and thickness	Shielding	Jacket type & thickness	Nom. Od	NEC type	Nom. capacitance & impedance	Jacket colors
538HMD1	OSDP reader	1 Pair	22AWG (7×30) TC	Foam PE .029”	Overall 100% foil shield	UV-resistant PVC .032”	.272”	Indoor/ outdoor CM	13.5 pF/ft 120 Oms	Orange
		2 Cond	18AWG (7×26) BC	PVC .011”	Waterblock tape					
	Door contact	2 Cond	22AWG (7×30) BC	PVC .009”	Waterblock tape	UV-resistant PVC	.168”			White
	Lock power	4 Cond	18AWG (7×26) BC	PVC .010”	Waterblock tape	UV-resistant PVC	.232”			Gray
	REX/ spare	4 Cond	22AWG (7×30) BC	PVC .010”	Waterblock tape	UV-resistant PVC	.187”			Blue

Overall jacket: UV Resistant PVC
Overall cable O.D. .566”

Access control is a system to gain access to a facility, building or room. An access control system can be as simiple as a hotel room to a complex government high-security location.

Most access control systems are analog Wiegand, proximity that provides sufficient data to the security detail. But there are situations such as high-level government facilities, or locations such as casinos, univerisity research or tech research facilities where a more robust system is needed to account for the access to these locations.

Belden