GP Electronics (HK)Limited
Gold Peak Building, 6/F, 30 Kwai Wing Road
Kwai Chung, New Territories, Hong Kong
Tel: (852) 2424 3521 Fax: (852) 2489 1309

2.0. Product Proposal Wireless Modules (Receiver).

2.1 Objectives.

The purpose of this document is to describe the proposal on design specifications and construction of KHT5005 wireless surround speaker for use in home theatre system.

Wireless surround speaker consists of internal antenna, receiver module and digital amplifier. These electronics parts are integrated with the speaker and will be configured to either left or right audio channel application. The wireless receiver operates at 2.4 GHz ISM band and utilizes Advanced Adaptive Frequency Hopping wireless technology to maintain high Quality of Service under interference environment.
The wireless surround speaker will be powered with an external AC adaptor (i.e. Wall-Wart type).

Two versions of KHT5005 design which will be considered are Floor Stand version and Table Stand version. The wireless and electronics design of these two versions are exactly same but with the different in mechanical assembly and tooling requirement.

2.2 Receiver Constructions.

2.2.1 KHT 5005 Surround Speaker – Floor Stand Version.

The drawing of Floor Stand version with wireless module is given below. This design is finished in silver and black colors. The color codes will be advised later.

2.2.2 KHT 5005 Surround Speaker – Table Stand Version.

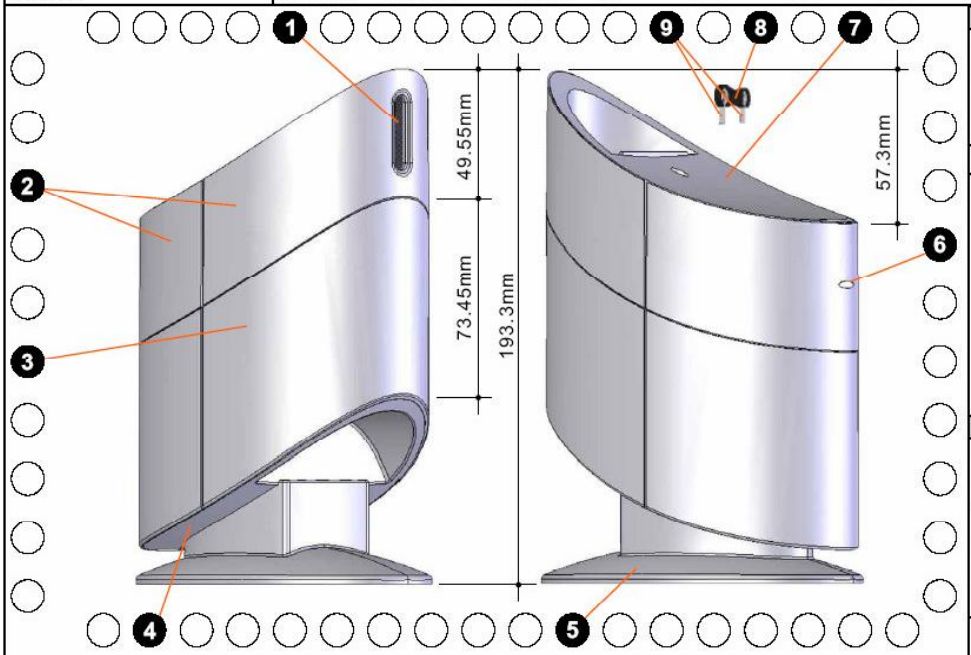
A. Silver Color:

GOLD PEAK

Product Planning Department

Make-up Sheet

Project Name	5005 Receiver Table Stand Version - Silver	Project No. :	P05/018	Design No. :	Design007 Version02
Product Designer: Jack Chang	Design Manager: Henry Lee	Project Management: Patrick Wu	Vendor :	GPE	
Date of Issue: 26/07/06	☐ 1st draft - FS1 Date: 05/04/06 ☐ 2nd draft - FS2 Date: 28/04/06 ■ Stage 1 - PDP Date: 26/07/06 ☐ Stage 2 - ES1 Date: ☐ Stage 3 - PR Date: ☐ Stage 4 - MP Date: ☐ Revision 1 Date: ☐ Revision 2 Date:				



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No. of Page :

Legend
FS1 - Feasability Study 1
FS1 - Feasability Study 2
PDP - Product Development Proposal
ES1 - Engineering Sample
PR - Pilot Run
MP - Mass Production
YS - Yik Sang
Ch - Charmilles

No.	Parts	Material	Texture	Substrate Color	Finish	Color	Remarks	Modifi.
1	Metal grill	Grill Material	Glossy	Nil	Paint	Black		
2	Plastic housing	ABS	Glossy	Black	Paint	Silver	Color refers to existing 5005 silver speaker. **(Code no. TBA)**	
3	Aluminum extrusion	Aluminum	Glossy	Nil	Paint	Silver	Use existing 5005 floor stand extrusion tooling	
4	Aluminum casing	Aluminum	Glossy	Nil	Paint	Silver	Color refers to existing 5005 silver speaker. **(Code no. TBA)**	
5	Aluminum foot	Aluminum	Glossy	Nil	Paint	Silver	Use existing 5005 table stand speaker's foot	
6	Bonding lens (Blue LED)	PC	See Color & Printing Info. 018_COL&PRN007V02	Transparent	Nil	Nil	Light on - Power on & Bonded	
							Flashing - Bonding error	
7	Top cover	ABS	Glossy	Black	Paint	Silver	Color refers to existing 5005 silver speaker. **(Code no. TBA)**	
8	Contact pin holder	PC **(TBA)**	See Color & Printing Info. 018_COL&PRN007V02	Black	Nil	Black		
9	Contact pin	Bronze	Glossy	Nil	Plating	Chrome	Finishing same as 5005 speaker jack	
10								
11								
12								
13								

Amendment Since Last Issue

- Item 6: Texture of the Bonding Lens is changed
- Item 9: Material of the Contact Pin changed from Brass to Bronze
- Rating Label is added (Refers to 018_COL&PRN007V02)
- Pattern of the Ventilation Holes is changed (Refers to 018_COL&PRN007V02)

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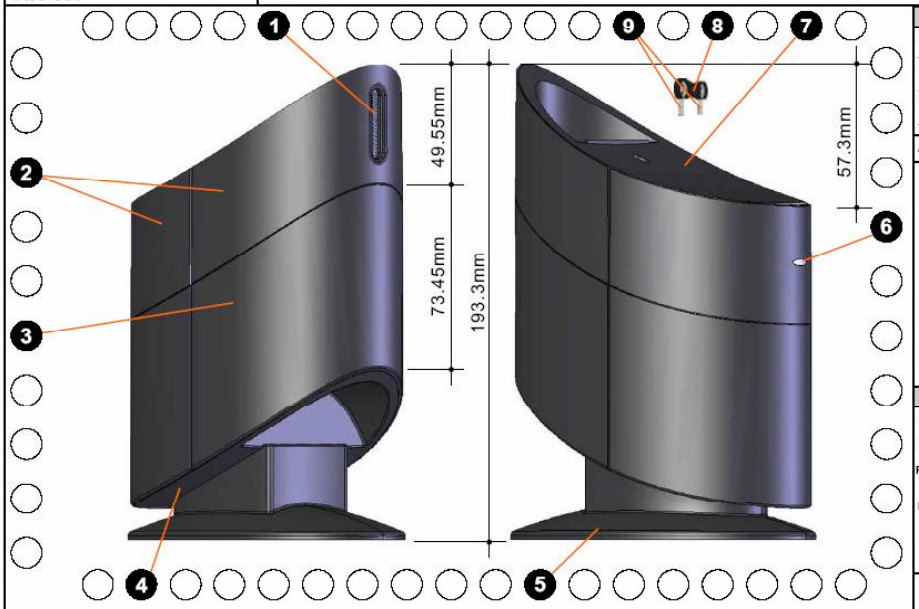
B. Black Color:

GOLD PEAK

Product Planning Department

Make-up Sheet

Project Name	5005 Receiver Table Stand Version - Black Mirror (TBA)	**Project No. :**	P05/018	**Design No. :**	Design007 Version02
Product Designer Jack Chang	**Design Manager** Henry Lee	**Project Management** Patrick Wu	**Vendor :**	GPE	
Date of Issue 26/07/06	☐ 1st draft - FS1 Date: 05/04/06	☐ 2nd draft - FS2 Date: 28/04/06	■ Stage 1 - PDP Date: 26/07/06	☐ Stage 2 - ES1 Date:	☐ Stage 3 - PR Date: ☐ Stage 4 - MP Date: ☐ Revision 1 Date: ☐ Revision 2 Date:



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Name:
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Legend
FS1 - Feasability Study 1
FS1 - Feasability Study 2
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YS - Yik Sang
Ch - Charmilles

No.	Parts	Material	Texture	Substrate Color	Finish	Color	Remarks	Modifi.
1	Metal grill	Grill Material	Glossy	Nil	Paint	Black		
2	Plastic housing	ABS	Glossy	Black	Paint	Black Mirror	Color refers to existing 5005 black mirror speaker **(Code no. TBA)**	
3	Aluminum extrusion	Aluminum	Glossy	Nil	Paint	Black Mirror	Use existing 5005 floor stand extrusion tooling	
4	Aluminum casing	Aluminum	Glossy	Nil	Paint	Black Mirror	Color refers to existing 5005 black mirror speaker **(Code no. TBA)**	
5	Aluminum foot	Aluminum	Glossy	Nil	Paint	Black Mirror	Use existing 5005 table stand speaker's foot	
6	Bonding lens (Blue LED)	PC	See Color & Printing Info. 018_COL&PRN007V02	Transparent	Nil	Nil	Light on - Power on & Bonded Flashing - Bonding error	
7	Top cover	ABS	Glossy	Black	Paint	Black Mirror	Color refers to existing 5005 black mirror speaker **(Code no. TBA)**	
8	Contact pin holder	PC **(TBA)**	See Color & Printing Info. 018_COL&PRN007V02	Black	Nil	Black		
9	Contact pin	Bronze	Glossy	Nil	Plating	Chrome	Finishing same as 5005 speaker jack	
10								
11								
12								
13								

Amendment Since Last Issue

- Item 6: Texture of the Bonding Lens changed
- Item 9: Material of the Contact Pin changed from Brass to Bronze
- Rating Label is added (Refers to 018_COL&PRN007V02)
- Pattern of the Ventilation Holes is changed (Refers to 018_COL&PRN007V02)

Note:

The above Table Stand designs require additional parts which are aluminium extrusion and aluminium casing.

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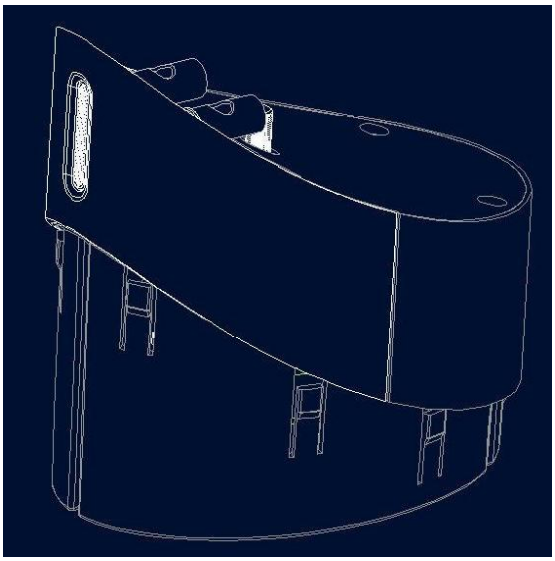
2.2.3 Wireless and Electronics Parts Assembly.

The wireless and electronics parts for both Floor Stand and Table Stand versions are assembly inside the plastic enclosure as given in the following figure. The radiation pattern of PIFA antenna is optimized in the front direction while integrated into the wireless board. The front side is a transparent lens material and the rear has a metal grill for ventilation purpose. A Bonding LED indicator is used in the front side to show the operation status of the receiver with a transmitter and the color of LED is blue.



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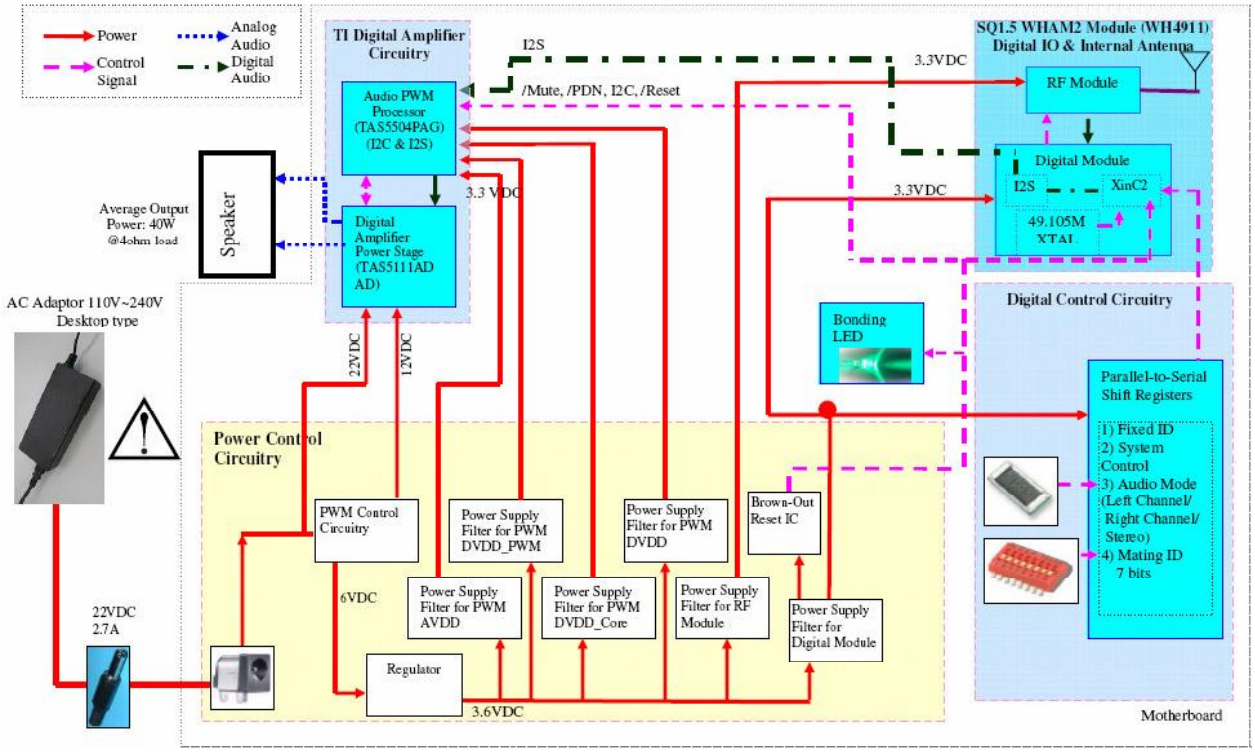
2.3 Block Diagram for Receiver.

The complete block diagram of wireless receiver is given below and based on the following:

- Eleven Engineering wireless receiver module – WH4911.
- Internal PIFA antenna.
- Texas Instruments Digital Amplifier – PWM IC (TAS5504) and Power Stage IC (TAS5111A).
- Wall-Wart Type Switched-Mode Power Supply (110 V_{AC} – 240 V_{AC}).
- 1-Channel (i.e. 60 W Peak Power or 40 Wrms) into 4 ohms speaker.



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2.4 Features for Receiver.

No	Feature	Type	Function	User Accessible
1.	Power Input	Typical DC Jack	• DC supply voltage input for overall receiver unit from AC Adaptor.	Yes
2.	Audio Mode	0 Ohm jumper resistor	• Selection of left and right stereo channels, OR left channel audio OR right channel audio.	No
3.	Volume Mode	N/A	• Fixed and default to System Control.	No
4.	Bonding Mode	N/A	• Fixed and default to Fixed ID.	No
5.	Mating ID	DIP Switch	• IDs require for TX and RX unit to be bonded with the same ID. • Totally 7-bit Mating ID available (i.e. 128 combination). • Serialize the product with the last two digits of the serial number between 00 and 99.	No
6.	Bonding LED	Blue LED	• Display the operation status between TX and RX. • Power Status LED at RX will flash when the volume up and volume down buttons at TX (if those buttons available) are pressed. **3-node operation:** • LED Solid Off when RX is not power-on. • LED Solid On when RX0 OR RX1 is bonded to the TX. • LED Flashing when RX0 is not bonded to the TX OR when RX1 is not bonded to the TX.	No
7.	License ID	N/A	• An ID provides by Eleven Engineering for using their Squeak1.5 platform in our product design. • This License ID is a 16-bit number that is reversed in the firmware to hold the license ID number. • Assign by Eleven Engineering for GP products.	No
8.	Device ID	N/A	• An ID that uses to differentiate our product line in order the TX and RX can communicate together. • This Device ID is a 16-bit number that is hardcoded into the firmware application code. • Default to 0x0000 by Eleven Engineering.	No
9.	Hops Channel	N/A	• Number of hops channel required in frequency hopping as defined by FCC / RTTE. • 20 hops will be used in our system.	No
10.	XPD Port	8-pin, 2.54 mm pitch Header – Male	• A port that use to program the WHAM2 module.	No

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11.	Speaker Label	N/A	A label to identify the following: • Left or right speaker. • Receiver Mating IDs and serial number. • The product is not for used in Japan. • For selling in France, the product, packaging and user manual must state that the product is for "Indoor Use Only".	Yes

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2.5 Product Performance Specifications for Receiver.

Parameter	Specification
RF System:	
Wireless Platform	Eleven Engineering – Squeak 1.5 Digital Wireless Audio Platform.
Wireless Processor	Eleven Engineering – XInC wireless processor
RF Transceiver	Micro Linear ML2724, 2.4 GHz, 1.5 Mbps
Frequency Band	2.4 – 2.483 GHz (ISM Band)
RF Technology	• FSK Modulation. • Duplex. • Advanced Adaptive Frequency Hopping (AAFH).
Transmission Method	FEC / ARQ with AAFH
RF Raw Data Rate	1.5 Mbps
Channel Width	1.94 MHz @ 20 dB
Number of RF Channels	38
Hopping Channel	20
Compression	HFADPCM 16-bit 48 kHz to 5-bit 48 kHz
Audio Sampling	16-bit per channel (up to 2 channels) 48 kHz
Buffer Size / Latency	15 ms
Indoor Range	Typical living room environment (Line-of-Sight - 15 meters).
Number of Nodes	Point to Multipoint (3-node system)
Receiver:	
RX sensitivity	-80 dBm @ BER 10^{-3}
Antenna Type	Internal Antenna
Antenna Gain	~ 0 dBi
Polarization	Vertical
Number of Antenna	One
Number of Audio Channels Available	Max 2 channels (only 1 channel used – Left channel audio or Right channel audio).
Current Consumption	~ 155 mA @ 6V (Bonded & digital amplifier Off). Max ~ 1.75A @ 18V (Bonded & digital amplifier On).
Digital Amplifier	Texas Instruments – TAS5504 PWM and TAS5111A PA
Audio Parameters:	
Output Power per channel	80 W Peak Power (40 Wrms) into 4 Ω.
Audio Bandwidth	20 Hz - 20 kHz
THD + N (Left / Right Channel) @ 1 kHz	0.2 %.
SNR, A-weighted (Left / Right Channel) @ 1 kHz	91 dB.
Power Supply & Others:	
Power Supply	Switched-Mode Power Supply (110 V_{AC} – 240 V_{AC}) – (i.e. Wall-Wart type).
DC Input Power	22 V_{DC} @ 2.7A
Operating Temperature	0°C to + 40°C

2.6 Electronics Circuitry for Receiver.

- The features described in this proposal are based on Squeak 1.5 Standard Product firmware provided by Eleven Engineering.
- Wireless performance must maintain high QoS with internal antenna.
- PWM IC (TAS5504) internal registers need to be written and compile into firmware hex file by Eleven Engineering. This is required for PWM IC initialization and configures internal register settings to default the volume level and mute control as according to our prototypes.
- Local materials are preferred to be used wherever possible.
- Materials must be RoHS compliant.
- Power supply and DC jack connection must be reliable.
- Audio and speaker connection must be reliable.
- Bonding Status LED is required for showing the operation status of a transmitter with a receiver and the color of LED is blue.
- Product must be approved for sell in the Europe and USA under RTTE & FCC regulations and also related meet the CE / safety requirements.

2.7 Software / Firmware for Receiver.

There is no firmware required for receiver product development as we are based on the same features as Squeak 1.5 Standard Product firmware.

3.0 Mechanical and Packaging.

3.1 Mechanical Design.

Cosmetic for Transmitter and Receiver: Black Mirror and Silver.