IS -500RSH1UP

Redundant Power Supply

(1U- 500W 1 + 1)

SPECIFICATION

Revision: 1.0

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1. General

This specification describes the electrical characteristics, functional and physical specification of 500 watts 1U redundant power supply based on ERP1U power module with active PFC (Power Factor Correction).

2. AC Input Characteristics

2.1 AC Input Voltage and Frequency (Rating: 100V-240Vac, 47-63Hz)

The power supply must operate within all specified limits over the input voltage range in table 1.
Harmonics distortion of up to 10% THD must not cause the power supply to go out of specified limits. Inrush current is tested at 25 ℃ambient and coldstart within 1/4 AC cycle. No damage shall be caused.

Parameter	Minimum	Rated	Maximum	Max. Current	Inrush Current
Voltage (115V)	90 Vac	100-127Vac	132 Vac	8A	40A@115VAC
Voltage (230V)	180 Vac	200-240Vac	264Vac	4A	80A@230VAC
Frequency	47 Hz	50 / 60 Hz	63 Hz		
Power Factor	Per EN61000-3-2			Min. 0.95@Full load	

Table 1 – AC Input Voltage, Frequency, and Inrush Current

2.2 AC Line Dropout

An AC line dropout shall not cause any tripping of control signals or protection circuits.
If the AC dropout, the power supply should recover and meet all turn on requirements. The power supply shall meet the regulation requirement over all rated AC voltages, frequencies, and output loading conditions. Any dropout of the AC line shall not cause damage to the power supply. An AC line dropout is defined as a drop in AC line to 0VAC at any phase of the AC line for any length of time.

2.3 AC Line Transients

AC line transient conditions shall be defined as “sag” and “surge” conditions. Sag conditions (also referred to as “brownout” conditions) will be defined as the AC line voltage dropping below nominal. Surge Conditions will be defined as the AC line voltage rising above nominal voltage.

The power supply shall meet the regulation requirements under the following AC line sag and surge conditions per EN61000-4-11.

Duration	Sag	Operating AC Voltage	Line Frequency	Load	Performance Criteria
Continuous	10%	Nominal AC Input ranges	50/60 Hz	100%	No loss of function or performance
0-1AC cycle	100%	Nominal AC Input ranges	50/60 Hz	80%	No loss of function or performance
> 1 AC cycle	> 10%	Nominal AC Input ranges	50/60 Hz	100%	Loss of function Acceptable,

Table 2 – AC Line Sag Transient Performance

Duration	Surge	Operating AC Voltage	Line Frequency	Performance Criteria
Continuous	10%	Nominal AC Voltage	50/60 Hz	No loss of function or performance
0 - ½ AC cycle	30%	Mid-point of Nominal AC Voltage	50/60 Hz	No loss of function or performance

Table 3 – AC Line Surge Transient Performance

3. DC Output Specification

3.1 Output Current / Loading

Output Voltage	+3.3V	+5V	+12V	-12V	+5VSB
Max. Load	20A	20A	38A	0.5A	3A
Min. Load	0.5A	0.5A	1A	0A	0.1A

Table 4 – Load Range:

Note: 1. +3.3V and +5V combined output shall not exceed 140W

2. Total combined output shall not exceed 500W

3.2 DC Voltage Regulation, Ripple and Noise

Output Voltage	+3.3V	+5V	+12V	-12V	+5VSB
Load Reg.	±5%	±5%	±5%	±5%	±5%
Line Reg.	±1%	±1%	±1%	±1%	±1%
Ripple & Noise	60mV	60mV	120mV	120mV	50mV

Table 5 – Regulation, ripple and noise

The maximum allowed ripple/noise output of the power supply is defined in table 5. This is measured over a bandwidth of 0 Hz to 20 MHz at the power supply output connectors. A 10 μF tantalum capacitor in parallel with a 0.1 μF ceramic capacitor are placed at the point of measurement.

3.3 Dynamic Loading

The output voltages shall remain within the limits specified in table 5 for the step loading and within the limits specified in table 7 for the capacitive loading. The load transient repetition rate shall be tested between 50Hz and 5kHz at duty cycle ranging from 10%-90%. The load transient repetition rate is only a test specification. The Δ step load may occur anywhere within the MIN load to the MAX load shown in table 4.

Output	Δ Step Load Size	Load Slew Rate	Capacitive Load
+12V	50% of Max. Load	0.5 A/uS	2200 uF
+3.3V/+5V	30% of Max. Load	0.5 A/uS	1000 uF
+5VSB	25% of Max. Load	0.5 A/uS	1 uF

Table 6 – Transient Load requirements

3.4 Capacitive Loading

The power supply shall be stable and meet all requirements, except dynamic loading requirements, with the following capacitive loading ranges.

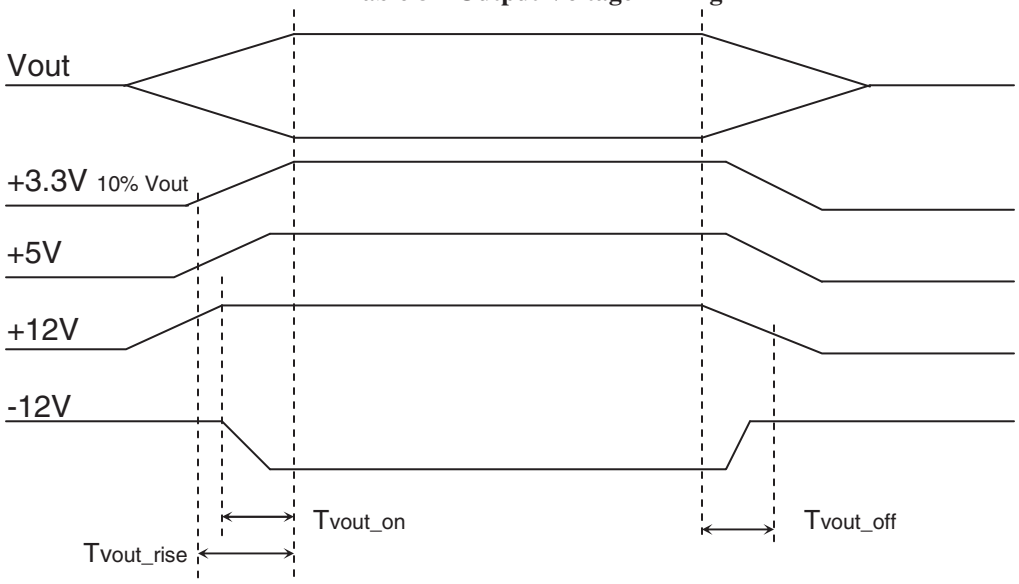
Output	MIN	MAX	Units
+12V	10	11,000	uF
+3.3V/+5V	10	12,000	uF
-12V/+5VSB	1	350	uF

Table 7 – Capacitive Loading Conditions

3.5 Timing Requirements

Item	Description	MIN	MAX	Units
Tvout_rise	Output voltage rise time from each output	1	20	ms
Tvout_on	All main outputs must be within regulation of each other within this time		20	ms
Tvout_off	All main output must leave regulation within this time		400	ms

Table 8 – Output Voltage Timing



Item	Description	MIN	MAX	Units
Tac_on-delay	Delay from AC being applied to all output voltages being within regulation.		2500	ms
Tsb_on-delay	Delay from AC being applied to +5VSB being with regulation		1500	ms
Tvout_holdup	Time all output voltage stay within regulation after loss of AC , tested at 80% load.	16		ms
Tpwok_holdup	Delay from loss of AC to deassertion of PWOK. Tested at 80% of maximum load and over 100-240VAC input.	15		ms
Tps_on-delay	Delay from PSON# active to output voltages within regulation limits.	5	400	
Tpson_pwok	Delay from PSON# deactive to PWOK being deasserted.		50	
Tpwok_on	Delay from output voltages within regulation limits to PWOK asserted at turn on.	100	500	
Tpwok_off	Delay from PWOK deasserted to output voltages (3.3 V, 5 V, 12 V, -12 V) dropping out of regulation limits.	1		
Tpwok_low	Duration of PWOK being in the deasserted state during an off/on cycle using AC or the PSON# signal	100		
Tsb_vout	Delay from 5 VSB being in regulation to O/Ps being in regulation at AC turn on.	50	1000	

Table 9 – Turn On/Off Timing

3.6 Overshoot at Turn-on /Turn-off

Any output overshoot at turn on shall be less than 10% of the nominal output value. Any overshoot shall recover to within regulation in less than 10ms.

3.7 Efficiency

The minimum power supply system efficiency shall be 80% at typical load, measured at normal input voltage 115 V.

4. Protection

Protection circuits inside the power supply shall cause only the power supply's main outputs to shutdown. If the power supply latches off due to a protection circuit tripping, an AC cycle OFF for 15 sec and PSON# cycle HIGH for 1 sec must be able to reset the power supply.

4.1 Over Current Protection

The power supply shall have current limit from exceeding the values shown in table 10. If the current limits are exceeded the power supply shall shutdown and latch off. The power supply shall not be damaged from repeated power cycling in this condition.

Voltage	Minimum	Maximum	Shutdown Mode
+12V	42A	57A	Latch Off
+3.3V/+5V	22A	30A	Latch Off

Table 10 –Over Current Protection

4.2 Over Voltage Protection

The power supply shall shut down in a latch off mode when the main output voltage exceeds the over voltage limit shown in Table 11.

Voltage	Minimum	Maximum	Shutdown Mode
+12V	+12.8V	+14.5V	Latch Off
+3.3V	+3.9V	+4.5V	Latch Off
+5V	+5.7V	+6.5V	Latch Off

Table 11 –Over Voltage Protection

4.3 Short Circuit Protection

The power supply shall shut down in a latch off mode when the output voltage is short circuit.

4.4 Over Temperature Protection

The power supply will shutdown due to an over temperature condition. No damage shall be caused.

4.5 No Load Operation

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

5. Environmental Requirements

Parameter	Standards	Conditions
Operating Temperature	0~50℃	Start to derate from 50℃, 5W/℃
Storage Temperature	-20~80℃	
Relative Humidty	20~90%RH while operating	Non-condensing
Insulation Resistance	Primary to Secondary Primary to FG	30 meg.ohm; min.500VDC
Hipot Test	Primary to Secondary Primary to FG	3000VAC for 1min 1800VAC/3sec test for production

Table 12 –Environmental Requirement

6. Agency Requirements

6.1 EMC Requirement

Electromagnetic Interference	FCC CFR Title 47 Part 15 Sub Part B EN55022/EN55024	Conducted B Class Radiated A Class
Harmonics	IEC61000-3-2 Class D	
Flicker	IEC61000-3-3	
ESD Susceptibility	EN-61000-4-2	±8KV by Air, ±4KV by Contact Performance Criteria B
Radiated Susceptibility	EN61000-4-3	80MHz~1000MHz (3V/m(mns) Amplitude 80% AM 1KHz Criteria A
EFT/Burst	EN61000-4-4	5KHz, AC: 1KV, DC: 0,5 KV, Performance Criteria B
Surge Voltage	EN61000-4-5	Line-to-Line: 1KV Line-to-Ground: 2KV Performance Criteria B
Conducted Susceptibility	EN61000-4-6	0.15MHz~80MHz 3V/m Amplitude 80% AM 1KHz Performance Criteria A
RF Conducted	EN61000-4-8	50 Hz/3A(ms)/m Performance Criteria A
Voltage Dips and Interruptions	EN61000-4-11	30%(Voltage Dips), 10ms, Performance Criteria B 60%(Voltage Dips), 100ms, Performance Criteria C >95%(Voltage Dips), 500ms， Performance Criteria C
Leakage Current	EN60950-1	3.5mA@240VAC

Table 13 –EMC Spec

6.2 Safety Requirement

This PSU is designed to meet safety requirement as follows:

UL,cUL UL60950-1
CB IEC60950-1
TUV EN60950-1
BSMI
CCC

7. Reliability

7.1 Mean Time Between failures (MTBF)

The MTBF of the power supply shall be calculated utilizing the Part-Stress Analysis method of Bellcore RPP or MIL217F. The calculated MTBF of the power supply shall be greater than 100,000 hours under full rated load; 115VAC input; Ground Benign; 25°C

8. Connections

8.1 AC Input Connector

The AC input receptacle (CN1) shall be a 3 pins inlet.

9.LED Indicators

There will be a LED on each power module to indicate power status

Power Supply Status	Color
Normal(AC OK)	Green
Standby (Only +5VSB output) (AC OK)	Blinking Green
Power Fail	Red
Fan Fail	Blinking Red
AC Loss	Red

Table 14: LED Color and Power Status

10. Signals from Wire Harness

Power Supply Status	Signal Type
Normal(AC OK)	High
Power Fail	Low
Fan Fail	Low
AC Loss	Low

Table 15: Signals from Wire Harness

11. Buzzer Status

Alarm reset is used to clear power fail status by shorting circuit activities.
Buzzer shall alarm if signal goes low.

Power Supply Status	Buzzer Status
Normal (AC OK)	Mute
Power Fail	Alarm
Fan Fail	Alarm
AC Loss	Alarm

Table 16: Buzzer Status

12. PMBus Managerial Function

Support PMBus mastering, support standard power supply managerial command, and at the same time provide below information:

12.1 Detect and Report Hot-Plug Activities

12.2 Detect and Report AC Lost/Recovery

12.3 Detect and Report Redundancy Status

12.4 Detect and Report Input Voltage/Current/Power

12.5 Detect and Report Output Voltage/Current/Power

12.6 Detect and Report FAN RPM

12.7 Detect and Report Temperature

12.8 Command Summary:

Command Code	Command Name	SMBus Transaction Type	Number of Data Bytes
19h	CAPABILITY	Read Byte	1
1Ah	QUERY	Read Byte	1
88h	READ_VIN(Note1)	READ WORD	2
89h	READ_IIN	READ WORD	2
8Bh	READ_VOUT	READ WORD	2
8Ch	READ_IOUT	READ WORD	2
8Dh	READ_TEMPERATURE_1	READ WORD	2
90h	READ_FAN_SPEED_1	READ WORD	2
91h	READ_FAN_SPEED_2	READ WORD	2
96h	READ_POUT	READ WORD	2
97h	READ_PIN	READ WORD	2
98h	PMBUS_REVISION	READ BYTE	1
99h	MFR_ID	R/W Block	Variable
9Ah	MFR_MODEL	R/W Block	Variable
9Bh	MFR_REVSION	R/W Block	Variable
9Eh	MFR_SERIAL	R/W Block	Variable
A0h	MFR_VIN_MIN	READ_WORD	2
A1h	MFR_VIN_MAX	READ_WORD	2
A7h	MFR_POUT_MAX	READ_WORD	2
B0h	USER_DATA_00	READ BYTE	1

Note1: If AC Input= 90V ~ 180V PMBus sent the value of 115V
If AC Input= 181V ~ 264V PMBus sent the value of 230V

MFR Meaning

Command Code	Command Name	Meaning
99h	MFR_ID	ETASIS
9Ah	MFR_MODEL	EFRP-S507
9Bh	MFR_REVSION	A0 ~ Z9
9Eh	MFR_SERIAL	Code = 12
A0h	MFR_VIN_MIN	100VAC
A1h	MFR_VIN_MAX	240VAC
A7h	MFR_POUT_MAX	500W

Status BYTE Message Contents
Command code = B0h (Command name = USER_DATA_00)

Bit Number	Status Bit Name	Meaning
7	Reserved	Default=0
6	Reserved	Default=0
5	Reserved	Default=0
4	Reserved	Default=0
3	Reserved	Default=0
2	Module Status	Inserted=0, Not inserted=1
1	PS_ON Status	PS_OFF=0, PS_ON=1
0	AC Status	AC OK=0, AC Fail=1

Device address locations

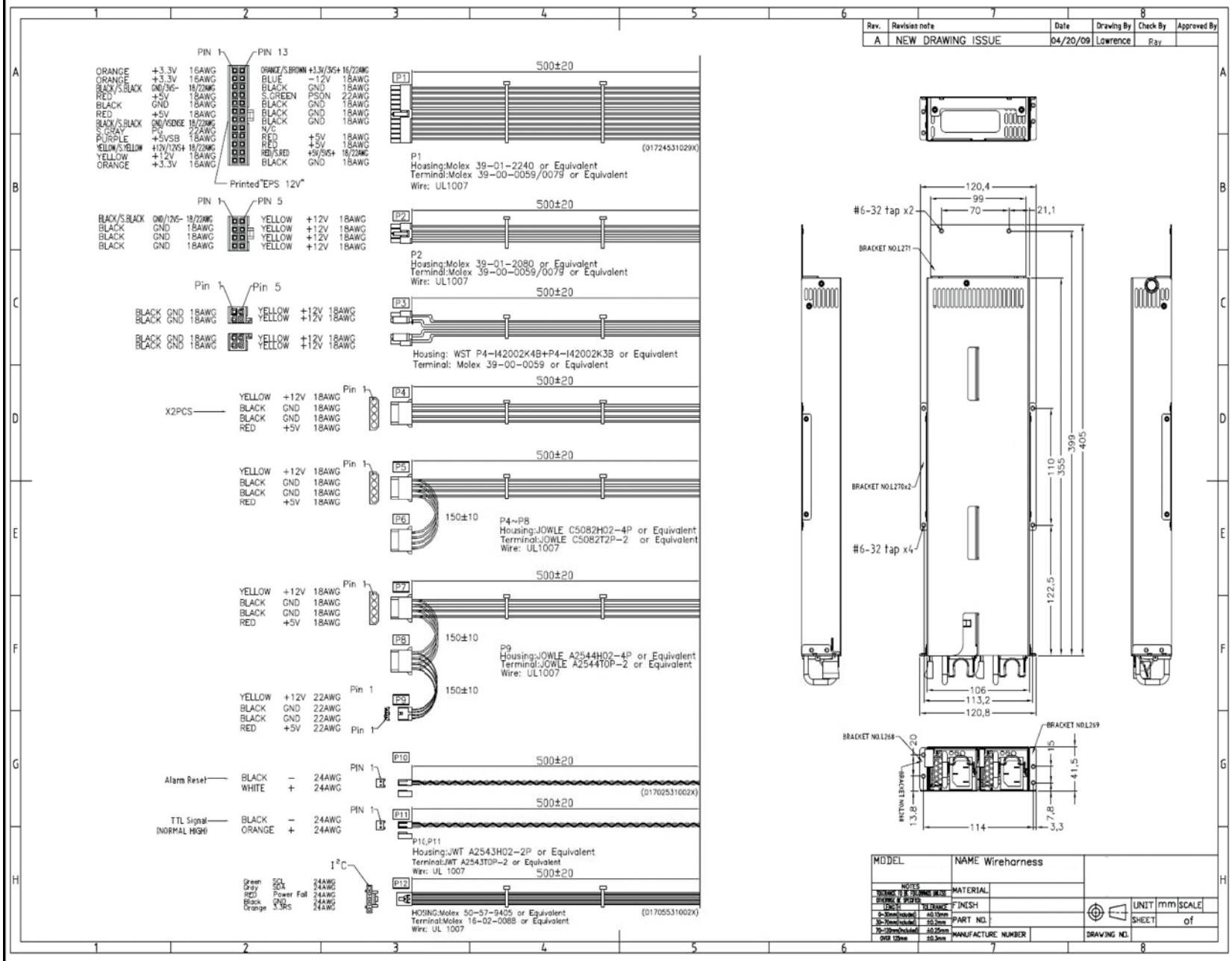
PDB adderss A0/A1	0/0	0/1	1/0	1/1
PSU PMBUS Device	B0h	B2h	B4h	B6h

13. Physical Characteristics Size

13.1 Dimension : 106mm(W) x 41.5mm(H) x 355mm(D)

13.2 Weight: Under 3 Kg

13.3 Outline Drawing and Wire Harness:


Rev. | Revision note | Date | Drawing By | Check By | Approved By
A | NEW DRAWING ISSUE | 04/20/09 | Lowrence | Ray
PIN 1
PIN 13
ORANGE +3.3V 16AWG
ORANGE +3.3V 16AWG
BLACK/S.BLACK GND/3VS- 18/22AWG
RED +5V 18AWG
BLACK GND 18AWG
RED +5V 18AWG
BLACK/S.BLACK GND/VSENSE 18/22AWG
S.GRAY PS_ 22AWG
PURPLE +5VSB 18AWG
YELLOW/S.YELLOW +12V/12VS+ 18/22AWG
YELLOW +12V 18AWG
ORANGE +3.3V 16AWG
ORANGE/S.BROWN +3.3V/3VS+ 16/22AWG
BLUE -12V 18AWG
BLACK GND 18AWG
S.GREEN PSON 22AWG
BLACK GND 18AWG
BLACK GND 18AWG
BLACK GND 18AWG
N/C
RED +5V 18AWG
RED +5V 18AWG
RED/S.RED +5V/5VS+ 18/22AWG
BLACK GND 18AWG
Printed"EPS 12V"
500±20
P1
(01724531029X)
P1
Housing:Molex 39-01-2240 or Equivalent
Terminal:Molex 39-00-0059/0079 or Equivalent
Wire: UL1007
PIN 1
PIN 5
BLACK/S.BLACK GND/12VS- 18/22AWG
BLACK GND 18AWG
BLACK GND 18AWG
BLACK GND 18AWG
YELLOW +12V 18AWG
YELLOW +12V 18AWG
YELLOW +12V 18AWG
YELLOW +12V 18AWG
500±20
P2
Housing:Molex 39-01-2080 or Equivalent
Terminal:Molex 39-00-0059/0079 or Equivalent
Wire: UL1007
Pin 1
Pin 5
BLACK GND 18AWG
BLACK GND 18AWG
YELLOW +12V 18AWG
YELLOW +12V 18AWG
500±20
Housing: WST P4-I42002K4B+P4-I42002K3B or Equivalent
Terminal: Molex 39-00-0059 or Equivalent
X2PCS
YELLOW +12V 18AWG
BLACK GND 18AWG
BLACK GND 18AWG
RED +5V 18AWG
Pin 1
500±20
150±10
P4~P8
Housing:JOWLE C5082H02-4P or Equivalent
Terminal:JOWLE C5082T2P-2 or Equivalent
Wire: UL1007
500±20
150±10
P9
Housing:JOWLE A2544H02-4P or Equivalent
Terminal:JOWLE A2544T0P-2 or Equivalent
Wire: UL1007
YELLOW +12V 22AWG
BLACK GND 22AWG
BLACK GND 22AWG
RED +5V 22AWG
Pin 1
Pin 1
150±10
Alarm Reset
BLACK - 24AWG
WHITE + 24AWG
500±20
(01702531002X)
TTL Signal (NORMAL HIGH)
BLACK - 24AWG
ORANGE + 24AWG
500±20
P10,P11
Housing:JWT A2543H02-2P or Equivalent
Terminal:JWT A2543T0P-2 or Equivalent
Wire: UL 1007
I²C
Green SCL 24AWG
Gray SDA 24AWG
RED Power Fail 24AWG
Black GND 24AWG
Orange 3.3RS 24AWG
500±20
HOSING:Molex 50-57-9405 or Equivalent
Terminal:Molex 16-02-0088 or Equivalent
Wire: UL 1007
(01705531002X)
120,4
99
70
21,1
#6-32 tap x2
BRACKET NO.L271
BRACKET NO.L270x2
#6-32 tap x4
110
355
399
405
122,5
106
113,2
120,8
BRACKET NO.L268
BRACKET NO.L269
20
15
41,5
13,8
7,8
3,3
114
MODEL
NAME Wireharness
NOTES
MATERIAL
FINISH
PART NO.
MANUFACTURE NUMBER
UNIT mm SCALE
SHEET of
DRAWING NO.