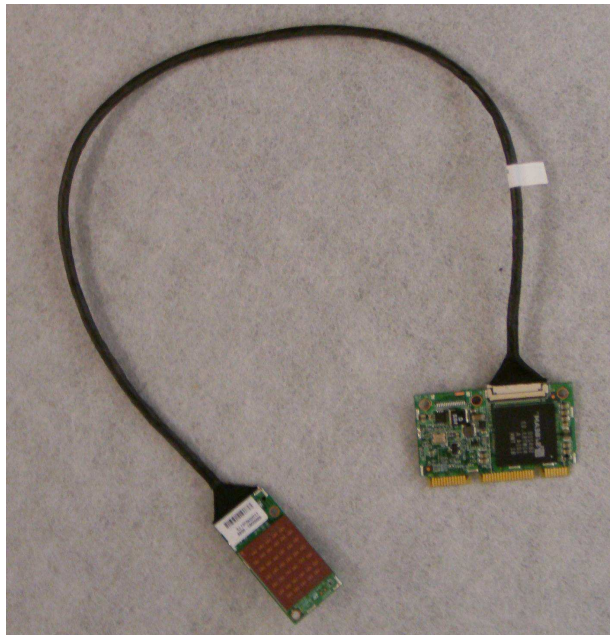


November 2010



SK9210TX-HS Wireless HD Module OEM Installation Guide



SiBEAM, Inc.

SB-UG-0004-B

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Purpose of this Document

This document provides customers with all the information necessary to allow them to utilize SiBEAM's SK9210TX-HS WirelessHD module. It takes the user through an explanation of the system components, operation and bring-up while also describing the basic system configuration and diagnostics.

It is expected that user of the SK9210TX-HS have some basic knowledge of the WirelessHD (WiHD) specification. If not, the user should review the major operation points of the specification to better understand the operation of the module.

Introduction

The SK9210TX-HS module provides a complete WiHD solution. The module is meant to be placed inside a Notebook PC's DisplayMini Card (DMC) socket. Alternatively, the SK9210TX-HS may be placed into a DMC adapter board provided by SiBEAM (SK9200DMCA).

The setup of the SK9210TX-HS is simple. Inserting the DMC board into the DMC socket and then properly placing the RF module in position followed by powering up the PC. A software applications tool, the WirelessHD Applications Controller (WAC), is provided to control the module in the PC.

Terminology

The following terms are used thru out this document.

Audio Video Control (AVC) – the command structure defined in the WiHD specification used between WiHD stations and coordinator.

Consumer Electronics Control bus (CEC) – the control bus defined in the HDMI specification which is used to pass command and other information between HDMI connected devices.

DMCA (DisplayMini Card Adapter) Board – a reference adapter board with USB and HDMI inputs which are provided to a DMC socket on board. An SK9210TX-HS can be plugged into this socket and the adapter board may be plugged into any PC with USB and HDMI outputs to create a functioning solution.

Embedded CPU – the 32-bit embedded CPU inside the SB9220 or SB9221 that runs all the WiHD protocol management between a source and sink device.

Host Microcontroller – the Atmel AT91SAM7S series microcontroller on the HDMI Interface board which provides over control of the WiHD board and standalone operation. In development, the majority of the code running in this microcontroller will be ported to the host processor which runs the system.

Line of Sight (LOS) - uninterrupted or blocked transmission from the WiHD Transmitter Module to the WiHD Receiver Module.

Non Line of Sight (NLOS) - a transmission from the WiHD Transmitter Module which is not LOS and travels by bouncing off one or more objects before reaching the WiHD Receiver Module.

SBAM2 – SiBEAM's Application Manager tool for the PC to monitor status, set configuration and control other parameters of the WiHD Transmitter and Receiver Modules. SBAM2 is used for the second generation SK9200 kits.

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Sink – a system which receives and renders A/V from a source device. This typically is a DTV or similar device. The WiHD Receiver Module can be considered a wireless A/V sink when it is connected to another A/V sink over HDMI. Sink devices may be a video sink, audio sink or audio/video (A/V) sink.

SK9210TX-HS – the WirelessHD module including the DMC board, cable and RF board. Full schematics, BOM and layout files are available.

Source – a system providing A/V to a sink device. This may be a DVD player, Set Top Box or A/V signal generator. The WiHD Transmitter Module can be considered a wireless A/V source when it is connected to another A/V source over HDMI. Source devices may be a video sources, audio source or audio/video (A/V) source. The SK9210TX-HS is a source device.

WAC (WirelessHD Applications Controller) – Application tool which runs on the PC to control and monitor the SK9210TX-HS in a Notebook PC.

WiHD Receiver Board – WiHD board which includes the SB9221 Network Processor and SB9211 RF HRRX Transceiver.

WiHD Transmitter Board – WiHD board which includes the SB9220 Network Processor and SB9210 RF HRTX Transceiver.

WVAN – Wireless Video Area Network. A network consisting of at least one WiHD enabled device which acts as a WiHD coordinator for the network. Additional stations may join or be added to the WVAN.

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Getting Started

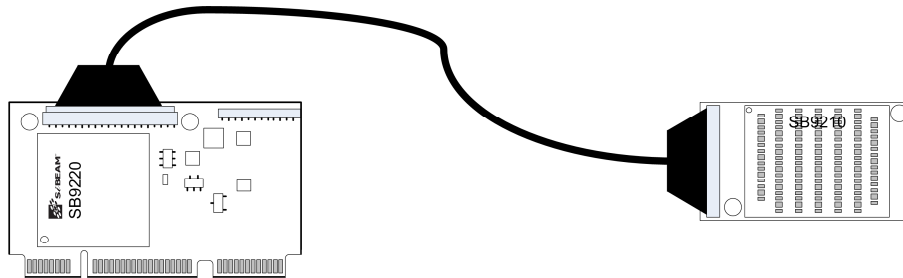
SK9210TX-HS Contents

The following items are included in a SK9210TX-HS module:

- DMC board
- Cable
- RF board

Unpacking the Module

The module will come with the two boards already connected. The only action by the user upon opening the packaging is to locate the DMC board and the RF board as shown in Figure 1.



100701-A

Figure 1. SK9210TX-HS Module

Customer Supplied Equipment

The customer should have available a Notebook PC with a DMC slot available and accessible. The RF board is typically mounted on the backside (outward facing) of the LCD panel with the cable running thru the hinge assembly. RF board shall be positioned to provide at least 0.65 cm from the end user. 0.65 cm distance is measured by positioning the display section of notebook/Netbook/Laptop computers perpendicular to the keyboard section. Measure the distance from the nearest point of antenna to the bottom of host. The PC should be running the 64-bit version of Windows 7. The SK9210TX-HS can support a number of audio and video formats as listed in Table 1 and Table 2. Also included but not listed are 3D video formats. The host equipment must be labeled with the following text: "Contains TX module FCC ID: UK2-SK9210TX-HS" and /or "Contains TX module IC: 6705A-SK9210TXHS".

The customer will also need a WirelessHD enabled sink device. There are a number of options for this available on the market or they may use SiBEAM's SK9200 reference design with the Rx module.

Table 1. Supported Video Formats

Video Format	Vertical Refresh	Color Space	Sampling	Bits/Pixel
480i	59.94/60Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
480p	59.94/60Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
576i	50Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
576p	50Hz	YCbCr	4:2:2	24/30-bits
		YCbCr	4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
720p	50Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
	59.94/60Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
1080i	50Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
	59.94/60Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
1080p	23.976/24Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24/30-bits
	50Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24/30-bits
		RGB	4:4:4	24-bits
	59.94/60Hz	YCbCr	4:2:2	24/30-bits
			4:4:4	24-bits
		RGB	4:4:4	24/30-bits
VGA	60Hz	RGB	4:4:4	24/30-bits
WVGA	60Hz	RGB	4:4:4	24/30-bits
SVGA	60Hz	RGB	4:4:4	24/30-bits
XGA	60Hz	RGB	4:4:4	24/30-bits
SXGA	60Hz	RGB	4:4:4	24/30-bits
WSXGA+	60Hz	RGB	4:4:4	24/30-bits

Table 2. Supported Uncompressed Audio Formats

Multiples of Fs	Audio Sample Rate, F's						
	2/6/8-channels					2-channel	
	32 kHz	44.1 kHz	48 kHz	88.2 kHz	96 kHz	176.4 kHz	192 kHz
128	4.096	5.645	6.144	11.290	12.288	22.579	24.576
256	8.192	11.290	12.288	22.579	24.576	45.158	49.152
384	12.288	16.934	18.432	33.864	36.864		
512	16.384	22.579	24.576	45.158	49.152		

Setup

The setup for the SK9210TX-HS is fairly straight forward.

Step 1: Make sure all power is off on the Notebook PC and remove the battery. Open up the Notebook PC so that DMC socket is accessible. This may require the removing of other boards/screws and plastic coverings.

Step 2: Insert the DMC board into the DMC socket. The socket is keyed so the board can only fit in one direction.

Step 3: Install the RF board into position. This typically will also involve opening up the LCD panel to provide access to the RF board location. Depending on the PC configuration, it may be necessary to unplug the cable between the DMC and RF board to do the installation. It's typically easiest to unplug the cable from the RF board and route the cable around other boards and thru the hinge assembly. If unplugged, plug back in the cable between the DMC and RF board once the RF board is in position.

Step 4: Close up the PC installing all boards, cables and plastic enclosures.

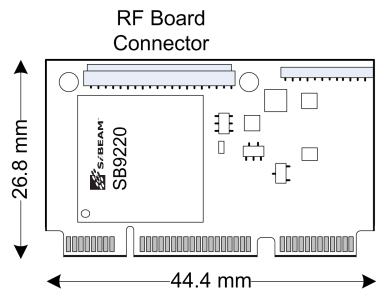
Step 5: Power on the Notebook PC. Make sure that the PC comes up with normal operation as expected.

Step 6: Install the WAC as described in the following section.

Step 7: Place the Notebook PC within range of a WiHD sink device (<10m) and power on the sink device.

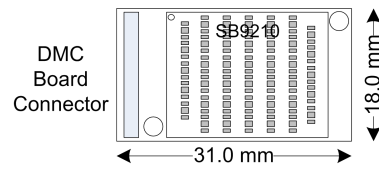
Step 8: Start the WAC and go to the Network tab. Select Refresh List to see the list of available WVAN's. The WVAN for the sink device powered up should be listed.

Step 8: Select the appropriate WVAN and press the Connect button. The A/V should start playing on the sink device after approximately 8-15 seconds.



100702-A

Figure 2. DisplayMini Card



100703-A

Figure 3. RF Board

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WirelessHD Applications Controller (WAC)

The WirelessHD Applications Controller (WAC) is provided for end user control over the SK9210TX-HS. Thru the WAC, the end user is able to connect/disconnect from a WVAN, see operating performance and update code on the module.

Figure 4 shows the Status screen of the WAC. In this screen the user is able to see the signal strength achieved, if the module is Associated in a WVAN or if there is an active Connection. The signal strength can be used to provide guidance should there be bad image quality and the user may use this information to move the source or sink to a better location for reception.

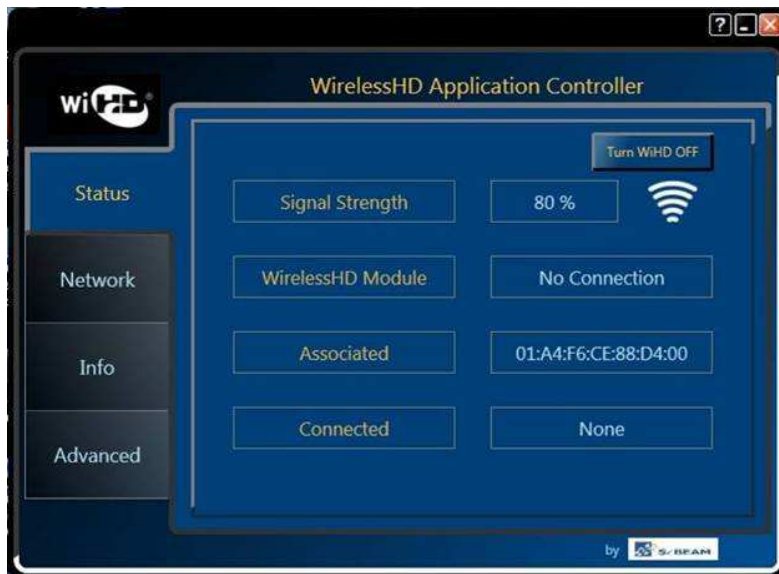


Figure 4. WAC Status Screen

The Network screen is shown in Figure 5. This is the main screen used to make an active connection to a display. In this screen the user can see the available WVAN's and select and connect to a particular WVAN. The HR and LR channel used by the WVAN is also shown.



Figure 5. WAC Network Screen

The Info screen of the WAC (Figure 6) is used to show what A/V formats are being transmitted and which code versions are running on the module. The code versions will consist of embedded code run on the embedded CPU of the SB9220 and the host code run on the Atmel host microcontroller.

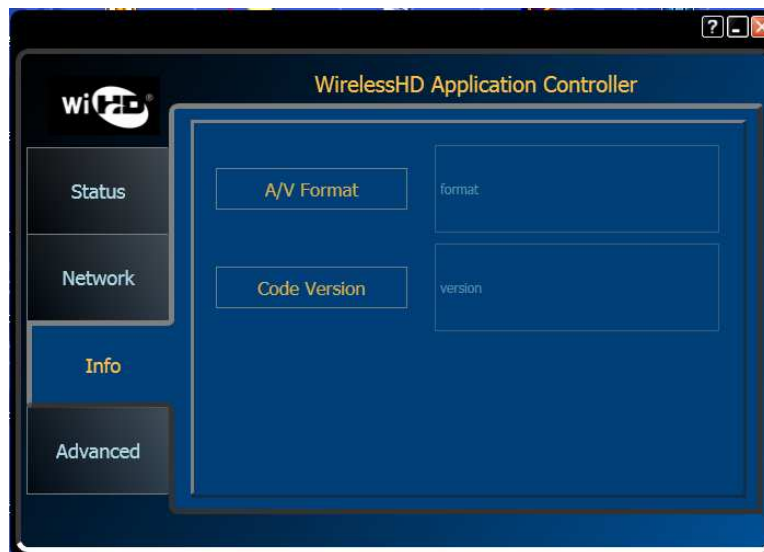


Figure 6. WAC Info Screen

The Advanced screen of the WAC (Figure 7) is used to for code updates. When selected, additional pop-up windows will ask for the location of the new code to update and then start the update process. The code update time takes approximately 5-7 minutes.

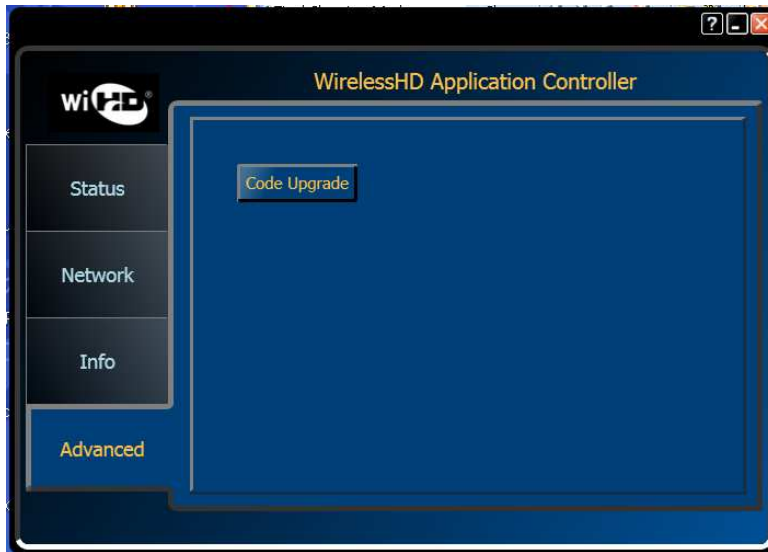


Figure 7. WAC Advanced Screen

Appendix A: Specifications

Standards	WirelessHD 1.0	
Operating Frequency	60.32 – 62.80 GHz	
Interface	DisplayMini Card	
Antenna Type	32 Antenna array embedded in SB9210 ceramic package	
Range	5-10m NLOS	
A/V Ports	Single WirelessHD 1.0 A/V port	
Physical Specifications	DMC Board	Height: 4.75mm
		Width: 26.8mm
		Length: 44.4mm
		Weight: 3.5g
	RF Board	Height: 5.00mm
		Width: 18.0mm
		Length: 31.0mm
Cable	Weight: 4 g	
	Cable	Length: 33cm
Module Power	3.6W (max), 3.3V±10% input	
Operating Environment	0 - 50°C operating temperature (ambient) -40 - 125°C storage temperature	



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Appendix B: Interference Statement

USA-Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
2. This product does not contain any user serviceable components. Any unauthorized product changes or modifications will invalidate warranty and all applicable regulatory certifications and approvals.
3. Caution: Exposure to Radio Frequency Radiation: The installer of this radio equipment must ensure that the antenna (RF board) is located at least 0.65 cm to the user and pointed away from the end user. The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter within a host device, except in accordance with FCC multi-transmitter product procedures.
4. Caution: User is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Canada – Industry Canada (IC)

This device complies with RSS 210 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.”

L' utilisation de ce dispositif est autorisée seulement aux conditions suivantes : (1) il ne doit pas produire de brouillage et (2) l' utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

The term "IC" before the equipment certification number only signifies that the Industry Canada technical specifications were met. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication. To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

Pour empêcher que cet appareil cause du brouillage au service faisant l'objet d'une licence, il doit être utilisé à l'intérieur et devrait être placé loin des fenêtres afin de fournir un écran de blindage maximal. Si le matériel (ou son antenne d'émission) est installé à l'extérieur, il doit faire l'objet d'une licence.

Caution: Exposure to Radio Frequency Radiation.

The installer of this radio equipment must ensure that the antenna (RF board) is located at least 0.65 cm to the user and pointed away from the end user such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hcsc.gc.ca/rpb.

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Revision History

Revision	Date	Change
A	11/1/10	Initial release.
B	11/10/10	Updated cover page, clarification of Customer Supplied Equipment and updated Appendix B.
C	11/11/10	Updated Appendix B Interference statements



SiBEAM, Inc.
555 N. Mathilda Ave.
Sunnyvale, CA 94085
408-245-3120 Phone
408-245-3120 Fax

SiBEAM Japan K.K.
Shinjuku Park Tower N30F
3-7-1 Shinjuku-ku,
Tokyo 163-1030 Japan
+81-3-5326-3085 Phone
+81-3-5326-3001Fax

SiBEAM Korea
#1906, 19F Parkview Tower
6 Jungja-Dong, Bundang-Gu,
Sungnam-Si, Gyunggi-Do
+82-31-711-2336 Phone
+82-31-783-2209 Fax

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