

CPS Industrial Power Supply

Power Supply Specification

Model Number:

Power Supply Module

RSABxG; x=450, 550, 650, 750

Completed Power System

RRABxGH; x=450, 550, 650, 750, 1200, 1400

Revision: A-02

AC PFC Input,

450W~1400W, +12V W/+5Vsb or ATX12V 5 Outputs

RoHS Compliance & 80+ Efficiency

Revision History

Rev	Description	Owner	Date
A-01	Initial release	C. P. Zhang	06/08/11
A-02	Add PSMI function and 1200W~1400W models	C.P. Zhang	03/05/12

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1. Scope

This document defines a series of power supply systems with the output power range from 450W to 1400W and with +12V & +5Vsb output rails or ATX output rails for 1U system application. The power supply system consists of one (1), two (2), or three (3) power supply modules providing the +12V & +5Vsb output rails and one (1) power distribution backplane providing the removable or redundancy function of the power supply modules and also generating the +5V, +3.3V, and -12V output rails which are powered by +12V output. The power supply module is capable of "HOT SWAP" exchanging with active current sharing and OR-ing isolation MOSFETs built in for +12V output, and droop current sharing and OR-ing isolation diode built in for +5Vsb output. The AC input is rated 90-264Vrms with power factor corrected (PFC > 0.95). A 38mm high reliable Sanyo Denki fan is installed to the power supply module for cooling the power supply module, power devices on the distribution backplane and part of the system.

2. Electrical

The electrical specifications that follow are to be met over the environmental ranges specified in Section 3 unless otherwise noted.

2.1. AC Input

Table 1 lists AC input voltage and frequency range for continuous operation. The power supply is capable of supplying full-rated output power over the input voltage ranges specified.

Parameter	Min	Nominal Input	Max	Unit
V _{in} Voltage	90	100-240	264	Vrms
V _{in} Frequency	47	50/60	63	Hz
V _{in} Current /450W		6.0		A
V _{in} Current /550W		8.0		A
V _{in} Current /650W		10.0		A
V _{in} Current /750W		10.0		A
V _{in} Current /1200W		10.0 per module		A
V _{in} Current /1400W		10.0 per module		A

Table 1. AC input

- The inrush current of power supply module is less than 30A under the conditions of 240Vrms input and 25°C ambient cold start.
- The leakage current of the power supply module is less than 1.15 mA measured at 264Vac input.
- The repetitive ON/OFF cycling of AC input voltage will not damage the power supply.
- The power supply can automatically recover from AC power loss.
- The power supply is equipped with primary fuse for input over-current protection, and meet product safety requirement.

2.2. DC Output

2.2.1. DC Output Voltage Regulations

The DC output voltages remain within the regulation ranges shown in Table 2 for both power supply module and the completed power system when measured at the load end of the output connectors under all AC line, O/P loads, and environmental conditions. The voltage regulation will be maintained under continuous operation for a period of time equal to the MTBF specified in section 5.2 at any steady state temperature and operating conditions specified in section 3.

	+12V	+5V	+3.3V	-12V	+5Vsb	Unit
Range	+5/-3%	+5/-3%	+5/-3%	±10%	±5%	Volt
Min	+11.64	+4.85	+3.20	-10.80	+4.75	Volt
Nom	+12.00	+5.00	+3.30	-12.00	+5.00	Volt
Max	+12.60	+5.25	+3.46	-13.20	+5.25	Volt

Table 2. DC Output Voltage Regulations

- The remote sensing is provided to +12V, +5V, and +3.3V outputs to compensate for excessive cable drops.
- +5V, +3.3V, and -12V outputs are located on the power distribution backplane.

2.2.2. DC Output Load Distributions

The Table 3A and 3B defines the power supply typical output load distribution.

Output Voltage	Minimum Current (A)	450W O/P Max. Current (A)	550W O/P Max Current (A)	650W O/P Max. Current (A)	750W O/P Max. Current (A)
+12V	2.0	37.0	45.0	54.0	62.5
+5Vsb	0.0	3.0	3.0	3.0	3.0

Table 3A. DC Output Load Distribution (power supply module)

Output Voltage	Min. Current (A)	450W Max. Current (A)	550W Max Current (A)	650W Max. Current (A)	750W Max. Current (A)	1200W Max. Current (A)	1400W Max. Current (A)
+12V	2.0	37.0	45.0	54.0	62.5	100.0	116.5
+5V	0.0	25.0	25.0	25.0	25.0	25.0	25.0
+3.3V	0.0	25.0	25.0	25.0	25.0	25.0	25.0
-12V	0.0	0.8	0.8	0.8	0.8	0.8	0.8
+5Vsb	0.0	3.0	3.0	3.0	3.0	4.0	4.0
The Max. combined O/P of +5V & +3.3V (Watt)		140.0	150.0	160.0	170.0	N/A	N/A

Table 3B. DC Output Load Distribution (completed power system)

- The total continuous output power is 450W~750W max. for one (1) or two (2) modules installed, and 1200W~1400W max. for two (2) or three (3) modules installed.
- The peak current of +12V output is 110% of max rated current and may last for 15 msec.
- Both +5V and +3.3V outputs can be loaded to their max. rated current, and the total continuous output can be still maintained to the max rated output power as specified.
- The total combined output of 3.3V and 5V is 140W max. (450W model), 150W max. (550W model), 160W max. (650W model), and 170W max. (750W model) that is used for the efficiency calculation.

2.2.3. DC Output Efficiency

The power supply efficiency, with one (1) power supply module ON only (for 450W~750W), and with two (2) power modules ON only (for 1200W~1400W), is 80% minimum measured at 20%, 50%, full load and nominal line input, which is 115Vrms and 230Vrms conditions. The efficiency is calculated in accordance with the definition released by the 80 Plus Organization (Plug Load Solutions).

2.2.4. DC Output Ripple & Noise

The output ripple & noise specifications listed in Table 4 will be met throughout the load ranges as specified in section 2.2.2 and the nominal line input voltage conditions as specified in section 2.1. Ripple & noise is defined as periodic or random signals over a frequency band of 10Hz to 20MHz. Measurements should be made with an

oscilloscope with 20MHz bandwidth. Add a 10uF electrolytic capacitor and a 0.1uF ceramic capacitor across output terminal during ripple & noise measurement.

	+12V	+5V	+3.3V	-12V	+5Vsb	Unit
Max. Ripple	120	50	50	120	50	mV P-P
Max Ripple & Noise	120	50	50	120	50	mV P-P

Table 4. DC Output Ripple & Noise

2.2.5. DC Output Transient Response

The output voltages will remain within the regulation limits specified in Table 2. The load-changing repetition rate is 50Hz to 10KHz, and the transient load slew rate 0.5A/us. The maximum step load size, and output capacitive loading are specified as followings in Table 5:

	+12V	+5V	+3.3V	-12V	+5Vsb
Step Load Size (A)	60% of Max Load	30% of Max Load	30% of Max Load	0.1A	0.5A
Capacitive Load (uF)	10000	10000	10000	330	1000

Table 5. DC Output Ripple & Noise

2.2.6. DC Output Voltage Hold-up Time

The power supply will maintain outputs in regulation per section 2.2.1 despite a loss of input power at the nominal range of AC input and at 80% of maximum continuous output load as applicable for a minimum of 16 ms.

2.3. Timing / Housekeeping / control

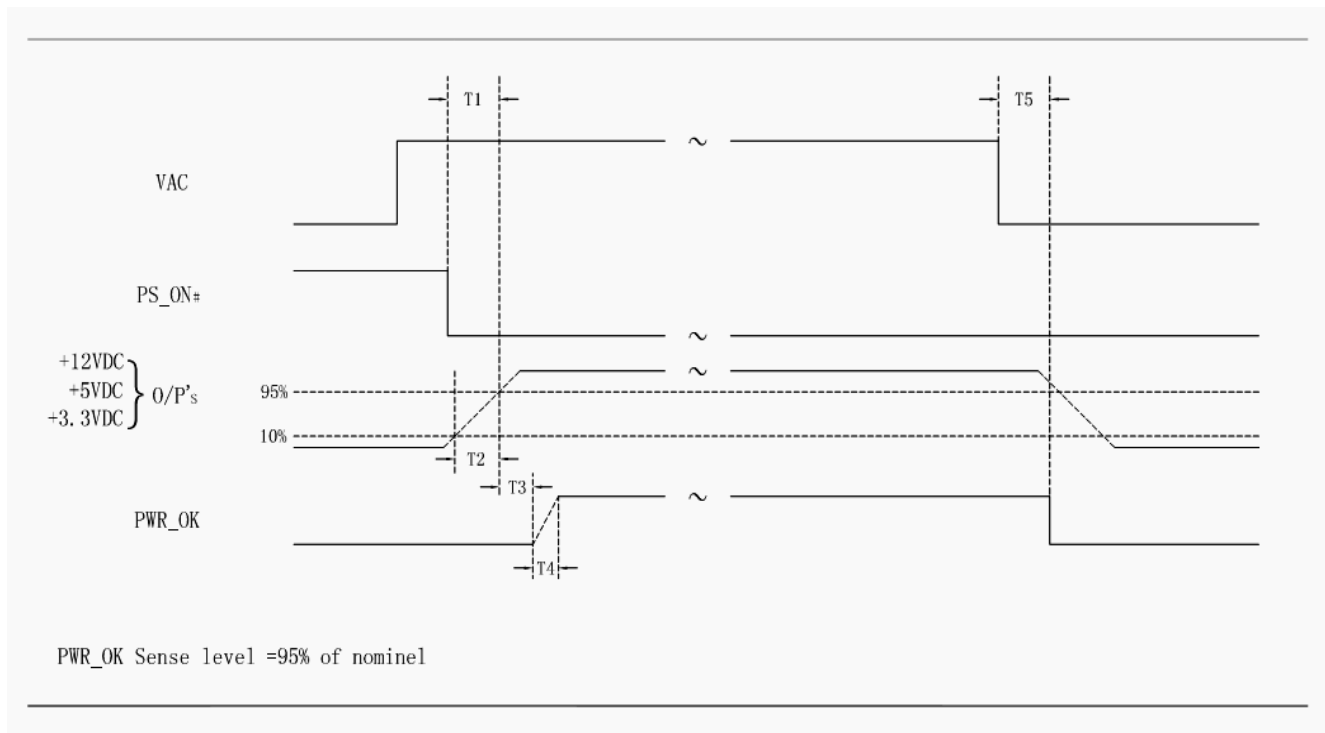


Figure 1. Power Supply Timing

- Notes: T1 is defined in section 2.3.4
- T2 is defined in section 2.3.5
- T3, T4, and T5 are defined in Table 6

2.3.1. PWR_OK (Power Good Signal)

PWR_OK is a “power good” signal. It will be asserted high by the power supply to indicate that the +12V and/or +5V, +3.3V outputs are above the under voltage threshold listed in Table 2 of Section 2.2. PWR_OK will be de-asserted to a low state when the +12V and/or +5V, +3.3V output voltage fall below under voltage threshold, or when AC power has been removed for a time sufficiently such that power supply operation cannot work normally. The electrical and timing characteristics of the PWR_OK signal are given in Table 6 and in figure 1.

Signal type	+5V TTL compatible
Logic level low	Less than 0.4V while sinking 10mA
Logic level high	Greater than 4.75V while sourcing 200uA
High-state output impedance	1kΩ from output to common
PWR_OK delay	100ms < T ₃ < 500ms
PWR_OK rise time	T ₄ ≤ 10ms
AC loss to PWR_OK hold-up Time	T ₅ ≥ 10ms (80% of max. rated output)

Table 6. PWR_OK Signal Characteristics

2.3.2. PS_ON (DC Soft Start)

PS_ON is an active-low, TTL-compatible signal that allows a motherboard to remotely control the power supply in conjunction with features such as soft on/off, Wake on LAN, or wake-on modem. When PS_ON is pulled to TTL low, the power supply will turn on the main DC output rails: +12V, and /or +5V, +3.3V, -12V. When PS_ON is pulled to TTL high or open-collected, the DC output rails will not deliver current and will be held at zero potential with respect to ground. PS_ON has no effect to the +5Vsb output, which is always enabled whenever the AC power is present. Table 7 lists PS_ON signal characteristics.

	Min	Max
V _{IL} , Input Low Voltage	0.0V	0.8V
I _{IL} , Input Low Current (V _{in} = 0.4V)		-1.6mA
V _{IH} , Input high Voltage (I _{in} = -200uA)	2.0V	
V _{IH} , open circuit, I _{in} = 0		5.25V

Table 7. PS_ON Signal Characteristics

2.3.3. +5Vsb (Standby Voltage Output)

+5Vsb is a standby voltage output that is active whenever the AC power is present. It provides a power source for circuits that must remain operational when the main DC output rails are in a disabled state. Example uses include soft power control, Wake on LAN, wake on modem, intrusion detection, or suspend state activities. There is over current protection on the +5Vsb output to ensure the power supply will not be damaged if external circuits draw more current than the supply can provide.

2.3.4. Power-on Time

The power-on time is defined as the time from when PS_ON is pulled low to when the +12V, and /or +5V, +3.3V output are within the regulation ranges specified in Section 2.2.1. The power-on time will be less than 800ms (T₁ < 800ms). +5Vsb has a power on time of two seconds max. after the valid AC Voltages applied.

2.3.5. Rise Time

The output voltage rise from ≤ 10% of nominal to within the regulation ranges specified in section 2.2.1 within 0.1 ms to 20 ms (0.1 ms ≤ T₂ ≤ 20 ms)

2.3.6. Power Sequencing

The +12V and +5V output levels are equal to or greater than the +3.3V output at all times during power-up and normal operation. The time between the +12V or +5V output reaching its minimum in-regulation level and +3.3V reaching its minimum in-regulation level is ≤ 20 msec.

2.3.7. Overshoot at Turn-on / Turn-off

The output voltage overshoot upon the application or removal of the input voltage, or the assertion / de-assertion of PS_ON will be less than 10% above the nominal voltage.

2.3.8. Reset after Shutdown

If the power supply latches into a shutdown state because of a fault condition on its outputs, the power supply can return to normal operation only after the fault condition has been removed and the PS_ON has been cycled OFF/ON with a minimum OFF time of 1 second.

2.3.9. +5Vsb at AC Power-down

After AC power is removed, the +5Vsb standby voltage output should remain at its steady state value for the minimum hold-up time specified in Section 2.2.6 until the output begins to decrease in voltage. The decrease can be monotonic in nature, dropping to 0.0V. There is no other perturbations of this voltage at or following removal of AC power.

2.4. Output Protection

2.4.1. Over Voltage Protection

The power supply can provide latch-mode over voltage protection as defined in Table 8.

Output	Min.	Nom.	Max.	Unit
+12VDC	13.6	14.6	15.6	Volts
+5VDC	5.5	6.25	7.0	Volts
+3.3VDC	3.7	4.1	4.5	Volts

Table 8. Over Voltage Protection

2.4.2. Over Current Protection

130% maximum for +12V output

150% maximum for +3.3V and +5V outputs

2.4.3. Short-circuit Protection

The power supply will shut down and latch off for shorting the +12VDC, +5VDC, and +3.3VDC rails to return or any other rails. Shorts between main output rails and +5Vsb will not cause any damage to power supply. The power supply will shut down and latch off for shorting the negative rail. +5Vsb is capable of being shorted indefinitely, but when the short is removed, the power supply will recover automatically or by cycling PS_ON. The power supply is capable of withstanding a continuous short circuit to the outputs without damage or overstress to the unit (for example, to components, PCB traces, connectors) under the input conditions specified in section 2.1.

2.4.4. No-load Operation

No damage or hazardous condition will occur with all the DC output connectors disconnected from the load. The power supply may latch into the shutdown state.

2.4.5. Isolation

Primary to Secondary	4242Vdc
Primary to Earth GND	2800Vdc

2.5. Output Signals (for Redundant System only)

2.5.1. Audible Alarm & TTL Signal

The Audible alarm and TTL signal are available from the signal card located on the backplane. The audible alarm is silence and TTL signal is "High" when all power modules are functioning properly. The audible alarm will be sound and TTL signal will be "Low" when following conditions happened:

- One of the power supply module is not functioning and is still attached to the backplane.
- One of the power supply module is attached to the backplane without AC power cord plugged in.

Removing the not functioning power module from backplane will reset the audible alarm and also the TTL signal.

2.5.2. LED light

The LED light installed on the power supply module is functioning as followings:

- Green color – Power module is ON and working properly.
- Amber color – Power module is under Standby Mode.
- No color – Power module is not working properly.

2.5.3. Fan Failed Signal (I2C/PSMI)

The Rotation Detector O/P signal is generated by fan: "0" fan is running well and "1" fan blade is locked or fan is not running properly.

2.5.4. PS Present Signal (I2C/PSMI)

The Power Supply Present signal: "0" power supply is present and "1" power supply is not present

2.5.5. Power Good Signal (I2C/PSMI)

The Power Good signal: "0" power supply is fail and "1" power supply is good

2.5.6. Temperature Warning Signal (I2C/PSMI)

The Temperature Warning signal: "0" PS is under normal condition and "1" PS is under full load and over 55°C

Note: Please refer to the PSMI specification attached for programming the firmware.

3. Environmental

The following subsections define recommended environmental specifications and test parameters. Based on the typical conditions to which an ATX power supply may be subjected during operation or shipment.

3.1. Temperature

Operating	+0°C to +50°C
Non-operating	-40°C to +85°C

3.2. Humidity

Operating	10% to 90% relative humidity (non-condensing)
Non-operating	5% to 95% relative humidity (non-condensing)

3.3. Altitude

Operating 0 to 10,000 feet
Storage 0 to 50,000 feet

4. Electromagnetic Compatibility

The following subsections outline applicable product regulatory specifications for this power supply.

4.1. Emissions

The power supply can comply with FCC Part 15 and EN55022: 2006 meeting Class B for both conducted and radiated emissions with a 3 dB margin.

4.2. Immunity

The power supply can comply with EN 55024: 1998+A1: 2001+A2: 2003.

4.3. CE Testing

The following standards are applied during the CE testing

CE EN 55022: 2006 Class B
EN 61000-3-2: 20006 Class D
EN 61000-3-3: 1995+A1: 2001+A2: 2005
EN 55024: 1998+A1: 2001+A2: 2003, including
IEC 61000-4-2: Criterion B
IEC 61000-4-3: Criterion A
IEC 61000-4-4: Criterion B
IEC 61000-4-5: Criterion B
IEC 61000-4-6: Criterion A
IEC 61000-4-8: Criterion A
IEC 61000-4-11: Criterion B/C/C

5. Reliability

5.1. Component De-rating

The derating process promotes quality and high reliability. All electronic components are designed with conservative derating for use in commercial and industrial environments.

5.2. Mean Time between Failures (MTBF)

100K hours minimum at full load 25°C

6. Safety

6.1. Safety

cUL UL 60950-1 (replaced by cTUVus)
TUV EN 60950-1
CB IEC 60950-1: 2005 (2nd Edition)
CCC

6.2. RoHS Compliance

The power supply system meets the requirement of RoHS Compliance.

7. Mechanical

Please see attached outline drawing and output cable drawing in details.

Power Supply Management Interface Specification V3.3 7/20/2012

I2C Interface

The I2C interface of power supply units supports 100Kbps communication protocol in 7-bit address slave mode only. All power supply I2C base addresses are optional to set from 0xB0, 0xB2, 0xB4, ..., 0xBE according to manufacturer's configuration. To prevent address conflict with other components on I2C bus, users may request other addresses in the range of 0xB0 to 0xBE to the manufacturer. The I2C interface of power supply unit is in slave mode and only support one byte read. When accessing registers, START and STOP bits are required for each register read. Multi-byte read and 10-bit address are **not** supported.

I2C Interface Signal Levels

SDA and SCL signals of I2C interface are floating at power supply and should be pulled up by the host. It is designed to support 3.3V and 5V logic, depends on the pull-up level at the host. It is important to pull up SDA and SCL since these signals are open drain at power supply. Fail to pull up these signals at host will make power supply I2C interface not able to function and potentially into damage. The DC characteristics of SDA and SCL signals are in the table below

Symbols	Conditions	Min	Max	Unit
VIL	SCL, SDA	-	0.8	V
VIH	SCL, SDA	2.0	$V_{\text{pull-up}}$	V
VOL	SDA	-	0.6	V
VOH	SDA	$V_{\text{pull-up}} - 0.7$	-	V
CB	SCL, SDA (Maximum bus capacitance permitted by I2C specification)		400	pF

I2C Register Functions

The register map contains power supply information as

Model number, register 01h ~ 0Ah;

Power supply status, register 0Bh, 0Ch

Serial number, register 0Eh ~ 19h;

Revision code, register 1Bh ~ 1Eh;

Manufacturing date code, register 1Fh and 20h;

Typical output voltage specification, register 2Fh ~ 36h;

Typical output current specification, register 39h ~ 40h;

Typical standby voltage specification, register 43h and 44h;

Typical standby current specification, register 45h and 46h;

Maximum output wattage specification, register 47h and 48h;

Register 00h, 0Dh, and 1Ah contain the number of register reserved for model number, serial number and revision code. In register map that 10 registers locations are reserved for model number, 12 register locations are reserved for serial number, and 4 register locations are reserved for revision code. However, due to manufacturer process that these registers may not be used in full.

I2C Read

All registers in the register map (showing below) are read only. It is to prevent accidentally erase factory preset data. The procedure to read one register data are following:

1. host checks if I2C bus is idle;
2. host sends START bit, I2C device slave address (ex. 0xB0), write bit, register address, and STOP bit
3. host sends START bit, I2C slave address, read bit, then send clock to read back one byte and to send STOP bit to complete register read.
4. Once the register read is successful, release I2C bus.

Power Supply Unit Status Register

The power supply unit status register contains status bits of SMBAlert, ac/dc input, PWR_OK(Power Good), OTP(Over Temperature Protection Warning), and Fan_Fail(Fan Failure Warning) in register address 0Bh and

0Ch, described as following:

Status Register 0Bh

b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	PWR_OK	0	0	SMBAlert

X: Reserved for future use. Default "0" when read back

SMBAlert: SMB Alert status bit.

When "1" fault status detected. This bit is cleared automatically upon host status register 0Bh
When "0" the power supply operating normally.

PG: Power good status bit.

When "1" the power supply unit is working properly. All outputs are within range.
When "0" the power supply unit is either malfunctioning or has shut down.

Status Register 0Ch

b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	Fan_Fail	0	OTP	0	ac/dc

ac/dc: Power good status bit.

When "1" the power supply unit is in AC input.
When "0" the power supply unit is in DC input.

OTP: Over Temperature Protection Warning

When "0" means power supply temperature is in normal range.
When "1" the power supply temperature is higher than normal condition. Over temperature protection function soon will be activated to shut down the power supply unit.

Fan_Fail: Cooling fan status

When "0" the fan is working properly.
When "1" the fan is not working correctly or not working at all.

Power supply status can be retrieved at any time. Power supply monitors its own status constantly as long as standby supply is available. The standby supply can be provided by another power supply unit in the chassis. Which means as long as one power supply unit is operating properly, the monitoring circuits in all power supply units will constantly monitoring its own power supply status. When receiving I2C read command from host, the power supply monitor circuit will be interrupted immediately to service I2C read and return to monitoring power supply status once the once the I2C read process is completed.

Power Supply Unit Present Detection and I2C Acknowledge

The power supply unit doesn't contain hardware PS_Present (Power Supply Unit Present) signal and there is no PS_Present status bit in the status register. Since the power supply status monitor circuit is built in power supply unit and host can only communicate with power supply units when they are connected in chassis, the host can only determine if one power supply unit presents in chassis by a software algorithm through I2C communication.

The host can determine if one power supply unit is presenting by checking the read back value of status register. When the power supply is missing, due to pull up of I2C data line, the data line will be pulled high all the time during read so the status register read back will be 0xFF. Since the non-used bits (marked as X) in status register are default "0", there will be not possible to read back 0xFF if the power supply unit is presenting and the I2C communication circuit is working. When host reads back 0xFF from the status register (or any register), the host can assume that the power supply unit is not presenting or, completely shut down, or its I2C communication is out of work. However, to make such determination that host should not wait for Acknowledge when initiating I2C communication. When host is waiting for Acknowledge while the power supply is not presenting, host I2C

function will be hanging in an endless loop until it times out. If checking Acknowledge cannot be avoid when reading status register, a time-out mechanism or a watchdog timer needs to be implemented to prevent host holding I2C bus in an endless loop.

Model Number

Model number is stored in registers 01h to 0Ah. Each register location is stored with one digit of the serial number in alphanumeric format. Depends on manufacturer process the serial number could be combined with number (0 ~ 9) and characters (A ~ Z). Not all 10 register locations may be used.

Serial Number

Serial number is stored in registers 0Eh to 19h. Each register location is stored with one digit of the serial number in alphanumeric format. Depends on manufacturer process the serial number could be combined with number (0 ~ 9) and characters (A ~ Z). Not all 12 register locations may be used.

Revision code

Revision code is stored in registers 1Bh to 1Eh. Each register location is stored with one digit of the serial number in alphanumeric format. Depends on manufacturer process the serial number could be combined with number (0 ~ 9) and characters (A ~ Z). Not all 4 register locations may be used.

Date Code

Date code is stored in registers 1Fh and 20h. Register 1Fh stores the YEAR code from 00 ~ 99 (2000 ~ 2099) and register 20h stores the WEEK number from 01 to 53. Different than serial number and revision code that are in ASCII format, the date code is in unsigned integer format from 00h to 7Fh (0 ~ 127).

Output Voltage and Output Current manufacturer Specification

Register 2Fh to register 46h store the power supply unit output specification. Register 2Fh to 36h store the output voltage specification and register 39h to register 40h store output current specification. All voltage or current specifications are represented in $mV \times 10^x$ or $mA \times 10^x$ format. For example, to read back +5V output voltage specification, host needs to read back register 2Fh and register 30h then to apply equation (*value of register 2Fh*) $\times 10^{(\text{value of register 30h})}$. For example if register 2Fh value is 52 (52mV) and register 30h value is 2 (10^2) then the +5V manufacturer default output specification would be $52mV \times 10^2 = 5200mV$ (+5.2V). All output voltage and output current specifications can be obtained in a same way. All registers stored output voltage and output current specifications are in 8 bits unsigned integer format.

Output Wattage Specification Read Back

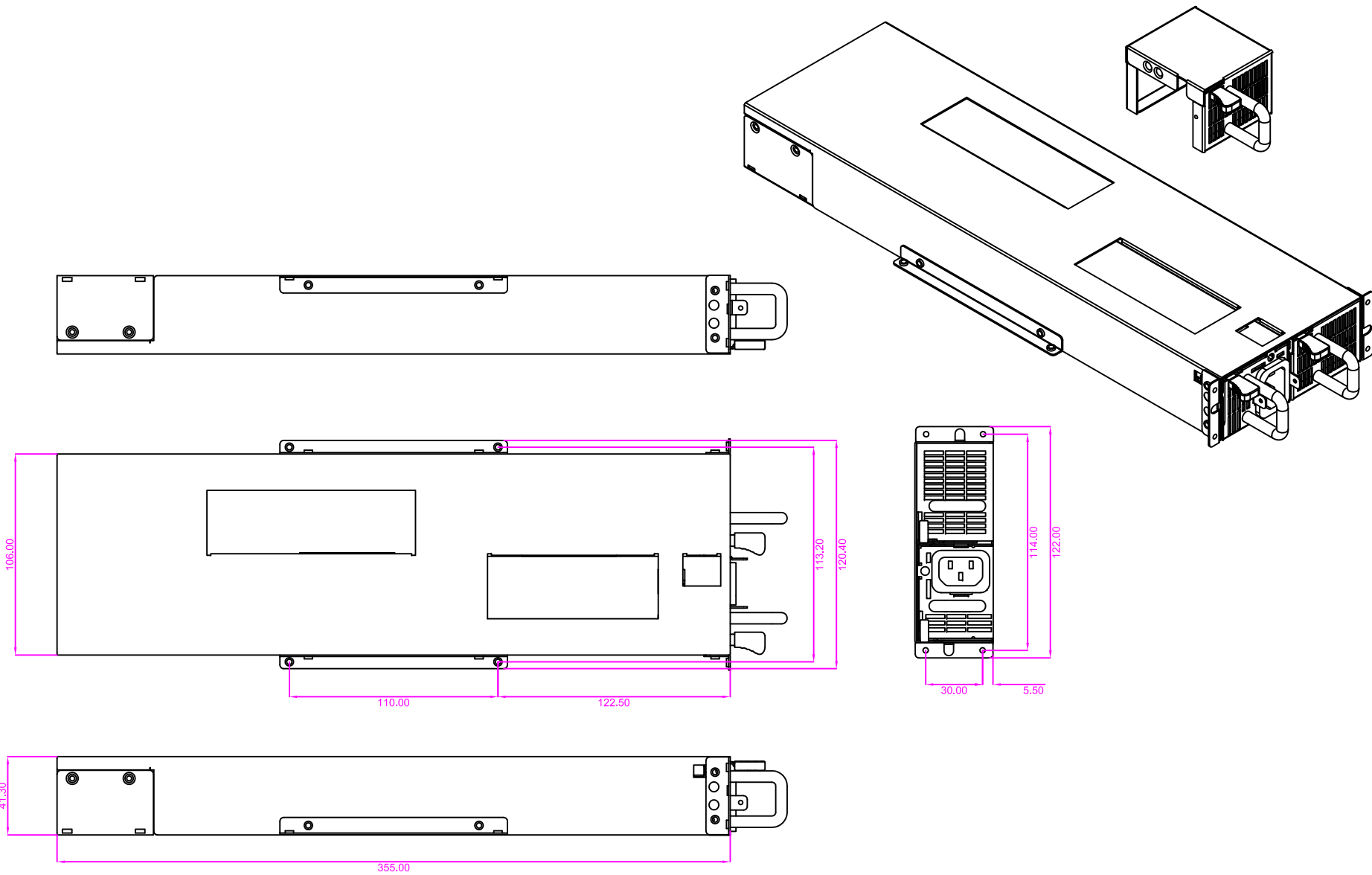
Power supply unit maximum output wattage specifications are stored in register 47h and 48h in 16 bits unsigned integer format. To read back, host should read back both values in register 47h and 48h and process as $\text{Register}[48h] * 256 + \text{Register}[47h]$. For example if register 47h and 48h have values as 0xee and 0x02, the maximum output power can be obtained as $(0x02 * 256) + (0xee) = 750$ (Watt).

Register Map

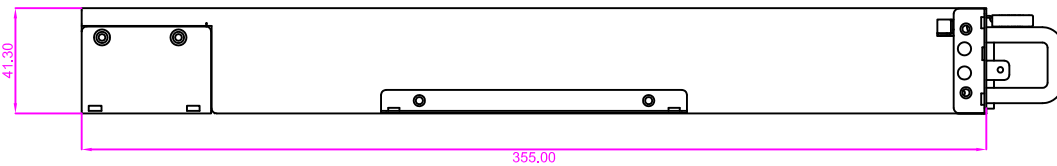
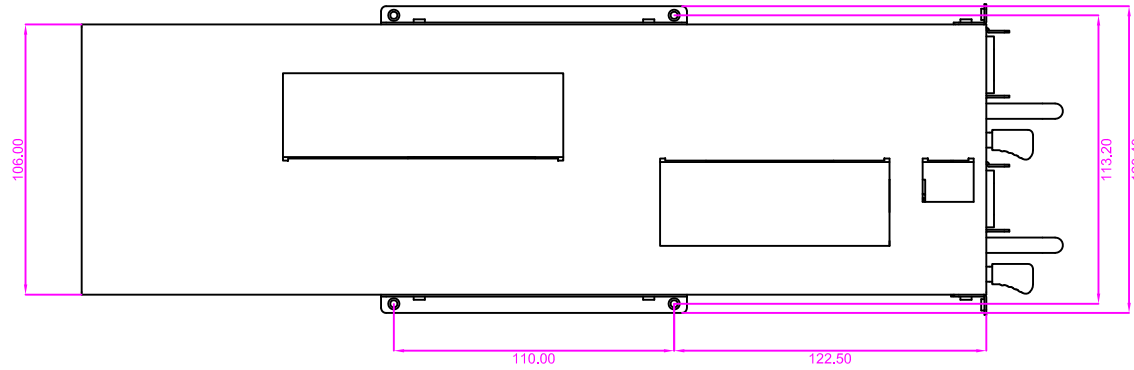
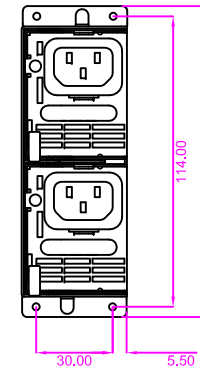
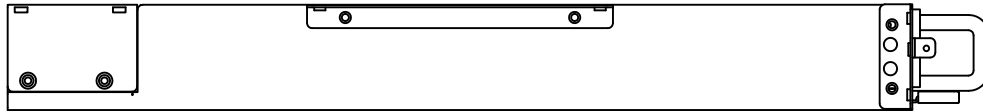
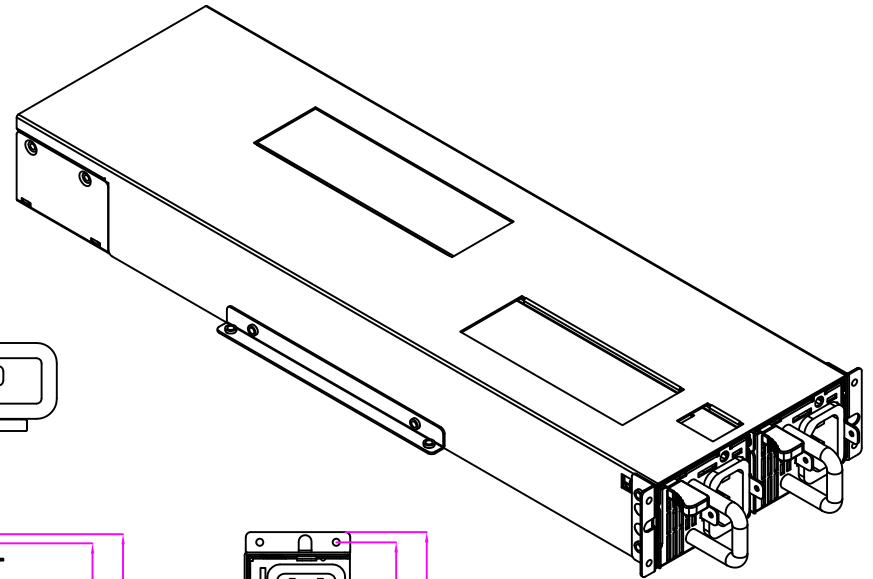
Address	b7	b6	b5	b4	b3	b2	b1	b0	R/W	Format	Description
00h				Number of character					RO	NUM	Number of character in Model Number
01h				Model number Char #1					RO	ASCII	Model number
02h				Model number Char #2					RO	ASCII	Model number
03h				Model number Char #3					RO	ASCII	Model number
04h				Model number Char #4					RO	ASCII	Model number
05h				Model number Char #5					RO	ASCII	Model number
06h				Model number Char #6					RO	ASCII	Model number
07h				Model number Char #7					RO	ASCII	Model number
08h				Model number Char #8					RO	ASCII	Model number
09h				Model number Char #9					RO	ASCII	Model number
0Ah				Model number Char #10					RO	ASCII	Model number
0Bh	X	X	X	X	PG ⁽²⁾	X	X	SMBAlert ⁽¹⁾	RO	ASCII	Power Supply Status
0Ch	X	X	X	Fan Fail ⁽⁵⁾	X	OTP ⁽⁴⁾	X	ac/dc ⁽³⁾	RO	ASCII	Power Supply Status
0Dh				Number of character					RO	NUM	Number of character in Serial Number
0Eh				Serial number Char #1					RO	ASCII	Serial number
0Fh				Serial number Char #2					RO	ASCII	Serial number
10h				Serial number Char #3					RO	ASCII	Serial number
11h				Serial number Char #4					RO	ASCII	Serial number
12h				Serial number Char #5					RO	ASCII	Serial number
13h				Serial number Char #6					RO	ASCII	Serial number
14h				Serial number Char #7					RO	ASCII	Serial number
15h				Serial number Char #8					RO	ASCII	Serial number
16h				Serial number Char #9					RO	ASCII	Serial number
17h				Serial number Char #10					RO	ASCII	Serial number
18h				Serial number Char #11					RO	ASCII	Serial number
19h				Serial number Char #12					RO	ASCII	Serial number
1Ah				Number of character					RO	NUM	Number of character in Revision Code
1Bh				Revision code Char #1					RO	ASCII	Revision code
1Ch				Revision code Char #2					RO	ASCII	Revision code
1Dh				Revision code Char #3					RO	ASCII	Revision code
1Eh				Revision code Char #4					RO	ASCII	Revision code
1Fh				MFG year					RO	NUM	XX, (0 - 255)
20h				MFG Week					RO	NUM	XX, (1-53)
21h				Reserved					RO	NUM	NA
22h				Reserved					RO	ASCII	NA
23h				Reserved					RO	ASCII	NA
24h				Reserved					RO	ASCII	NA
25h				Reserved					RO	ASCII	NA
26h				Reserved					RO	ASCII	NA
27h				Reserved					RO	ASCII	NA
28h				Reserved					RO	ASCII	NA
29h				Reserved					RO	ASCII	NA
2Ah				Reserved					RO	ASCII	NA
2Bh				Reserved					RO	ASCII	NA
2Ch				Reserved					RO	ASCII	NA
2Dh				Reserved					RO	ASCII	NA
2Eh				Reserved					RO	ASCII	NA
2Fh				+5V Output Voltage					RO	NUM	in milliVolts
30h				+5V Output Voltage Scale					RO	NUM	2 (10 ²)
31h				+12V Output Voltage					RO	NUM	in milliVolts
32h				+12V Output Voltage Scale					RO	NUM	2 (10 ²)
33h				-12V Output Voltage					RO	NUM	in milliVolts
34h				-12V Output Voltage Scale					RO	NUM	2 (10 ²)
35h				+3.3V Output Voltage					RO	NUM	in milliVolts
36h				+3.3V Output Voltage Scale					RO	NUM	2 (10 ²)
37h				Reserved					RO	ASCII	NA
38h				Reserved					RO	ASCII	NA
39h				+5V Output Current					RO	NUM	in milliAmps
3Ah				+5V Output Current Scale					RO	NUM	3 (10 ³)
3Bh				+12V Output Current					RO	NUM	in milliAmps
3Ch				+12V Output Current Scale					RO	NUM	3 (10 ³)
3Dh				-12V Output Current					RO	NUM	in milliAmps
3Eh				-12V Output Current Scale					RO	NUM	2 (10 ²)
3Fh				+3.3V Output Current					RO	NUM	in milliAmps
40h				+3.3V Output Current Scale					RO	NUM	3 (10 ³)
41h				Reserved					RO	ASCII	NA
42h				Reserved					RO	ASCII	NA
43h				Standby Output Voltage					RO	NUM	in milliVolts
44h				Standby Output Voltage Scale					RO	NUM	2 (10 ²)
45h				Standby Output Current					RO	NUM	in Amps, (0 - 255)
46h				Standby Current Scale					RO	NUM	3 (10 ³)
47h				Maximum Output Power Specification, Low Byte					RO	NUM	in Watts
48h				Maximum Output Power Specification, High Byte					RO	NUM	in Watts

Notes:

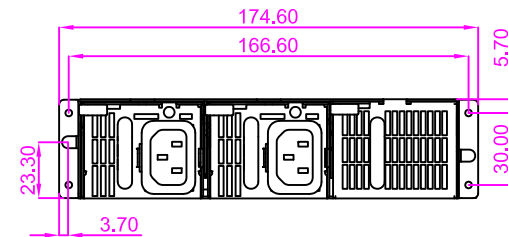
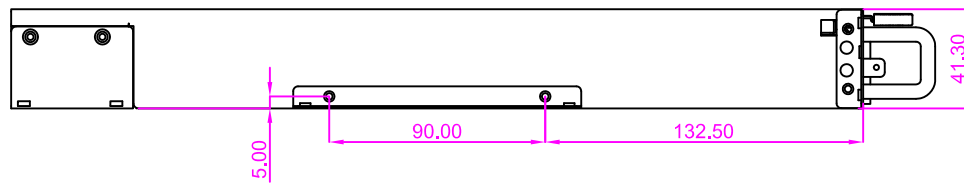
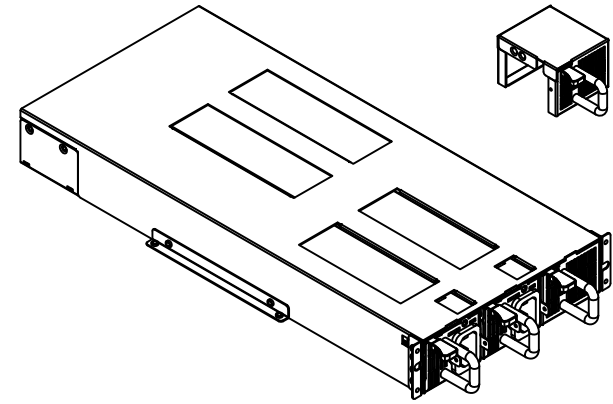
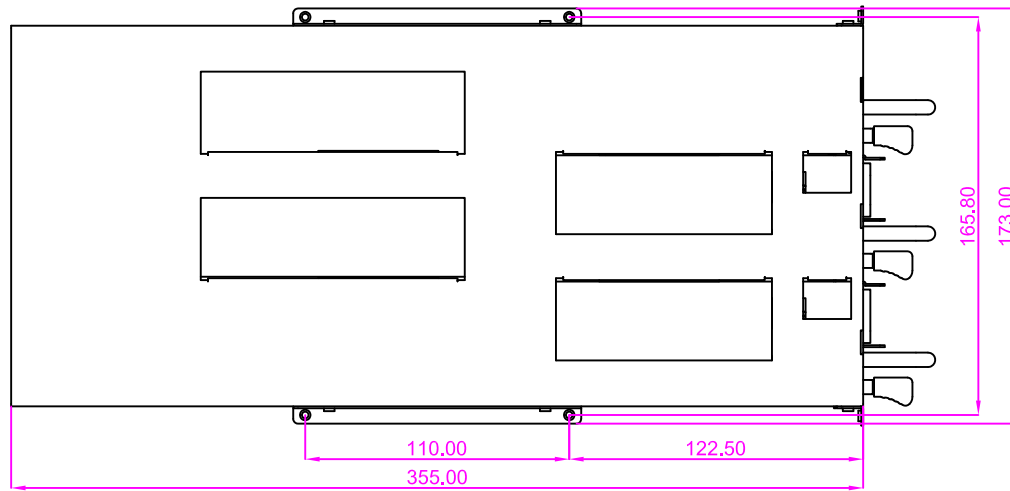
- 1) "0": PS operation normal; "1": faulty conditions detected, automatically cleared upon host reads 0Bh
- 2) "1": PWR_OK ok; "0" PWR_OK failure detected
- 3) "1": AC input; "0" DC input
- 4) "0" Temperature ok; "1" Over temperature detected
- 5) "0" Fan ok; "1" Fan failed




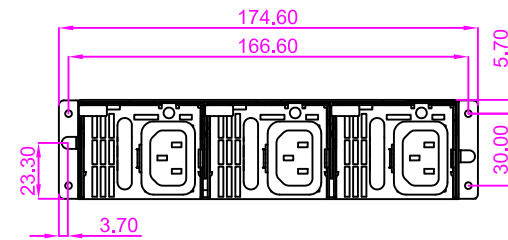
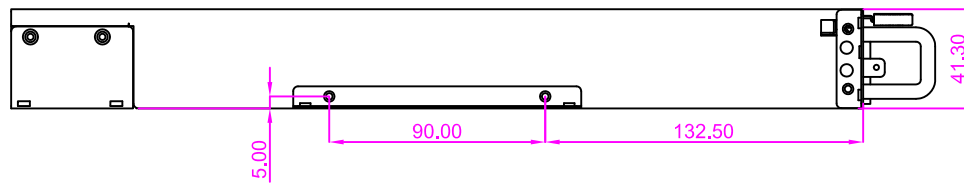
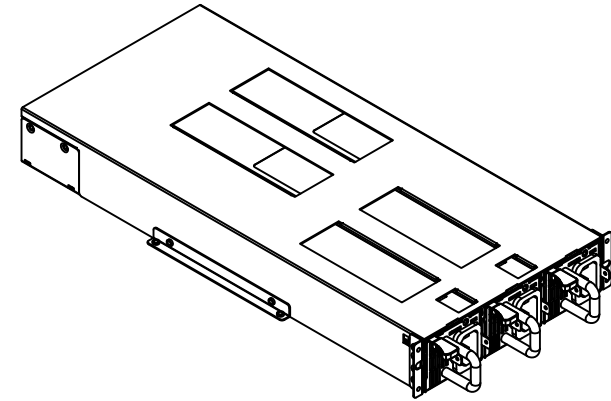
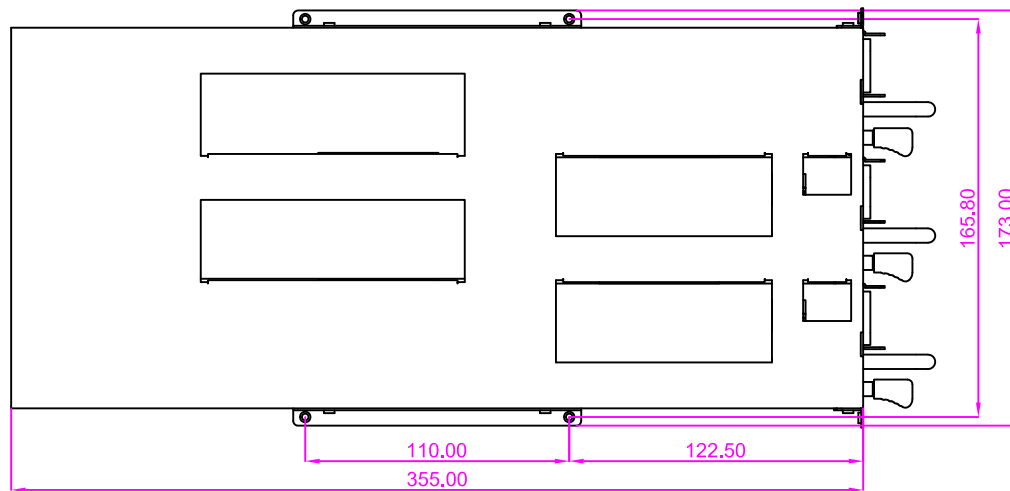
Drawing Number: GH-1U-AC04-21				Dimension	Tolerance
Model Number: RRAB GH Series				0.0~10.0	±0.1
Date	January 03, 2011	REV.	1.0	10~100	±0.2
Design	C.Y. Chen	UNIT	mm	100~400	±0.25
				400~	±0.3



Drawing Number: GH-1U-AC04-22				Dimension	Tolerance
Model Number: RRAB GH Series				0.0~10.0	±0.1
Date	January 03, 2011	REV.	1.0	10~100	±0.2
Design	C.Y. Chen	UNIT	mm	100~400	±0.25
				400~	±0.3



	Drawing Number: GH-IU-AC04-32			Dimension	Tolerance
	Model Number: RRAB GH Series			0.0~10.0	±0.1
Date	March 05, 2012	REV.	1.0	10~100	±0.2
Design	C.Y. Chen	UNIT	mm	100~400	±0.25
				400~	±0.3



Drawing Number: GH-1U-AC04-33				Dimension	Tolerance
Model Number: RRAB GH Series				0.0~10.0	±0.1
Date: March 05, 2012				10~100	±0.2
Date	REV.	1.0	100~400	±0.25	
Design	C.Y. Chen	UNIT	mm	400~	±0.3