# Third Generation Configuration Software



## **General Overview**

The Third Generation Configuration Software works with the following 3G Development Kits available as:

- DR7000-DK (433.92 MHz)
- DR7001-DK (315.00 MHz)
- DR7003-DK (303.825 MHz)
- DR8000-DK (916.5 MHz)
- DR8001-DK (868.35 MHz)
- DR8100-DK (916.5 MHz w/DSSS)

The 3G Configuration Software allows for complete evaluation and application development of RFM's SRR (Short Range Radio) line of RFIC's. A communication link or Range Test can be executed with the Data Terminal to evaluate system performance.

#### **Key Features:**

- Full development with Silicon Labs C8051F330 IDE (sold separately)
- Comprehensive Evaluation of Third Generation
   Virtual Wire devices
- Individual parameter configuration
- Adjustable RF output power
- USB 2.0 serial communication
- Example Code
- 2-way communication link
- Range Test
- Fixed 4.8kbps Data Rate
- Data Terminal Program
- Diagnostic LED's
- "Out of the box" operation
- Device register Read/Write
- Backward-compatible 2G mode



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# Software Setup and Use

## **1.1 Installation**

When the CD is inserted into the CD drive, the installation should begin automatically. If it does not then open the CD drive through Explorer and Click on the "Install.exe" file and a pop-up box will allow you to install the application software as well as the USB drivers needed for the USB to UART interface chip. Follow the instructions to install the files in the desired folder. When finished simply Click on EXIT.



#### **1.2 Getting Started**

Double-click on the 3G Config SW icon to start the software. The initial screen will ask for what development kit is being used. Click on the development kit you are using.

SH 3G Configuration - v1.0	
<ul> <li>▲ ASH 3G Configuration - v1.0</li> <li>Select Device:</li> <li>○ DR7000 (433.92 MHz)</li> <li>○ DR7001 (315.00 MHz)</li> <li>○ DR7003 (303.825 MHz)</li> <li>○ DR8000 (916.5 MHz)</li> <li>○ DR8001 (868.35 MHz)</li> <li>○ DR8100 (916.5 MHz w/DSSS)</li> </ul>	
C DR8100 (916.5 MHz w/DSSS)	

#### 1.3 Setup

After selecting the kit you will be prompted to set the COM port being used for communication between the PC and the development board.



Before clicking "OK", follow the steps below to determine the COM port being used by the PC:

# **1** – Get into the Control Panel by:

Click >Start>Settings>Control Panel

#### OR

## Click from the desktop >My Computer>Control Panel

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File Edit	View Favor	ites Tools H	Help						
🔇 Back 🝷	O · 🗊	🔎 Search 🧯	> Folders	» 🖉 🗙 😫	▶				
Address 🔂	Control Panel								💌 🔁 Go
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Accessibility Options	Add Hardware	Add or Remov	Administrative Tools	Automatic Updates	Broadcom ASF Configuration	Broadcom Control Suite 2	Date and Time	Display	Folder Options
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Fonts	Game Controllers	Internal NIC Configuration	Internet Options	Java	Keyboard	Mail	Microsoft Mail Postoffice	Mouse	Network Connections
<b></b>		٩.	2		3	1	۲	Σ	O,
Network Setup Wizard	Phone and Modem	Power Options	Printers and Faxes	Regional and Language	Scanners and Cameras	Scheduled Tasks	Security Center	SigmaTel Audio	Sounds and Audio Devices
2			<u> </u>	3	6				
Speech	System	Taskbar and Start Menu	User Accounts	Viewpoint	Windows Firewall	Wireless Network Set			

# 2 – Double click "System".

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🕒 Control P	Panel									90
File Edit	View Favor	rites Tools	Help							4
🔇 Back 🔻	• 🗇 · 😰	🔎 Search	> Folders	s 🔉 🗙 🖌	?					
Address 🔂	Control Panel								✓ →	Go
Ġ.	Ń	6	<b>i</b>	🌯	<b>8</b>	<b>N</b>	P	<u>s</u>	N.	
Accessibility Options	Add Hardware	Add or Remov	Administrative Tools	Automatic Updates	Broadcom ASF Configuration	Broadcom Control Suite 2	Date and Time	Display	Folder Options	
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Fonts	Game Controllers	Internal NIC Configuration	Internet Options	Java	Keyboard	Mail	Microsoft Mail Postoffice	Mouse	Network Connections	
<b>1</b>		4			3	1	۲	Σ	O,	
Network Setup Wizard	Phone and Modem	Power Options	Printers and Faxes	Regional and Language	Scanners and Cameras	Scheduled Tasks	Security Center	SigmaTel Audio	Sounds and Audio Devices	
2	<b>S</b>		<u> </u>	$\bigcirc$	6					
Speech	System	Taskbar and Start Menu	User Accounts	Viewpoint	Windows Firewall	Wireless Network Set				

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# **3** – Click on the "Hardware" tab and click on "Device Manager".



# **4** – Double click on "Ports (COM & LPT)" to expand the listing.

System Properties	📙 Device Manager 📃 🗖 🔀	
System Restore Automatic Updates	File Action View Help	
General Computer Name Hardwa		A 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997
Device Manager         Image: The Device Manager lists all the hardware on your computer. Use the Device Manager properties of any device.         Device Manager intervention         Drivers         Driver Signing lets you make sure that inst compatible with Windows. Windows Upd how Windows Upd Driver Signing         Driver Signing         Windows connects to Windows Upd how Windows connects to Windows Upd Manager Profiles         Hardware Profiles         Wardware profiles provide a way for you to different hardware configurations.         Hardware Manager M	DDFNM381      Batteries     Computer     Computer     Disk drives     Display adapters     DVD/CD-ROM drives     Display adapters     DVD/CD-ROM drives     DIDE ATA/ATAPI controllers     Keyboards     Mice and other pointing devices     Modems     Monitors     Motions     Moti	V Sigma Tel Audio

Under the COM port listings the connection will be listed as:

# CP210x USB to UART Bridge Controller (COM?)

Use this as the COM port to enable communication between the PC and the development board. If you have two boards connected, two COM ports will show to be connected. You can determine which board uses which COM port by sending a command and verifying a response. No response, wrong port.

Once the COM port has been identified, select the appropriate port connection.

Mode Control	Can Gen Mode     Sleep     Transmit - ASK     Transmit - 00K     Receive	Eval/Dev Mode Evaluation Mode
Connection Serial Port Com1 Com2 Com3 Com4 Com5 Com5 Com6 Com7 Com8	3rd Gen Mode       Read       Write       Range Test       OFF       Terminal	CFG0         CFG1           Bit-7: -         ?           Bit-6: (R) VCD locked         0x?3           Bit-5: ISSMod         0x?3           Bit-4: -         8           Sta 3-0: Clock Recovery Baud Rate         7           C 1200         57600           C 2200         115200           C 4800         230400           C 4800         230400           C 13200         921600           C 38400         232600

After selecting the COM port, turn on the development board. The LED's should light in sequence and the "Heartbeat" will flash.



# 1.4 Second-Generation (2G) Operating Mode

The software is primarily designed to exercise the third-generation functions of the device. Although it is possible to setup the device in backward compatible second-generation mode, the active functions of the software, the Terminal and Range test, for example, are primarily for operation using the third-generation operating mode, thus, Range Test is not available using 2G mode. This will be an option added in a future revision of the software.



Transmitting using 2G Mode requires applying an external signal to the TX testpoint terminal from a user application or function generator. Received data may be viewed by connecting an oscilloscope probe to the RX testpoint terminal or connecting to a user application.

# 1.5 Third-Generation (3G) Operating Mode

3G Mode is invoked by selecting "**3G Mode**" in the **Mode Control** frame. When selected the software requires confirmation to set to 3G mode. This is necessary because it is **NOT** possible to revert back to 2G Mode once the device is configured into 3G Mode without cycling power to the board OFF, then ON again.

Mode Control C 2G Mode C 3G Mode Reset	2nd Gen Mode Sleep Transmit - ASK Transmit - 00K Receive	Eval/Dev Mode Evaluation Mode
Serial Pc C Co C Co	This function sets the dev Continue?	Cancel
C Com/ C Com8	Range Test OFF	Bit-2 - Bit-1 - Bit-0 SVEnab ode Entry-

Once 3G Mode is enabled, the 2<sup>nd</sup> Gen Mode frame becomes inactive and the controls on the 3<sup>rd</sup> Gen Mode frame become active.

🛸 ASH 3G Configura	ation - v1.0	
Mode Control C 2G Mode C 3G Mode Reset	2nd Gen Mode – Sleep Transmit - ASK Transmit - OOK Receive	Eval/Dev Mode Evaluation Mode MODE
Connection Serial Port Com1 Com2 Com3 Com4 Com5 Com6 Com6 Com7 Com8	- 3rd Gen Mode Read Write Range Test OFF Terminal	CFG0         CFG1           Bit-7: Sleep         2           Bit-8: Tx/Fix         0x??           Bit-3: ASK/DOK         0x??           Bit-3: Mode (see below)         0x??           Bit-1: -         Bit-1: -           Bit-1: -         Bit-1: -           Bit-1: -         Bit-1: -           Fixed Seg         DSS5

If the switch is not turned on to power the board then a message will pop up indicating unsuccessful communication with the board.

Mode Control	C Transmit - ASK C Transmit - ODK C Receive	val/Dev Mode Evaluation Mode MDDE
Connection Serial Port Com1 Com2 Com3 Com4 Com5 Com6	Comm Error No response received from	n hardware. <u>?</u> 0x??
C Com7 C Com8	Bits 3-0: C Range Test OFF Terminal	Cock Recovery Baud Rate           00         © 57600           00         © 115200           00         © 230400           00         © 460800           200         © 921600

Otherwise, a message will pop up confirming successful communication and configuration.

Mode Control C 2G Mode 3G Mode Reset	Cand Gen Mode Caracter Caracte	Eval/Dev Mode Evaluation Mode MODE
Connection Serial Port Com1 Com2 Com3 Com4 Com5 Com6 Com7	Ord Gen Mode       Write       Image: Operating the second s	ifigured for 3G mode! ed 0x??
C Com8	Range Test OFF Terminal	1200     77600     2400     115200     4800     230400     5600     7460800     19200     921600     39400

Once the COM port assignment has been established and 3G Mode enabled, configuration of the device may be performed.

# 1.6 Third-Generation (3G) READ Configuration

A register Read or Write may be performed at this point. To check the internal state of the configuration registers, click on the Read button. A READ can be performed at any time.

Mode Control	2nd Gen Mode Sleep Transmit - ASK Transmit - OOK Receive	Eval/Dev Mode Evaluation Mode MODE
Connection Serial Port Com1 Com2 Com3 Com4 Com5 Com6 Com6 Com7 Com8	3rd Gen Mode	CFG0     CFG1       Bit-7:     Sleep     ?       Bit-6:     Tx/Rx     ?       Bit-5:     ASK/OOK     0x??       Bit-3:     Mode (see below)       Bit-1:     -       Bit-1:     -       Bit-2:     -       Bit-1:     -       Bit-2:     -       Bit-1:     -       Bit-2:     -       Bit-3:     Mode (see below)       Bit-1:     -       Bit-2:     -       Bit-3:     Mode (see below)       Bit-1:     -       Bit-2:     -       Bit-3:     Mode (see below)

A message box will pop up with the hexadecimal value (0x????) of both registers.

Mode Control C 2G Mode G 3G Mode Reset	Content of the second s	Eval/Dev Mode Configuration Mode MDDE
Serial Port Com Com Com Com Com Com Com Com Com Com	Read command complet     The register bits have b     Response = '0x0040'.     OK	ed properly. een updated accordingly. 0x40
C Com8	Range Test	C 1200 C 57600 C 2400 C 115200 C 4800 C 230400

The default READ value of the internal registers is 0x0040. Click "OK" to close the pop up widow and view the individual bit settings.

Mode Control	2nd Gen Mode	Eval/Dev Mode	Mode Control	2nd Gen Mode	Eval/Dev Mode
<ul> <li>2G Mode</li> <li>3G Mode</li> </ul>	C Transmit - ASK C Transmit - OOK	Configuration Mode	C 2G Mode ● 3G Mode	<ul> <li>Sleep</li> <li>Transmit - ASK</li> <li>Transmit - 00K</li> </ul>	Configuration Mo
Reset	C Receive	MODE	Reset	C Receive	MODE
Connection Serial Port Com1 Com2 Com3 Com4 Com4 Com5 Com6 Com7 Com8	3rd Gen Mode       Read       Write       Range Test       OFF       Terminal	FGI CFG1 Bit-5: Sleep ? Bit-6: Tx/Rx Bit-5: ASK/OOK 0x00 Bit-4: - Bit-3: Mode (see below) Bit-2: - Bit-1: - Bit-1: - Bit-1: - Fixed Seq C DSSS	Connection Serial Port Com1 Com2 Com3 Com4 Com5 Com5 Com6 Com7 Com8	3rd Gen Mode	CF60         CF61           Bit7: -         Bit5: ISSMod           Bit5: ISSMod         Bit4: -           Bit3: Clock Recovery Baud         Control (Control (Contro) (Control (Contro) (Control (Control (Control (Contr

**NOTE:** If on power-up there is residual voltage on capacitor C3 from the last powered state, this can cause the default Read value to be slightly different. Make sure C3 is totally discharged by setting SW1 to the **OFF** position for at least 10 secs. This is ample amount of time for the capacitor to discharge enough to reset the internal configuration registers.

# 1.7 Third-Generation (3G) WRITE Configuration

A WRITE to the device will write the current configuration to the internal configuration registers.

Mode Control C 2G Mode C 3G Mode	C Transmit - ASK	⊂ Eval/Dev Mode E∨aluation Mode
Reset	C Receive	MODE
Connection Serial Port Com1 Com2 Com3 Com4 Com5 Com6 Com7 Com8	3rd Gen Mode       Read       Vrite       Range Test       OFF	CFG0     CFG1       Bit-7:     Sleep     ?       Bit-6:     Tx/Fix     ?       Bit-5:     ASK/OOK     0x??       Bit-3:     Mode (see below)       Bit-1:     -       Bit-1:     -       Bit-0:     SVEnab       ode Entry     C       Fixed Seq     DSSS

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To SET a bit, simply click on the bit and the box will be marked with a checkmark, indicating the bit is SET or '1' A box that has no mark is regarded as CLEAR or '0'. The same is true for the option buttons. To SET a bit, simply click on the option.



Once the configuration is written, a message box will pop up confirming a successful write to the device as well as what configuration word was written. All bit states are updated after a WRITE.



The "Command string" can be verified by the contents of each configuration register.

Search School Sc		ASH 3G Configuration - v1.0	$\mathbf{X}$
Mode Control C 20 Mode C 36 Mode Reset C 7ransmit - ASK C 7ransmit - 00 C Receive	Eval/Dev Mode Configuration Mode MODE	Mode Control     C 2d Mode     Sleep     Evel/Dev       3 G Mode     C Transmit - ASK     C Transmit - ODK     Control       Reset     C Receive     C Receive     Control	Mode guration Mode
Sriil Port     3rd Gen Mode       Sriil Port     Com1       C Com3     Com3       C Com5     Read       C Com7     Write       C Com8     Prange Test       OFF     Terminal	CF60         CF61           IF 8i-7:         Sleep         21           IF 8i-7:         Bi-7         0xC0           IF 8i-7:         Bi-7         Bi-7           IF 8i-7:         Bi-7         Bi-7           IF 8i-7:         Bi-7         Bi-7           IF 8i-7:         Bi-7         Bi-7           IF 8i-7:         File-1         Bi-7           IF 8i-7:         File-1         Bi-7           IF 8i-7:         File-1         Bi-7           IF 8i-7         File-1         Steab           Mode Entry         C Fiked Seq         DSSS	Connection         3rd Gen Mode           Serial Port         CFG0           C Com1         D           C Com2         D           C Com3         Read           C Com6         Write           C Com7         DFF           C Com8         OFF           OFF         39400           C State         C State	61 cked 0x02 sovery Baud Rate 57600 115200 232400 460800 921600

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Refer to the individual device datasheets for a detailed explanation on each bit function.

# 1.8 **RANGE TEST** Configuration

The development boards are equipped to perform range testing, providing a benchmark for performance in different environments. When Range Test is initiated, the board will begin transmitting a predefined data packet. The opposite board need only be programmed for Receive Mode.

To activate the Range Test install a shorting jumper on to J5 prior to switching SW1 **ON**. When using J5 to enable the Range Test the board will begin transmission immediately after power-up.



To disable Range Test, switch SW1 to **OFF**, remove jumper, switch SW1 back to **ON** to power the board.

Refer to the 3G VWO User's Guide for a detailed discussion of the Range Test hardware function.

#### **1.9 Software Terminal**

The configuration software has a built-in terminal program that can be used to view RF traffic between the two boards. The terminal has a separate Transmit and Receive window.

Host Terminal Program	
File Edit View Commands	
>RX Message Window<	-
J	$\checkmark$
>TX Message Window<	~
>Set for Node 2 & 2<	
TX Buffer	Keyboard Active

The Terminal application is automatically set to the same COM port as the configuration application.

In order to run two development boards on one PC, this will require opening two separate configuration tools.

ASH 3G Configuration - v1.0	ASH 3G Configuration - v1.0
Select Device:	Select Device:
<ul> <li>DR7000 (433.92 MHz)</li> <li>DR7001 (315.00 MHz)</li> <li>DR7003 (303.825 MHz)</li> <li>DR8000 (916.5 MHz)</li> <li>DR8001 (868.35 MHz)</li> <li>DR8100 (916.5 MHz w/DSSS)</li> </ul>	<ul> <li>○ DR7000 (433.92 MHz)</li> <li>○ DR7001 (315.00 MHz)</li> <li>○ DR7003 (303.825 MHz)</li> <li>○ DR8000 (916.5 MHz)</li> <li>○ DR8001 (868.35 MHz)</li> <li>○ DR8100 (916.5 MHz w/DSSS)</li> </ul>

Once the device is selected, the COM port may be selected for each board so that configuration can be performed without changing COM port assignments.

🛸 ASH 3G Configu	ration - v1.0		🛸 ASH 3G Config	uration - v1.0	
Mode Control	2nd Gen Mode Sleep Transmit - ASK Transmit - 00K Receive	Eval/Dev Mode Configuration Mode MODE	Mode Control	Cand Gen Mode Sleep Transmit - ASK Transmit - OOK Receive	Eval/Dev Mode Evaluation Mode
Connection Serial Port Com1 Com2 Com3 Com4 Com4 Com5 Com6 Com7 Com8	3rd Gen Mode     CF       Read     I       Write     Bit       Range Test     OFF       Terminal     I	GO         CFG1           3h-6: [R] VCD locked         ?           3h-6: [R] VCD locked         0x??           3h-4: -         *           s 30: Clock Recovery Baud Rate         © 1200           © 1200         © 57600           © 4800         © 230400           © 5600         © 460800           © 19200         © 921600           © 38400         *	Connection Serial Port Com1 Com2 Com3 Com4 Com5 Com5 Com6 Com7 Com8	3rd Gen Mode Read Write Range Test OFF Terminal	CF60 CFG1 Bit-7: Sleep ? Bit-6: Tx/Rx Bit-5: ASK/00K 0x?? Bit-4: Bit-3: Mode (see below) Bit-2: Bit-1: Bit-0: SVEnab Mode Entry • Fixed Seq C DSSS

Click READ on each device and make sure that the synthesizer is locked. This should read out a 0x0040, but may depend on the previous power-up state. As long as bit 6 of the CFG1 register is checked, the synthesizer is locked.

ASH 3G Configuration - v1.0	SASH 3G Configuration - v1.0
Mode Control     2nd Gen Mode     Eval/Dev Mode       C 26 Mode     C Sleep     C Transmit - ASK       C 3G Mode     C Transmit - OOK     C Onfiguration Mode       Reset     MODE	Mode Control     2nd Gen Mode     Eval/Dev Mode       C 2G Mode     C Sleep     Transmit - ASK.     Configuration Mode       G 3G Mode     C Receive     MODE
Connection       3rd Gen Mode         Serial Pott       Read       Provide the command completed property.       ?         Com2       Image: Com4       Image: Com4       ?       ?         Com3       Com4       Com4       ?       ?         Com5       OK       0x00       0x00         Com8       Com4       Bit-0:       SVEnab         DFF       DFF       Mode Fritu       Image: Com4	Connection       3/d Gen Mode         Serial Pott       Read         Com1       Read command completed property.         Com3       Read command completed property.         Com4       Response = '0x0040'.         Com6       OK         Com7       OK         Com8       C 2400         Range Test       C 4800         OFF       C 4800
Terminal Fixed Seq C DSSS	Terminal C 38400

Then select the Terminal application by clicking on the "Terminal" button in each window.

S Host Terminal Program	🔀 🖻 Host Terminal Program
File Edit View Commands	File Edit View Commands
>RX Message Window	RX Message Window<
>TX Message Window< >Set for Node 2 & 2<	>TX Message Window< >Set for Node 2 & 2<
TX Buffer Keyboard Act	e TX Buffer Keyboard Active

# 1.9.1 Range Test using the Terminal

After configuring the terminals as above and enabling the Range Test, as described in section 1.8, the actual Range Test packets may be observed in the Receive window of the receiving device.

Host Terminal Program	
ile Edit. View Commands	
>RX Message Window< Range Test <from 0="" 2="" :="" n="" p=""> Range Test <from 1="" 2="" :="" n="" p=""> Range Test <from 2="" :="" n="" p=""> Range Test <from 2="" 3="" :="" n="" p=""> Range Test <from 2="" 4="" :="" n="" p=""> Range Test <from 2="" 5="" :="" n="" p=""> Range Test <from 2="" 5="" :="" n="" p=""> Range Test <from 2="" 7="" :="" n="" p=""> Range Test <from 2="" 7="" :="" n="" p=""> Range Test <from 0="" 2="" :="" n="" p=""></from></from></from></from></from></from></from></from></from></from>	
>TX Message Window< >Set for Node 2 & 2<	
TX Buffer	Keuhoard Active

On the development boards, the transmitting board will flash the TX Packet LED, indicating each time the TX packet is sent, and the Serial Traffic LED each time an ACK or nACK is sent to the PC.



Serial Traffic

On the receiver board two LED's will flash continuously. The "CRC Good" LED flashes when the packet is received and the frame check (CRC) of the packet has been verified as good and the "Serial Traffic" LED will flash when an ACK or nACK is sent to the PC via the serial port. The ACK or nACK will appear in the Transmit window of the configuration software.





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