



ZEBRA

User Guide

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Overview

Use this chapter to familiarize yourself with Bluetooth technology and the various Zebra printers that are Bluetooth enabled.

Bluetooth-Enabled Printers

Table 1 Bluetooth-Enabled Mobile Printers

Model	Wireless Options	Android Support	Apple iOS Support
P4T	- BT 2.0 (standard) 802.11b/g (optional)	✓	✓
QLn420	- BT 2.1 (optional) - Dual Radio (BT 3.0 + 802.11 a/b/g/n)	✓	✓
ZQ110	- BT 3.0 (Standard) 802.11b/g (optional)	✓	✓
ZQ320	Outdoor unit (Black) - BT (Classic, LE 4.0) Indoor unit (Silver/Black shown) - Dual Radio (BT Classic, LE	✓	✓
ZQ510	- BT 4.0/LE + BT 3.0 - Dual Radio (BT 3.0 + 802.11 a/b/g/n)	✓	✓
ZQ520	- BT 4.0/LE + BT 3.0 - Dual Radio (BT 3.0 + 802.11 a/b/g/n)	✓	✓

* Apple iOS support is available with the BT Classic option.

Table 1 Bluetooth-Enabled Mobile Printers (Continued)

Model	Wireless Options	Android Support	Apple iOS Support
ZD230/ZD888	BT 4.1/LE	✓	✓
 Apple iOS support and Made for iPod, iPhone, iPad means that an electronic accessory has been designed to connect specifically to iPod, iPhone, or iPad, respectively, and is certified by the developer to meet Apple performance standards. Apple is not responsible for the operation of this device or its compliance with safety and regulatory standards. Please note that the use of this accessory with iOS devices may affect wireless performance.			
 NOTE: QLn printers with SKUs QNx-xxNxxMxx-xx and QNx-xxCxxMxx-xx support Made for iPod iPhone iPad.			
* Apple iOS support is available with the BT Classic option.			

Table 2 Bluetooth-Enabled Desktop and Industrial Printers

Model	Wireless Options	Android Support	Apple iOS Support
ZD410	- Bluetooth LE (standard) - BT 4.0 (Classic + Bluetooth LE) + 802.11a/b/g/n/ac (Optional)	✓	✓ *
ZD420 Series	- Bluetooth LE (standard) - BT 4.0 (Classic + Bluetooth LE) + 802.11a/b/g/n/ac (optional)	✓	✓ *
ZD500 Series	- BT 2.0 Standard - Dual Radio (BT 3.0 + 802.11 a/b/g/n) (optional)	✓	✗
ZD500R Series	- BT 2.0 (standard) - Dual Radio (BT 3.0 + 802.11 a/b/g/n) (optional)	✓	✗
ZD620 Series	- Bluetooth LE (optional) - BT 4.0 (Classic + Bluetooth LE) + 802.11a/b/g/n/ac (optional)	✓	✓ *
ZE511/ ZE521	BT 4.1	✓	✓
ZT400 Series: ZT410, ZT411, ZT420, ZT421	- BT 2.1+ EDR (standard) 802.11 a/b/g/n (optional) (EDR: Enhanced Data Rate)	✓	✓



Apple iOS support and Made for iPod, iPhone, iPad means that an electronic accessory has been designed to connect specifically to iPod, iPhone, or iPad, respectively, and is certified by the developer to meet Apple performance standards. Apple is not responsible for the operation of this device or its compliance with safety and regulatory standards. Please note that the use of this accessory with iOS devices may affect wireless performance.

* Apple iOS support is available with the BT Classic option.

Bluetooth FAQ's



NOTE: Apple iOS support and Made for iPod, iPhone, iPad means that an electronic accessory has been designed to connect specifically to iPod, iPhone, or iPad, respectively, and is certified by the developer to meet Apple performance standards. Apple is not responsible for the operation of this device or its compliance with safety and regulatory standards. Please note that the use of this accessory with iOS devices may affect wireless performance.

What is Bluetooth?

Bluetooth technology is the global wireless standard for enabling low energy, small range, secure connectivity for Bluetooth-enabled devices without the use of cables or wires. Bluetooth devices send and receive data over short distances using radio transmissions.

What is Bluetooth Classic (BT)?

Bluetooth Classic is a wireless small range network technology for streaming data applications such as voice communications. Bluetooth Classic provides a robust connection between devices such as headsets, cars, industrial sensors, and medical sensors.

What is Bluetooth Low Energy (LE)?

Bluetooth Low Energy (Bluetooth LE or Bluetooth Smart) is a wireless short range network technology created for the healthcare, fitness, security, and home entertainment industries.

Bluetooth Low Energy is intended to provide considerably reduced power consumption compared to Bluetooth Classic, while maintaining a similar range of communications. Bluetooth Low Energy is a low power consumption device that operates in sleep mode most of the time and wakes up when a connection is initiated.



NOTE: It is recommended that only configuration functions should be performed over a Bluetooth LE connection. Printer configuration functions via Bluetooth LE can be performed using Zebra's Printer Setup for Android.

Zebra Bluetooth Radio Range

Bluetooth technology (BT) operates in the unlicensed industrial, scientific, and medical (ISM) band using spread spectrum, frequency hopping, full-duplex signal at a nominal rate of 1600 hops/sec. The 2.4 GHz ISM band is available and unlicensed in most countries.

	Bluetooth Classic	Bluetooth Low Energy
Range	100 m (328 ft)	25 m (82 ft)
Throughput	2 Mbps	100kbps

Zebra Radios and BT Specifications

The Bluetooth radio inside Zebra printers complies with BT 2.0 Specification or BT Specification 2.1 (B-radio) or the BT Specification 3.0 (C-radio, or Dual Radio) or BT specification 4.0 and supports the SPP (Serial Port Profile). All print jobs sent to the printer will be done through the ZPS (Zebra Parser Service), which is basically a BT emulation of an RS-232 serial communication.

The Desktop printers (ZD621 and ZD421) released in 2021 support Bluetooth Low Energy 5 (Bluetooth LE5).

What is Bluetooth used for?

Bluetooth capability is built into electronic devices and adapters. Bluetooth is a direct device-to-device connection which allows the user to wirelessly share data and other information between paired devices. A Bluetooth radio is designed to replace cables by taking the information normally carried by the cable and transmitting it over a radio frequency to a receiving Bluetooth radio device.

Is Bluetooth technology hardware or software?

It's a combination of both. In products that contain Bluetooth, a small computer chip containing the Bluetooth radio is installed in the product. But it also needs software to connect to other products.

What devices can communicate with Zebra's Bluetooth printers?

Any computer or hand-held device that has a Bluetooth radio inside and supports the SPP (Serial Port Profile) of the Bluetooth specification can communicate with Zebra Bluetooth printers.



NOTE: Bluetooth LE-only printers can only communicate with hand-held devices supporting Bluetooth LE.

What information can be transmitted via Bluetooth to Zebra printers?

All data that can be transmitted over a serial cable can be sent over Bluetooth. The practical and intended uses are data that has been formatted for printing of receipts, labels, and bar codes. Zebra provides a label creation utility called ZebraDesigner to facilitate the formatting of labels or text. For more information about ZebraDesigner, visit zebra.com/software.

To view the Zebra Programming Guide, visit zebra.com/support.

Independent Software Vendors

Zebra partners with Independent Software Vendors (ISVs) to develop software and mobile applications for use with Zebra printers. The Zebra ISV program is designed to provide ISVs with access to the sale, marketing, and technical support that they will need to develop, integrate, and promote solutions in new markets around the globe. To become a Zebra ISV Partner, please visit zebra.com/us/en/partners/become-a-partner.html.

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Zebra's Link-OS® Multiplatform Software Development Kit (SDK) enables app creation for Desktop PCs, smartphones, and tablets, supporting the most popular operating systems. Including demo apps with source code, the Link-OS SDK makes creating powerful apps simple straightforward for our developer community. Visit zebra.com/sdk for more details and to download the SDK.

What is a central device and what is a peripheral device?

The central device refers to the device that initiates the connection with other Bluetooth devices. The peripheral device refers to the Bluetooth device that listens for and receives the connection information from the central device.

What is Link-OS?

Link-OS is Zebra's one-of-a-kind enterprise printer operating system. Enabling advanced connectivity capabilities, extensive device management, and advanced privacy controls, no other printer OS delivers this level of intelligence and innovation. Printers running Link-OS are supported by our powerful Print DNA suite of Applications, Utilities, and Developer Tools, making it simple to create robust, adaptable, and intelligent print solutions.

What is Print DNA?

Our unique combination of innovative Applications, Utilities, and Developer Tools produces high performing, remotely manageable printers that are easy to integrate and secure, ensuring Zebra Link-OS printers provide a superior printing experience from the inside.

Visit zebra.com/printdna to learn more.

What type of security does Bluetooth support?

The Bluetooth specification supports authentication and encryption. For the authentication algorithm, the size of the key used is always 128 bits. For the encryption algorithm, the key size may vary between 1 and 16 octets (8-128 bits).

See [Security on page 11](#) for more information.

Security

This section explains the various security features included in Zebra Bluetooth enabled printers.

Minimum Security Mode

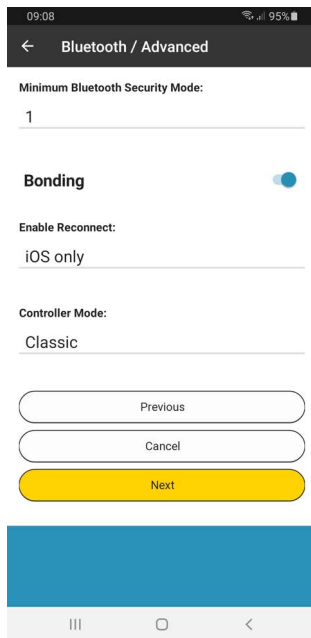
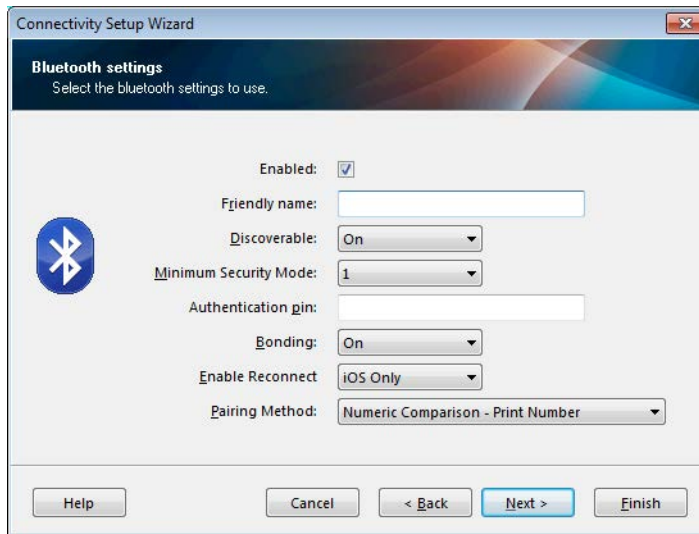
Minimum Security Mode sets the minimum security mode at which the printer connects. The central device dictates the security mode and the printer will agree to connect at a higher security. Security Mode levels are as follows:

Table 3 Minimum Security Mode

If the central device is Bluetooth 2.0 or older:					If the central device is Bluetooth 2.1 or newer:	If the central device is Bluetooth LE:
	Encryption Level	PIN	MITM	Description		
Security Mode 1 (default)	Unencrypted	NO PIN required	Not required	No data is encrypted	Secure Simple Pairing will always be used if both devices are Bluetooth 2.1 or newer. See Bluetooth Pairing on page 13 .	Neither encryption nor MITM protection is required to send/receive label data.
Security Mode 2	Profile-level	PIN required	Not required	All user data is encrypted		Encryption, but not MITM protection is required to send/receive label data (i.e., Just Works is allowed).
Security Mode 3 (default if the printer has a display)	Link-level	PIN required	Required	All user data and Bluetooth management commands are encrypted		
Security Mode 4	Not Applicable	Not Applicable	Required	Printer will not connect to Bluetooth 2.0 central device		Encryption and MITM protection are required to send/receive label data (i.e., Just Works is NOT allowed.)

Changing the Minimum Security Mode

You can change the **Minimum Security Mode**, (the mode the printer connects to the central device), in Windows, Android or iPhone/iPad setup apps.



Bluetooth Pairing

Secure Simple Pairing

Bluetooth 2.1 introduced Secure Simple Pairing. SSP improves the security of Bluetooth by not using a static PIN and requires that all data be encrypted. SSP replaces the older Minimum Security Mode model for devices with Link-OS compatible printers. SSP supports two modes:

- **Numeric Comparison** displays a 6-digit number on both the central device and the printer that must be confirmed on both devices.
- **Just Works** requires no printer confirmation when in pairing mode.

The printers automatically decide whether to use **Numeric Comparison** or **Just Works** based on the features of the printer and the central device. If both devices have a way of displaying a 6-digit number, the printer will use Numeric Comparison.

The printing behavior for printers without a display is controlled by the Set/Get/Do command and its values. See [Table 4 on page 14](#) for more information.

Bluetooth LE

Bluetooth LE supports three pairing modes:

- **Numeric Comparison** displays a 6-digit number on both, the central device and the printer, that must be confirmed on both devices.



NOTE: This mode is not supported by all LE printers and/or central devices.

- **Passkey**, similar to **Numeric Comparison**, displays or prints a 6-digit number. Unlike **Numeric Comparison**, this number must be typed in on the central device.
- **Just Works** requires no printer confirmation when in pairing mode.

[Table 4](#) also applies to printers using Bluetooth LE. Depending on the version(s) of LE supported by the printer and/or central device, the 6-digit pairing code will be confirmed by the central device (**Numeric Comparison**) or entered by the central device (**Passkey**).

Table 4 Set/Get/Do for Printers Without a Display

Set/Get/Do Command: <code>bluetooth.non_display_numeric_comparison</code>			
Default Value:	print	Prints the 6-digit number	If the printer does not have an LCD, the printer will print the 6-digit number, and you must confirm the number on the central device.  NOTE: The printed code will use 1-2 inches of media. Printing the code is only necessary the first time the printer pairs with each device.
Other Values:	noprint	The 6-digit number is not printed	The central device will display the 6-digit code, and you must confirm it on the central device.  IMPORTANT: There is no way to know if a third party device has established a MITM attack because the code cannot be displayed on the printer!
	off	Disables Numeric Comparison	Security Modes 3 and 4 will result in a pairing failure. “Just Works” (no MTIM protection) is supported.

Man-In-The-Middle Protection

MITM (Man-In-The-Middle) refers to an attack between two devices. This MITM Protection guards against a third party intercepting a connection between two devices. Just Works pairing mode does not support MITM protection. Numeric Comparison and Passkey modes support MITM protection. During Numeric Comparison and Passkey modes pairing, both devices specify if they require MITM protection. If either device requires MITM protection, Just Works pairing mode cannot be used.

If one device requires MITM protection and the other device only supports Just Works pairing mode, this may cause the pairing to fail.

The printer does not require MITM protection in Minimum Security Mode 1 and 2. The printer does require MITM protection for Minimum Security Mode 3 and 4.

For more advanced security settings and to customize security settings with Set/Get/Do commands, refer to the Zebra Programming Guide on zebra.com/manuals.

Connectivity

Connecting the Printer

This guide assumes that you have installed the proper drivers (if necessary) on the central device and then the device is Bluetooth compatible. A central device is any Bluetooth radio enabled device that can initiate a connection with a Bluetooth radio enabled printer. These instructions include connecting your Bluetooth printer to:

- Computer running Microsoft® Windows® desktop editions
- Apple iOS® devices (iPhone, iPad, iPod Touch)
- Android™ devices

Print a Network Configuration Label

Verify that your Zebra printer has the Bluetooth radio installed. You can verify this by printing a network configuration label (see [Figure 1 on page 16](#) and [Figure 1 on page 16](#) for sample labels). Zebra printers with the Internal Bluetooth option installed print a configuration label with information needed to establish and troubleshoot printing from a network. Refer to your printer's user guide for instructions on how to print a configuration label.

The printer's Bluetooth settings help identify the printer for installation, print operations, and network connectivity.

1. Depending on the model of your printer, make sure the printer is plugged into a proper power source or the battery is installed. If your printer uses a battery as the power source, you may need to charge the battery before you can continue setting up your printer.
2. Load media into the printer. For more information regarding loading media into your printer, refer to your printer's User Guide.
3. Turn on (I) the printer. Ensure Bluetooth Discovery is turned ON by referring to the network configuration label.
4. Print a network configuration label. For instructions, refer to your printer's User Guide.
5. Looking at the network configuration label, ensure that Bluetooth discover mode is ON. If not, change the setting. Refer to [Configuring Bluetooth Settings on Your Printer on page 17](#) for instructions.

Figure 1 An example of a network configuration label (ZPL)

Network Configuration	
Zebra Technologies ZTC ZD500R-203dpi ZPL XXXXXX-XX-XXXX	
PrintServer.....	LOAD LAN FROM?
UNKNOWN.....	ACTIVE PRINTSRVR
Wired	
ALL.....	IP PROTOCOL
000.000.000.000....	IP ADDRESS
255.255.255.000....	SUBNET
000.000.000.000....	GATEWAY
000.000.000.000....	WINS SERVER IP
YES.....	TIMEOUT CHECKING
300.....	TIMEOUT VALUE
000.....	ARP INTERVAL
9100.....	BASE RAW PORT
9200.....	JSON CONFIG PORT
Wireless	
ALL.....	IP PROTOCOL
000.000.000.000....	IP ADDRESS
255.255.255.000....	SUBNET
000.000.000.000....	GATEWAY
000.000.000.000....	WINS SERVER IP
YES.....	TIMEOUT CHECKING
300.....	TIMEOUT VALUE
000.....	ARP INTERVAL
9100.....	BASE RAW PORT
9200.....	JSON CONFIG PORT
INSERTED.....	CARD INSERTED
02dfH.....	CARD MFG ID
9118H.....	CARD PRODUCT ID
00:00:00:00:00:00..	MAC ADDRESS
YES.....	DRIVER INSTALLED
INFRASTRUCTURE....	OPERATING MODE
125.....	ESSID
100.....	TX POWER
ALL.....	CURRENT TX RATE
OPEN.....	WEP TYPE
NONE.....	WLAN SECURITY
1.....	WEP INDEX
000.....	POOR SIGNAL
LONG.....	PREAMBLE
NO.....	ASSOCIATED
ON.....	PULSE ENABLED
15.....	PULSE RATE
OFF.....	INTL MODE
not available.....	REGION CODE
no region code.....	COUNTRY CODE
0x3FFFFFFFFF.....	CHANNEL MASK
Bluetooth	
4.2.0.....	FIRMWARE
04/20/2012.....	DATE
on.....	DISCOVERABLE
3.0.....	RADIO VERSION
on.....	ENABLED
AC:3F:A4:05:E7:F9..	MAC ADDRESS
XXXXXX-XX-XXXX....	FRIENDLY NAME
No.....	CONNECTED
1.....	MIN SECURITY MODE
nc.....	CONN SECURITY MODE
FIRMWARE IN THIS PRINTER IS COPYRIGHTED	

Configuring Bluetooth Settings on Your Printer

If your network configuration label indicated that Bluetooth discovery is OFF, enable the option and configure other Bluetooth settings using the Printer Setup app for Windows, Android or iPhone/iPad on zebra.com/setup.

The user guides for the Printer Setup for Android and iPhone/iPad provide instructions for connecting your mobile device and printer.

Bluetooth configuration may also be achieved by sending a number of Set/Get/Do commands. See the PrintSecure Printer Administration Guide on zebra.com/PrintSecure for more specific details about Bluetooth Set/Get/Do commands.

Bluetooth Classic Discoverability

The SGD command "**bluetooth.discoverable**" controls whether the Zebra printer will respond to inquiry requests from a remote device. This Classic feature is called **discoverable mode**: if it is disabled, remote devices are not able to easily find the printer.



NOTE: Starting with Link-OS v6, the "**bluetooth.discoverable**" function is now **off** by default and other devices cannot see or connect to the printer.

With discoverability disabled, the printer will still make connections with a remote device that was previously paired.

RECOMMENDATION: Only keep discoverable mode enabled while pairing to a remote device. Once paired, discoverable mode should be disabled. Starting with Link-OS v6, a new feature was introduced to enable limited discovery. Holding down the **FEED** button for 5 seconds will enable limited pairing mode. Limited pairing mode enables discovery and pairing for 2 minutes. This enables the printer to operate safely with discoverable mode disabled until a user with physical access to the printer activates it.

Upon entering Bluetooth Pairing Mode, the printer will provide feedback that the printer is in Pairing Mode using one of these methods:

- On printers with a "Bluetooth" screen icon or Bluetooth LED, the printer shall flash the "Bluetooth" screen icon or Bluetooth LED on and off every second while in pairing mode.
- On printers without a "Bluetooth" screen icon or Bluetooth LED, the printer shall flash the "Data" icon or Data LED on and off every second while in pairing mode.
- Specifically, on the ZD220, ZD230, and ZD888 models, the 4 flash LED sequence places the printer into Bluetooth Pairing Mode.
- Specifically, on the ZD510 model, the 5 flash LED sequence places the printer into Bluetooth Pairing Mode.

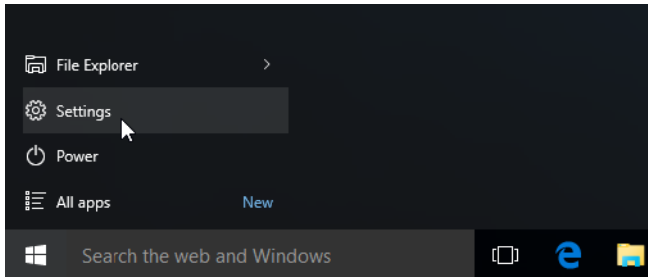


NOTE: If the user wants to completely disable Bluetooth connectivity, including discovery and pairing, they can disable the Bluetooth radio entirely.

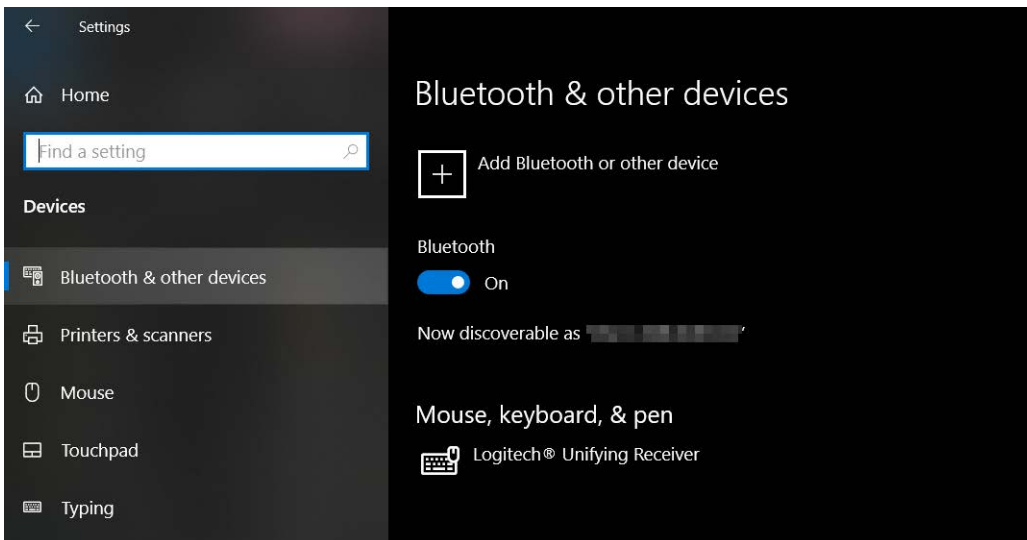
Connecting the Printer to a Windows 10 PC

Your screens may vary from those shown below.

1. Open the Windows Start Menu by clicking on the Windows Start button and select **Settings**.

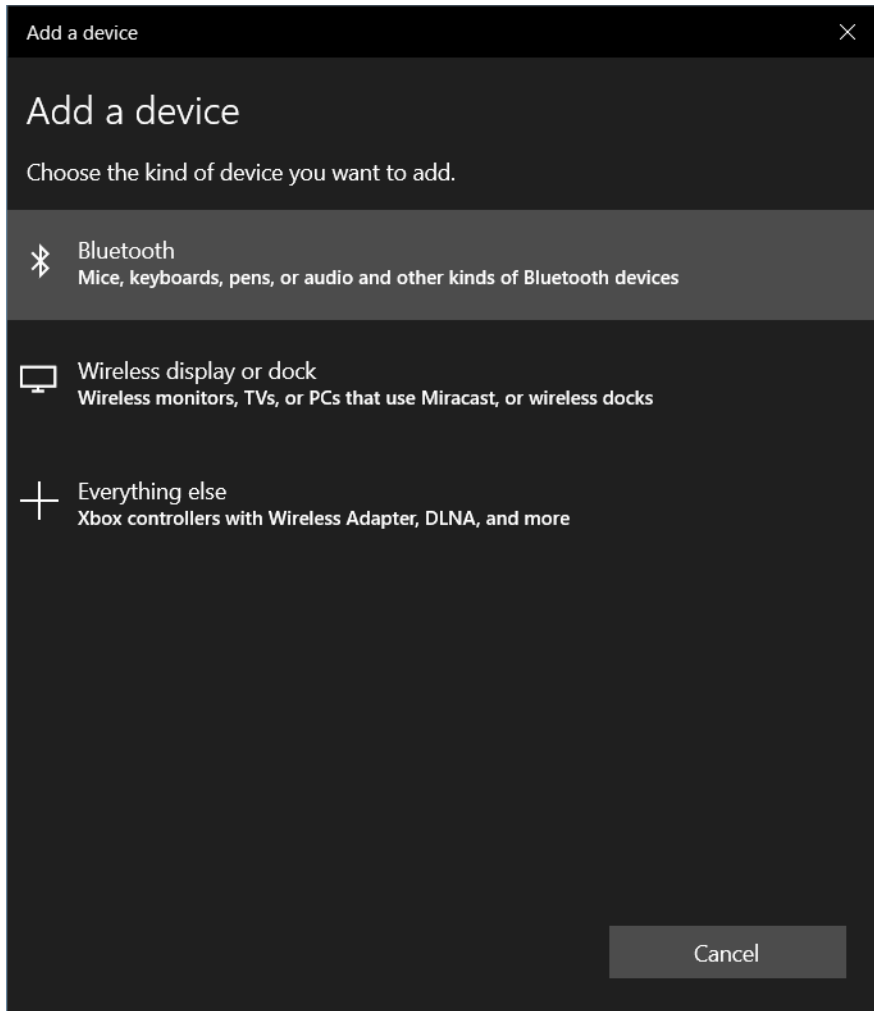


2. Click on the **Devices** category in the Settings window. If your PC doesn't have Bluetooth installed, the Bluetooth category will not be displayed in the list of device categories.
3. Click on **Bluetooth & other devices**.

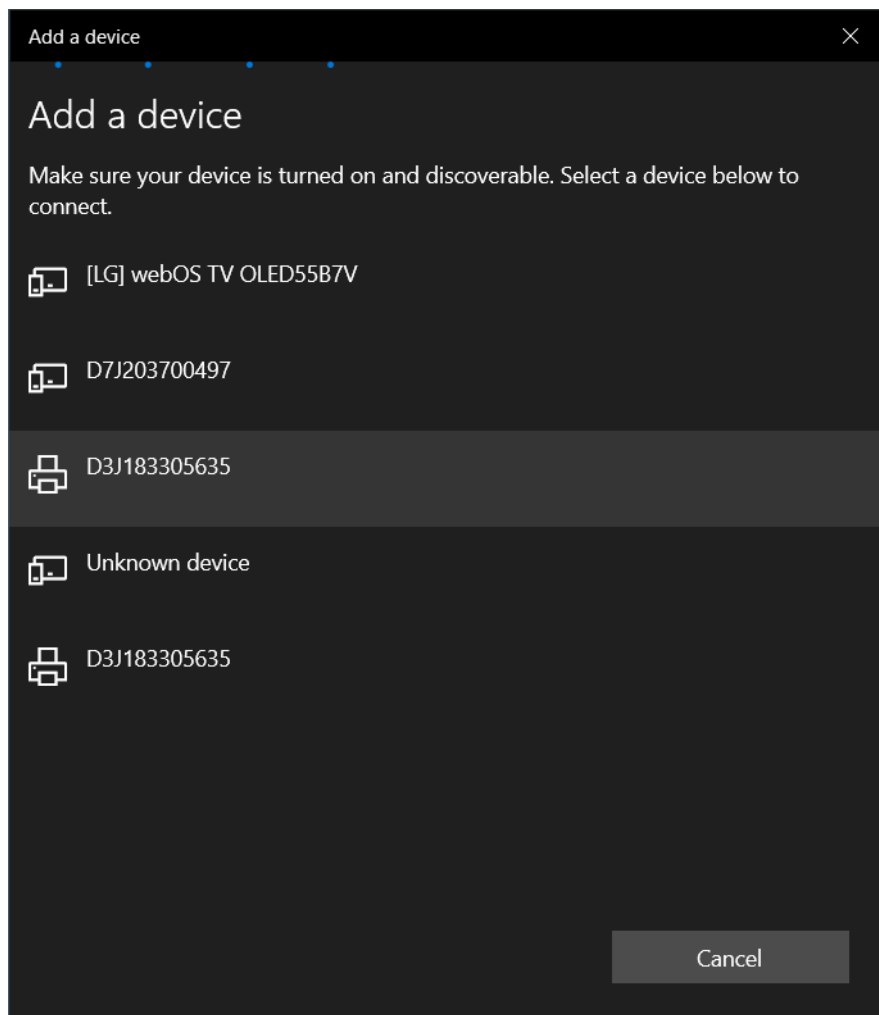


4. Click on **Add Bluetooth or other devices**.

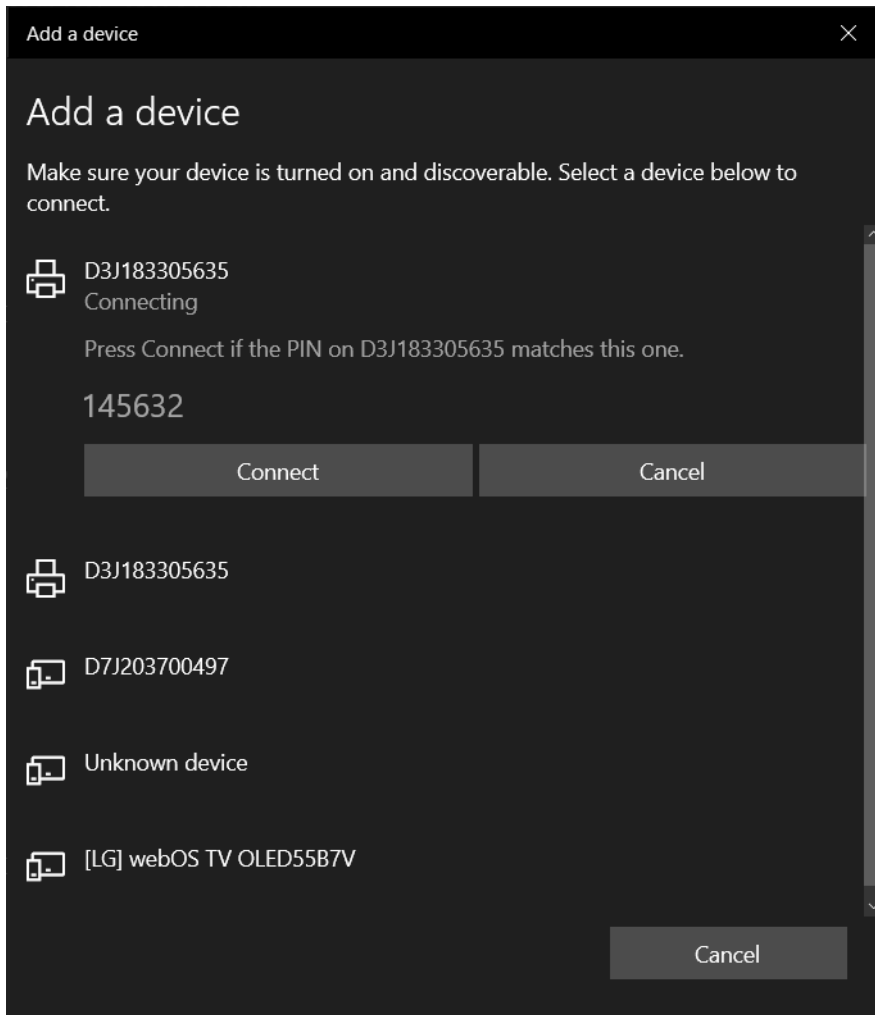
Add a device dialog opens.



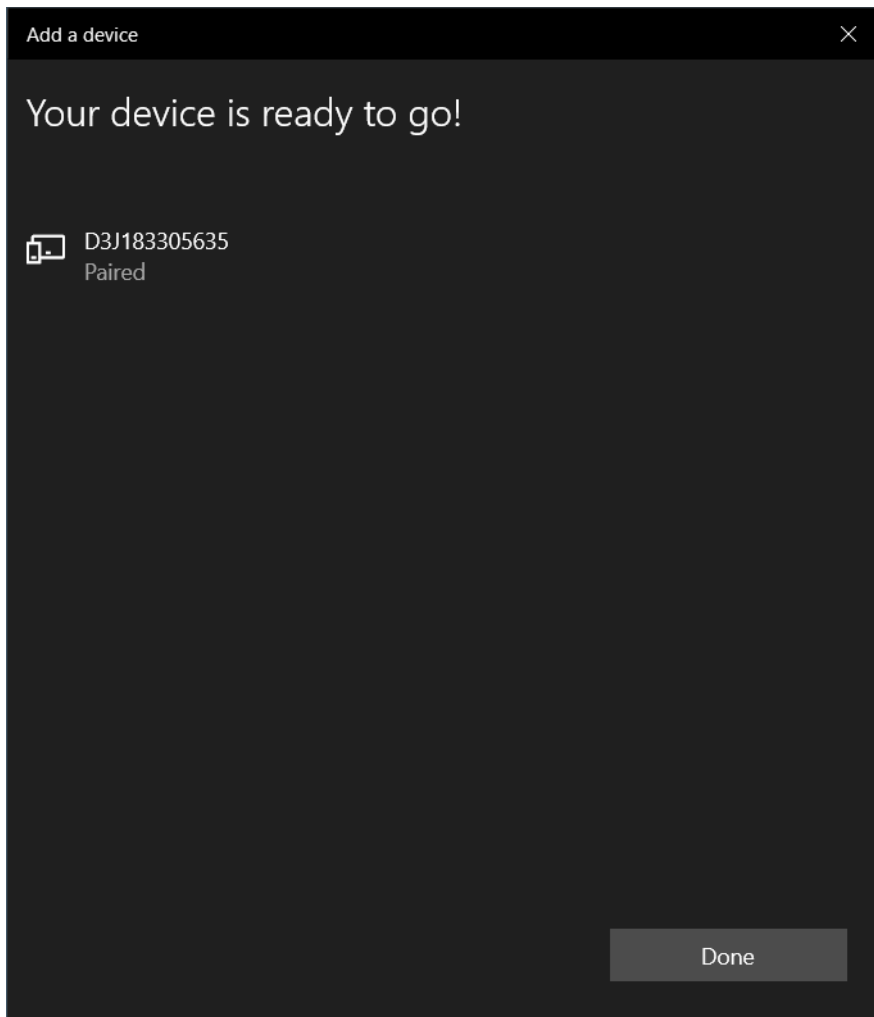
5. Click on **Bluetooth**. The system will display “discovered” bluetooth devices.
The printer is identified by the serial number.



- When you select the printer from the list, the printer will either print a passcode or display the passcode on its LCD screen, if it has one.
 - Compare that output with the passcode shown on the computer screen. If they match, **Accept** the passcode on the printer first, then click **Connect** on the computer.
- If the passcodes do not match, click **Reject** the passcode on the printer first, then click **Cancel** and try pairing again.



8. If the pairing is successful, the printer status changes to **Paired** (below your printer). Click **Done** to exit.



Troubleshooting

This section explains common troubleshooting procedures when connecting Bluetooth devices.

Troubleshooting Steps

If you are experiencing Bluetooth connectivity issues, first perform the following basic troubleshooting steps that may quickly resolve your issue.

1. If your Bluetooth device uses batteries, make sure that your batteries are charged.
2. If your Bluetooth device uses a Bluetooth adapter that connects to your computer through a USB port, try connecting the adapter to another USB port on your computer.
3. If there are multiple Bluetooth devices connected to your computer, temporarily disconnect them. They can interfere with a Bluetooth communications.
4. Verify that the Bluetooth device that you are troubleshooting is powered on and that Bluetooth is enabled. If your device has a wireless switch, make sure that the wireless switch is turned on. Check your printer's User Guide that came with your printer or on-line at zebra.com/support to locate the wireless switch on your printer.



IMPORTANT: Make sure your Windows computer is up to date with all the latest service packs and drivers.

5. In Windows 10, use your **Start** menu to check for updates. Click the **Start** button, click **Settings**, and then click **Update & Security**.
6. If any important updates are available for your computer, install them. To do this, click **Install updates**. If you are prompted to restart your computer after all the updates are installed, restart your computer.
7. If it still does not work, go to zebra.com/support for assistance.

