Ḣ HiTRON

UNIVERSAL INPUT HARMONIC CORRECTION (PFC)
AC-DC N+1 REDUNDANCY AND LOAD SHARING
INTERNAL FRONT-END SWITCHING POWER SUPPLIES
2000 WATTS SINGLE OUTPUT WITH STANDBY HTCA2000R SERIES

FEATURES:

- **1U HEIGHT FRONT-END POWER SUPPLY**
- **BUILT-IN 5V/1A STANDBY POWER**
- **WIDE OPERATING TEMPERATURE RANGE OF -40°C TO +70 °C**
- **INTERNAL OR-ING DIODES FOR N+1 REDUNDANCY**
- **HOT-SWAPPABLE**
- **HIGH EFFICIENCY & DENSITY**
- **I²C/TxRx INTERFACE STATUS & CONTROL**
- **PROGRAMMMABLE OUTPUT VOLTAGE & CURRENT LIMITED**
- **CE LEVEL IV COMPLIANT**

SPECIFICATION

INPUT SPECIFICATION

Input Voltage: Typ. 90-264Vac.
Power Factor: Meet Harmonic Correction IEC 61000-3-2. Power Factor typ. 0.99.
Input Connector: Positronic 47-pin PCIH47M400A1.
Input Frequency: 47-63Hz.
Inrush Current: 18A(rms) at 230Vac; 39A (peak) at 230Vac.
Input Current: 13.5A at 115Vac / 9.5A at 230Vac.
Dielectric Withstand: Meet IEC 60950-1 regulation.
EMI: Meet EN 55022 FCC Class B.
Hold-up Time: Typ. 15mS at 115Vac. Typ. 8mS at 230Vac.
Remote ON/OFF: Available.
Power Fail Signal: Available.
Status LED: See Front panel LED status & monitoring signal.
Over Temperature Protection (OTP): Installed NTC and thermostat.
Leakage Current: Typ. 0.9mA at 230Vac.
No-Load Power: Typ.20Watt at 115Vac. Typ.18Watt at 230Vac.

OUTPUT SPECIFICATION

Output Voltage: See Ratings Chart.
Output Current: See Ratings Chart.
Output Power: Total continuous 1400W at 90-180Vac. Total continuous 2000W at 180-264Vac.
Output Connector: Positronic 47-pin PCIH47M400A1.
Line Regulation: VO1 typ. 0.5%, VO2 typ. 0.5%.
Load Regulation: VO1 typ. 1.0%, VO2 typ. 3%.
Total Regulation: VO1 typ. 2.0%, VO2 typ. 5.0%.
Noise & Ripple: Typ. 1% peak-peak.
OVP: Built-in at all outputs.
Adjustability: Available for VO1.
Hot-Swap: Available.
N+1 Redundancy: Installed with internal OR-ing diodes at all outputs and third-wire current sharing method for N+1 redundancy operation.
Current Sharing: Available for VO1.
DC OK Signal: Available for VO1.
Power OK Signal: Available for VO1.
Over Current Protection (OCP): Installed at each rail.
Overload Protection (OLP): Fully protected against output overload or short circuit. Programmable output current limited.

GENERAL SPECIFICATION

Efficiency: Typ. 91% at 115Vac, 93% at 230Vac.
Switching Frequency: 70KHz for PFC, 120KHz for PWM.
Circuit Topology: Interleaved PFC & ZVS Full-bridge circuit.
Transient Response: Peak transient less than 520mV and recover within 2ms at 25% load-change.
Safety Standard: IEC 60950-1 Class I.
Construction: 348 x 101.6 x40.2mm/13.7 x 4 x 1.58inch.

Operating Temperature: -40°C to +70 °C derate linearly from 100% power at +50 °C to 60% power at +70 °C. (Please refer to the derating chart)
Storage Temperature: -40°C to +85 °C.
Cooling: Built-in dual internal DC ball bearing fans with smart fan speed control.
Power Density: Typ. 15.7 Watts/ cubic inch at 90-180Vac. Typ. 22.4 Watts/ cubic inch at 180-264Vac.

NOTE: (1)All measurement are at nominal input, full load and +26℃ unless otherwise specifications.
(2)Due to requests in market and advances in technology, specifications subject to change without notification.
(3)A warm-up time 3 minutes is required after cold start at temperature from -40 °C to +0°C.

OUTPUT VOLTAGE / CURRENT RATINGS CHART

SINGLE OUTPUT w/Standby Power

MODEL NO.	MAIN +VO1 @★≡⊙					STANDBY +VO2 ⊙★				
	Min.	Typ.	**Volt.**	Max.	Peak	Min.	Typ.	**Volt.**	Max.	Peak
HTCA2000R-D500E	0A	28.0A	**+50V**	40A	40A	0A	1.0A	**+5V**	1.0A	1A
HTCA2000R-D600E	0A	24.0A	**+60V**	33A	33A	0A	1.0A	**+5V**	1.0A	1A
HTCA2000R-D840E	0A	16.7A	**+84V**	24A	24A	0A	1.0A	**+5V**	1.0A	1A

Symbol: "★" OVP built-in. "@" Adjustable. "≡" Load Sharing. "⊙" Installed with Or-ing diode.

Remark: 1. All signals are reference with V0-

2. HTCA2000R can provide maximum power 1400Watt while Vin at 90-180Vac and 2000Watt while Vin at 180-264Vac.

MECHANICAL DIMENSIONS: MM [INCHES]   WEIGHT: 2.30kg (5.1lb)
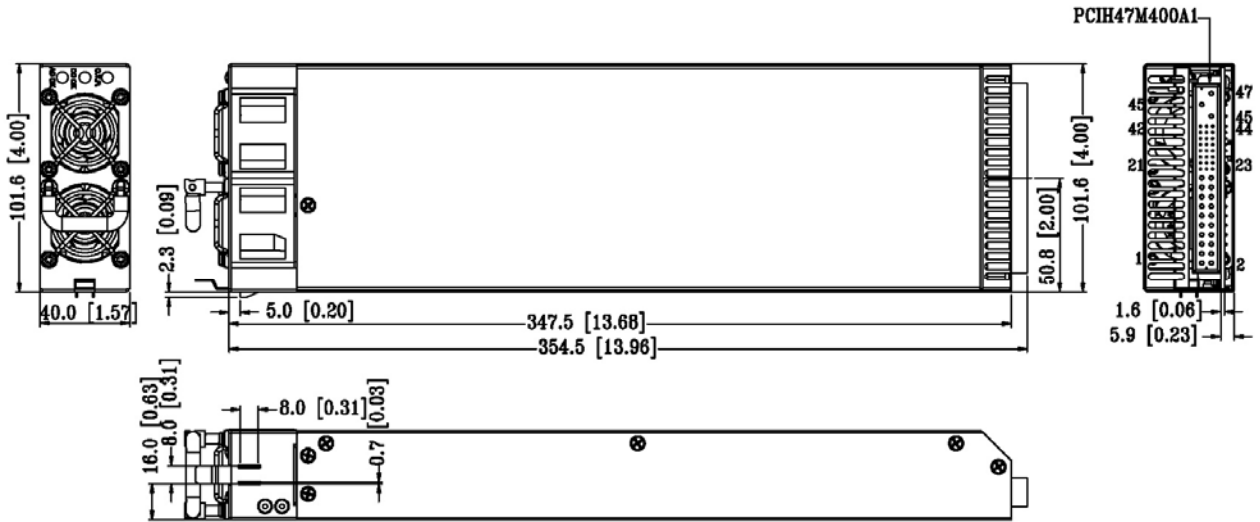
DERATING CHART

POWER DERATING CURVE
(When 180VAC ≥ I/P > 90VAC)

POWER DERATING CURVE
(When 264VAC ≥ I/P > 180VAC)

POWER DERATING CURVE
(When Ta ≤ 50°C)

INPUT & OUTPUT CONNECTORS PIN ASSIGNMENT

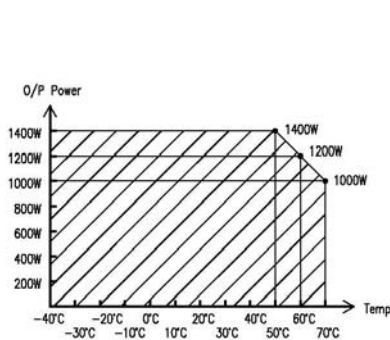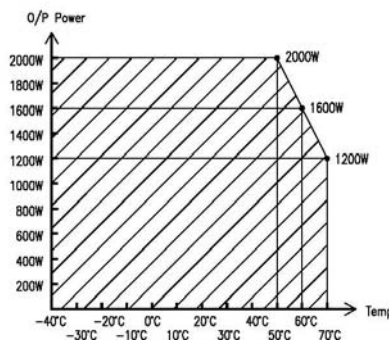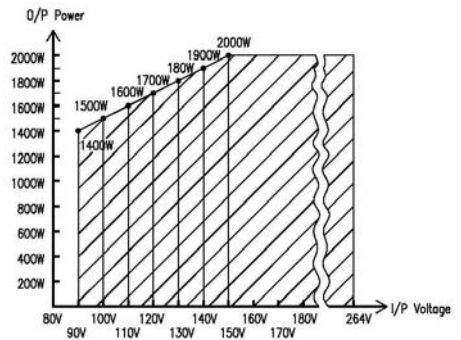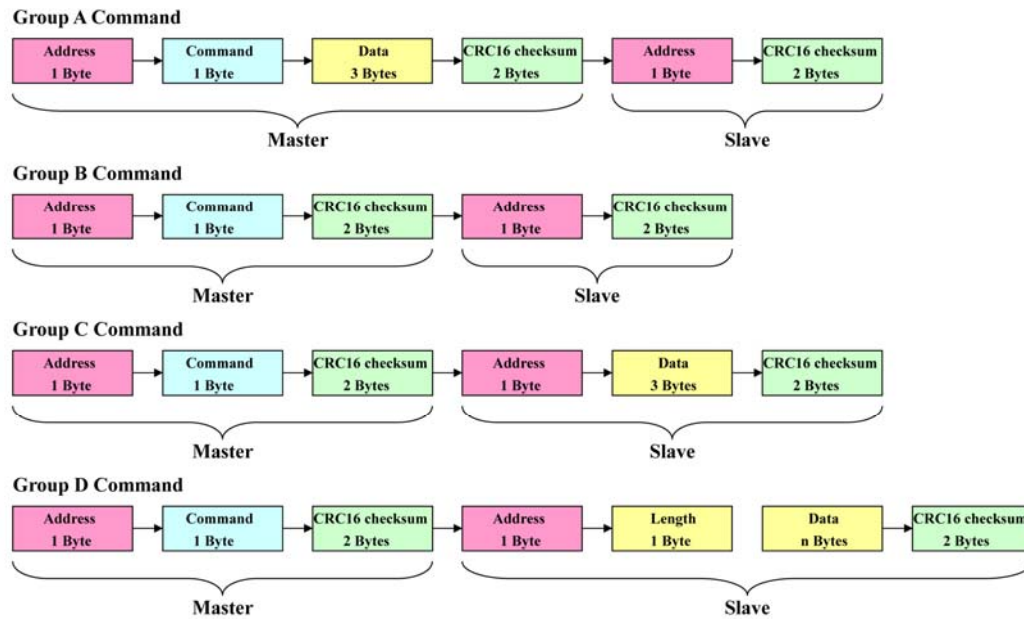| PIN NO.	ASSIGNMENT	REMARKS
3,4,5,6,7,8	V0+	Output voltage VO1
9,10,11,12,13,14	V0-	Return of output voltage VO1
19,43	+5VS	+5V Signal
22	S-RTN	Return of +5V Signal (Same level with VO-)
23	DC_OK	Active High for DC OK
25	A0	Address A0 of I^2C (Internal pull to High 3.3V)
26	Fan_Fail	Active Low for Fan Fail
27	EN	Active Low to Enable
28	A1	Address A1 of I^2C (Internal pull to High 3.3V)
31	A2	Address A2 of I^2C (Internal pull to High 3.3V)
32	P0.14(Alert)	Debug use & Alert for PM-Bus function (Active High to Run)
33	nRest	Debug use(Active to Reset MCU)
34	PS_PRNT	Pull to Low
35	CS	Current Share bus for VO1
36	TXD1	Tx (RS232 for ISP)
37	SCL	Clock Line of I^2C Interface
38	OTW	Active Low for Over Temperature
39	IHN	Active Low to Inhibit
40	SDA	Data Line of I^2C Interface
41	RXD1	Rx (RS232 for ISP)
42	AC_Fail	Active Low for AC Fail
44	H_POWER	Active Low for High Power
45	AC-G	AC-Earth/Ground Connection
46	AC-N	AC-Neutral Connection
47	AC-L	AC-Line Connection

FRONT PANEL LED STATUS & MONITORING SIGNAL

Condition	Front Panel LED Status			Monitoring Signal				
	AC OK (Green)	DC OK (Green)	Fault (Red)	AC_Fail	DC_OK	Fan_Fail	OTW	PS_PRNT
OK	1	1	0	High	Low	High	High	Low
Thermal Alarm	1	1	Blinks	High	Low	High	Low	Low
Thermal Shutdown	1	0	1	High	High	High	Low	Low
Defective Fan	1	0	1	High	High	Low	High	Low
Blown AC Fuse in unit	1	0	1	Low	High	High	High	Low
No AC <10mS (Single Unit)	0	1	0	Low	Low	High	High	Low
AC present but no within limits	Blinks	0	0	Low	High	High	High	Low
AC not present	0	0	0	Low	High	High	High	Low
Over Voltage Shutdown	1	0	1	High	High	Low	High	Low
Over Current	1	Blinks	0	High	Low	High	High	Low
Standby	1	0	0	High	High	High	High	Low

I²C COMMAND FORMAT

Group A Command

Master: Address 1 Byte → Command 1 Byte → Data 3 Bytes → CRC16 checksum 2 Bytes
Slave: Address 1 Byte → CRC16 checksum 2 Bytes

Group B Command

Master: Address 1 Byte → Command 1 Byte → CRC16 checksum 2 Bytes
Slave: Address 1 Byte → CRC16 checksum 2 Bytes

Group C Command

Master: Address 1 Byte → Command 1 Byte → CRC16 checksum 2 Bytes
Slave: Address 1 Byte → Data 3 Bytes → CRC16 checksum 2 Bytes

Group D Command

Master: Address 1 Byte → Command 1 Byte → CRC16 checksum 2 Bytes
Slave: Address 1 Byte → Length 1 Byte → Data n Bytes → CRC16 checksum 2 Bytes

Note: 1. There are four types of I2C command ,Group A-D, as below for MCU in HTC2000R series.
    2. The Frequency of I2C is set at 400KHz.
    3. After getting the command, the Slave must reply the Master within the period between 1uS and 2mS to avoid "time-out" problem.
    4. The time between Start bit of each byte format should be less then 400uS to avoid "Time-out" problem.

I²C COMMAND LIST

GROUP	COMMAND	DESCRIPTION	REMARK						
A	AAh	Set Output Voltage in mV.	Use 3 bytes binary value in mV and MSB first						
A	ACh	Set High line Output Current in mA	Use 3 bytes binary value in mA and MSB first						
A	AEh	Set Low line Output Current in mA	Use 3 bytes binary value in mA and MSB first.						
B	BAh	Turn on the main output.	N/A						
B	BCh	Turn off the main output.	N/A						
C	C1h	Read Fan 1 speed in RPM.	Use 3 bytes binary value in RPM and MSB first.						
C	C2h	Read Fan 2 speed in RPM.	Use 3 bytes binary value in RPM and MSB first.						
C	C3h	Read Output Voltage (Before Oring Diode) in mV	Use 3 bytes binary value in mV and MSB first.						
C	C4h	Read Output Voltage (After Oring Diode) in mV.	Use 3 bytes binary value in mV and MSB first.						
C	C5h	Read +5VSB Voltage (Before Oring Diode) in mV	Use 3 bytes binary value in mV and MSB first.						
C	C6h	Read +5VS Voltage (After Oring Diode) in mV	Use 3 bytes binary value in mV and MSB first.						
C	C7h	Read Ambient Temperature in ^{O}C./1000.	Use 3 bytes binary value in ^{O}C./1000. and MSB first.						
C	C8h	Read Working Temperature in ^{O}C./1000.	Use 3 bytes binary value in ^{O}C./1000. and MSB first.						
C	C9h	Read Output Current in mA.	Use 3 bytes binary value in mA and MSB first.						
C	CAh	Read the setting Voltage in mV	Use 3 bytes binary value in mV and MSB first.						
C	CBh	Read the High Power setting Current in mA	Use 3 bytes binary value in mA and MSB first.						
C	CCh	Read the Low Power setting Current in mA	Use 3 bytes binary value in mA and MSB first.						
C	CDh	Read Warming Status 1 : Warming, 0 : Normal	00h	00h	000b	OTW	AC-Fail	Fan_F	DC_OK	H_Power
D	DAh	Read equipment.	One Length byte & n data bytes in ASCII code.						
D	DCh	Read Hardware Version.	One Length byte & n data bytes in ASCII code.						
D	DEh	Read Software Version.	One Length byte & n data bytes in ASCII code.						

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Sep. 11 2013

4

ADDRESS DEFINITION

A2	A1	A0	I²C Bits 7-1	EEPROM(24C02) Bits 7-1
0	0	0	0011 000	1010 000
0	0	1	0011 001	1010 001
0	1	0	0011 010	1010 010
0	1	1	0011 011	1010 011
1	0	0	0011 100	1010 100
1	0	1	0011 101	1010 101
1	1	0	0011 110	1010 110
1	1	1	0011 111	1010 111

Tx/Rx COMMAND FORMAT

ASSIGNMENT	DESCRIPTION
F1	Read Fan 1 output
F2	Read Fan 2 output
V1	Read Output Voltage (Before Oring Diode)
V2	Read Output Voltage (After Oring Diode)
V3	Read +5VSB Voltage (Before Oring Diode)
V4	Read +5VSB Voltage (After Oring Diode)
SV	Set Output Voltage in mV (ex. SV 50000)
SH	Set High power Output Current in mA (ex. SH 40000)
SL	Set Low power Output Current in mA (ex. SL 28000)
C1	Read Output Current
T1	Read Ambient Temperature
T2	Read Working Temperature
RW	Read Output warning 1:warning 0:normal (OTW, AC_Fail, Fan_F, DC_OK, H_POWER)
RV	Read Output Voltage
RC	Read Output Current
Rv	Read Hardware Version & Software Version
RE	Read Equipment
PU	Power On
PD	Power Down
CR	Clear Record
RR	Read Record

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5

Tx/Rx COMMAND LIST

COMMAND	DESCRIPTION				
F1	Read Fan 1 speed in RPM				
F2	Read Fan 2 speed in RPM				
V1	Read Output Voltage (Before Oring Diode) in Volt				
V2	Read Output Voltage (After Oring Diode) in Volt				
V3	Read +5VSB Voltage (Before Oring Diode) in Volt				
V4	Read +5VS Voltage (After Oring Diode) in Volt				
T1	Read Ambient Temperature in ºC				
T2	Read Working Temperature in ºC				
C1	Read Output Current in mA				
SV	Set Output Voltage in mV				
SH	Set High line Output Current in mA				
SL	Set Low line Output Current in mA				
RV	Read the setting Voltage in Volt				
RC	Read the setting Current in Amp				
RW	Read Warming Status 1 : Warming, 0 : Normal				
	OTW	AC-Fail	FAN_F	DC_OK	H_Power
PU	Turn on the main output				
PD	Turn off the main output				
Rv	Read Hardware Version & Software version				
RE	Read equipment				
CR	Clear Record				
RR	Read Record				

Tx/Rx RECORD DEFINITION

ITEM	RECORD NUMBER	RECORD DESCRIPTION	REMARK
1	0h	Power-off by out of range of AC input voltage	AD1, AD2
2	1h	Power-off by out of range of Ambient Temperature	T1
3	2h	Power-off by out of range of Working Temperature	T2
4	3h	Power-off by out of range of output current	OCP/OLP/SC
5	4h	Power-off by RS232	N/A
6	5h	Power-off by I^{2}C	N/A
7	6h	Voltage setting is modified	N/A
8	7h	Current setting is modified	N/A
9	8h	Un-known	N/A
10	9h	N/A	N/A
11	Ah	N/A	N/A
12	Bh	N/A	N/A
13	Ch	N/A	N/A
14	Dh	N/A	N/A
15	Eh	N/A	N/A
16	Fh	N/A	N/A

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6