



EM759X Series

Migration Guide

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Rev. 5



SIERRA
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Revision History

Revision number	Release date	Changes
1	April 2022	Document creation
2	June 2022	Added Software section
3	June 2022	Updated Table 2-11 Regulatory Compliance (removed EM7411 Japan, added EM7565 Anatel)
4	June 2022	Updated Table 2-11 Regulatory Compliance (added EM7455 Japan)
5	August 2023	<ul style="list-style-type: none"> Renamed document from EM7590 to EM759X Series AT Command Reference Added EM7595 Updated Table 2-11 Regulatory Compliance (added EM7421 Brazil)

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>> 1: Introduction

This document provides information for developers planning to migrate to EM759X Series modules (EM7590, EM7595) from EM7411/EM7421/EM7431, EM7430/EM7455, or EM7511/EM7565 modules. EM759X modules are drop-in compatible, sharing common characteristics such as dimensions, power supply, environmental specifications, etc.

Included in this document are summaries of specific RF, interface, and regulatory features and differences between these module series.

Important: *This document summarizes key differences between modules. For detailed module specifications, including module-specific current consumption and RF sensitivity measurements, refer to each device's Product Technical Specification—see [Reference Documents on page 14](#).*

2.1.2 Data Rates

Table 2-2: 3GPP Compliance and Data Rates

	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565	EM7590	EM7595
3GPP Standard	Release 11	Release 11 + partial Release 12/13		Release 12 + partial Release 13	
LTE Category	Cat 6	Cat 7	Cat 12	Cat 13	
LTE DL data rate	300 Mbps		600 Mbps	400 Mbps	600 Mbps
LTE UL data rate	50 Mbps	150 Mbps			
Downlink MIMO	2x2, 4x2 MIMO				
UMTS Category	DC-HSPA+ (DL 42 Mbps/UL 5.76 Mbps)				

2.1.3 Supported Carrier Aggregation Combinations

Supported carrier aggregation combinations vary from module to module. For details, refer to the module-specific Product Technical Specification documents—see [Reference Documents on page 14](#).

2.2 Module Pinouts

EM759X modules are pin-compatible with all other EM74xx/EM75xx modules, except as indicated in [Table 2-3](#).

Table 2-3: Pin Support Variations by EM Series Module Type

Pin #	Group	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565	EM7590
20	Audio	PCM_CLK/I2S_CLK	NC	NC	NC
22	Audio	PCM_DIN/I2S_DIN	NC	NC	NC
24	Audio	PCM_DOUT/I2S_DOUT	NC	NC	NC
28	Audio	PCM_SYNC/I2S_WS	NC	NC	NC
41	PCIe	NC	NC	PCIE_TXM ^a	NC
43	PCIe	NC	NC	PCIE_TXP ^a	NC
47	PCIe	NC	NC	PCIE_RXM ^a	NC
49	PCIe	NC	NC	PCIE_RXP ^a	NC
50	PCIe	NC	NC	PCIE_PERST_N ^a	NC
52	PCIe	NC	NC	PCIE_CLKREQ_N ^a	NC
53	PCIe	NC	NC	PCIE_REFCLKM ^a	NC

Table 2-3: Pin Support Variations by EM Series Module Type (Continued)

Pin #	Group	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565	EM7590
54	PCIe	NC	NC	PCIE_PEWAKE_N ^a	NC
55	PCIe	NC	NC	PCIE_REFCLKP ^a	NC
56	Audio	I2C_DATA	NC	NC	NC
58	Audio	I2C_CLK	NC	NC	NC

a. Reserved pin; leave floating on host side

2.3 Software

2.3.1 Firmware Filenames

All EM74xx and EM75xx modules support firmware (FW) images and carrier PRIs. However, EM759X filename extensions are different from the other modules, as indicated in [Table 2-4](#).

Table 2-4: Firmware Filenames

File Type	Filename Extension			
	EM7590 EM7595	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565
FW image	.fwi		.cwe	
Carrier PRI	.mcf		.nvu	
Package (multiple FW+PRI)	.sop		.spkg	

2.3.2 USB Interface ID

EM759X modules support the same USB interface IDs as other EM74xx and EM75xx modules, except for the differences indicated in [Table 2-5](#).

Table 2-5: USB Interface ID Differences

Type	Interface IDs			
	EM7590 EM7595	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565
GNSS port	0x04		n/a	

2.3.3 FOTA

EM759X modules support different FOTA methods than other EM74xx and EM75xx modules, as indicated in [Table 2-6](#).

Table 2-6: FOTA Methods

Type	FOTA Methods			
	EM7590 EM7595	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565
FOTA	Carrier FOTA Host-based FOTA	AV FOTA		

2.3.4 AT Commands

For a list of AT commands supported by EM759X modules, including commands that are unique to the EM759X series, refer to [9] EM759X AT Command Reference (Doc# 41114426).

2.3.5 Windows Drivers and Tools

Table 2-7 indicates Windows drivers and tools used with EM74xx/EM75xx modules.

Table 2-7: Windows Drivers and Tools

Type	Drivers / Tools			
	EM7590 EM7595	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565
MBIM driver	Microsoft Mobile Broadband Inbox Driver	Microsoft Mobile Broadband Inbox Driver		
Location sensor driver	GNSS UMDF 2.0 driver ^a	Sierra Wireless Location Sensor Driver		
Windows Service	Swiservicelite for host image switching	Swiservice for host image switching plus additional features		
AT command over MBIM	Yes ^b	n/a		
QMI over MBIM	Yes	Yes		
Windows application	Win VANUI	Win VANUI/Skylight		
Windows logging tool	Win Logger	SWI Diag Util		
FW download tool	FDTW	FDT/FDT2		
FW logging	Modem Logger	SwiLogPlus/dm-logger		

a. Must enable the GNSS USB interface using AT!USBCOMP

b. AT over MBIM is used by MBIMAT, which is a host tool that is included in the EM7590 Driver Package.

2.3.5.1 Windows Interfaces

Make sure the following interfaces are properly configured:

- MBIM—This is an essential module interface for Windows 10/11. Make sure MBIM is enabled using AT!USBCOMP? to display configured interfaces.

```
at!usbcomp?  
Config Index: 1  
Config Type: 1 (MBIM USBIF)  
Interface bitmask: 00001019 (diag,modem,gnss,mbim)  
OK
```

If MBIM is not enabled, enable it using AT!USBCOMP=<parameter_list>.

- Serial/AT port—Per Microsoft Mobile Broadband requirements, the serial/AT port must be physically disabled in the shipped image.

For details, see <https://docs.microsoft.com/en-us/windows-hardware/design/component-guidelines/mobile-broadband>.

- GNSS—To use the Location Sensor interface in Windows 10/11, make sure GNSS is enabled using AT!USBCOMP? to display configured interfaces.

```
at!usbcomp?  
Config Index: 1  
Config Type: 1 (MBIM USBIF)  
Interface bitmask: 00001019 (diag,modem,gnss,mbim)  
OK
```

If GNSS is not enabled, enable it using AT!USBCOMP=<parameter_list>. (Note—The GNSS and NMEA interfaces are mutually exclusive.)

2.3.5.2 Location Sensor Driver

To confirm the Location Sensor interface installed successfully when the driver package was installed, open Windows Device Manager—the Sierra Wireless Location Sensor device will appear under Sierra Wireless Location Sensor Interconnect.



2.3.6 Linux Drivers and Tools

Table 2-8 indicates linux drivers and tools used with EM74xx/EM75xx modules.

Table 2-8: Linux Drivers and Tools

Type	Drivers / Tools			
	EM7590 EM7595	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565
Linux kernel version	Version 4.4+			
MBIM driver	cdc_mbim			
QMI driver	qmi_wwan			
Serial driver	qcserial			
Linux driver	Open source (maintained by Sierra Wireless)		Open source	
Linux lib/SDK	libmbim or libqmi		MBPL	
FW logging	Fw-logger		Dm-logger	
FW download tool	FW download tool Linux (FDTL)		MBPL	

2.3.6.1 Drivers

Sierra Wireless maintains the Linux driver for EM759X modules and upstreams kernel changes to be incorporated into the open source drivers.

If the full kernel is not pulled and installed, the following patches must be applied to the qcserial and qmi_wwan drivers for use with EM759X modules to support additional VID/PID values (Note—cdc_mbim does not require an additional patch):

Table 2-9: Linux Driver patches

Driver	Patch Details
qcserial	https://git.kernel.org/pub/scm/linux/kernel/git/stable/stable-queue.git/diff/queue-4.14/usb-serial-qcserial-add-support-for-sierra-wireless-em7590.patch?id=1f8d024c4e4c52d96ebbdee2b93d78f492a3148f
qmi_wwan	https://git.kernel.org/pub/scm/linux/kernel/git/netdev/net-next.git/commit/?id=561215482cc6

To apply the patches for EM759X VID/PID values:

1. Refer to the URLs in [Table 2-9](#) for the required patch details, apply the patches to your source files and then rebuild the driver.

2. To confirm the patches were correctly applied:
 - a. Set the module's USB configuration to include the MBIM interface. For example, set the configuration to present DM, NMEA, AT, and MBIM:

```
AT!USBCOMP=1,1,100D
```

- b. Display the current USB interface status:

```
lsusb -t
```

```
n@ethan-Latitude-7280:~$ lsusb -t
Bus 02.Port 1: Dev 1, Class=root_hub, Driver=xhci_hcd/6p, 5000M
|__ Port 1: Dev 5, If 0, Class=Vendor Specific Class, Driver=qcserial, 5000M
|__ Port 1: Dev 5, If 2, Class=Vendor Specific Class, Driver=qcserial, 5000M
|__ Port 1: Dev 5, If 3, Class=Vendor Specific Class, Driver=qcserial, 5000M
|__ Port 1: Dev 5, If 12, Class=Communications, Driver=cdc_mbim, 5000M
```

- c. Set the module's USB configuration to include the QMI interface. For example, set the configuration to present DM, NMEA, AT, and QMI:

```
AT!USBCOMP=1,1,10D
```

- d. Display the current USB interface status:

```
lsusb -t
```

```
n@ethan-Latitude-7280:~$ lsusb -t
Bus 02.Port 1: Dev 1, Class=root_hub, Driver=xhci_hcd/6p, 5000M
|__ Port 1: Dev 6, If 0, Class=Vendor Specific Class, Driver=qcserial, 5000M
|__ Port 1: Dev 6, If 2, Class=Vendor Specific Class, Driver=qcserial, 5000M
|__ Port 1: Dev 6, If 3, Class=Vendor Specific Class, Driver=qcserial, 5000M
|__ Port 1: Dev 6, If 8, Class=Vendor Specific Class, Driver=qmi_wan, 5000M
```

Important: On some Linux distributions, ModemManager automatically interacts with the EM759X module's modem, and will interfere with AT/MBIM interfaces. If you do not intend to use ModemManager, it is strongly recommended to stop the process:

For example, to stop ModemManager in Ubuntu, use:

```
$ sudo systemctl stop ModemManager.service
```

2.3.7 Android Drivers

EM759X Android drivers are under development. Table 2-10 presents a partial list.

Table 2-10: Android Drivers^a

Type	Drivers / Tools			
	EM7590 EM7595	EM7430 EM7455	EM7411 EM7421 EM7431	EM7511 EM7565
Drivers/SDK	New RIL library, MBIM only		MBPA	

a. Preliminary content

2.4 Regulatory Compliance and Industry Certifications

Table 2-11 and Table 2-12 list the regulatory compliance and industry certifications for each EM series module. For detailed information, refer to the specific product specifications for each module, as listed in [Reference Documents on page 14](#).

Table 2-11: Regulatory Compliance

Regulatory Compliance		EM7430	EM7455	EM7411	EM7421	EM7431	EM7511	EM7565	EM7590	EM7595
Brazil	OCD	Y	Y		Y			Y		
China	CCC	Y						Y		
USA	FCC		Y	Y			Y	Y	Y	Y
Canada	IC		Y	Y			Y	Y	Y	Y
Mexico	IFT		Y					Y		
Japan	MIC	Y	Y			Y		Y	Y	Y
Taiwan	NCC	Y	Y		Y		Y	Y	Y	Y
South Korea	KCC	Y			Y			Y		
EU	RED			Y	Y	Y		Y	Y	Y
Australia ^a		Y	Y		Y			Y	Y	Y

a. Module is compliant with applicable requirements from AS/CA S042.1:2018 and AS/CA S042.4:2018. Relevant supporting documentation will be provided to support RCM certification at end-device level.

Table 2-12: Industry Certifications

Certification	EM7430	EM7455	EM7411	EM7421	EM7431	EM7511	EM7565	EM7590	EM7595
GCF	Y	Y	Y	Y	Y	Y	Y	Y	Y
PTCRB		Y	Y			Y	Y	Y	Y

>> 3: References

3.1 Web Site Support

Check source.sierrawireless.com for the latest available documentation for EM series modules.

3.2 Reference Documents

- [1] EM7411 Product Technical Specification (Doc# 41113694)
- [2] EM7421 Product Technical Specification (Doc# 41113693)
- [3] EM7430 Product Technical Specification (Doc# 4116235)
- [4] EM7431 Product Technical Specification (Doc# 41113759)
- [5] EM7455 Product Technical Specification (Doc# 4116236)
- [6] EM7511 Product Technical Specification (Doc# 41112028)
- [7] EM7565 Product Technical Specification (Doc# 41110788)
- [8] EM759X Product Technical Specification (Doc# 41114425)
- [9] EM759X AT Command Reference (Doc# 41114426)