

S Ingle Mode Fiber Patch Cord and Pigtail

1. General :

- 1.1 This specification covers the requirements of the standard patch cord and pigtail to be supplied to TOT Public
- 1.2 Company Limited (TOT). The patch cord shall be used for optical fiber jumpering between FDF (Fiber Distribution Frame) on patching panel and equipment. The pigtail application shall be used to splice at non-connector end with incoming cable and the another end of pigtail coupling with connector shall be terminated to patching panel of FDF.
- 1.3 This patch cord and pigtail shall be designed under indoor environmental condition which used in TOT exchange or building. The primary design consideration of the cable shall protect the optical fiber from environmental and mechanical stresses. The patch cord and pigtail required as this specification.
- 1.4 Abbreviation; FC/UPC : Fiber Connector/Ultra polished Physical Contact.
SC/UPC : Subscription channel Connector/Ultra polished
Physical Contact
LC/UPC : Lucent/Ultra polished Physical Contact
- 1.5 Full details of this following information shall be provided in technical bidding proposal by bidder, Failure in this Section (1.4) the proposal shall be disqualified.

2. Specific Requirements

The patch cord and pigtail shall composed of fiber cord (cable) and connector kit assemblies as shown in Fig. 1

2.1 fiber Cord requirements

2.1.1 Fiber Characteristics

All fiber characteristics of the fiber cord shall be, at least, in accordance with the ITU-T Recommendation G.652.D, TOT specification no. OES-004-030-XX (latest issue) single Mode Optical Fiber Cable and shall be as follows.

Cladding Diameter	125 μ m \pm 1 μ m
Core-Clad Concentricity Error:	\leq 0.5 μ m

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Cladding Non-Circularity: $\leq 1.0\%$

Mode Field Diameter @ 1310 nm: $9.2 \mu\text{m} \pm 0.4\mu\text{m}$

Cable Cut-Off Wavelength (λ_{cc}): $\leq 1260 \text{ nm}$

Attenuation Coefficient:

$\leq 0.35 \text{ dB/km @ } 1310 \text{ nm}$

$\leq 0.35 \text{ dB/km @ } 1383 \text{ nm}$

$\leq 0.21 \text{ dB/km @ } 1550 \text{ nm}$

$\leq 0.23 \text{ dB/km @ } 1625 \text{ nm}$

PMD coefficient : $\leq 0.2 \text{ ps} / \sqrt{\text{km}}$

Maximum Attenuation with –

Macrobending 2 turns 30 mm radius : $\leq 0.10 \text{ dB @ } 1550 \text{ nm}$

2.1.2 Fiber Cord Physicals

Structure & Materials :

Outer jacket and boot: Polymer or polyethylene (PE) filled with FR (Flame Retardant, UL94-V0), LS(Low Smoke) and ZH(Zero Halogen or Halogen Free), Fiber cord jacket overall Diameter of FC, SC and LC shall be 2.4mm, 2.0mm and 0.9mm respectively, Boot shall be designed to be applicable For cord strain relief.

Jacket Color : Yellow

Boot Color : Yellow, Blue, Beige See Fig. 2

Strain relief : Aramid yarns (fully completely cover around the tight buffer, no adhesion to jacket or buffer tube), as Fig.1

Tight buffer tube : Jelly free, tight buffer tube $\Phi 900\mu\text{m}$

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(0.9mm), non-bucking, made from TPE
(Thermo plastic elastomer) or PBT
(Polybutylen terephthalate) or PA
(Polyamide) or equivalent, filled with FR
(Flame Retardant, UL94-V0), in Yellow
Color.

2.2 Connector Kit Assembly Requirements

Connector kit assembly shall be at least composed of followings:

FC/UPC: connector body (housing), strain relief crimp,
connector key, ferrule and dust cap (cover).

SC/UPC, LC/UPC connector body (housing), connector
subassembly, strain relief crimp, ferrule and
Dust cap (cover).

Note : In case of duplex connector SC,LC), the connector body
(housing) shall be duplex clip connector.

2.2.1 Materials

1) Metallic materials

All metallic parts of connector kit assembly shall be resistant to the corrosive influences they may encounter in normal use. No signs of corrosion shall be visible after 7 days exposure to non-acidic salt fog spray (5% NaCl, 35°C) according to IEC 61300-2-26. If stainless steel used, it shall be made of 300 series stainless steel or better corrosion resistance material. The metallic part of galvanized steel or other steel materials that have corrosion resistance property lower than 300 series stainless steel are not allowable.

2) Plastic materials

All plastic parts of connector kit assembly (except dust cap) shall be made of flame retardant material with flammability rating of V-0 according to UL 94 standard.

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2.2.2 Specific materials

1) FC/UPC

Connector body : Ni (nickel) plated brass or stainless steel
(300 series grade) or better corrosion
Resistance material.

Ferrule : Zirconia Ceramic

2) SC/UPC, LC/UPC

Connector body: PBT material with flame retardant
UL94-V0 or equivalent plastic material

Ferrule: Zirconia Ceramic

3. Performance Requirements

Test item	Conditions	Requirements	References
3.1 Insertion Loss (connector only)	<ul style="list-style-type: none">Source wavelength 1310 nm \pm 10nm 1550 nm \pm 10 nm	<ul style="list-style-type: none">IL \leq 0.2 dB	IEC 61300-3-34 Method 2
3.2 Return Loss	<ul style="list-style-type: none">Source wavelength 1310 nm \pm 10nm 1550 nm \pm 10 nm	<ul style="list-style-type: none">RL \geq 50 dB	IEC 61300-3-6

4. Mechanical Requirements

The propose single mode fiber patch cord and pigtail in this specification shall be in accordance with Section 4.1 to 4.6 which all tests in Section 4.1 to 4.6 shall be run in sequence. Unless otherwise specified, the measurement of insertion loss (IL) and return loss (RL) shall be tested at 1310nm \pm 10nm and 1550nm \pm 10nm.

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Test Item	Conditions	Requirements	References
4.1 Appearance	<ul style="list-style-type: none"> ✦ Exam the product with the naked eye 	<ul style="list-style-type: none"> ✦ No deformation, crack, scratch, flaw, stain, looseness and burr. 	-
4.2 Tensile Strength	<ul style="list-style-type: none"> ✦ Patch cord maximum tensile strength: 70 N • Pigtail maximum tensile strength: 5 N • Rate : 0 N to full load in 15 sec • Point of application: 500 mm from plug • Duration: 1 minute 	<ul style="list-style-type: none"> ✦ $\Delta IL \leq 0.2$ dB ✦ $\Delta RL \leq 2$ dB • Appearance 	IEC-61300-2-4
4.3 Endurance	<ul style="list-style-type: none"> • Mating and demating 500 times 	<ul style="list-style-type: none"> ✦ $\Delta IL \leq 0.2$ dB ✦ $\Delta RL \leq 2$ dB • Appearance 	IEC-61300-2-2
4.4 Strength of Coupling Mechanism	<ul style="list-style-type: none"> ✦ Patch cord maximum tensile strength: 40 N • Rate: 0 N to full load in 15 sec • Point of application: 500 mm from plug • Duration: 1 minute 	<ul style="list-style-type: none"> ✦ $\Delta IL \leq 0.2$ dB ✦ $\Delta RL \leq 2$ dB • Appearance 	IEC-61300-2-6
4.5 Torsion	<ul style="list-style-type: none"> • Maximum load: 15 N for patch cord and 2 N for pigtail • Cable clamp distance: 200 mm from the tip • Torsion: +180°/-180° • Cycles: 25 	<ul style="list-style-type: none"> ✦ $\Delta IL \leq 0.2$ dB ✦ $\Delta RL \leq 2$ dB • Appearance 	IEC-61300-2-5
4.6 Strippability	<ul style="list-style-type: none"> • Strip the outer jacket out of patch cord in one action (one time) ✦ Strip tight buffer tube out of fiber in one action (one time) 	<ul style="list-style-type: none"> ✦ Minimum length of the outer jacket shall be capable to be stripped to 1 meter • Minimum length of the tight buffer tube shall be capable to be stripped to 25 mm 	-

5. Marking

- 5.1 The patch cord shall be marked on the connector or the boot or the fiber cord (jacket) with manufacturer's name or trademark.
- 5.2 The patch cord jacket shall be provided length marking at intervals of approximately 1 meter along the whole patch cord length. The accuracy of the measurement of length marking shall be held within the limits of $\pm 1\%$
- 5.3 The patch cord jacket identification marking.

Each length marking interval, the identification marking shall be permanently identified as the followings:

- Manufacturer name or trade mark
- Date month and year (C.E) of fiber cord manufacture or finished product manufacture.
- Type of fiber and jacket, O.D. such as SMOF...PE-FR-LS-ZH, O.D, etc.

- 5.4 For traceability purpose, necessary information shall be placed on the patch cord for instance:- the trace label etc.

6. Packing and ordering information

The patch cord and pigtail shall be packed in a plastic bag or equivalent labeled to show the description, TOT code, contract number, batch number and name of supplier as same as labeling to show the description on the cardboard box.

The ordering information shall be as following in table below:-

TOT Code	Product Type	Boot Color	Min. Length(M)	Packing
10057949	FC to FC Patch Cord (SM)	Yellow	3	1 pc/Bag, 100 bag/box
10057950	FC to FC Patch Cord (SM)	Yellow	5	1 pc/Bag, 60 bag/box
10057951	FC to FC Patch Cord (SM)	Yellow	10	1 pc/Bag, 40 bag/box
10057952	FC to FC Patch Cord (SM)	Yellow	15	1 pc/Bag, 30 bag/box
10057953	FC to FC Patch Cord (SM)	Yellow	20	1 pc/Bag, 20 bag/box
10057954	FC to FC Patch Cord (SM)	Yellow	30	1 pc/Bag, 15 bag/box
10057955	FC to FC Patch Cord (SM)	Yellow	40	1 pc/Bag, 10 bag/box
10057956	SC to SC Patch Cord (SM)	Blue	3	1 pc/Bag, 100 bag/box
10057957	SC to SC Patch Cord (SM)	Blue	5	1 pc/Bag, 60 bag/box
10057958	SC to SC Patch Cord (SM)	Blue	10	1 pc/Bag, 40 bag/box
10057959	SC to SC Patch Cord (SM)	Blue	15	1 pc/Bag, 30 bag/box
10057960	SC to SC Patch Cord (SM)	Blue	20	1 pc/Bag, 20 bag/box
10057961	SC to SC Patch Cord (SM)	Blue	30	1 pc/Bag, 15 bag/box

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10057962	SC to SC Patch Cord (SM)	Blue	40	1 pc/Bag, 10 bag/box
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TOT Code	Product Type	Boot Color	Min. Length(M)	Packing
10059222	LC to LC Patch Cord (SM)	Beige	3	1 pc/Bag, 100 bag/box
10059223	LC to LC Patch Cord (SM)	Beige	5	1 pc/Bag, 60 bag/box
10059224	LC to LC Patch Cord (SM)	Beige	10	1 pc/Bag, 40 bag/box
10059225	LC to LC Patch Cord (SM)	Beige	15	1 pc/Bag, 30 bag/box
10059226	LC to LC Patch Cord (SM)	Beige	20	1 pc/Bag, 20 bag/box
10059227	LC to LC Patch Cord (SM)	Beige	30	1 pc/Bag, 15 bag/box
10059228	LC to LC Patch Cord (SM)	Beige	40	1 pc/Bag, 10 bag/box
10057963	FC to SC Patch Cord (SM)	Yellow to Blue	3	1 pc/Bag, 100 bag/box
10057964	FC to SC Patch Cord (SM)	Yellow to Blue	5	1 pc/Bag, 60 bag/box
10057965	FC to SC Patch Cord (SM)	Yellow to Blue	10	1 pc/Bag, 40 bag/box
10057966	FC to SC Patch Cord (SM)	Yellow to Blue	15	1 pc/Bag, 30 bag/box
10057967	FC to SC Patch Cord (SM)	Yellow to Blue	20	1 pc/Bag, 20 bag/box
10057968	FC to SC Patch Cord (SM)	Yellow to Blue	30	1 pc/Bag, 15 bag/box
10057969	FC to SC Patch Cord (SM)	Yellow to Blue	40	1 pc/Bag, 10 bag/box
10059229	FC to LC Patch Cord (SM)	Yellow to Beige	3	1 pc/Bag, 100 bag/box
10059230	FC to LC Patch Cord (SM)	Yellow to Beige	5	1 pc/Bag, 60 bag/box
10059231	FC to LC Patch Cord (SM)	Yellow to Beige	10	1 pc/Bag, 40 bag/box
10059232	FC to LC Patch Cord (SM)	Yellow to Beige	15	1 pc/Bag, 30 bag/box
10059233	FC to LC Patch Cord (SM)	Yellow to Beige	20	1 pc/Bag, 20 bag/box
10059234	FC to LC Patch Cord (SM)	Yellow to Beige	30	1 pc/Bag, 15 bag/box
10059235	FC to LC Patch Cord (SM)	Yellow to Beige	40	1 pc/Bag, 10 bag/box
10059236	SC to LC Patch Cord (SM)	Blue to Beige	3	1 pc/Bag, 100 bag/box
10059237	SC to LC Patch Cord (SM)	Blue to Beige	5	1 pc/Bag, 60 bag/box
10059238	SC to LC Patch Cord (SM)	Blue to Beige	10	1 pc/Bag, 40 bag/box
10059239	SC to LC Patch Cord (SM)	Blue to Beige	15	1 pc/Bag, 30 bag/box
10059240	SC to LC Patch Cord (SM)	Blue to Beige	20	1 pc/Bag, 20 bag/box
10059241	SC to LC Patch Cord (SM)	Blue to Beige	30	1 pc/Bag, 15 bag/box
10059242	SC to LC Patch Cord (SM)	Blue to Beige	40	1 pc/Bag, 10 bag/box

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TOT Code	Product Type	Boot Color	Min. Length(M)	Packing
10059243	FC to FC Patch Cord Duplex (SM)	Yellow	3	1 pc/Bag, 50 bag/box
10059244	FC to FC Patch Cord Duplex (SM)	Yellow	5	1 pc/Bag, 30 bag/box
10059245	FC to FC Patch Cord Duplex (SM)	Yellow	10	1 pc/Bag, 20 bag/box
10059246	FC to FC Patch Cord Duplex (SM)	Yellow	15	1 pc/Bag, 15 bag/box
10059247	FC to FC Patch Cord Duplex (SM)	Yellow	20	1 pc/Bag, 10 bag/box
10059248	FC to FC Patch Cord Duplex (SM)	Yellow	30	1 pc/Bag, 7 bag/box
10059249	FC to FC Patch Cord Duplex (SM)	Yellow	40	1 pc/Bag, 5 bag/box
10059250	SC to SC Patch Cord Duplex (SM)	Blue to Blue	3	1 pc/Bag, 50 bag/box
10059251	SC to SC Patch Cord Duplex (SM)	Blue to Blue	5	1 pc/Bag, 30 bag/box
10059252	SC to SC Patch Cord Duplex (SM)	Blue to Blue	10	1 pc/Bag, 20 bag/box
10059253	SC to SC Patch Cord Duplex (SM)	Blue to Blue	15	1 pc/Bag, 15 bag/box
10059254	SC to SC Patch Cord Duplex (SM)	Blue to Blue	20	1 pc/Bag, 10 bag/box
10059255	SC to SC Patch Cord Duplex (SM)	Blue to Blue	30	1 pc/Bag, 7 bag/box
10059256	SC to SC Patch Cord Duplex (SM)	Blue to Blue	40	1 pc/Bag, 5 bag/box
10059257	LC to LC Patch Cord Duplex (SM)	Beige	3	1 pc/Bag, 50 bag/box
10059258	LC to LC Patch Cord Duplex (SM)	Beige	5	1 pc/Bag, 30 bag/box
10059259	LC to LC Patch Cord Duplex (SM)	Beige	10	1 pc/Bag, 20 bag/box
10059260	LC to LC Patch Cord Duplex (SM)	Beige	15	1 pc/Bag, 15 bag/box
10059261	LC to LC Patch Cord Duplex (SM)	Beige	20	1 pc/Bag, 10 bag/box
10059262	LC to LC Patch Cord Duplex (SM)	Beige	30	1 pc/Bag, 7 bag/box

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10059263	LC to LC Patch Cord Duplex (SM)	Beige	40	1 pc/Bag, 5 bag/box
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TOT Code	Product Type	Boot Color	Min. Length(M)	Packing
10059264	FC to SC Patch Cord Duplex (SM)	Yellow to Blue	3	1 pc/Bag, 50 bag/box
10059265	FC to SC Patch Cord Duplex (SM)	Yellow to Blue	5	1 pc/Bag, 30 bag/box
10058663	FC to SC Patch Cord Duplex (SM)	Yellow to Blue	10	1 pc/Bag, 20 bag/box
10058664	FC to SC Patch Cord Duplex (SM)	Yellow to Blue	15	1 pc/Bag, 15 bag/box
10059266	FC to SC Patch Cord Duplex (SM)	Yellow to Blue	20	1 pc/Bag, 10 bag/box
10059267	FC to SC Patch Cord Duplex (SM)	Yellow to Blue	30	1 pc/Bag, 7 bag/box
10059268	FC to SC Patch Cord Duplex (SM)	Yellow to Blue	40	1 pc/Bag, 5 bag/box
10059269	FC to LC Patch Cord Duplex (SM)	Yellow to Beige	3	1 pc/Bag, 50 bag/box
10059270	FC to LC Patch Cord Duplex (SM)	Yellow to Beige	5	1 pc/Bag, 30 bag/box
10058666	FC to LC Patch Cord Duplex (SM)	Yellow to Beige	10	1 pc/Bag, 20 bag/box
10058667	FC to LC Patch Cord Duplex (SM)	Yellow to Beige	15	1 pc/Bag, 15 bag/box
10059271	FC to LC Patch Cord Duplex (SM)	Yellow to Beige	20	1 pc/Bag, 10 bag/box
10059272	FC to LC Patch Cord Duplex (SM)	Yellow to Beige	30	1 pc/Bag, 7 bag/box
10059273	FC to LC Patch Cord Duplex (SM)	Yellow to Beige	40	1 pc/Bag, 5 bag/box
10059274	SC to LC Patch Cord Duplex (SM)	Blue to Beige	3	1 pc/Bag, 50 bag/box
10058921	SC to LC Patch Cord Duplex (SM)	Blue to Beige	5	1 pc/Bag, 30 bag/box
10058922	SC to LC Patch Cord Duplex (SM)	Blue to Beige	10	1 pc/Bag, 20 bag/box

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10058923	SC to LC Patch Cord Duplex (SM)	Blue to Beige	15	1 pc/Bag, 15 bag/box
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TOT Code	Product Type	Boot Color	Min. Length(M)	Packing
10059275	SC to LC Patch Cord Duplex (SM)	Blue to Beige	20	1 pc/Bag, 10 bag/box
10059276	SC to LC Patch Cord Duplex (SM)	Blue to Beige	30	1 pc/Bag, 7 bag/box
10059277	SC to LC Patch Cord Duplex (SM)	Blue to Beige	40	1 pc/Bag, 5 bag/box
10057970	FC Pigtail (SM)	Yellow	1.5	1 pc/Bag, 100 bag/box
10057971	FC Pigtail (SM)	Yellow	3	1 pc/Bag, 50 bag/box
10057972	FC Pigtail (SM)	Yellow	5	1 pc/Bag, 30 bag/box
10057973	SC Pigtail (SM)	Blue	1.5	1 pc/Bag, 100 bag/box
10057974	SC Pigtail (SM)	Blue	3	1 pc/Bag, 50 bag/box
10057975	SC Pigtail (SM)	Blue	5	1 pc/Bag, 30 bag/box
10059278	LC Pigtail (SM)	Beige	1.5	1 pc/Bag, 100 bag/box
10059279	LC Pigtail (SM)	Beige	3	1 pc/Bag, 50 bag/box
10059280	LC Pigtail (SM)	Beige	5	1 pc/Bag, 30 bag/box

The other lengths shall be specified on order.

Note : The patch cord and pigtail should not be used for length longer than 40 meters and 5 meters respectively. The FDF tie with indoor optical fiber cable shall be applied for The patch cord length longer than 40 meters. Since the pigtail cord covered by tight Buffer tube so that the whole length of pigtail shall be installed in the enclosure such as in fiber distribution box or in the same sub rack shelf of FDF etc.

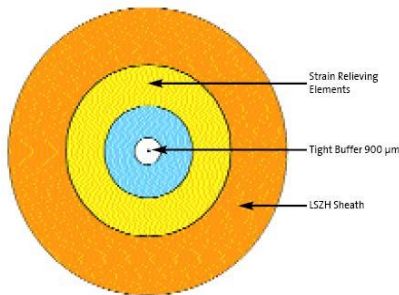


Fig.1

CABLE FOR ASSEMBLIES

Applications

Simplex bulk cabling for cable assembly manufacturing operations is designed with 900 µm tight buffers for direct assembly of single-fiber connectors.

Features

- Utilizes 900 µm Tight-buffered fibers with TB4 , TB3 coating, enabling easy stripping Flame-retardant jacket.
- Cables meet the application requirements of the National Electrical Code® (NEC®Article 770) and are listed Jelly free
- All-dielectric cable construction requires no grounding or bonding
- Jacket - OFNR (PVC Flame-retardant to IEC 60 332-3 , FRNC (Flame-retardant to IEC 60 332-3 and noncorrosive to IEC 60754-2) , LSZH (Low-smoke to IEC 61034 and zero-halogen
- Overall diameter 3.0 , 2.4 .2.0 mm
- Yellow jacket (single mode) , Orange (multimode)
- Strain relief - Aramid Yarns around tight buffer , no adhesion to jacket of buffer tube

Optical Fiber, continually pushing single-mode fiber to new performance levels., As the first manufacturer to upgrade standard single-mode fiber worldwide, we're providing our customers with greater value today and in the future., optical fiber is: Incompliance with or exceeding the industry's most stringent requirements, including: ITU-T G.652 (all tables) , IEC Specifications 60793-2-50 Type B1.3 , TIA/EIA 492-CAAB , Telcordia's GR-20

Fig. 2

FC/UPC Connector



LC Connector



SC/UPC Connector



SC/APC Connector



SC/UPC Duplex Connector



LC/UPC Duplex Connector

