Standards

ANSI/TIA/EIA 598-A

OPTICAL FIBER CABLE COLOR CODING

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The goal of this standard is to provide a uniform identification process for fiber optic cable by color coding the individual fibers and the jacket. The standard applies to premise and outside plant fiber for both long and short haul applications. While the original documentation is focused at the manufacturer, installation and design organizations should be familiar with the color coding scheme of the individual fibers for termination purposes.

When terminating fiber optic cable, each fiber is assigned a numerical position in relation to the termination box positions, beginning with the number one. Each color of fiber then has a corresponding position number that it is associated with.

Optical premise cable:

- is intended primarily for indoor use
- shall meet the appropriate National Electrical Code requirements for particular installations (plenum cable, riser cable, or general purpose cable, as applicable), and other mechanical and/or environmental requirements as specified for the intended applications
- may be suitable for limited outdoor applications if constructed for that application
- normally consists of one or more fibers of specified fiber sizes, coated or uncoated and buffered to an appropriate specified diameter.

CABLE TYPES

Distribution Cable

Distribution cable normally consists of two or more fibers bundled together in units and is generally used to distribute signals within a building.

Interconnect Cable or Cord

An Interconnect Cable or Interconnect Cord consists of one or two fibers, reinforced and jacketed, and is intended for short distance applications such as intra-equipment jumpers or patch cords.

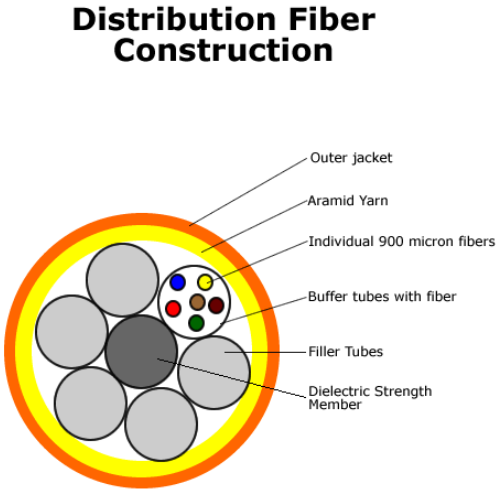
A single fiber cable is referred to as a simplex cable, and a two-fiber cable is called duplex cable. A duplex cable consists of two simplex cables or two individual fibers assembled with an overall jacket, or two simplex cables bonded together. A dual fiber cable which can be separated into two individual cables by "tearing" them apart is also referred to as a "zip cord".

Breakout Cable

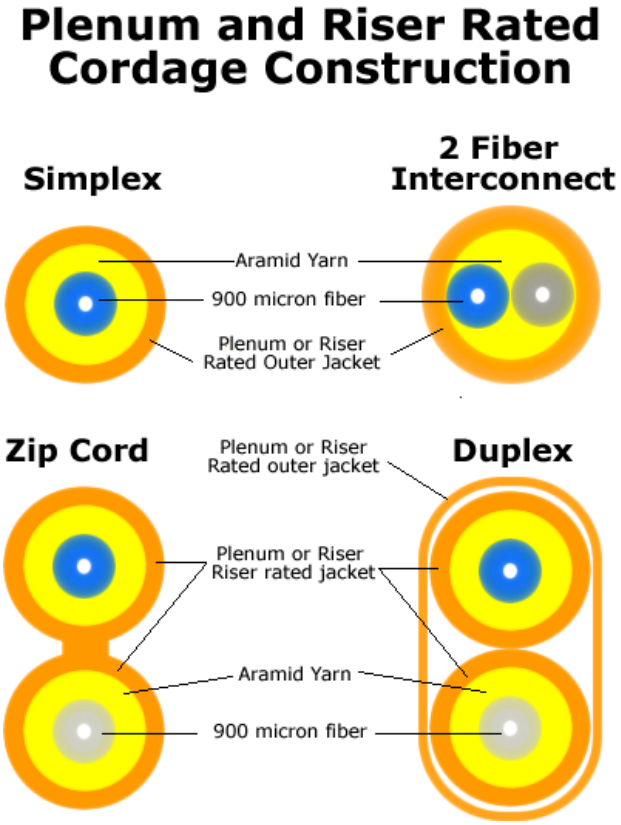
Premises Breakout Cable is made up of two or more stand alone sub-cables assembled together under a common outer jacket so that each sub-cable can be separated from the main cable for routing to, and termination at, various locations. These cables have a larger overall diameter than normal premise cabling because of the size of the sub cables.

Cable Construction

Premise Cable

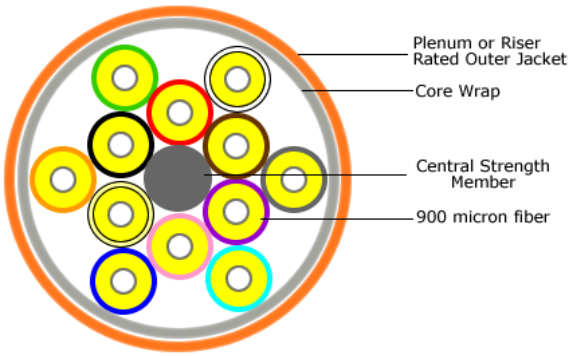


Interconnect Cable



Breakout Cable

Plenum and Riser Rated Breakout Cable



COLOR CODING SCHEME

When multiple fibers are housed in a single buffer tube, the color coding of the fiber optic cables enables the installer/administrator to easily identify the individual fibers. This color scheme may also be used, but is not mandatory for fibers that are identified by their position; eg: ribbon fiber.

When a number of fibers (e.g., 6, 12, 18, 24) form a unit/bundle, and units/bundles are grouped to form groups, the units and groups shall be uniquely identified and shall also follow the color scheme shown in the Fiber Optic Cable Color Code chart.

Fiber Color Identification Chart

Position Number	Color & Tracer
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White
7	Red
8	Black
9	Yellow
10	Violet
11	Rose
12	Aqua
13	Blue with Black Tracer
14	Orange with Black Tracer

15	Green with Black Tracer
16	Brown with Black Tracer
17	Slate with Black Tracer
18	White with Black Tracer
19	Red with Black Tracer
20	Black with Yellow Tracer
21	Yellow with Black Tracer
22	Violet with Black Tracer
23	Rose with Black Tracer
24	Aqua with Black Tracer

The identification may be accomplished by:

- simple coloring
- printed legend
- printed bar code
- any other means acceptable to the manufacturer and end user, as long as the intent of this standard is maintained.

Generally, most manufacturers use the color coding technique for identification purposes. If the number of fiber strands creates the need for bundles to be housed in its own sheath, then the tube itself will be color coded using the colors in the color code table, with the first tube being blue, the second orange etc. The standard allows for a printed legend and bar coding but the size of the individual fibers it too small to easily see, and identify the markings. The original standards documents contain the necessary information for bar coding.

Binder Groups

Just as in copper cabling, groups of fibers can be grouped together using binder twine and/or tape. When this occurs the colors of the identifiers shall be unique and clearly visible and must conform as closely as possible to the requirements of clause 5 in the original standards documents. When binder tape, ribbons or threads are used to bind fibers into groups beyond twelve, 2 binders should be used. The first one will match the base colour for the group in use, and the second one will match the tracer color.

Tracers

Tracer colors may be:

- Continuous
- Intermittent (dashed) longitudinal or spiral lines
- Continuous or intermittent ring stripes (sometimes called band marking)
- Hash marks as long as they meet the requirements of 3.6.1, 3.6.2, or 3.6.3, in the original standards documentation.

Continuous Intermittent Longitudinal and Spiral Tracers

- Are not permitted on fiber optic cable, or tubes less than 300mm outer diameter because it is too difficult to be able to see the markings clearly
- Shall cover 30% of the circumference of the fiber or tube being striped.

There are other limitations and specifications which cover these tracers which are geared more toward the manufacturers of the cables and are outside the intent of this document. That information may be obtained from the original standards documentation.

Continuous, Intermittent Ring Stripe and Hash Tracers

- For fibers, the minimum ratio of base color to tracer shall not be less than 2:1 (by width)
- For tubes, the minimum ratio of base color to tracer shall be not less than 4:1 (by width)
- Hash stripe widths shall be measured at right angles to the direction of the hash mark, and spacing between hash marks shall be measured along the axis of the fiber or tube.

COLOR CODING OF OPTICAL PREMISES CABLE

Color coding of premise cable shall follow the Fiber Optic Color Code chart.

Colored outer jackets may be used on Premises Distribution, Interconnect, Breakout Cable or Interconnect Cord, to identify fiber classifications (eg: multimode or singlemode), and fiber sizes (for multimode only). If the cables are color coded for, the cable jacket shall:

- Be color coded to identify the fiber type when there is one type of fiber contained in the jacket as per the Fiber Optic Cordage Jacket Color Chart.
- Be colored black and shall identify the fiber classifications with a printed legend identifying the quantities and types of fibers within the cable, for example "12 Fiber - 8 x 50/125, 4 x 62.5/125."
- Use the colors in the Fiber Optic Cordage Jacket Color Chart for the outer jackets of premises interconnect cable or interconnect cord.

Fiber Cordage Jacket Color Standards

Fiber Type & Class	Diameter (µm)	Jacket Color
Multimode 1a	50/125	Orange
Multimode 1a	62.5/125	Slate
Multimode 1a	85/125	Blue
Multimode 1a	100/140	Green
Singlemode IVa	All	Yellow
Singlemode IVb	All	Red

Premise Breakout Cable

Shall be color coded as follows:

- Each jacketed cord (single-fiber or dual-fiber cordage) within the cable shall be considered an individual unit.
- When the cable contains only one type of fiber, the unit identification shall adhere to the requirements of clause 3.3 of the original standards documentation.
- If the cable contains more than one type of fiber, the fiber type within each single-fiber or dual-fiber cordage unit shall be identified by color coding the unit jacket in accordance with the Fiber Optic Cordage Jacket Color Chart. It is recommended that the units should contain only one type of fiber for ease of identification.

- For coding purposes, all units containing the same type of fiber shall be considered a super-unit.

In Premises Breakout Cable where the cordage units within the cable contain only one fiber (single-fiber cordage), the color coding shall be as follows:

- If there is only one type of fiber, the fibers within such units do not need to be individually color coded.
- If the cable contains more than one type of fiber, the fibers within each super-unit shall be sequentially identified by means of a printed legend or bar code on the unit jacket as per clause 3.3 of the original standards documentation.

In Premises Breakout Cable where cordage units within the cable contain two fibers (dual-fiber cordage) or more, the color coding shall be as follows:

- When the cable contains only one type of fiber, but more than one fiber, one of the fibers within each cord shall be colored Blue and the other fiber shall be left natural or colored orange.
- Where cords contain more than two fibers, the fibers within each cord shall follow the Fiber Optic Color Code Chart.
- When the cable contains more than one type of fiber, one of the fibers in each dual-fiber unit within each super-unit shall be sequentially identified using the color coding scheme of Fiber Optic Color Code and the other fiber shall be left natural.

Color Control, Limits and Permanency

ANSI/EIA 359 specifies colors by Hue (H), Value (V) and chroma (C) as they relate to the Munsell Color System. The colors of fibers or buffer tubes must meet the requirements of this standard. More information can be found by going to www.munsell.com.

It is the intent of this Standard that all colors used in accordance with this Standard should meet the Wire and Cable Limits defined in ANSI/EIA-359-A. However, there may be some cases where the pigments and the materials do not match for various chemical or physical properties and the resultant color(s) may not be compatible. All colors should be made as close to the standards as possible. All colors shall be readily identifiable.

Specifically the limitations of polyvinyl chloride (PVC) compounds often do not permit compliance with either this, and other related standards, such as ANSI/EIA-359-A. The compounds used in Weatherized PVC products get their weather-resistant properties through the addition of titanium dioxide. This affects the ability to color the compounds, therefore, unless otherwise agreed upon by the manufacturer and the user, colors only are specified for PVC and are listed in Table 5 of the original standards documentation.

Summary

Although this standard pertains mostly to the manufacturers of fiber optic cable, the installer/designer should be familiar with the intent, and that is to create a color coding system to aid in the termination of the fiber optic cable. Both groups should understand what to expect from the manufacturer. If a cable has 12 fibers in it and you cannot tell the difference between the black and the blue fiber, then the manufacturer has not done his job properly and the product should be questioned as to its usefullness.