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## field & installation

A wide range of electronic and communications devices require multiple cables to transmit a combination of applications, including power, voice, data, video and control. Bundled cables that combine various wires and cables together are more convenient and less expensive to install in a variety of residential, commercial and industrial applications.



**George Tokatli** is an advanced electronics engineer for General Cable, manufacturer of copper, aluminum and optical fiber wire and cable products for the energy, industrial, broadcast, specialty and communications markets. George has more than 30 years of experience in electronics wire and cable manufacturing. He can be reached at [gtokatli@generalcable.com](mailto:gtokatli@generalcable.com).



# BUNDLED CABLE

## Saving Time and Money in a Single Pull

by George Tokatli

The common practice of pulling a single cable through pathways and conduit is a labor-intensive process. Installers need to ensure that the cable is the right length, is not kinked or damaged during the process and is then properly stripped and terminated at the device end. Now think about needing to pull multiple cables to the same location. If each cable is pulled individually, the entire process must be repeated for each cable.

The installer then needs to ensure that the pathway or conduit has ample space to accommodate all the cables and that the cables do not tangle or twist with other cables in the pathway. At the device end, the installer must identify each cable

and strip and terminate the right cable to the right location. When all is completed, the cumbersome process of pulling and terminating multiple cables to one location comes with a high labor price tag.

There is an alternative. Bundled cables allow installers to run multiple cables to one location in a single pull, resulting in significant less time and headaches.

### BENEFITS ABOUND

With many installers charging based on the number of pulls, the use of bundled cable can save significant labor costs in a variety of applications. While the reduced time to pull a bundled cable versus multiple cables is the key cost benefit,

bundled cables offer additional benefits that result in a lower total installed cost.

Individual components within the bundled cable are color-coded, making it easy to identify the application of each component for proper termination. Color coding of the individual components also facilitates moves, adds, and changes (MACs) in the future.

When only one bundled cable is pulled, the potential for length variations across individual cables is eliminated, reducing cable scrap and additional time needed to re-pull short lengths. Having only one box or reel with bundled cable also provides overall easier handling and less waste on the work site.

When wires and cables are combined in a bundled cable, the overall jacket also protects the inner elements from damage during installation for more reliable performance. Because the elements are tightly bundled together, a bundled cable also takes up less space in conduit and pathways than multiple cables. This overall smaller size cable is ideal for delivering multiple applications through tight spaces.

Another benefit of bundled cables that many do not think about is aesthetics. When multiple cables are pulled into a control room or other space, they can appear messy. In contrast, a bundled cable offers a clean, attractive appearance. The overall cable jacket on a bundled cable is also available in a variety of colors to fit seamlessly into any décor. For example, power and control cables running alongside theme park rides can be inconspicuous because they are bundled together under a single jacket that matches the existing color scheme of the ride.

### A VARIETY OF APPLICATIONS

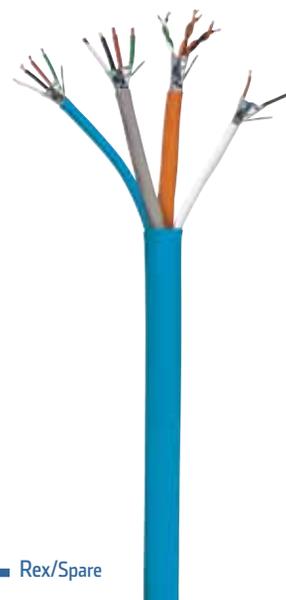
A wide range of electronic and communications devices require multiple cables to transmit a combination of applications, including power, voice, data, video and control. Bundled cables that combine various wires and cables together are more convenient and less expensive to install in a variety of residential, commercial and industrial applications, including:

- Access control.
- Video surveillance.
- AV.

- Multimedia and entertainment systems.
- Home automation.
- Medical diagnostics and monitoring.
- Industrial and military.
- Data centers and central offices.

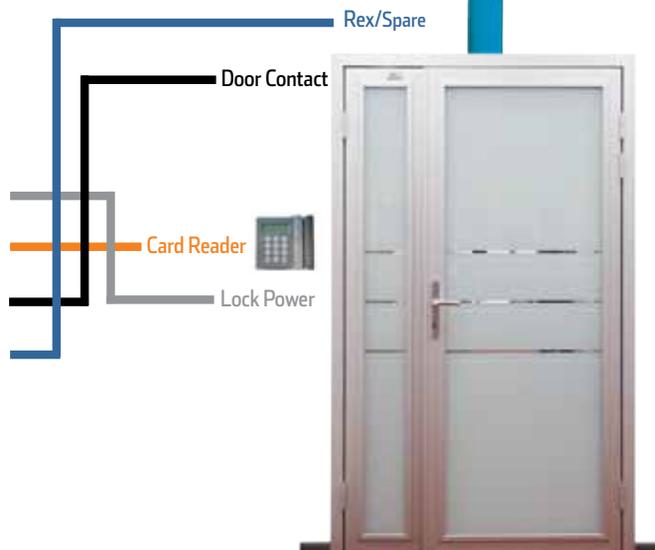
### Access Control

Looking at an access control system (ACS) as an example, it is easy to see how a bundled cable makes sense. At each entrance monitored by an ACS, there is a device that manages the entry point via authentication of access cards or keypads, door contacts that indicate whether the door is open,



### Jacket Color Coding & Component Application

Component	Jacket Color	Cable Type	Application
1	Gray	4 Conductor, 18 AWG	Lock Power
2	Orange	3 Pair, 22 AWG	Card Reader
3	White	2 Conductor, 22 AWG	Door Contact
4	Blue	4 Conductor, 22 AWG	Rex/Spare



**Figure 1:** Bundled cable is ideal for supporting all of the door requirements of an ACS, including reader, door contacts, lock power and REX.

Cable Type	Total Installation Cost	Savings (%)
<b>Four Individual Components</b> 18 AWG, 4-conductor cable (lock power) 22 AWG, 3-pair cable (card reader) 22 AWG, 2-conductor cable (door contact) 22 AWG, 4-conductor cable (spare/request-to-exit)	\$3,574.38	<b>-51%</b>
<b>One Bundled Access Control Cable</b> 3 multi-conductor cables + 1 multi-pair cable with overall jacket	\$1,751.32	

**Table 1:** Approximate installation cost for individual cables vs. bundled cable in an access control application

and a locking mechanism, which is typically an electromagnetic or electric strike lock that keeps the door locked as long as it is receiving power. While most ACSs only monitor entry, a system that also controls exit may require a second reader on the opposite side of the door or a simple request-to-exit (REX) device such as a push button or motion detector. See Figure 1 for an example of an access control application.

At each door, the card reader or keypad requires a communications cable to send information to a control panel to verify access. The door contacts require a control cable to indicate the door position. The lock itself requires a cable to deliver power. Additional cables may also be needed for buzzers or REX devices. Imagine how much easier it would be to pull one bundled cable to the door that combines all the required cables and wires together versus having to pull a separate cable for each system component.

For example, available access control cables bundle all the required cables under one jacket, including a 3-pair, 22 AWG cable for the card reader or keypad; a 2-conductor, 22 AWG cable for the door contact; a 4-conductor, 18 AWG cable to power the lock; and a spare 4-conductor, 22 AWG cable for a REX or other device. For an access control application,

the decreased labor cost of pulling one bundled cable versus four can provide up to 50 percent savings on installation, as shown in Table 1.

#### **Smart Homes**

Another common application where bundled cable makes sense is smart home applications. A comprehensive cable for this application can support whole house access to voice, video, data and other emerging technologies. For locations with fiber-to-the-home (FTTH) or fiber-to-the-curb (FTTC), a smart home bundled cable can include multimode optical fiber for ultra-high-speed data transfer or digital distribution, category 5e or 6 copper cabling for high-speed data and voice distribution and RG6 coaxial cabling for cable TV distribution.

Depending on the application, any combination of these cables can be bundled, including eliminating the optical fiber and adding additional category copper cables. More expensive coaxial cable could also be eliminated from the bundled cable, and optional baluns can be installed at the central location to convert video signals from coaxial to category copper cable. With the ability to customize the cables, smart home bundled cables can support everything from high-definition TV and intelligent lighting systems,

to home networking and video surveillance.

In a smart home application, these bundled cables are typically run in a star configuration from a central location, such as the basement or garage to each room, providing in-room connections for cable TV or satellite TV, video distribution of in-house generated channels, cable modems, multiple telephone lines, computer networking, audio and other services. The cables are terminated in the central location, and patching is used to determine which cables and services are active in each room. Even if not all applications are needed in each room, the house is future-proofed, and home owners have the flexibility of moving devices from one room to another.

#### **Virtually Any Application**

With manufacturers that offer the ability to customize, the applications for bundled cables are virtually endless—from hospitals to universities, to commercial businesses and to hospitality venues. Applications such as video surveillance systems or broadcasting might use a bundled cable with optical fiber for the video signal and additional cables for camera power and control (e.g., pan, tilt and zoom [PTZ]). Industrial machinery and robotic equipment also often require multiple cables for data, power and control. For example, many of today's advanced x-ray machines are connected with a bundled cable that uses optical fiber for transmitting the digital medical image and copper conductors for power and control.

In conference centers, hotels and dormitories, bundled cables can support Internet access, video conferencing, cable and satellite TV and other services. On cruise ships, the overall smaller bundled cables are ideal for pulling through tight spaces to each cabin. For example, one cruise ship uses bundled cables that combine a

two-pair copper control cable, four shielded category 6 cables, two RG6 coaxial cables and a four-fiber optical fiber cable. If pulled individually, these eight cables would require at least 51 millimeters (mm [2 inches (in)]) of conduit space. By combining the cables into one bundled cable, the overall diameter is reduced to 25 mm (1 in). Smaller bundled cables are also an ideal fit for historical buildings that may have limited pathway space, or for applications such as parking lot poles that need power for the lights and optical fiber for a security camera.

Another option with a bundled cable is to include an empty tube for blown optical fiber applications. The empty tube is bundled in the cable along with other cable types, and the optical fiber can be blown into the tube at a later date. This offers customers a future-proofing capability

and eliminates the need to install an optical fiber at initial installation. It also offers the ability to blow out an optical fiber and blow in another type if an upgrade is needed in the future.

## **SOME KEY CONSIDERATIONS**

There are a few key considerations when it comes to bundled cables. Some types of cables can interfere with each other, causing noise and crosstalk that can adversely impact the performance of one or more of the cables. For example, when unshielded twisted-pair (UTP) communications cables are placed side by side, they can inject noise on adjacent cables, otherwise known as alien crosstalk. Standards bodies have specified limits for this type of interference.

It is also not recommended to combine UTP and power cables in

the same cable. Interference from the power cable can cause excessive bit errors and impact the ability of the UTP cables to properly transmit data signals. When bundling cables, it is also important that each cable meets its required listing. For example, plenum cables require listings for each individual component of the bundled cable while non-plenum (riser) cables can be readily bundled together. As with any cabling technology, the designer and installer of the system should be aware of all required specifications and codes.

While there are some limitations on components and compliances, the options and applications for bundled cables are virtually endless. The next time you find yourself needing to pull multiple cables to one location, consider a bundled cable and save significant installation time and cost. ■

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**ELECTRONICS  
WIRE & CABLE**

# Are Your Doors Carol® Brand Secure?



## Carol® Brand's Access Control Cable Gets the Job Done

Carol® Brand Composite Access Control Cable is manufactured for use in Building Access & Control applications. It has been designed to power up to four components, such as **card readers, door contacts, locking power and retinal or biometric scanners** in commercial buildings, distribution centers, manufacturing facilities and government buildings.

### Benefits of the Composite Access Control Cable:

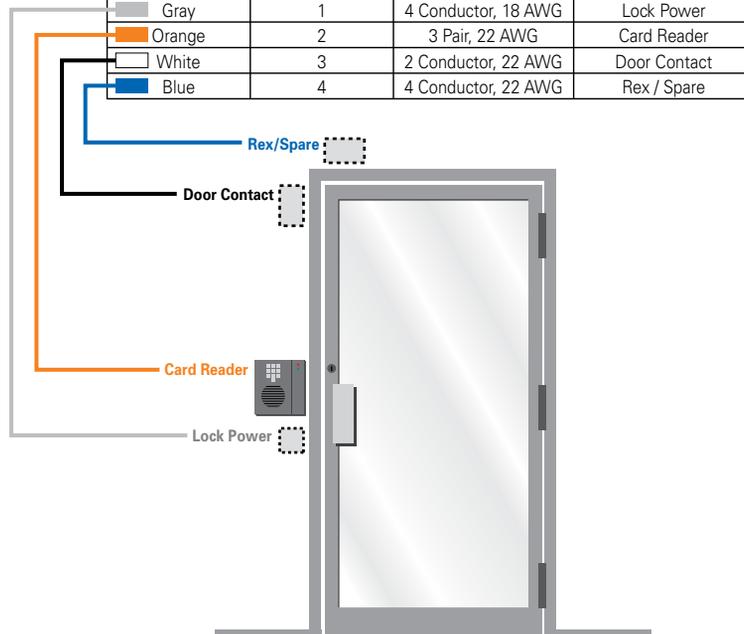
- Available in riser or plenum
- Installer-friendly
- Multiple cables under one jacket allows for single cable run, saving time in prep, set-up, pulling & termination
- Overall jacket protects individual elements

When your job requires security and peace of mind, think of Carol Brand cables first. You can always **Demand Better...Expect More™** with General Cable Carol Brand Electronic Cables. We manufacture over 1,300 standard electronic cables.

**Demand  
Better...  
Expect  
More™**

### Jacket Color Coding & Component Application

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 **General Cable**

Phone: 888.259.5896  
www.generalcable.com