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ZALMAN
Zalman Tech Co., Ltd.

Totally No Noise Computer Case

TNN 500AF
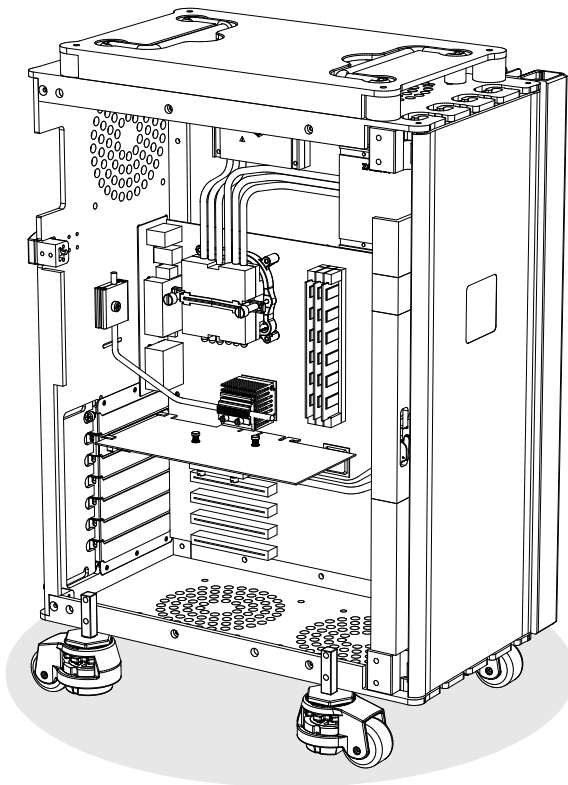
ENGLISH

한   글

※ **For other language versions please visit our website.**

English Edition

◈ **Please read before installation.**

◈ **Visit our website and watch the TNN500AF installation video first to make your installation easier.**

◻ Welcome

Congratulations on your purchase of ZALMAN Tech's TNN 500AF. With TNN500AF, you are now in the world of silent computing. TNN 500AF is the ultimate answer to every computer user's dream of creating a silent computing environment with total system stability.

English

◻ Contents

1 Safety Notices

1) Keep this unit away from heat sources and direct sunlight.

2) This unit should be placed on a flat, level, and solid surface.

3) Always shut down the operating system and switch the AC OFF before disassembling.

4) Keep this unit in an upright position when the AC power is ON.

5) Do not place or spill liquids on this unit.

6) Avoid inserting any objects into the system while it is ON.

7) Lower the caster stops to immobilize the unit before using the system.

8) If this unit is to be transported a long distance, place it in the original packing box or a custom made hard case.

9) Do not drop or expose this unit to shock while it is in transit.

10) Store and use out of the reach of children.

11) Check the condition of the product and its components before installation.
    If there is a problem with the product and/or its components, please contact the Retailer immediately.

◈ Disclaimer

Zalman Tech Co., Ltd. Is not responsible for any damages due to external causes, including but not limited to, improper use, problems with electrical power, accident, neglect, alteration, repair, improper installation, or improper testing.

2 Features

TNN 500AF is the world's first truly noiseless high-end computer case, developed with heatpipe technology, HSC(Heat Source Contact) power technology, High Capacity Extrusion technique, and FMS (Flexible Mounting Structure) design technology by ZALMAN Tech Co., Ltd. The

TNN 500AF package contains a high performance aluminum computer case with an absolutely noiseless cooling solution for the CPU, VGA Card, Power Supply, and Northbridge free of fans, making it ideal for storage servers, workstations, high-end home systems, and sound studio computer systems.

1) Complete Silence

The cooling system does not generate any noise because it does not utilize any fans. Even the HDD noise is blocked out by the sturdy aluminum plates 5 to 7mm thick, achieving completely silent computing.

2) Stability

① No Fans in the System

The majority of heat generated inside the system is transferred through heatpipes to the heatsink plates where it is dissipated via natural convection, reducing inflow of dust dramatically. Consequently, this prevents system crashes caused by dust buildup and fan failures (fans last around 20,000 to 50,000 hours).

② High-Capacity Aluminum Heatsink Plates for Natural Convection

Two large aluminum heatsink plates cool heat generating components, such as the CPU and VGA Chipset, through natural convection. Without any moving parts, the TNN 500AF is virtually free of the need for mechanical maintenance, and it is 100% recyclable, making it environmentally friendly.
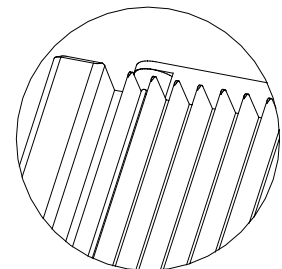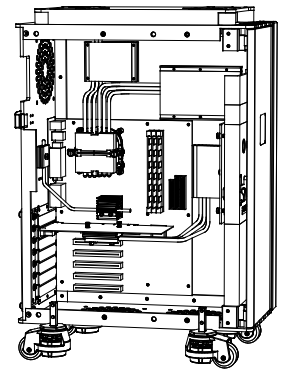
③ **Heat Transfer via Heatpipes**

Virtually ever-lasting heatpipes transfer heat away from the CPU, VGA chipset, and Northbridge chipset preventing system crashes due to over heating.
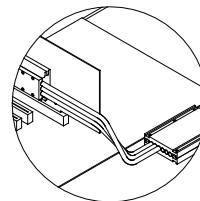
- **CPU Heatpipes**

Heat from the CPU is transferred to the heatsink plate through 6 heatpipes each 6 millimeters in diameter. The six heatpipes can transfer up to 150W of heat from the CPU - sufficient for the hottest CPUs on the market. The CPU Block Base is made of pure copper to ensure the highest cooling performance.
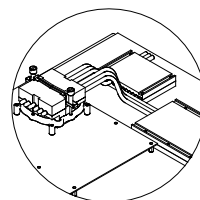
CPU Heatpipes

- **VGA Card Heatpipes**

Heat from the VGA Card is transferred to the heatsink plate through 3 heatpipes each 6 millimeters in diameter. The three heatpipes can transfer up to 75W of heat from the VGA chipset - sufficient for the hottest VGA cards on the market.

VGA Card Heatpipes

- **Northbridge Heatpipe**

Heat from the Northbridge chipset is transferred to the heatsink plate through a single heatpipe, 5 millimeters in diameter. This heatpipe can transfer up to 20W of heat.
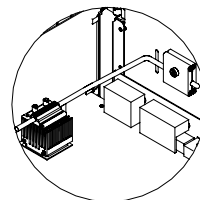
Northbridge Heatpipe

③ **Heat Transfer via Rear-mount Thermal Blocks**

When the Rear-mount Thermal Blocks are installed on the back-side of the motherboard in line with the position of the FETs (Field Effect Transistor) and the Northbridge chipset, each can lower the FET temperature by 10 to 30℃ and the Northbridge chipset by 5 to 10℃.
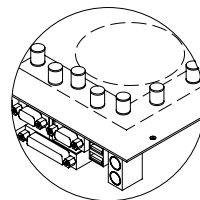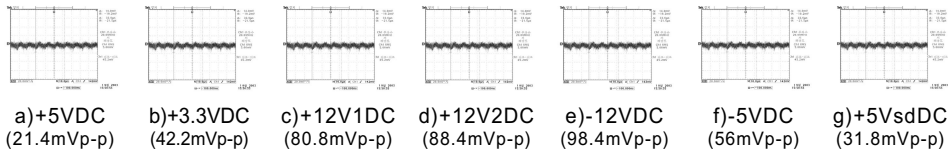
Rear-mount Thermal Blocks

⑤ **High-Efficiency, Fanless Power Supply**

The power supply uses high-efficiency FET components and Heat Source Contact (HSC) technology, eliminating the need for a fan, and has a 10% higher power conversion efficiency (80%) rating than conventional power supplies. Heat from the power supply is transferred directly to the high-capacity heatsink plates, where it is dissipated by natural convection, making the power supply free of noise and vibration.
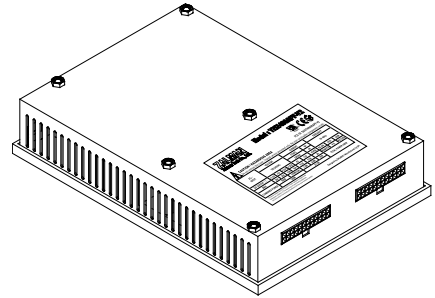
- High-capacity active PFC inductors, separate switching transformers for each power rail (+12V, +5V, +3.3V), and 2-FET forward converter design all work to create a superior level of stable power quality.

- Conventional power supplies tend to have lower output voltage due to line-dropping phenomenon. The TNN Power Supply extends the output voltage sensors up to the motherboard connection for +3.3V, +5V, and +12V rails to prevent this, enhancing output voltage accuracy and assuring system stability.

■ **Ripple and noise waveforms at DC output**

| a)+5VDC	b)+3.3VDC	c)+12V1DC	d)+12V2DC	e)-12VDC	f)-5VDC	g)+5VsdDC
(21.4mVp-p)	(42.2mVp-p)	(80.8mVp-p)	(88.4mVp-p)	(98.4mVp-p)	(56mVp-p)	(31.8mVp-p)

※ Data above were measured according to INTEL ATX v2.03/ATX12V power supply specs.

Measurement specifications : For each DC output, a bypass made up of one 0.1μF ceramic capacitor and one 10μF electrolytic capacitor is connected and measured with an oscilloscope (input impedance 1MΩ) at a frequency bandwidth of 20MHz. The waveforms may differ under different measurement conditions.
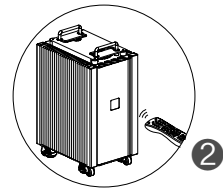
3) Electricity Conservation

Since TNN 500AF is equipped with a high-efficiency power supply and does not use any fans, it utilizes 10 to 15% less power compared to a conventional computer system under the same configuration.
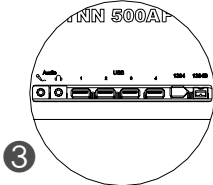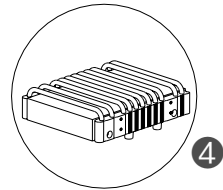
4) Ease of Use
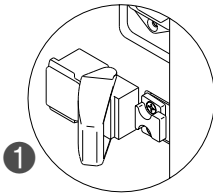
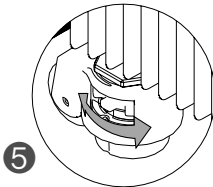① A latch is installed to prevent component theft.

② The Remote Control enables the user to conveniently experience multimedia content and control the PC.
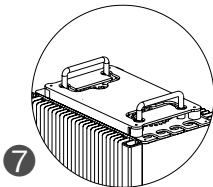
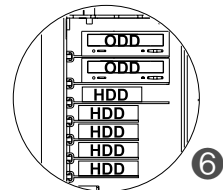③ Various I/O ports are provided (Audio, USB, IEEE-1394, 1394B)

④ Heatpipe HDD Cooler dissipates heat from the hard disk and reduces vibration transferred to the case.

⑤ Four casters (wheels) withstand up to four metric tons of weight in total, and have skid prevention / height adjustment features built in.
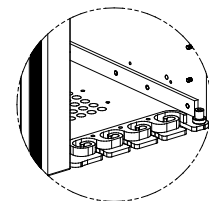
⑥ The case is structured to easily house up to two ODDs and five HDDs.

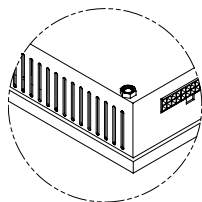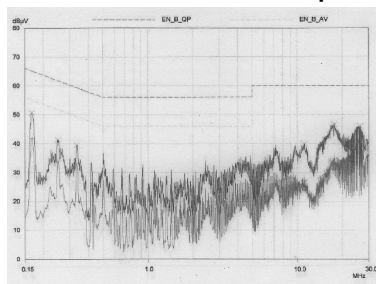⑦ Retractable handles are attached for short-range transportation.

5) Shielding from EMI (Electro-Magnetic Interference)

The sturdy, thick (5 to 7mm) aluminum case and the EMI Interception Block effectively contain EMI. Even the power supply housing is designed with EMI shielding.

EMI Measurement Data Graphs

EMI Interception Block

EMI Interception Design

※ Test Results

▶ **AMD AMD64 Athlon64 System**

① Thermal Test (Room Temperature : 25℃)

	Component	TNN 500AF AMD System Temperature(℃)		Conventional AMD System Temperature(℃)		Notes
		Idle	Full Load	Idle	Full Load	
1	CPU	42.28	58.09	45.47	61.91	Daq/56
2	VGA	47.69	52.12	50.52	52.78	Daq/56
3	Northbridge	42.63	48.23	41.33	46.06	Daq/56
4	FET (Arround CPU)	44.86	60.70	42.06	56.18	Daq/56
5	Case Interior	35.79	38.95	32.26	34.58	Daq/56
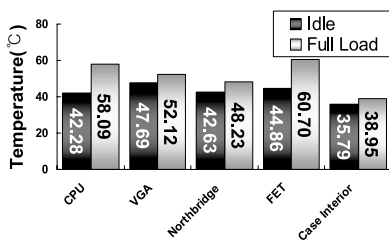
TNN 500AF AMD System
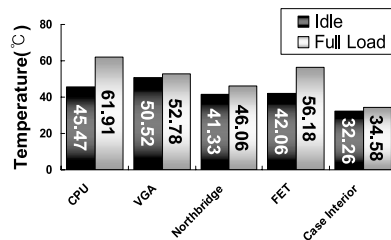
Conventional AMD System

※ Fan rpm at Full Load

Fan Position	TNN 500AF AMD System (rpm)	Conventional AMD System (rpm)
CPU Cooler	O(Fanless)	5094
VGA Cooler	O(Fanless)	4463
Northbridge Cooler	O(Fanless)	O(Fanless)
Exhaust Fan	O(Fanless)	1600

② Power Consumption Test
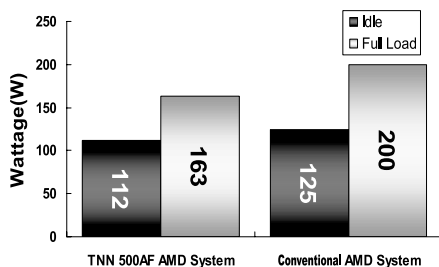
③ Configuration of Systems for Testing

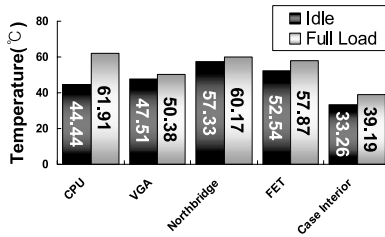|	TNN 500A AMD System	Conventional AMD System
Case	TNN 500AF	Micronics TH1100
CPU	AMD Athlon 64 3500+	
CPU Cooler	Fanless Heatpipe CPU Cooler	AMD Stock CPU Cooler
Motherboard	ASUS A8V Deluxe (939)	
HDD	Seagate Barracuda 80G (7200rpm)	
ODD	Samsung Combo 52X	
RAM	Two (2) Samsung DDR2 256MB (3200)	
VGA Card	Unitech ATI Radeon 9800 Pro 128MB	
VGA Card Cooler	Fanless Heatpipe VGA Cooler & RAM Heatsink	Unitech Stock VGA Cooler
Northbridge Cooler	Fanless Heatpipe Northbridge Cooler & Rear-mount Thermal Blocks	Intel Stock Northbridge Cooler
Power Supply	Fanless TNN400APF-V2(400W)	Zalman ZM400B-APS
Exhaust Fan	None	Zalmam ZM-F2

④ Testing Equipment and Programs

◉ **CPU Loading Program**
   CPU Burm (47, High)

◉ **Measurement Instrument**
   Personal Daq/56 (Iotech, Inc.) KIKUSUI PCR 1000L

◉ **Temperature Measurement Program**
   DaqView (Iotech, Inc.)

▶ **Intel P4 Prescott System**

① Thermal Test (Room Temperature : 25℃)

	Component	TNN 500AF Intel System Temperature(℃)		Conventional Intel System Temperature(℃)		Notes
		Idle	Full Load	Idle	Full Load	
1	CPU	44.44	61.91	41.61	60.90	Daq/56
2	VGA	47.51	50.38	41.56	45.92	Daq/56
3	Northbridge	57.33	60.17	53.60	56.41	Daq/56
4	FET (Arround CPU)	52.54	57.87	45.49	52.42	Daq/56
5	Case Interior	33.26	39.19	28.94	40.80	Daq/56

TNN 500AF Intel System
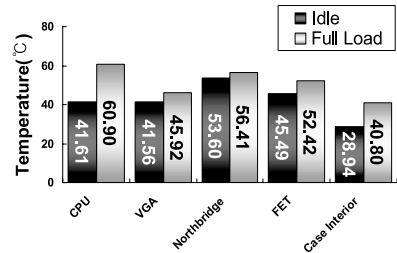
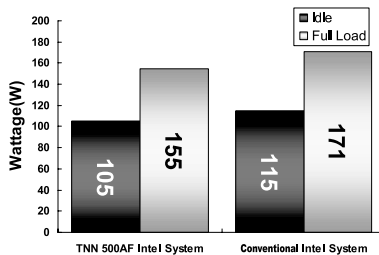**Conventional Intel System**

※ Fan rpm at Full Load

Fan Position	TNN 500AF Intel System (rpm)	Conventional Intel System (rpm)
CPU Cooler	O(Fanless)	4600
VGA Cooler	O(Fanless)	6405
Northbridge Cooler	O(Fanless)	O(Fanless)
Exhaust Fan	O(Fanless)	1600

② Power Consumption Test

③ Configuration of Systems for Testing

	TNN 500AF Intel System	Conventional Intel System
Case	TNN 500AF	Micronics TH1100
CPU	Intel Prescott 520	
CPU Cooler	Fanless Heatpipe CPU Cooler	Intel Stock CPU Cooler
Motherboard	Intel D925XCV (LGA 775)	
HDD	Seagate Barracuda 80G (7200rpm)	
ODD	Samsung Combo 52X (TS-H492A)	
RAM	Two (2) Samsung DDR2 256MB (PC4200)	
VGA Card	Bytel ATI Radeon X800 XT 256MB	
VGA Card Cooler	Fanless Heatpipe VGA Cooler & RAM Heatsink	Bytel Stock VGA Cooler
Northbridge Cooler	Fanless Heatpipe Northbridge Cooler & Rear-mount Thermal Blocks	Intel Stock Northbridge Cooler
Power Supply	Fanless TNN400APF-V2(400W)	Zalman ZM400B-APS
Exhaust Fan	None	Zalman ZM-F2

④ Testing Equipment and Programs

▣ **CPU Loading Program**
Maximum Power Program for the Prescott Processor Rev. 1.2

▣ **Measurement Instrument**
Personal Daq/56 (Iotech, Inc.) KIKUSUI PCR 1000L

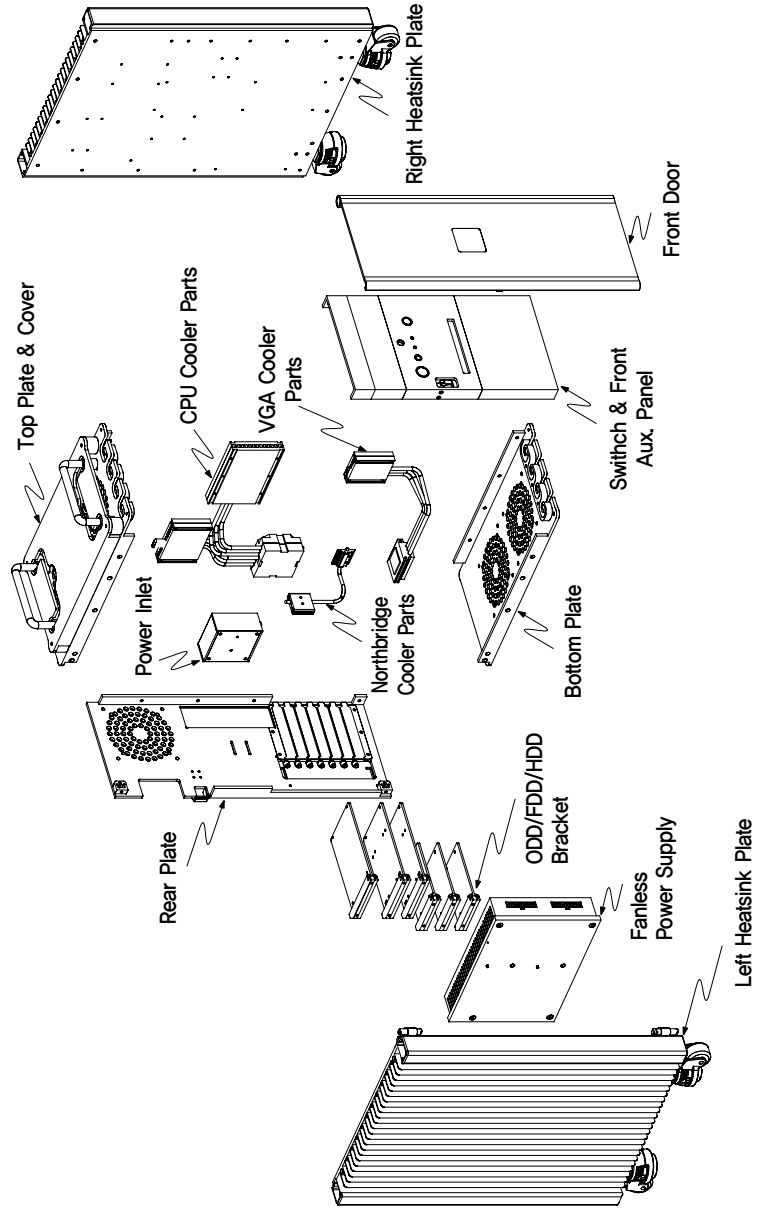▣ **Temperature Measurement Program**
DaqView (Iotech, Inc.)

※ **Caution**

1) If the CPU has a higher Thermal Design Power (TDP) rating than an Intel Prescott or an AMD Athlon64 3500+, the Heatpipe Northbridge Cooler and a Rear-mount Thermal Blocks (ZM-RTB1) MUST be installed to cool the Northbridge.

2) To use CPUs with a 100W or higher TDP rating, Rear-mount thermal Blocks Must be installed (one for each FET) on the backside of the motherboard in-line with each FET.

3 Patents
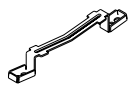
◈ Korean Patent Application #04-82817

◈ Korean Patent Application #03-30358

◈ Korean Design Application #03-19970

◈ International patent applications pending in the EU, USA, Japan and 30+ other countries

4 Components

Right Heatsink Plate

Front Door

Top Plate & Cover

CPU Cooler Parts

VGA Cooler Parts

Switch & Front Aux. Panel

Power Inlet

Northbridge Cooler Parts

Bottom Plate

Rear Plate

ODD/FDD/HDD Bracket

Fanless Power Supply

Left Heatsink Plate

1) Heatpipe CPU Cooler Parts [One(1) Bag]

1) Components for Intel Pentium 4 (Socket 478)

One (1) Socket 478 CPU Clip

Four(4) PH M4X22 bolts

Two (2) Socket 478 Finger Bolts (M3X52)

Two (2) Socket 478 Clip Supports

2) Components for Intel Pentium 4 (Socket 775)
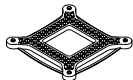
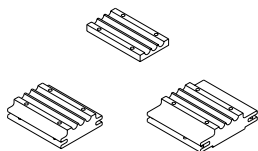One(1) Socket 775 Clip Support

One(1) Socket 754 Back Plate

Two (2) Socket 775 Finger Bolts (M3X49)

Four (4) PH M3X22 Bolts

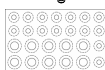**3) Components for AMD Amd64 (Socket 478)**

Two Socket 754 Finger Bolts (#6-32X40)

Two (2) Socket 754 AMD Nipples

2) Heatpipe VGA Cooler Parts [One(1) Bag]

VGA Block A/B & Cover [one(1) Each]

Four (4) VGA Finger Bolts A (M2.5)

Eight (8) Ram Heatsinks

Four (4) VGA Springs

Four (4) VGA Finger Bolts B (M3)

Paper Washers

3) Heatpipe Northbridge Cooler Parts [One(1) Bag]
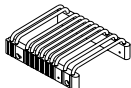
Block Base

Block Cover

Thermal Pad

Two (2) Common Finger Bolts

4) Heatpipe HDD Cooler

One (1) ZM-2HC2 Set

5) Rear-mount Thermal Blocks

One(1) ZM-RTB1 Set (8 Blocks)

6) HDD Set [One(1) Bag]

Five (5) Ground Wires

Twenty Four (24) FH #6-32X7 Bolts

ZALMAN

TNN 500AF

7) ODD/FDD Bolts [One(1) Bag]

Twelve (12) PH M3X10 Bolts
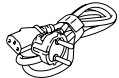
8) Motherboard Bolts [One(1) Bag]

Ten (10) PWH M3X5 Bolts

9) Thermal Grease

2.5 ml

10) ATA 133 Cable [One(1) Bag]

One (1) ATA 133 Cable

11) Power Cord [One(1) Bag]

One (1) Power Cord

12) Latch Key [One(1) Bag]

Two (2) Latch Keys

13) Remote Control Set

One(1) Remote Control

Two(2) AAA Batteries

One(1) Installation CD

One(1) iMON & Multi-Median User's Guide

14) Motherboard Power Cable [One(1) Bag]

One(1) Motherboard Power Cable
(24 pin -> 20pin)

15) TNN 500AF User's Guide (1Copy)

One(1) TNN 500AF User's Guide

16) Spare Parts [One(1) Bag]

※ Interpreting the Bolt Abbreviations

PH M4X20 : PH(Pan Head) Type, Meter Screw, 4mm in Diameter, 20mm in Length

FH #6-32X8 : FH(Flat Head) Type, Screw #6, 32 Pitches per Inch, 8mm in Length

Length
Pan Head

Length
Pan-Washer Head

Length
Flat Head

Length
Socket Head

5 Optional Components

Heatpipe HDD Cooler (ZM-2HC2)

6 Specifications

1) **Model : TNN 500AF**
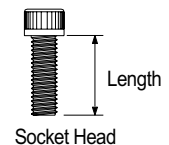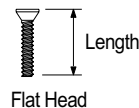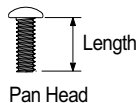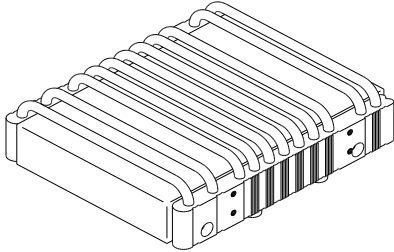2) **Dimensions : 400(L) x 286(W) x 597(H) mm**
3) **Weight : 26Kg**
4) **Compatible CPUs : All Intel Pentium 4 CPUs and AMD AMD64 CPUs Supported**

※ **NOTE** : When the Thermal Design Power rating of the CPU is 100W or higher, a quiet 120mm case fan MUST be installed and operated at 1000~1200rpm, and Rear-mount Thermal Blocks (ZM-RTB1) must be installed on the backside of the motherboard. Refer to page 22.

1) CPUs that require a quiet case fan and Rear-mount Thermal Blocks(ZM-RTB1) (As of Oct. 30, 2004)			
CPU		Socket	TDP
Intel Pentium 4	Prescott 3.2E GHz	478	103W
	Prescott 550 (3.2 GHz)	775	115W
AMD AMD64	Athlon 64 FX 55 (2.6 GHz)	939	104W

(※ Before using one of the latest CPUs, check our website for usage guidelines and information regarding compatibility.)

2) CPUs with Thermal Design Power ratings under 100W.   **(As of Oct. 30, 2004)**

CPU		Socket	TDP
Intel Pentium 4	Northwood 3.4 GHz	478	89W
	Prescott 3.0E GHz	478	89W
	Prescott 540 (3.2 GHz)	775	84W
AMD AMD64	Athlon 64 4000 + (2.4 GHz)	775	89W
	Athlon 64 FX 53 (2.4 GHz)	939	89W
	Opteron 150 (2.4 GHz)	940	84W

(All CPUs that are slower than those mentioned above have Thermal Design Power ratings under 100W.)

**3. Refer to the following website for more information regarding CPU compatibility.
(www.zalman.co.kr/product/TNN500AF.html)**

5) Compatible VGA Cards

All AGP / PCI Express VGA cards that have heatsink mounting holes

(As of Oct. 30, 2004)

Manufacturer	Model
ATI	Up to X 800 XT
nVidia	Up to geForce 6800
Matrox	All Parhelia Series

※ **Notes**

1. NVIDIA PCX Series VGA Cards are not supported. Replace with a Zalman-recommended VGA card.

2. If the VGA card does not install normally due to physical incompatibility with the case, stop installation and replace with a Zalman-recommended VGA card listed on the following website. (www.zalman.co.kr/product/TNN500AF)

Heatsink Mounting Hole
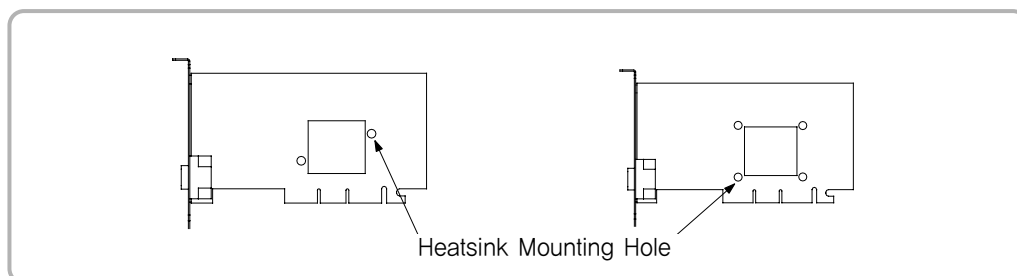
6) Thermal Transfer Capacity

① CPU Heatpipe (ZMC-6HB) : 150W

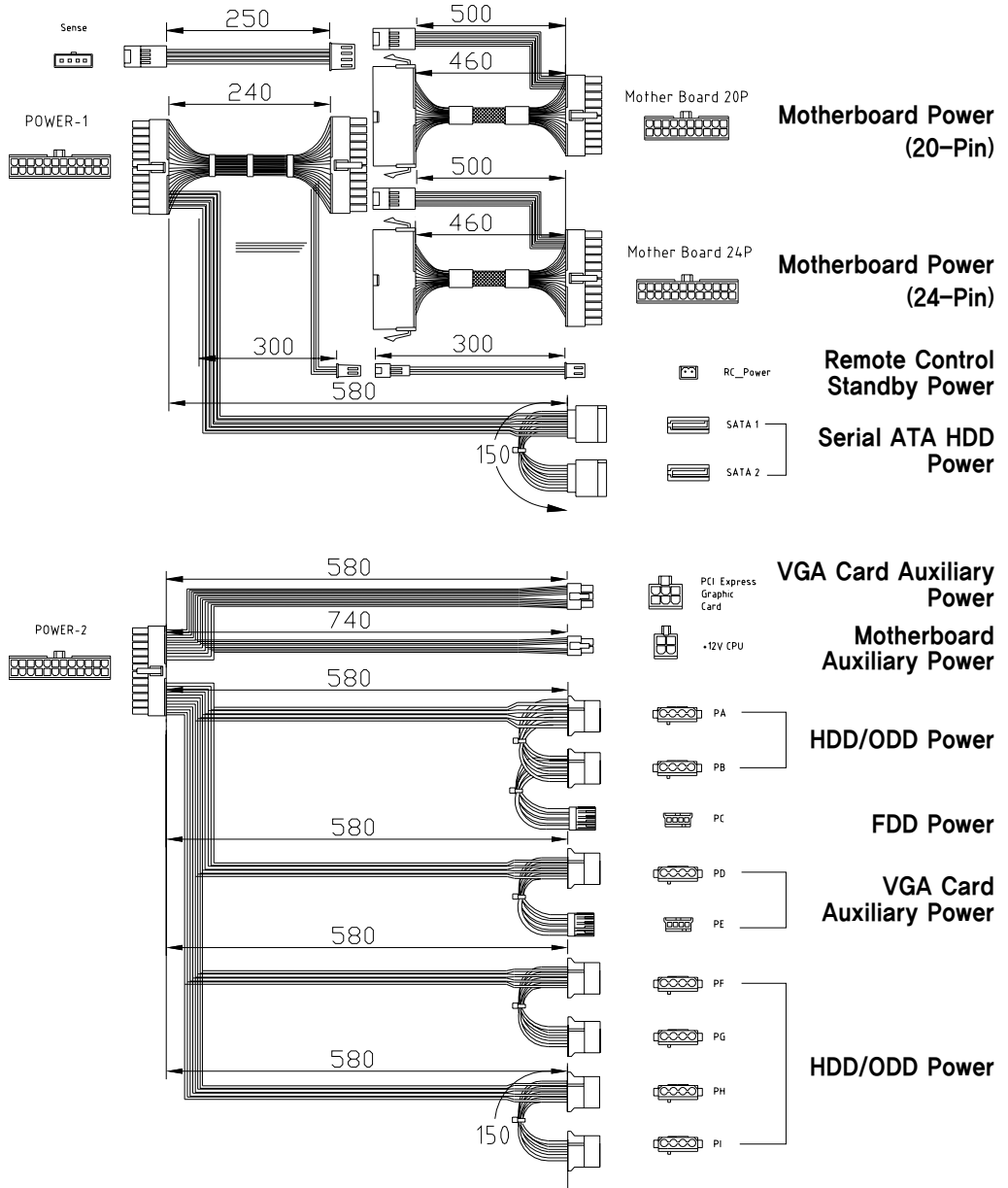② VGA Card Heatpipe (ZMV-3HA) : 75W

③ Northbridge Heatpipe (ZMN-1HB) : 20W

7) Power Supply Output Capacity : 400W

8) Power Supply Electrical Specifications (Model : TNN400APF - V2)

AC Input Range	Voltage	100VAC ~ 240VAC ±10%	Output	Load Range — Imin	Imax	Ipeak	Combined (Imax)
	Frequency	50Hz~60Hz					
AC Input Current (Sustained)	115VAC	8A	+5VSB	0.0A	2A	2.5A	
	230VAC	5A	+3.3VDC	1A	20A		180W
Inrush Current Limit (@ 25℃ Cold Run)	115VAC	70A	+5VDC	2A	20A		380W
	230VAC	50A	+12V1DC	1A	18A		216W
Efficiency	75% min. @ 230VAC (Full Load)		+12V2DC	0A	16A		
			−12VDC	0.0A	0.6A		
			−5VDC	0.0A	0.3A		

DC Output Voltage Stability Parameters	Output	Stable Range				
	+5VSB	±5%	+4.75V	~	+5.25V	Under Full Load
	+3.3VDC	±5%	+3.14V	~	+3.45V	
	+5VDC	±5%	+4.75V	~	+5.25V	
	+12V1DC	±5%	+11.4V	~	+12.6V	
	12V2DC	±5%	+11.4V	~	+12.6V	
	−12VDC	±10%	−10.8V	~	−13.2V	
	−5VDC	±10%	−4.50V	~	−5.50V	

DC Output Ripple & Noise Parameters	Output	Nominal Range		Protections
	+5VSB	80mV	Under Full Load	Over−Voltage Protection (OVP)
	+3.3VDC	80mV		Over−Current Protection (OCP)
	+5VDC	80mV		Under−Voltage Protection (UVP)
	+12VDC	120mV		Short Circuit Protection(SCP)
	+12VDC	120mV		EMC(EMI & EMS)
	−12VDC	120mV		FCC Part 15 Class 'B',CISPR22 Class 'B'
	−5VDC	100mV		UL, CE, MIC

List of compatible motherboards, HDDs, and ODDs for building a TNN 500AF system is available at the following website (www.zalman.co.kr/product/TNN500AF.html).

9) Output Power Cable

Sense

250   500

460

POWER-1   Mother Board 20P   **Motherboard Power
(20-Pin)**

240

500

460

Mother Board 24P   **Motherboard Power
(24-Pin)**

300   300

RC_Power   **Remote Control
Standby Power**

580

SATA 1   **Serial ATA HDD
Power**

150

SATA 2

580   PCI Express
Graphic
Card   **VGA Card Auxiliary
Power**

740   +12V CPU   **Motherboard
Auxiliary Power**

POWER-2

580   PA   **HDD/ODD Power**

PB

580   PC   **FDD Power**

PD   **VGA Card
Auxiliary Power**

PE

580   PF

PG

580   PH   **HDD/ODD Power**

150   PI

7 Operational Notes

1) Operating Environment

Recommended Room Temperature : 15~28℃

Operation in comfortable room temperature is recommended.

2) Precautionary Notes on Booting

When booting the computer, it may automatically power down after an alarm sound is generated to indicate that the rotation of the CPU fan is slow by a system monitoring program. If this happens, connect the fan on the stock CPU Cooler to the 3-pin connector for the CPU Cooler on your motherboard. Boot the system and set "CPU Fan Detected" to "Disabled" in the BIOS settings. Turn the system off, remove the CPU Cooler fan, and reboot.

NOTES)

1. Some motherboards do not boot if the rotation of the CPU fan is not detected. There might not be a "CPU Fan Detected" setting in the BIOS setup, but updating the BIOS could solve this problem. For more information on updating the BIOS, please refer to your motherboard manufacturer's website.
2. When using an Intel motherboard, if you remove the motherboard from an existing system and attach it to the TNN 500AF, the system's Active Monitor may generate an alarm sound with a warning that there is no CPU fan. Remove Active Monitor from Add/Remove Programs applet in Control Panel and reinstall.

3) Compatible Components

A list of compatible components for building a TNN 500AF system is available at the following website (www.zalman.co.kr/product/TNN500AF.html).

※ NOTE

Only use motherboards recommended by Zalman.[Certain motherboards have unusually high power consumption and/or are not compatible with the Rear-mount Thermal Blocks (ZM-RTB1). Refer to Page 22.]
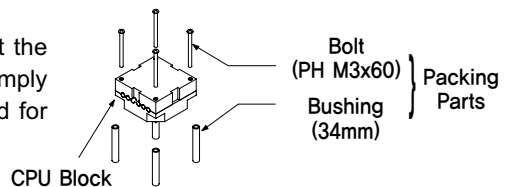
8 Installation Guide

1) Opening and Disassembling the TNN500AF Case

① As shown in the diagram, lay the TNN500AF down on a flat surface and open the front door.

② Open the latch with the key.

③ Unscrew four bolts (PH M5x15-S) on the Left Heatsink Plate and open the plate as shown.

④ Remove the blocks and Heatpipes in an orderly fashion using a screwdriver and store them in a safe place.

❷

Latch

❹

Left Heatsink Plate

❶

Front Door

❸

Bolt (PH5x15−S)
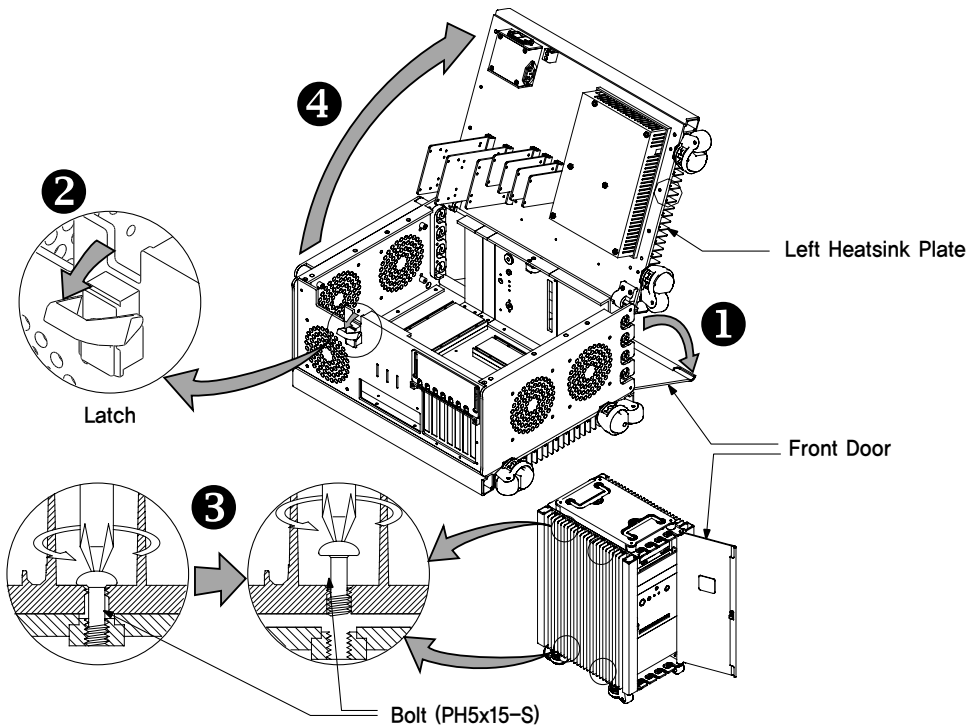
The Bushings and the bolts separated at the time of the CPU Block's removal are simply for packaging purposes and are not used for the actual assembly of the system.

Bolt (PH M3x60) } Packing Parts

Bushing (34mm)

CPU Block

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2) Installing the CPU Clip Support and Motherboard

① Choose the correct Clip Support & bolts for the CPU type being used.

▶ **For Intel Pentium 4 Socket 478 Motherboards**

Place two Socket 478 Clip Supports on the notches of the Retention Guide.

Retention Guide   Socket 478
Clip Supports
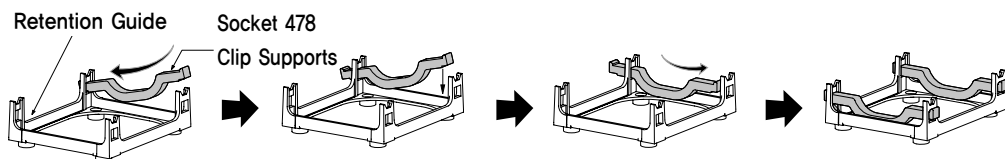
Installation for Intel P4 Socket 478 Motherboards

▶ **For Intel Pentium 4 Socket 775 Motherboards**

Align the Socket 775 Clip Support and the Socket 775 Back Plate with the mounting
holes on the motherboard and fasten with bolts (PH M3x22).

Socket 775
Clip Support

Bolt(PH M3x22)

Hole

M/B

Socket 775
Back Plate

CPU

Lever slot

Socket Lever
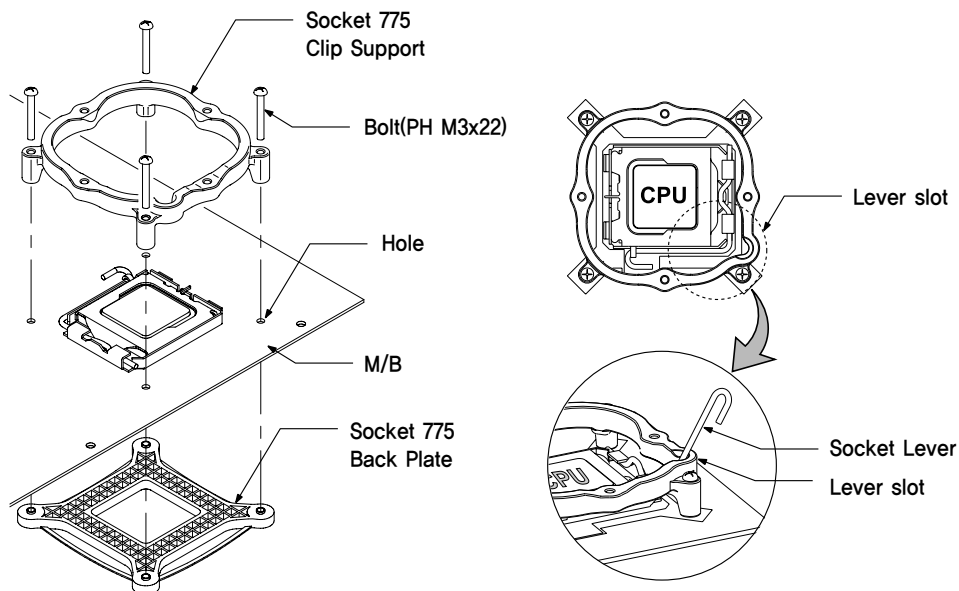
Lever slot

Installation for Intel P4 Socket 775 Motherboards

NOTE) The Lever Slot on the Clip Support should be properly oriented on the hinged side
of the Socket Lever when installing.

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▶ For AMD AMD64 Motherboards

Insert the Socket 754 AMD Nipples into the holes on the Retention Frame and fasten the Socket 754 Back Plate .

Socket 754 AMD Nipple

Retention Frame

M/B

Socket 754 Back Plate
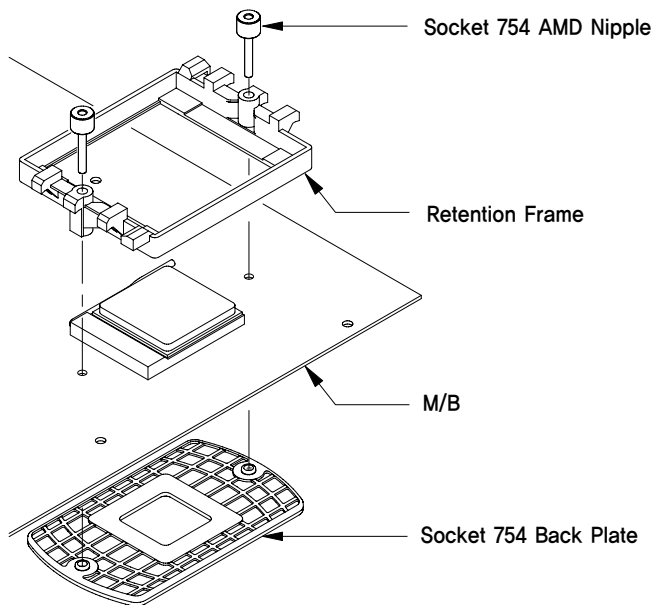
Installation for AMD AMD64 Socket 754 Motherboard
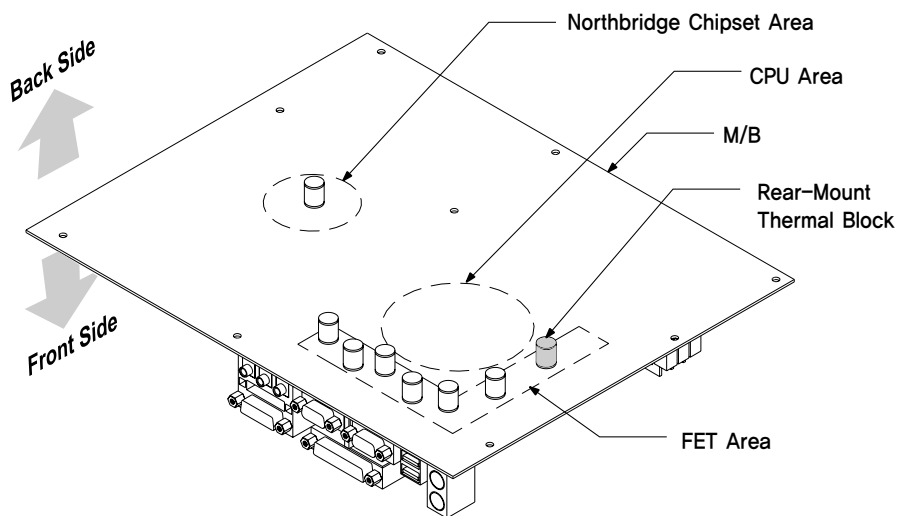
3) Installing the Rear-mount Thermal Blocks

※ **Caution)**

1) Motherboards with a Northbridge that has integrated video capability is not recommended. If such Northbridge is used, the Rear-mount Thermal Blocks MUST be installed.
2) Zalman Tech does not recommend using a motherboard with a fan on the Northbridge Cooler. If the fan is removed, the Rear-mount Thermal Blocks MUST be installed.
3) If the CPU has a higher Thermal Design Power (TDP) rating than an Intel Prescott or an AMD Athlon64 3500+, the Heatpipe Northbridge Cooler and a Rear-mount Thermal Block MUST be installed to cool the Northbridge.
4) To use CPUs with a 100W or higher TDP rating, Rear-mount Thermal Blocks MUST be installed (one for each FET) on the backside of the motherboard in-line with each FET.
5) If interference occurs between components or any problems appear, visit Zalman's website for a list of recommended motherboards, and replace before installation. (www.zalman.co.kr/product/TNN500AF.html)
6) The Rear-mount Thermal Blocks are proprietary components of Zalman's TNN series cases. Do not use with other cases!

① Determine the points that correspond to the location of the FETs and Northbridge chipset on the back side of the motherboard.

② Clean the surface of the point where the block will be attached.

③ Peel off the Film from the Thermal Pad on both ends of the block.
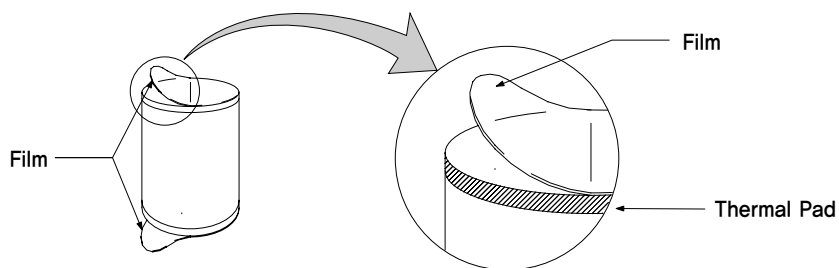
④ Firmly attach the blocks on the determined points.

NOTES : 1) To prevent short circuiting the motherboard, avoid soldered points, and any exposed wiring or circuitry when installing the Rear-mount Thermal Blocks.
2) Thermal Pads lose adhesiveness after it has been used once. Try to attach it properly on the first attempt.
3) Do not touch the Thermal Pad with your hands.

⑤ Install the motherboard using the bolts (PWH M3x5).

Bolt (PWH M3x5)

M/B

I/O Shield
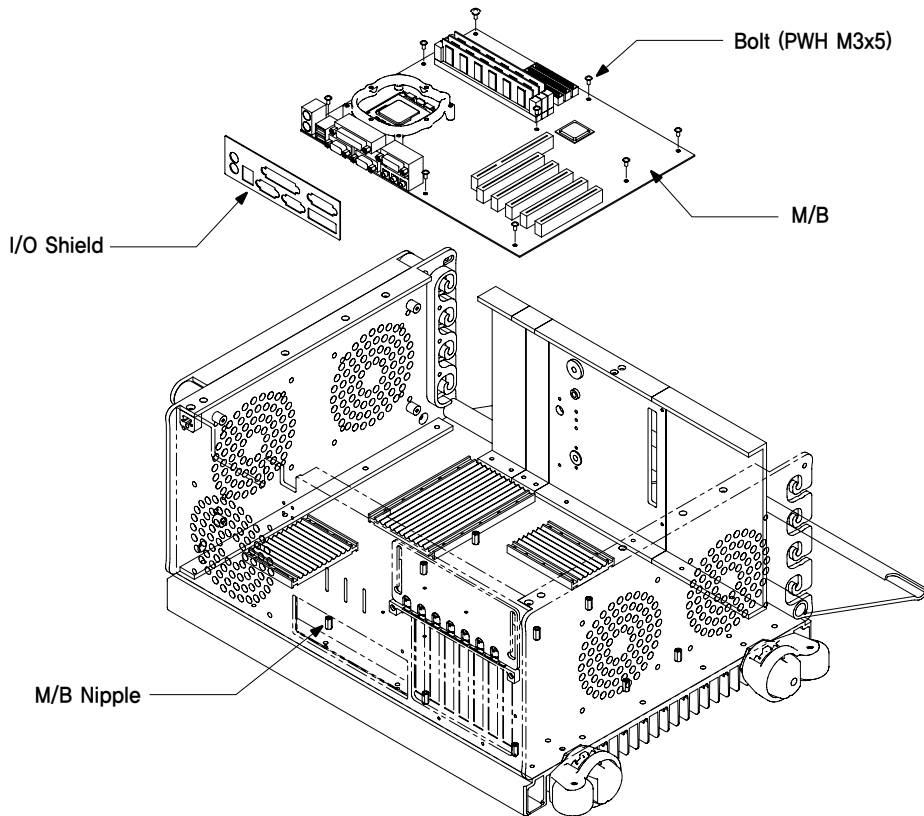
M/B Nipple

NOTES

1) To prevent short-circuiting the motherboard, nipples that are not required for motherboard installation must be removed first.

2) Fix the motherboard to the TNN using all of the motherboard's mounting holes.

3) Be careful to not let the Rear-mount Thermal Blocks fall off from the back of the motherboard.

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4) Installing the Heatpipe Northbridge Cooler

NOTES

1) The Heatpipe Northbridge Cooler can be installed only when the Northbridge is located in the appropriate area as shown in the diagram.

2) If the Northbridge chipset is located in the inappropriate area, it should be cooled with a Rear-mount Thermal Blocks(Refer to page 22).

If the CPU's Thermal Design Power rating is lower than an AMD Opteron 3500+ or Intel Prescott, it is not necessary to install a Rear-mount Thermal Block for the Northbridge, for the Heatpipe Northbridge Cooler is sufficient.
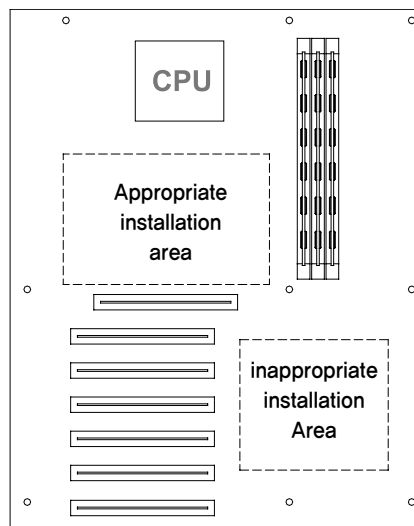
① Check what type of Stock Northbridge Heatsink is on the motherboard and determine the method of Northbridge Block installation.

Northbridge Block

Northbridge Stock Heatsink

Thermal Tape Film

Sliding
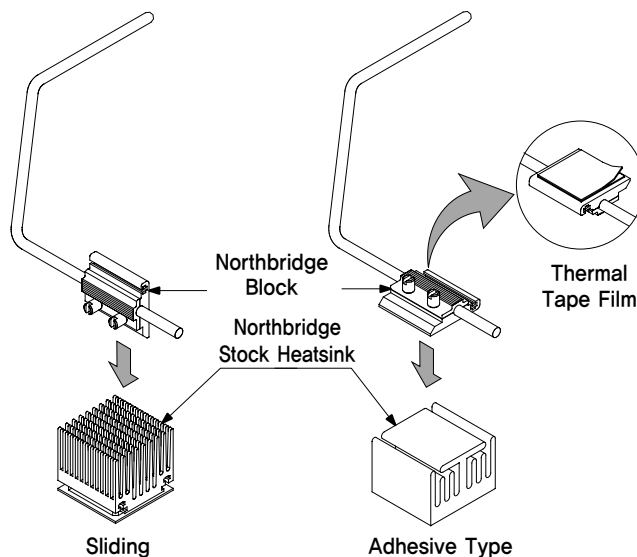
Adhesive Type

※ Notes on Installation of the Adhesive Type

1. The Thermal Tape must be adhered to the bottom of the Northbridge Block.

2. Remove the film from the Thermal Tape before adhering the Northbridge Block to the Stock Northbridge Heatsink.

② Determine the installation point of the Northbridge Case Block and the Northbridge Heatpipe. The Position of the Northbridge Case Block can be adjusted horizontally as well as vertically.

Northbridge
Heatpipe

Northbridge Case
Block
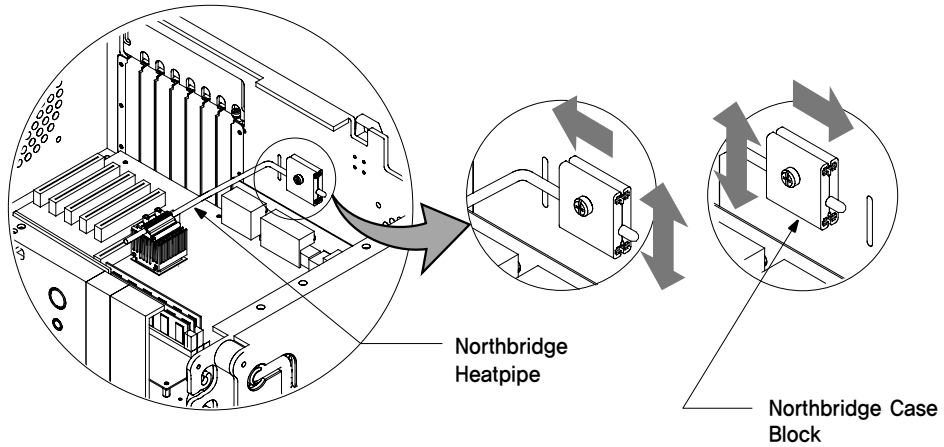
The position of the Northbridge Case Block can be adjusted horizontally as well as vertically.

③ Assemble and install the Northbridge Cooler as shown in the Diagram.

Common Finger Bolt

Northbridge Case Block Base

Northbridge Case Block Cover

Northbridge Heatpipe

Northbridge Block Cover

Northbridge Block Base

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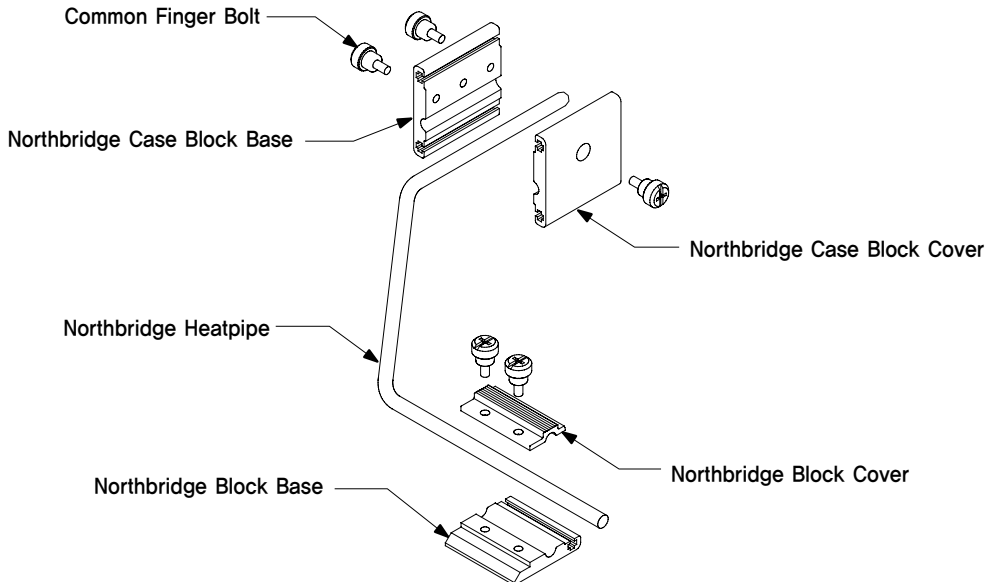
5) Installing the Heatpipe CPU Cooler

① Refer to the diagram below to check the appropriate layout of the CPU Heatpipes for each general location of the CPU.

CPU Heatpipes
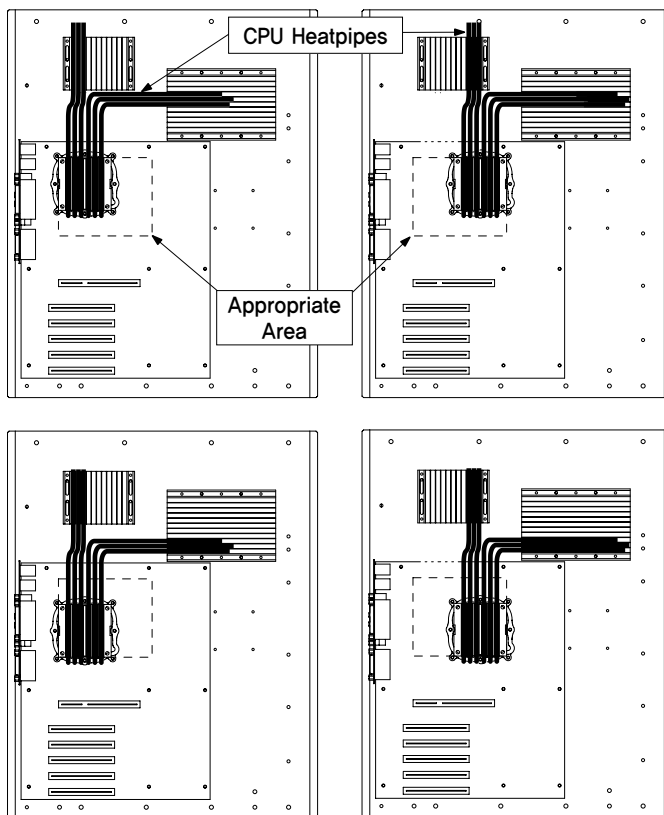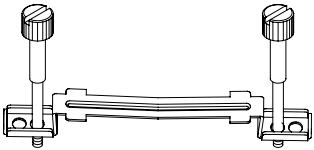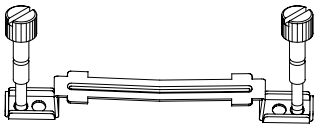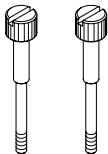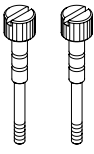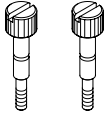
Appropriate Area

NOTES

1) If the CPU Heatpipes interfere with certain components, turn the Heatpipes upside down or adjust the CPU Case Block Base A vertically and try installing again.

2) If the CPU is located beyond the appropriate area and the Cooler is deemed uninstallable, stop and replace the motherboard with a Zalman-recommended model (www.zalman.co.kr/product/TNN500AF.html)

CPU Case Block Base A

ZALMAN   TNN 500AF
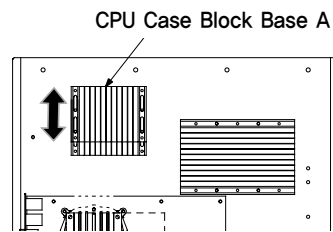
② Determine the appropriate CPU Finger Bolts & clip holes.

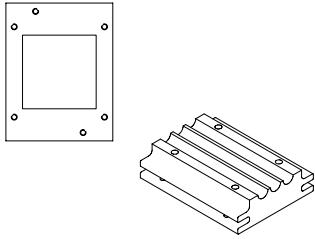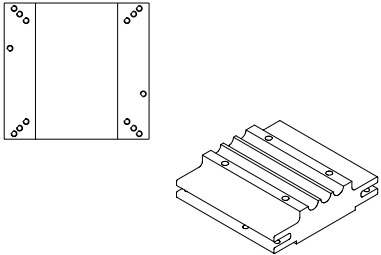| TYPE	Intel Socket 478	Intel Socket 775	AMD Socket 775
Appropriate Installation Holes	(Inner Holes)		(Outer Holes)
Finger Bolts To Use	Socket 478 Finger Bolts (M3x52)	Socket 775 Finger Bolts (M3x49)	Socket 754 Finger Bolts (#6-32x40)

NOTES

1) Apply a generous quantity of thermal grease (1mm or 0.04 inches in height) on the CPU core, and install the CPU Block Base (gold colored).

2) Apply thermal grease on the grooves of the CPU Block Base and the CPU Case Block Base where the CPU Heatpipes come in contact.

3) The CPU Case Block Base already has thermal grease coated underneath, so it should not be taken off under normal circumstances.

4) Use a coin or a screwdriver to firmly tighten the CPU Finger Bolts.

③ Install the Heatpipe CPU Cooler as shown in the diagram.

CPU Finger Bolt

Clip

Bolt(PH M4x20)

CPU Block Cover

CPU Heatpipe

CPU Block Base

Bolt(PH M3x15)

CPU Case Block Cover

CPU Case Block Base

Thermal Grease

Thermal Grease

ZALMAN

TNN 500AF
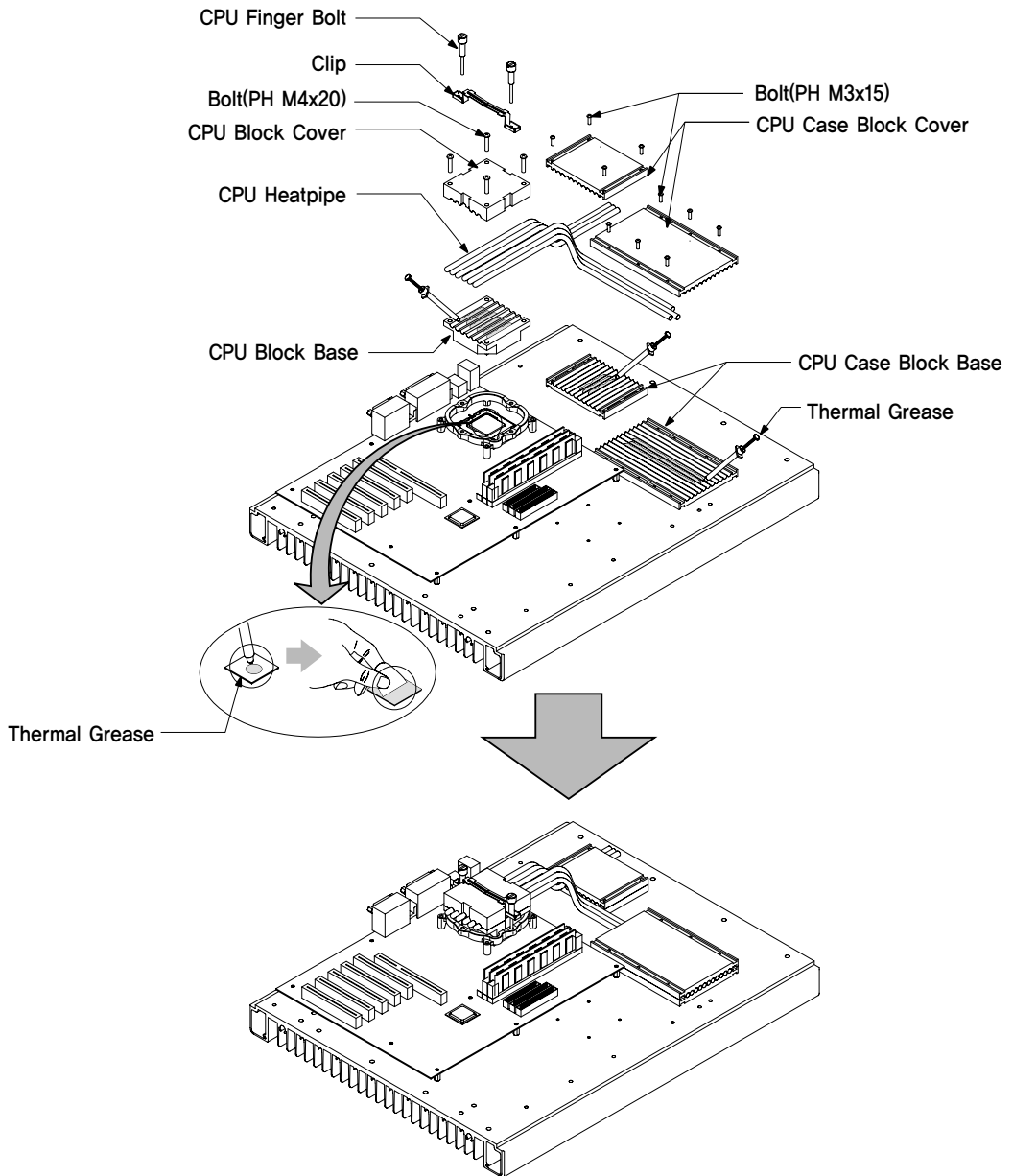
6) Installing the Heatpipe VGA Cooler

TYPE	VGA Block Base A	VGA Block Base B
Block		
ATI	ATI Radeon Series	–
Nvidia	GeForce4 Ti Series	FX 5900 Series
	GeForce3 MX Series	GeForce 6800 Series
Matrox		Parhelia

NOTE) If the VGA card interferes with certain components of the case, stop and refer to the
following website (www.zalman.co.kr/product/TNN500AF.html), and replace the VGA
card with one that is recommended.

As you install the VGA card, move the VGA Case Block Base vertically as needed to
accommodate the VGA card.
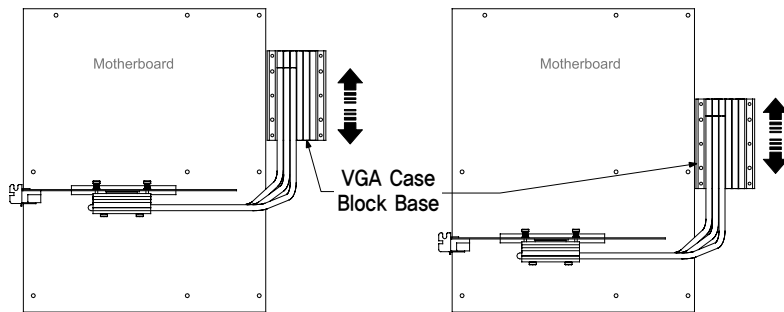
① Remove the Stock VGA Cooler on the VGA card and clean off the exposed contact surface
completely.

    NOTE) Be extremely careful when taking off the Stock VGA Cooler. Zalman is not responsible
for any damages Due to user negligence during the Cooler's removal.

② Peel off the Film from the Thermal Tape on the bottom of the RAM Heatsinks.

Thermal Tape
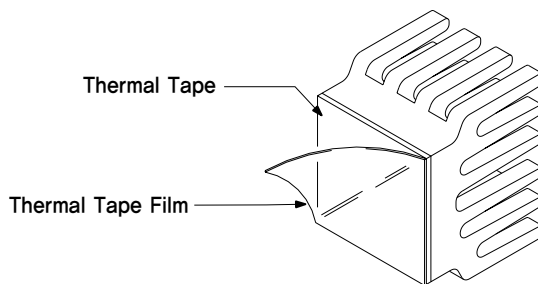
Thermal Tape Film

NOTE : 1) The bending strength of the Thermal Tapes reaches 90% after 24 hours of curing. Do not put excessive force on the RAM heatsinks during this period.

2) Avoid getting grease or any kind of stain on the surface of the Thermal Tape. The Thermal Tape may not stick. Clean the surface of the RAM with acetone or alcohol before attaching.

③ Stick the RAM Heatsinks onto the VGA RAM chips. Press the RAM Heatsinks firmly with your finger for proper adhesion.

RAM Heatsink

VGA RAM

VGA Chipset
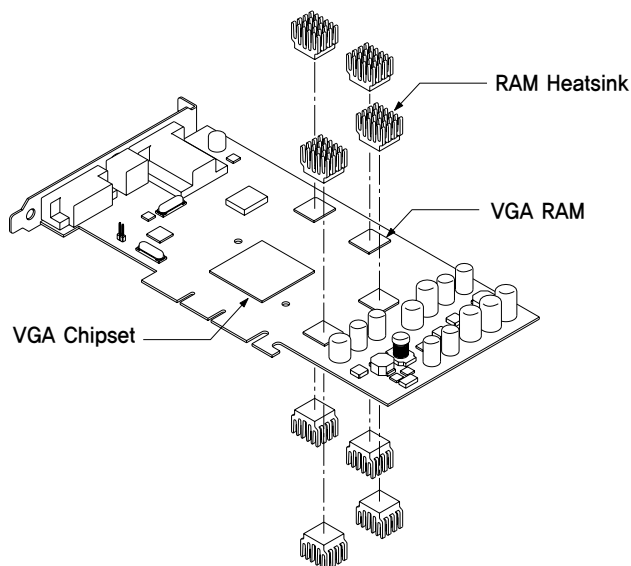
1) If there are more than 8 VGA RAM chips on your VGA card, purchase additional RAM Heatsinks (ZM-RHS1).

2) Thermal Tape loses adhesiveness after it has been used once. Thermal Tape cannot be reused after it has been detached from a surface. If you need more, purchase it separately.

④ Apply a thin layer of thermal grease on the VGA chipset.

   NOTE) Most VGA chipsets on the VGA card have a concave curvature towards the middle and
   need more thermal grease at the center.

⑤ Make sure the VGA Block Base is level and firmly installed onto the VGA chipset using the
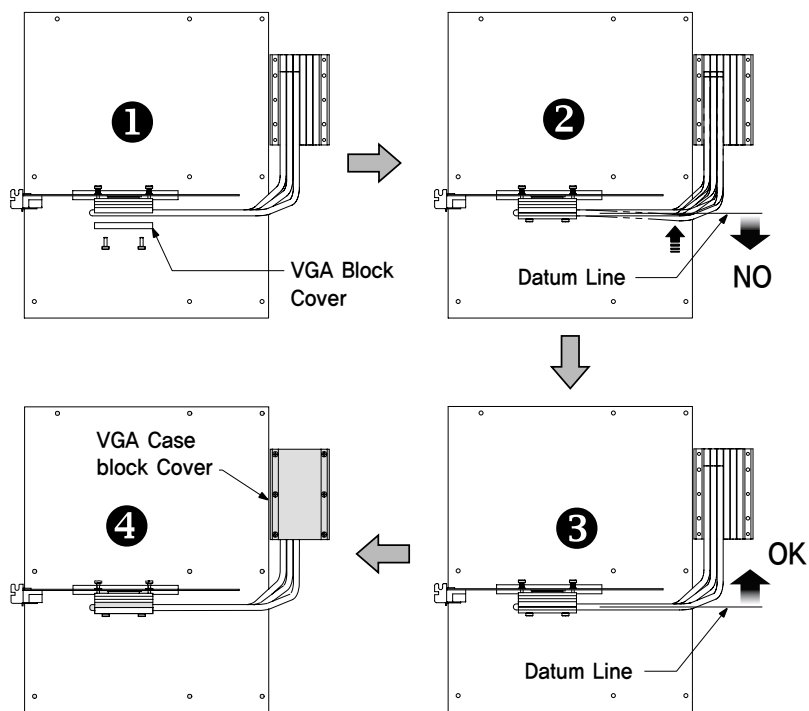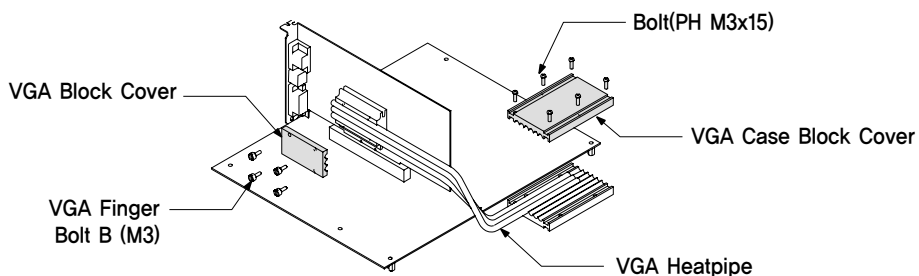Paper Washers, the VGA springs, and the VGA Finger Bolts A(M2.5).

VGA Block Base

VGA Finger Bolt A (M2.5)
VGA Spring
Paper Washer

VGA Chipset
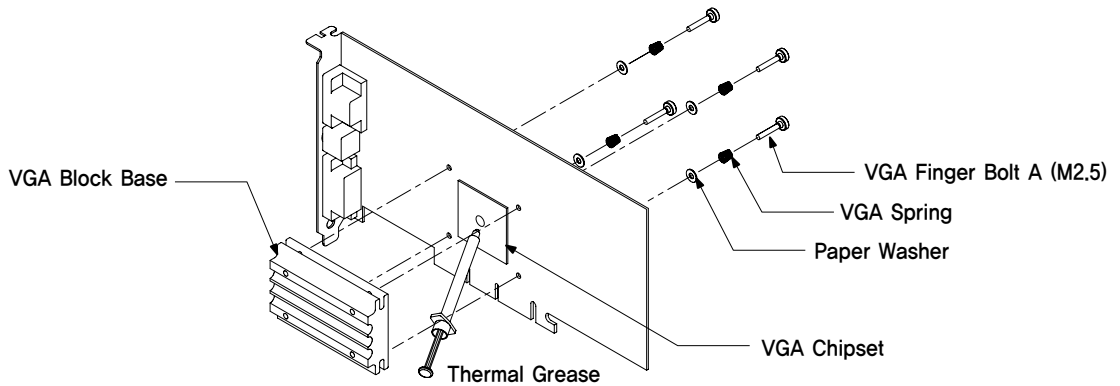
Thermal Grease

⑥ Apply thermal grease evenly onto the grooves on the VGA Case Block Base that come in
contact with the VGA Heatpipes, and install the VGA card on the motherboard.

VGA Block Base

Thermal Grease

VGA Case Block Base

M/B
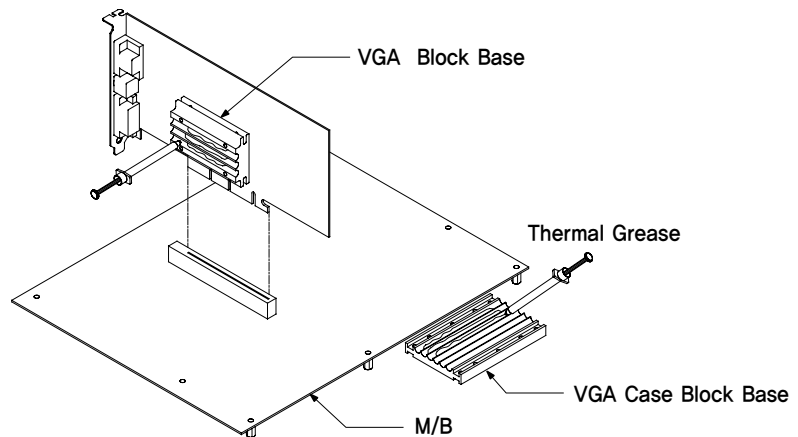
   NOTE) The VGA Case Block Base already has thermal grease coated underneath, and
   should not be taken off under normal circumstances.

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⑦ Install the VGA Heatpipes in sequence and fix the Block Cover over them using the VGA Finger Bolts B(M3). Then, fix the VGA Case Block Cover using bolts (PH M3x15).

Bolt(PH M3x15)

VGA Block Cover

VGA Case Block Cover

VGA Finger Bolt B (M3)

VGA Heatpipe

❶

❷

VGA Block Cover

Datum Line

NO

❹

VGA Case block Cover

❸

OK

Datum Line

NOTES

1) There are many types of VGA cards and the VGA Heatpipes may not fit the grooves on the VGA Case Block very well. In this case, the user needs to modify the VGA Heatpipes to fit the grooves.

2) If the VGA Heatpipes must bend below the datum line, the VGA Heatpipes will not function properly and the VGA chipset may get damaged. Check if this is the case before proceeding.

7) Installing the ODD/FDD/HDD

① The ODD/HDD/FDD can be installed as shown in the diagrams below.
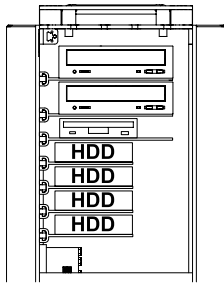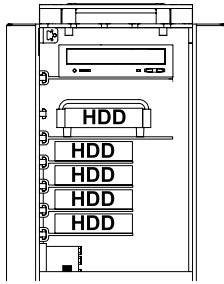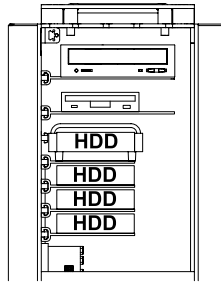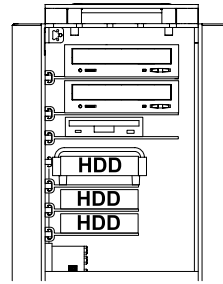
❶ ODD 2EA
FDD 1EA
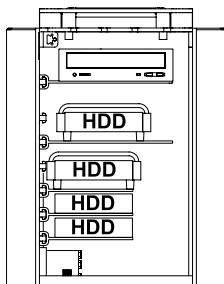HDD 4EA
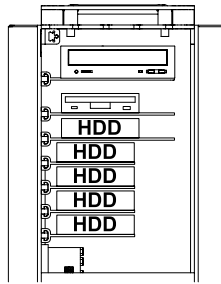
❷ ODD 1EA
FDD 1EA
HDD 5EA
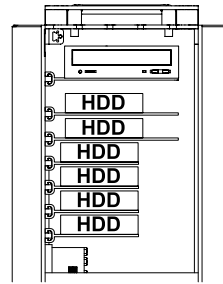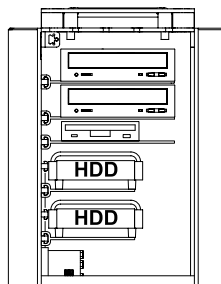
❸ ODD 1EA
HDD 6EA

❹ ODD 1EA
HDD Cooler 1EA
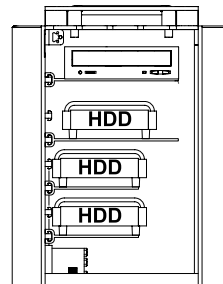HDD 4EA

❺ ODD 1EA
FDD 1EA
HDD Cooler 1EA
HDD 3EA

❻ ODD 2EA
FDD 1EA
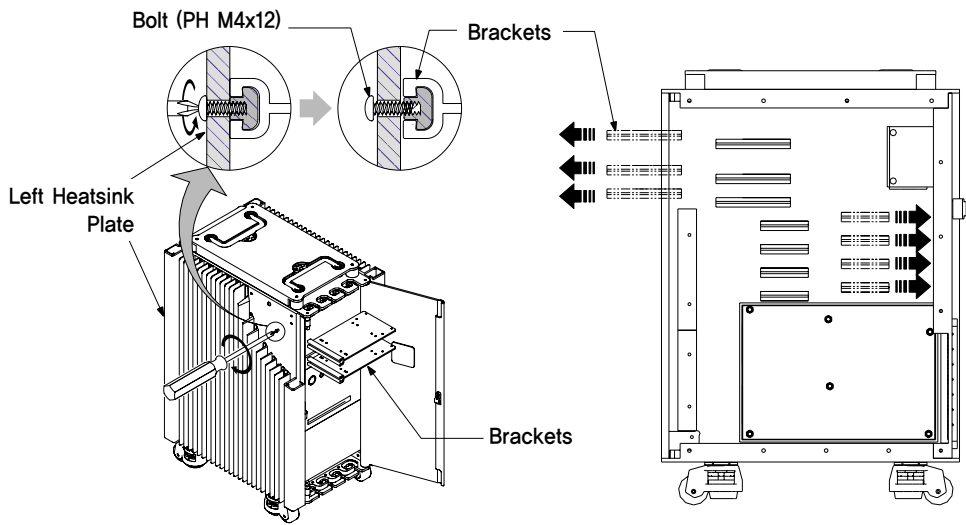HDD Cooler 1EA
HDD 2EA

❼ ODD 1EA
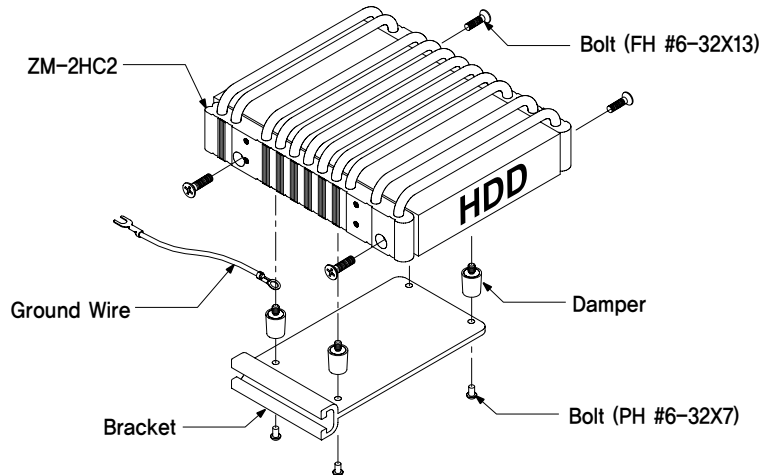HDD Cooler 2EA
HDD 2EA

❽ ODD 2EA
FDD 1EA
HDD Cooler 2EA

❾ ODD 1EA
HDD Cooler 3EA

② Loosen the bolts (PH M4x12) on the left heatsink slightly and remove the ODD/FDD/HDD Brackets.
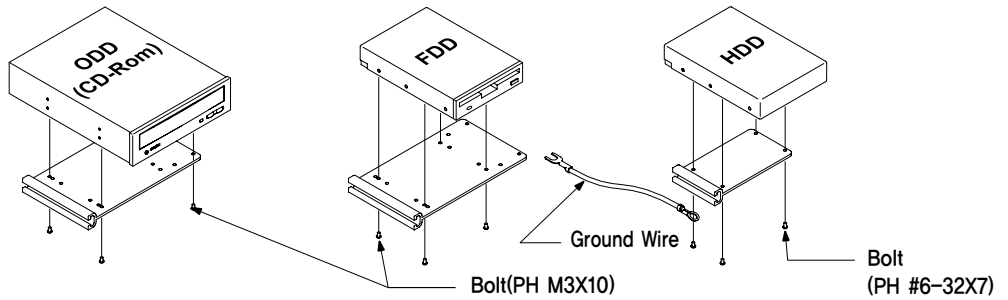
Bolt (PH M4x12)
Brackets
Left Heatsink Plate
Brackets

③ Install the Heatpipe HDD Cooler as shown in the diagram.

ZM-2HC2
Bolt (FH #6-32X13)
HDD
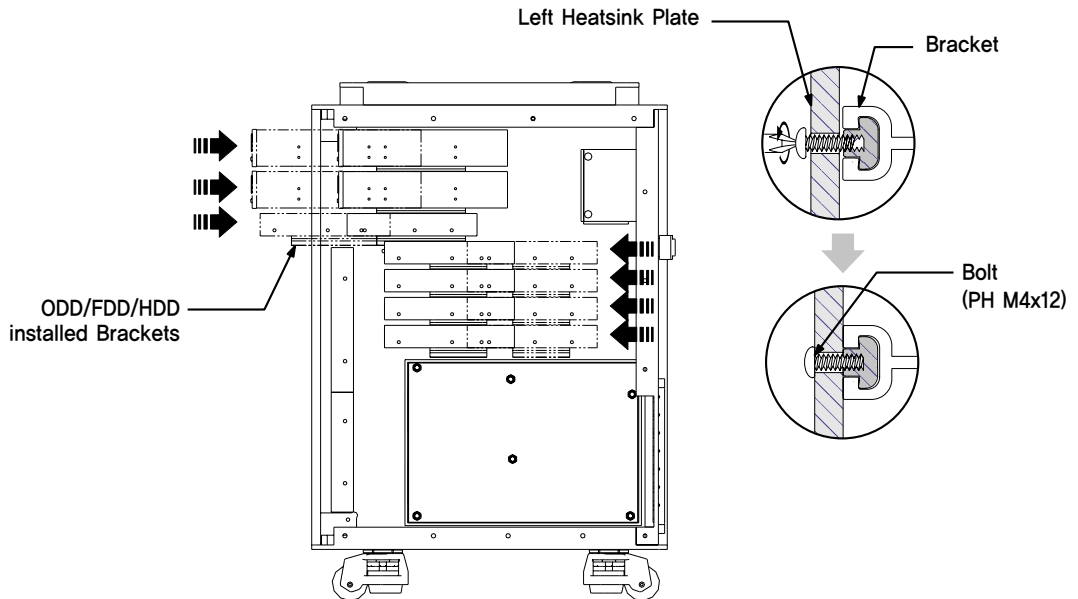Ground Wire
Damper
Bracket
Bolt (PH #6-32X7)

NOTES) The ground wire MUST be connected to Both the HDD and the Damper as shown.
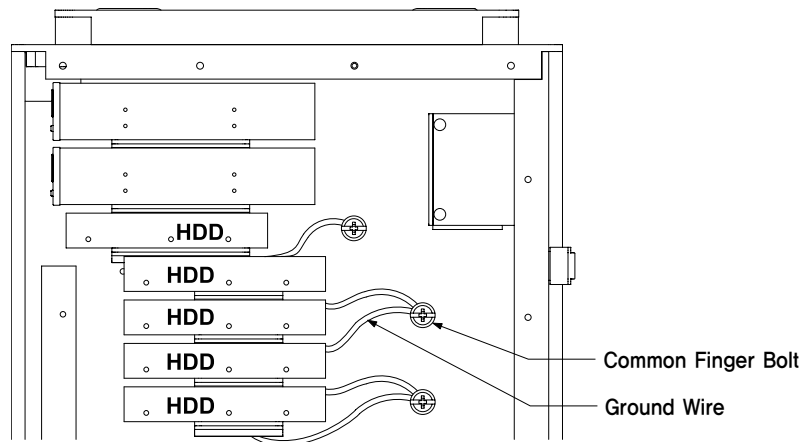
④ Install the ODD/FDD/HDD on the Brackets.

NOTE) Remember to connect the Ground Wire to the HDD.

⑤ Insert the ODD/FDD/HDD installed Brackets in the direction shown in the diagram, and re-fasten the Bracket fixing bolts (PH M4x12) on the Left Heatsink Plate completely.
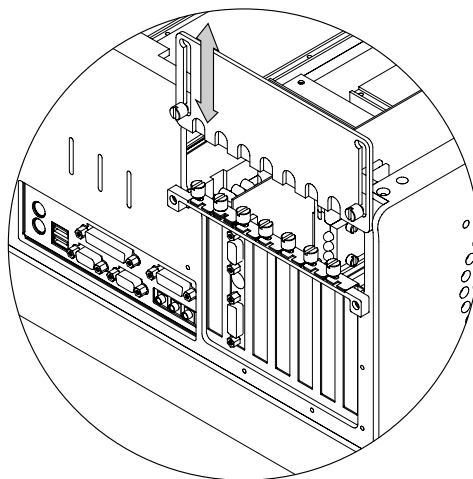
⑥ Connect the Ground Wire to the right heatsink.

HDD

HDD

HDD

HDD

HDD

Common Finger Bolt

Ground Wire

8) Installing PCI Cards

Insert the PCI cards into the PCI slots and fix them firmly in place using the card fixing bolts.

9) Connecting the Power & Data Cables

① Check whether the power connector on the motherboard is a 24 pin or 20 pin type connector and connect the appropriate Motherboard Power Cable.

Sensor Connector

Power Supply

Motherboard Power Cable (20 Pin)

Motherboard Power Cable (24 Pin)
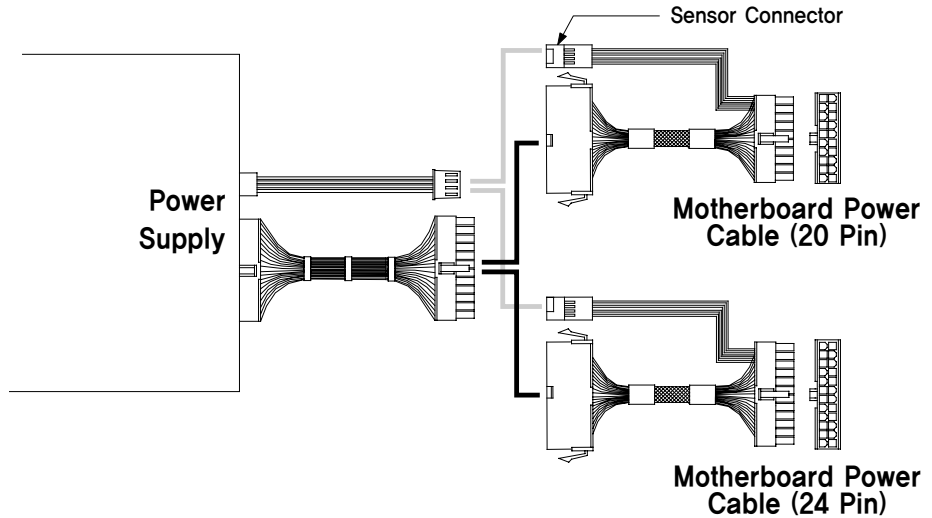
② Connect the various power and data cables as needed.

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10) Connecting the Remote Control receiver and USB Cables
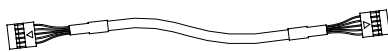
▶ Two Available Dual USB Port on the Motherboard

① **To Use the Remote Control Function**

  - Plug the Dual USB-A Connector into the Dual USB Port on the motherboard(M/B).

Dual USB-A Connector

M/B

M/B Dual
USB Port
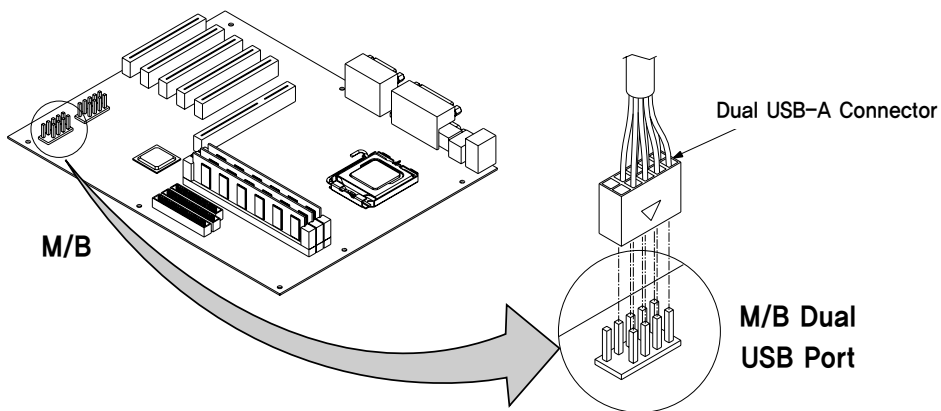
Note)

1) As shown below, there are two types of USB cables (USB-A & USB-B).
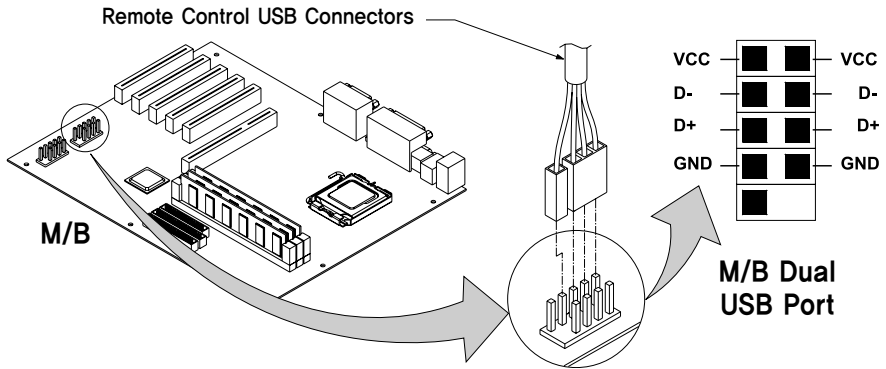   Please connect the cables according to the instructions in this guide.

Dual USB-A Cable   Dual USB-B Cable

2) Verify the location and the layout of the USB headers from the motherboard manual.
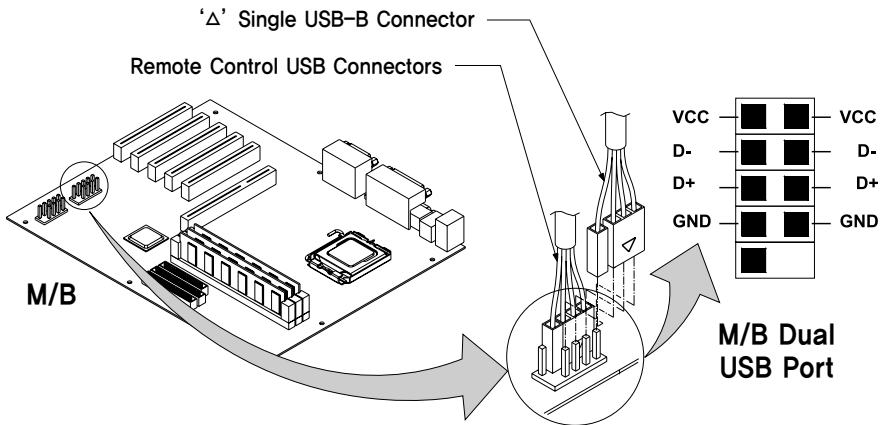
- Plug the Remote Control USB Connectors into the Dual USB Port on the motherboard.
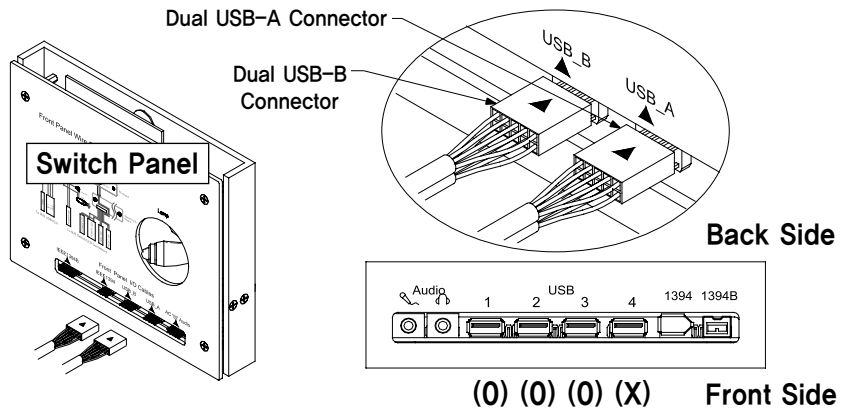

Color codes

VCC : red (yellow), D- : white (orange), D+ : green (blue), GND : black

- Next to where the Remote Control USB Connectors have been connected, on the same Dual USB Port, connect the Single USB-B Connectors that have the '△' marking.
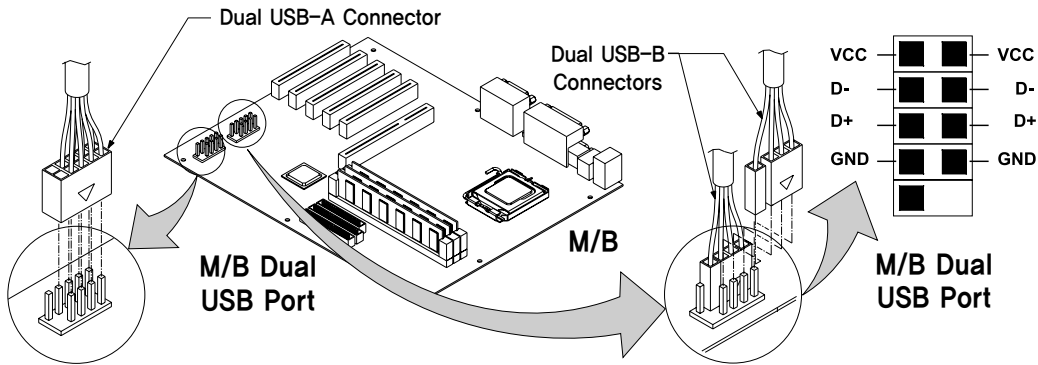
- Plug in the Dual USB-A and USB-B Connectors into their respective ports on the back of the Switch Panel.

Dual USB-A Connector

Dual USB-B Connector

Switch Panel

USB_B   USB_A

Back Side

Audio   USB   1   2   3   4   1394 1394B

(0) (0) (0) (X)   **Front Side**

> USB ports #1 through #3 (see diagram) can be used in this configuration.

② To Sacrifice the Remote Control Function

- Plug the Dual USB-A Connector and the Dual USB-B Connectors into each of the Dual USB Ports on the motherboard.

Dual USB-A Connector

Dual USB-B Connectors

VCC   VCC
D-   D-
D+   D+
GND   GND

M/B Dual USB Port

M/B

M/B Dual USB Port

> 1) Verify the location and the layout of the USB headers from the motherboard manual.
> 2) Color codes
>   VCC : red (yellow), D- : white (orange), D+ : green (blue), GND : black

- Plug in the Dual USB-A and USB-B Connectors into their respective ports on the back of the Switch Panel.

Dual USB-A Connector
Dual USB-B Connector
USB_B
USB_A
Back Side

Audio   USB
1   2   3   4   1394 1394B
(0) (0) (0) (0)   Front Side

All of the USB ports (see diagram) can be used in this configuration.

▶ **Three Available Dual USB Port on the Motherboard**
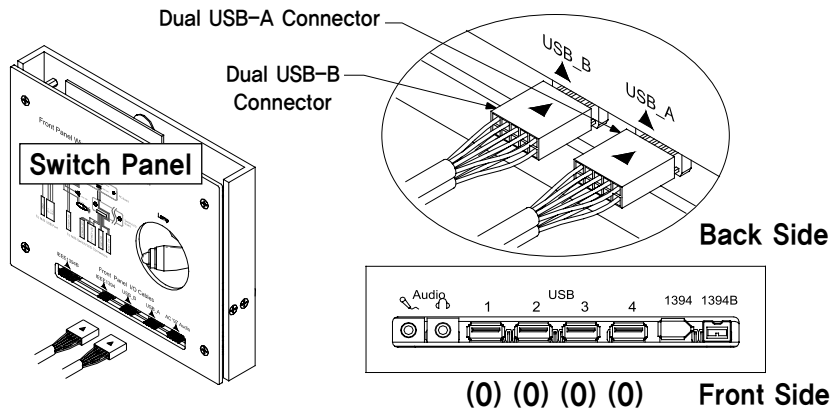
① **Plug the Dual USB-A Connector and the Dual USB-B Connectors into each of the Dual USB Ports on the motherboard.**

Dual USB-A Connector

Dual USB-B Connectors

VCC — VCC
D- — D-
D+ — D+
GND — GND

M/B Dual USB Port

M/B

M/B Dual USB Port

1) Verify the location and the layout of the USB headers from the motherboard manual.
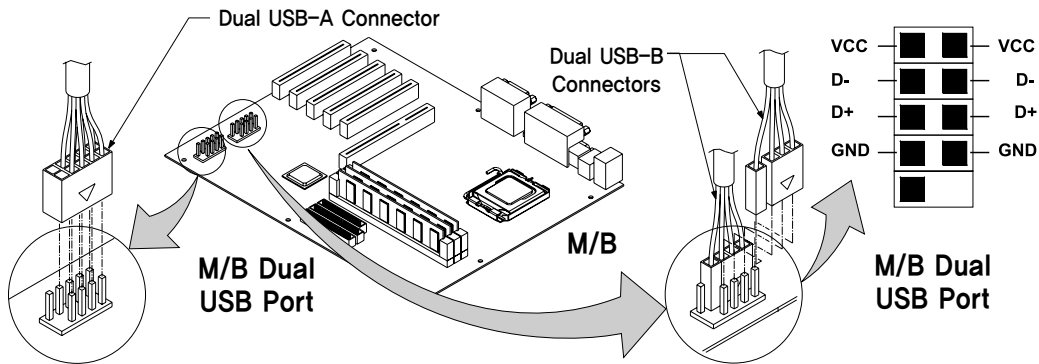2) **Color codes :** VCC : red (yellow), D- : white (orange), D+ : green (blue), GND : black

② **In the remaining Dual USB Port on the motherboard, connect the Remote Control USB Connectors.**
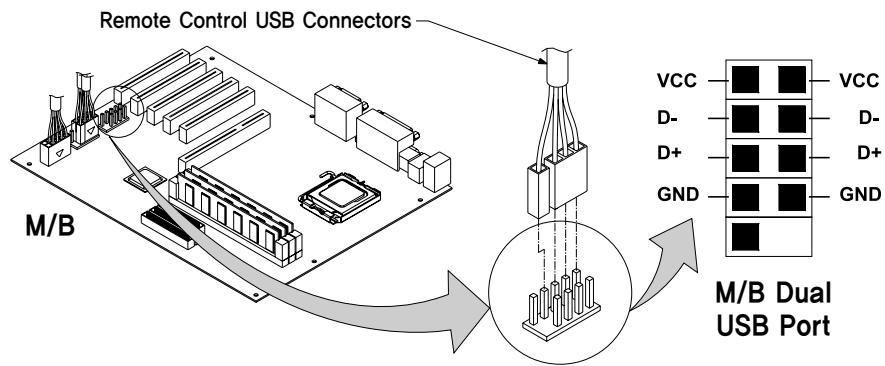
Remote Control USB Connectors

VCC	**VCC**
D-	**D-**
D+	**D+**
GND	**GND**

M/B

M/B Dual USB Port

③ **Plug in the Dual USB-A and USB-B Connectors into their respective ports on the back of the Switch Panel.**
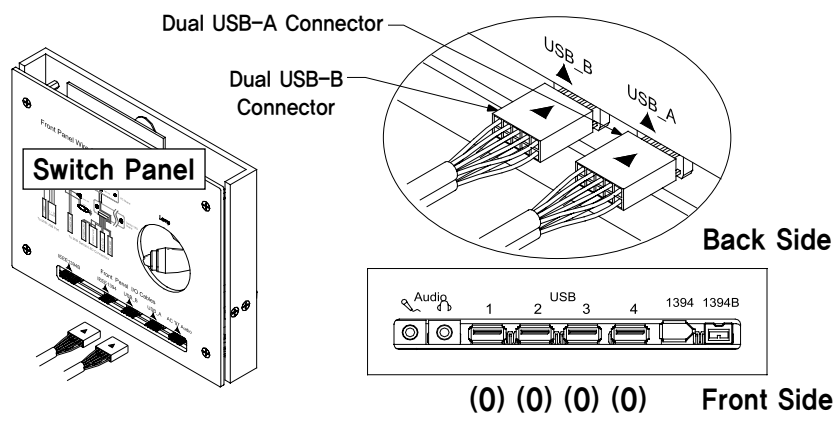
Dual USB−A Connector

Dual USB−B Connector

USB_B

USB_A

Switch Panel

Back Side

Audio   USB   1   2   3   4   1394 1394B

(0) (0) (0) (0)   **Front Side**

All of the USB ports (see diagram) can be used in this configuration.

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11) Connecting Audio I/O, IEEE1394, and IEEE1394B Cables

① **Plug the Audio I/O Connectors onto the Audio Port on the motherboard.**

Caution : The audio headers arrangement may differ among motherboards.
Check the motherboard's manual for correct header arrangement First.

Audio I/O Connectors   **Audio Port**   **M/B**
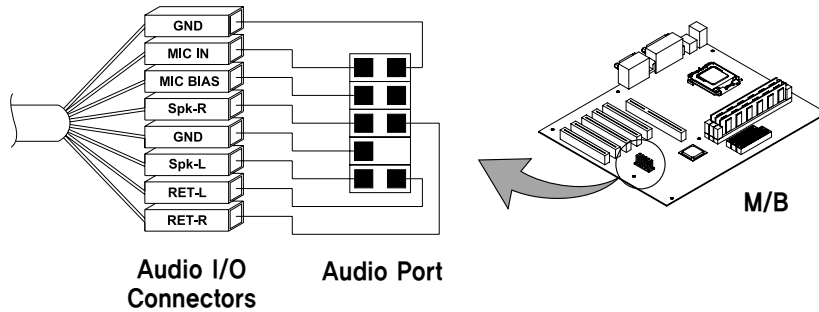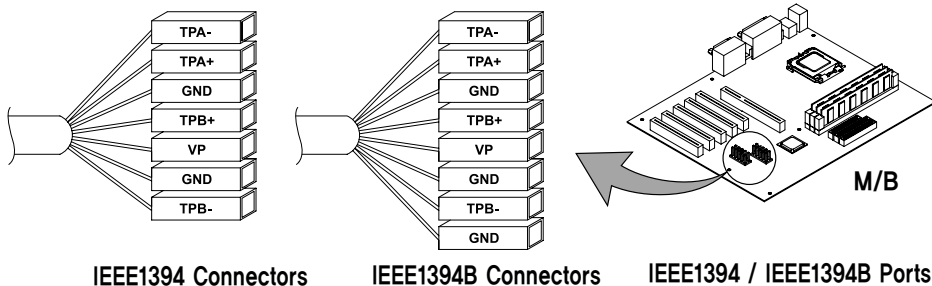
Color codes :
GND : Black, MIC : Orange, MIC BIAS : Red, Spk-R : Green,
Spk-L : Yellow, RET-L : Brown, RET-R : Blue

② Plug the IEEE1394/IEEE1394B Connectors onto the IEEE1394/IEEE1394B Port on the motherboard.

**Caution :** The IEEE1394 / IEEE1394B headers arrangement may differ among motherboards.
Check the manual for correct header arrangement first.

IEEE1394 Connectors   **IEEE1394B Connectors**   **IEEE1394 / IEEE1394B Ports**   **M/B**
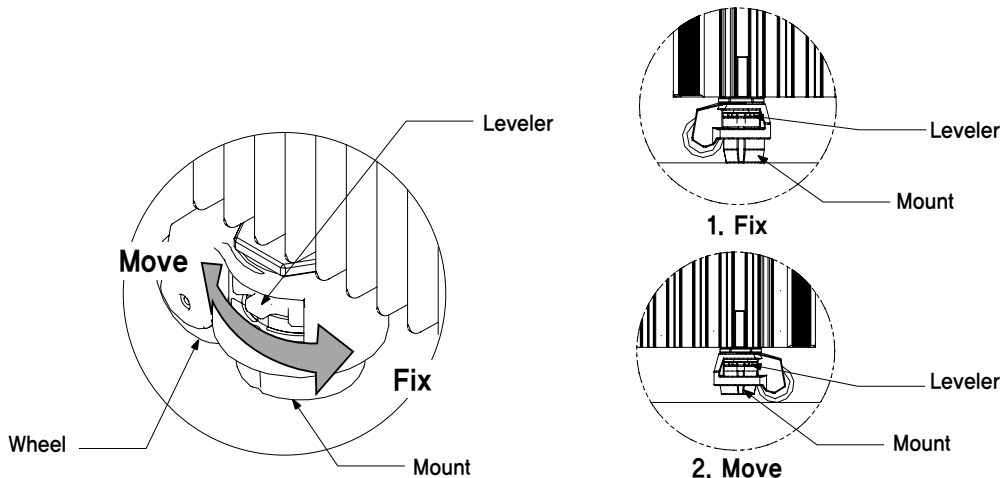
Color codes :
TPA - : Green, TPA + : Red, GND : Black, VP : White,
TAPB + : Orange, TAPB - : Blue

③ Plug the other end of the audio I/O, IEEE1394 & 1394B cables into the back side of the Switch Panel. Note the arrows for orientation.
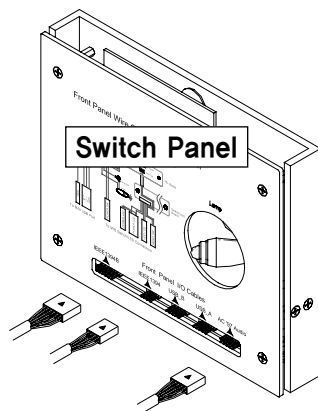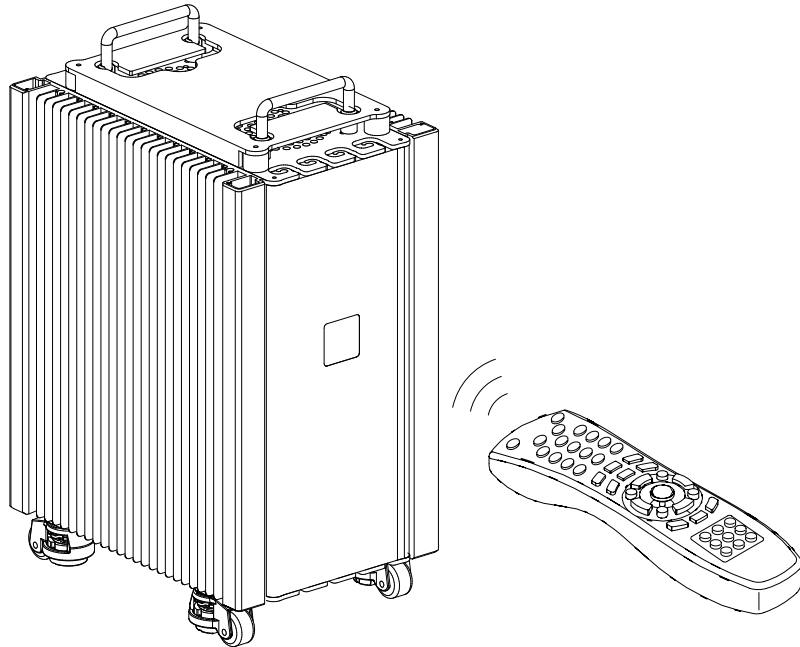

12) Use Casters

The Casters' level can be adjusted to either fix the TNN500AF in place or make it move freely.

If the TNN500AF cannot be installed on a flat surface, the leveler can be used to make it level; doing so also reduces noise from vibration.

13) Using the Remote Control

Refer to the iMON & Multi-Median User's Guide for Details.

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