AirPrime EM Series

Migration Guide

41112212
Rev 1

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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Do not operate the Sierra Wireless modem in areas where blasting is in progress, where explosive atmospheres may be present, near medical equipment, near life support equipment, or any equipment which may be susceptible to any form of radio interference. In such areas, the Sierra Wireless modem **MUST BE POWERED OFF**. The Sierra Wireless modem can transmit signals that could interfere with this equipment.

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Note: Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. Sierra Wireless modems may be used at this time.

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Corporate and product information	Web: sierrawireless.com

Revision History

Revision number	Release date	Changes
1	June 2018	Initial release

Contents

1: Introduction

This document is intended to provide guidance for migrating applications from using AirPrime EM73xx or EM74xx modules to AirPrime EM75xx modules.

The document summarizes the primary features of the EM Series module variants, and differences between them.

2: Features Comparison

The following table summarizes the features available in each EM73xx, EM74xx, and EM75xx variant.

Table 2-1: Features Comparison

Group / Feature	7305	7330	7355	7430	7430C	7455	7511	7565
RF	Number of bands supported							
LTE	5	3	6	13	13	15	24[a]	24[a]
UMTS	4	4	5	6	6	6	8	8
GSM	4	4	4	0	0	0	0	0
CDMA	0	0	3	0	0	0	0	0
TD-CDMA	0	0	0	1	0	0	0	0
GNSS	Features supported							
GPS	Yes						Yes	
GLONASS	Yes						Yes	
BeiDou	No			Yes			Yes	
Galileo	No			Yes			Yes	
QZSS	No			Yes			Yes	
A-GPS	Yes						Yes	
A-GNSS	Yes						Yes	
gpsOneXtra	Yes						Yes	

Table 2-1: Features Comparison (Continued)

Group / Feature	7305	7330	7355	7430	7430C	7455	7511	7565
Interfaces								
SIM	(1) 1.8V/3V			(2) 1.8V/3V			(2) 1.8V/3V	
USB	USB 2.0			USB2.0, USB3.0			USB2.0, USB3.0	
Antennas	3			3			3	
Audio (digital)	n/a			(1) PCM/I2S			Reserved[b]	
GPIO	1			4			4	
Flash LED	1			1			1	
I^2C	1			1			1	
Environmental								
Operating temperature range	Class A: -20C to +60C	Class A: -20C to +60C Class B: -30C to +75C	Class A: -20C to +60C	Class A: -30C to +70C Class B: -40C to +85C			Class A: -30C to +70C Class B: -40C to +85C	
Mechanical								
Length (mm)	42.15			42.15			42.15	
Width (mm)	30.15			30.15			30.15	
Height (mm)	2.33			2.33			2.33	
Weight (g)	6.25			6.5			6.5	

a. LTE B42/B43/B48 currently disabled, pending regulatory approval.
b. EM75xx modules—PCM/I2S support not currently available; pending future hardware support

3: Hardware Compatibility

This chapter describes hardware differences between EM73xx, EM74xx, and EM75xx module variants.

These differences include:

- Supported RF Bands on page 9
- Available RF Connectors on page 12
- Supported Temperature Range on page 13
- Power on page 14 (voltage range, current consumption)
- Second SIM Interface on page 14
- Antenna Control, DPR, and GPIOs on page 16 (GPIOs as alternate functions)
- PCM/I2S Audio, and I2C on page 16
- USB Interface on page 17

RF Bands

The following tables summarize the RF bands (Table 3-1, Table 3-2) and data rates (Table 3-3) supported by EM Series module variants.

Table 3-1: Supported RF Bands (LTE)

EM	LTE[a]																														
	1	2	3	4	5	7	8	9	12	13	14	17	18	19	20	21	25	26	28	29	30	32	38	39	40	41	42	43	46	48	66
7305	F		F			F	F								F																
7330	F													F		F															
7355		F		F	F					F		F					F														
7430	F		F		F	F	F						F	F		F			F				T	T	T	T					
7430C	F		F		F	F	F						F	F		F			F				T	T	T	T					
7455	F	F	F	F	F	F	F		F	F					F		F	F		F	F					T					
7511	F	F	F	F	F	F	F	F	F	F	F		F	F	F			F		F[b]	F	F[b]				T	T[c]	T[c]	T[b]	T[c]	F
7565	F	F	F	F	F	F	F	F	F	F			F	F	F			F	F	F[b]	F	F[b]				T	T[c]	T[c]	T[b]	T[c]	F

a. F=FDD; T=TDD
b. Downlink only
c. B42/B43/B48 disabled as of publication date, support pending regulatory approval

Table 3-2: Supported RF Bands (UMTS, GSM, CDMA, TD-SCDMA, GNSS)

EM	UMTS									GSM				CDMA			TD[a]	GNSS				
	1	2	3	4	5	6	8	9	19	850	900	1800	1900	BC0	BC1	BC10	39	GPS	GLO[b]	Bei	Gal	QZSS
7305	Y	Y			Y		Y			Y	Y	Y	Y					Y	Y			
7330	Y				Y	Y			Y	Y	Y	Y	Y					Y	Y			
7355	Y	Y		Y	Y		Y			Y	Y	Y	Y	Y	Y	Y		Y	Y			

Table 3-2: Supported RF Bands (UMTS, GSM, CDMA, TD-SCDMA, GNSS) (Continued)

EM	UMTS									GSM				CDMA			TD[a]	GNSS				
	1	2	3	4	5	6	8	9	19	850	900	1800	1900	BC0	BC1	BC10	39	GPS	GLO[b]	Bei	Gal	QZSS
7430	Y				Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	
7430C	Y				Y	Y	Y	Y	Y								Y	Y	Y	Y	Y	
7455	Y	Y	Y	Y	Y		Y											Y	Y	Y	Y	
7511	Y	Y		Y	Y	Y	Y	Y	Y									Y	Y	Y	Y	Y
7565	Y	Y		Y	Y	Y	Y	Y	Y									Y	Y	Y	Y	

a. TD=TD-SCDMA
b. GLO=GLONASS; Bei=BeiDou; Gal=Galileo

Table 3-3: Supported Data Rates

Module	Data rates					Notes
	LTE	UMTS	GSM	CDMA	TD-CDMA	
EM73xx	DL (Cat 3): • 100 Mbps (20 MHz BW) • 50 Mbps (10 MHz BW) UL (Cat 3): • 50 Mbps (20 MHz BW) • 25 Mbps (10 MHz BW)	• DL (Cat 24): Up to 42 Mbps • UL (Cat 6): Up to 5.76 Mbps	• EDGE throughput to 236 kbps	CDMA IS-856 (1xEV-DO Release A) • Up to 3.1 Mbps forward channel • Up to 1.8 Mbps reverse channel CDMA IS-2000 • Up to 153 kbps, simultaneous forward and reverse channel Circuit-switched data bearers up to 14.4 kbps	n/a	• LTE: MIMO support • UMTS: Diversity support • CDMA: Diversity support
EM74xx	DL (Cat 6): • FDD: 300 Mbps • TDD: 222 Mbps UL (Cat 6): • FDD: 50 Mbps • TDD: 26 Mbps	• DL (Cat 24): Up to 42 Mbps • UL (Cat 6): Up to 5.76 Mbps	n/a	n/a	• DL: Up to 2.8 Mbps • UL: Up to 2.2 Mbps • Spreading rate DL: 1.28 Mcps	• LTE: Downlink MIMO support (2x2, 4x2) • UMTS: Diversity support • TD-SCDMA: Diversity support
EM75xx	DL (Cat 12 with 3CA): • 256QAM: 600 Mbps UL (Cat 13 with 2CA contiguous): • 64QAM: 150 Mbps	• DL (Cat 24): Up to 42 Mbps • UL (Cat 6): Up to 11 Mbps	n/a	n/a	n/a	• LTE: Downlink MIMO support (2x2, 4x2) • UMTS: Diversity support

RF Connectors

All EM Series modules have three RF connectors (Main, GNSS, and Auxiliary). The Auxiliary connector is used for a combination of Diversity, MIMO, and GNSS, depending on the module type, as described in the following table.

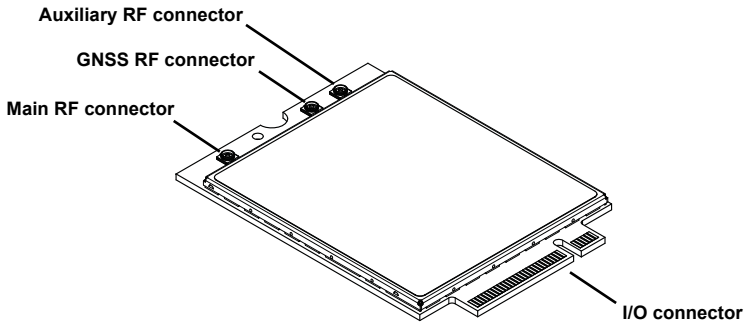

Figure 3-1: Module Connector Locations (EM74xx module shown)

Table 3-4: RF Connector Usage

EM Module	Num. conns	Main Connector	GNSS Connector	Auxiliary connector		
				Diversity / MIMO / GPS / GLONASS	Diversity / MIMO / GPS / GLONASS / Galileo	Diversity / GPS / GLONASS / BeiDou / Galileo / QZSS
7305	3	Y	Y	Y		
7330	3	Y	Y	Y		
7355	3	Y	Y	Y		
7430	3	Y	Y		Y	
7430C	3	Y	Y		Y	
7455	3	Y	Y		Y	
7511	3	Y	Y			Y
7565	3	Y	Y			Y

GNSS Antenna

Table 3-5 on page 13 describes GNSS antenna features that vary between EM Series modules.

Table 3-5: GNSS Antenna Connector Details

EM Module	GPS Bias	Voltage (Max)	Current
7305	No	-	-
7330	No	-	-
7355	No	-	-
7430	Yes	3.25 V	100 mA
7430C	Yes	3.25 V	100 mA
7455	Yes	3.25 V	100 mA
7511	Yes	3.25 V	100 mA
7565	Yes	3.25 V	100 mA

Temperature Range

EM Series modules have different operating temperature ranges as detailed in the following table.

Table 3-6: Operating Temperature Ranges

Module	Class A	Class B	Internal temperature recommendation
7305 7355	-20C to +60C	n/a	< +85°C
7330	-20C to +60C	-30C to +75C	< +85°C
7430 7430C 7455	-30C to +70C	-40C to +85C	< +80°C
7511 7565	-30C to +70C	-40C to +85C	< +85°C

Power

Power Supply

EM Series modules have different operating voltage ranges as detailed in Table 3-7.

Table 3-7: Operating Voltages

Module	Minimum	Typical	Maximum
73xx 74xx	3.135 V	3.70 V	4.40 V
75xx	3.135 V	3.30 V	4.40 V

Current Consumption

Table 3-8 lists the maximum or typical averaged call mode DC power consumption values for EM Series modules.

Table 3-8: Max Averaged Call Mode DC Power Consumption

Module	Current (mA)	Max/Typ	RAT
7305	950	Max	LTE
7330	950	Max	LTE
7355	950	Max	EV-DO
	950	Max	LTE
7430	1000	Typ	LTE
7430C	1000	Typ	LTE
7455	1000	Typ	LTE
7511	1030	Typ	LTE
7565	1030	Typ	LTE

Interfaces

SIM Interface

All EM Series modules support a SIM interface for 1.8V/3.0V SIMs on pins 30, 32, 34, and 36.

Primary UIM interface voltage levels differ between the EM73xx and the EM74xx/EM75xx modules as detailed in the following table.

Table 3-9: UIM1 Interface Voltage Levels (V)

Pin	Signal	Direction	Active State	SIM	EM73xx	EM74xx/EM75xx
30	UIM-RESET (UIM1_RESET)	Output	Low	3V/1.8V	0/-/0.45	0/-/0.45
			High	3V	2.40/-/2.85	2.55/3.00/3.10
				1.8V	1.35/-/1.8	1.35/1.80/1.90
32	UIM-CLK (UIM1_CLK)	Output	Low	3V/1.8V	0/-/0.45	0/-/0.45
			High	3V	2.40/-/2.85	2.55/3.00/3.10
				1.8V	1.35/-/1.8	1.35/1.80/1.90
34	UIM-DATA (UIM1_DATA)	Input	Low	3V	-0.3/-/0.7	-0.30/-/0.60
				1.8V	-0.3/-/0.63	-0.30/-/0.35
			High	3V	1.85/2.85/3.15	2.10/3.00/3.30
				1.8V	1.17/1.8/2.1	1.17/1.80/2.10
		Output	Low	3V/1.8V	0/-/0.45	0/-/0.40
			High	3V	2.40/-/2.85	2.55/3.00/3.10
				1.8V	1.35/-/1.8	1.35/1.80/1.90
36	UIM-PWR (UIM1_PWR)	Output	Power	3V	2.75/2.85/3.05	2.90/3.00/3.10
				1.8V	1.75/1.8/1.85	1.75/1.80/1.85

EM74xx and EM75xx modules also support a second SIM interface (UIM2) for 1.8V/3.0V SIMs as detailed in the following table.

Table 3-10: UIM2 Interface

Pin	Signal		Function	SIM Contact	Description
	EM73xx	EM74xx/ EM75xx			
40	Reserved[a]	SIM_DETECT_2	SIM2 indication		Indicates whether SIM is present
42	Reserved[a]	USIM2_DATA	SIM 2 IO Data	7	Bi-directional SIM 2 data line
44	Reserved[a]	USIM2_CLK	SIM 2 Clock	3	Serial clock for SIM 2 data
46	Reserved[a]	USIM2_RST	SIM 2 Reset	2	Active low SIM 2 reset
48	Reserved[a]	USIM2_PWR	SIM 2 VCC supply	1	Power supply for SIM 2

a. EM73xx pins 40, 42, 44, 46, 48 reserved for future use (low-power GNSS)

Antenna Control, DPR, and GPIOs

All EM Series modules provide four pins (ANT_CTRL0:3) for output signals that may be used for host designs that incorporate tunable antennas, and a pin for Dynamic Power Reduction (DPR).

Each EM module series allows some of these pins to be used as GPIOs as well (as alternate functions).

Table 3-11: Antenna Control, DPR, and GPIO Pin Assignments

Module	Pin 25	Pin 59	Pin 61	Pin 63	Pin 65
7305	DPR/GPIO	ANT_CTL0	ANT_CTL1	ANT_CTL2	ANT_CTL3
7330					
7355					
7430	DPR	ANT_CTRL0/GPIO1	ANT_CTRL1/GPIO2	ANT_CTRL2/GPIO3	ANTCTRL3/GPIO4
7430C					
7455					
7511					
7565					

PCM/I^2S Audio, and I2C

EM74xx and EM75xx modules support a four-pin PCM/I2S digital audio interface and two-pin I2C interface. These interfaces are not available on EM73xx modules.

Table 3-12: PCM/I^2S Audio Interface and I2C Interface Support

	I2C		PCM/I^2S			
Module	Pin 56	Pin 58	Pin 20	Pin 22	Pin 24	Pin 28
7305	NC	NC	NC	NC	NC	NC
7330						
7355						
7430	I2C_DATA	I2C_CLK	PCM_CLK/ I2S_CLK	PCM_DIN/ I2S_DIN	PCM_DOUT/ I2S_DOUT	PCM_SYNC/ I2S_WS
7430C						
7455						
7511	Reserved	Reserved	NC	NC	NC	NC
7565						

USB Interface

All EM Series modules support a USB 2.0 interface.

EM74xx and EM75xx modules also support a USB 3.0 interface.

Table 3-13: USB 3.0 Interface Availability

Module	Pin 29	Pin 31	Pin 35	Pin 37
7305	NC	NC	NC	NC
7330				
7355				
7430	USB3.0_TX-	USB3.0_TX+	USB3.0_RX-	USB3.0_RX+
7430C				
7455				
7511				
7565				

Mechanical Differences

Weight:

- EM73xx—6.25 g
- EM74xx/EM75xx—6.5 g

Thermal Considerations

EM75xx and EM74xx modules generate more heat than EM73xx modules, and may require a heatsink or air flow to meet the temperature specifications listed in Table 3-6 on page 13. If the module will be operated in a hot environment, make sure to perform thorough thermal testing.

4: Regulatory Compliance and Industry Certifications

The following table enumerates the regulatory compliance and industry certification of each EM Series module variant. For detailed information, refer to the corresponding product specification listed in section 7.1 Hardware Reference Documents.

Table 4-1: Module Regulatory Compliance and Industry Certification

Regulatory Compliance / Industry Certification	7305	7330	7355	7430	7430C	7455	7511	7565
CDG2			Y					
EU	Y			Y		Y		Y
USA	Y		Y			Y	Y	Y
GCF	Y			Y		Y	Y	Y
Canada			Y			Y	Y	Y
Japan		Y		Y		Y		Y
Taiwan	Y	Y	Y	Y		Y	Y	Y
PTCRB			Y			Y	Y	Y
China					Y			

5: Pinouts

Most pin assignments are the same between EM73xx, EM74xx, and EM75xx modules. The following table indicates only the pins that are different.

Table 5-1: Module Pinout Variations

Pin	EM73xx	EM74xx	EM75xx	Details
10	LED#1	WWAN_LED#	WWAN_LED#	LED signal, naming change only.
20	NC	PCM_CLK/I2S_CLK	Reserved[a]	PCM/I2S Audio, and I2C on page 16
22	NC	PCM_DIN/I2S_DIN	Reserved[a]	PCM/I2S Audio, and I2C on page 16
24	NC	PCM_DOUT	Reserved[a]	PCM/I2S Audio, and I2C on page 16
25	DPR/GPIO	DPR	DPR	Antenna Control, DPR, and GPIOs on page 16
26	W_DISABLE#2	W_DISABLE2#	GPS_DISABLE#	GNSS disable, naming change only.
28	NC	PCM_SYNC/ I2S_WS	Reserved[a]	PCM/I2S Audio, and I2C on page 16
29	NC	USB3.0_TX-	USB3.0_TX-	USB Interface on page 17
30	UIM-RESET	UIM1_RESET	UIM1_RESET	SIM Interface on page 14
31	NC	USB3.0_TX+	USB3.0_TX+	USB Interface on page 17
32	UIM-CLK	UIM1_CLK	UIM1_CLK	SIM Interface on page 14
34	UIM-DATA	UIM1_DATA	UIM1_DATA	SIM Interface on page 14
35	NC	USB3.0_RX-	USB3.0_RX-	USB Interface on page 17
36	UIM-PWR	UIM1_PWR	UIM1_PWR	SIM Interface on page 14
37	NC	USB3.0_RX+	USB3.0_RX+	USB Interface on page 17
40	Reserved[b]	SIM_DETECT_2	SIM_DETECT_2	SIM Interface on page 14
41	NC	NC	Reserved[c]	
42	Reserved[b]	UIM2_DATA	UIM2_DATA	SIM Interface on page 14
43	NC	NC	Reserved[c]	
44	Reserved[b]	UIM2_CLK	UIM2_CLK	SIM Interface on page 14
46	Reserved[b]	UIM2_RESET	UIM2_RESET	SIM Interface on page 14
47	NC	NC	Reserved[c]	
48	Reserved[b]	UIM2_PWR	UIM2_PWR	SIM Interface on page 14
49	NC	NC	Reserved[c]	
50	NC	NC	Reserved[c]	
52	NC	NC	Reserved[c]	

Table 5-1: Module Pinout Variations (Continued)

Pin	EM73xx	EM74xx	EM75xx	Details
53	NC	NC	Reserved[c]	
54	NC	NC	Reserved[c]	
55	NC	NC	Reserved[c]	
56	NC	I2C_DATA	Reserved[d]	PCM/I2S Audio, and I2C on page 16
58	NC	I2C_CLK	Reserved[d]	PCM/I2S Audio, and I2C on page 16
59	ANTCTL0	ANTCTL0 (GPIO1)	ANTCTL0 (GPIO1)	Antenna Control, DPR, and GPIOs on page 16
61	ANTCTL1	ANTCTL1 (GPIO2)	ANTCTRL1 (GPIO2)	Antenna Control, DPR, and GPIOs on page 16
63	ANTCTL2	ANTCTL2 (GPIO3)	ANTCTL2 (GPIO3)	Antenna Control, DPR, and GPIOs on page 16
65	ANTCTL3	ANTCTL3 (GPIO4)	ANTCTL3 (GPIO4)	Antenna Control, DPR, and GPIOs on page 16

a. EM75xx pins 20, 22, 24, 28 reserved for future use (PCM)
b. EM73xx pins 40, 42, 44, 46, 48 reserved for future use (low-power GNSS)
c. EM75xx pins 41, 43, 47, 49, 50, 52–55 reserved for future use (PCIe)
d. EM75xx pins 56, 58 reserved for future use (Audio)

6: References

Module-specific Product Technical Specifications and AT Command Reference documents are available at source.sierrawireless.com.