
LTE Wireless Data Module WPD-600

User Guide for LTE Data Module

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1. Overview

1.1. Introduction

The WPD-600 manufactured by WeTelecom is a wireless wide-area network (WWAN) data card implemented in a PCI Express Mini Card Form Factor (Type F2). The WPD-600 supports 4G LTE, 3G HSPA, and 2G GPRS/EDGE.

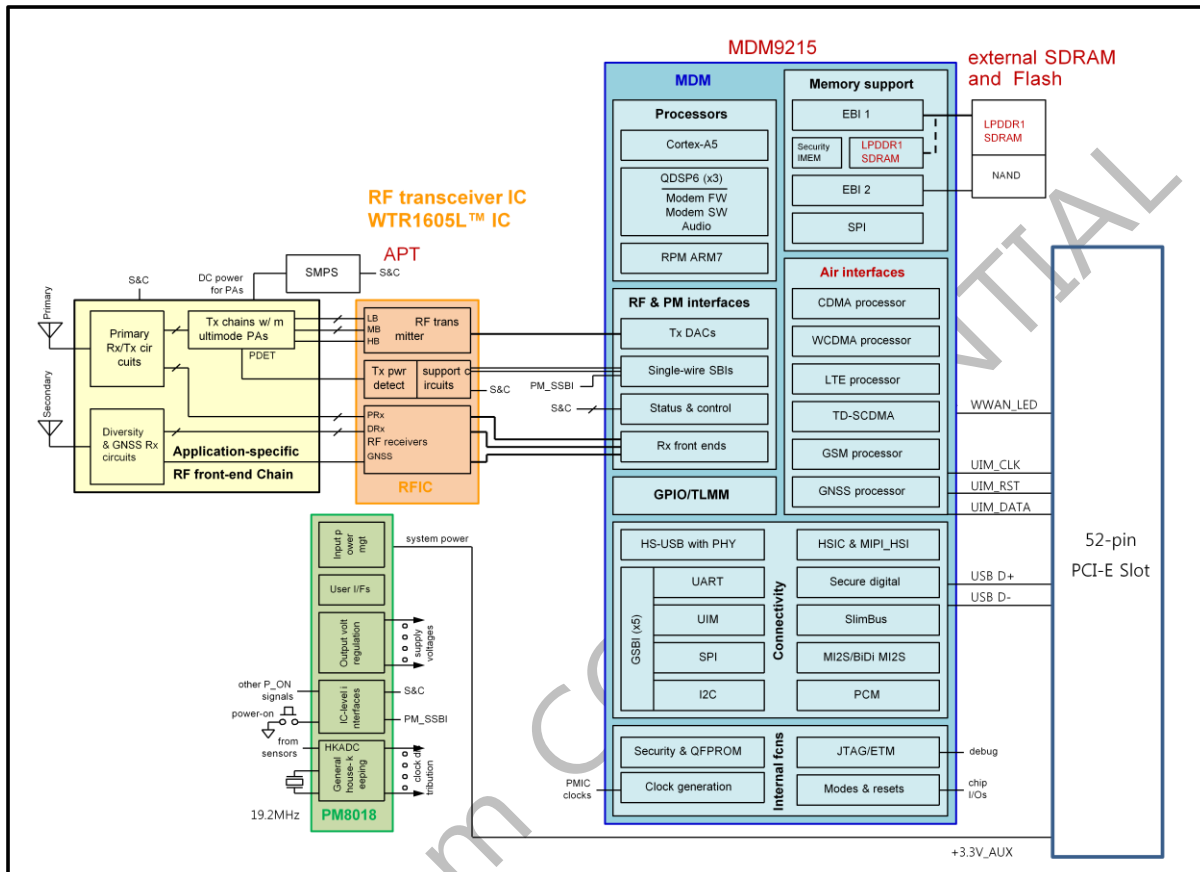
The WPD-600 module mounts in a notebook PC or any other equipment that has embedded PCI Express mini card slot. It also has connection to embedded antenna system via RF cables. The WPD-600 with its HS-USB 2.0 (High Speed – USB) interface enables notebook computer to transmit data.

1.2. Revision history

Version	Date	Descriptions
0.1	May 2013	Initial release
0.2	July 11, 2013	-Updated Pin interface (p.11) 1)pin1 : WAKE_N to NC 2)pin16 : UIM_VPP to NC 3)pin28 : NC to GPIO1 4)pin30 : NC to GPIO2 5)pin31 : NC to LED1 6)pin32 : NC to LED2 7)pin44 : NC to LED_WLAN 8)pin46 : NC to LED_WPAN -Modified height(p.7 & p.9) 1) 4.7mm to 4.4mm
0.2	July 29, 2013	-Updated Input power supply voltage(p.7) 1) Change nominal input voltage : +3.3V to +3.5V 2) Add Table 4.5.
0.2	September 17, 2013	-Changed Input power supply 1.0A to 1.2A
0.3	September 17, 2013	-Add SGPS(p.5) 1)Change USB Driver PID : 0x9043(p.7) -Add AT Command 1) AT\$QCPDPP(p.31) 2) AT*WGPSS.(p.32) 2) AT*WNMEAF(p.33)

2. Features

2.1. Block Diagram



2.2. Modem Capabilities

- LTE-FDD & TDD R8 Cat.3
 - 2X2 DL MIMO supported
 - Receiver Equalization
- DC-HSPA+ R8 / HSPA+ R7 / WCDMA R99
 - Rx Diversity supported
- GPRS/EDGE R99
- SGPS(Standalone GPS)

2.3. Supported RF Bands and Frequency Range

Table 2.3. Supported Frequency Bands

Technology	Band Class	Uplink (MHz)	Downlink (MHz)
LTE-FDD	2100MHz (B1)	1920 ~ 1980	2110 ~ 2170
	1800MHz (B3)	1710 ~ 1785	1805 ~ 1880
	850MHz (B5)	824 ~ 849	869 ~ 894
	2600MHz (B7)	2500 ~ 2570	2620 ~ 2690
	900MHz (B8)	880 ~ 915	925 ~ 960
	800MHz (B20)	832 ~ 862	791 ~ 821
LTE-TDD	2600MHz(B38)	2570 ~ 2620	2570 ~ 2620
UMTS	2100MHz(B1)	1920 ~ 1980	2110 ~ 2170
	1800MHz(B3)	1710 ~ 1785	1805 ~ 1880
	850MHz(B5)	824 ~ 849	869 ~ 894
	900MHz(B8)	880 ~ 915	925 ~ 960
GSM	850MHz	824 ~ 849	869 ~ 894
	900MHz	880 ~ 915	925 ~ 960
	1800MHz	1710 ~ 1785	1805 ~ 1880
	1900MHz	1850 ~ 1910	1930 ~ 1990

2.4. Data Speed

Table 2.4. Data speed for each operating network

Operating Network	Downlink	Uplink
LTE-FDD	100Mbps	50Mbps
LTE-TDD	68Mbps	17Mbps
DC-HSPA+	42Mbps	5.76Mbps
HSPA	14.4Mbps	5.76Mbps
WCDMA	384Kbps	384Kbps
EDGE	236.8Kbps	118.4Kbps
GPRS	85.6Kbps	42.8Kbps

2.5. Power Class

Table 2.5. Power class for each operating frequency bands

Technology	Bands	Power Class	Maximum TX Output Power (dBm)
LTE-FDD	B1/B3/B5/B8/B20	Power Class3	+23
	B7	Power Class3	+22
LTE-TDD	B38	Power Class3	+22
HSPA/WCDMA	B1/B3/B5/B8	Power Class3	+23
GPRS	850/900MHz	Power Class4	+32
	1800/1900MHz	Power Class1	+30
EDGE	850/900MHz	Power Class E2	+32
	1800/1900MHz	Power Class E2	+30

2.6. General Specifications

Parameters	Descriptions
Mechanical Interface	PCI Express Mini Card Form Factor (52pin) - Type F2
External Network Access	LTE / HSPA / UMTS / GPRS / EDGE
Chipsets	Qualcomm MDM9X15 / WTR1605L / PM8018
Input Power Supply	+3.5V/1.2A from PC and other equipment
Main Chipsets	Qualcomm MDM9215 / WTR1605L / PM8018
Data Peed	LTE-FDD Down link : 100Mbps, Up link : 50Mbps LTE-TDD Down link : 61Mbps, Up link : 18Mbps
Operating System	Windows 8/7/Vista/XP, Linux, Mac
VID	0x22DE
PID	0x9043
RX Diversity	Support
MIMO	2X2
AT Commands	Support
Operating Temperature	-20°C ~ +60°C
Size	30.0 mm (W) X 51.0 mm (L) X 4.4 mm (H)

Weight	13 g
Interfaces	External Antenna Connector (Main, Diversity) USIM HS USB 2.0 LED_WWAN_N/LED_WPAN_N/LED_WLAN_N UART GPIO1/GPIO2

2.7. Functions

Item	Descriptions
Data	- Auto Connection - Manual Connection - Set data parameter
Module Status	- Service status - System mode - Registration status - Roaming status - RSSI level - Data call status

2.8. Device Certifications

- RoHS Compliant
- CE (TBD)
- FCC (TBD)
- GCF (TBD)
- PTCRB (TBD)

3. Mechanical Specifications

3.1. Mechanical Drawing

The WPD-600 module is compatible with the PCI Express Mini Card 52-pin card edge-type connector. The figure 3.1 and 3.2 show the WPD-600 module's mechanical constraints.

- Dimension : 30mm(W) x 51mm(L) x 4.4mm(H) (Height tolerance : +0.1mm)

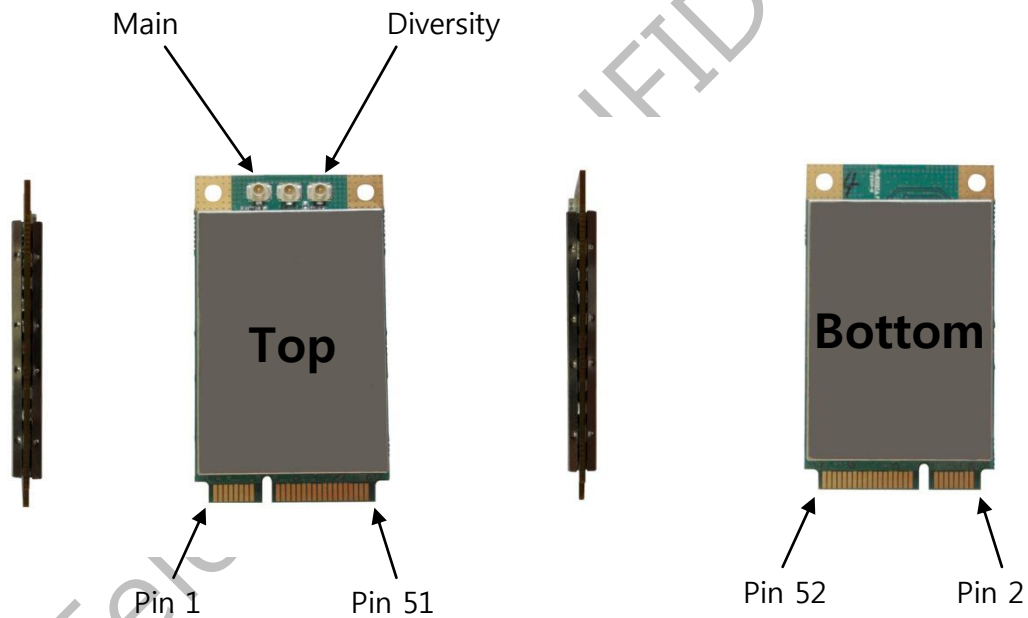


Figure 3.1. WPD-600 module

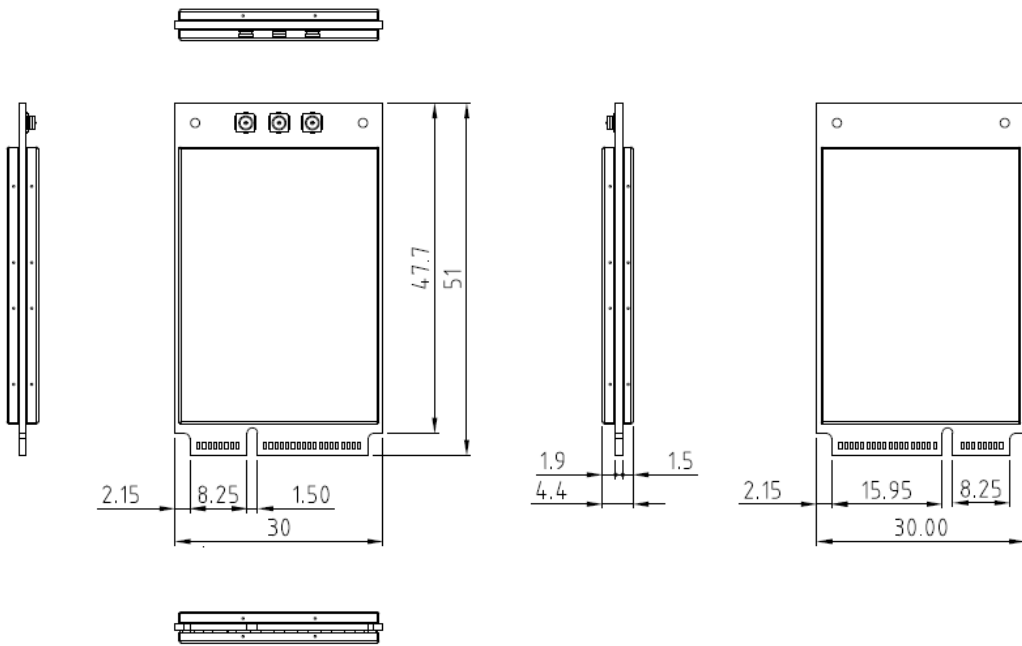


Figure 3.2

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3.2. Pin Descriptions

Table 3.2. Pin Interface of PCI Express Mini Card connector (Type1)

Pin Number	Name	Description
1	NC	No Connect
2	+3.3V_AUX	Input power source (+3.5V,typical)
3	NC	No Connect
4	GND	Ground
5	NC	No Connect
6	NC	No Connect
7	NC	No Connect
8	UIM_PWR	Power source for UICC
9	GND	Ground
10	UIM_DATA	UICC data signal
11	NC	No Connect
12	UIM_CLK	UICC clock signal
13	NC	No Connect
14	UIM_RESET	UICC reset signal
15	GND	Ground
16	NC	No Connect
17	NC	No Connect
18	GND	Ground
19	NC	No Connect
20	W_DISABLE_N	Active low. Used by the system to disable radio operation
21	GND	Ground
22	RESET_N	Active low. Reset pin
23	NC	No Connect
24	+3.3V_AUX	Input power source (+3.5V,typical)
25	NC	No Connect
26	GND	Ground
27	GND	Ground
28	GPIO1	GPIO (reserved pin)
29	GND	Ground
30	GPIO2	GPIO (reserved pin)
31	LED1	LED control (reserved)
32	LED2	LED control (reserved)
33	NC	No Connect
34	GND	Ground
35	GND	Ground
36	USB_D-	USB2.0 serial data 3interface
37	GND	Ground
38	USB_D+	USB2.0 serial data interface
39	+3.3V_AUX	Input power source (+3.5V,typical)
40	GND	Ground
41	+3.3V_AUX	Input power source (+3.5V,typical)
42	LED_WWAN_N	Active low when any Radio are capable of transmitting
43	GND	Ground
44	LED_WLAN	Active high. LED control (reserved)
45	NC	No Connect
46	LED_WPAN	Active high. LED control (reserved)
47	NC	No Connect
48	NC	No Connect
49	UART_TX	Serial port to transmit
50	GND	Ground, Return current path
51	UART_RX	Serial port to receive
52	+3.3V_AUX	Input power source (+3.5V,typical)

3.2.1. USB

The WPD-600 device complies with the high-speed electrical interface specification, except for the detection or use of the USB_VBUS signal which is not used in PCI Express Mini Card applications. This device supports both high-speed and full-speed connections.

3.2.2. UICC

The WPD-600 device connects to an UICC card via the PCI Express connector and is compliant with all standards specification. This device supports Class B and C UICC devices but does not support Class A (5V) devices.

3.2.3. LED_WWAN_N

The LED_WWAN_N pin goes to logic low when any Radio is capable of transmitting.

3.2.4. +3.3V_AUX

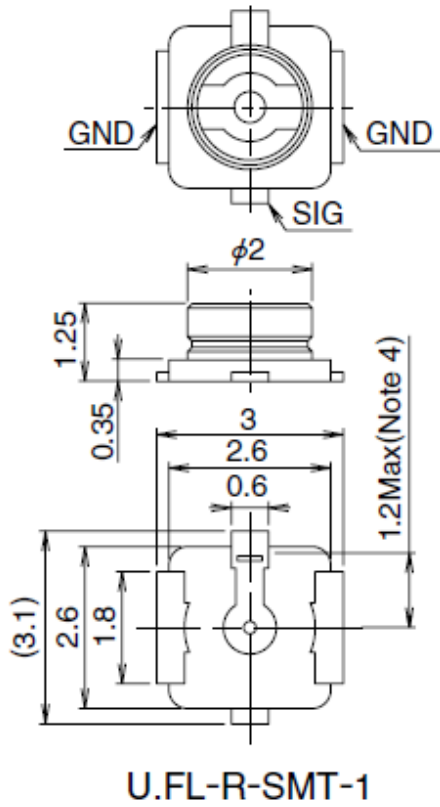
The device provides one power source (+3.3V_AUX). +3.3V_AUX is the only supply voltage available during the system's active and stand-by, and suspend state.

3.2.5. Exterior temperature rises due to power dissipation

The WPD-600 module exterior's temperature may rise above the ambient air temperature during operation due to thermal dissipation from its components. When the module is attached in its typical mounting configuration (system connector engaged and mounting screws are screwed in or board locker used), and transmitting maximum power in EDGE or WCDMA or LTE radio modes, the typical exterior temperature may rise above 50°C for both top and bottom side. The hottest areas are around power amplifiers.

3.3. Connector Information

3.3.1. RF Connector



Recommended PCB Mounting Pattern

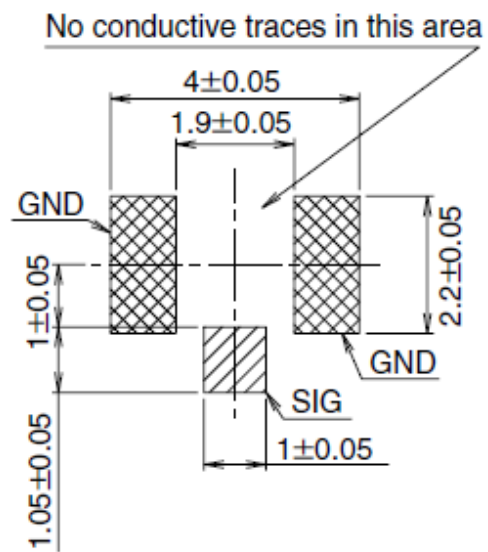


Figure 3.3

	U.FL-LP-040	U.FL-LP-066	U.FL-LP(V)-040	U.FL-LP-062	U.FL-LP-088
Part No.					
Mated Height	2.5mm Max. (2.4mm Nom.)	2.5mm Max. (2.4mm Nom.)	2.0mm Max. (1.9mm Nom.)	2.4mm Max. (2.3mm Nom.)	2.4mm Max. (2.3mm Nom.)
Applicable cable	Dia. 0.81mm Coaxial cable	Dia. 1.13mm and Dia. 1.32mm Coaxial cable	Dia. 0.81mm Coaxial cable	Dia. 1mm Coaxial cable	Dia. 1.37mm Coaxial cable
Weight (mg)	53.7	59.1	34.8	45.5	71.7
RoHS	YES				

Figure 3.4

3.3.2. PCI Express Mini Card Connector

We recommend 901-002-0008. Use alternatives if there is a sufficient space in height. Visit Longwell's website, http://www.astron.com.tw/astron_web/index.php for more information.

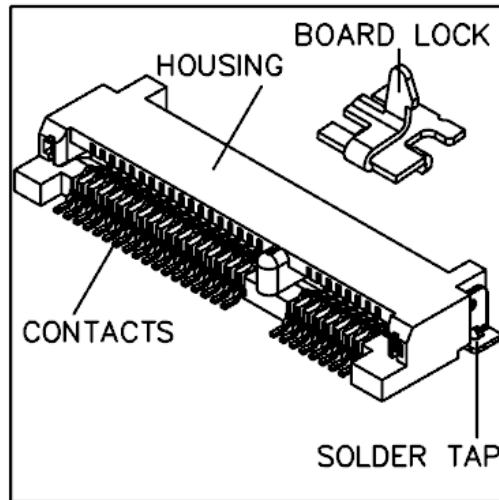


Figure 3.5

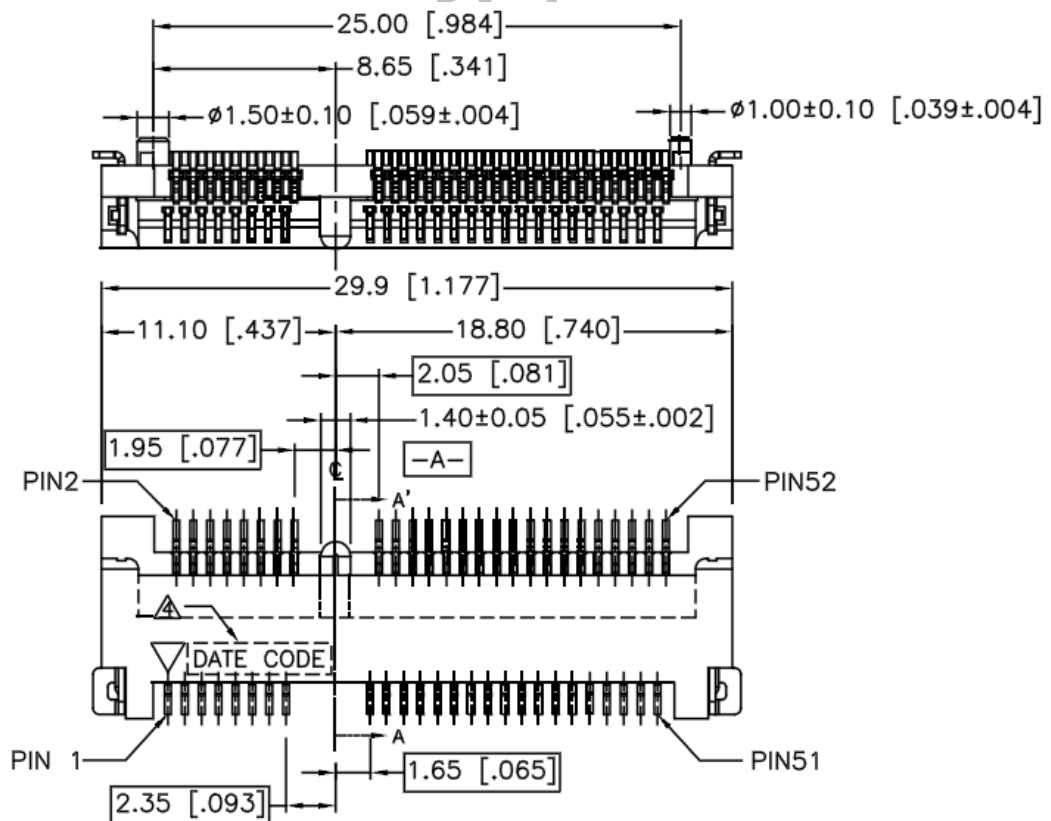


Figure 3.6

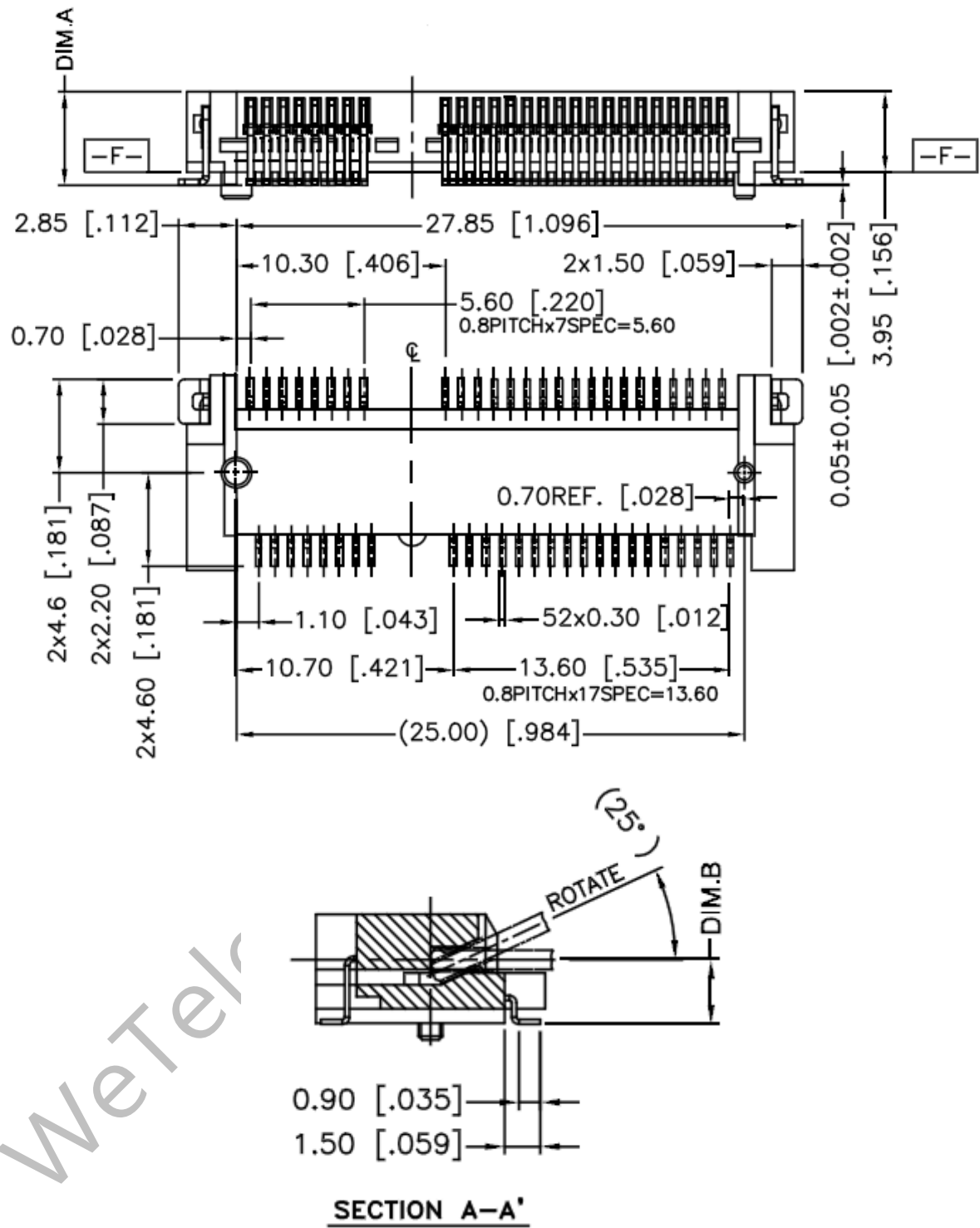
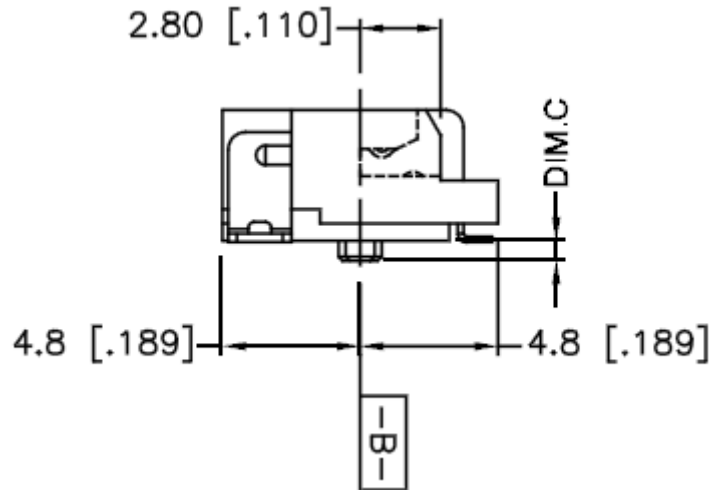


Figure 3.7



(E)	901-002-6008	4.85mm	2.95mm	0.70
(D)	901-002-5108	5.75mm	3.85mm	1.85
(C)	901-002-4008	6.75mm	4.85mm	0.70
(B)	901-002-3008	4.6mm	2.70mm	
	901-002-2008	6.0mm	4.10mm	
	901-002-1008	5.2mm	3.30mm	
	901-002-0008	4.0mm	2.10mm	
	PROD. NO.	DIM.A±0.05	DIM.B	DIM.C

Figure 3.8

4. Electrical Specifications

4.1. Absolute maximum ratings

Operating the module under conditions that exceed those listed in the absolute maximum ratings table may result in damage to the module. Absolute maximum ratings should be considered as limiting values. The module may not function properly and should not be operated if any one of the parameters is not within its specified operating range.

Table 4.1 Absolute maximum conditions

Parameter	Min	Max	Unit
Storage Temperature	-30	+85	°C
DC power on +3.3V_AUX	-0.5	+4.0	V
Non-operating humidity	5	95	%

4.2. Recommended operating conditions

Operating conditions including power supply voltage and ambient temperature are controlled by user. The module meets all performance specifications listed in Section 1.3 when used within the recommended operating conditions

Table 4.2 Recommended operating conditions

Parameter	Min	Typ	Max	Unit
Operating Temperature	-20	-	+60	°C
DC power on +3.3V_AUX	+3.2	+3.5	+3.8	V
Power source noise (60Hz to 2MHz)	-	-	20	mV
Operating Humidity	10	-	90	%

4.3. DC characteristics

The below specifications apply over the conditions in Table 3.2.

Table 4.3. UIM_DATA, UIM_CLK, and UIM_RST

Parameter	Min	Typ	Max	Unit
USIM power supply (Vsim)	-	1.8/2.85	-	V
High-level input voltage	0.7xVsim	-	Vsim	V
Low-level input voltage	0	-	0.2xVsim	V
High-level output voltage	0.7xVsim	-	Vsim	V
Low-level output voltage	0	-	0.2xVsim	V

Table 4.4. LED_WWAN_N

Parameter	Min	Typ	Max	Unit
Current sink	-	10	-	mA
Von (Host ON voltage)	0.5	-	2.3	V
Vmax (Safe Host voltage range)	0	-	3.6	V

Table 4.5. LED1, LED2, GPIO1, GPIO2, UART_TX, UART_RX, LED_WLAN, LED_WPAN, RESET_N

Parameter	Min	Typ	Max	Unit
I/O supply voltage (Vg)	-	1.8	-	V
High-level input voltage	0.7xVg	-	Vg	V
Low-level input voltage	0	-	0.2xVg	V

4.4. Power State

4.4.1. USB power State

State	Descriptions
Active	Packets are being transferred on the USB interface
Suspend	USB physical layer interface is IDLE
Off	The device is disconnected from the USB bus.

4.4.2. Device power state

State	Descriptions
D0	Full power, the device is fully on
D3	Sleep state. The USB port is suspended

4.4.3. Radio state

Radio State	Descriptions
Active Data Session	Connected to the network and is transferring data
Standby	Looking for network or periodically looking for pages after already finding a network. The Tx may be periodically enabled to maintain connectivity with the network
Sleep	Both Rx and Tx are off
Low Power Mode	Radio is disabled. But the baseband interface(ex: USB) is still operational

4.4.4. System state

System	USB	Device	Radio State
S0	Active	D0	Any
S3	Suspend	D3	Standby/Sleep/LPM
S3	Off	Off	Off
S4/S5	Off	Off	Off

4.4.5. Current consumption

Parameter	Max. current (mA)	Note
Normal current	1100	The highest averaged current value over any 1-second period

5. Applications Information

5.1. USIM Interface

- Connect a 0.1 μF capacitor between LDO6 (UIM_PWR) and ground near the host USIM card connector's Vcc pin. Refer to Figure 5.1. Reference Schematic.
- Keep the trace length to the USIM card connector < 10 inches
- The USIM electrical tests require < 1mA sunk into the USIM card when it drives the DATA=LOW. So select a value of any pull-up resistors on UIM_DATA pin on the host platform side to meet the requirement.
- Electromagnetic coupling between the host side UIM_PWR, UIM_DATA, UIM_CLK, and UIM_RESET signal traces can cause overshoot or undershoot on these signals.
- A LOW-to-HIGH or HIGH-to-LOW signal transition from one trace couple high-frequency signals to the other trace, it generates overshoot or undershoot. The most sensitive pair is UIM_DATA-to-UIM_CLK.
- The device supports Class B and C UICC devices but does not support Class A(5V) devices.

Figure 5.1. Reference schematic

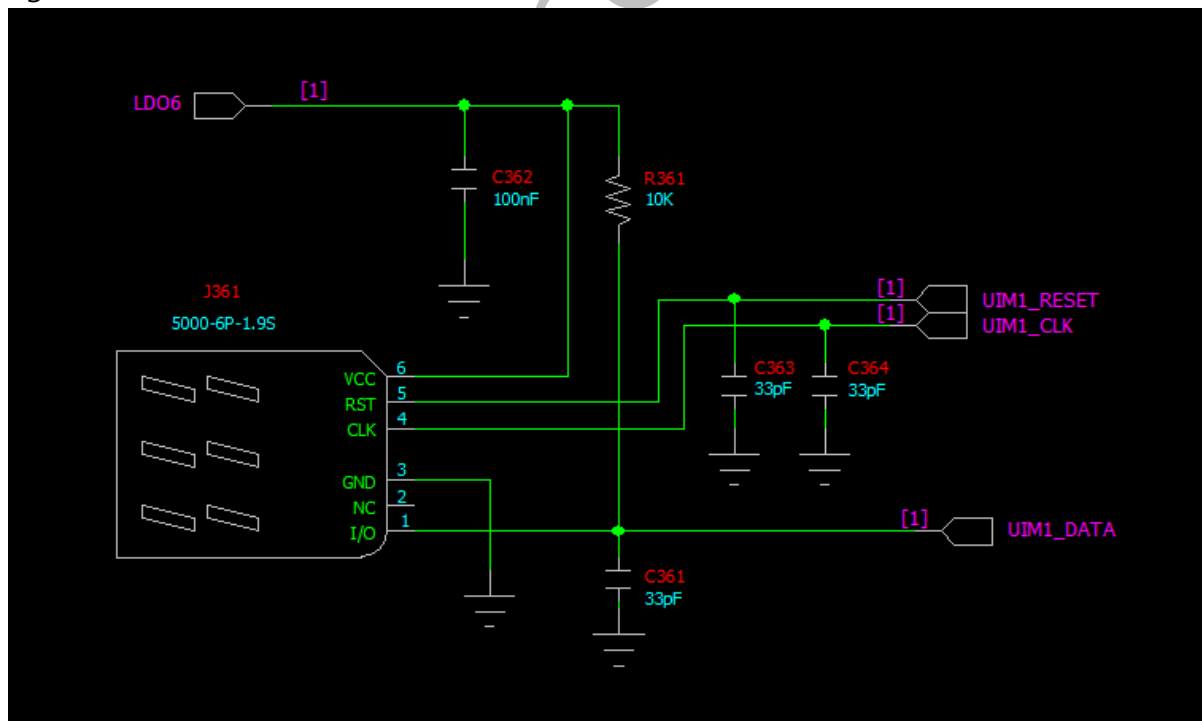


Table 5.1. Pin Interface

Pin Number	Pin Name	Description
8	UIM_PWR	Power source for USIM
10	UIM_DATA	USIM data signal
12	UIM_CLK	USIM clock signal
14	UIM_RESET	USIM reset signal

Table 5.2. Applicable Standards

Standards	Status
ISO/IEC 7816-3	Compliant

5.2. LED_WWAN_N

- Ensure the host side WWAN LED will not light up in a condition which some host devices disable WPD-600 module by removing voltage from the 3.3V_AUX pin and leaving the pin either open or shorted to ground.

Table 5.3. Pin Interface

Pin Number	Pin Name	Description
42	LED_WWAN_N	Active low when any Radio are capable of transmitting

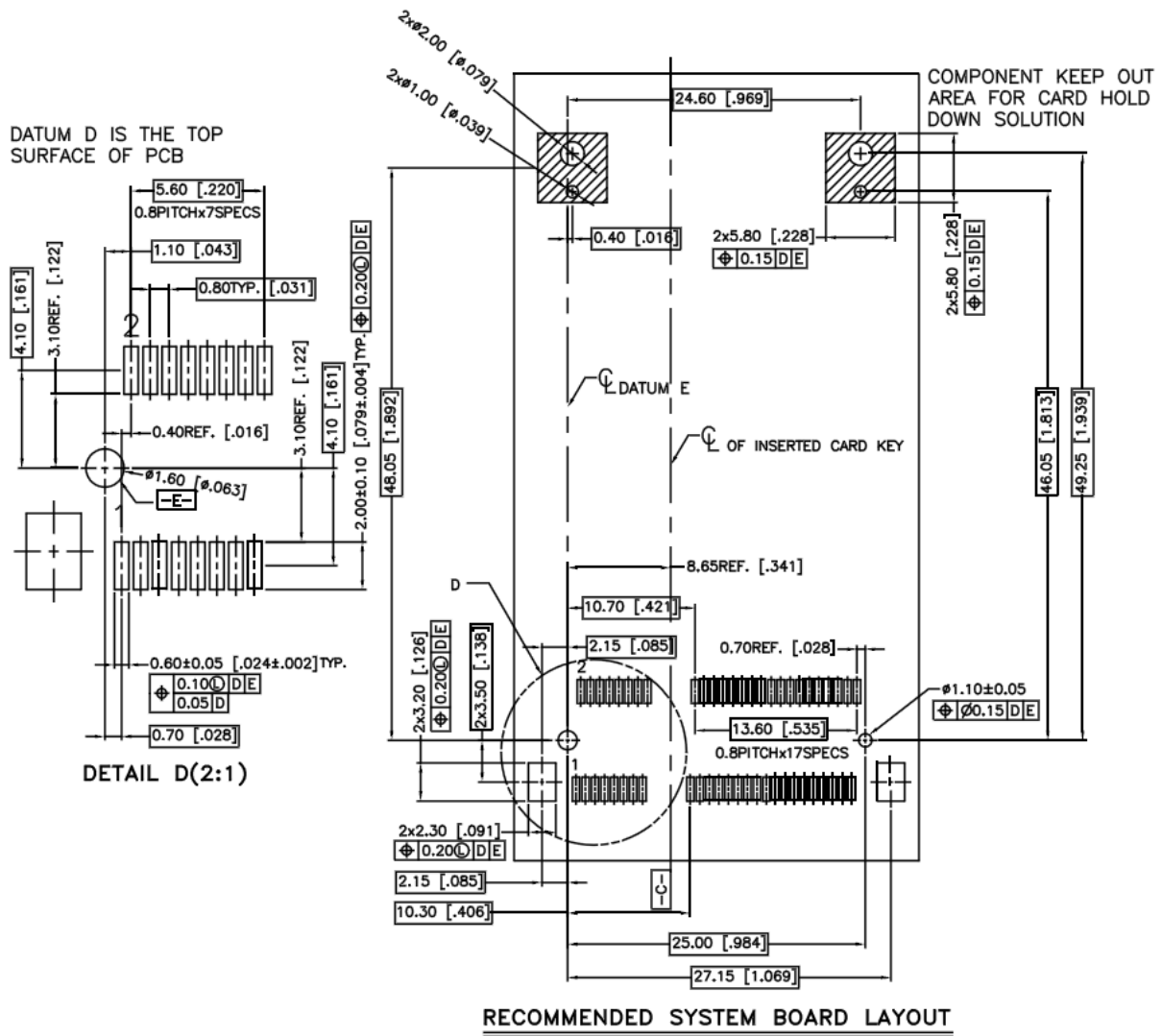
Table 5.4. Pin Interface

Operation	Description	Note
OFF	Service is not available	No Service
ON	Network is available	Network Ready
BLINK	Data Connection is established	Connected

5.3. Power On/Off

The WPD-600 does not have power on/off functionality. If the user wants to power on/off, turn on/off the main power supply, +3.3V_AUX.

5.4. Recommended System Board Layout



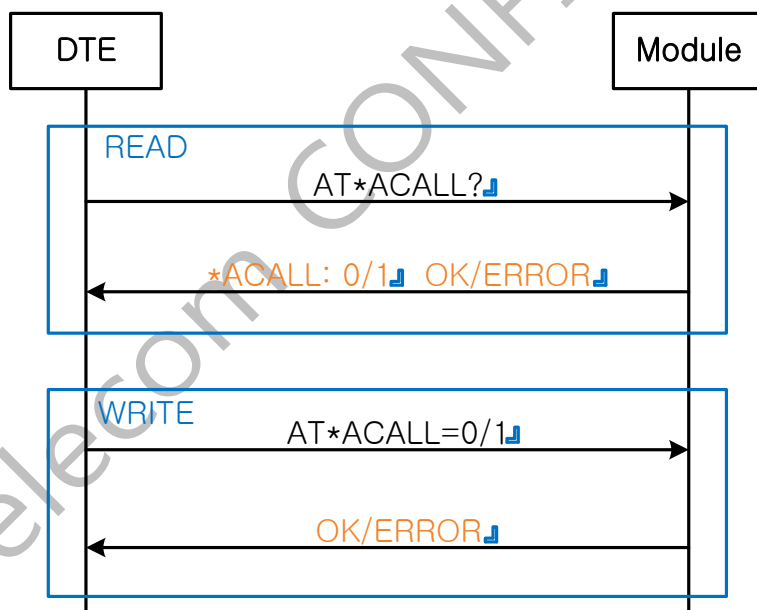
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6. AT Commands Implementation

6.1. Vendor Specific commands

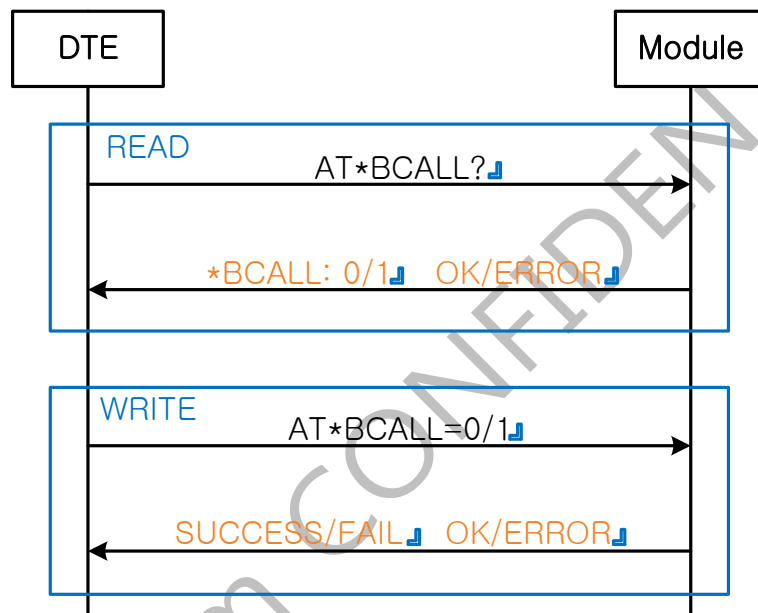
6.1.1 Auto Call setup – AT*ACALL

Function	This is setting for Automatic or Manual data call. <ul style="list-style-type: none"> - Automatic data call connects automatically to the data call whenever there is an available service nearby. - Manual data call can be controlled by user to connect or to disconnect whenever needed. For actual data call connect or disconnect, please refer to AT*BCALL command.
Validation	AT*ACALL?↵ ->*ACALL: 0/1↵
Configuration	AT*ACALL=0/1↵ (0:Manual data call, 1:Automatic data call) ->OK↵ / ERROR↵
Distinction	Must insert SIM card and verified PIN. Data call connection automatically disconnects when status changes from Automatic mode to Manual mode even data call is connected in Automatic mode



6.1.2 Data call Connect/Disconnect – AT*BCALL

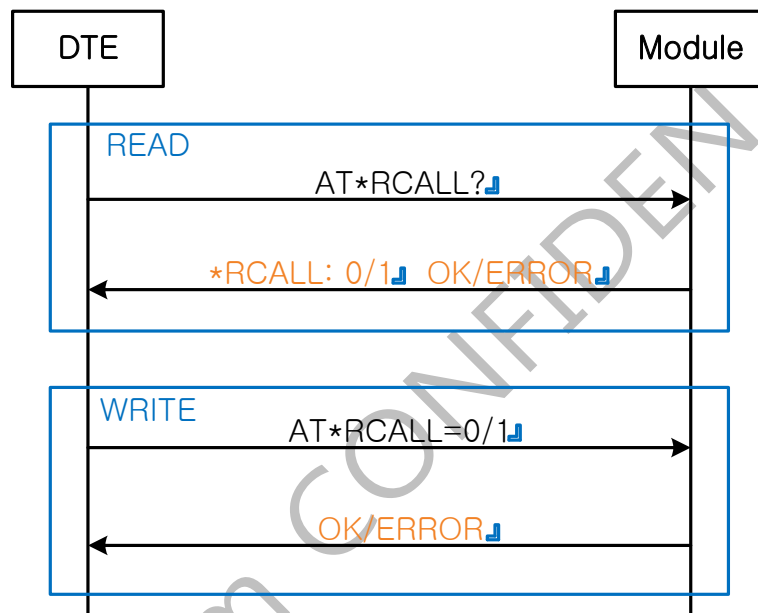
Function	AT*ACALL=0, means performing data call connect or disconnect in Manual mode.
Validation	AT*BCALL?␣ ->*BCALL: 0/1␣ (0:Disconnected, 1:Connected)
Configuration	AT*ACALL=0/1␣ (0:Disconnect, 1:Connect) ->OK␣ / ERROR␣
Distinction	Must insert SIM card and verified PIN.



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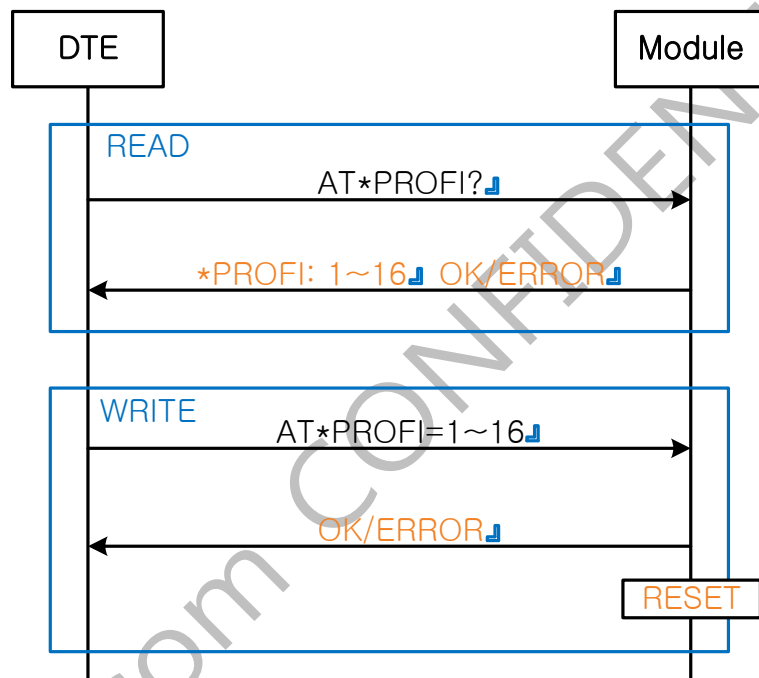
6.1.3 Set Roaming call – AT*RCALL

Function	This is to set for roaming data call
Validation	AT*RCALL?↵ ->*RCALL: 0/1↵ (0:Not Allowed, 1:Allowed)
Configuration	AT*RCALL=0/1↵ (0:Not Allowed, 1: Allowed) ->OK↵ / ERROR↵
Distinction	Must insert SIM card and verified PIN.



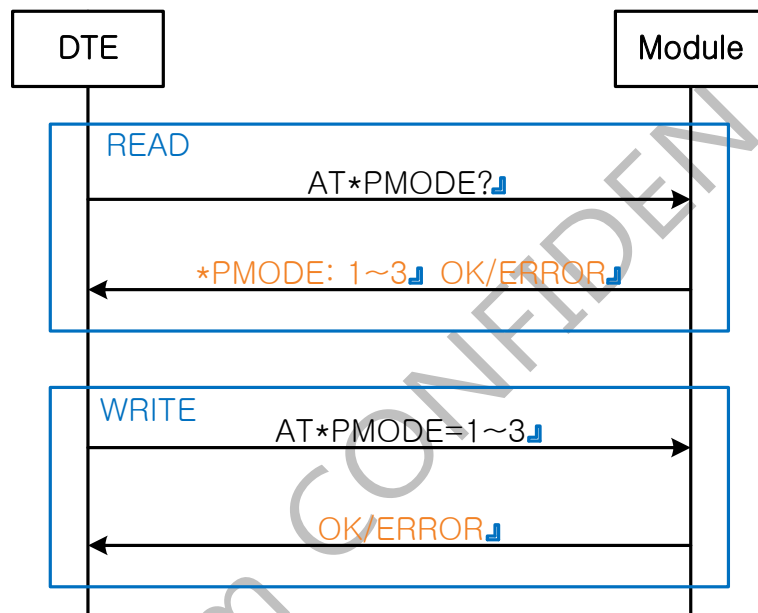
6.1.4 Set Profile index – AT*PROFI

Function	This is to set Profile index(CID).
Validation	AT*PROFI?↵ ->*PROFI: 1~16↵
Configuration	AT*PROFI=1~16↵ ->OK↵ / ERROR↵
Distinction	Must insert SIM card and verified PIN. Must use available CID value that was attained from command "AT+CGDCONT?". If change profile index, device will be reset.



6.1.5 Set System Mode – AT*PMODE

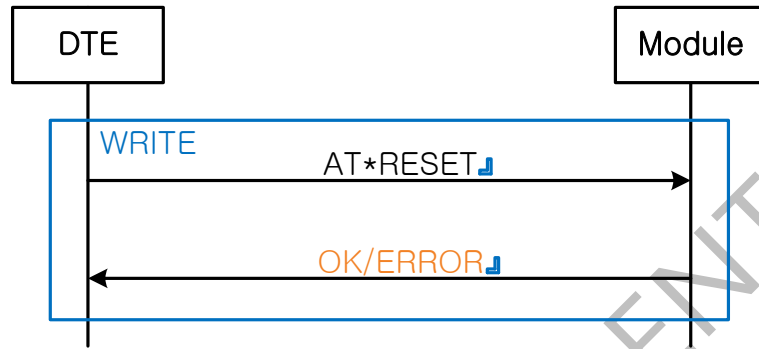
Function	To modify Prefer Mode of the module.
Validation	AT*PMODE?␣ ->*PMODE: 1~3␣ (1:GSM/WCDMA/LTE, 2:WCDMA/LTE, 3:LTE Only)
Configuration	AT*ACALL=1~3␣ (1:GSM/WCDMA/LTE, 2:WCDMA/LTE, 3:LTE Only) ->OK␣ / ERROR␣
Distinction	Must insert SIM card and verified PIN.



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6.1.6 Reset Module – AT*RESET

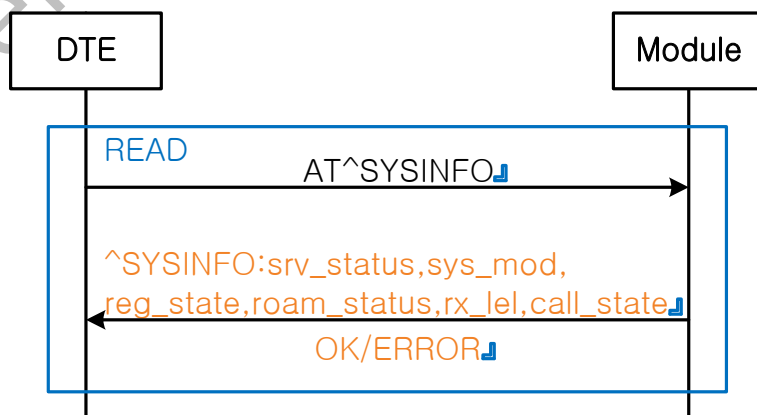
Function	This is to reset modem.
Configuration	AT*RESET␣ -> OK␣ / ERROR␣



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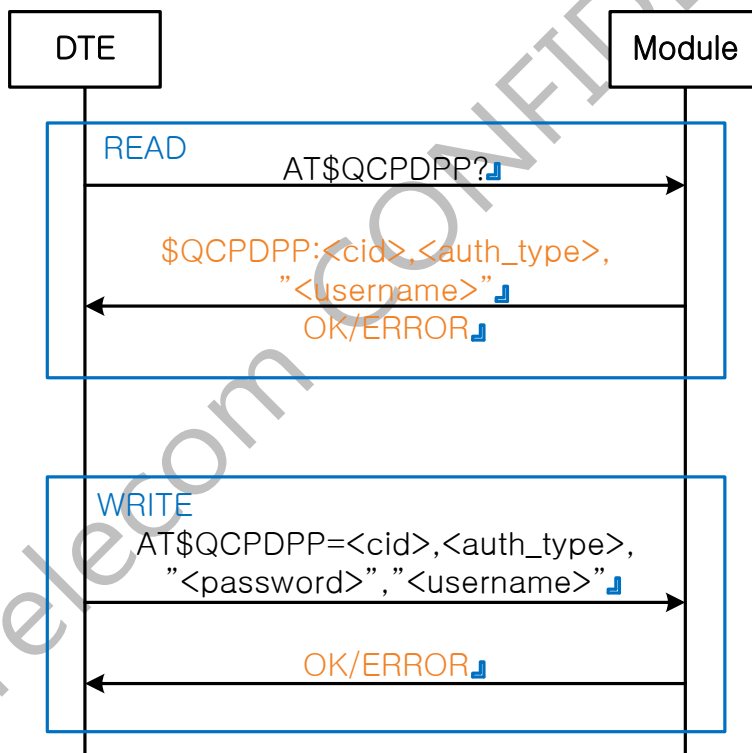
6.1.7 Checking System State – AT^SYSINFO

Function	It fetches status of the module as follows : system service status, system mode, registration status, roam status, rx level, data call status																						
Validation	AT^SYSINFO↓ -> ^SYSINFO:srv_status,sys_mod,reg_state,roam_status,rx_lcl,call_state ↓																						
Distinction	<table border="1"> <thead> <tr> <th>Items</th> <th>Descriptions</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>srv_status</td> <td>0 – no service 1 – limited service 2 – service available 3 – limited area service 4 – power saving and dormancy status</td> <td>0~4</td> </tr> <tr> <td>sys_mod</td> <td>0 – unknown 5 – GSM 6 – IMTS 9 - LTE</td> <td>0/5/6/9</td> </tr> <tr> <td>reg_state</td> <td>0-unknown 1-not registered, not searching 2-registered 3-not registered, searching 4-registration denied</td> <td>0~4</td> </tr> <tr> <td>roam_status</td> <td>0- non-roaming status. 1- roaming status.</td> <td>0~1</td> </tr> <tr> <td>rx_lcl</td> <td>0- no service 1~4 : Bigger the number, stronger the signal.</td> <td>0~4</td> </tr> <tr> <td>call_state</td> <td>0- data call not connection 1- data call connection 2- preservation</td> <td>0~2</td> </tr> </tbody> </table>	Items	Descriptions	Range	srv_status	0 – no service 1 – limited service 2 – service available 3 – limited area service 4 – power saving and dormancy status	0~4	sys_mod	0 – unknown 5 – GSM 6 – IMTS 9 - LTE	0/5/6/9	reg_state	0-unknown 1-not registered, not searching 2-registered 3-not registered, searching 4-registration denied	0~4	roam_status	0- non-roaming status. 1- roaming status.	0~1	rx_lcl	0- no service 1~4 : Bigger the number, stronger the signal.	0~4	call_state	0- data call not connection 1- data call connection 2- preservation	0~2	
	Items	Descriptions	Range																				
	srv_status	0 – no service 1 – limited service 2 – service available 3 – limited area service 4 – power saving and dormancy status	0~4																				
	sys_mod	0 – unknown 5 – GSM 6 – IMTS 9 - LTE	0/5/6/9																				
	reg_state	0-unknown 1-not registered, not searching 2-registered 3-not registered, searching 4-registration denied	0~4																				
	roam_status	0- non-roaming status. 1- roaming status.	0~1																				
	rx_lcl	0- no service 1~4 : Bigger the number, stronger the signal.	0~4																				
call_state	0- data call not connection 1- data call connection 2- preservation	0~2																					



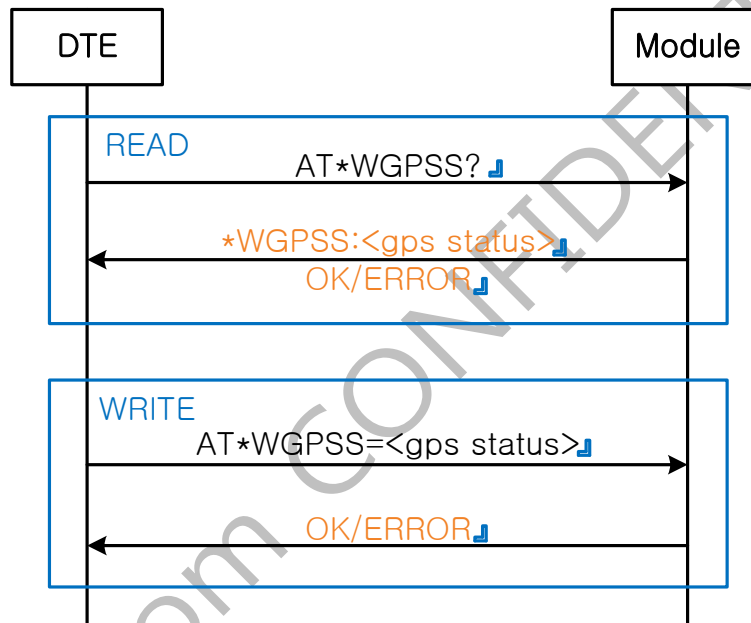
6.1.8 Set authentication for PDP-IP – AT\$QCPDPP

Function	Set authentication for PDP-IP packet data calls.
Validation	AT\$QCPDPP?↵ \$QCPDPP: <cid>,<auth_type>,<username>↵ cid : 1 ~16 auth_type : 0 : None 1 : PAP 2 : CHAP 3 : PAP or CHAP
Configuration	AT\$QCPDPP =<cid>,<auth_type>,<password>,<username>↵ ->OK↵ / ERROR↵
Distinction	Must insert SIM card and verified PIN. Query command, i.e., \$QCPDPP?, does not display password values and only displays username.



6.1.9 Enable/Disable Standalone GPS – AT*WGPSS

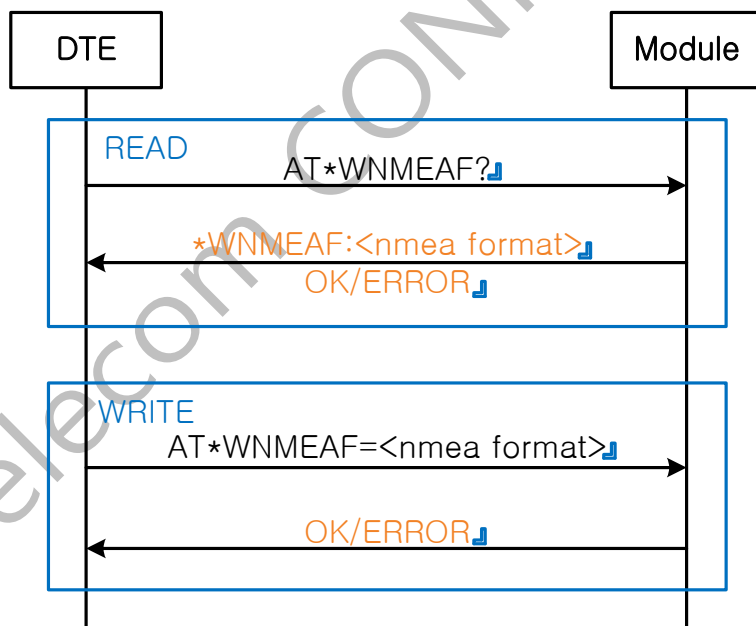
Function	Enable/Disable standalone GPS.
Validation	AT*WGPSS?↵ *WGPSS: <gps status>↵ gps status : 0 : Disable 1 : Enable
Configuration	AT*WGPSS = <gps status>↵ ->OK↵ / ERROR↵
Distinction	-



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6.1.10 Set NMEA format – AT*WNMEAF

Function	Set NMEA format for standalone GPS.
Validation	<p>AT*WNMEAF?↵</p> <p>*WNMEAF: <nmea format>↵</p> <p>Nmea format :</p> <ul style="list-style-type: none"> 0x0001 : GGA/GPGGA (fix data) 0x0002 : RMC/GPRMC (recommended minimum data) 0x0004 : GSV/GPGSV (GPS SVs in view) 0x0008 : GSA/GPGSA (GPS SV dop and active SV info) 0x0010 : VTG/GPVTG (Speed and heading info) 0x0020 : PQXFI 0x0040 : GLGSV (Glonass SV in view info) 0x0080 : GNGSA (Dop and Active SV info iff Glonass SVs are used) 0x0100 : GNGNS (new GGA message for GNSS) 0x0200 : PSTIS (proprietary sentence at beginning of each sess) 0x4000 : Extended GPGSV (Enable/Disable Extended GPGSV)
Configuration	<p>AT*WNMEAF = <nmea format>↵</p> <p>->OK↵ / ERROR↵</p>
Distinction	<p>NMEA format is bit mask.</p> <p>ie. GGA(0x0001) & GSV(0x0004) is 0x0005.</p>



6.2. 3GPP TS 27.007 commands

6.2.1 UMTS general commands

Commands	Descriptions	Explanation
+CGMI	Request manufacturer identification. Command processed regardless of SIM state.	
+CGMM	Request model identification. Command processed regardless of SIM state.	
+CGMR	Request revision identification. Command processed regardless of SIM state.	
+CGSN	Request product serial number identification. Command processed regardless of SIM state.	Unit outputs: IMEI
+CSCS= <chset>	Select TE character set Values per spec <chset> IRA,GSM,UCS2	
+CIMI	Request International Mobile Subscriber Identity	
+CLAC	List all available AT commands	

6.2.2 Mobile equipment commands

Commands	Descriptions	Explanation
+CMEE= <n>	Report mobile equipment error Values per spec Power on value of 2 for <n>	
+CPAS	Report phone activity status Values per spec Only states ready, ringing and call in progress are reported Command processed when ME in Limited Service state	
+CFUN= [<fun>,<rst>]]	Sets the level of functionality in the ME Values per spec Parameter values supported: <fun>: 0, 1, 4 – Per spec 5 – Factory Test Mode 6 – Reset 7 – Offline <rst>: 0 – Do not reset 1 – Reset Abort Command is <mod> – 3	<rst> parameter value of 1 is supported only with <fun> value of 1
+CSQ	Report signal quality; values per spec	Bit error rate reporting not supported in this release
+CPIN= <pin>, <newpin>	Enter PIN Values per spec Only SIM PIN/PUK and PIN2/PUK2 supported Command processed when ME in Limited Service state	

6.2.3 UMTS packet domain commands

Commands	Descriptions	Explanation
+CGQREQ = <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>	Set the QoS Profile that is used in Activate PDP Context Request Message Values per spec Parameter values supported: <cid> – 1 to 16 <precedence> – 1 to 3 <delay> – 1 to 4 <reliability> – 1 to 5 <peak> – 1 to 4 <mean> – 1 to 18, 31	Set values are saved across power cycles
+CGQMIN = <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>	Set minimum acceptable profile against the negotiated profile in Activate PDP Context Accept message Values per spec Parameter values supported: <cid> – 1 to 16 <precedence> – 1 to 3 <delay> – 1 to 4 <reliability> – 1 to 5 <peak> – 1 to 4 <mean> – 1 to 18, 31	Set values are saved across power cycles
+CGEQREQ = <cid>, <Traffic_class>, <maximum_ itrate_UL>, <maximum_ itrate_DL>, <Guaranteed_bitrate_UL>, <Guaranteed_bitrate_DL>, <Delivery_ order>, <Maximum_SDU_size>, <SDU_error_r atio>, <Residual_bit_error_ratio>, <Delivery_of_ erroneous_SDUs>, <Transfer_ delay>, <Traffic_ handling_ priority>	Set the UMTS QoS Profile that is used in Activate PDP Context Request message Values per spec Parameter Values supported: <cid> – 1 to 16 <Traffic_class> – 0 to 4 <maximum_ bitr ate_UL> – 0 to 512 <maximum_ bitr ate_DL> – 0 to 512* <Guaranteed_bi trate_UL> – 0 to 512 <Guaranteed_bi trate_DL> – 0 to 512* <Delivery_order> – 0 to 2 <Maximum_ SD U_size> – 0 to 1520 <SDU_error_ratio>: 0E0, 1E1, 1E2, 7E3, 1E3, 1E4, 1E5, 1E6 <Residual_ bit_error_ratio>:0E0, 5E2, 1E2, 5E3, 4E3, 1E3, 1E4, 1E5, 1E6, 6E8 <Delivery_of_erroneous_SDUs> – 0 to 3	Setting these parameters will reset +CGQMIN and +CGQREQ to defaults. Set values are saved across power cycles

	<p><Transfer_delay> -0, 100 to 4000</p> <p><Traffic_handling_priority> - 0 to 3</p>	
<p>+CGEQMIN = <cid>, <Traffic_class>, <maximum_ibrate_UL>, <maximum_ibrate_DL>, <Guaranteed_bitrate_UL>, <Guaranteed_bitrate_DL>, <Delivery_order>, <Maximum_SDU_size>, <SDU_error_ratio>, <Residual_bit_error_ratio>, <Delivery_of_erroneous_SDUs>, <Transfer_delay>, <Traffic_handling_priority></p>	<p>Set the UMTS QoS Profile that is used in Activate PDP Context Request Message</p> <p>Values per spec Parameter</p> <p>Values supported:</p> <p><cid> -1 to 16</p> <p><Traffic_class>- 0 to 4</p> <p><maximum_ibrate_UL> - 0 to 512</p> <p><maximum_ibrate_DL> - 0 to 512*</p> <p><Guaranteed_bitrate_UL> - 0 to 512</p> <p><Guaranteed_bitrate_DL> - 0 to 512*</p> <p><Delivery_order> - 0 to 2</p> <p><Maximum_SDU_size> - 0 to 1520</p> <p><SDU_error_ratio>: 0E0, 1E1, 1E2, 7E3, 1E3, 1E4, 1E5, 1E6</p> <p><Residual_bit_error_ratio>:0E0, 5E2, 1E2, 5E3, 4E3, 1E3, 1E4, 1E5, 1E6, 6E8</p> <p><Delivery_of_erroneous_SDUs> - 0 to 3</p> <p><Transfer_delay> -0, 100 to 4000</p> <p><Traffic_handling_priority> - 0 to 3</p>	<p>Setting these parameters will reset +CGQMIN and +CGQREQ to defaults. Set values are saved across power cycles</p>
+CGATT	<p>Attach or detach from the Packet Domain service</p> <p>Values per spec</p>	
+CGACT	<p>Activate or deactivate the specified PDP context(s)</p> <p>Values per spec Parameter</p> <p>values supported:</p> <p><cid> - 1 to 16</p>	
<p>+CGDCONT= <cid>, <PDP_Type>, <APN>, <PDP_addr>, <d_comp>, <h_comp></p>	<p>Set PDP Context parameter values for a PDP context identified by connection identifier</p> <p>Values per spec Parameter</p> <p>values supported:</p> <p><cid> - 1 to 16</p> <p><PDP_type>: IP, PPP, IPV6, IPV4V6</p> <p><d_comp> - 0, 1</p> <p><h_comp> - 0, 1</p>	

6.2.4 Network service commands

Commands	Descriptions	Explanation
+CGREG= [<n>]	<p>Presentation of unsolicited GPRS network registration status</p> <p>Values per spec Parameter values supported:</p> <p><n> – 0, 1, 2</p>	
+CREG=<n>	<p>Presentation of unsolicited network registration status</p> <p>Values per spec Parameter values supported:</p> <p><n> – 0, 1, 2</p>	
+CEREG=<n>	<p>Presentation of unsolicited EPS network registration status</p> <p><n> – 0, 1, 2</p>	
+CR=<mode>	<p>Service reporting</p> <p>0:Disable result codes</p> <p>1:enable result codes</p>	
+CLCK=<fac>,<mode>,<passwd>,<class>	<p>Lock, unlock, or interrogate an ME or a network facility</p> <p>Values per spec</p> <p>Command is aborted</p> <p>Parameter values supported:</p> <p><fac>: AB,,AC,AG,AI,AO,IR,OI,OX,SC,PN,PU,PP,PC,PF</p> <p><mode> – 0 to 2</p> <p><class> – 1 to 255</p>	
+CPWD=<fac>,<oldpwd>,<newpwd>	<p>Set new password for a Facility Lock function</p> <p>Values per spec</p> <p>Parameter values supported:</p> <p><fac>: AB,,AC,AG,AI,AO,IR,OI,OX,P2,SC</p>	
+COPS=<mode>,<format>,<oper>	<p>Operator selection</p> <p>Parameter values supported:</p> <p><mode> – 0, 1, 3, 4</p> <p><format> – 2</p>	
+CNUM	Subscriber number	

6.3. ITU_T Recommendation V.250 commands

6.3.1 TE-TA interface commands

Commands	Descriptions	Explanation
E<value>	<value> 0: Do not echo commands in command state. 1: Echo commands in command state.	
Q<value>	<value> 0: DCE transmits result codes. 1: Result codes are suppressed and not transmitted.	
S0	0:Disable auto answer, 1~255:Enable auto answer after [(value-1)x6] second	
S3	13: Carriage return character.	
S4	10: Line feed character.	
S5	8: Backspace character.	
S5	8:Backspace character	
S6	2~10:Pause before blind dialing	
S7	1~255:Number of seconds to establish end-to-end data connection	
S8	0~255:Number of seconds to pause when "," is encountered in dial string	
V<value>	<value> 0: Display result codes as numbers. 1: DCE Display result codes as words.	
X<value>	<value> 0: Sends a CONNECT when a connection is established. Ignores dial tone and busy signal. 1: Enable additional result code CONNECT <rate>. Disable dial tone and busy detection. 2: Enable additional result code CONNECT <rate> and NO DIALTONE. Disable busy detection. Enable dial tone detection. 3: Enable additional result code CONNECT <rate> and BUSY. Enable busy detection. Disable dial tone detection. 4: Enable additional result code CONNECT <rate>, BUSY and NO DIALTONE. Enable busy and dial tone detection	
&C<value>	<value> 0: The DCE always presents the ON condition on circuit 109. 1: Circuit 109 changes in accordance with the underlying DCE, which may include functions other than the physical layer functions	
&D<value>	<value> 0: Ignore circuit 108/2 (CD) 1: Circuit Enter online command state following On-to-Off transition of circuit 108/2 2: Enter command state following On-to-Off transition of circuit 108/2	
+IPR= <rate>	Fixed DTE rate. Specifies the data rate at which the DCE will accept commands. Auto baud rate detection is not supported. <rate>	Default DTE rate fixed at 115200 bps.

	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200,230400	
+ICF= <format>, <parity>	Determine the local serial port start-stop character framing. <format>: 3: 8 data, 1 stop <parity>: Values per spec	QUALCOMM Rm interface fixed at 8 data bits, no parity, 1 stop bit; error returned for any other parameters
+IFC= <DCE by DTE>, <DTE by DCE>	Control the operation of the local flow control between the DTE and DCE. <DCE by DTE> Values per spec <DCE by DTE> Values per spec	Default settings For <DCE by DTE>: 2 For <DTE by DCE>: 2

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6.3.2 Generic TA control commands

Commands	Descriptions	Explanation
Z<value>	Reset to default configuration. <value> Values per spec.	Resets configuration. Does not change DCE baud rate or PDP context profiles.
&F<value>	Set to factory defined configuration (effect is implementation dependent).	Same behavior as Z except it changes baud rate to default value.
+DR	Data Compression reporting. Result code is from IWF over the Um interface	
+DS	Data Compression. V.42bis data compression function on the PSTN link	
+GMI	Request manufacturer identification.	
+GMM	Request model identification.	
+GMR	Request revision identification.	
+GSN	Request product serial number identification.	Unit outputs: IMEI
+GCAP	Request complete capabilities list.	

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7. Reference Standards

1. 3GPP TS 36.101: User Equipment (UE) radio transmission and reception (Release 8)
2. 3GPP TS 36.133: Requirements for support of radio resource management (Release 8)
3. 3GPP TS 36.124: ElectroMagnetic Compatibility (EMC) requirements for mobile terminals and ancillary equipment (Release 8)
4. PCI Express Mini Card Electromechanical Specification Rev. 1.2
5. 3GPP TS 27.007: AT command set for User Equipment(Release 8)

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Appendix A. Antenna recommendation

Parameters		Min	Max	Unit
Primary Antenna (Transmit and Receive)				
Gain	Peak	0	-	dBi
	Average	-3	-	dBi
VSWR		-	2.5 : 1	-
Secondary Antenna (Receive)				
Average gain	LTE	-3	-	dBi
	UMTS	-9	-	dBi
VSWR		-	2.5 : 1	-
Antenna to Antenna Requirement				
Isolation		8	-	dB

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Appendix B. Development Kit

Refer to the below.

- 1) User manual, "WPD-600 Development Kit_User Manual_V02_130729.pdf".
- 2) Reference schematic of Development Kit,
"WPD-600 Development Kit_Reference Ckt_V01_130725.pdf".

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Appendix C. U.FL-to-SMA RF Cable Insertion Loss

Number	Frequency	Insertion loss(dB)
1	700 MHz	0.12
2	800 MHz	0.14
3	900 MHz	0.16
4	1.5 GHz	0.26
5	1.6 GHz	0.27
6	1.7 GHz	0.26
7	1.8 GHz	0.26
8	1.9 GHz	0.24
9	2.1 GHz	0.22
10	2.6 GHz	0.5