Hardware User Manual for G8 Q7M i.Mx51 Module

iW-PRDUQ-UM-01-R1.0

REL1.0

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APPROVAL

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1. Introduction

1.1 Purpose

The purpose of this document is to explain the procedure about the user interface, Power ON procedure for i.Mx51 Q7 Module.

1.2 Scope

This document describes the Hardware details, ATK flash programming and setting up Serial communication with PC/Laptop & ATK Flash programming for i.Mx51 Q7 Module.

1.3 Acronyms and Abbreviations

Table 1: Acronyms and Abbreviations

Acronyms	Description.
ATK	Advanced Tool Kit
CAN	Controller Area Network
LCD	Liquid Crystal Display
DDR	Double Data Rate
FAQ	Frequently Asked Question
HT	Hyper Terminal
MMC	Multi Media Card
PC	Personal computer
RS232	Recommended Standard 232
SATA	Serial Advanced Technology Attachment
SD	Secure Digital
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
VGA	Video graphic Array

2. Hardware Details

2.1 Board Configurations and Default Features

Table 2: Board Configurations

Board Configuration / Feature	Default Configuration	Optional Configurations
DDR2	128MB	512MB
NANDF(1)	128MB	2GB
Micro SD slot	YES	YES
USB Host x4	YES	YES
USB OTG x1	YES	YES
Ethernet PHY	YES	YES
LVDS transmitter (RGB to LVDS)	YES	YES
80Pin Expansion Conn1	YES	YES
80Pin Expansion Conn 2	YES	YES
CAN Controller (SPI interface)	NO	YES
PATA to SATA bridge(1)	NO	YES
SPI NOR Boot Flash	NO	YES

Note (1): Both NANDF & SATA interfaces are not accessible simultaneously. Both interfaces are sharing same IO lines from CPU

2.2 Power Rating

Input supply to the Q7 module form MXM connector should meet below power & tolerance requirement.

Input Voltage: 5V ± 5%

Input Current: 1A

2.3 Guidelines to insert the Processor board into Carrier board

- Make sure that the carrier board is completely powered off.
- Insert the Q7 module in to the MXM connector at an angle of 45° as shown in Figure 3.
- Check the Notch position of Q7 module is proper while inserting.
- Insert the Q7 module as shown in below.
- Once the Q7 module is inserted to the MXM connector properly, press the board vertically down as shown below, such that the board is fixed firmly into the expansion connectors.

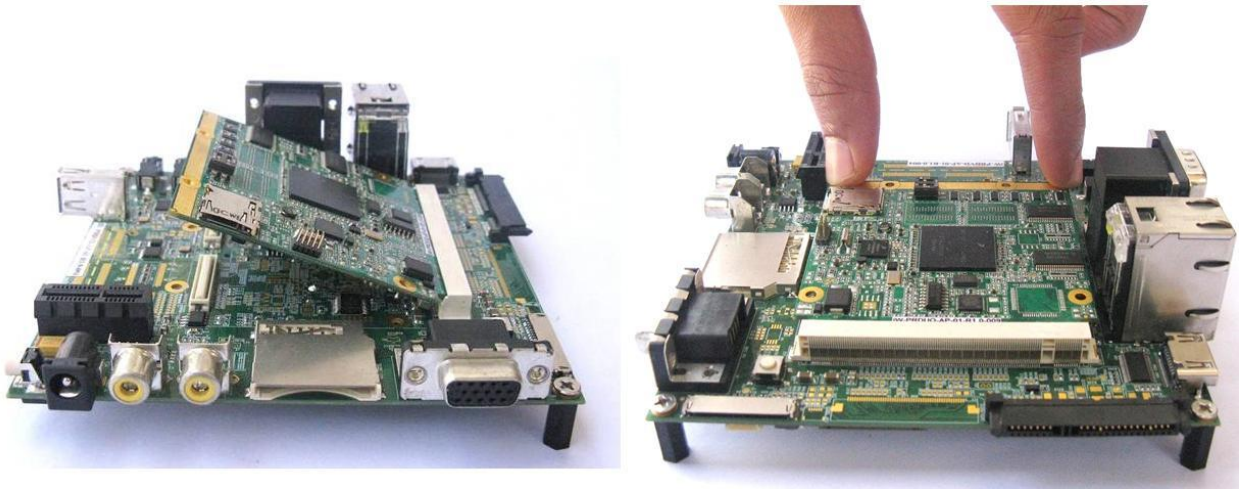


Figure 1: Q7 Module Insertion procedure

3. i.Mx51 Q7 Module Connector Pin Assignments

3.1 i.Mx51 Q7 Module Top

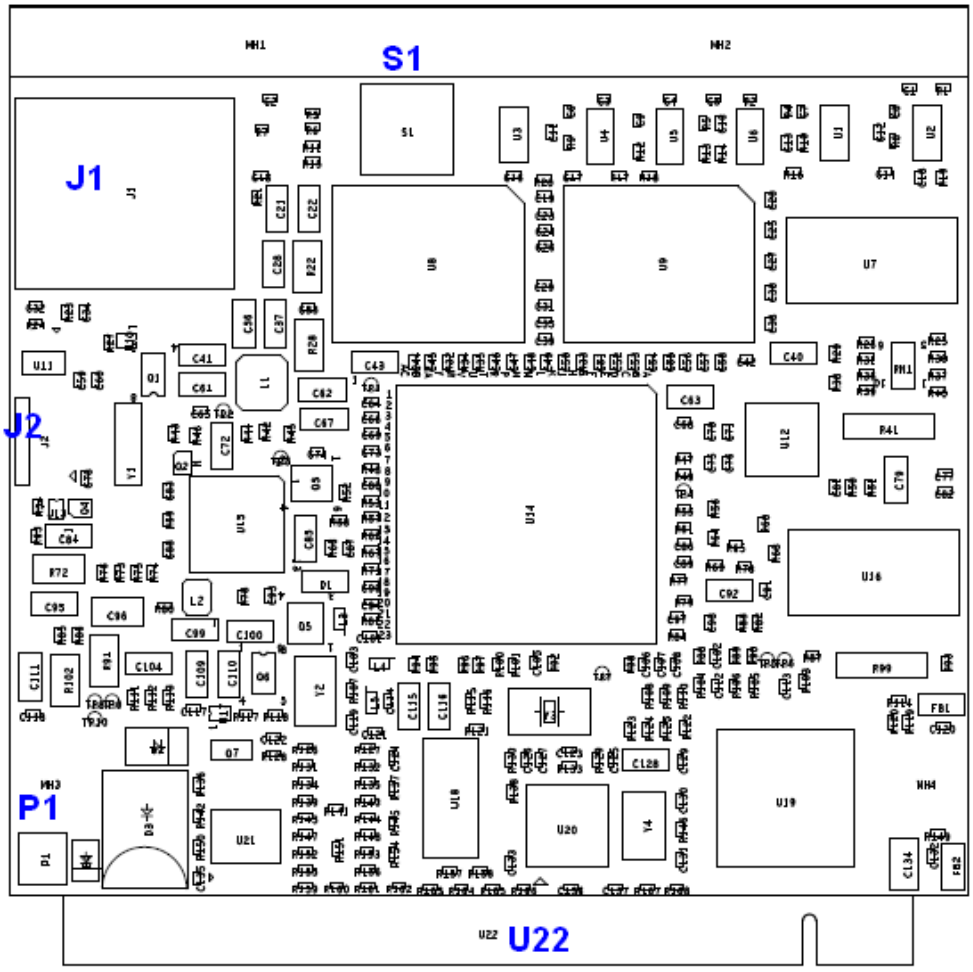


Figure 2: i.Mx51 Q7 Module Connector detail Top

Above Figure Shows the CPU module connector reference numbers on top side.

Following are the list of Connectors on Top side

- Micro SD slot (J1)
- JTAG Connector (J2)
- Stand alone Power connector (P1)
- Power Jack(J3)
- 230pin Edge connector Top (U22)
- BOOT Switch (S1)

3.2 i.Mx51 Q7 Module Bottom

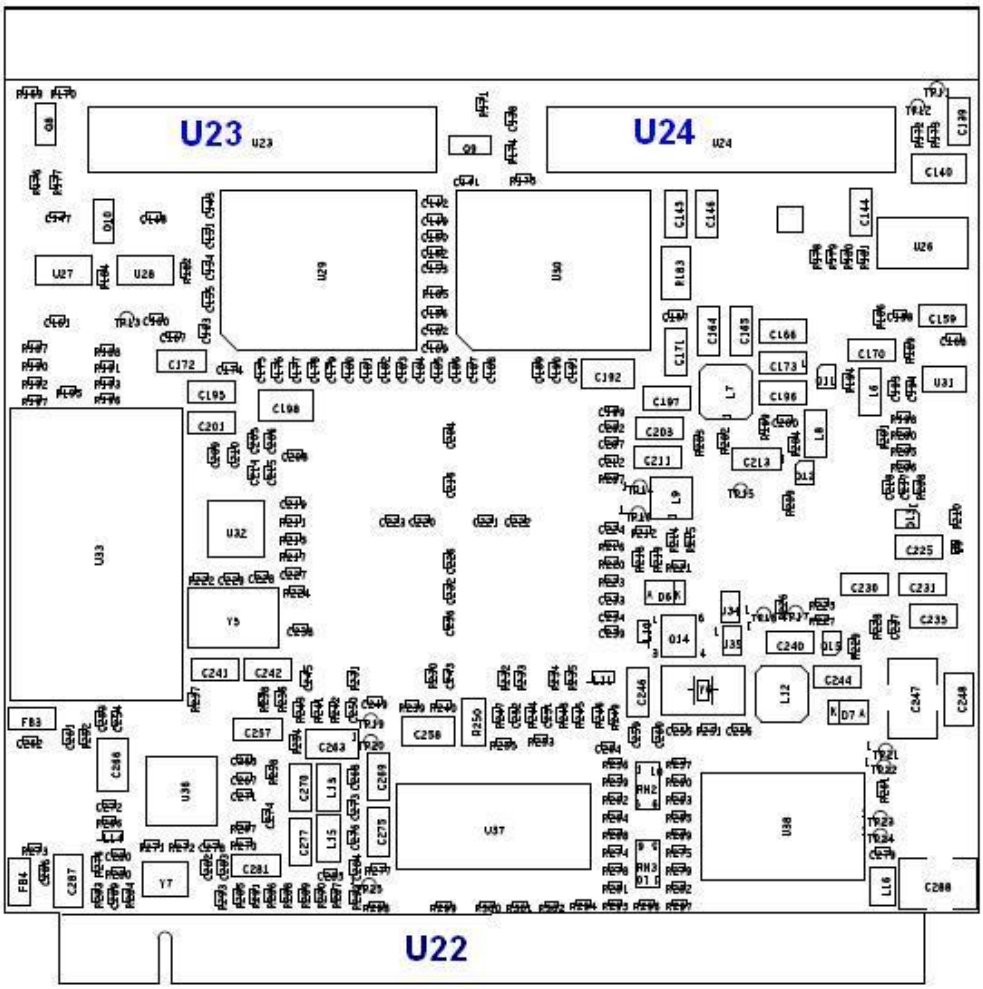


Figure 3: i.Mx51 Q7 Module Connector detail Bottom

Above Figure Shows the CPU module connector reference numbers on bottom side.

Following are the list of Connectors on Bottom side.

- 80pin Expansion connector 1 (U23)
- 80pin Expansion connector 2 (U24)
- 230pin Edge connector Bottom (U22)

3.3 Micro SD Connector pin assignment

Table 3: Micro SD connector pin assignment

Pin	Signal Name	Direction	Description
1	SD1_DATA2	IO	Data2 Signal
2	SD1_DATA3	IO	Data3 Signal
3	SD1_CMD		Command Signal
4	VSD	Power	3.15V power
5	SD1_CLK	Output	Clock signal
6	VSS1		Ground
7	SD1_DATA0	IO	Data0
8	SD1_DATA1	IO	Data1
9	SD1_CD	Input	Card Detect
10	VSS1		Ground

3.4 JTAG Connector pin assignment

Table 4: JTAG Connector pin assignment

Pin	Signal Name	Direction	Pin	Signal Name	Direction
1	1V8_DDR		2	JTAG_TRST_B	IO
3	JTAG_TDI	IO	4	JTAG_TMS	IO
5	GND		6	VCC_3V3	IO
7	JTAG_DE_B	IO	8	JTAG_TCK	IO
9	JTAG_TDO	IO	10	GND	

3.5 230pin Edge Connector pin assignment

Table 5: 230pin Edge Connector pin assignment

Pin	Signal (bottom)	Pin	Signal (top)
1	GND	2	GND
3	NC	4	NC
5	NC	6	NC
7	LINK100#	8	NC
9	MDI1-/10,100Mbps Tx/Rx-	10	MDI0-/10,100Mbps Tx/Rx-
11	MDI1+/10,100Mbps Tx/Rx+	12	MDI0+/10,100Mbps Tx/Rx+
13	LINK#	14	ACT#
15	CTREF	16	NC
17	WAKE#/GPIO	18	SUS_S3#/GPIO
19	SUS_STAT#/GPIO	20	PWRBTN#
21	NC	22	NC
23	GND	24	GND
25	GND	26	PWRGIN/GPIO 5V CMOS INPUT
27	NC	28	RSTBN#/ INPUT
29	SATA0_TX+ *	30	NC
31	SATA0_TX- *	32	NC
33	SATA_ACT#/OC_OUTPUT *	34	GND
35	SATA0_RX+ *	36	NC
37	SATA0_RX- *	38	NC
39	GND	40	GND
41	NC	42	SDIO_CLK#
43	SDIO_CD#	44	SDIO_LED
45	SDIO_CMD	46	SDIO_WP
47	SDIO_PWR/GPIO OUTPUT	48	SDIO_DAT1

49	SDIO_DAT0	50	SDIO_DAT3
51	SDIO_DAT2	52	SDIO_DAT5 *
53	SDIO_DAT4 *	54	SDIO_DAT7 *
55	SDIO_DAT6 *	56	RSVD
57	GND	58	GND
59	HDA_SYNC (AC'97)	60	NC
61	HDA_RST/GPIO OUTPUT	62	NC
63	HDA_BITCLK (AC'97)	64	NC
65	HDA_SDI (AC'97)	66	I2C_CLK
67	HAD_SDO (AC'97)	68	I2C_DAT
69	NC	70	WDTRIG#
71	NC	72	WDOUT
73	GND	74	GND
75	NC	76	NC
77	NC	78	NC
79	NC	80	USB_4_5_OC#
81	NC	82	USB_P4-
83	NC	84	USB_P4+
85	USB_2_3_OC#	86	USB_0_1_OC#
87	USB_P3-	88	USB_P2-
89	USB_P3+	90	USB_P2+
91	USB_CC	92	USB_ID
93	USB_P1-/OTG-	94	USB_P0-
95	USB_P1+/OTG+	96	USB_P0+
97	GND	98	GND
99	LVDS_A0+	100	NC
101	LVDS_A0-	102	NC
103	LVDS_A1+	104	NC

105	LVDS_A1-	106	NC
107	LVDS_A2+	108	NC
109	LVDS_A2-	110	NC
111	LVDS_PPEN/GPIO OUTPUT	112	LVDS_BLEN/GPIO OUTPUT
113	LVDS_A3+	114	NC
115	LVDS_A3-	116	NC
117	GND	118	GND
119	LVDS_A_CLK+	120	NC
121	LVDS_A_CLK-	122	NC
123	LVDS_BLT_CTRL/GP_PWM_OUT0/ PWM0	124	RSVD
125	LVDS_DID_DAT/GP_I2C_DAT/TBD(I2C DATA)	126	LVDS_BLC_DAT/TBD(I2C DATA)
127	LVDS_DID_CLK/GP_I2C_CLK/TBD(I2C CLK)	128	LVDS_BLC_CLK/TBD(I2C CLK)
129	CAN0_TX *	130	CAN0_RX *
131	NC	132	NC
133	NC	134	NC
135	GND	136	GND
137	NC	138	NC
139	NC	140	NC
141	GND	142	GND
143	NC	144	NC
145	NC	146	NC
147	GND	148	GND
149	NC	150	/NC
151	NC	152	NC
153	NC	154	NC
155	NC	156	NC

157	NC	158	NC
159	GND	160	GND
161	NC	162	NC
163	NC	164	NC
165	GND	166	GND
167	NC	168	NC
169	NC	170	NC
171	NC	172	NC
173	NC	174	NC
175	NC	176	NC
177	NC	178	NC
179	NC	180	NC
181	NC	182	NC
183	GND	184	GND
185	NC	186	NC
187	NC	188	NC
189	NC	190	NC
191	NC	192	NC
193	VCC_RTC	194	SPKR / GP_PWM_OUT2/PWM1
195	NC	196	FAN_PWMOUT/GP_PWM_OUT1 /TBD (OUTPUT)*
197	GND	198	GND
199	SPI_MOSI	200	SPI_CS0#
201	SPI_MISO	202	SPI_CS1#
203	SPI_SCK	204	NC
205	VCC_5V_SB	206	VCC_5V_SB
207	NC	208	UART_RX
209	UART_TX	210	NC

211	VCC	212	VCC
213	VCC	214	VCC
215	VCC	216	VCC
217	VCC	218	VCC
219	VCC	220	VCC
221	VCC	222	VCC
223	VCC	224	VCC
225	VCC	226	VCC
227	VCC	228	VCC
229	VCC	230	VCC

Note (*): Optional feature and not supported in default configuration due to of pin multiplexing.

Note: If not specified, default IO level is 3V3

3.6 80pin Expansion Connector-1 pin assignment

Table 6: 80pin Expansion Connector-1 pin assignments

Pin #	signal	Instants	Pin #	signal	Instants
1	GND		2	B_GPIO0	GPIO
3	B_GPIO1	GPIO	4	B_GPIO2	
5	B_GPIO3		6	B_GPIO4	
7	B_GPIO5		8	B_GPIO6	
9	B_GPIO7		10	B_GPIO8	
11	B_GPIO9		12	B_GPIO10	
13	B_GPIO11		14	B_GPIO12	
15	B_GPIO13		16	B_GPIO14	
17	B_GPIO15		18	B_GPIO16	
19	PWM	PWM	20	B_GPIO20	GPIO
21	B_GPIO21	GPIO	22	B_GPIO22	
23	B_GPIO23		24	B_GPIO24	
25	B_GPIO25		26	B_GPIO26	
27	GND		28	B_GPIO27	GPIO
29	B_GPIO28	GPIO	30	B_GPIO29	
31	B_GPIO30		32	GND	
33	AI_MCLK	SSI Input	34	AI_LRCK	SSI Input
35	AI_BCLK		36	AI_DATA	
37	GND		38	GPIO	GPIO
39	GND		40	B_LVDS_BLEN	LVDS Backlight control
41	TS_INT#	Touch screen interrupt	42	GND	
43	GPIO	GPIO Input	44	GND	
45	AO_DATA	SSI Output	46	AO_BCLK	SSI Output
47	AO_LRCK		48	AO_MCLK	
49	GND		50	B_UART1_TX	UART
51	B_UART1_RT	UART	52	B_UART1_RX	

	S				
53	B_UART1_CTS		54	GND	
55	B_GPIO31	GPIO	56	B_GPIO32	GPIO
57	B_GPIO33		58	B_GPIO34	
59	GND		60	UART3_TXD	UART
61	GPIO	GPIO	62	GPIO	GPIO
63	UART3_RXD	UART	64	B_CSI1_MCLK	Camera Interface
65	B_CSI1_PCLK	Camera Interface	66	B_CSI1_HSYNC	
67	B_VCLK		68	B_CSI1_VSYNC	
69	B_CSI1_DAT0		70	B_CSI1_DAT1	
71	B_CSI1_DAT2		72	B_CSI1_DAT3	
73	B_CSI1_DAT4		74	B_CSI1_DAT6	
75	B_CSI1_DAT7		76	B_CSI1_DAT5	
77	B_GPIO17	GPIO Bidirectional	78	B_GPIO18	GPIO Bidirectional
79	B_GPIO19		80	GND	

Note: If not specified, default IO level is 3V3

3.7 80pin Expansion Connector-2 pin assignment

Table 7: 80pin Expansion Connector-2 pin assignment

Pin#	signal	Instants	Pin#	signal	Instants
1	TSX2	Touch interface	2	TSX1	Touch interface
3	TSY2		4	TSY1	
5	GND		6	GND	
7	KP_ROW0	Keypad (4x4) (2V775 IO Level)	8	KP_ROW1	Keypad (4x4) (2V775 IO Level)
9	KP_ROW2		10	KP_ROW3	
11	KP_COL0		12	KP_COL1	
13	KP_COL2		14	KP_COL3	
15	GND		16	GND	
17	EIM_DA1	EIM Interface (1V8 IO Level)	18	EIM_DA0	EIM Interface (1V8 IO Level)
19	EIM_DA3		20	EIM_DA2	
21	EIM_DA5		22	EIM_DA4	
23	EIM_DA7		24	EIM_DA6	
25	EIM_DA9		26	EIM_DA8	
27	EIM_DA11		28	EIM_DA10	
29	EIM_DA13		30	EIM_DA12	
31	EIM_DA15		32	EIM_DA14	
33	GND		34	GND	
35	EIM_RW		36	EIM_CS0	
37	EIM_BCLK		38	EIM_CRE	
39	EIM_EB1		40	EIM_WAIT	
41	AUD6_RXD	Audio Interface (1V8 IO Level)	42	EIM_EB0	
43	AUD6_TXFS		44	AUD6_TXD	Audio Interface(1V8 IO Level)
45	AUD6_TXC		46	GND	
47	GND		48	CSI2_D13	Camera2 interface (2V775 IO Level)
49	CSI2_D12	Camera2 interface (2V775 IO Level)	50	CSI2_D15	
51	CSI2_D14		52	CSI2_D17	
53	CSI2_D16		54	CSI2_D18	
55	CSI2_D19		56	CSI2_HSYNC	

57	CSI2_VSYNC		58	CSI2_PIXCLK	
59	GND		60	GND	TV out
61	NC	Leave no connect Only for test purpose	62	TV_OUT_RED	
63	NC		64	GND	
65	NC		66	TV_OUT_GRN	
67	NC		68	GND	
69	NC		70	TV_OUT_BLU	
71	ADIN7	ADC inputs from PMIC Leave no connect	72	GND	
73	ADIN6		74	TP	Leave no connect Only for test purpose
75	ADIN5		76	TP	
77	GND		78	GND	
79	NC	Leave no connect Only for test purpose	80	NC	Leave no connect Only for test purpose

4. Flash Programming using ATK

4.1 Instructions to install Advanced Toolkit

1. Install the **Advanced Toolkit** by double clicking the file **FSL_ATK_TOOL_WINS_STD_INSTALL_1_67.exe**

2. After installing setup, double click on Advanced Tool Kit V1.67 to get the window

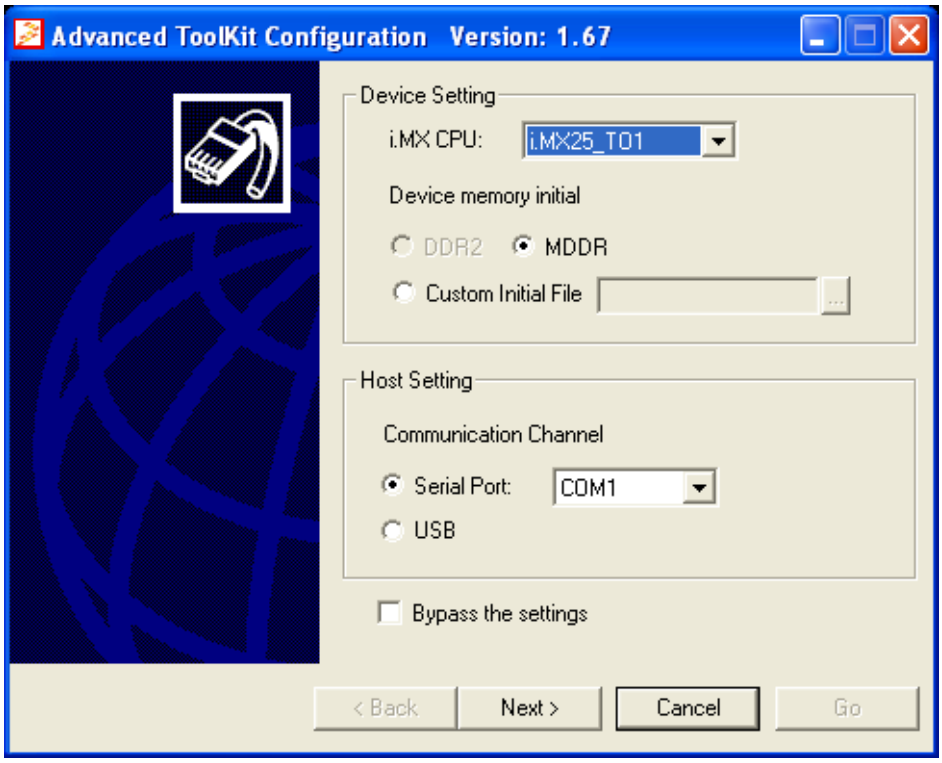


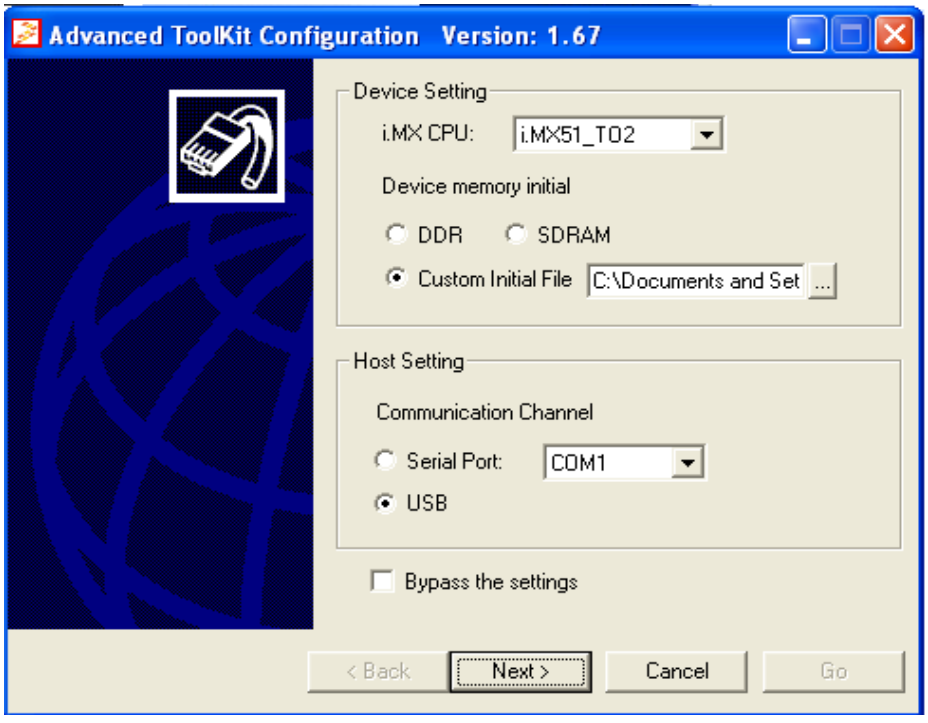
Figure 4: ATK Window

4.2 Programming i.MX51 board using Advanced Tool Kit

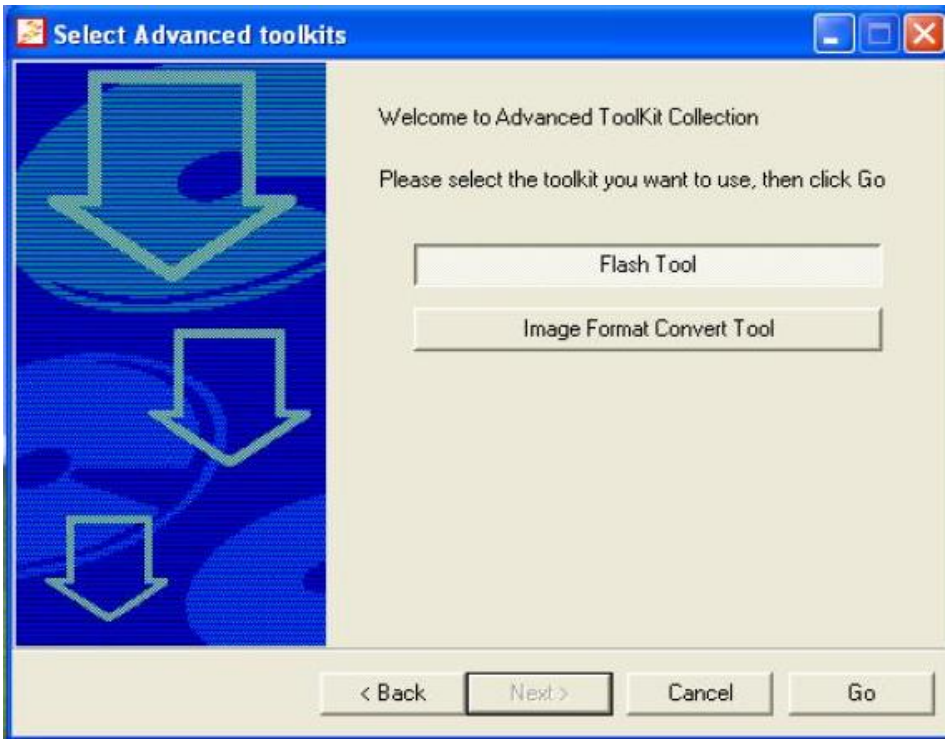
1. Connect USB Cable between USB OTG (mini AB, J26) port of Q7 carrier card and PC.
2. Set the Bootstrap mode in the Processor board as mentioned in picture below (DIP switch to ON position for bootstrap). Don't change the switch setting while power is ON.
3. After changing the switch position, Power On the system.

Figure 5: Switch Position for Boot Strap Mode

4. Run the Open Advanced Toolkit application by double clicking the "Advanced Tool Kit V1.67" located in Desktop.
5. In Device Setting select the i.MX CPU as iMX51 TO2.
6. In Device Initial File select the Custom Initial file and Browse the Custom DDR initialization file "ddr_0to15.txt".
7. In Host Setting, select Communication channel as "USB".
8. Click Next to Continue

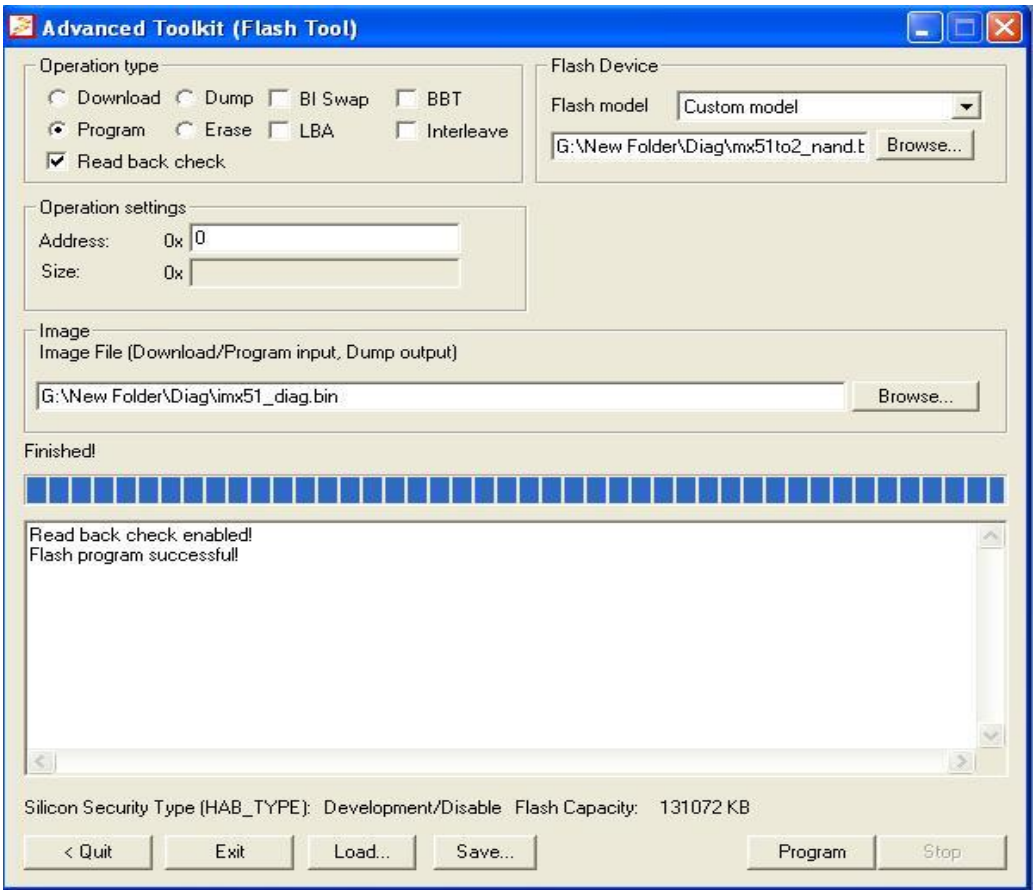


9. Select Flash Tool and Click Go button.



4.3 Flash Programming the Boot Code

1. In the next screen select below things.
2. Select Flash model as Custom model.
3. Click Browse button (under Flash model) and Select the given Binary File (“mx51to2_nand.bin”)
4. In Operation type Select Program.
5. In Operation settings, type Address as “0”.
6. Click Browse button (Under image) and select the image file (“imx51_diag.bin”).
7. Click Program button.



8. Next NK.bin has to be programmed.

Flash Programming the WinCE Image

1. In the next screen select below things.
2. Select Flash model as Custom model.
3. Click Browse button (under Flash model) and Select the given Binary File (“mx51to2_nand.bin”).
4. In Operation type Select Program.
5. In Operation settings, type Address as “100000”.
6. Click Browse button (Under image) and select the image file (“NK.bin”).
7. Click Program button.
8. After successful programming, switch off the power supply & put the DIP switch in Boot mode.

5. Hyper Terminal Set up & boot OS from NAND Flash

5.1 Hyper Terminal Set up

1. Insert one end of the serial cable to PC/Laptop COM port (DB9 Male Connector.)
2. Connect the other end of the serial cable to serial connector of the Board.
3. Open the HyperTerminal on the PC/Laptop as mentioned below
4. Go to Start -> Programs -> Accessories -> Communication -> HyperTerminal on the host PC/Laptop.
5. In hyperterminal,Go to Files ->Properties
6. Select COM1 or COM2 port depending on which port you have connected the serial cable as shown below.

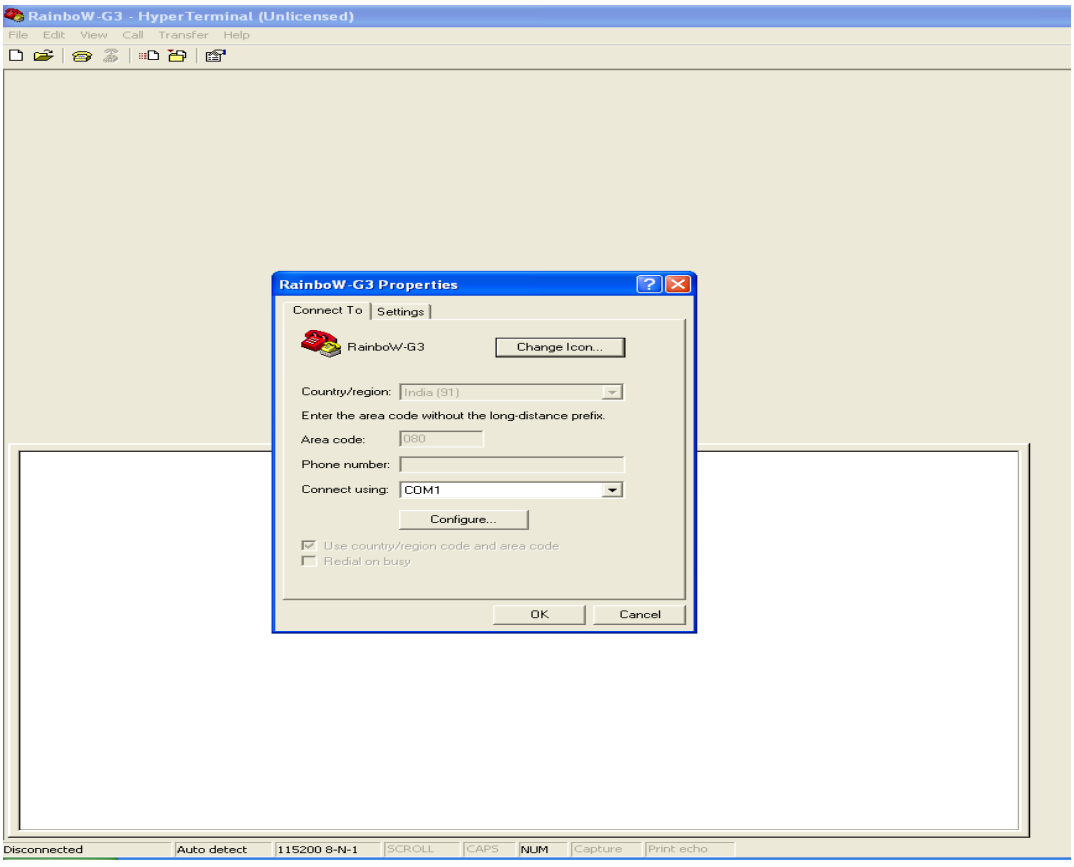


Figure 6: HyperTerminal settings-1

7. Now Click Configure button and do Port Settings as below..

Bits per Second (Baud Rate)	:**115200**
Data bits	:**8**
Parity	:**None**
Stop Bits	:**1**
Flow Control	:**None**

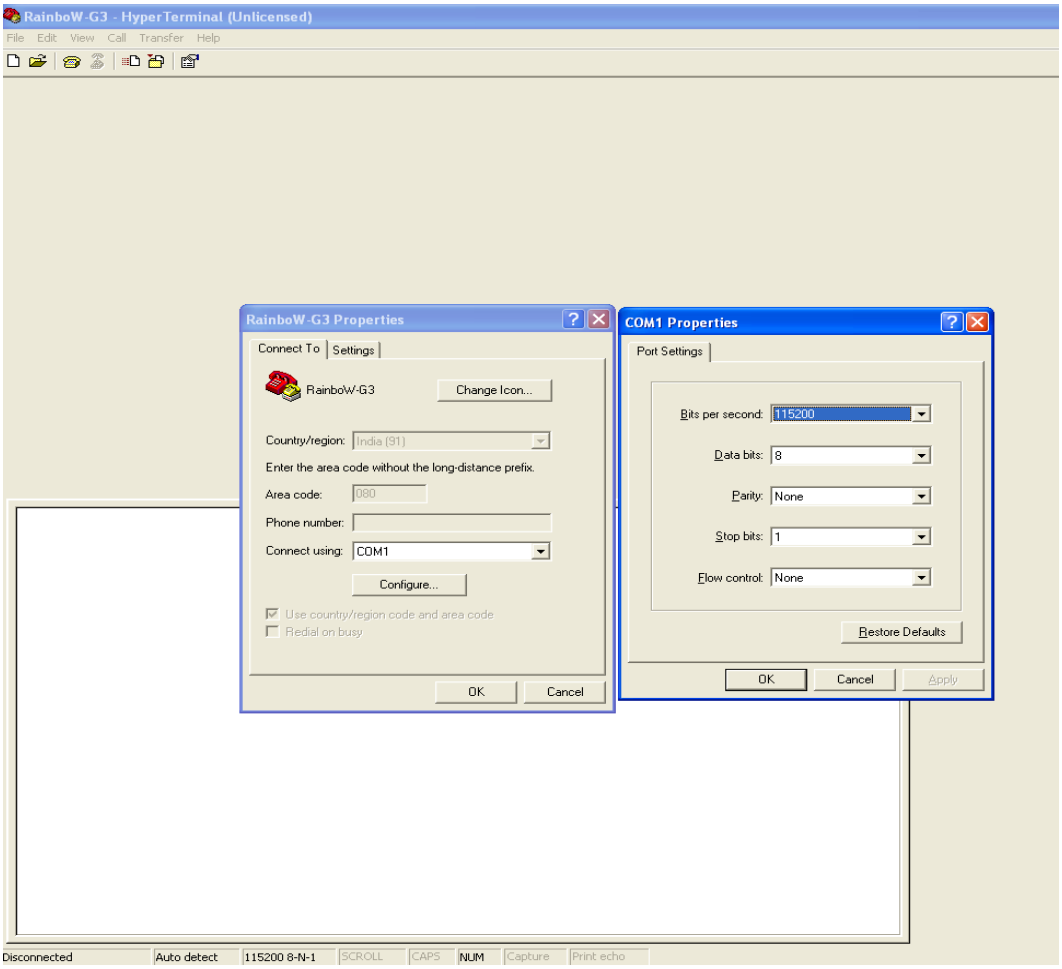


Figure 7: HyperTerminal settings-2

8. Go to File -> Properties -> Settings ->ASCII Setup.
9. Now Select 'Echo typed characters locally' has to be enabled as shown below
10. Go to Call -> Call to connect.

11. If you want to disconnect, Go to Call -> Disconnect.

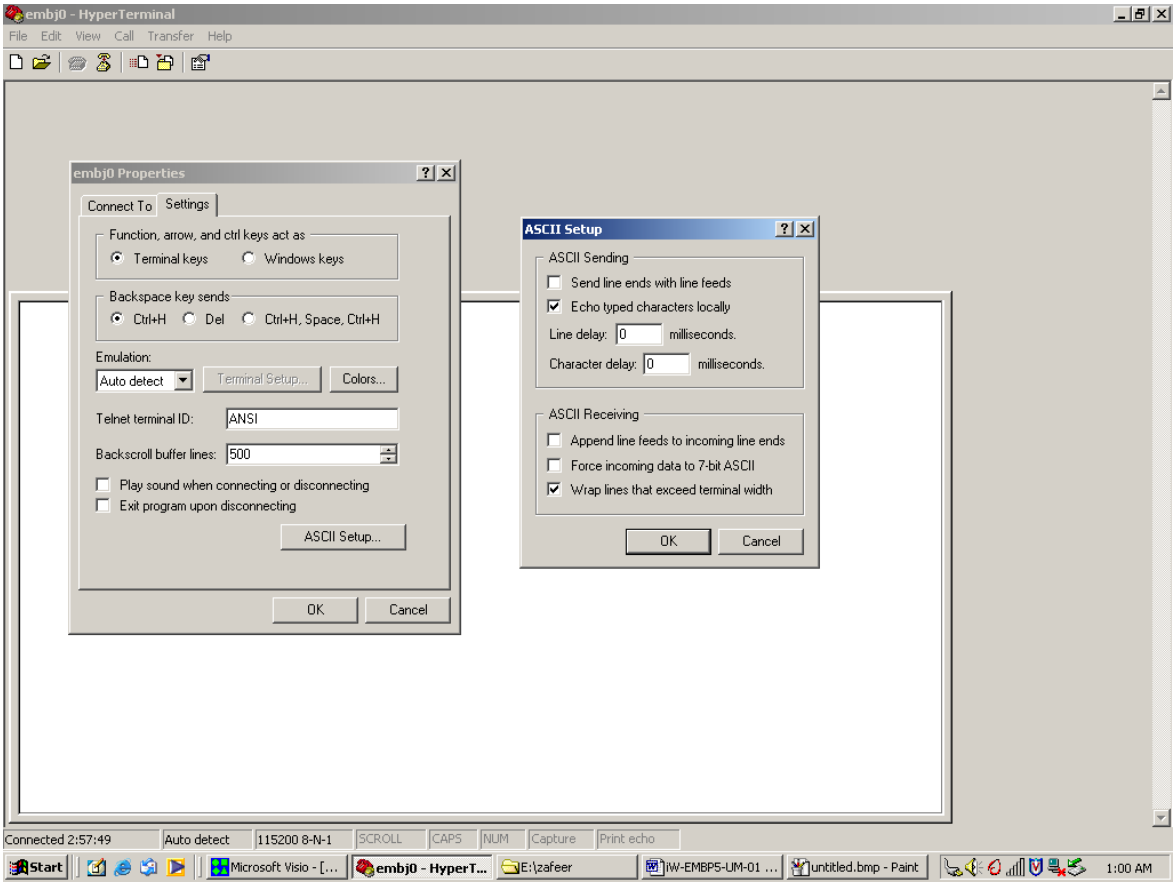


Figure 8: Enable Echo typed characters

12. The UART console messages will appear on the HT as shown below.

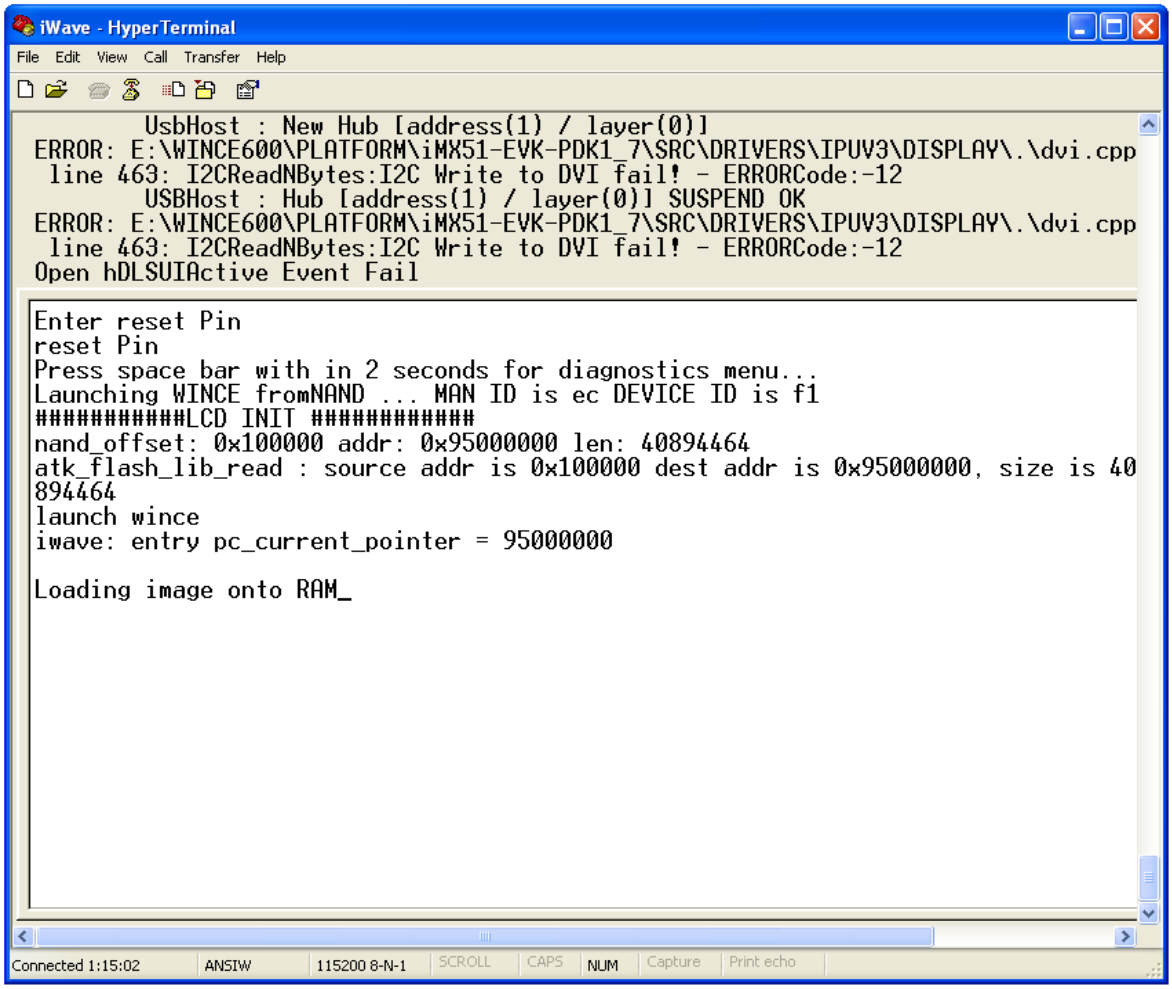


Figure 9: UART Console Window

5.2Default Configuration Setup

- Power the Board, the below diagnostics Menu will appear in the hyper terminal.

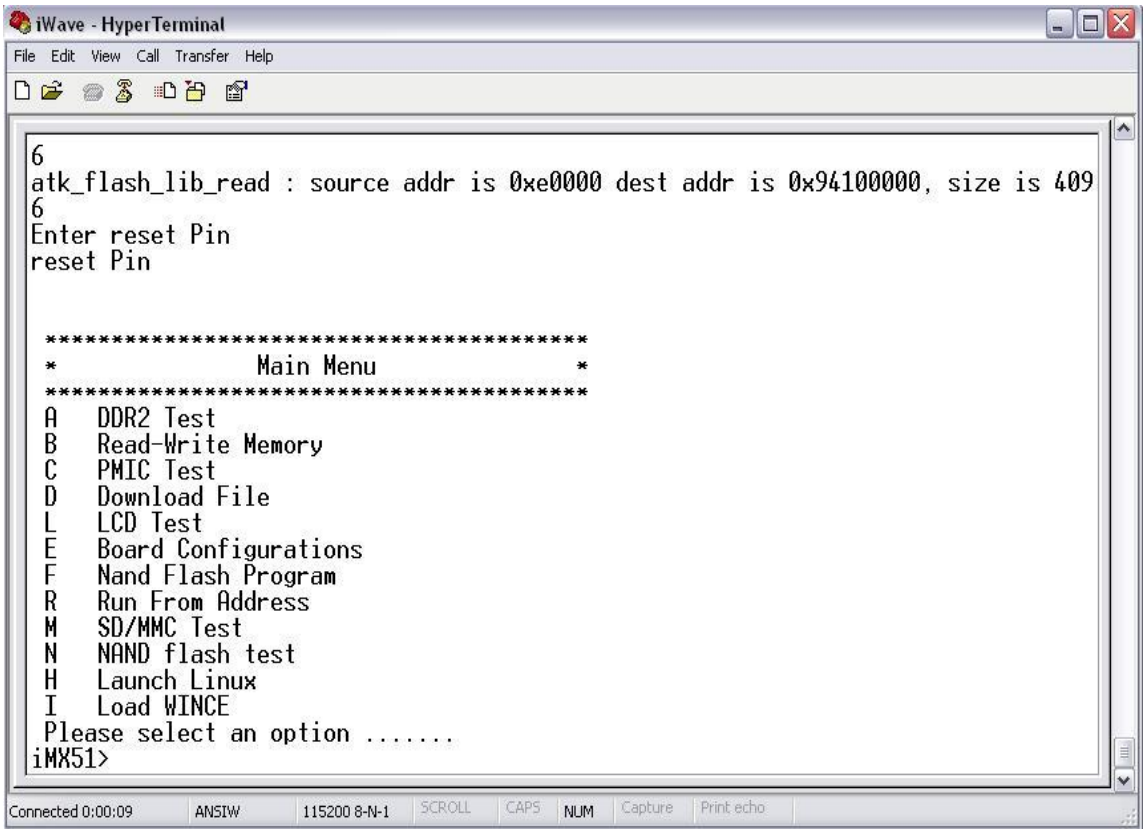


Figure 10: Diagnostic Main Menu

- Press "**E"** for Board Configuration and enter the password as "aaabacad".

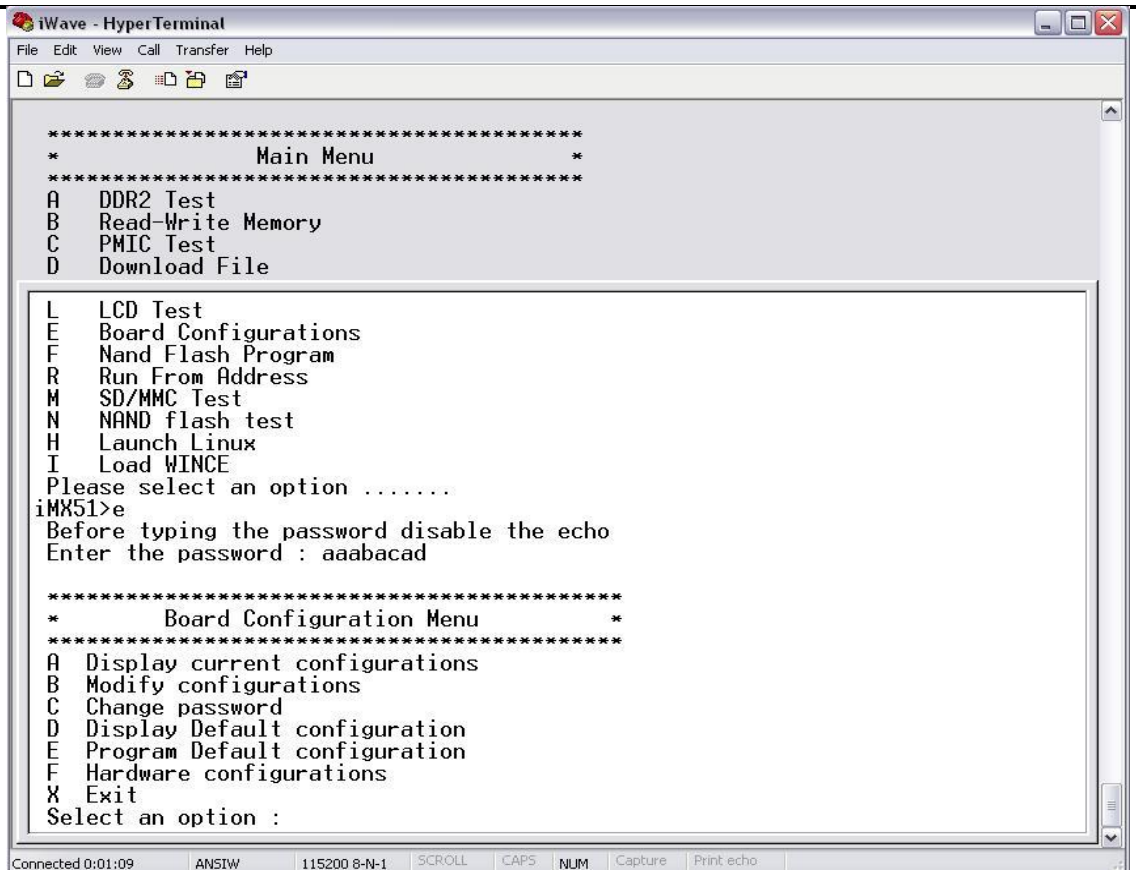


Figure 11: Board Configuration Menu

- In Board Configuration menu, again press "**E"** for Programming the Default Configuration.
- After Programming the Default Configuration reboot the board.

5.3 Power ON and Launch WinCE from NAND Flash

- Power on the system.
- Diagnostic Main Menu will appear in Hyper Terminal.

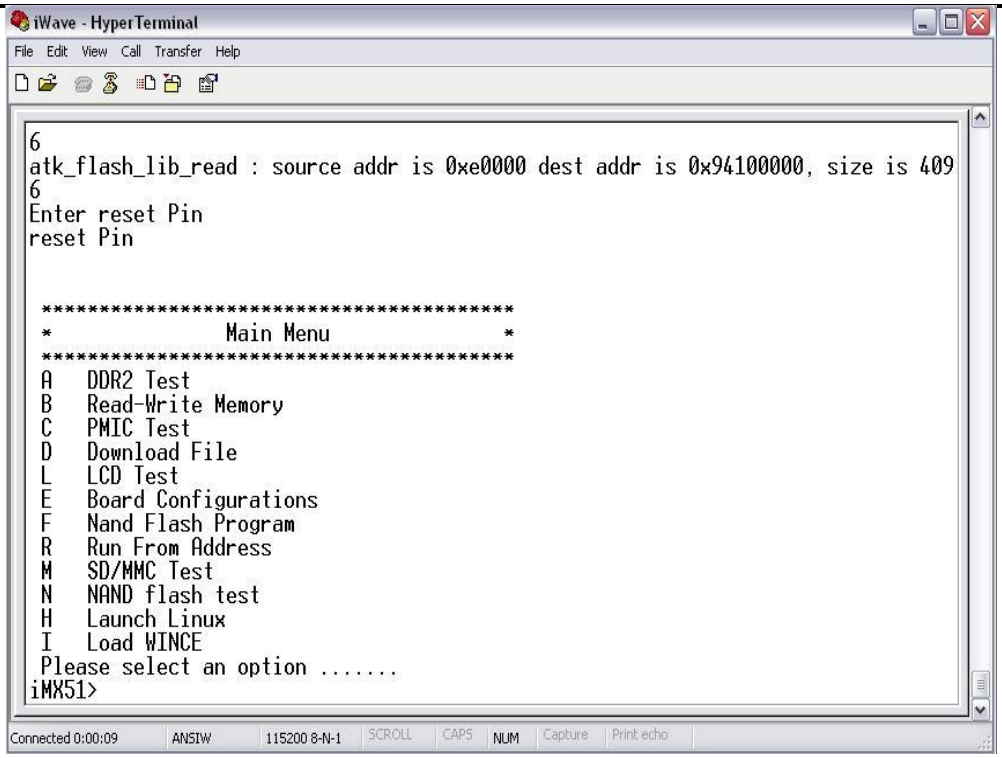


Figure 12: Diagnostic Main Menu

- Select **"I"** Option from Menu to load WINCE, the below menu will appear.

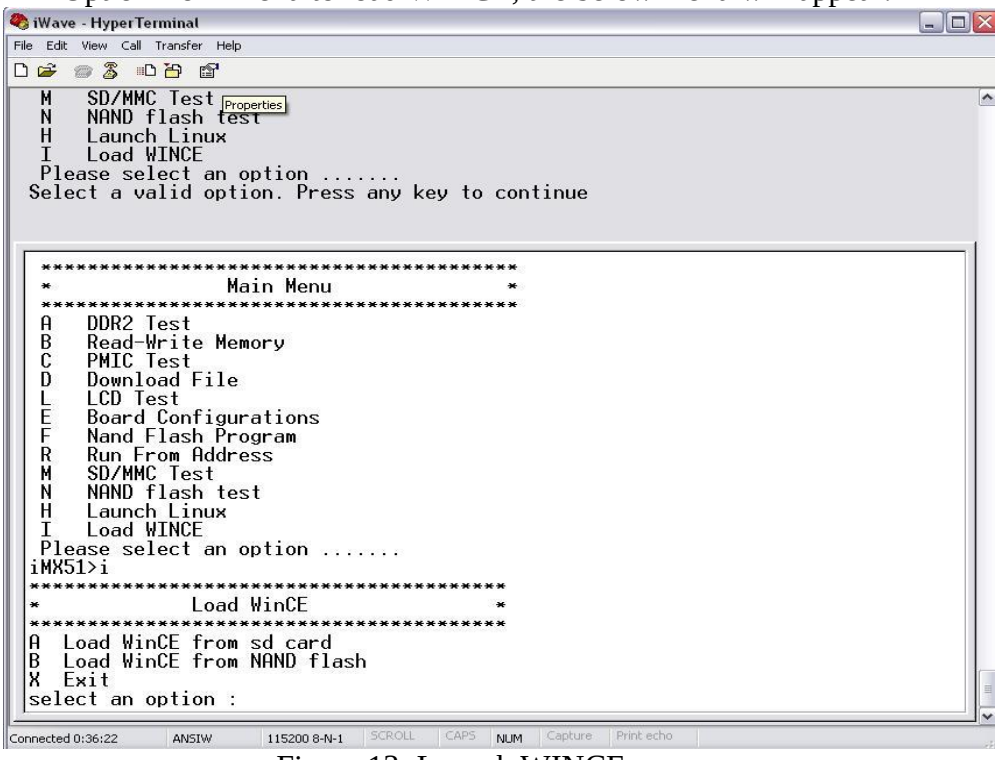


Figure 13: Launch WINCE

- Select **"B"** for Load WinCE from NAND flash.
- Wait for 1 min for WinCE 6.0 boots up, WinCE Desktop screen will be displayed in the LCD screen as shown below.

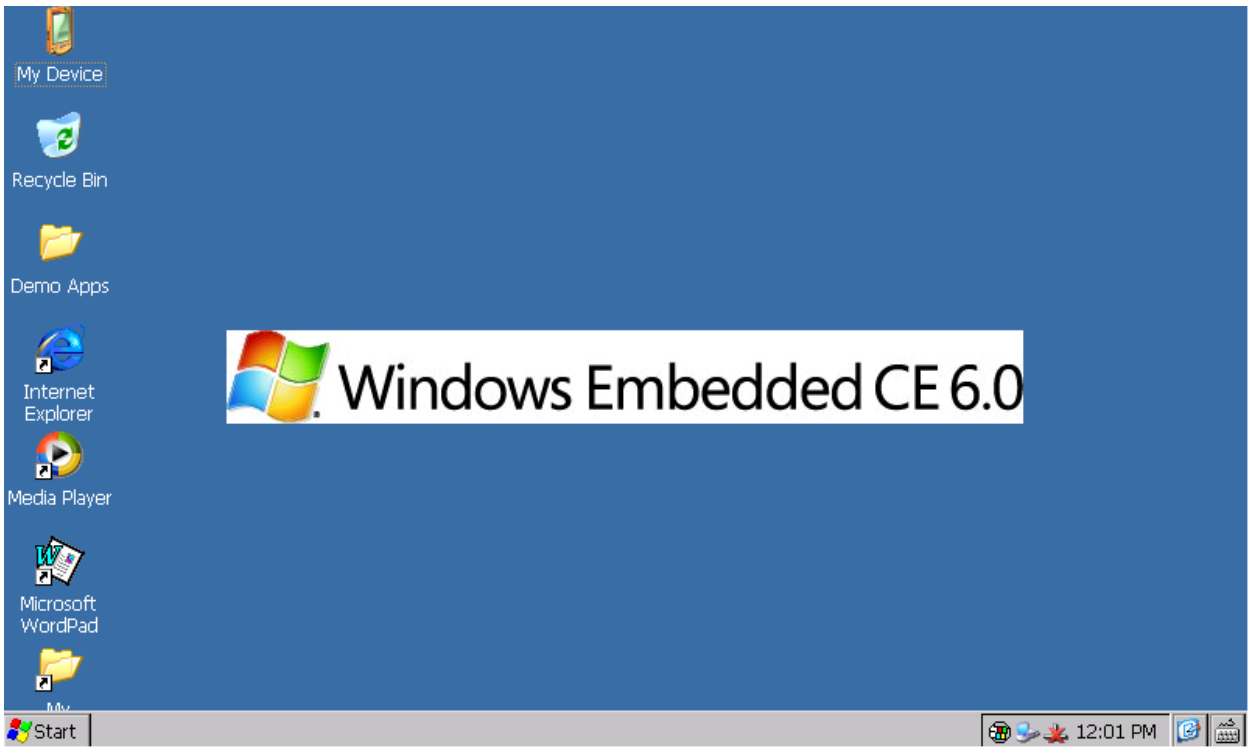


Figure 14: WinCE Desktop

6. Reference Documents/Links

Q7 specification:

http://www.qseven-standard.org/fileadmin/spec/Qseven-Spec_1.20.pdf

Carrier card design guide:

http://www.qseven-standard.org/fileadmin/spec/Qseven-DG_10_Release_Candidate.pdf

Carrier card reference schematic:

http://www.qseven-standard.org/fileadmin/spec/reference_carrier_schematics_sp31e900001.pdf

Brochure & high level Block diagrams for iWave G8 Q7M i.Mx51 module:

http://www.iwavesystems.com/i.MX51Q7SOM.htm

Brochure & high level Block diagrams for iWave G7D Generic Q7 Carrier Card:

http://www.iwavesystems.com/iW-RainboW-G7D.htm

ATK User Guide:

ATK User's Guide Standard Version.pdf

7. Technical Support

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