



Helios® Digital TD-LTE ICS Pico Repeaters
TD-LTE 2300MHz / TD-LTE 2500MHz / TD-LTE 2600MHz

User Manual



Fujian Helios Technologies Co., Ltd.
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Copyright

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Local Representativ



Warning

The product has been tested and found to comply with the Federal Communications Commission(FCC) RF Exposure Requirements,pursuant to FCC Part 27.

The Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5dB,especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

In order to comply with the FCC RF exposure requirements, the BDA-CELLAB/PCSF-33/33-80-AB antenna installation must comply with following:

The base station antenna must be installed so as to provide a minimum separation distance of 60cm between the antenna and persons within the area.This antenna should with gain less than 11dBi ,VSWR \leq 1.5:1,Z₀=50ohms)

The service antenna must be installed so as to provide a minimum separation distance of at least 25cm between the indoor antenna connected to the RF booster and the human user's body within the area. This antenna should with gain of 0-7dBi,VSWR \leq 2:1, Z₀=50ohms.

INSTALLATION

WARNING:This is NOT a CONSUMER device.It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS.You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device.Unauthorized use may result in significant forfeiture penalties,including penalties in excess of \$100,000 for each continuing violation.

Thanks for choosing Helios Pico Repeaters, please read the User Manual carefully before using the repeater.

1 Overview

TDD-LTE, also known as TD-LTE, was adopted as the evolution of choice for TD-SCDMA, China's 3G standard. Compare with LTE FDD, LTE TDD uses a different approach, a single frequency sharing the channel between transmission and reception, spacing them apart by multiplexing the two signals on a real time basis. While FDD transmissions require a guard band between transmission and reception, TDD schemes require a guard time or guard interval between transmission and reception.

For TD-LTE operators, they must optimize their network and offer best service to users to improve their competitive ability. However, and 4G signals attenuate severely when traveling through walls, floors, and windows, leaving more than 50% of all indoor spaces with inadequate coverage and poor data throughput. Then the operators need a cost-effective solution to resolve such coverage problems easily and rapidly.

Repeaters, Boosters and Amplifiers for mobile network are to relay RF signals for both uplink and downlink, they are effective tools to enhance mobile network coverage for telecom operator, but there are one of the key technologies for the Repeaters, Boosters and Amplifiers with TDD mode must be first resolved, which is Frame Synchronization, without accurate & reliable TDD Frame Synchronization with BTS, the Repeaters will be unable to normally switch between the different time-slots for uplink and downlink and working in harmony with macro network, even will cause big air-interference to macro network.

With ultra-low-noise RF frontend, innovative digital filter, high SFDR (Spurious Free Dynamic Range) ADC, patented TD-LTE frame synchronization algorithms in SDR, TDD-Mate enables accurate, speedy and reliable frame synchronization with TD-LTE BTS and working in harmony with macro network. It receives TDD signal from BTS and down-converts to IF signals firstly, then digitalizes signal via high speed ADC and implements baseband demodulation on DSP, and Identifies PSS in DwPTS and SSS in TS0 according to TD-LTE frame structure, and acquire the accurate switch point between UpPTS and DwPTS.

Helios TDD-Mate series TD-LTE ICS Pico Repeater is designed for industry users looking to enhance TD-LTE indoor wireless connectivity. It will be connected via coaxial cable to an outside Donor Antenna, whereas Service Antenna is built-in inside the repeater. Donor Antenna is placed outside the building where it has easy access to TD-LTE BTS signal, and the Pico Repeater with built-in Service Antenna is placed in the building where it can extend TD-LTE radio coverage to the blind area.

2 Illuminating

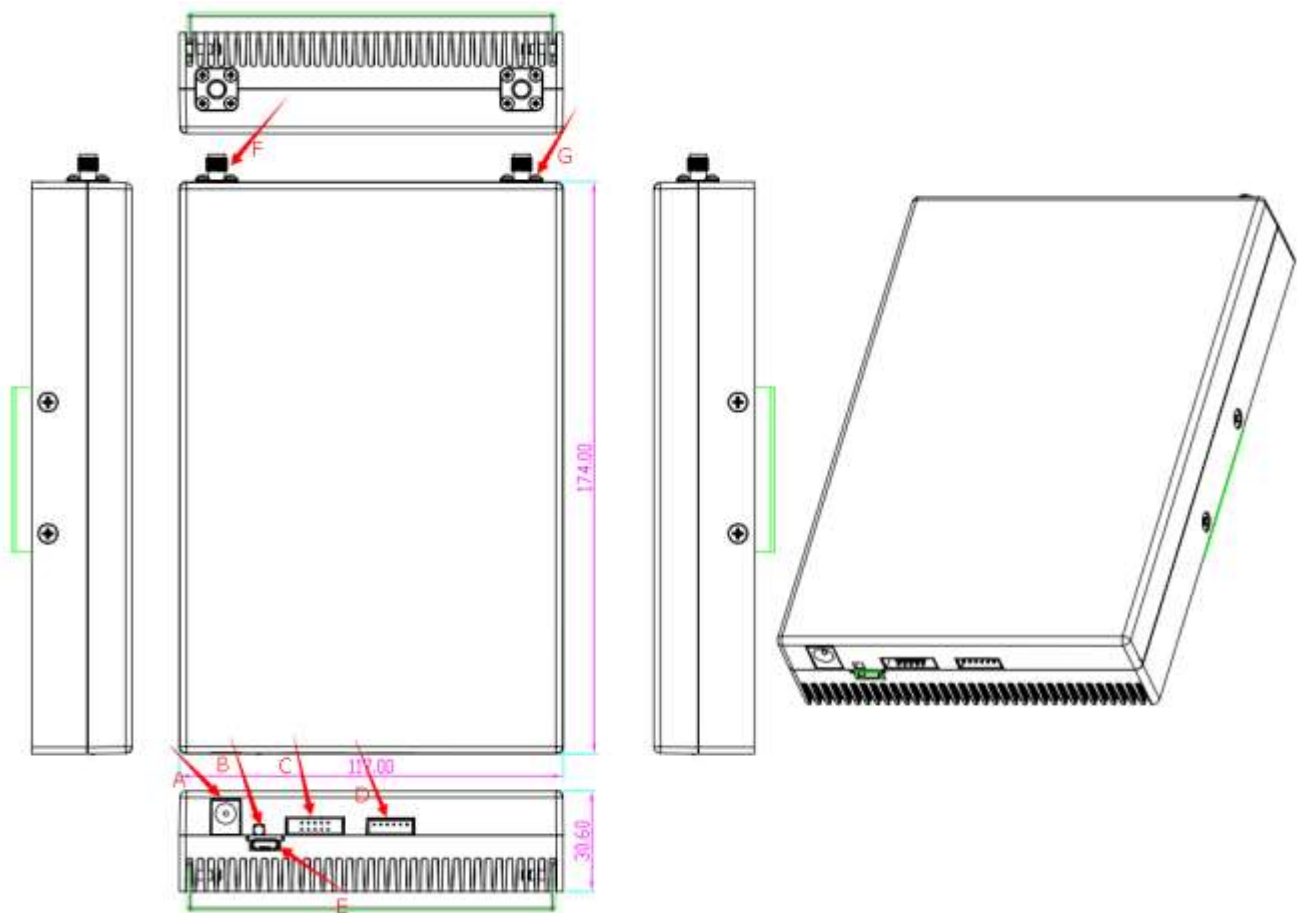
Uplink: Communication link from handset to BTS.

Downlink: Communication link from BTS to handset.

Self-oscillation: An amplified signal being received & amplified again by repeater is called self-oscillation that will cause components fault.

ICS:The Interference Cancellation System, which can automatically detect and eliminate all multi-path feedback signals. It can moderate the requirements of isolation between donor antenna and service antenna.

3 Product Overview



- A. **DC-12V**: Connect to AC/DC power adapter, input voltage is +12VDC
- B. **PWR** indicator: Green LED for power supply indicator
- C. **RS485** port: Connect to laptop via RS485 cable for local control
- D. **JTAG** port: Reserved for manufacturer only
- E. **Micro-USB** port: Connect to laptop via Micro-USB cable for local control
- F. **MSport**: SMA type female connector for service antenna
- G. **BTS** port: SMA type female connector for donor antenna

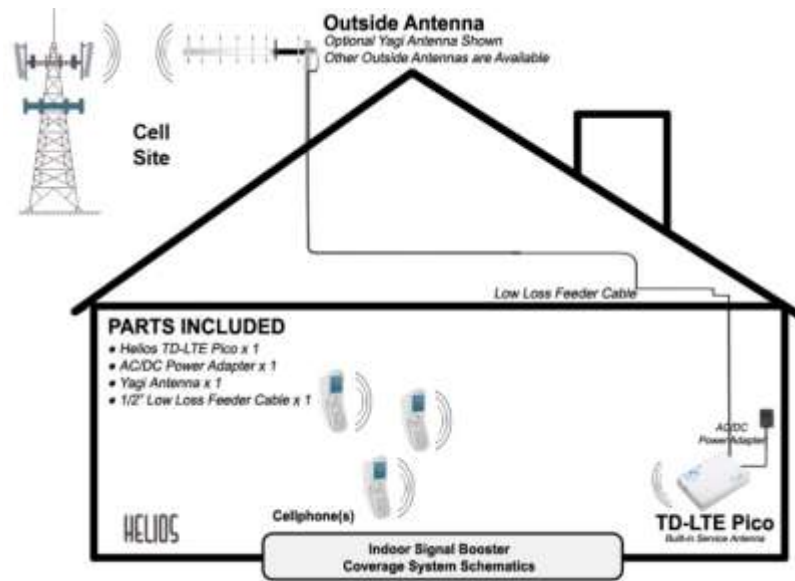
4 Main Features

- Support single band TD-LTE2300MHz, 2500MHz and 2600MHz.
- Built-in Patented TDD-Mate™ frame synchronization algorithm for TDD system to ensure accurate synchronization and eliminate interference to macro network.
- Built-in patented ICS (Interference Cancellation System) arithmetic in DSP to ensure stable operation.
- High working gain as Min. 70dB significantly improves 4G TD-LTE network capacity for operators.
- Built-in Intelligent Carrier Scan Function (CSF) and auto local cell with best QoS and RSSI by PSS & SSS, likewise support manually lock expected carrier by software.
- Flexible TDD UL/DL Allocations configurable by software (0 to 6), default UL/DL Ratio

is 1.

- Configurable field length of DwPTS/GP/UpPTS by software (0 to 8).
- Both support Normal CP (Cyclic Prefix) and Extended CP.
- Innovative Digital Filtering and advanced baseband algorithms in SDR to provide accurate AGC, MGC and Power Control for each time slot with minimum time delay.
- Significantly improve data rates in both weak signal areas and most area with good signal areas.
- Lower cost of indoor coverage and rapidly increases capacity of TD-LTE wireless networks.
- Significantly improve Battery Life of subscribers' handset and UE.
- Automatic Gain Control (AGC) continuously monitors path loss and transmit power to deliver max gain.
- Optional wireless modem for remote monitoring by SMS, GPRS or TCP/IP.

5 Application Diagram



6 Technical Specification

TD-LTE PICO QA INSPECTION RECORD				
Items	Technical Specification		DL	UL
Freq Range	2570~2620MHz			
Working Bandwidth	Total working bandwidth 50MHz, 20MHz/carrier, total 2 carriers			
Output Power	DL: 15±2dBm; UL: 15±2dBm			
Gain	DL: 70±2dB; UL: 70±2dB			
Frequency Error	≤0.01ppm (RMS)			
EVM	EVM≤8%			
Input Intermodulation	the spurious on Central frequency ≤ 10dB@RBW1MHz compare to without the input interference singals (F1,F2).F1=F0± 1MHz,F2=F0± 11MHz			
Out of Band gain (from the edge of transmit band)	0.2~1MHz offset	60.5dB		
	1~5MHz offset	45.5dB		
	5~10MHz offset	45.5dB		
	>10MHz offset	35.5dB		
Noise Figure	≤8dB			
Spectrum Emission Mask	0.05MHz~5.05MHz	≤-7~-14dBm		

	5.05MHz~10.05MHz	≤-14dBm		
	10.05MHz~offset-max	≤-15dBm		
Spurious Emissions	9kHz ~1GHz	≤-36dBm@RBW100KHz		
	1GHz ~12.5GHz	≤-30dBm@RBW1MHz		
ACRR	5MHz	> 20dB		
	10MHz	> 20dB		
Output Intermodulation	ETSI TS 136 106			
Synchronization Range	-90~-40dBm			
Maximum Input Power	-10dBm, 1 minute			
Input Power Detection	Detection Range for each time slot: -80dBm~-20dBm			
Output Power Detection	Detection Range for each time slot: -20dBm~+15dBm			
Power Supply	DC +12V			
Power Consumption	≤14W			
Temperature Range	0°C~50°C			
RF Connector	SMA Type Female, 50Ω			
Dimensions	172.5*114.5*29 (mm)			
Monitoring Interface	Micro USB 2.0			
	RS485 protocol, compatible with common protocol			
	Box-Header Pitch 2*5	1: 485-A 3: 485-B 5: GND 7: SWDIO 9: GND	2: 485-A 4: 485-B 6: GND 8: SWCLK 10: +3.3V	
CONCLUSION		TEST ENGINEER	APPROVED	ISSUED STAMP

Other Technical Specification:

Items	Helios®Digital TD-LTE ICS Pico Repeaters	
Frequency Range (Customized)	TD-LTE 2.3G, TD-LTE 2.5G, TD-LTE 2.6G	
Max Output Power	+15dBm	
Working Bandwidth	Customized	
TDD UL/DL Allocations Configurable	0 to 6 configurable by software (Default setting is 1)	
Cyclic Prefix Configurable	Normal CP or Extend CP configurable by software	
Field Length of DwPTS/GP/UpPTS Configurable	0 to 8 configurable by software	
Gain	Min70dB	
AGC Control Range	Min 40dB	
Gain Control Range	31dB (1dB Step)	
VSWR	< 1.5	
Ripple in Band	Max +/- 1.5dB	
Cancellation Window Size	0 - 6μSec	
Interference Cancellation Range	Min. 25dB (Gain ≤ Isolation + 10dB)	
In-band Intermodulation	Complies with ETSI	
Spurious Emissions	9KHz-1GHz	Max -36dBm
	1GHz-12.75GHz	Max -30dBm
RF Connector	MCX-type Female for option external Receiver Antenna	
I/O Impedance	50 ohm	
Noise Figure	Max 5dB	
Group Time Delay	Max 6μS	
Temperature Range	-25 degree Celsius to +55 degree Celsius	
Relative Humidity	Max 95%	
MTBF	Min. 100000 hrs	
Power Supply	AC220V (+/-15%), 50Hz	
Power Consumption	Max 25W	
NMS Monitor Function	Real-time alarm for Temperature, RSSI, Input Under Power, Input Over Power, Output Under Power, Output Over Power, VSWR, Output Power, Gain, Uplink ATT, Downlink ATT, Return Loss, ICS Switch, Isolation and etc.	
Dimensions	224.5mm*164mm*42mm	
Weight	2.5Kgs	

* Technical Specification subject to change without notice

7 Typical Applications

- Office, mini basement and so on.
- Meeting room, supermarket, marketplace and so on.
- Pub, net bar, dance hall, coffee hall, health club, entertainment place, house, office plant, yacht, public security system and so on.

8 Optional Accessories



9 Installation

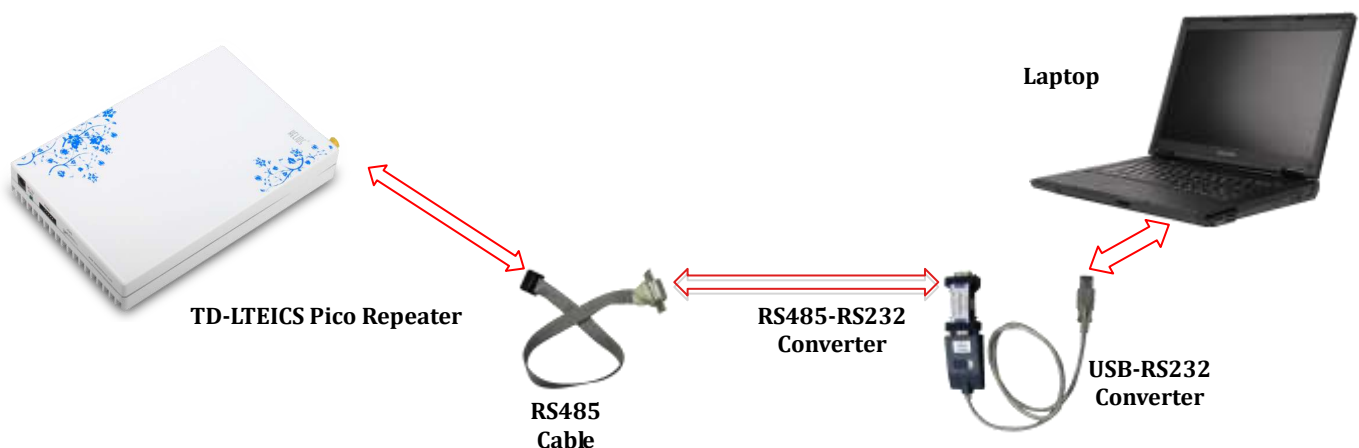
- With the aid of mobile phone or TEMS, find a suitable place to install the donor antenna on the wall of the building or parapet wall on the top of the building where the signal bar is full and call quality is good. Note that **the height of donor antenna should be less than 7 floors or 20 meters** to ensure good call quality and avoid interference to the BTS. On the other hand, users should try their best to separate the donor antenna from the area to be covered as far as possible to ensure the isolation between the donor antenna and service antenna.
- Fasten the donor antenna (Yagi or Log antenna) on the selected place, and the donor antenna should face to the BTS direction.
- Fasten the TD-LTE ICS Pico Repeater on the wall where is close to the area to be covered and has available mains socket nearby. The side with Helios logo is service antenna direction which should face to the area to be covered.
- Connect the feeder cable to the donor antenna and run the cable to the BTS port of the TD-LTE ICS Pico Repeater and fasten it along the wall. Note that when the cable goes from outdoor to indoor, **the outdoor section should be made U-type bend** to prevent water goes into indoor place. Remember to have weatherproofing process for RF connectors.
- Connect the feeder cable to the BTS port of the TD-LTE ICS Pico Repeater and have weatherproofing process for RF connectors.
- Ensure all connections are correct and lock them. Now, the primary installation is finished.
- Ensure don't use unauthorized antennas, cables, and/or coupling devices not conforming with ERP/EIRP and/or indoor-only use restrictions.
- Please don't installed the device in out-door.

10 Commissioning

- 1) Plug in the AC/DC power adapter to the nearest 120VAC mains socket, and connect the DC output port to the DC-12V input port of TD-LTE ICS Pico Repeater.
- 2) Power On.
- 3) Check the green PWR LED indicator of TD-LTE ICS Pico Repeater should be light on.
- 4) The TD-LTE ICS Pico Repeater can run normally after above process. Users can have a Walk Test or CQT Test to check the working status and compare the coverage performance between before and after.
- 5) If it needs to configure ARFCNs and UL/DL Allocations, please refer to clause 11.

11 Local Control

11.1 Hardware Connection



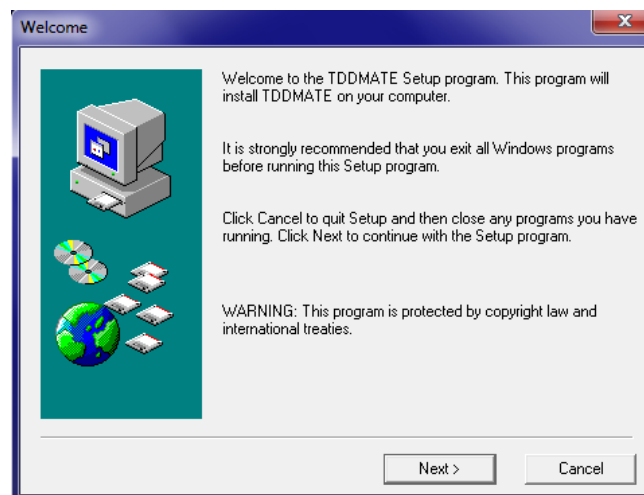
Connect RS485 Port of TD-LTE ICS Pico Repeater with RS232 port of laptop via RS485 cable and RS485-RS232 converter. If the laptop doesn't have RS232 port, a USB-RS232 converter can be used.

11.2 System Requirements

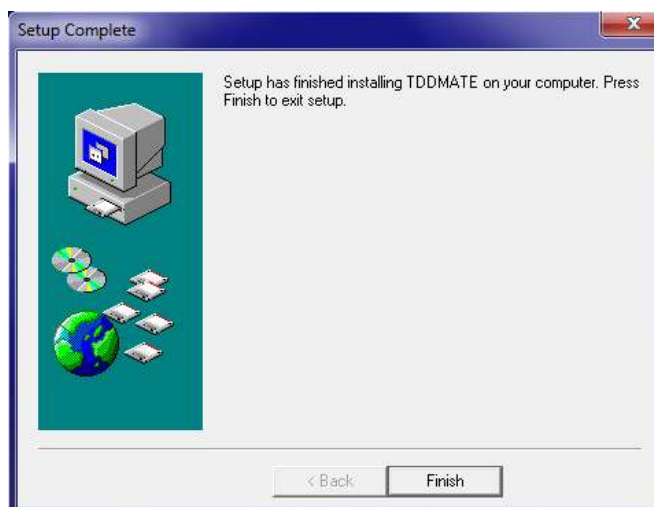
- Operating System: Windows XP/2007/2008
- CPU: Intel, Pentium, Pentium Pro, Pentium II or higher processor with minimum speed of 1GHz.
- Memory: At least 1GB RAM and 2 GB is suggested to satisfy with minimum requirements for operating system software.
- RS232 port: At least 1 serial COM port or USB-RS232 converter, default baud rate 9600bps.

11.3 Software Installation

Click on *TDDMATE_Setup_V4.2.exe* as following:



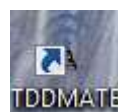
Click *Next* to install the software.



Click *Finish* to finish the installation.

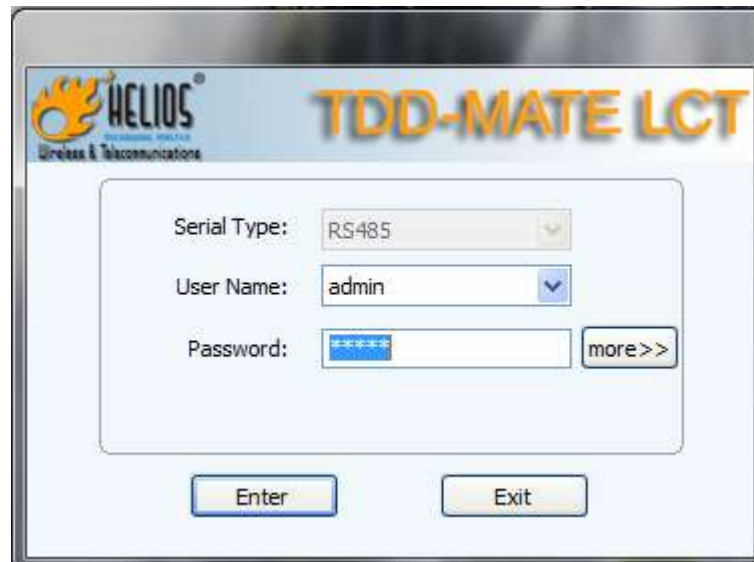
11.4 Log on

Click shortcut *TDDMATE* on the desktop as following:




Default *User Name*: admin

Default *Password*: admin, click *Enter* to log on



Administrator: has the right to set and query information. The administrator username and password are available to set from Tool / Management sub-menu.

After successful logon, it will enter into the main windows of TDDMATE LCT Software V4.2, and shows the default page of “Basic Info”. The main window includes six sub windows, such as “Basic Info”, “Setup Wizard”, “Alarm Info”, “Timeslot Set”, “Advance” and “Hardware”. Please refer to “Figure 2”. Click “” button on the top right corner of the main window to log out.

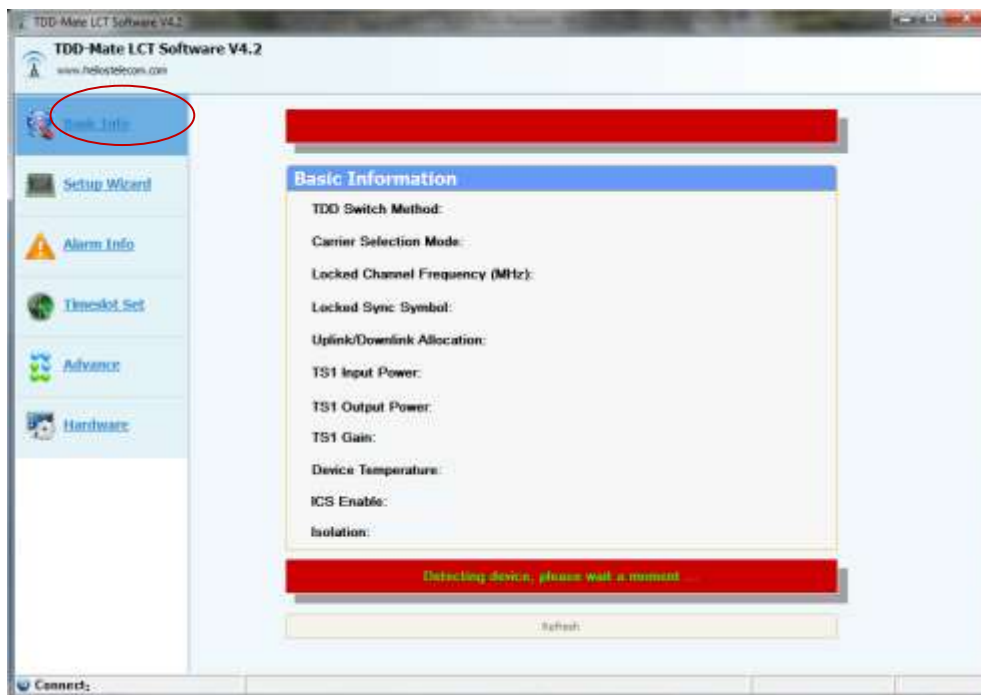
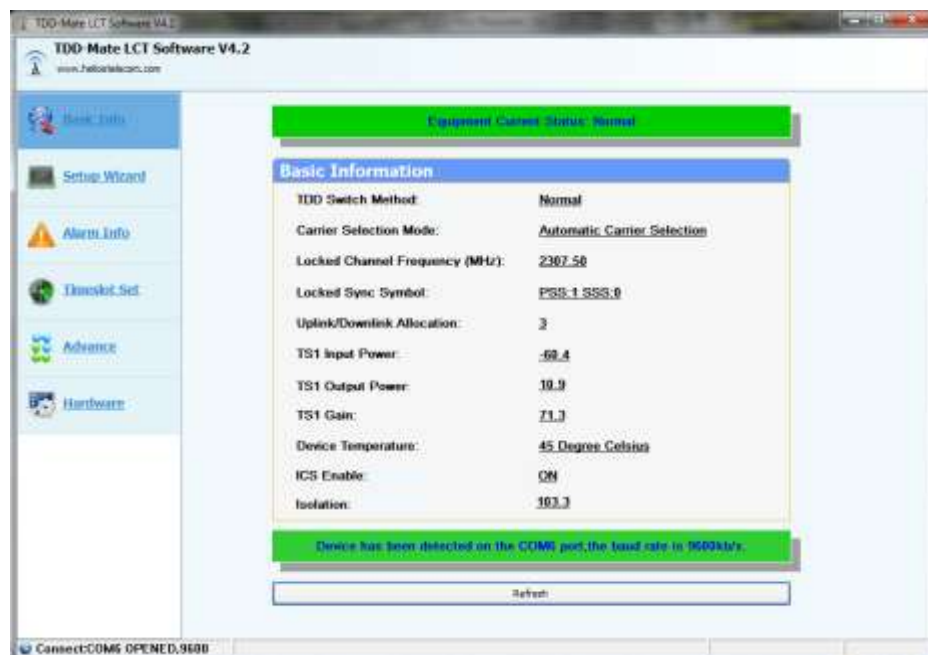


Figure 2 Main Window

11.5 Basic Info



This window shows basic information of TD-LTE ICS Pico Repeater.

- **TDD Switch Method:** There're four options: UL Off/DL On, UL On/DL Off, UL Off/DL Off and Normal
- **Carrier Selection Mode:** Manual/Automatic.
- **Locked Channel Frequency (MHz):** Center frequency of locked channel in MHz(default working bandwidth: 20MHz which can be customized)
- **Locked Sync Symbol:** PSS(Primary Synchronization Signal): 0~2, SSS (Secondary Synchronization Signal): 0~167
- **Uplink/Downlink Allocation:** Uplink-Downlink Allocations Configuration. Following table shows the possible UL/DL allocations configuration (0 to 6):

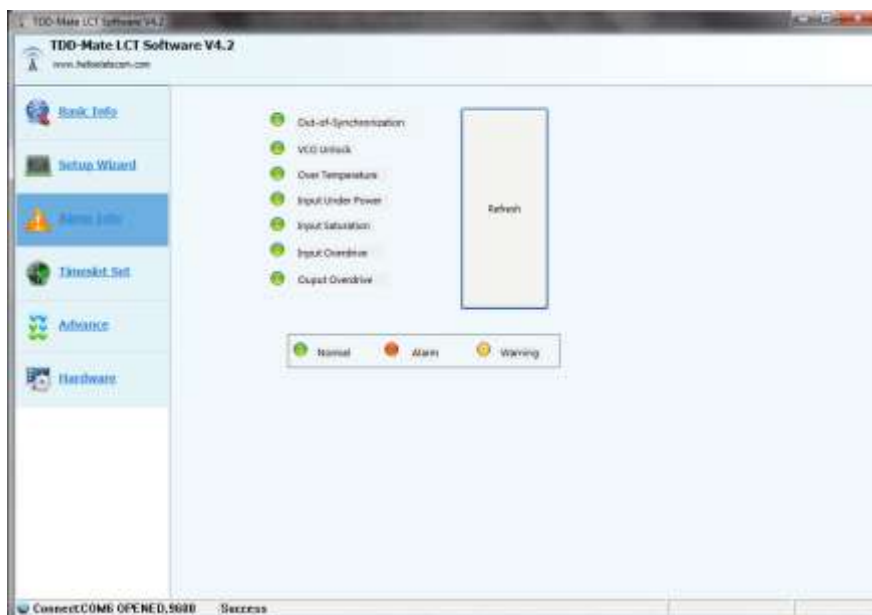
Uplink-DownlinkAllocations											
UL/DL Configuration	Period (ms)	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5	D	S	U	U	U	D	S	U	U	U
1		D	S	U	U	D	D	S	U	U	D
2		D	S	U	D	D	D	S	U	D	D
3	10	D	S	U	U	U	D	D	D	D	D
4		D	S	U	U	D	D	D	D	D	D
5		D	S	U	D	D	D	D	D	D	D
6	5	D	S	U	U	U	D	S	U	U	D

- **TS1 Input Power:** Input power of Timeslot 1 in dBm
- **TS1 Output Power:** Output power of Timeslot 1 in dBm
- **TS1 Gain:** System gain of Timeslot 1 in dB
- **Device Temperature:** temperature of the Pico Repeater in degree Celsius.
- **ICS Enable:** switch on/off ICS function.
- **Isolation:** it's defined as (work gain - isolation).For example, "Isolation: 5" means work gain is 5dB higher than the isolation between BTS port and MS port.

- **Device has been detected on the COMx port, the baud rate is 9600bps:** When the software is open, it will automatically search available COM port and check if it's connected to valid TD-LTE ICS Pico Repeater. “*Device has been detected on the COMx port, the baud rate is 9600bps*” means the Pico Repeater is well connected and users can get information and set parameters now.
- **PC does not have serial port:** “*PC does not have serial port*” means there's no available COM port in the laptop and users should insert one USB-RS232 converter and try again.
Refresh: Click “Refresh” to update the basic information.

11.6 Alarm Info

The “Alarm Info” window shows all detailed information of working status.



- **Out of Synchronization:** Out of synchronization alarm
- **VCO Unlock:** VCO unlock alarm
- **Over Temperature:** Over temperature alarm (default alarm threshold: 85 degree Celsius)
- **Input Under Power:** Timeslot 1 input power is lower than Sync Threshold
- **Input Saturation:** Timeslot 1 input power is higher than the threshold that the output power reaches the maximum
- **Input Overdrive:** Timeslot 1 input power is higher than -25dBm
- **Output Overdrive:** Timeslot 1 Output power is higher than 25dBm
- **Refresh:** Click to update working status
- **Normal:** Working status is normal in green
- **Alarm:** In case of alarm items in red, it will switch off the Pico Repeater
- **Warning:** In case of warning items in yellow, it shows warning information only and the Pico Repeater will continue to be working

11.7 Timeslot Set

As per 3GPP standard, each radio frame consists of 20 Timeslots whose detailed information can be viewed and set individually.

The screenshot shows the 'TDD-Mate LCT Software V4.2' interface. On the left is a navigation menu with icons for 'Basic Info', 'Setup Wizard', 'Alarm Info', 'Threshold Set', 'Advance', and 'Hardware'. The main area displays a table with the following data:

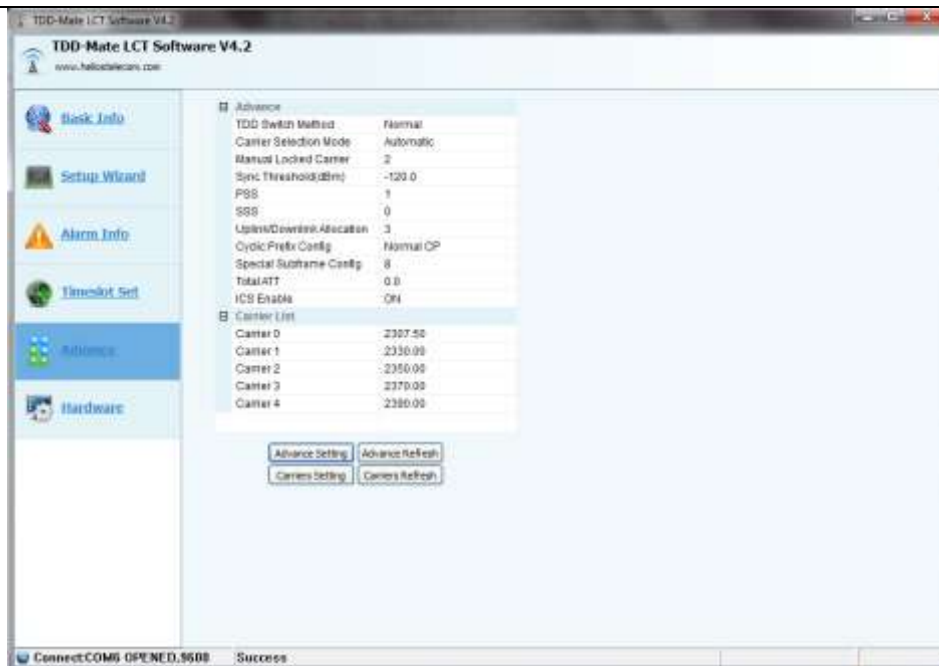
Time-slots	Input Power	Output Power	LNA ATT	DSP ATT	Time-slot ATT	O/P Power Threshold
T0	-68.5	13.9	0.0	0.0	0.0	17.0
T1	-65.4	11.0	0.0	0.0	0.0	17.0
T2	-61.7	8.7	0.0	0.0	0.0	17.0
T3	-66.0	-27.2	0.0	0.0	0.0	17.0
T4	-66.0	-27.1	0.0	0.0	0.0	17.0
T5	-66.1	-27.2	0.0	0.0	0.0	17.0
T6	-66.1	-27.0	0.0	0.0	0.0	17.0
T7	-66.2	-27.1	0.0	0.0	0.0	17.0
T8	-66.2	-27.0	0.0	0.0	0.0	17.0
T9	-66.2	-27.1	0.0	0.0	0.0	17.0
T10	-65.2	11.2	0.0	0.0	0.0	17.0
T11	-65.4	11.0	0.0	0.0	0.0	17.0
T12	-65.3	11.1	0.0	0.0	0.0	17.0
T13	-65.3	11.1	0.0	0.0	0.0	17.0
T14	-65.3	11.1	0.0	0.0	0.0	17.0
T15	-62.4	11.0	0.0	0.0	0.0	17.0
T16	-62.4	11.0	0.0	0.0	0.0	17.0
T17	-62.5	11.9	0.0	0.0	0.0	17.0
T18	-65.4	11.0	0.0	0.0	0.0	17.0
T19	-65.5	11.8	0.0	0.0	0.0	17.0

Below the table are several control buttons: 'Refresh Time-slots List', 'Refresh Time-slot ATT', 'Refresh O/P Power Threshold', 'Set Time-slot ATT', and 'Set O/P Power Threshold'. At the bottom, a status bar shows 'Connect:COM5 OPENED,9600' and 'Success'.

- **Timeslots:** Timeslot number.
- **Input Power:** Input power of the timeslot in dBm.
- **Output Power:** Output power of the timeslot in dBm.
- **LNA ATT:** LNA attenuation in dB.
- **DSP ATT:** DSP attenuation in dB.
- **Timeslot ATT:** Timeslot attenuation in dB.
- **O/P Power Threshold:** Output over power alarm threshold for each timeslot.
- **Refresh Timeslots List:** Update Timeslots information.
- **Refresh Timeslots ATT:** Update Timeslots attenuation information.
- **Refresh O/P Power Threshold:** Update over power alarm threshold information.
- **Set Timeslots ATT:** Modify attenuation value for each timeslot and click *Set timeslots ATT* to modify and click *Refresh Timeslot ATT* to verify.
- **Set O/P Power Threshold:** Modify over power alarm threshold value for each timeslot and click *Set O/P Power Threshold* to modify and click *Refresh O/P Power Threshold* to verify.

11.8 Advance

The page is mainly for advanced items setting.



- **TDD Switch Mode:** Including 4 modes of Uplink Off/Downlink On, Uplink On/Downlink Off, Uplink Off/Downlink Off and Normal
- **Carrier Selection Method:** Manual/Automatic
- **Manual Locked Carrier:** Lock the carrier from the Carrier List
- **Sync Threshold (dBm):** Minimum Timeslot 1 input power for synchronization
- **PSS:** Primary Synchronization Signal
- **SSS:** Secondary Synchronization Signal
- **Uplink/Downlink Allocation:** As per 3GPP standard, there're 7 kinds of Uplink/Downlink Allocations as following:

Uplink-Downlink Allocations

UL/DL Configuration	Period (ms)	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5	D	S	U	U	U	D	S	U	U	U
1		D	S	U	U	D	D	S	U	U	D
2		D	S	U	D	D	D	S	U	D	D
3	10	D	S	U	U	U	D	D	D	D	D
4		D	S	U	U	D	D	D	D	D	D
5		D	S	U	D	D	D	D	D	D	D
6	5	D	S	U	U	U	D	S	U	U	D

- **Cyclic Prefix Config:** 0 (normal CP) or 1 (Extended CP)
- **Special Subframe Config:** As per 3GPP standard, there're 9 kinds of Special Subframe configuration as following:

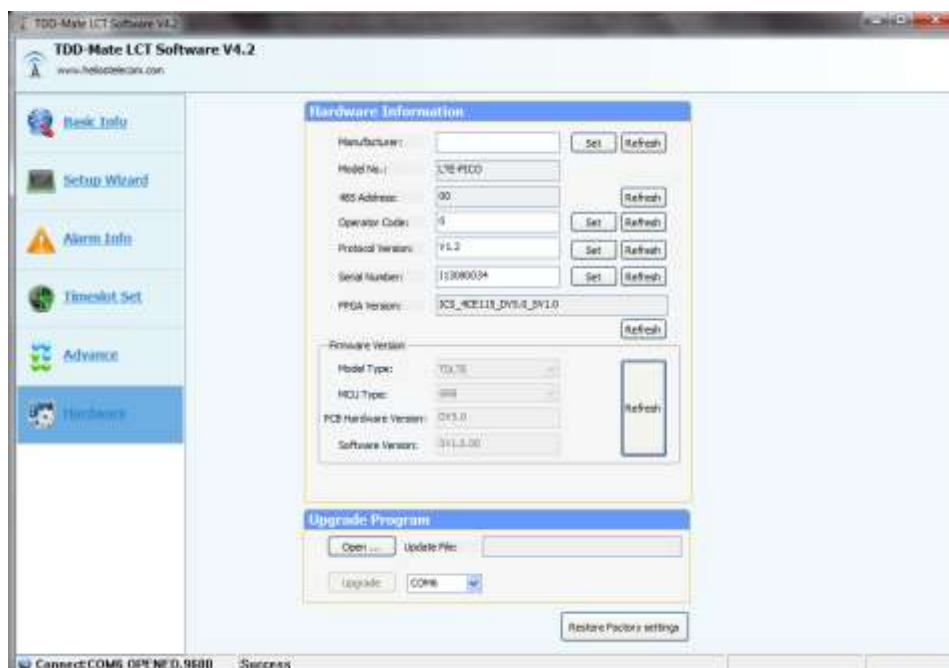
DwPTS/GP/UpPTS length (OFDM symbols)		
Format	Normal CP (Cyclic Prefix)	Extended CP (Cyclic Prefix)

	DwPTS	GP	UpPTS	DwPTS	GP	UpPTS	
0	3	10	1	3	8	1	
1	9	4		8	3		
2	10	3		9	2		
3	11	2		10	1		
4	12	1		3	7		
5	3	9	2	8	2	2	
6	9	3		9	1		
7	10	2		-	-		-
8	1	1		-	-		-

- **Total ATT:** Total system attenuation
- **ICS Enable:** Switch on/off ICS function
- **Carrier List:** It supports up to 5 carriers (default working bandwidth is 20MHz which can be customized) in the carrier list which can be customized. It's used for carrier scanner
- **Advance Setting:** Modify all Advance items and click *Advance Setting* to accept
- **Advance Refresh:** After advance setting, click *Advance Refresh* to verify if the configuration is updated or not
- **Carrier Setting:** Modify the center frequency of all five carriers in *Carrier List* and click *Carrier Setting* to accept
- **Carriers Refresh:** After carrier setting, click *Carrier Refresh* to verify if the configuration is updated or not

11.9 Hardware

The page is mainly for “Hardware Information” and “Upgrade Program”



Hardware Information:

- **Manufacture:** default Helios, configurable
- **Model No:** Model number of the Pico Repeater
- **485 Address:** default 00
- **Operator Code:** PLMN code of the operator
- **Protocol Version:** NMS protocol version number
- **Serial Number:** Serial number of the Pico Repeater
- **FPGA Version:** Firmware version number of FPGA
- **Firmware Version:** Firmware version number of ARM

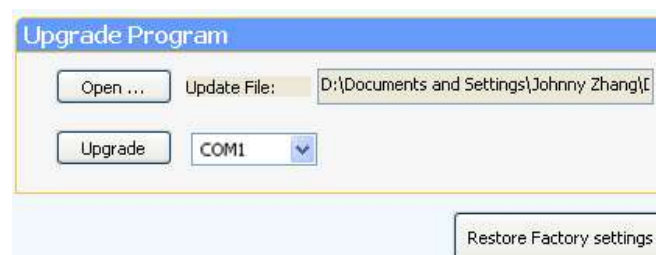
Upgrade Program:

It can upgrade program for ARM only via RS485 port, hardware connection refer to clause 11.1.

- Click *Open* and select the update file such as *TdPicoEnc.bin*.
Note: It's recommended to put the update file into root path of C:\ before upgrade to avoid unpredictable errors



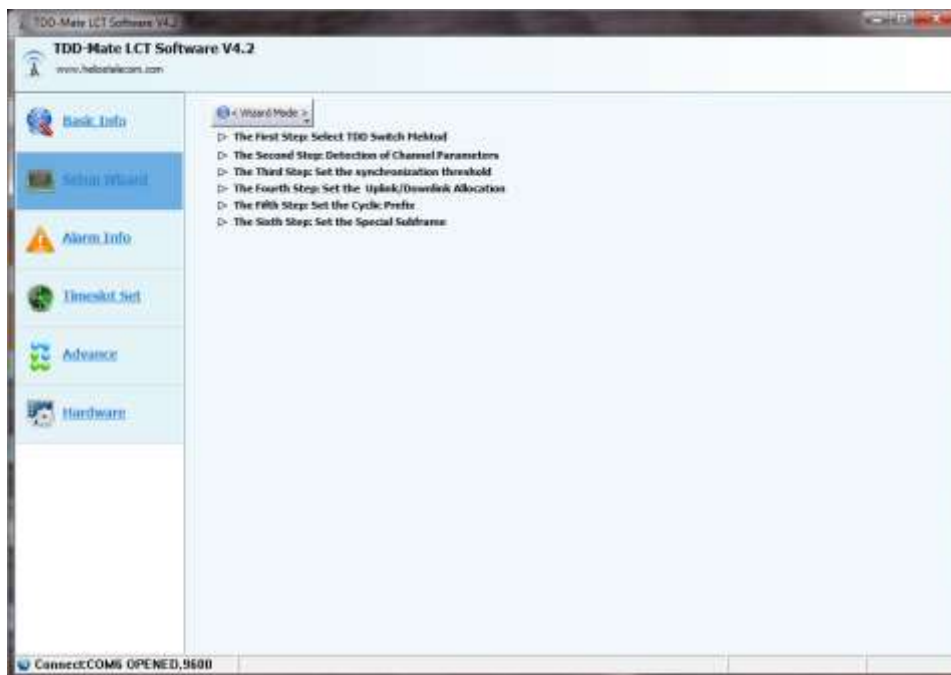
- Click *Upgrade* to finish the upgrading.



Restore Factory Settings: Restore the default settings from ARM

11.10 Setup Wizard

If users don't know how to setup the Pico Repeater the first time, setup wizard can help users step by step. There're two modes automatic and manual can be selected.

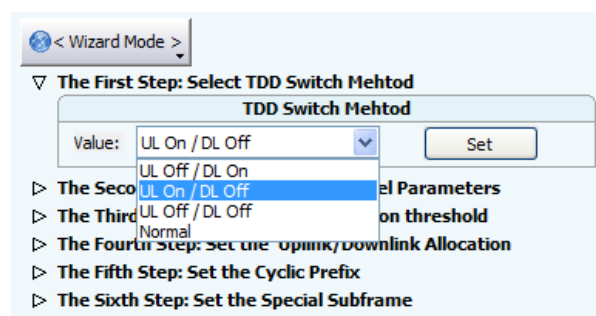


Wizard Mode:

- **Automatic:** In automatic mode, it will scan and lock on the strongest carrier according to the carrier list, users no need to do anything. However the locked carrier maybe not the target carrier which users want to use
- **Manual:** In manual mode, it can guide the users to setup the Pico Repeater step by step. Following is the detailed description of manual wizard:

The 1st Step: Select TDD Switch Method

Since in TDD system, working frequency is the same for both uplink and downlink, it's necessary to switch off downlink during uplink test in the lab, and vice versa.



- **UL Off / DL On:** Switch off uplink and switch on downlink for downlink testing
- **UL On / DL Off:** Switch off downlink and switch on uplink for uplink testing
- **UL Off / DL Off:** Switch off uplink and downlink
- **Normal:** Under normal mode which should be used on site, it automatically switches on uplink and downlink alternately according to sync signal

The 2nd Step: Detection of Channel Parameters

It supports up to 5 carriers (default working bandwidth is 20MHz which can be customized) in the carrier list which can be customized

No.	Frequency(MHz)	PSS	SSS	QoS	Rx Level	Spe
00	2307.50	1	0	9	-60.5	8
01	2330.00	--	--	--	-127.0	8
02	2350.00	--	--	--	-127.0	8
03	2370.00	--	--	--	-127.0	8
04	2390.00	--	--	--	-127.0	8

Carrier: PSS: SSS:

- **List from Intelligent Carrier Scanner:** Click this button to get detailed information of all carriers within the carrier list
- **No:** Carrier number
- **Frequency:** Center frequency of the carrier in MHz
- **PSS:** Primary Synchronization Signal
- **SSS:** Secondary Synchronization Signal
- **QoS:** Quality of Service which is defined by Helios. It's based on 10 times of statistics, the value in QoSbox means the successful times to get SSS code. Higher QoS, better quality of service
- **Rx Level:** Timeslot 1 input power in dBm
- **Special Subframe:** 0 (normal CP) or 1 (Extended CP)
- **Uplink/Downlink Allocation:** Uplink/Downlink allocation, 0~6
- **Cyclic Prefix:** 0 (normal CP) or 1 (Extended CP)
- **Operator Code:** PLMN code of the operator
- **Set:** Click on target carrier and click *Set* to lock on it
- **Previous:** Back to previous page

The 3rd Step: Set the Synchronization Threshold

If the input power is too weak to ensure normal synchronization, then the Pico Repeater cannot be normal working, in such case, it's necessary to switch off the Pico Repeater to avoid interference

Value:

- **Synchronization threshold:** If the Rx Level is less than the synchronization threshold (default -90dBm, configurable), it will switch off the Pico Repeater
- **Value:** Minimum Rx Level for synchronization in dBm
- **Set:** Input minimum Rx Level in *Value* box and click *Set* to modify the threshold
- **Previous:** Back to previous page

The 4th Step: Set the Uplink/Downlink Allocation

As per 3GPP standard, there're 7 kinds of Uplink/Downlink Allocations as following:

Uplink-Downlink Allocations											
UL/DL Configuration	Period (ms)	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5	D	S	U	U	U	D	S	U	U	U
1		D	S	U	U	D	D	S	U	U	D
2		D	S	U	D	D	D	S	U	D	D
3	10	D	S	U	U	U	D	D	D	D	D
4		D	S	U	U	D	D	D	D	D	D
5		D	S	U	D	D	D	D	D	D	D
6	5	D	S	U	U	U	D	S	U	U	D

Users should select appropriate configuration number according to BTS' configuration

- **Value:** Range: 0~6
- **Set:** Select configuration number in *Value* box and click *Set* to modify the allocation
- **Previous:** Back to previous page

The 5th Step: Set the Cyclic Prefix

- **Value:** Normal CP or Extended CP
- **Set:** Select CP type in *Value* box and click *Set* to modify
- **Previous:** Back to previous page

The 6th Step: Set the Special Subframe

As per 3GPP standard, there're 9 kinds of Special Subframe configuration as following:

DwPTS/GP/UpPTS length (OFDM symbols)							
Format	Normal CP(Cyclic Prefix)			Extended CP(Cyclic Prefix)			
	DwPTS	GP	UpPTS	DwPTS	GP	UpPTS	
0	3	10	1	3	8	1	
1	9	4		8	3		
2	10	3		9	2		
3	11	2		10	1		
4	12	1		3	7		
5	3	9	2	8	2	2	
6	9	3		9	1		
7	10	2		-	-		-
8	1	1		-	-		-

Users should select appropriate configuration number according to BTS' configuration

▽ The Sixth Step: Set the Special Subframe

Special Subframe

Value: Set Previous

- **Value:** Range: 0~8
- **Set:** Input configuration number in *Value* box and click *Set* to modify
- **Previous:** Back to previous page



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