



National Wire & Cable
Custom Cable Manufacturing

**Shielded &
Coaxial Cable**
Catalog

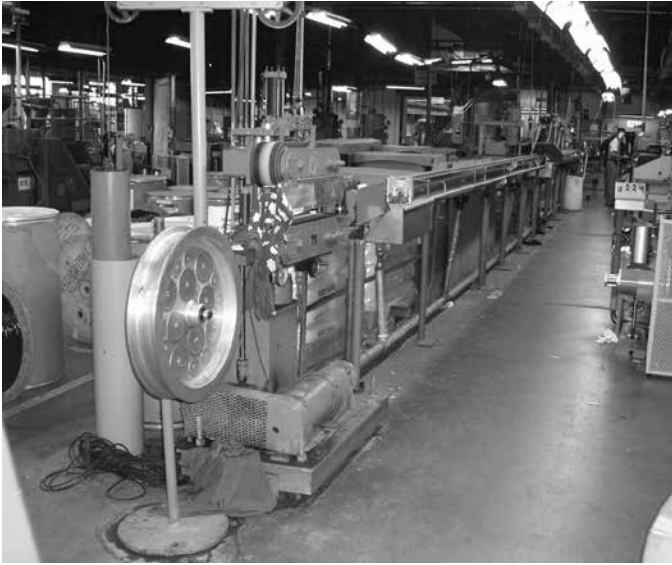


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SHIELDED CABLE

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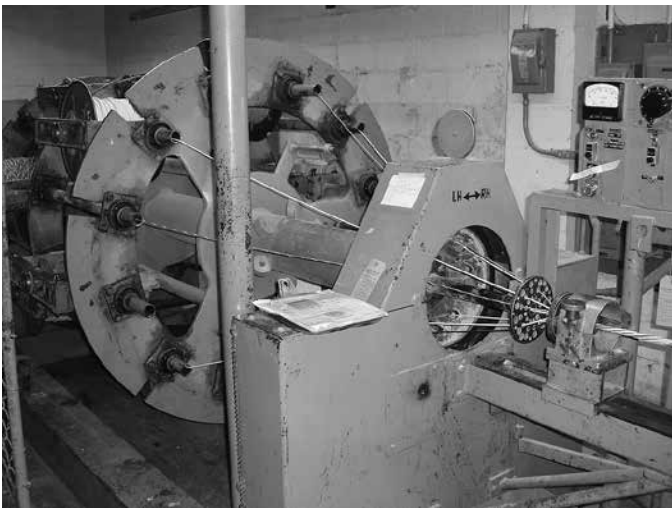


WIRE EXTRUSION

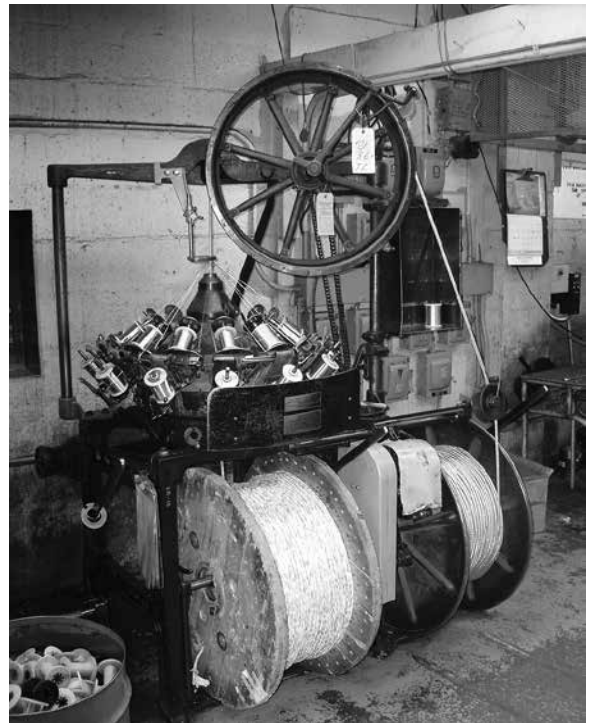
JACKET EXTRUSION



SHIELDING



CABLING



SHIELDED INSTRUMENT CABLE

MIL-C-27072

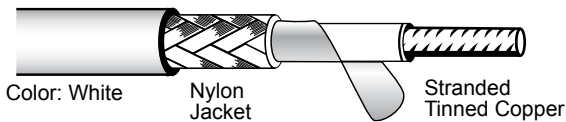
National Wire & Cable Corp. manufactures a line of shielded instrument cables for MILITARY and UL applications.

All insulated wires use double-insulated (ie: Nylon-armored over PVC vinyl primary insulation) stranded tinned copper wires per MIL-W-16878/17. (BN) All 19 strand. Shields are full Military 90% min. coverage tinned copper braid. Overall sheath is tough, flexible white PVC compound.

Meets MIL-C-27072 as subcable.**(105°C, 600 volt)
Standard putups: 500 & 1000 ft. on no-deposit reels. Special lengths to order.

**Using type I wire, shielded, with Class B jacket

NOTE: Can be supplied cabled into highly flexible multicables with overall shield and sheath. See our type NTS/NTP cable families. Meets MIL-W-16878/17 UL Style 1004 for 80°C Service, and UL Style 1005 for 90°C Service, except where noted.



Thermoplastic Jacket Overall Braided Tinned Copper Shield Thermoplastic Insulation

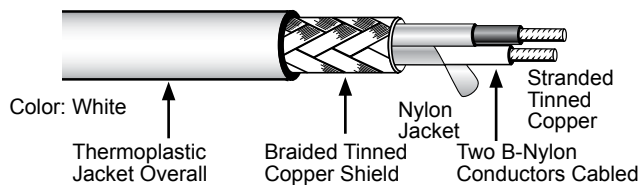
SINGLE CONDUCTOR SHIELDED AND JACKETED

- -54°C to +105°C
- 600 Volts (Working)

The color table for single conductors can be viewed in the National Wire Cable Designers Guide, page 7-12.

CONDUCTOR INSULATION COLOR: WHITE

GAUGE OF CONDUCTORS	PART NO.	NUMBER OF STRANDS PER COND.	GAUGE OF STRANDS	O/A DIAM. OF STRANDED CONDUCTOR		NOMINAL VALUES OF CAPACITANCE PER FOOT		NOM. WT.	
				IN.	mm	WIRE- WIRE pt/FT	WIRE-SHIELD pt/FT	LBS per 1000-ft	Kg/Km
26	NB1938N1SJ	19	38	.087	2.21	-	65.1	6.2	9.2
24	NB1936N1SJ	19	36	.097	2.46	-	74.8	8.1	12.1
22	NB1934N1SJ	19	34	.110	2.79	-	82.8	9.6	14.3
20	NB1932N1SJ	19	32	.120	3.05	-	101.0	15.1	22.5
18	NB1930N1SJ	19	30	.123	3.12	-	115.0	15.1	22.5
16	NB1929N1SJ	19	29	.134	3.40	-	123.0	18.0	26.8



Color: White Thermoplastic Jacket Overall Braided Tinned Copper Shield Nylon Jacket Stranded Tinned Copper Two B-Nylon Conductors Cabled

TWO CONDUCTOR, TWISTED SHIELDED AND JACKETED

- -54°C to +105°C
- 600 Volts (Working)

CONDUCTOR INSULATION COLORS: BLACK & WHITE or RED & BLUE

GAUGE OF CONDUCTORS	PART NO.	NUMBER OF STRANDS PER COND.	GAUGE OF STRANDS	O/A DIAM. OF STRANDED CONDUCTOR		NOMINAL VALUES OF CAPACITANCE PER FOOT		NOM. WT.	
				IN.	mm	WIRE- WIRE pt/FT	WIRE-SHIELD pt/FT	LBS per 1000-ft	Kg/Km
26	NB1938N2SJ	19	38	.150	3.81	31.2	56.9	14.	20.8
24	NB1936N2SJ	19	36	.155	3.94	35.9	65.5	18.	26.8
22	NB1934N2SJ	19	34	.170	4.32	39.7	72.4	21.	31.2
20	NB1932N2SJ	19	32	.190	4.83	48.5	88.4	27.	40.2
18	NB1930N2SJ	19	30	.215	5.46	55.1	101.0	32.	47.6
16	NB1929N2SJ	19	29	.235	5.99	59.0	123.0	35.	52.1

*Note: Other conductor combinations available on request

SHIELDED INSTRUMENT CABLE

MIL-C-27072

National Wire & Cable Corp. manufactures a line of shielded instrument cables for MILITARY and UL applications.

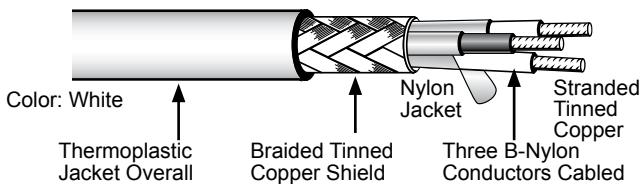
All insulated wires use double-insulated (ie: Nylon-armored over PVC vinyl primary insulation) stranded tinned copper wires per MIL-W-16878/17. (BN) All 19 strand. Shields are full Military 90% min. coverage tinned copper braid. Overall sheath is tough, flexible white PVC compound.

Meets MIL-C-27072 as subcable. ** (105°C, 600 volt)
Standard putups: 500 & 1000 ft. on no-deposit reels. Special lengths to order.

**Using type I wire, shielded, with Class B jacket

NOTE: Can be supplied cabled into highly flexible multicables with overall shield and sheath. See our type NTT/NTQ cable families.

TECHNICAL SPECIFICATIONS	
Military:	600 VAC Working
UL Agency:	300 VAC Working
Spark Test:	Passes 3400 VAC Stress on every wire.
Hipot Test:	Passes 1500 VAC as finished cable.
Puncture:	Nominal 5000 VAC as insulated.
Temp:	Military: working -40°C to +105°C UL Agency: working -40°C to +80°C
Cold Bend:	Cables can be formed into a circle diameter of 6 cable diameters to temperatures as low as -20°C. Recommended flex diameters should be greater than 20 cables diameters for bending at -40°C.
Leakage:	200 megohms/1000 feet min. @ 500 VDC from any conductor to all else in cable. (@25°C). 10 megohms/1000 feet @ 500 vdc from overall shield through sheath to water bath. (@25°C)
Capacitance	See tables below

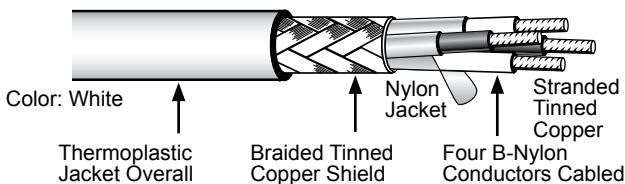


THREE CONDUCTOR SHIELDED AND JACKETED

- -54°C to +105°C
- 600 Volts (Working)

CONDUCTOR INSULATION COLOR: WHITE

GAUGE OF CONDUCTORS	PART NO.	NUMBER OF STRANDS PER COND.	GAUGE OF STRANDS	O/A DIAM. OF STRANDED CONDUCTOR		NOMINAL VALUES OF CAPACITANCE PER FOOT		NOM. WT.	
				IN.	mm	WIRE- WIRE pt/FT	WIRE-SHIELD pt/FT	LBS per 1000-ft	Kg/Km
26	NB1938N3SJ	19	38	.154	3.91	29.6	53.3	16.2	24.1
24	NB1936N3SJ	19	36	.165	4.19	34.0	61.4	21.0	31.2
22	NB1934N3SJ	19	34	.178	4.52	37.7	67.9	23.3	34.7
20	NB1932N3SJ	19	32	.199	5.05	46.0	82.8	29.8	44.3
18	NB1930N3SJ	19	30	.229	5.82	52.3	94.2	39.5	58.8
16	NB1929N3SJ	19	29	.254	6.45	55.9	101.0	48.0	71.4



FOUR CONDUCTOR SHIELDED AND JACKETED

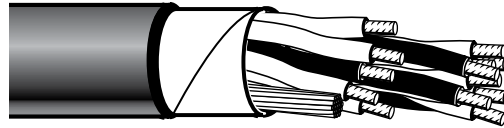
- -54°C to +105°C
- 600 Volts (Working)

CONDUCTOR INSULATION COLORS: BLACK, WHITE RED, GREEN

GAUGE OF CONDUCTORS	PART NO.	NUMBER OF STRANDS PER COND.	GAUGE OF STRANDS	O/A DIAM. OF STRANDED CONDUCTOR		NOMINAL VALUES OF CAPACITANCE PER FOOT		NOM. WT.	
				IN.	mm	WIRE- WIRE pt/FT	WIRE-SHIELD pt/FT	LBS per 1000-ft	Kg/Km
26	NB1938N4SJ	19	38	.166	4.22	27.3	54.0	19.0	28.3
24	NB1936N4SJ	19	36	.178	4.52	31.4	62.1	22.2	33.0
22	NB1934N4SJ	19	34	.195	4.95	34.8	68.7	28.0	41.7
20	NB1932N4SJ	19	32	.211	5.36	42.4	83.9	35.7	53.1
18	NB1930N4SJ	19	30	.240	6.10	48.2	95.4	48.1	71.6
16	NB1929N4SJ	19	29	.262	6.65	51.6	102.0	58.4	86.6

*Note: Other conductor combinations available on request

DIGITAL DATA TRANSMISSION CABLES



Low Voltage Computer Cable

- D-200 Series are multi-pair cables of 110-ohm twisted pairs, group shielded
- UL AWM Style 2835 60°C, 30 volt

Meets E.I.A. Standards RS-422, RS-423, RS-485

THE D-200 SERIES CABLE ARE MULTIPLE-PAIR FLEXIBLE CABLES DESIGNED FOR TRANSMISSION OF DIGITAL PULSE SIGNALS.

DESIGN FEATURES OF THE D-200 SERIES DIGITAL DATA CABLE

Unlike conventional flexible cable construction, the primary features offered by the D-200 series data cable are the high and accurately controlled characteristic impedance of every pair, regardless of its position in the cable and special geometry chosen to reduce crosstalk.

ADVANTAGES

1. Less Crosstalk and noise from mismatches due to consistent impedance along the cable.
2. Special geometry and pair construction provide exceptionally uniform capacitance between pair wires, reducing crosstalk.

STANDARD DATA CABLE CONSTRUCTIONS

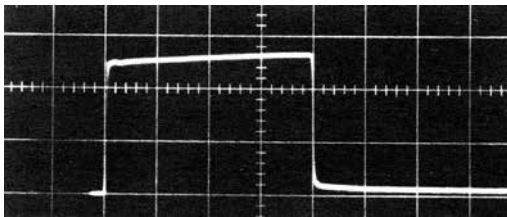
BLACK JACKET	GREY JACKET	NO. OF PAIRS	COND.AWG.	DELAY NS/FT	CABLE DIAMETER		WEIGHT	
					Inches	MM	Lbs per 1000 ft.	Kg/Km
D-200-4	D-200-4G	4	24	1.61	.315"	8.00	41.	61.0
D-200-7	D-200-7G	7	24	1.61	.410"	10.41	73.	109.0
D-200-12	D-200-12G	12	24	1.61	.455"	11.56	96.	143.0
D-200-15	D-200-15G	15	24	1.61	.510"	12.95	120.	179.0
D-200-20	D-200-20G	20	24	1.61	.635"	16.13	160.	238.0
D-200-24	D-200-24G	24	24	1.61	.660"	16.76	180.	268.0
D-200-27	D-200-27G	27	24	1.61	.690"	17.53	210.	312.0
D-200-30	D-200-30G	30	24	1.61	.710"	18.03	230.	342.0
D-200-33	D-200-33G	33	24	1.61	.750"	19.05	250.	372.
D-200-42	D-200-42G	42	24	1.61	.840"	21.34	280.	417.0
D-200-50	D-200-50G	50	24	1.61	.910"	23.10	320.	476.0

TECHNICAL DATA

Characteristic	Balanced**	Single-endedΔ
Characteristic Impedance	110. ohms ±5%	78. ohms ± 4%
Capacitance	14. pf/ft (46. PF/MTR)	21. pf/ft (68.9 PF/MTR)
Signal Delay	1.61 ns/ft (5.28 NS/MTR)	1.61 ns/ft (5.28 NS/MTR)
DC Resistance/100 ft.	5.6 ohms loop	2.8 ohms
Insulation Breakdown	6. KV min. DC	6. KV min DC
Insulation Resistance	>1000. megohms/M'	>1000. megohms/M'
Temperature Range	-20°C up to +80°C (60°C for U.L.)	
Min. Bend Radius	6 x cable diameter	

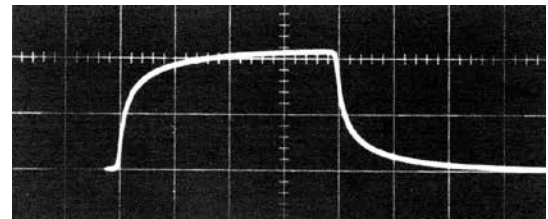
The Photos below (for a 1.25 megabit clock rate) show typical waveforms.

INPUT PULSE



Horizontal: 200. ns/cm
Vertical: 2 volts/cm

OUTPUT PULSE at 500 FT.

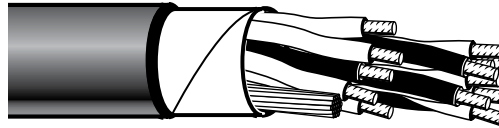


Horizontal: 200. ns/cm
Vertical: 2 volts/cm

Pulse transmission loss in data cables causes a moderate amplitude loss, with definite rounding of the leading and trailing edges. We recommend the use of differential (balanced) pair drivers and differential-input pair receivers for lowest crosstalk and best pulse shape. Where the system uses differential (balanced) drive and receive, all D-200 pairs exhibit 110-ohm characteristic impedance. Where the system uses single ended (unbalanced) drive and receive, all D-200 pairs exhibit 78-ohm impedance. Since these line receivers cannot discriminate between noise and the desired signal, crosstalk may limit the cable length over which transmission is reliable. Although the use of balanced drive and differential line reception will avoid most noise problems, there can be installations where the expected external noise is unknown but assumed to be very great. Here the use of data cables having individually-shielded pairs may be considered as conservative engineering practice. The assurance of a lower received noise may justify the increased size and cost.

The D-210 series cables (using individual shields over pairs) are recommended for high noise or long run application. See the following page.

DIGITAL DATA TRANSMISSION CABLES



Low Voltage Computer Cable

- D-210 Series
- UL AWM Style 2835

Characteristic	Balanced**	Single-ended
Impedance	110. ohms \pm 10%	63. ohms \pm 7%
Capacitance	14. pf/ft (46. pf/mtr)	23. pf/ft (68.9 pf/mtr)
Signal Delay	1.61 ns/ft (5.28 ns/mtr)	1.61 ns/ft (5.28 ns/mtr)
DC Resistance/100 ft.	5.6 ohms loop	5.6 ohms loop
Insulation Breakdown	6. KV DC	6. KV DC
Insulation Resistance	>1000. megohms/1000 ft	>1000. megohms/1000 ft
Temperature Range	-20°C up to +75°C (+60°C for U.L. 2835)	
Min. Bend Radius	9 x cable diameter	

Cabled multiple D-210 individually shielded & jacketed 110-ohm pairs

Part No.	No. of Pairs	Cond. AWG /Strand	Diameter Inches	Diameter mm	O'all TC Braid Shield	O' all Sheath
D-210-1	1	24(7)	.220	5.6	NO	PVC
D-210-12	12	24(7)	.980	24.9	NO	PVC
D-210-15	15	24(7)	1.06	26.9	NO	PVC
D-210-20	20	24 (7)	1.20	30.5	NO	PVC

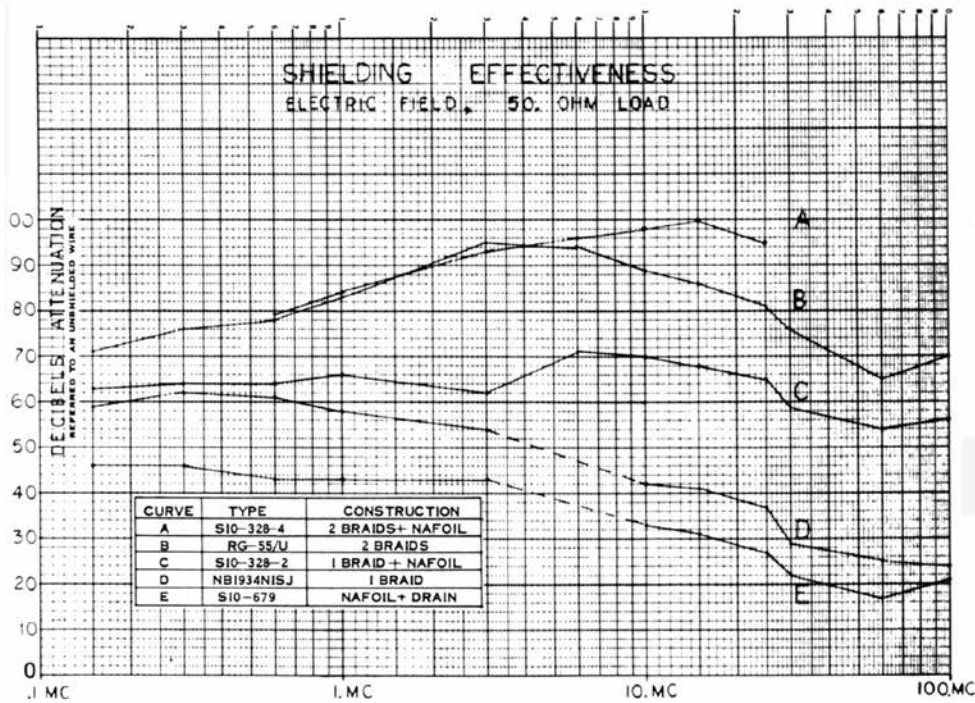
D-210-1-RF	1	24(7)	.240	6.1	YES	PVC
D-210-12-RF	12	24(7)	1.01	25.7	YES	PVC
D-210-15-RF	15	24(7)	1.09	27.7	YES	PVC
D-210-20-RF	20	24 (7)	1.23	31.2	YES	PVC

Individual pairs are identified by use of a colored spiral stripe on the white PVC jacket. All pairs have one green wire and one white (natural) wire. Pair insulation is polyethylene.

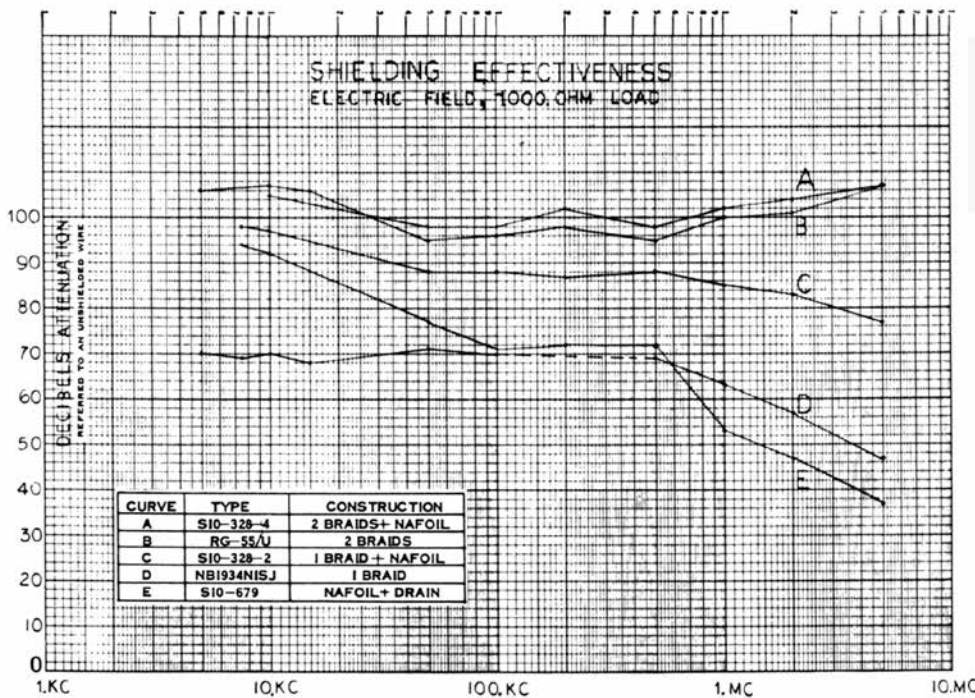
For high-noise and long run applications, National has developed the D-210 series individually-shielded & jacketed 110-ohm data pair cables. Pair shields are aluminum-polyester foil with drain wire.

An additional overall isolated tinned-copper shield braid may be specified by the suffix-RF on the part number.

SHIELD EFFECTIVENESS



NOTE:
The zero db. Reference Level is the field from the unshielded wire.



These graphs are of test measurements made on various shielded wires. They are intended to assist the designer in the proper choice of shielding for various applications.

the data is obviously not offered as being an absolute measurement of shield performance. It may be noted that the graphs include irregularities which are due to variations in equipment calibration. However, for comparative performance of one shielding method over another, the information may be of value.

The performance of a NAFOIL shield over a conventional braided shield below 100 KC may be noted in the calibration high impedance load.

Contact National Wire & cable engineering department for information concerning your shielding problems.

HOW TO SPECIFY PAIRS

WE RECOMMEND THE FOLLOWING FORMAT WHEN SPECIFYING TWISTED PAIRS AND TRIOS:

EXAMPLE

NB1934U-(2 A)-(0/2)-(0/4)

Base color/stripe color
Base color/stripe color
Twisting code (see key below)
No. of wires to be twisted (2 for pairs, etc.)
Part No. for type of insulated wire

Part No. (see "How to Specify Wire", Page 12)

KEY TO TWISTING CODE

- A = SHORT TWINNER LAY
- B = STANDARD TWINNER LAY
- C = SHORT PLANETARY LAY
- D = STANDARD PLANETARY LAY

THE "SHORT" LAY IS DEFINED AS EQUAL TO $5 \times D \times N$ AND THE "STANDARD" LAY IS DEFINED AS $10 \times D \times N$ WHERE D = CONDUCTOR DIAMETER, N = NO. OF CONDUCTORS

DIFFERENCES IN PAIR TWISTING

THE MOST COMMON COMMERCIAL PAIR-FORMING MACHINES ARE CALLED "TWINNERS." THIS TYPE OF PAIR-FORMING IS THE LEAST EXPENSIVE WAY TO FORM TWISTED PAIRS. HOWEVER, PAIRS FORMED ON THIS TYPE OF EQUIPMENT HAVE BEEN KNOWN TO EXPERIENCE DEFORMATION OF THE STRANDED COPPER, STRAIN IN THE INSULATION AND POOR ELECTRICAL BALANCE.

THE SUPERIOR METHOD OF PAIR-FORMING IS BY USE OF A PLANETARY OR TUBULAR CABLING MACHINE IN SUCH A MANNER THAT NO RESIDUAL TWIST IS IMPARTED TO THE INDIVIDUAL WIRES FORMING THE TWISTED GROUP. THIS RESULTS IN BETTER ELECTRICAL BALANCE AND IMPROVES FLEXIBILITY.

NATIONAL IS EQUIPPED FOR ALL OF THE ABOVE DESCRIBED TECHNIQUES. CHOOSE THE METHOD BEST SUITED FOR YOUR PARTICULAR APPLICATION.