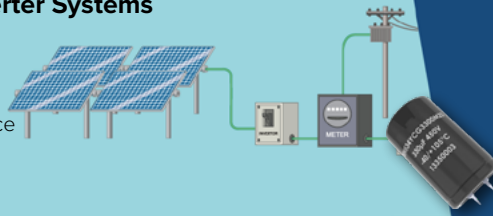


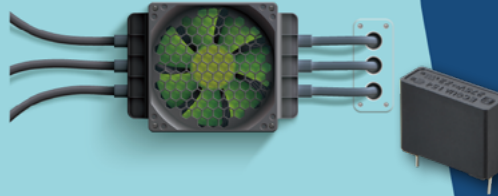
## Filter Capacitors in Solar Inverter Systems

In solar inverter systems, high voltage, high frequency, and continuous ripple currents are generated. It is crucial to control the Equivalent Series Resistance (ESR) to suppress thermal effects and ensure stable filtering performance.



## DC-Link Film Capacitors for Three-Phase Motor Drives

ESR (Equivalent Series Resistance) determines whether a capacitor can safely absorb PWM ripple currents, preventing thermal runaway or failure.



## DC-Link Film Capacitors for On-Board Charger (OBC) Systems in Electric Vehicles

In OBC (On-Board Charger) modules, capacitors must withstand high voltages of 400V/ 800V/ 1200V and endure prolonged exposure to fast, high frequency current ripples. If the ESR is too high, it can lead to abnormal temperature rise, accelerating material degradation and causing reliability issues such as dielectric shrinkage and cracking.



## Accurately Assess Actual Capacitor Loss ESR

### ESR Is the Key Indicator

Capacitor loss mainly comes from dielectric polarization loss and heat dissipation caused by conductor contact impedance. Excessive loss reduces performance and shortens capacitor lifespan.

While LCR Meters measure Resistance ( $R_s$ ) to estimate loss,  $R_s$  represents a combined impedance component under specific conditions. ESR (Equivalent Series Resistance) is the critical indicator for actual loss, accurately reflecting dielectric and conductor losses. ESR closely relates to heating, energy dissipation, and high-frequency performance, making it the standard for engineers and manufacturers to evaluate capacitor quality.

MICROTEST 6632C measures ESR directly in Meter Mode, ensuring capacitor reliability and performance under real circuit conditions.

## 6632C precisely measures ESR across varying frequencies masterfully mastering capacitor performance.

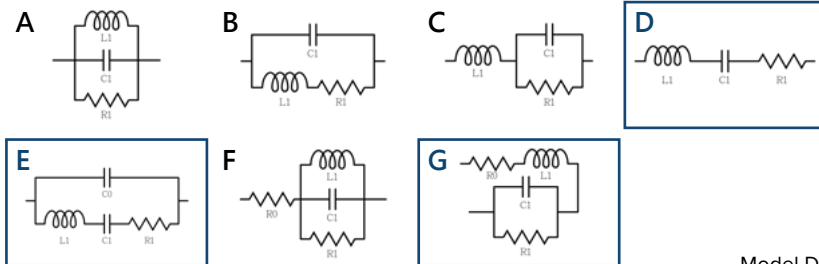


## 6632C Capacitor Analyzer

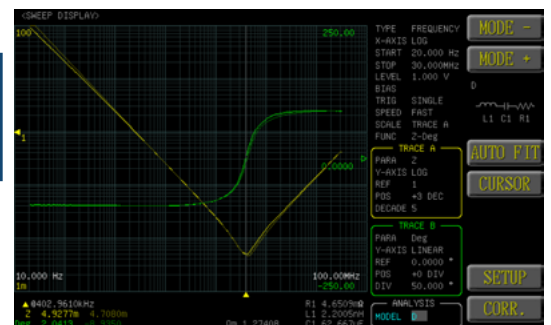
Built-in ESR measurement

Sweep Mode

## Support Equivalent Circuit Analysis



Model D



6632C features an equivalent circuit model function to analyze high-frequency characteristics and parasitic effects of capacitors.

Parasitic resistance arises from electrode conductivity and contact impedance, while parasitic inductance relates to lead length and structural loops. These parameters affect impedance and frequency response at high frequencies.

In Equivalent Circuit Analysis Mode, engineers can adjust parasitic parameters (e.g., ESR/ESL) directly on the instrument to simulate frequency response under different conditions in real-time, enabling prediction of material and structural impacts on high-frequency capacitor behavior without physical samples.

# Capacitor Analyzer

## 6632C

Frequency Range

10Hz~10MHz

Component Tester



MICROTEST 6632C offers comprehensive capacitance measurement capabilities, including ESR, Impedance(Z), Phase Angle( $\theta$ ), and Capacitance(C) values, with a frequency range of 10Hz to 10MHz for precise analysis of capacitance loss and frequency response.

In Meter Mode, it features built-in ESR measurement to display real-time capacitance loss. In Sweep Mode, it analyzes Impedance(Z) and Phase( $\theta$ ) changes across frequencies to identify the Self-Resonant Frequency (SRF). The instrument also includes an equivalent circuit analysis function using an RLC model to help engineers evaluate SRF and ESR characteristics. 6632C supports DC Bias Voltage testing up to 2000V and C-V curve sweeps of capacitive components.

For material analysis, the 6632C has a built-in dielectric constant ( $\epsilon_r$ ) function, eliminating manual calculations and quickly providing dielectric constant and loss measurements.

## Application

Aluminum Electrolytic Capacitors | Measure ESR to evaluate aging and filtering efficiency

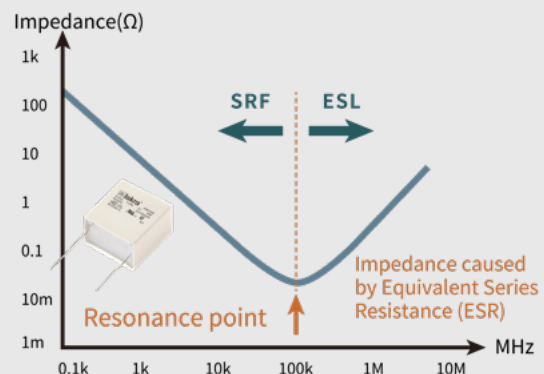
Conductive Polymer Solid Aluminum Capacitors | Measure ultra-low ESR characteristics to meet high-speed digital power supply requirements

MLCCs for Power Supply Decoupling | Measure ESR to assess power filtering, decoupling performance, and EMI suppression

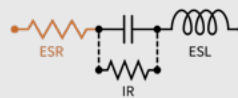
Film Capacitors | In high-frequency, high-power applications, measure ESR to evaluate energy loss and thermal effects, enhancing component reliability

## Features

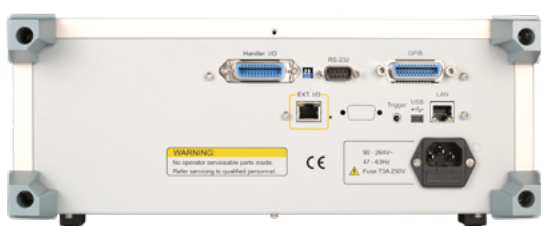
- Frequency range: DC, 10Hz~10MHz
- Equivalent Circuit Analysis
- Basic accuracy up to  $\pm 0.08\%$  (typical  $\pm 0.05\%$ )
- In Meter Mode, built-in  $R_{ESR}$  (Equivalent Series Resistance) parameter
- Built-in Dielectric constant- $\epsilon_r$
- Built-in Permeability- $\mu_r$
- Built-in DC Bias voltage  $\pm 12V$
- External DC bias testing ( $\pm 200V/600V/2000V$ )
- Support Sweep/ List/ Meter Measurement Mode
- Binning and Comparator Function
- Automatic Level Control (ALC)
- Output impedance 25 $\Omega/100\Omega$ , switchable
- Open circuit/ short circuit/ load correction function
- Access configuration files via USB
- Store test data and capture screenshots of the test screen



### ESR (Equivalent Series Resistance)



Under AC conditions, energy losses from internal conductors, electrode materials, and junctions manifest as the capacitor's equivalent series resistance (ESR). This ESR impacts filtering efficiency and thermal behavior, making it a critical parameter in high frequency power supply design.



### Standard Interfaces

RS-232

USB Host

LAN

Handler

USB Device

EXT. I / O

## Specification

Model	6632C	
Frequency Range	10Hz~10MHz	
Points of Test Frequency	Programmable	
Frequency Resolution	100mHz, 6 digits of setting	
Frequency Output Accuracy	±0.01%	
Basic Accuracy	±0.08% (typical±0.05%)	
AC Drive Level	Voltage	10mV~2Vrms(FREQ. ≤ 1MHz), 10mV~1Vrms(FREQ.>1MHz or FREQ. ≤ 1MHz and RO=25Ω)
	Current	100μA~20mA Arms(RO=100Ω), 200μA~40mA Arms(RO=25Ω)
	Voltage Minimum Resolution	1mV
	Current Minimum Resolution	10μA
DC Drive Level	DCR Voltage	1Vdc (40mA max.)
ALC	ALC ON : 6% * Voltage ±2mV ALC OFF : 10% * Voltage ±2mV	
Output Impedance	25Ω, 100Ω (switchable)	
Test Time (Fastest)	<3mS	
Built-in DC Bias Voltage	±12V	
Measurement Parameters and Ranges	Z	0.000mΩ~9999.99MΩ
	R, X	±0.000mΩ~9999.99MΩ
	Y	0.00000μS~999.999kS
	G, B	±0.00000μS~999.999kS
	θRAD	±0.00000~3.14159
	θDEG	±0.000°~180.000°
	Cs, Cp	±0.00000pF~9999.99F
	Ls, Lp	±0.00nH~9999.99kH
	D	0.00000~9999.99
	Q	0.00~9999.99
	Δ	±0.00%~9999.99%
	Rdc	0.00mΩ~99.9999MΩ
	ε <sub>r</sub> ' ε <sub>r</sub> ''	0~100000
	μ <sub>r</sub> ' μ <sub>r</sub> ''	0~100000
	R <sub>AC</sub>	±0.000mΩ~9999.99MΩ
	R <sub>ESR</sub>	±0.000mΩ~9999.99MΩ

## General

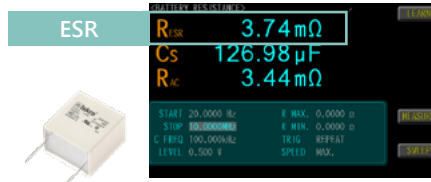
Measurement Mode	Meter Mode, List Mode, Sweep Mode	
Measurement Circuit	Series/ Parallel	
Correction	Open Circuit/ Short Circuit/ Load correction	
Cable Compensation	0/ 0.5/ 1/ 2m	
List Mode	50 groups of Multi-Steps setting (Each group contains up to 15 steps)	
Built-in DC Bias	-12 to +12V, 0.3% ±1.5mV, 100Hz to 10MHz	
BIN	9	
Comparator	ABS, ΔABS, Δ%, OFF	
Built-in Storage	100 sets LCR Meter setting documents, 50 sets List Mode setting documents	
USB Host Storage	LCR setting documents, list mode setting documents, BMP graphics, Sweep screen and test result data	
Trigger Test	Auto/ Manual/ RS-232/ Handler/ GPIB (Option OP-663201)	
Interface	RS-232/ Handler/ LAN/ USB Host/ USB Device/ GPIB (Option OP-663201)	
Option	PC link Software	
	MLCC Component Measurement (Option FX-LR0001)	MLCC (Class 2) AC Voltage Level Compensation Test Function
	Output DC Bias Voltage/ Current (Option F420005)	0~±40V/±100mA
Power Supply	Voltage : 100~240Vac	
	Frequency : 50~60Hz	
	Low power consumption : Maximum 30W	
Power Consumption	30VA	
Display	7" TFT, Color LCD (800*480)	
Environment	Temperature : 10~40°C, Humidity : 20~80%RH	
Dimension (W*H*D)	358×148×343mm	
Weight	3.95Kg	

# Functions

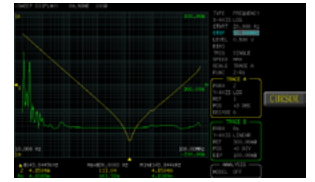
## 6632C built-in ESR (equivalent series resistance) measurement and supports sweep analysis.

6632C Capacitor Analyzer supports high frequency measurements from 10 Hz to 10 MHz and features built-in ESR (equivalent series resistance) measurement. In Meter Mode, it rapidly acquires  $R_{ESR}$  values to help engineers assess capacitor losses and thermal stability in real time.

In Sweep Mode, Impedance (Z) and Phase ( $\theta$ ) versus frequency to identify the Self-Resonant Frequency (SRF). By examining the capacitor's frequency response curve, engineers can optimize filter and power decoupling designs, ensuring component performance at different operating frequencies and enhancing the reliability and effectiveness of filtering, decoupling, and power applications.



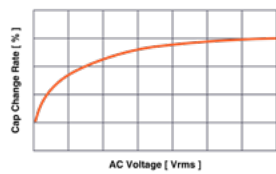
Meter Mode-Built-in  $R_{ESR}$



Sweep Mode-Capacitor frequency-response curve

## AC Signal Level Enhancement Solution for Accurate MLCC

The regulations (JIS C 5101-1-1998) stipulate standards for test signals. When measuring MLCC capacitance, the LCR Meter must enable the Automatic Level Control (ALC) function. This function introduces a stable level circuit into the test circuit to automatically correct any level offset back to the user-set voltage signal value.



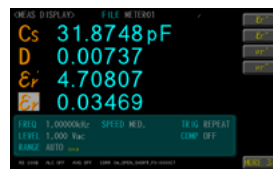
ALC Open

External AC Voltage Level Compensation Box (FX-LR0001)	
Frequency Range	100Hz~100kHz
Voltage compensation (ALC ON)	0.1Vrms~1Vrms
Current compensation (ALC ON)	0.15A

The figure below shows the measured MLCC capacitance value. Without enabling the ALC function, the measured capacitance value (7.85uF) is lower than the standard value. By using an External AC Voltage Level Compensation Box (FX-LR0001), the measured capacitance value under stable level signals is closer to the standard value (9.09uF).

## Material Analysis - Dielectric Constant

The relative dielectric constant can be measured using 6632C Capacitor Analyzer, which provides an AC excitation signal to the material, while simultaneously monitoring the actual voltage on the material. By measuring the material's dimensions and its capacitance value along with the loss factor D, the material's relative dielectric constant  $\epsilon_r$  is obtained.



Monitoring  $\epsilon_r/\epsilon_r''$  in Meter Mode

### Dielectric Constant & Loss Test Solution

Based on the material form, the 6632C Capacitor Analyzer tester can be equipped with the following Dielectric Constant test fixtures.

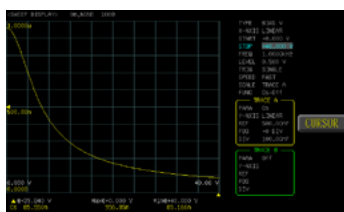
Solid-State/Thin-Film material selection  
**FX-0000C7**

Liquid material selection  
**FX-000C20**

## Capacitor DC-Bias Voltage Characterization Solution

In electronic circuits, capacitors serve filtering, decoupling, energy storage, and voltage stabilization, but their capacitance can drop sharply under DC bias. Applied DC voltage suppresses dielectric polarization, especially in high-k ceramics, leading to significant capacitance loss. Ignoring this effect in power modules, decoupling networks, DC-DC converters, or high speed communications can cause increased ripple, instability, and EMI issues.

MICROTEST 6632C built-in  $\pm 12$  V DC Bias voltage measurement capability for precise analysis of capacitor bias characteristics. Additionally, it offers the following external DC Bias testing solutions:



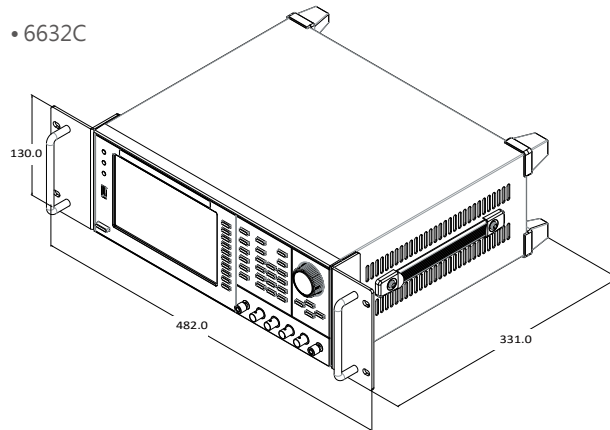
Sweep Mode:Capacitance Drop Curve

F420003	F420005	F420001	F420006
±40V	±40V/±100mA	±200V	±2000V
100Hz~1MHz	≤ 30 MHz	100Hz~1MHz	100Hz~1MHz

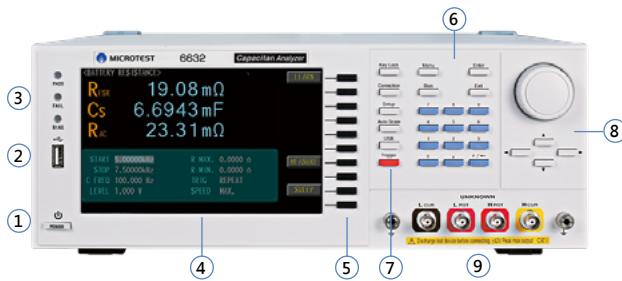
## Automatic Chassis Dimension

• Dimension (mm)

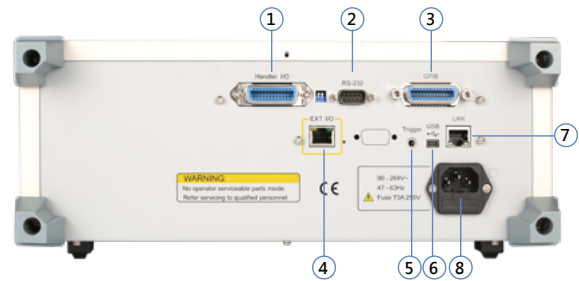
• 6632C



## Appearance



- 1. Power Switch
- 2. USB
- 3. PASS/ FAIL/ BIAS
- 4. LCD Screen
- 5. Function
- 6. Setup/ Number Key
- 7. Trigger
- 8. Direction
- 9. BNC Terminal



- 1. Handler
- 2. RS232
- 3. GPIB (Optional)
- 4. EXT. I/O
- 5. Trigger
- 6. USB
- 7. LAN
- 8. Power Jack/ Fuse Block

## Ordering Information

6632C Capacitor Analyzer	Standard	Optional
<ul style="list-style-type: none"> <li>6632C(Frequency Range 10Hz~10MHz)</li> </ul>	<ul style="list-style-type: none"> <li>FX-000C19 DIP Test Fixture</li> <li>Power Cord</li> </ul>	<ul style="list-style-type: none"> <li>F423906A Kelvin Clip Leads (100cm)</li> <li>F423906B Kelvin Clip Leads (50cm)</li> <li>F663001A BNC Test Leads (50cm)</li> <li>F663001B BNC Test Leads (100cm)</li> <li>F663001C BNC Test Leads (200cm)</li> <li>F420001 External Voltage Bias (±200V/1MHz)</li> <li>F420003 External Voltage Bias (±40V/1MHz)</li> <li>F420005 External Voltage/ Current Bias (±40V/100mA)</li> <li>F420006 External Voltage Bias (±2000V/1MHz)</li> <li>FX-0000C6 DIP Test Fixture</li> <li>FX-0000C7 Dielectric Material</li> <li>FX-0000C8 Magnetic Material Test Fixture</li> <li>FX-0000C9 Material Testing Fixture</li> <li>FX-000C10 Bottom Electrode SMD Test Fixture</li> <li>FX-000C11 SMD Tweezers Test Leads</li> <li>FX-000C12 SMD Test Fixture</li> <li>FX-000C20 Liquid Dielectric Material Test Fixture</li> <li>FX-LR0001 Automatic Level Compensation Fixture</li> <li>FX-0000C4 DIP Test Fixture</li> <li>TL-000003 RS-232 Cable (180cm)</li> <li>TL-000007 USB Cable (180cm I Type-A TO Type-B)</li> <li>OP-663201 GPIB Interface</li> <li>PC Link Software</li> </ul>

# Fixture & Accessories

**FX-000C19**  
DIP Test Fixture



**F423906A**  
Kelvin Clip Leads (100cm)

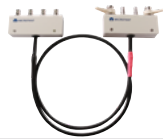


**F423906B**  
Kelvin Clip Leads (50cm)



Frequency	DC~50MHz	DC~1MHz	DC~1MHz
Max. Voltage/ Current	±42V	±42V	±42V
DUT Size	-	Max. 6mm	Max. 6mm
Applicable Models	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630/ 6363~6367

**F663001A**  
BNC Test Leads (50cm)



**F663001B**  
BNC Test Leads (100cm)



**F663001C**  
BNC Test Leads (200cm)



Frequency	DC~20M	DC~10M	DC~5MHz
Max. Voltage/ Current	±200V	±200V	±200V
DUT Size	-	-	-
Applicable Models	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630/ 6363~6367

**F420001** External Voltage Bias (±200V/1MHz)    **F420003** External Voltage Bias (±40V/1MHz)



**F420005** External Voltage/Current Bias (±40V/100mA)

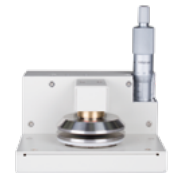


Frequency	100Hz~1MHz	100Hz~1MHz	≤ 30 MHz
Max. Voltage/ Current	±200V	±40V	DC ±40V
Accessory Description	-	-	DC ±100mA
Applicable Models	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630

**F420006** External Voltage Bias (±2000V/1MHz)    **FX-0000C6** DIP Test Fixture

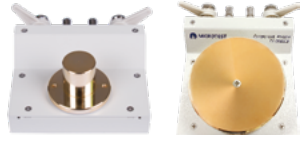


**FX-0000C7** Dielectric Material

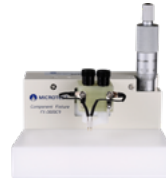


Frequency	100Hz~1MHz	DC~30MHz	≤30MHz
Max. Voltage/ Current	±2000V	±42V	±42V
DUT Size	-	-	≤10mm (Electrode Diameter : 38mm · 5mm)
Applicable Models	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630

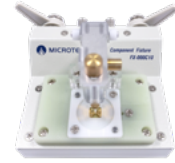
**FX-0000C8**  
Magnetic Material Test Fixture



**FX-0000C9**  
Material Testing Fixture



**FX-0000C10**  
Bottom Electrode SMD Test Fixture



Frequency	≤30MHz	DC~30MHz	DC~30MHz
Max. Voltage/ Current	±42V	±42V	±42V
DUT Size	Type A : OD 8, ID 3.1, H 3mm Type B : OD 20.5, ID 4.8, H 11mm Type C : OD 65.5, ID 7.1, H 28mm	≤10mm	≤9x9x5mm
Applicable Models	6632/ 6621/ 6630	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630/ 6363~6367

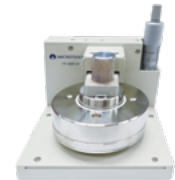
**FX-000C11**  
SMD Tweezers Test Leads



**FX-000C12**  
SMD Test Fixture



**FX-000C20**  
Liquid Dielectric Material Test Fixture



Frequency	DC~10MHz	DC~30MHz	DC~30MHz
Max. Voltage/ Current	±42V	±42V	±42V
DUT Size	≤10mm	≤7mm	Electrode Diameter : 38mm Gap of electrodes : 0.3/0.5/1/2/3/5mm
Applicable Models	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630

**FX-LR0001**  
Automatic Level Compensation Fixture



**FX-0000C4**  
DIP Test Fixture



Frequency	100Hz~100kHz	Frequency	DC~1MHz
Output Impedance	10 Ω (ON), 25 Ω/ 100 Ω (OFF)	Max. Voltage/ Current	±42V
Output Voltage Sweeping	AC 0.1 ~ 1V rms (ALC ON)	DUT Size	Max. 64mm
Max. Output Current	0.15A	Applicable Models	6632/ 6621/ 6630/ 6363~6367
Applicable Models	6632/ 6621/ 6630		

**TL-000003**  
RS-232 Cable



**TL-000007**  
USB Cable



Applicable Models	6632/ 6621/ 6630/ 6363~6367	6632/ 6621/ 6630
Accessory Description	180cm	Type-A TO Type-B   180cm