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Western Electric
TELEPHONE CABLE
AND WIRE

TELEPHONE CABLE AND WIRE

LEAD COVERED CABLE MULTIPLE SHEATH CABLE

Paper Insulated Exchange Area and Toll Cable
Textile Insulated Terminating Cable
Jute Protected Tape Armored Wire Armored

SWITCHBOARD CABLE

WIRE

Distributing Frame Wire Switchboard Wire
Wire for Apparatus Assemblies such as Amplifiers,
Carrier Terminating Equipment, Filters, Networks,
Telephone Sets and Shielded Wire for Power Equipment

Western Electric

Types of Cable

Telephone cables may be divided into four general classes according to their insulation and type of use as follows:

1. Paper (Ribbon or Pulp) Insulated Local or Exchange Area Cables.
 - (a) Lead Sheath
 - (b) Multiple Sheath
2. Paper (Ribbon or Pulp) Insulated Toll and Toll Entrance Cables.
 - (a) Lead Sheath
3. Textile Insulated Terminating Cables.
 - (a) Lead Sheath
4. Special Cables.

Local and exchange area cables equipped with a multiple sheath have been standardized, in addition to the lead-covered type. Multiple sheath cables include Alpeth and Stalpeth sheath cables.

Alpeth sheath cable consists of an aluminum envelope longitudinally applied over the core and then covered with an extruded polyethylene jacket to the desired thickness depending on the size of the cable. Alpeth is a name coined from "Al" for the inner shield of aluminum and "peth" for the outer coating of polyethylene, a plastic. The coded types of cable furnished with this sheath are identified by the addition of the letter "A" as a suffix to the code number.

Stalpeth sheath cable has a layer of corrugated steel plate with overlapped and soldered seam applied over the aluminum covered core. The extruded polyethylene jacket is then applied over the corrugated steel. This cable provides maximum protection of the core against diffusion of moisture through the polyethylene. It also makes possible the soldering of joints between the steel plate and the lead sleeves at splices. The coded types of cable furnished with this sheath are identified by the addition of the letter "C" as a suffix to the code number.

The core construction of Alpeth and Stalpeth cables are the same as Standard lead covered cables and likewise the electrical characteristics are the same.

Multiple sheath cables were introduced several years ago because of the short lead supply and heavy demand for exchange cable. Some economies result in the use of these cables particularly in the following situations.

1. Where the light weight permits substantially longer span lengths of aerial cable and consequent savings in pole line costs.
2. Where the light weight of polyethylene jacketed cables used aerially permits reduction in the size of supporting strand, associated guys and anchors.
3. Where the light weight makes it possible to eliminate splices in underground cable by pulling through intermediate man-holes.
4. Where corrosion of lead sheath is known to present a difficult problem in the maintenance of underground lead sheath cables.

PAPER INSULATED LOCAL OR EXCHANGE AREA CABLES

Wood pulp insulation is a form of insulation developed by the Western Electric Company, and known as "Pulp Insulation" because of the method of application to the wire. The pulp is applied directly on the conductor in such a way as to form a continuous seamless tube. This form of insulation has the advantage of not unfurling during splicing operations and splices can be made without first boiling out with hot paraffin wax, if precautions are taken to thoroughly dry the splice after completion.

Another development is the multiple unit design for constructing cable cores. With this type of construction the pairs are first stranded in single units of about 25, 50 or 100 pairs and these units are then stranded together to form a cable. Each unit is wrapped with a spaced binding of cotton thread colored to indicate the gauge of the conductor and the position of the units in the cable according to layers, as shown in the diagrams for the individual coded types. This construction offers a distinct advantage in splicing in that the color groups are units and require but little time for separation in preparation for splicing.

GUARANTEE

Extra pairs are placed in all cables containing conductors smaller than No. 16 gauge to take care of any pairs which may become defective. In the majority of cases all or part of the extra pairs will be good and may be used for additional circuits. The coding of all cables is on the basis of the actual number of pairs in the cable.

The actual and guaranteed number of pairs in the various sizes of standard cable are shown in the tabulation covering the various types of cable. The number of pairs indicated in the table are guaranteed to be free from opens, shorts, crosses, and grounds, and the capacitance and the conductor resistance are guaranteed not to increase nor the insulation resistance to decrease beyond the limits stated due to defective material or manufacture.

REELS

Western Electric cables are shipped on substantial reels designed to withstand reasonable handling during the transportation and installation of the cables. The ends of the cables are fastened securely to the reels, and unarmored cable is protected by lags securely fastened around the periphery of the reel. The reels are made in a number of sizes, providing economical shipping packages for various sizes and lengths of cables.

These are paper insulated cables having the conductors twisted in pairs and used for connecting subscribers to central offices or for trunks between central offices. Most such circuits are so short that loading is not necessary, but all Western Electric cables are suitable for loading. The most popular sizes of these cables have been standardized and coded and are described in the tables following.

Gauge	Code Designation	Approx. Mutual Capacitance Microfarads per Mile at 1000 Cycles	Insulation	Type of Stranding
16	NH	.066	Paper Tape	Layer
19	ENB	.086	Wood Pulp	Unit
	ENBC			
19	FNBL	.084	Paper Tape	Layer or Unit
	FNBC			
19	GNBL	.066	Paper Tape	Layer or Unit
	GNBC			
22	DSA	.082	Wood Pulp	Layer or Unit
	DSAC			
22	ESAL (See Note)	.082	Paper Tape	Layer
24	DSM	.084	Wood Pulp	Unit
	DSMC			
24	ESML (See Note)	.072	Paper Tape	Layer
26	BST	.079	Wood Pulp	Unit
	BSTC			

NOTE: ESAL cable may be supplied as a substitute for DSA type cable of corresponding sizes, in the interest of securing maximum production of exchange cable.
ESML cable may be supplied as a substitute for DSM type cable of corresponding sizes, in the interest of securing maximum production of exchange cable.

16 Gauge Cable—Type NH

Sheath. NH 26 to 152 pairs Lead-Antimony alloy.

Conductors. No. 16 AWG annealed copper, insulated with a single wrap of paper tape applied helically to the wire.

ELECTRICAL CHARACTERISTICS

D.C. Resistance. 42 ohms approx. per mile at 68°F.

Mutual Capacitance. 0.066 mf. approx. per mile at 1000 cycles.

Conductance. 1.72 micromhos approx. per mile at 1000 cycles.

Attenuation. .75 db approx. per mile at 1000 cycles.

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 700 volts r.m.s. between conductors.

In excess of 1000 volts r.m.s. between each conductor and sheath.

MECHANICAL CHARACTERISTICS

The mechanical characteristics are given in the following table.

The insulated conductors are twisted in pairs and the pairs are arranged in layers to form a cylindrical core which is wrapped with two paper tapes, at least one of which is dyed red, and sheathed with lead-antimony alloy.

Three types of pairs colored to indicate different lengths of twist and a tracer are used in these cables. The color code is shown as follows:

Type	Colors of Insulation	
	First Wire	Second Wire
1	Orange	Blue
2	Orange	Green
3	Orange	Red
Tracer	White	Orange

Pairs	Number of Pairs Guaranteed	Sheath Thickness (Inches)	Outside Diameter (Inches)	Weight per Foot (Pounds)
26	26	.080	1.13	1.78
51	51	.089	1.52	2.92
101	101	.103	2.11	5.07
152	152	.113	2.54	7.05

Each layer is made up of type 1 and type 2 pairs arranged alternately, one type 3 pair being used in layers containing an odd number of pairs to avoid the adjacency of pairs having the same length of twist. Two tracer pairs are substituted for two of the type 1 pairs located as follows: One in the center and the other in the outer layer of the cable.

FIELD OF USE

These cables are intended for general use primarily in the exchange trunk plant.

19 Gauge Cable—Types ENB and ENBC

Sheath. ENB 6 to 455 pairs, Lead-Antimony alloy.

ENBC 16 to 455 pairs, Stalpeth.

Conductors. No. 19AWG annealed copper, insulated with wood pulp applied directly to the wires.

ELECTRICAL CHARACTERISTICS

D.C. Resistance. 85 ohms approx. per loop mile at 68°F.

Mutual Capacitance. .086 Mf approx. per mile at 1000 cycles.

Conductance. 2.18 micromhos approx. per mile at 1000 cycles.

Attenuation. 1.26 db approx. at 1000 cycles.

Attenuation. 48 KC—approx. 4.8 db/mi.
N Carrier. 136 KC—approx. 7.4 "

Frequencies. 168 KC—approx. 8.2 "
250 KC—approx. 10.2 "

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 500 volts rms between conductors. In excess of 1000 volts rms between each conductor and sheath.

MECHANICAL CHARACTERISTICS

The mechanical characteristics of ENB and ENBC cables are shown in the table.

The sheath of EMBC cable consists of a .008 inch aluminum tape applied longitudinally without overlap, a .005 inch corrugated steel tape with soldered longitudinal seam and a polyethylene jacket.

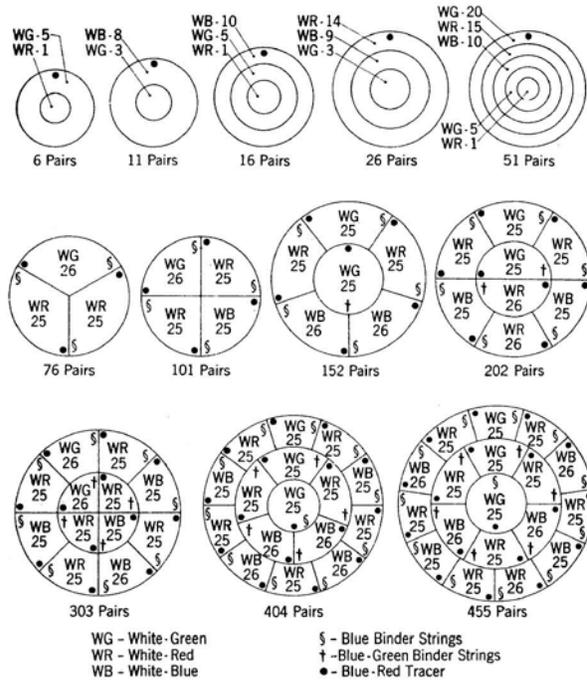
The colors of insulation, arrangement of color groups, number and location of tracer pairs and the colors of the binding strings around individual units for the various sizes of cable are shown in the figure. The core is wrapped with two paper tapes, at least one of which is dyed red.

STRANDING

In order to obtain satisfactory cross-talk characteristics, the sizes from 16 to 455 pairs are made of pairs having nine different lengths of twist, three in each of three pair colors. The pairs are assembled into small layer type cables or units having the mixed color code arrangement illustrated. The colors of insulation in the outer layer of a unit indicate the color code of the unit for counting purposes. Units contain 25 or 26 pairs.

FIELD OF USE

ENB cables are intended for use in subscriber and exchange trunk plant and in toll plant intended for N Carrier operation.



The colors of insulation indicated for the units are those of the pairs in the outside layer of the unit. The colors of the pairs in the layers and the center are shown below. The 26 pair units have a white marker thread in the binder

Outside Layer	First Layer	Center
WG	WR	WB
WR	WB	WG
WB	WG	WR

Core Make-up ENB Type Cable

Pairs	Number of Pairs Guaranteed	Approx. Diam. (Inches)		Approx. Weight (Pounds)		Sheath Thickness (Inch)	Standard Reel Lengths (Feet)
		ENB	ENBC	ENB	ENBC	Lead ENB	
6	5	.4	—	.4	—	.063	3,000
11	10	.5	—	.6	—	.065	3,000
16	15	.6	.7	.7	.2	.067	4,500
26	25	.7	.8	.9	.3	.070	4,500
51	50	1.0	1.1	1.5	.6	.075	3,000
76	75	1.2	1.3	2.0	.9	.080	2,200
101	100	1.3	1.5	2.5	1.2	.084	2,200
152	150	1.6	1.7	3.4	1.7	.090	1,400
202	200	1.8	1.9	4.2	2.2	.095	1,400
303	300	2.2	2.3	6.0	3.2	.104	*
404	401	2.5	2.7	7.6	4.3	.111	*
455	452	2.6	2.8	8.5	4.8	.115	*

* Cables of these sizes are manufactured to length only.

19 Gauge Cable—Types

FNBL and FNBC

Sheath. FNBL 6 to 455 pairs, Lead-Antimony alloy.

FNBC 16 to 455 pairs, Stalpath.

Conductors. No. 19AWG annealed copper, insulated with a single wrap of paper tape applied helically to the wire.

ELECTRICAL CHARACTERISTICS

D.C. Resistance. 85 ohms approx. per loop miles at 68°F.

Mutual Capacitance. 0.084 Mf approx. per mile at 1000 cycles.

Conductance. 2.18 micromhos approx. per mile at 1000 cycles.

Attenuation. 1.26 db approx. at 1000 cycles.

Attenuation. 48 KC—approx. 4.8 db/mi.

N Carrier. 136 KC—approx. 7.4 "

Frequencies. 168 KC—approx. 8.2 "

250 KC—approx. 10.2 "

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 500 volts rms between conductors. In excess of 1000 volts rms between each conductor and sheath.

MECHANICAL CHARACTERISTICS

The mechanical characteristics of FNBL, and FNBC cables are shown in the table below:

The sheath of FNBC cable consists of .008 inch aluminum tape applied longitudinally without overlap, a .005 inch corrugated steel tape with soldered longitudinal seam and a polyethylene jacket.

CORE MAKE-UP

The insulated wires are twisted in pairs and the pairs are arranged in layers to form the unit or core. The core is wrapped with two paper tapes at least one of which is dyed red.

Cables of 51 pairs and smaller are of layer construction, and cables of 76 pairs and larger may be of either layer or unit construction. The colors of insulation, number of like colored pairs in each color group and the location of the color groups for layer cables 152 pairs and larger are shown in the table on the next page:

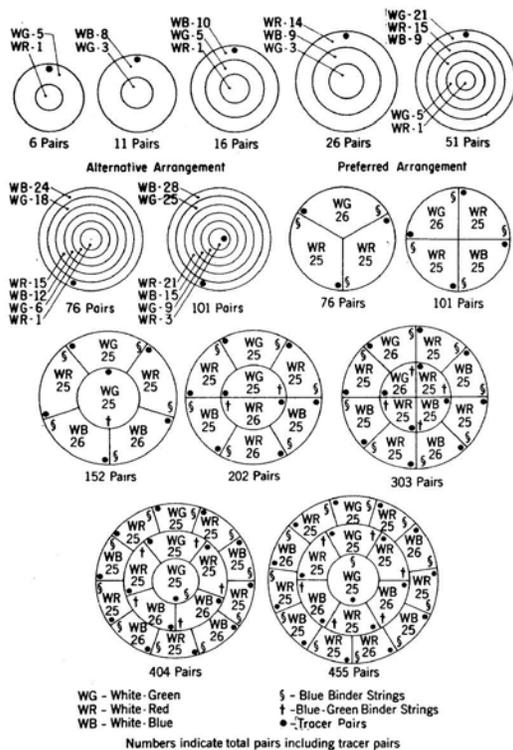
Pairs	Number of Pairs Guaranteed	Approx. Diam. (Inches)		Approx. Weight per Ft. (Pounds)		Sheath Thickness (Inch)	Standard Reel Lengths (Feet)
		FNBL	FNBC	FNBL	FNBC	Lead FNBL	
6	5	.4	—	.4	—	.063	3,000
11	10	.5	—	.6	—	.065	3,000
16	15	.6	.7	.7	.2	.067	4,500
26	25	.7	.8	.9	.3	.070	4,500
51	50	1.0	1.1	1.5	.6	.075	3,000
76	75	1.2	1.3	2.0	.9	.080	2,200
101	100	1.3	1.5	2.5	1.2	.084	2,200
152	150	1.6	1.7	3.4	1.7	.090	1,400
202	200	1.8	1.9	4.2	2.2	.095	1,400
303	300	2.2	2.3	6.0	3.2	.104	—*
404	401	2.5	2.7	7.6	4.3	.111	—*
455	452	2.6	2.8	8.5	4.8	.115	—*

* Cables of these sizes are manufactured to length only.

Color Group			Number of Pairs in Cable				
First Wire	Second Wire	Position in Cable	152, 202, 303, 404, 455 Number of Pairs in Each Group				
White	Green	1st (Center)	50	100	100	100	100
White	Red	2nd	50	100	101	101	101
White	Blue	3rd	50		100	101	101
White	Green	4th				100	101
White	Red	5th					50
Blue	Red	Tracer Pairs*	2	2	2	2	2

* One of the tracers is in the center of the first color group and the other in the outer layer of the last color group.

For cables of unit construction and layer cables of 101 pairs and less, the colors of insulation, arrangement of the units, number and location of the tracer pairs and the colors of the binding strings around the individual units are shown in the following figure.



The colors of insulation indicated for the units are those of the pairs in the outside layer of the unit. The colors of the pairs in the layers and the center are shown below. The 26 pair units have a white marker thread in the binder

Outside Layer	First Layer	Center
WG	WR	WB
WR	WB	WG
WB	WG	WR

Core Make-up FNB Type Cable

FIELD OF USE

FNB type cables are intended for use in subscriber and exchange trunk plant and in toll plant intended for N carrier operation.

19 Gauge Cable—Types GNBL, GNBC

Sheath. GNBL 6 to 303 pairs, Lead-Antimony alloy.

GNBC 11 to 303 pairs, Stalpeth

Conductors. No. 19 AWG annealed copper, insulated with a single wrap of paper tape applied helically to the wire.

ELECTRICAL CHARACTERISTICS

D.C. Resistance. 85 ohms approximately per loop mile at 68°F.

Mutual Capacitance. 0.066 MF approximately per mile at 1000 cycles.

Conductance. 1.72 micromhos per mile at 1000 cycles.

Attenuation.

	Db per mile (approx.)
1000 cycles	1.11
48 KC	3.84
136 KC	5.89
168 KC	6.51
256 KC	8.13

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 500 volts rms between conductors. In excess of 1000 volts rms between each conductor and sheath.

Pairs	Number of Pairs Guaranteed	Approx. Diam. (Inches)		Approx. Weight (Pounds)		Sheath Thickness (Inch)
		GNBL	GNBC	GNBL	GNBC	Lead GNBL
6	5	.5	—	.5	—	.064
11	10	.6	.7	.7	.2	.067
16	15	.7	.8	.8	.3	.069
26	25	.8	1.0	1.1	.4	.072
51	50	1.1	1.2	1.7	.7	.079
76	75	1.3	1.5	2.3	1.0	.084
101	100	1.5	1.7	2.8	1.3	.088
152	151	1.8	2.0	4.0	1.9	.096
202	201	2.1	2.2	5.0	2.4	.102
303	302	2.5	2.7	7.0	3.5	.112

MECHANICAL CHARACTERISTICS

The mechanical characteristics of GNBL, and GNBC cables are shown in the above table. The sheath of GNBC cable consists of an .008-inch aluminum tape applied longitudinally without overlap, an .005-inch corrugated steel tape with soldered longitudinal seam, a coating of asphalt compound and a polyethylene jacket.

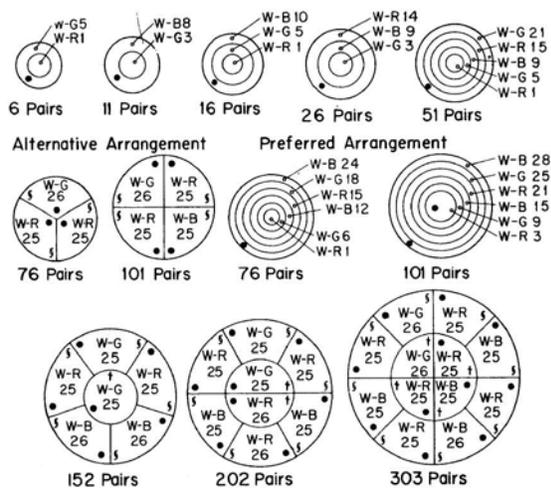
CORE MAKE-UP

The insulated conductors are twisted in pairs and the pairs are arranged in layers to form the unit or core.

Cables of 51 pairs and smaller have layer construction; the 76 pair and larger cables may be either layer or unit construction.

The colors of insulation, number of like colored pairs in each color group, and the location of the color groups for layer cables containing 152, 202 and 303 pairs are shown in the tabulation below.

The colors of insulation, arrangement of color groups, number and location of the tracer pairs and the colors of the binder strings around the individual units for cables of unit construction are shown in the figure. The make up of cables in sizes 6 to 101, inclusive are also shown.



KEY
W-G=White-Green
W-R=White-Red
W-B=White-Blue
• = Blue-Red Tracer Pair
S = Slate Binder Strings
† = Slate-Green Binder Strings

NOTES
The numbers denote the total pairs in a layer or unit including one tracer pair where indicated. The colors of insulation indicated are those of the pairs in the outer layer of the unit. The colors of the pairs in the layers and center are as follows:

Outer Layer	First Layer	Center
W-G	W-R	W-B
W-R	W-B	W-G
W-B	W-G	W-R

The 26-Pair units have white marker threads in the binder.

Core Make-up GNB Type Cable

Color Group	First Wire	Second Wire	Position in Cable	Number of Pairs in Cable		
				152	202	303
White	Green	Red	1st (Center)	50	100	100
			2nd	50	100	101
			3rd	50		100
Blue	Red		Tracer Pairs*	2	2	2

* One of the tracers is in the center of the first color group and the other in the outer layer of the last color group.

22 Gauge Cable—Types DSA and DSAC

Sheath. DSA 11 to 909 pairs, Lead Antimony alloy.

DSAC 26 to 909 pairs, Stalpeth.

Conductors. No. 22 A.W.G. annealed copper, insulated with wood pulp applied directly to the wires.

ELECTRICAL CHARACTERISTICS

D.C. Resistance. About 171 ohms per loop mile at 68°F.

Mutual Capacitance. About 0.082 mf per mile at 1000 cycles.

Conductance. About 2.1 micromhos per mile at 1000 cycles.

Attenuation. About 1.8 db per mile at 1000 cycles.

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 350 volts rms between conductors. In excess of 1000 volts rms between each conductor and sheath.

MECHANICAL CHARACTERISTICS

The mechanical characteristics of DSA and DSAC cables are shown in the table below.

The sheath of DSAC cable consists of an .008 inch aluminum tape applied longitudinally without overlap, an .005 inch corrugated steel tape with soldered longitudinal seam and a polyethylene jacket.

The colors of insulation, arrangement of color groups, number and location of tracer pairs and colors of the binding strings around the individual groups for the various sizes of cable are shown in the figure on the next page.

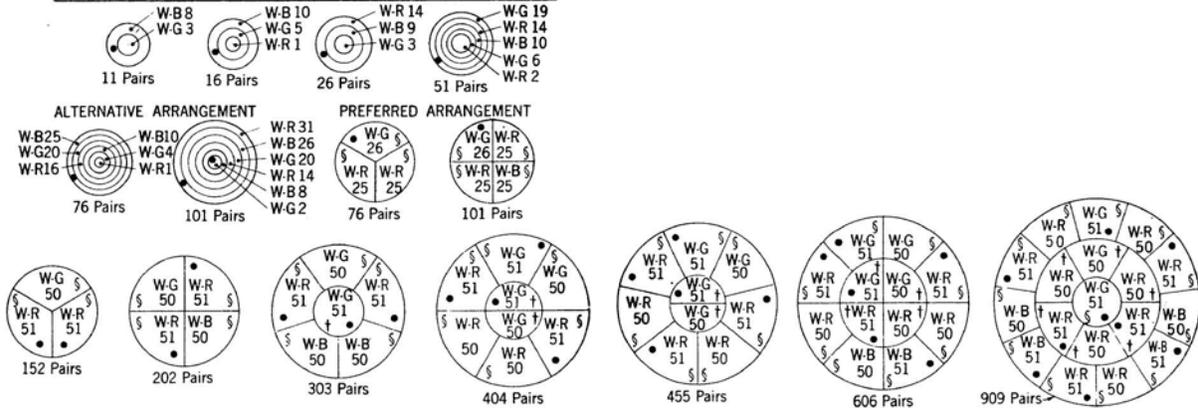
In order to obtain satisfactory cross-talk characteristics, these cables (16 pairs and larger) are made of pairs having nine different lengths of twist, three in each of the three pair colors. The pairs are assembled in small layer type cables or units having the mixed color code arrangement shown in the figure. The colors of insulation in the outer layer of a unit indicate the color code of the unit for counting purposes. It will be noted from the sketch that cables in the 76 and 101 pair sizes may be multiple unit construction with 25 and 26 pair units or of layer construction with mixed colors similar to that in 51 pair and smaller cables.

The core is wrapped with two paper tapes, at least one of which is dyed red.

Pairs	Number of Pairs Guaranteed	Approx. Diam. (Inches)		Approx. Weight (Pounds)		Sheath Thickness (Inch)		Standard Reel Lengths (Feet)
		DSA	DSAC	DSA	DSAC	Lead	DSA	
11	10	.4	—	.4	—	.063		3,000
16	15	.5	—	.5	—	.064		3,000
26	25	.6	.7	.6	.2	.066		4,500
51	50	.7	.8	.9	.3	.070		4,500
76	75	.9	1.0	1.2	.5	.073		4,500
101	100	1.0	1.1	1.5	.6	.076		3,000
152	150	1.2	1.3	2.0	.9	.080		2,250
202	200	1.3	1.5	2.5	1.2	.084		2,250
303	300	1.6	1.7	3.4	1.7	.090		1,500
404	400	1.8	1.9	4.3	2.2	.095		1,200
455	451	1.9	2.1	4.8	2.6	.098		—*
606	601	2.2	2.3	6.0	3.2	.104		—*
909	903	2.6	2.8	8.5	4.7	.115		—*

* Cables of these sizes are manufactured to length only.

ARRANGEMENT OF LAYERS AND UNITS IN 22-GAUGE CABLE



- KEY -
 WG = White-Green
 WR = White-Red
 WB = White-Blue
 • = Blue-Red Tracer Pair
 § = White Binder Strings
 † = White-Green Binder Strings

NOTES: Numbers denote total pairs in layer or unit including one tracer pair where indicated. The colors of insulation indicated are those of the pairs in the outer layer of the unit. The colors of the pairs in the layers and center are as follows:

No. of Pairs in Unit	Outside Layer	Third Layer	Second Layer	First Layer	Center
25 or 26	WG			WR	WB
	WR			WB	WG
	WB			WG	WR
50 or 51	WG	WR	WB	WG	WR
	WR	WB	WG	WR	WB
	WB	WG	WR	WB	WG

Core Make-up DSA Type Cable

22 Gauge Cable—Type ESAL

Sheath. ESAL Lead Antimony alloy.

Conductors. No. 22 A.W.G. annealed copper, insulated with a single wrap of paper tape applied helically with an overlap.

ELECTRICAL CHARACTERISTICS

D.C. Resistance. 171 ohms approximately per loop mile at 68°F.

Mutual Capacitance. 0.082 mf. approximately per mile at 1000 cycles.

Conductance. 2.1 micromhos approximately per mile at 1000 cycles.

Attenuation. 1.8 db approximately per mile at 1000 cycles.

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 350 volts between each conductor and sheath.

MECHANICAL CHARACTERISTICS

The mechanical characteristics of ESAL cables are shown in the following table.

Pairs	Guaranteed Number of Pairs	Approx. Diam. (Inches) ESAL	Approx. Weight (Pounds) ESAL	Sheath Thickness (Inch) Lead ESAL	Standard Reel Lengths (Feet)
11	10	.4	.4	.063	3,000
16	15	.5	.5	.064	3,000
26	25	.6	.6	.066	4,500
51	50	.7	.9	.070	4,500
76	75	.9	1.2	.073	4,500
101	100	1.0	1.5	.076	3,000
152	150	1.2	2.0	.080	2,250
202	200	1.3	2.5	.084	2,250
303	300	1.6	3.4	.090	1,500
404	400	1.8	4.3	.095	1,200
455	451	1.9	4.8	.098	—*
606	601	2.2	6.0	.104	—*
909	903	2.6	8.5	.115	—*

* Cables of these sizes are manufactured to length only.

Color Group	Position in Cable	Number of Pairs in Cable						
		101	152	202	303	404	505	909
		Number of Pairs in Each Color Group						
White-Green	1st (Center)	50T	51T	101T	101T	101T	101T	101T
White-Red	2nd Layer	51T	50	101T	101	101	101	101
White-Blue	3rd "		51T		101T	101	101	101
White-Green	4th "					101T	101	101
White-Red	5th "						101	101
White-Blue	6th "						101T	101
White-Green								101
White-Red								101
White-Blue								101T

T = Blue-Red Tracer included in group. One of the tracers is in the center of the first color group and the other in the outer layer of the last color group.

The insulated conductors are twisted into pairs and the pairs are arranged in layers to form a cylindrical core.

In cables of 76 pairs and smaller, the core consists of white-green pairs and one blue-red tracer. The colors of insulation in each color group and the arrangement of groups for the remaining sizes are indicated above.

Each layer is made up of pairs having three dissimilar lengths of twist. The adjacent layers have three different lengths of twist to avoid adjacency of like twists. Where two layers of pairs are stranded in the same direction, the stranding lay is different to avoid the possibility of like twists from alternate layers becoming adjacent through displacement.

The core of the cable is wrapped with two paper tapes, at least one of which is dyed red.

FIELD OF USE

These cables are intended primarily for use in subscriber and exchange trunk plant.

24 Gauge Cable Types DSM and DSMC

Sheath. DSM 11 to 1515 pairs, Lead Antimony alloy.

DSMC 51 to 1515 pairs, Stalpath.

Conductors. No. 24 A.W.G. annealed copper, insulated with wood pulp applied directly to the wire.

ELECTRICAL CHARACTERISTICS

D-C Resistance. 274 ohms approximately per loop mile at 68°F.

Mutual Capacitance. 0.084 mf approximately per mile at 1000 cycles.

Conductance. 2.18 micromhos approximately at 1000 cycles.

Average Attenuation. 2.3 db approximately per mile at 1000 cycles.

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 350 volts rms between conductors. In excess of 1000 volts rms between each conductor and sheath.

MECHANICAL CHARACTERISTICS

The mechanical characteristics of DSM, and DSMC cables are shown on following page.

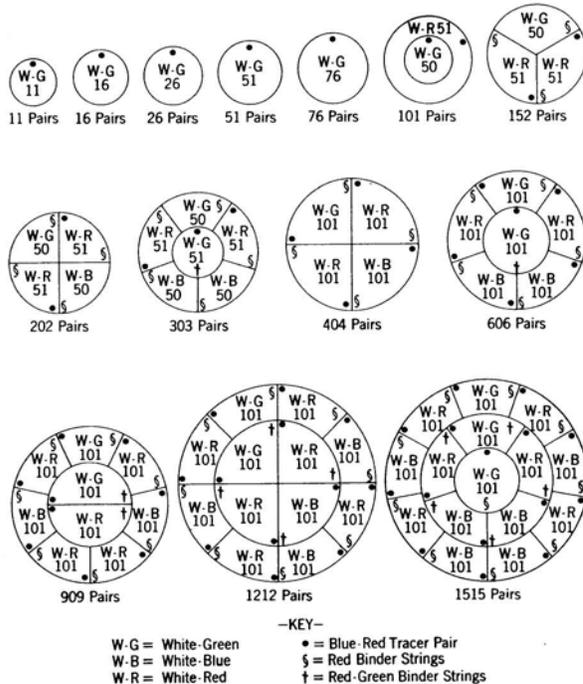
The sheath of DSMC cable consists of an .008 inch aluminum tape applied longitudinally without overlap, an .005 inch corrugated steel tape with soldered longitudinal seam, and a polyethylene jacket.

Pairs	Number of Pairs Guaranteed	Approx. Diam. (Inches)		Approx. Weight per Ft. (Pounds)		Sheath Thickness (Inch)	Standard Reel Lengths (Feet)
		DSM	DSMC	DSM	DSMC	Lead DSM	
11	10	.4	—	.3	—	.061	3,000
16	15	.4	—	.4	—	.062	3,000
26	25	.5	—	.5	—	.064	4,500
51	50	.6	.7	.7	.2	.067	4,500
76	75	.7	.8	.9	.3	.069	4,500
101	100	.8	.9	1.1	.4	.071	4,500
152	150	.9	1.1	1.4	.6	.075	3,000
202	200	1.1	1.2	1.7	.8	.078	2,250
303	300	1.2	1.4	2.3	1.1	.082	2,250
404	400	1.4	1.6	2.9	1.4	.086	1,500
606	600	1.7	1.9	4.0	2.1	.093	*
909	900	2.0	2.2	5.5	3.0	.101	*
1212	1200	2.4	2.5	7.1	3.9	.109	*
1515	1500	2.6	2.8	8.6	4.9	.115	*

* Cables of these sizes are manufactured to length as ordered.

The colors of insulation, arrangement of color groups, number and location of tracer pairs and colors of the unit binding strings are shown in

the illustration. Sizes 11 to 101, inclusive, consist of conductors twisted in pairs and all stranded in one direction to form a complete core. The remaining sizes are of the multiple unit construction, i.e., the insulated conductors are twisted in pairs and stranded in units which in turn are cabled together to form the complete core. The core is wrapped with two paper tapes, at least one of which is dyed red.



NOTE: Numbers are total pairs in group including one tracer pair where indicated.

Core Make-up DSM Type Cable

FIELD OF USE

These cables are intended for general use in subscriber and exchange trunk plant.

24 Gauge Cable Type ESML

Sheath. ESML Lead Antimony alloy.

Conductors. No. 24 A.W.G. annealed copper, insulated with a single wrap of paper tape applied helically with an overlap.

ELECTRICAL CHARACTERISTICS

D.C. Resistance. 274 ohms approximately per loop mile at 68°F.

Mutual Capacitance. 0.072 mf. approximately per mile at 1000 cycles.

Conductance. 1.87 micromhos approximately per mile at 1000 cycles.

Pairs	Number of Pairs Guaranteed	Sheath Thickness (Inches)	Approx. Diameter (Inches)	Approx. Weight per Foot (Pounds)	Standard Reel Lengths (Feet)
11	10	.062	.37	.3	3,000
16	15	.063	.43	.4	3,000
26	25	.065	.5	.5	4,500
51	50	.068	.6	.7	4,500
76	75	.070	.7	.9	4,500
101	100	.073	.8	1.2	4,500
152	150	.076	1.0	1.5	3,000
202	200	.079	1.1	1.8	2,250
303	300	.085	1.3	2.5	2,250
404	400	.089	1.5	3.1	1,500
606	600	.096	1.8	4.3	*
909	900	.105	2.2	6.0	*
1212	1200	.115	2.6	7.9	*

* Cables of these sizes are manufactured to length as ordered.

Attenuation. 2.14 db approximately per mile at 1000 cycles.

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 350 volts rms between conductors. In excess of 1000 volts rms between each conductor and sheath.

MECHANICAL CHARACTERISTICS

The mechanical characteristics of ESML cables are shown in the above table.

The insulated conductors are twisted into pairs

and the pairs are arranged in layers to form a cylindrical core.

In cables of 76 pairs and smaller, the core consists of white-green pairs and one blue-red tracer. The colors of insulation, number of like colored pairs in each color group and the arrangement of groups for the remaining sizes are indicated below.

The core of the cable is wrapped with two paper tapes, at least one of which is dyed red.

One of the tracers is in the center of the first color group and the other in the outer layer of the last color group.

Color Group	Position in Cable	Number of Pairs in Cable							
		101	152	202	303	404	606	909	1212
White-Green	1st (Center)	50T	51T	101T	101T	101T	101T	101T	101T
White-Red	2nd "	51T	50	101T	101	101	101	101	101
White-Blue	3rd "		51T		101T	101	101	101	101
White-Green	4th "					101T	101	101	101
White-Red	5th "						101	101	101
White-Blue	6th "						101T	101	101
White-Green	7th "							101	101
White-Red	8th "							101	101
White-Blue	9th "							101T	101
White-Green	10th "								101
White-Red	11th "								101
White-Blue	12th "								101T

T = Blue-Red Tracer included in group.

FIELD OF USE

These cables are intended for use in subscriber and exchange trunk plant. They can be used interchangeably with DSM cable since the resistance is the same and the attenuation is slightly lower.

26 Gauge Cable—Types BST and BSTC

Sheath. BST 11 to 2121 pairs, Lead Antimony alloy.

BSTC 51 to 2121 pairs, Stalpeth.

Conductors. No. 26 A.W.G. annealed copper, insulated with wood pulp applied directly to the wire.

ELECTRICAL CHARACTERISTICS

D.C. Resistance. 440 ohms approximately per loop mile at 68° F.

Mutual Capacitance. 0.079 mf approximately per mile at 1000 cycles.

Conductance. 2.05 micromhos approximately per mile at 1000 cycles.

Average Attenuation. 2.9 db approximately per mile at 1000 cycles.

Insulation Resistance. In excess of 500 megohm miles.

Dielectric Strength. In excess of 350 volts rms between conductors. In excess of 850 volts rms between each conductor and sheath.

MECHANICAL CHARACTERISTICS

The mechanical characteristics of BST, and BSTC cables are shown in the table below.

The sheath of BSTC cable consists of an .008 inch aluminum tape applied longitudinally without overlap, an .005 inch corrugated steel tape with soldered longitudinal seam and a polyethylene jacket.

CORE MAKE-UP

The colors of insulation, arrangement of color groups, number and location of tracer pairs and colors of the unit binding strings are shown in the diagram entitled Core Make-up. One of the tracers of the 101 pair size is in the center of the W-G color group and the other in the outer layer of the W-R group. Sizes 11 to 101 pairs, inclusive, consist of conductors all stranded in one direction. The remaining sizes are of multiple unit construction, i.e., the insulated conductors are twisted in pairs and stranded in units which in turn are cabled together to form the complete core. The core is wrapped with two paper tapes, at least one of which is dyed red.

Pairs	Number of Pairs Guaranteed	Approx. Diam. (Inches)		Approx. Weight per Ft. (Pounds)		Sheath Thickness (Inch) Lead		Standard Reel Lengths (Feet)
		BST	BSTC	BST	BSTC	BST		
11	10	.3	—	.3	—	.061		3,200
16	15	.4	—	.3	—	.061		3,200
26	25	.4	—	.4	—	.063		4,800
51	50	.5	.6	.6	.15	.065		4,800
76	75	.6	.7	.7	.2	.067		4,800
101	100	.7	.8	.8	.3	.069		4,800
152	150	.8	.9	1.1	.4	.072		3,200
202	200	.9	1.0	1.3	.5	.074		3,200
303	300	1.1	1.2	1.8	.8	.078		2,400
404	400	1.2	1.4	2.2	1.0	.081		1,600
606	600	1.4	1.6	2.9	1.4	.087		*
909	900	1.7	1.9	4.0	2.0	.094		*
1212	1200	2.0	2.2	5.1	2.6	.100		*
1515	1500	2.2	2.4	6.1	3.3	.106		*
1818	1800	2.4	2.6	7.2	3.9	.110		*
2121	2100	2.6	2.8	8.2	4.5	.115		*

* Cables of these sizes are manufactured to length as ordered.

Coaxial. Coaxial cable is provided for television. Such cables may employ only coaxial conductors with a few service pairs or they may contain a combination of coaxials and other standard types of quads or pairs.

A coaxial consists of a combination of one inner and one outer conductor. The inner conductor consists of a semi-hard-drawn copper wire positioned in the center of the outer conductor by hard rubber or polyethylene discs placed at short intervals along the conductor. The outer conductor consists of a longitudinal seam copper tube. Two steel tapes are used over the copper tube to provide mechanical support and shielding. In the present standard coaxial, the inner conductor is approximately 10-gauge and the inside diameter of the outer conductor is approximately .375 inch.

Video Pairs. Video pairs are employed primarily for television transmission between studios and transmitters and between other points in the television network in exchange areas. Cables may be made up entirely of video pairs or they may contain a combination of video and other standard types of quads or pairs.

A video pair consists of two 16-gauge copper wires each of which is insulated by expanded polyethylene extruded on the wire. The pair is formed by twisting the two insulated conductors together. The two conductors are assembled with two spaces made of expanded polyethylene reinforced with glass fibers. The pair is wrapped with a serving of polyethylene tape, an inner longitudinal copper tape and an outer spiral copper tape.

Spiral-Four Disc-Insulated. This type of cable is used under certain conditions for toll entrance cables involving Type J carrier systems. The quads are 16-gauge disc-insulated of spiral-four

construction. Cables are available composed entirely of disc-insulated quads and also cables containing disc-insulated quads and standard paper-insulated quads and pairs.

Building-out. Cables referred to as "building-out" are provided for the purpose of building out the capacitance or the capacitance and resistance of voice frequency loading sections in toll and toll entrance cables. These cables contain long pair twist type 22-gauge quads, 19-gauge quads and 19-gauge non-quadded pairs in various combinations. By means of suitable lengths of these cables, capacitance and resistance can be added to a short loading section to make it the approximate electrical equivalent of a full loading section. These cables in general have the same color codes as the cables with which they are used.

24-Gauge Quadded Protective. 24-gauge cable is available for use at the central office end of toll or toll entrance cables to provide protection against damage to central office equipment from currents accidentally impressed on the cable conductors. These are of the long pair twist type.

Elective Complements of Exchange Conductors. Elective complements of exchange types of pairs can be included in all of the above cables if the toll requirements in them are such that the diameter over the sheath is less than about 2½ inches.

The elective complements of non-quadded exchange pairs available with each of the cables are indicated on the individual cable drawings (see tabulation). All such non-quadded pairs in toll and toll entrance cables are of the high capacitance types and are similar to those used in the present standard exchange cables; namely, the ENB 19-gauge, DSA 22-gauge, DSM 24-gauge and BST 26-gauge.

The elective complements of non-quadded exchange pairs included in the cables have insulation and construction as follows:

Gauge of Elective Complement	Type of Insulation	Type of Construction
19	Strip or Pulp Paper	Layer
22	Pulp*	Layer
24	Pulp*	Layer & Unit
26	Pulp	Unit

* In order to gain maximum efficiency in manufacturing production, strip paper insulation may be supplied in some cases in place of pulp insulation.

QUADDED CABLE—SHORT PAIR TWIST

Number	Required Toll Complement	Elective Complements of Non Quadred Pairs			
		19 Gauge	22 Gauge	24 Gauge	26 Gauge
CA 1200	4 Quads, 1 Pair 19 Gauge	0, 16, 26, 51, 76, 101, 152, 202, 303, 404	0, 21, 76, 101, 152, 202, 303, 404, 505, 606, 707, 808, 833	0, 26, 51, 76, 101, 152, 202, 303, 404, 505, 606, 909, 1212, 1414	0, 303, 404, 707, 909, 1212, 1515, 1818, 1919
CA 1212	7 Quads 19 Gauge	0, 16, 51, 76, 101, 152, 202, 303, 404	0, 26, 51, 76, 101, 152, 202, 303, 404, 505, 606, 833	0, 26, 51, 76, 101, 152, 202, 303, 404, 505, 606, 909, 1212, 1313	0, 505, 606, 909, 1212, 1515, 1919, 1818
CA 543	12 Quads 19 Gauge	0, 21, 51, 76, 101, 152, 202, 303, 379	0, 31, 51, 101, 152, 202, 303, 404, 606, 783	0, 41, 76, 126, 152, 177, 202, 303, 404, 505, 606, 909, 1212, 1313	0, 404, 505, 606, 909 1212, 1515, 1818
CA 948	16 Quads 19 Gauge	0, 26, 51, 76, 101, 152, 202, 303, 354	0, 36, 76, 101, 152, 202, 303, 404, 505, 606, 758	0, 41, 76, 126, 152, 202, 303, 404, 505, 606, 909, 1212	0, 606, 909, 1212, 1515, 1717
CA 593	19 Quads 19 Gauge	0, 26, 51, 101, 152, 202, 303, 379	0, 36, 76, 101, 152, 202, 303, 404, 505, 606, 732	0, 41, 76, 101, 152, 202, 303, 404, 606, 909, 1212, 1111	0, 404, 505, 606, 1010, 1212, 1515, 1616, 1717
CA 1091	24 Quads 19 Gauge	0, 26, 51, 101, 152, 202, 303, 354	0, 41, 76, 126, 152, 202, 303, 404, 505, 606, 707	0, 51, 101, 152, 202, 303, 404, 505, 606, 1111, 1162	0, 505, 707, 808, 1212, 1515, 1616
CA 961	27 Quads 19 Gauge	0, 31, 101, 152, 202, 303, 354	0, 41, 76, 126, 202, 303, 404, 505, 606, 682	0, 51, 101, 152, 202, 303, 404, 505, 606, 808, 1010, 1111	0, 505, 606, 909, 1212, 1515, 1616
CA 469	32 Quads 19 Gauge	0, 36, 76, 101, 152, 202, 303, 328	0, 51, 101, 152, 202, 303, 404, 505, 606, 657	0, 61, 126, 177, 202, 303, 404, 505, 707, 808, 1061	0, 505, 606, 909, 1212, 1515
CA 471	37 Quads 19 Gauge	0, 36, 76, 101, 152, 202, 303	0, 51, 101, 152, 202, 303, 404, 505, 606	0, 61, 126, 202, 303, 404, 505, 707, 808	0, 505, 606, 909, 1212, 1414
CA 803	44 Quads 19 Gauge	0, 41, 76, 126, 202, 278	0, 51, 101, 152, 202, 303, 404, 505, 581	0, 61, 76, 152, 202, 303, 404, 505, 606, 909	0, 606, 909, 1313
CA 470	48 Quads 19 Gauge	0, 41, 76, 126, 152, 202, 278	0, 51, 101, 152, 202, 303, 404, 505, 556	0, 76, 126, 152, 202, 303, 404, 505, 606, 909	0, 606, 909, 1010, 1111, 1263
CA 541	52 Quads 19 Gauge	0, 41, 126, 152, 177, 202, 253	0, 51, 101, 126, 177 202, 303, 404, 505, 530	0, 76, 152, 202, 303 404, 505, 606, 808	606, 909, 1111
CA 774	61 Quads 19 Gauge	0, 51, 101, 152, 202, 227	0, 61, 126, 202, 303, 404, 455	0, 76, 152, 202, 303, 404, 505, 606, 707	0, 606, 707, 808, 1010
CA 1083	70 Quads 19 Gauge	0, 51, 101, 152, 202	0, 61, 76, 126, 152, 202, 303, 404	0, 76, 152, 177, 303, 404, 505, 606, 657	0, 707, 808, 859
CA 1191	84 Quads 19 Gauge	0, 51, 101, 152	0, 76, 152, 202, 303, 328	0, 91, 177, 303, 505, 530	0, 707, 758
CA 1204	108 Quads 19 Gauge	0, 61, 101	0, 76, 152, 177	0, 101, 328	

TEXTILE INSULATED TERMINATING CABLES

Textile insulated cables are insulated with cotton and acetate yarn and are used to terminate paper insulated cables in central offices and buildings where sealed chamber terminals are not required. The textiles provide a substantial cover for the wires exposed in cable forms and minimize humidity effects on the open cable ends.

A coating of cellulose acetate lacquer is applied over the textile insulated conductors in some cables. This coating prevents the fraying of the insulation and makes it unnecessary to wax the cable forms for certain uses.

Textile insulated cables are available having No. 19-gauge conductors either paired or quadded for use in terminating heavy gauge exchange or toll cables. The conductors in these cables are insulated with two servings of acetate yarn and two outer servings of cotton.

22 Gauge Textile Insulated Cable—Types AFA, NFA, BUA, OUA

Sheath. Chemical Lead.

Conductors.

Code	No. of Pairs	Textile Insulation	Color Code	Conductors
AFA	101-606	Two servings of acetate yarn, one of cotton	Non-color code	Tinned copper
NFA	101-606	Two servings of acetate yarn, one of cotton	Non-color code	Tinned copper with enamel
BUA	6-202	Two servings of acetate yarn and one of cotton, lacquered	Distinctively colored pairs	Tinned copper
OUA	6-202	One serving of acetate yarn and one of cotton, lacquered	Distinctively colored pairs	Tinned copper with enamel

ELECTRICAL CHARACTERISTICS

D.C. Resistance. 174 ohms per loop miles at 68°F.

Insulation Resistance. In excess of 500 megohm miles for AFA and NFA cables. In excess of 10 megohm miles for BUA cables. In excess of 20 megohm miles for OUA cables.

Dielectric Strength. 500 volts rms between conductors.

MECHANICAL CHARACTERISTICS

The mechanical characteristics of AFA, NFA, BUA and OUA cables are shown in the following tabulation.

TYPE AFA CABLE

Number of Pairs	Allowable Number of Defective Pairs	Thickness of Sheath (Inches)	Outside Diameter (Inches)	Weight (Lbs./Ft.)	Standard Reel Lengths (Feet)
101	0	.065	.99	1.4	1000
152	1	.072	1.18	2.0	1000
202	1	.078	1.36	2.6	1000
303	1	.089	1.64	3.6	800
404	1	.097	1.87	4.7	700
606	1	.113	2.29	6.8	500

TYPE NFA CABLE

Number of Pairs	Allowable Number of Defective Pairs	Thickness of Sheath (Inches)	Outside Diameter (Inches)	Weight (Lbs./Ft.)	Standard Reel Lengths (Feet)
101	0	.066	1.03	1.5	1000
152	1	.074	1.25	2.1	1000
202	1	.081	1.42	2.7	1000
303	1	.092	1.72	3.9	800
404	1	.101	1.97	5.0	700
606	1	.117	2.39	7.3	500

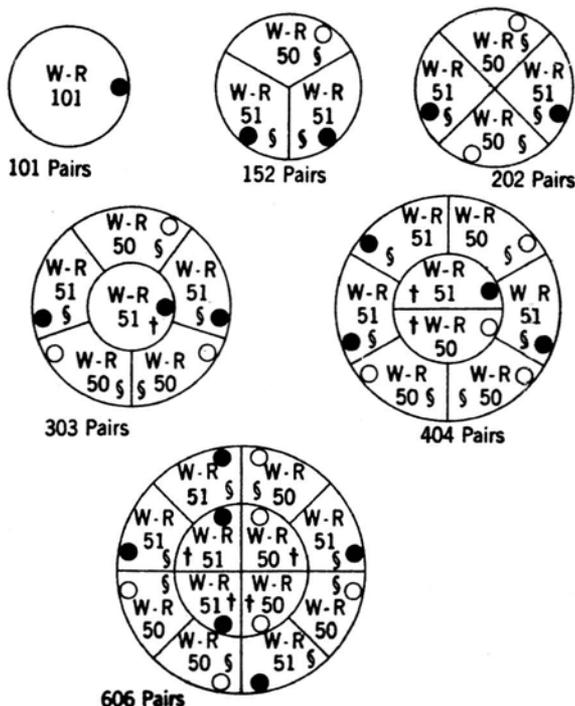
TYPES BUA AND OUA CABLES

Number of Pairs	Allowable Number of Defective Pairs	Thickness of Sheath (Inches)	Outside Diameter (Inches)	Weight (Lbs./Ft.)	BUA		OUA
					Short	Long	
6	0	.040	.33	.21	1400	3400	1000
11	0	.043	.42	.31	800	3000	"
16	0	.045	.47	.38	700	2500	"
21	0	.048	.54	.48	500	2000	"
26	0	.049	.58	.54	500	1750	"
31	0	.050	.62	.62	400	1500	"
41	0	.054	.71	.77	1000	1000	"
51	0	.057	.77	.90	1000	1000	"
76	0	.061	.92	1.23	500	1000	"
101	0	.067	1.05	1.54	400	1000	"
152	1	.075	1.27	2.19		1000	"
202	1	.082	1.45	2.82		1000	"

Colors of Insulation: The colors of insulation, arrangement of units, numbering of pairs in each unit and colors of binding strings of AFA and NFA cables are shown in the diagram.

- W-R = White - Red Pairs**
- = White - Blue Tracer Pair
- = White - Brown Tracer Pair
- § = White Binder Strings
- † = White - Green Binder Strings

Numbers indicate total pairs including tracer pairs



Core Make-up AFA and NFA
Type Cables

FIELD OF USE

Type AFA cable is intended for general use in terminating leadcovered paper insulated cables in central offices and other buildings. Type NFA cable is intended for use where a higher degree of insulation resistance is required than can be obtained with non-enameled conductors. BUA cable may be used to terminate cable by workmen who are not equipped with the facilities required for boiling out, where fumes that would be objectionable to owners or tenants, or where local ordinances do not permit the use of open flames for heating the boiling out compounds in buildings. OUA cable is intended for use where a higher degree of insulation resistance is required than can be obtained with BUA cable. If there is likelihood of moisture trouble in cable forms, it is advisable to employ sealed chamber type terminals whenever practicable rather than terminate by means of cable forms.

Special Cables

TOLL CABLE

In recent years, several other types of toll cables have been developed. Toll entrance cables both paired and quadded are available, suitable for bringing carrier or voice telephone circuits from open wire lines to central offices. Other designs are available for all cable carrier circuits.

PROTECTIVE COVERINGS FOR LEAD SHEATH CABLES

JUTE PROTECTED CABLE

While the unprotected sheath gives excellent service when installed aerially or underground in ducts, there are other situations where cables buried directly in the ground offer advantages over other forms of construction. The life of unprotected buried cable sheath may be very short depending upon the particular soil conditions. We do not, therefore, recommend it for this use. To meet this need the Bell Telephone Laboratories and the Western Electric Company have developed types of covering for the cable sheath which effectively protect the sheath from soil corrosion. This protection consists of the following materials in the order named:

1. Asphalt compound.
2. Two layers impregnated paper.
3. Asphalt compound.
4. One or two layers impregnated jute.
5. Asphalt compound.
6. Coating of whiting.

The above protection adds to the diameter over the lead sheath about 0.2 inch for the smaller size cables and about 0.3 inch for full size cables.

TAPE ARMORED CABLE

In cases where protection against low frequency induction from power lines or somewhat more mechanical protection is desired, a steel tape armor can be furnished. This type of sheath covering is similar to that used for jute protected cables except for the addition of two servings of steel tapes. This protection consists of the following materials in the order named:

1. Asphalt compound.
2. One or more layers impregnated paper.
3. Asphalt compound.
4. One or two layers impregnated jute.
5. Asphalt compound.
6. Two layers steel tape.
7. Asphalt compound.
8. One or two layers impregnated jute.
9. Asphalt compound.
10. Coating of whiting.

For this construction the increase in diameter varies with the size of cable from about 0.3 inch to about 0.6 inch.

MODIFIED TAPE ARMORED CABLE

A modified tape armor protection has been developed which will provide mechanical and rodent protection comparable to that furnished by regular tape armor. This protection is also designed to eliminate arcing between the steel tapes and the lead sheath in the event that lightning strikes the cable.

GALVANIZED TAPE ARMORED CABLE

Western Electric can furnish galvanized tape armored cable for aerial use where protection against low frequency induction from power lines is desired.

CORROSION PROTECTED CABLE

In connection with the mitigation of stray current electrolysis and chemical corrosion of cable sheath in underground conduit, there has been developed a corrosion protection which can be applied to any of the lead covered cables. This protection adds about 0.25" to 0.30" to the diameter over the lead sheath. The size and condition of the duct should be given consideration before ordering this type of cable.

GOPHER PROTECTED CABLE

Where conditions do not justify the heavy steel tapes used for regular tape armored cables, and but little mechanical protection is required, such as for example protection against rodents, a single tape armored cable is available using thin steel tape. This protection consists of the following materials in the order named:

1. Asphalt compound.
2. One layer impregnated paper.
3. Asphalt compound.
4. One layer steel tape.
5. Asphalt compound.
6. One or more layers impregnated paper.
7. Asphalt compound.
8. One or two layers impregnated jute.
9. Asphalt compound.
10. Coating of whiting.

The desired type of covering should be specified in each order. For brevity, the following symbols may be used to describe the protective coverings and may be added to the CA number as a suffix:

- L Plain Lead Covered
- JP Jute Protected
- BT Buried Tape Armored
- AT Aerial Tape Armored
- CP Corrosion Protected
- MTA Modified Tape Armored
- GP Gopher Protected

WIRE ARMORED CABLE (SUBMARINE)

It is the usual practice to provide somewhat higher dielectric strength in the submarine cable as insurance against insulation failure in the submarine where repairs are difficult. Also the sheath on submarine cable is usually thicker than that on corresponding sizes of land cable. When paper insulated submarine cable is installed in comparatively long lengths, such that the cost of repairing a break in the sheath would be less than the cost of a new cable, a high density core design is used which retards the penetration of water along the cable core in case the sheath fails. It is common practice to specify double paper insulation for the more important submarine cables but for short non-quadded cables where high dielectric strength and high density is not necessary, single paper insulation is satisfactory.

The drawings listed below cover standard exchange submarine cable.

Either single or double armored cable can be furnished. In most cases single armor gives suffi-

cient mechanical protection. Double armored cable is intended primarily for use under unusually severe conditions, such as in tidal waters having rocky irregular bottoms, where it is likely that the cable will not rest on the bottom throughout its length. The added stiffness of the double armor under this condition tends to avoid fatigue failure of the lead sheath which might otherwise result from movement of the cable back and forth caused by the tidal action. Double armor also has application where the cable is likely to be subjected to the scoring action of ice flows.

This armor protection consists of the following materials in the order named:

SINGLE ARMORED SUBMARINE

1. Two layers impregnated jute roving.
2. Asphalt compound.
3. Layer of armor wire.
4. Asphalt compound.
5. Two layers impregnated jute yarn.
6. Asphalt compound.
7. Coating of whiting.

DOUBLE ARMORED SUBMARINE

1. Two layers impregnated jute roving.
2. Asphalt compound.
3. Layer of armor wire.
4. Asphalt compound.
5. One layer impregnated jute roving.
6. Asphalt compound.
7. Layer of armor wire.
8. Asphalt compound.
9. Two layers impregnated jute yarn.
10. Asphalt compound.
11. Coating of whiting.

Drawing No.	Conductor Gauge	No. Pairs
CA 1148	22	7 12 17 27 53
		78 104 154 205 306
		407 459 611 915 1219
CA 1147	19	7 12 17 27 52
		77 103 153 204 305
		407 458
CA 1149	24	13 18 28 53 79 104
		155 206 307 401 460
		613 917 1221 1525

LIGHT WIRE ARMORED CABLE (GULLY TYPE)

A light wire armored cable is also available for crossing gullies, small bodies of water or swamps. This cable provides greater mechanical strength than the tape armored cable and is lighter and less expensive than the standard wire armored submarine design.

This protection is the same as for single armored submarine except that somewhat lighter weight armor wire is used.

The symbols listed designate the various types of wire armoring and are applied to the CA drawing number as a suffix.

Type	Armoring	Symbol
Single	Armored	SA
Double	Armored	DA
Light	Wire Armored	LA

The desired type of armoring should be specified on orders or inquiries.

For example: CA 1148-L-SA

Switchboard Cable

"CL" TYPE

The CL type cables listed in the following tables, except the 1450CL cables, consist of copper conductors, either tinned or tinned and enameled, with two servings of cellulose acetate rayon yarn, and one serving of cotton, coated with cellulose acetate lacquer. The 1450CL cables have enameled conductors with two servings of cellulose acetate rayon yarn and a cotton braid coated with cellulose acetate lacquer. All cables have a moisture barrier provided in the cover, either a coated crepe paper or a plastic jacket. Cables having enameled conductors are identified by four digit code numbers—1016CL, 1024CL, etc.

The "CL" type switchboard cable is designed in three general shapes—flat, oval and round. In oval and round cables, where the number of pairs exceed twenty, the conductors are arranged in units around the center. Each unit is bound with spaced servings of cotton of distinctive color. The spare conductors and the sixth unit when required are in the center. The larger

dimensions listed in the tabulation for flat and oval cable represent the width and the smaller dimensions the thickness.

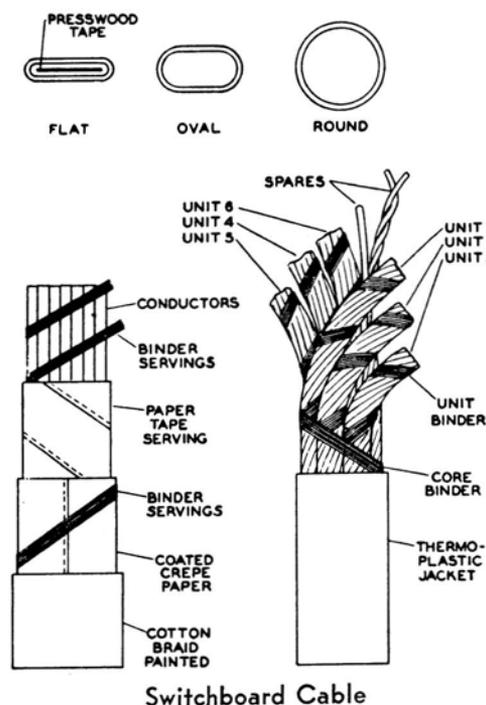
Round and oval shaped cables, except the 753A cable, are made with either braided cotton or extruded plastic covers. All flat cables and the 753A are made only with braided cotton covers.

BRAIDED COTTON COVERS

Cables furnished with braided cotton covers, except the 750A types, have a serving of paper tape and a covering of coated crepe paper tape applied longitudinally over the cabled conductors. Over this is applied a close braiding of cotton and the completed cable is painted with gray cable paint. The polyethylene insulated, 750 type cables, furnished with braided cotton covers are made in the same manner except that the paper tape serving is omitted and the crepe paper is uncoated.

EXTRUDED PLASTIC COVERS

The slate colored covering is applied directly over the cabled conductors except for the 750 types. The latter have a longitudinally applied crepe paper tape between the cabled conductors and the plastic cover.



Switchboard Cable

TINNED COPPER CONDUCTORS, COVERED WITH TWO SERVINGS OF
CELLULOSE ACETATE YARN, ONE SERVING OF COTTON AND LACQUER COATED

Code No.	Conduc-tors	Pairs			Singles			Dimensions (Inches)	Shape
		No.	Gauge	†Color	No.	Gauge	†Color		
16CL	63	20	22	181-200	20	22	1-20	.69 x .34	Oval
24CL	43	20	22	181-200	—	—	—	.52 x .36	Oval
50CL	33	10	22	181-190	10	22	1-10	.41 Diam.	Round
62CL	63	{ 15	22	181-195	—	—	—	.54 Diam.	Round
		{ 15	22	181-195					
		{ 20	22	181-200					
66CL	103	{ 20	22	181-200	—	—	—	.67 Diam.	Round
		{ 10	22	181-190					
		{ 20	22	181-200					
69CL	208	{ 20	22	181-200	—	—	—	.93 Diam.	Round
		{ 20	22	181-200					
		{ 20	22	181-200					
70CL	83	{ 20	22	181-200	—	—	—	.74 x .44	Oval
		{ 20	22	181-200					
74CL	21	10	22	181-190	—	—	—	.35 Diam.	Round
79CL	21	10	22	181-190	—	—	—	.41 x .24	Oval
84CL	63	20	22	181-200	20	22	1-20	1.32 x .32	Flat
97CL	132	{ 20	22	181-200	—	—	—	.74 Diam.	Round
		{ 20	22	181-200					
		{ 4	22	181-184					
100CL	83	{ 20	24	181-200	—	—	—	.68 x .40	Oval
		{ 20	24	181-200					
103CL	42	20	24	181-200	—	—	—	.51 x .32	Oval
106CL	103	{ 20	22	181-200	20	22	1-20	.66 Diam.	Round
		{ 20	22	181-200					
182CL	13	6	22	181-186	—	—	—	.29 Diam.	Round
183CL	53	20	22	181-200	10	22	1-10	.50 Diam.	Round
190CL	30	{ 5	22	1,3,5,7&9	10	22	1-10	.38 x .23	Flat
		{ 5	22	182,184					
				186,188 & 190					
191CL	93	{ 20	22	181-200	20	22	1-20	.63 Diam.	Round
		{ 10	22	181-190	10	22	1-10		
205CL	39	12	22	181-192	12	22	1-12	.43 Diam.	Round
227CL	83	{ 20	24	1-20	—	—	—	1.32 x .35	Flat
		{ 20	24	181-200					
230CL	136	{ 6	22	181-186	—	—	—	.75 Diam.	Round
		{ 20	22	181-200					
		{ 20	22	181-200					
232CL	83	{ 20	22	1-20	—	—	—	1.57 x .37	Flat
		{ 20	22	181-200					
233CL	123	{ 20	22	181-200	20	22	1-20	.71 Diam.	Round
		{ 20	22	181-200	20	22	1-20		
234CL	164	{ 20	22	181-200	—	—	—	.82 Diam	Round
		{ 20	22	181-200					
		{ 20	22	181-200					
235CL	208	{ 20	22	181-200	20	22	1-20	.92 Diam.	Round
		{ 20	22	181-200	20	22	1-20		
		{ 20	22	181-200					

NOTE: Quantity shown under heading "Conductors" includes spares.

† The numbers listed refer to the color combinations shown under the heading "Colors of Insulation on Conductors," pages 28 to 31.

TINNED COPPER CONDUCTORS, COVERED WITH TWO SERVINGS OF
CELLULOSE ACETATE YARN, ONE SERVING OF COTTON AND LACQUER COATED

Code No.	Conduc-tors	Pairs			Singles			Dimensions (Inches)	Shape
		No.	Gauge	†Color	No.	Gauge	†Color		
236CL	63	20	24	181-200	20	24	1-20	.76 x .37	Flat
239CL	103	{ 20	22	1-20	20	22	1-20	1.57 x .39	Flat
		{ 20	22	181-200					
241CL	43	20	22	181-200	—	—	—	.76 x .34	Flat
242CL	63	20	22	181-200	20	22	1-20	1.57 x .33	Flat
		{ 20	22	181-200	20	22	1-20		
		{ 20	22	181-200	20	22	1-20		
243CL	312	{ 20	22	181-200	20	22	1-20	1.12 Diam.	Round
		{ 20	22	181-200	20	22	1-20		
		{ 20	22	181-200	20	22	1-20		
		{ 20	22	181-200	20	22	1-20		
252CL	12	6	24	181-186	—	—	—	.26 Diam.	Round
253CL	22	10	24	181-190	—	—	—	.33 Diam.	Round
254CL	33	10	24	181-190	10	24	1-10	.37 Diam.	Round
255CL	43	20	24	181-200	—	—	—	.42 Diam.	Round
256CL	63	20	24	181-200	20	24	1-20	.49 Diam.	Round
257CL	83	{ 20	24	181-200	—	—	—	.56 Diam.	Round
		{ 20	24	181-200					
258CL	103	{ 20	24	181-200	—	—	—	.74 x .44	Oval
		{ 20	24	181-200	—	—	—		
		{ 20	24	181-200	20	24	1-20		
		{ 2	24	181-182					
259CL	127	{ 20	24	181-200	20	24	1-20	.66 Diam.	Round
		{ 20	24	181-200	20	24	1-20		
		{ 20	24	181-200	20	24	1-20		
260CL	153	{ 20	24	181-200	20	24	1-20	.71 Diam.	Round
		{ 10	24	181-190	10	24	1-10		
		{ 20	24	181-200					
261CL	164	{ 20	24	181-200	—	—	—	.75 Diam.	Round
		{ 20	24	181-200					
		{ 20	24	181-200					
		{ 20	24	181-200					
262CL	208	{ 20	24	181-200	—	—	—	.84 Diam.	Round
		{ 20	24	181-200					
		{ 20	24	181-200	20	24	1-20		
		{ 20	24	181-200	20	24	1-20		
263CL	312	{ 20	24	181-200	20	24	1-20	1.01 Diam.	Round
		{ 20	24	181-200	20	24	1-20		
		{ 20	24	181-200	20	24	1-20		
		{ 20	24	181-200	20	24	1-20		
264CL	185	{ 20	24	181-200	20	24	1-20	.77 Diam.	Round
		{ 20	24	181-200	20	24	1-20		
265CL	26	12	24	181-192	—	—	—	.35 Diam.	Round
266CL	50	{ 12	24	181-192	—	—	—	.45 Diam.	Round
		{ 12	24	181-192					
		{ 12	24	181-192					
267CL	146	{ 12	24	181-192	—	—	—	.71 Diam.	Round
		{ 12	24	181-192					
		{ 12	24	181-192					
		{ 12	24	181-192					

NOTE: Quantity shown under heading "Conductors" includes spares.

† The numbers listed refer to the color combinations shown under the heading "Colors of Insulation on Conductors," pages 28 to 31.

TINNED COPPER CONDUCTORS, COVERED WITH TWO SERVINGS OF
CELLULOSE ACETATE YARN, ONE SERVING OF COTTON AND LACQUER COATED

Code No.	Conduc-tors	Pairs			Singles			Dimensions (Inches)	Shape
		No.	Gauge	†Color	No.	Gauge	†Color		
269CL	74	{ 12 12 12	24	181-192	—	—	—	.53 Diam.	Round
275CL	103	{ 20 20	22	181-200	20	22	1-20	.76 x .55	Oval
276CL	26	12	22	181-192	—	—	—	.37 Diam.	Round
277CL	21	10	22	181-190	—	—	—	.76 x .28	Flat
278CL	68	20	22	181-200	24	22	1-24	.67 x .39	Oval
279CL	68	20	22	181-200	24	22	1-24	1.57 x .33	Flat

ENAMELED CONDUCTORS

TINNED ENAMELED COPPER CONDUCTORS, COVERED WITH TWO SERVINGS OF
CELLULOSE ACETATE RAYON YARN, ONE SERVING OF COTTON AND LACQUER COATED

Code No.	Conduc-tors	Pairs			Singles			Dimensions (Inches)	Shape
		No.	Gauge	†Color	No.	Gauge	†Color		
1016CL	63	20	22	181-200	20	22	1-20	.68 x .40	Oval
1024CL	43	20	22	181-200	—	—	—	.58 x .36	Oval
1050CL	33	10	22	181-190	10	22	1-10	.42 Diam.	Round
1066CL	103	{ 20 20 10 20	22	181-200	—	—	—	.69 Diam.	Round
1069CL	208	{ 20 20 20 20	22	181-200	—	—	—	.96 Diam.	Round
1070CL	83	{ 20 20	22	181-200	—	—	—	.75 x .48	Oval
1074CL	21	10	22	181-190	—	—	—	.36 Diam.	Round
1125CL	23	10	19	181-190	—	—	—	.50 x .34	Oval
1182CL	13	6	22	181-186	—	—	—	.30 Diam.	Round

TINNED COPPER CONDUCTORS, COVERED WITH EXTRUDED
POLYVINYL CHLORIDE COMPOUND (PLASTIC) AND COTTON BRAID

Code No.	Conduc-tors	Gauge	Pairs		Triples		Approx. Dimensions (Inches)	Replaces No.
			No.	Color	No.	Color		
400A	18	22	—	—	6	1b-6b	.43 Diam.	1460CL
401A	10	22	5	1b-5b	—	—	.34 Diam.	1461CL
402A	20	22	10	1b-10b	—	—	.44 Diam.	1462CL
403A	6	22	3	1b-3b	—	—	.28 Diam.	—
404A	9	22	—	—	3	1b-3b	.33 Diam.	—
405A	30	22	—	—	10	1b-10b	.53 Diam.	1463CL

NOTE: Quantity shown under heading "Conductors" includes spares.

† The numbers listed refer to the color combinations shown under the heading "Colors of Insulation on Conductors," pages 28 to 31.

TYPE "CL" TOLL QUADDED CABLE

TINNED COPPER CONDUCTORS, COVERED WITH TWO SERVINGS OF
CELLULOSE ACETATE YARN, ONE SERVING OF COTTON AND LACQUER COATED

Code No.	Conductors	No. of Quads	Gauge	+Quad Color	Dimensions (Inches)
500CL	8	2	22	1 & 2	.26 Diam.
501CL	16	4	22	1-4	.33 Diam.
502CL	32	8	22	1-8	.45 Diam.
503CL	40	10	22	1-10	.49 Diam.
504CL	52	12	22	1-12	.55 Diam.
505CL	68	16	22	1-16	.62 Diam.
506CL	84	20	22	1-20	.67 Diam.

NOTE: Quantity shown under heading "Conductors" includes spares.

† The numbers listed refer to the color combinations shown under the heading "Colors of Insulation on Conductors," pages 28 to 31.

ENAMELED CONDUCTORS

TINNED ENAMELED COPPER CONDUCTORS, COVERED WITH TWO SERVINGS OF
CELLULOSE ACETATE RAYON YARN, ONE SERVING OF COTTON AND LACQUER COATED

Code No.	Conductors	No. of Quads	Gauge	+Quad Color	Dimensions (Inches)
1500CL	8	2	22	1 & 2	.27 Diam.
1501CL	16	4	22	1-4	.35 Diam.
1502CL	32	8	22	1-8	.46 Diam.
1503CL	40	10	22	1-10	.50 Diam.
1504CL	52	12	22	1-12	.57 Diam.
1505CL	68	16	22	1-16	.64 Diam.
1506CL	84	20	22	1-20	.70 Diam.

NOTE: Quantity shown under heading "Conductors" includes spares.

† The numbers listed refer to the color combinations shown under the heading "Colors of Insulation on Conductors," pages 28 to 31.

750A TYPE

Tinned Copper Conductors, Polyethylene Insulated. The conductors are twisted into pairs and

each pair is shielded with a tinned copper braid with a ground wire within the shield.

Code No.	Conductors	No.	Pairs Gauge	Color	Approx. Dim. Inches
750A	4	2	22	1 & 2	.35 x .22
751A	6	3	22	1 to 3	.43
752A	12	6	22	1 to 5, 21	.57
753A	24	12	22	{ 1 to 5, 21 to 25 41 & 42	.68
755A	4	2	19	1 & 2	.37 x .23
756A	16	8	19	{ 1 to 5, 21 to 23	.71
757A	20	10	19	{ 1 to 5, 21 to 25	.74
758A	8	4	22	1 to 4	.48
759A	16	8	22	{ 1 to 5, 21 to 23	.62

“1450CL” TYPE

TINNED ENAMELED COPPER CONDUCTORS, COVERED WITH TWO SERVINGS OF
CELLULOSE ACETATE YARN, COTTON BRAID AND LACQUER COATED

Code No.	Conduc-tors	No.	Pairs Gauge	†Color	No.	Spare Pairs Gauge	†Color	Approx. Dimensions (Inches)
1450CL	6	3	20	1b-3b	—	—	—	.28 dia.
1451CL	12	6	20	1b-6b	—	—	—	.37 dia.
1452CL	16	8	20	1b-8b	—	—	—	.42 dia.
1453CL	22	11	20	1b-11b	—	—	—	.47 dia.
1454CL	20	10	16	1b-10b	—	—	—	.56 dia.
1456CL	6	3	16	1b-3b	—	—	—	.34 dia.
1457CL	12	6	16	1b-6b	—	—	—	.45 dia.
1458CL	16	8	16	1b-8b	—	—	—	.51 dia.
1459CL	42	20	16	1b-20b	1	16	1b	.78 dia.

† Numbers listed refer to the color combinations given on pages 28 to 31.

COLORS OF INSULATION ON CONDUCTORS

In all types of Western Electric switchboard cable, the outer insulation on each of the conductors is colored in accordance with a definite color scheme that they may be easily identified. In our tabulation of switchboard cable on preceding pages under the heading of "Color," the various color combinations of the conductors are identified by the numbers shown, which refer to the following lists:

PAIRS					
Com- bination No.	Colors of Insulation		Com- bination No.	Colors of Insulation	
1	Blue	Paired with white	48	Blue-green	Paired with black
2	Orange	Paired with white	49	Blue-brown	Paired with black
3	Green	Paired with white	50	Blue-slate	Paired with black
4	Brown	Paired with white	51	Orange-white	Paired with black
5	Slate	Paired with white	52	Orange-green	Paired with black
6	Blue-white	Paired with white	53	Orange-brown	Paired with black
7	Blue-orange	Paired with white	54	Orange-slate	Paired with black
8	Blue-green	Paired with white	55	Green-white	Paired with black
9	Blue-brown	Paired with white	56	Green-brown	Paired with black
10	Blue-slate	Paired with white	57	Green-slate	Paired with black
11	Orange-white	Paired with white	58	Brown-white	Paired with black
12	Orange-green	Paired with white	59	Brown-slate	Paired with black
13	Orange-brown	Paired with white	60	Slate-white	Paired with black
14	Orange-slate	Paired with white	61	Blue	Paired with red-white
15	Green-white	Paired with white	62	Orange	Paired with red-white
16	Green-brown	Paired with white	63	Green	Paired with red-white
17	Green-slate	Paired with white	64	Brown	Paired with red-white
18	Brown-white	Paired with white	65	Slate	Paired with red-white
19	Brown-slate	Paired with white	66	Blue-white	Paired with red-white
20	Slate-white	Paired with white	67	Blue-orange	Paired with red-white
21	Blue	Paired with red	68	Blue-green	Paired with red-white
22	Orange	Paired with red	69	Blue-brown	Paired with red-white
23	Green	Paired with red	70	Blue-slate	Paired with red-white
24	Brown	Paired with red	71	Orange-white	Paired with red-white
25	Slate	Paired with red	72	Orange-green	Paired with red-white
26	Blue-white	Paired with red	73	Orange-brown	Paired with red-white
27	Blue-orange	Paired with red	74	Orange-slate	Paired with red-white
28	Blue-green	Paired with red	75	Green-white	Paired with red-white
29	Blue-brown	Paired with red	76	Green-brown	Paired with red-white
30	Blue-slate	Paired with red	77	Green-slate	Paired with red-white
31	Orange-white	Paired with red	78	Brown-white	Paired with red-white
32	Orange-green	Paired with red	79	Brown-slate	Paired with red-white
33	Orange-brown	Paired with red	80	Slate-white	Paired with red-white
34	Orange-slate	Paired with red	81	Blue	Paired with black-white
35	Green-white	Paired with red	82	Orange	Paired with black-white
36	Green-brown	Paired with red	83	Green	Paired with black-white
37	Green-slate	Paired with red	84	Brown	Paired with black-white
38	Brown-white	Paired with red	85	Slate	Paired with black-white
39	Brown-slate	Paired with red	86	Blue-white	Paired with black-white
40	Slate-white	Paired with red	87	Blue-orange	Paired with black-white
41	Blue	Paired with black	88	Blue-green	Paired with black-white
42	Orange	Paired with black	89	Blue-brown	Paired with black-white
43	Green	Paired with black	90	Blue-slate	Paired with black-white
44	Brown	Paired with black	91	Orange-white	Paired with black-white
45	Slate	Paired with black	92	Orange-green	Paired with black-white
46	Blue-white	Paired with black	93	Orange-brown	Paired with black-white
47	Blue-orange	Paired with black	94	Orange-slate	Paired with black-white

PAIRS

Com- bination No.	Colors of Insulation	Com- bination No.	Colors of Insulation		
95	Green-white	Paired with black-white	149	Red-blue-brown	Paired with red
96	Green-brown	Paired with black-white	150	Red-blue-slate	Paired with red
97	Green-slate	Paired with black-white	151	Red-orange-white	Paired with red
98	Brown-white	Paired with black-white	152	Red-orange-green	Paired with red
99	Brown-slate	Paired with black-white	153	Red-orange-brown	Paired with red
100	Slate-white	Paired with black-white	154	Red-orange-slate	Paired with red
101	Blue	Paired with red-black	155	Red-green-white	Paired with red
102	Orange	Paired with red-black	156	Red-green-brown	Paired with red
103	Green	Paired with red-black	157	Red-green-slate	Paired with red
104	Brown	Paired with red-black	158	Red-brown-white	Paired with red
105	Slate	Paired with red-black	159	Red-brown-slate	Paired with red
106	Blue-white	Paired with red-black	160	Red-slate-white	Paired with red
107	Blue-orange	Paired with red-black	161	Black-blue	Paired with red
108	Blue-green	Paired with red-black	162	Black-orange	Paired with red
109	Blue-brown	Paired with red-black	163	Black-green	Paired with red
110	Blue-slate	Paired with red-black	164	Black-brown	Paired with red
111	Orange-white	Paired with red-black	165	Black-slate	Paired with red
112	Orange-green	Paired with red-black	166	Black-blue-white	Paired with red
113	Orange-brown	Paired with red-black	167	Black-blue-orange	Paired with red
114	Orange-slate	Paired with red-black	168	Black-blue-green	Paired with red
115	Green-white	Paired with red-black	169	Black-blue-brown	Paired with red
116	Green-brown	Paired with red-black	170	Black-blue-slate	Paired with red
117	Green-slate	Paired with red-black	171	Black-orange-white	Paired with red
118	Brown-white	Paired with red-black	172	Black-orange-green	Paired with red
119	Brown-slate	Paired with red-black	173	Black-orange-brown	Paired with red
120	Slate-white	Paired with red-black	174	Black-orange-slate	Paired with red
121	Red-blue	Paired with white	175	Black-green-white	Paired with red
122	Red-orange	Paired with white	176	Black-green-brown	Paired with red
123	Red-green	Paired with white	177	Black-green-slate	Paired with red
124	Red-brown	Paired with white	178	Black-brown-white	Paired with red
125	Red-slate	Paired with white	179	Black-brown-slate	Paired with red
126	Red-blue-white	Paired with white	180	Black-slate-white	Paired with red
127	Red-blue-orange	Paired with white			
128	Red-blue-green	Paired with white			Paired with
129	Red-blue-brown	Paired with white	181	Blue	Blue-Novely red white
130	Red-blue-slate	Paired with white	182	Orange	Orange-Novely red white
131	Red-orange-white	Paired with white	183	Green	Green-Novely red white
132	Red-orange-green	Paired with white	184	Brown	Brown-Novely red white
133	Red-orange-brown	Paired with white	185	Slate	Slate-Novely red white
134	Red-orange-slate	Paired with white	186	Blue-white	Blue-white-Novely red white
135	Red-green-white	Paired with white	187	Blue-orange	Blue-orange-Novely red white
136	Red-green-brown	Paired with white	188	Blue-green	Blue-green-Novely red white
137	Red-green-slate	Paired with white	189	Blue-brown	Blue-brown-Novely red white
138	Red-brown-white	Paired with white	190	Blue-slate	Blue-slate-Novely red white
139	Red-brown-slate	Paired with white	191	Orange-white	Orange-white-Novely red white
140	Red-slate-white	Paired with white	192	Orange-green	Orange-green-Novely red white
141	Red-blue	Paired with red	193	Orange-brown	Orange-brown-Novely red white
142	Red-orange	Paired with red	194	Orange-slate	Orange-slate-Novely red white
143	Red-green	Paired with red	195	Green-white	Green-white-Novely red white
144	Red-brown	Paired with red	196	Green-brown	Green-brown-Novely red white
145	Red-slate	Paired with red	197	Green-slate	Green-slate-Novely red white
146	Red-blue-white	Paired with red	198	Brown-white	Brown-white-Novely red white
147	Red-blue-orange	Paired with red	199	Brown-slate	Brown-slate-Novely red white
148	Red-blue-green	Paired with red	200	Slate-white	Slate-white-Novely red white

NOTE: Color listed as "Novely Red White" consists of one ply of red yarn twisted together with one ply of white yarn to form a single thread.

COLORS OF INSULATION ON CONDUCTORS

SINGLES					
Com- bination No.	Colors of Insulation	Com- bination No.	Colors of Insulation	Com- bination No.	Colors of Insulation
1	Red-blue	21	Black-blue	41	Red-black-blue
2	Red-orange	22	Black-orange	42	Red-black-orange
3	Red-green	23	Black-green	43	Red-black-green
4	Red-brown	24	Black-brown	44	Red-black-brown
5	Red-slate	25	Black-slate	45	Red-black-slate
6	Red-blue-white	26	Black-blue-white	46	Red-black-blue-white
7	Red-blue-orange	27	Black-blue-orange	47	Red-black-blue-orange
8	Red-blue-green	28	Black-blue-green	48	Red-black-blue-green
9	Red-blue-brown	29	Black-blue-brown	49	Red-black-blue-brown
10	Red-blue-slate	30	Black-blue-slate	50	Red-black-blue-slate
11	Red-orange-white	31	Black-orange-white	51	Red-black-orange-white
12	Red-orange-green	32	Black-orange-green	52	Red-black-orange-green
13	Red-orange-brown	33	Black-orange-brown	53	Red-black-orange-brown
14	Red-orange-slate	34	Black-orange-slate	54	Red-black-orange-slate
15	Red-green-white	35	Black-green-white	55	Red-black-green-white
16	Red-green-brown	36	Black-green-brown	56	Red-black-green-brown
17	Red-green-slate	37	Black-green-slate	57	Red-black-green-slate
18	Red-brown-white	38	Black-brown-white	58	Red-black-brown-white
19	Red-brown-slate	39	Black-brown-slate	59	Red-black-brown-slate
20	Red-slate-white	40	Black-slate-white	60	Red-black-slate-white

PAIRS (With Braided Cotton Conductors)

Combination No.	Colors of Insulation	Paired with
1b	Blue	Blue-Red
2b	Orange	Orange-Red
3b	Green	Green-Red
4b	Brown	Brown-Red
5b	Slate	Slate-Red
6b	Blue-White	Blue-White-Red
7b	Blue-Orange	Blue-Orange-Red
8b	Blue-Green	Blue-Green-Red
9b	Blue-Brown	Blue-Brown-Red
10b	Blue-Slate	Blue-Slate-Red
11b	Orange-White	Orange-White-Red
12b	Orange-Green	Orange-Green-Red
13b	Orange-Brown	Orange-Brown-Red
14b	Orange-Slate	Orange-Slate-Red
15b	Green-White	Green-White-Red
16b	Green-Brown	Green-Brown-Red
17b	Green-Slate	Green-Slate-Red
18b	Brown-White	Brown-White-Red
19b	Brown-Slate	Brown-Slate-Red
20b	Slate-White	Slate-White-Red

SPARE PAIRS

Combination No.	Colors of Insulation	Paired with
1b	White	Red

TRIPLES (With Braided Cotton Conductors)

Combination No.	Colors of Insulation	Paired with
1b	Blue	Blue-red and white
2b	Orange	Orange-red and white
3b	Green	Green-red and white
4b	Brown	Brown-red and white
5b	Slate	Slate-red and white
6b	Blue-white	Blue-white-red and white
7b	Blue-orange	Blue-orange-red and white
8b	Blue-green	Blue-green-red and white
9b	Blue-brown	Blue-brown-red and white
10b	Blue-slate	Blue-slate-red and white

SPARE PAIRS

Combination No.	Colors of Insulation	Paired with
1	White	Paired with red
2	White	Paired with black
3	Red	Paired with black
4	Red-white	Paired with white
5	Red-white	Paired with red
6	Red-white	Paired with black
7	Black-white	Paired with white
8	Black-white	Paired with red
9	Black-white	Paired with black
10	Red-black	Paired with white
11	Red-black	Paired with red
12	Red-black	Paired with black

SPARE SINGLES

Combination No.	Colors of Insulation
1	Red-white
2	Black-white
3	Red-black
4	Red-black-white

GROUND WIRE

Combination No.	Colors of Insulation
1	Black

QUADS

Quad No.	First Pair Color of Cotton	Second Pair *Color of Cotton
	Paired With	Paired With
1	Blue	Blue-Nov. black white
2	Orange	Orange-Nov. black white
3	Green	Green-Nov. black white
4	Brown	Brown-Nov. black white
5	Slate	Slate-Nov. black white
6	Blue-white	Blue-white-Nov. black white
7	Blue-orange	Blue-orange-Nov. black white
8	Blue-green	Blue-green-Nov. black white
9	Blue-brown	Blue-brown-Nov. black white
10	Blue-slate	Blue-slate-Nov. black white
11	Orange-white	Orange-white-Nov. black white
12	Orange-green	Orange-green-Nov. black white
13	Orange-brown	Orange-brown-Nov. black white
14	Orange-slate	Orange-slate-Nov. black white
15	Green-white	Green-white-Nov. black white
16	Green-brown	Green-brown-Nov. black white
17	Green-slate	Green-slate-Nov. black white
18	Brown-white	Brown-white-Nov. black white
19	Brown-slate	Brown-slate-Nov. black white
20	Slate-white	Slate-white-Nov. black white
Spare Red	Red-white	Black

* Color listed as "Novelty Black White" or "Novelty Red White" consists of one ply of black or red yarn, respectively, twisted together with one ply of white yarn to form a single thread.

WIRE

The following types of wire are especially adapted for use in apparatus wiring and in local and toll switchboards. They are for the most part lacquer treated. This lacquer treatment has many advantages over wax impregnation, some of which are as follows:

1. Eliminates wax as a fire hazard;
2. Eliminates insulation fraying at terminals;
3. Does not collect dirt;
4. Colors remain brighter for long periods of service.

C Type Wire

Designed primarily for use in local cable forms, in local toll and telegraph circuits.

Solid tinned conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in Nos. 22 and 24 gauges; singles, pairs, triples and quads and in various colors.

Weight 2.627 pounds per 1000 ft. for No. 22 gauge single and 1.815 pounds per 1000 ft. for No. 24 gauge single.

D Type Wire

Designed primarily for use in circuits above 48 volts in moisture-proof installations.

Solid tinned enameled conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in Nos. 20 and 22 gauges; singles, pairs, triples and quads and in various colors.

Weight 4.040 pounds per 1000 ft. for No. 20 gauge single and 2.732 pounds per 1000 ft. for No. 22 gauge single.

G Type Wire

Designed primarily for use in surface wiring. Solid tinned conductors, double cellulose acetate yarn serving and cotton braid, wax impregnated.

Obtainable in Nos. 22 and 24 gauges; singles only and in various colors.

Weight 3.094 pounds per 1000 ft. for No. 22 gauge and 2.313 pounds per 1000 ft. for No. 24 gauge.

H Type Wire

Designed primarily for wiring telephone sets and for miscellaneous apparatus strapping.

Tinned stranded conductors, double cellulose acetate yarn servings, cotton braid, lacquer coated.

Obtainable in No. 22 gauge; singles only and in various colors.

Weight 3.192 pounds per 1000 ft. for No. 22 gauge.

J Type Wire

Designed primarily for use as strap wire.

Solid tinned conductors, double cotton braid, asphaltic or wax impregnation.

Obtainable in Nos. 18, 20, 22 and 24 gauges; singles only; black only.

Weight per 1000 ft. for wire various gauges.

No. 18.... 6.636 pounds No. 22.... 3.381 pounds
No. 20.... 4.664 pounds No. 24.... 2.559 pounds

K Type Wire

Designed primarily for cross-connecting relay frames.

Solid tinned conductors, double cellulose acetate yarn servings and cotton braid, lacquer coated.

Obtainable in Nos. 22 and 24 gauges; singles, pairs and triples and in various colors.

Weight 2.766 pounds per 1000 ft. for No. 22 gauge single and 2.341 pounds per 1000 ft. for No. 24 gauge single.

M Type Wire

Designed primarily for wiring carrier terminating equipment.

Solid tinned conductors, double cellulose acetate yarn servings and cotton braid, lacquer coated.

Obtainable in No. 22 gauge; singles, pairs and triples and in various colors.

Weight 3.229 pounds per 1000 ft. for No. 22 gauge single.

P Type Wire

Designed primarily for use where a shielded wire is required in high grade transmission circuits.

Solid tinned enameled conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in No. 22 gauge; singles, pairs and triples and in various colors.

A No. 22 gauge tinned copper ground wire is laid longitudinally with the insulated single, pair or triple conductors and the combination is covered with a braided shield of tinned copper wire, paper tape and slate colored cotton braid.

Weight 10.832 pounds per 1000 ft. for No. 22 gauge single.

AA Type Wire

Designed primarily for wiring rectifiers.

Tinned stranded conductors, double nylon yarn and single cotton servings, cotton braid, lacquer coated.

Obtainable in Nos. 12, 14, 16, 18, 20 and 22 gauges; singles and pairs and in various colors.

Weight per 1000 ft. for single wire various gauges.

No. 12 ....25.73 pounds	No. 18 ....8.65 pounds
No. 14 ....17.19 pounds	No. 20 ....6.30 pounds
No. 16 ....11.95 pounds	No. 22 ....5.41 pounds

AB Type Wire

Designed primarily for wiring amplifiers and lead out wire for coils.

Tinned stranded conductors, double nylon yarn and single cotton servings, cotton braid, wax impregnated.

Obtainable in Nos. 12, 14, 16, 18, 20 and 22 gauges; singles and pairs and in various colors.

Obtainable unimpregnated when specified.

Paired impregnated wire obtainable with a cotton braid and a braided copper shield, when specified.

Weight per 1000 ft. for single wire various gauges.

No. 12 ....26.49 pounds	No. 18 ....9.18 pounds
No. 14 ....17.85 pounds	No. 20 ....6.79 pounds
No. 16 ....12.54 pounds	No. 22 ....5.41 pounds

AC Type Wire

Designed primarily for use as quadded switch-board wire.

Solid tinned conductors, double cellulose acetate yarn, single cotton servings, lacquer coated.

Obtainable in No. 22 gauge in multiple twin quads and in various color combinations.

Weight per 1000 ft. No. 22 gauge 11.21 pounds.

AD Type Wire

Designed primarily for use as quadded switch-board wire.

Solid tinned enameled conductors, double cellulose acetate yarn, single cotton servings, lacquer coated.

Obtainable in No. 22 gauge in multiple twin quads and in various color combinations.

Weight per 1000 ft. No. 22 gauge 11.529 pounds.

AF Type Wire

Designed primarily for use in transmission networks.

Solid tinned conductors, double cellulose acetate yarn servings, cotton braid, wax impregnated.

Obtainable in Nos. 20, 22 and 24 gauges; singles and pairs and in various colors.

Weight per 1000 ft. for single wire various gauges.

No. 20	4.68 pounds
No. 22	3.40 pounds
No. 24	2.57 pounds

AG Type Wire

Designed primarily for use in filter networks and as lead-out wire for coils.

Tinned stranded conductors, double cellulose acetate yarn servings, cotton braid, wax impregnated.

Obtainable in No. 22 gauge singles only and in various colors.

Weight per 1000 ft. No. 22 gauge 3.43 pounds.

AK Type Wire

Designed primarily for use in carrier telephone systems.

Solid tinned enameled conductor, double cellulose acetate yarn servings, cotton braid, lacquer coated.

Obtainable in No. 16 gauge; singles only and in various colors.

The conductor is covered with a braided shield of tinned copper wire.

Weight per 1000 ft. No. 16 gauge 17.090 pounds.

AM Type Wire

Designed primarily as a slow burning wire for use as battery leads in local cables.

Solid tinned enameled conductors, double cellulose acetate yarn servings, cotton braid, lacquer coated.

Obtainable in Nos. 14, 16, 18, 19, 20 and 22 gauges; singles, pairs, triples, quads and 5-wire and in various colors.

Weight per 1000 ft. for single wire various gauges.

No. 14 ...	14.68 pounds	No. 19	5.49 pounds
No. 16 ...	9.74 pounds	No. 20	4.61 pounds
No. 18 ...	6.62 pounds	No. 22	3.31 pounds

AP Type Wire

Designed primarily for use as a support in local cable forms.

Solid galvanized iron wire, black cotton braid, wax impregnated.

Obtainable in No. 12 BWG, black only. Not intended to be used as an electrical conductor.

Weight per 1000 ft. 34.94 pounds.

AR Type Wire

Designed primarily for use in bank wiring in mechanized assembly.

Tinned stranded conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in No. 24 gauge; singles only, in red and blue colors.

Weight per 1000 ft. No. 24 gauge 1.918 pounds.

BD Type Wire

Designed primarily for use in telephone set wiring and key telephone set cords.

Tinned stranded conductors, colored cotton serving for color designation and transparent thermoplastic covering.

Obtainable in No. 22 gauge; singles only and in various colors.

Weight per 1000 ft. No. 22 gauge 3.6 pounds.

BF Type Wire

Designed primarily for use where a shielded wire is required in carrier installations.

Solid tinned conductors, extruded covering of colored polyethylene.

Obtainable in No. 22 gauge; singles, pairs or triples in the following solid colors:

Blue, Orange, Green, Brown, Slate, White, Red and Black.

The single, pair or triple polyethylene conductors are covered with a braided shield of tinned copper wire, paper tape and slate colored cotton braid.

Weight per 1000 ft. for No. 22 gauge single 10.915 pounds.

BG Type Wire

Designed primarily for surface wiring.

Solid tinned conductors, thermoplastic, single cotton serving, lacquer coated.

Obtainable in Nos. 20, 22 and 24 gauges; singles, pairs, triples and quads in various colors.

Weight per 1000 ft. for single wire various gauges.

No. 20	.....4.742	pounds
No. 22	.....3.068	pounds
No. 24	.....2.242	pounds

BH Type Wire

Designed primarily for lead-out wire.

Solid tinned conductors, thermoplastic, cotton braid, lacquer coated.

Obtainable in Nos. 20, 22 and 24 gauges; singles, pairs, triples and quads in various colors.

Weight per 1000 ft. for single wire various gauges.

No. 20	.....5.205	pounds
No. 22	.....3.617	pounds
No. 24	.....2.777	pounds

BK Type Wire

Designed primarily for use where a shielded wire is required for power equipment.

Solid tinned enameled conductors, double cellulose acetate yarn servings, cotton braid, lacquer coated.

Obtainable in Nos. 16 and 20 gauge; singles, pairs or triples and in various colors.

A No. 22 gauge tinned copper ground wire is laid longitudinally with the single, pair or triple insulated conductors and the combination is covered with a braided shield of tinned copper wire, paper tape and slate colored cotton braid.

Weight per 1000 ft. for single wire various gauges.

No. 16	.....21.022	pounds
No. 20	.....16.513	pounds

BM Type Wire

Designed primarily for use in filter networks. Tinned stranded conductors, double nylon yarn servings and cotton braid.

Obtainable in No. 27 gauge; singles only and in various colors.

Obtainable wax impregnated when specified.

Weight per 1000 ft. No. 27 gauge 1.493 pounds.

Cross-Connecting or Distributing Frame Jumper Wire

"L" TYPE

Designed primarily for use as distributing frame wire, usually referred to as "jumper wire."

Solid tinned enameled conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in Nos. 20 and 22 gauges; singles, pairs, triples and quads, in the colors shown below. Furnished in 1500-foot coils.

Code No.	Size (AWG Gauge)	No. of Conductors	Weight (Pounds) per 1000 Foot	Colors	Replaces
L20S	20	1	4.018	Brown	E20S and E22S
L20P	20	(a) 2	8.052	Brown, *Black	.....
L22M	22	(b) 4	10.940	Black, Black-white, Red, Green	L20F
L22P	22	(a) 2	5.459	White, Black	E22P and L20P
L22T	22	(a) 3	8.197	White, Black, Red	E22T and L20T
L22F	22	(a) 4	10.940	White, Red, Black, Green	E22F

* Has a single thread brown tracer.

(a) Conductors are twisted together in a spiral.

(b) The black and black-white conductors form one twisted pair; the red and green conductors form another twisted pair and the two pairs are twisted together to form a quad.

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