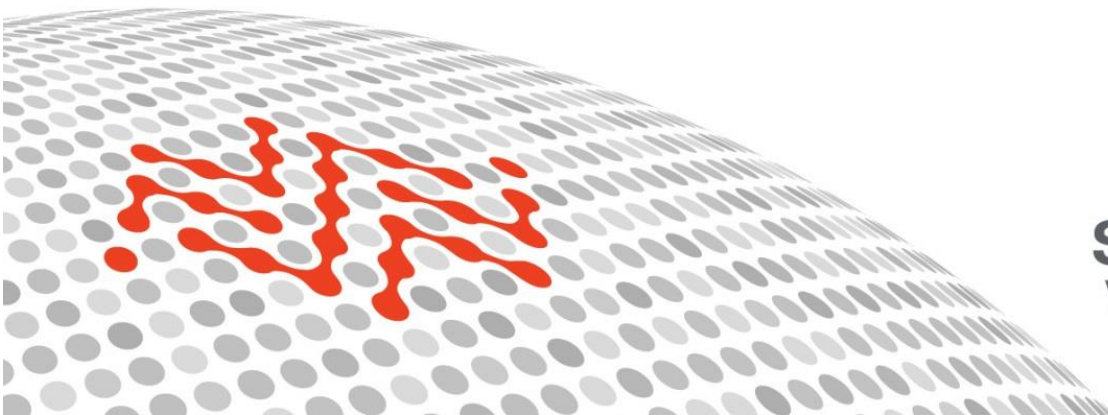


# Customize Legato USB



## **Important Notice**

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

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# WORKING WITH USB IN THE LEGATO YOCTO DISTRIBUTION

## INTRODUCTION AND SCOPE

This document provides details on how to customize the USB behavior of the Legato Yocto distribution when working with the following Sierra Wireless devices:

- AR755x
- AR8652
- WP71xx

## USB INTERFACES

### USB Enumeration Sequence

USB endpoints are enumerated during the boot sequence as follows:

First, the USB boot script (S41usb) starts /usr/bin/usb/boot\_hsusb\_composition. This script executes the following:

IF /etc/legato/usbmode exists

THEN execute /etc/legato/usbsetup

ELSE setup default composition

The actions taken are described in the sections following.

## Default endpoints

The table shows all the possible USB interfaces available on the AR7 family.

I/F Index	Endpoint Number	Supported Service Names	Service Names for M2M	Interface Type / Class	AR7	Description / Use
0	1 IN, 1 OUT	DIAG	DIAG	OBEX – QC	x	FW Download, Provisioning, Modem Logging
2	1 IN, 1 OUT	NMEA	NMEA	OBEX – QC	x	GNSS Sentences
3	2 IN, 1 OUT	MODEM	MODEM	SERIAL – QC	x	DUN (also AT if not separate AT port)
4	2 IN, 1 OUT		AT	SERIAL – QC	x	Control and Status
5	1 IN, 1 OUT		RAW data	OBEX – QC	x	Application and host communication data pipe
6	1 IN, 1 OUT		OSA	OBEX – QC	x	Open SIM Access Data
8	2 IN, 1 OUT	RMNET0	RMNET0	ECM–RMNET	x	Programmatic Control & Status / WWAN Data 1
10	2 IN, 1 OUT	RMNET1	RMNET1	ECM–RMNET	x	Programmatic Control & Status / WWAN Data 2
11	2 IN, 1 OUT	RMNET2	RMNET2	ECM–RMNET	x	Programmatic Control & Status / WWAN Data 3
14,15	2 IN, 1 OUT	RNDIS	RNDIS	COMM-ACM	x	IDE. RNDIS Supported by Windows
16,17,18	2 IN, 1 OUT		USB Audio	AUDIO	x	Assume Windows/Linux Native driver is used
19,20	2 IN, 1 OUT		ECM 1.0	CDC-ECM	x	IDE support on Linux

These endpoints are grouped into compositions, and a fixed set of compositions is provided as shown in the next table. Switching between these compositions is done using the AT!USBCOMP command. The default composition for the AR7 is composition 2.

I/F Index	Service Name	Comp0	Comp8	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7
0	DIAG <sup>1</sup>	X	X	x	x	x	x	x	x
1	ADB <sup>1</sup>	x	x						
2	NMEA <sup>1</sup>	x	x	x	x	x	x	x	x
3	MODEM	x	x	x	x	x	x	x	x
4	AT		x	x		x	x	x	x
5	RAW data			x	x		x	x	
6	OSA			x	x	x	x		
8	RMNET0	x		x	x	x		x	x
10	RMNET1	x			x	x		x	x
11	RMNET2	x							
16,17,18	USB Audio	x	x	x	x	x	x	x	x
14,15	IDE – RNDIS <sup>1</sup>			D <sup>1</sup>	D <sup>1</sup>	D <sup>1</sup>	D <sup>1</sup>	D <sup>1</sup>	D <sup>1</sup>
19,20	IDE – ECM 1.0 <sup>1</sup>								
<b>Total EPs</b>	<b>IN / OUT</b>	<b>13 / 8</b>	<b>9 / 6</b>	<b>14 / 9</b>	<b>14 / 9</b>	<b>15 / 9</b>	<b>12 / 8</b>	<b>15 / 9</b>	<b>14 / 8</b>
<b>Product</b>		<b>MC73xx</b>		<b>AR755x</b>				<b>WP710x</b>	
<b>Purpose</b>		MC73 Default	AT+ MODEM	AR7 Default	OSA + 2RMNet	Bit-Pipe only	AT+ MODEM	WP710x Default	Bit-Pipe only

D = Enumeration of RNDIS and ECM are mutually exclusive, ECM default.

<sup>1</sup> Enumeration based on NV flag

## Using legato to customize the endpoints

If none of the provided compositions meet your needs it is possible to fine-tune the USB configuration using a mechanism built into Legato.

The first step is to create `/etc/legato/usbmode`. An example file is shipped in this directory in the default distribution, called `usbmode.ex`.

`usbmode` contains a list, one per line, of the endpoints you wish to enumerate. For example, the default file contains

```
ecm
acm
nmea
```

The full list of supported modes is:

Name	Description
<b>ecm</b>	CDC-ECM, providing an IP connection over USB
<b>acm</b>	CDC_ACM, providing an AT command port
<b>nmea</b>	A serial interface which outputs NMEA strings when positioning is enabled
<b>audio</b>	USB audio interface
<b>serial</b>	A serial interface to the embedded linux
<b>mbim</b>	Mobile Broadband Interface Model (an extension of NCM)

## FURTHER READING

More information on the USB implementation on these devices can be found in the USB Driver Developer's Guides available from the [Sierra Wireless Source](#).