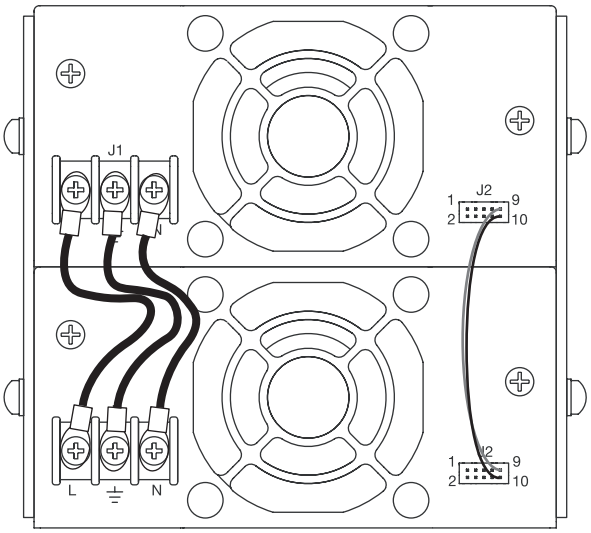
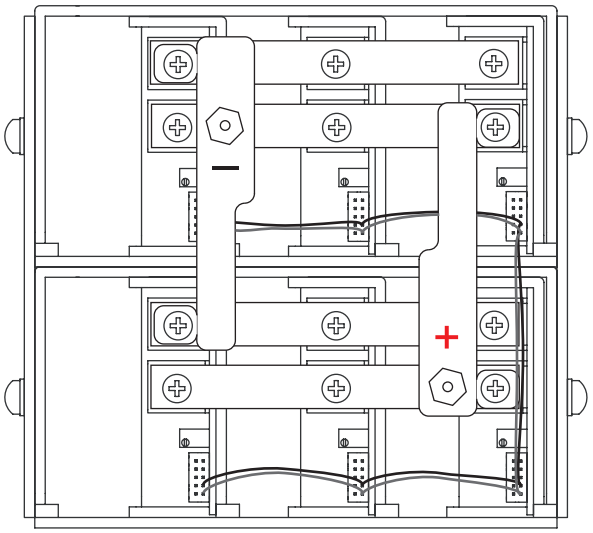
# SYNRAD DC-48 DC Power Supply
# (XP Power X7DD)




Front (AC Input)




Rear (DC Output)

* CHASSIS SIZE (HxWxL)  5 x 5.2 x 10 inches.

* For single-phase operation (85–264 VAC):
  1400W low line (90–132 VAC).
  1800W high line (180–264 VAC).

* Connect AC Line (Hot) to ‘L’ terminal on J1.
* Connect AC Neutral to ‘N’ terminal on J1.
* Attach safety ground (earth) to Ground (⏚) terminal on J1.

* Connect DC Positive (red wire) to Positive (+) 48 VDC terminal post.
* Connect DC Return (black wire) to Negative (–) terminal post.

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P/N 900-19799-01

4600 Campus Place • Mukilteo, WA 98275 • (425) 349-3500 • Fax (425) 349-3667

# 400-2400 Watts
# fleXPower Series



- Industrial/IT & Medical Approvals
- Configurable for Fast Time to Market
- SEMI F47 Compliant
- Flexible Series & Parallel Capability
- Output Voltages up to 150 VDC
- -20 °C Operation
- Extra Power Available at High Line

## Specification

### Input

| | |
|---|---|
| Input Voltage | • 85-264 VAC (120-370 VDC). Full power at 90 VAC, derate by 10% at 85 VAC |
| Input Frequency | • 47-63 Hz, 400 Hz (unit meets all specs at 400 Hz, except leakage current) |
| Input Current[1] | • X4: 5.33 A at 115 VAC, 2.67 A at 230 VAC<br>X5: 6.67 A at 115 VAC, 3.33 A at 230 VAC<br>X7: 9.33 A at 115 VAC, 4.67 A at 230 VAC<br>X9: 12.0 A at 115 VAC, 6.00 A at 230 VAC<br>X10: 13.3 A at 115 VAC, 6.67 A at 230 VAC |
| Inrush Current[1] | • X4, X5, X7: <20 A, X9/X10: <40 A |
| Power Factor | • 0.99 typical at 115 VAC & 230 VAC full load |
| Earth Leakage Current[1] | • X models <1.5 mA at 264 VAC, 50 Hz<br>XM models <200 µA at 264 VAC, 50 Hz |
| Input Protection | • Dual fusing, line & neutral |

### Output

| | |
|---|---|
| Output Power | • See tables. Chassis can deliver an extra 200 W at high line (180-264 VAC) |
| Output Voltage | • See table |
| Output Voltage Trim | • ±10% |
| Minimum Load | • No min load required for 2 slot or 3 slot single output modules. 2 slot dual outputs require 10% load on V1 to meet specified regulation on V2 output |
| Start Up Delay | • 2 s max |
| Hold Up Time | • 20 ms from 90 VAC input & full output load |
| Line Regulation | • <0.1% |
| Load Regulation | • <1.0% |
| Ripple & Noise | • 50 mV or 1% pk-pk at 20 MHz BW, whichever is greater |
| Overvoltage Protection | • 115-130% Vnom |
| Overtemperature Protection | • 115 °C measured internally, recycle mains to reset |
| Overload Protection | • 110-140% |
| Short Circuit Protection | • Continuous |
| Temperature Coefficient | • 0.03%/°C |
| Remote Sense | • Compensates for up to 0.5 V drop |
| Enable/Inhibit | • See chassis signals page |
| Current Share | • See module signals page |
| Housekeeping Voltage | • 5 V/1 A from each chassis |

### General

| | |
|---|---|
| Efficiency | • 83.5% typical at 115 VAC |
| Isolation | • 4000 VAC Input to Output<br>1500 VAC Input to Ground<br>250 VDC Output to Ground |
| Switching Frequency | • 60 kHz typ PFC, 200 kHz typ modules |
| Signals | • See chassis & module signals pages |
| MTBF | • 225 kHrs to MIL-HDBK-217F at +25 °C |

### Environmental

| | |
|---|---|
| Operating Temperature | • -20 °C to +70 °C. For operation above +50 °C, derate linearly to 50% load at +70 °C. Reverse air option derate from +40 °C to half load at +60 °C |
| Cooling | • Forced air cooling (via field-replaceable internal fan) |
| Operating Humidity | • 5-95% RH, non-condensing |
| Storage Temperature | • -40 °C to +85 °C |
| Operating Altitude | • 3000 m at full specification |
| Shock | • MIL STD-810 Method 516.4 Procedure 1, 30 g, half sine, 6 axis |
| Vibration | • MIL STD-810 Method 514.4 Procedure 1, 1 g rms, 5-500 Hz, 3 axis |

### EMC & Safety

| | |
|---|---|
| Emissions | • X version: EN55022 (CISPR22) Class B conducted<br>XM version: EN55011 (CISPR 11) Class A conducted |
| Immunity | • EN60601-1-2, EN61204-3 |
| Harmonic Currents | • EN61000-3-2 |
| Voltage Flicker | • EN61000-3-3 |
| ESD Immunity | • EN61000-4-2, level 4 Perf Criteria A |
| Radiated Immunity | • EN61000-4-3, 10 V/m Perf Criteria A |
| EFT/Burst | • EN61000-4-4, level 3 Perf Criteria A |
| Surge | • EN61000-4-5, level 3 Perf Criteria A |
| Conducted Immunity | • EN61000-4-6, level 3 Perf Criteria A |
| Dips & Interruptions | • EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B |
| Safety Approvals | • EN60950-1, UL60950-1, CSA22.2 No. 60950-1-03, EN60601-1, UL60601-1, SEMI F47 |

### Note

*1. Current specifications double for DD chassis versions.*

# Configuration - Model Number Construction



The fleXPower range allows for simple configuration of a custom modular power supply with up to fourteen outputs. The chassis consists of either ten, twelve or fourteen slots, and modules are either two or three slots wide.

| CHASSIS | OUTPUT MODULES 1-5 (1-6: 900 W chassis/ 1-7: 1000 W chassis) | | | | | | | OPTIONS | |
|---|---|---|---|---|---|---|---|---|---|
| | MOD. 1 | MOD. 2 | MOD. 3 | MOD. 4 | MOD. 5 | MOD. 6 | MOD. 7 | | |
| X X X | - | | | | | | | - | P P S S + + |

| Chassis Designations, Power & sizes | | |
|---|---|---|
| Code | Power | Slots |
| X4 | 400 W Industrial | 10 |
| X5 | 500 W Industrial | 10 |
| X7 | 700 W Industrial | 10 |
| X9 | 900 W Industrial | 12 |
| X10 | 1000 W Industrial | 14 |
| XM4 | 400 W Medical | 10 |
| XM5 | 500 W Medical | 10 |
| XM7 | 700 W Medical | 10 |
| XM9 | 900 W Medical | 12 |
| XM10 | 1000 W Medical | 14 |

Power increases by 200 W at high line (180-264 VAC).

| Single Output - Module Voltage/Current Rating | | | |
|---|---|---|---|
| Voltage | Current | Slots | Code |
| 3.3 V | 40.0 A | 2 | 2C |
| 3.3 V | 60.0 A | 3 | 3C |
| 5.0 V | 40.0 A | 2 | 2D |
| 5.0 V | 60.0 A | 3 | 3D |
| 12.0 V | 17.0 A | 2 | 2J |
| 12.0 V | 25.0 A | 3 | 3J |
| 15.0 V | 14.0 A | 2 | 2L |
| 15.0 V | 20.0 A | 3 | 3L |
| 24.0 V | 10.5 A | 2 | 2P |
| 24.0 V | 17.0 A | 3 | 3P |
| 28.0 V | 9.0 A | 2 | 2Q |
| 28.0 V | 14.0 A | 3 | 3Q |
| 36.0 V | 7.0 A | 2 | 2U |
| 36.0 V | 11.0 A | 3 | 3U |
| 48.0 V | 5.2 A | 2 | 2W |
| 48.0 V | 8.5 A | 3 | 3W |
| 60.0 V | 4.2 A | 2 | 2Y |
| 60.0 V | 7.0 A | 3 | 3Y |

| Dual Output - Module Voltage/Current Rating | | | | | |
|---|---|---|---|---|---|
| Output 1 | | Output 2 | | Slots | Code |
| Voltage | Current | Voltage | Current | | |
| 5.0 V | 10.0 A | 5.0 V | 10.0 A | 2 | 5A |
| 5.0 V | 10.0 A | 3.3 V | 10.0 A | 2 | 5B |
| 12.0 V | 10.0 A | 12.0 V | 8.0 A | 2 | 5D |
| 15.0 V | 8.0 A | 15.0 V | 6.0 A | 2 | 5E |
| 15.0 V | 8.0 A | 12.0 V | 8.0 A | 2 | 5F |
| 12.0 V | 10.0 A | 5.0 V | 10.0 A | 2 | 5G |
| 12.0 V | 10.0 A | 3.3 V | 10.0 A | 2 | 5H |
| 12.0 V | 10.0 A | 2.0 V | 10.0 A | 2 | 5J |
| 15.0 V | 10.0 A | 5.0 V | 10.0 A | 2 | 5K |
| 15.0 V | 10.0 A | 3.3 V | 10.0 A | 2 | 5L |
| 15.0 V | 10.0 A | 2.0 V | 10.0 A | 2 | 5M |
| 24.0 V | 6.0 A | 5.0 V | 10.0 A | 2 | 5N |
| 24.0 V | 6.0 A | 3.3 V | 10.0 A | 2 | 5P |
| 24.0 V | 6.0 A | 2.0 V | 10.0 A | 2 | 5Q |
| 24.0 V | 6.0 A | 12.0 V | 6.0 A | 2 | 5T |

| Parallel Option Codes | |
|---|---|
| Code | Description |
| 00 | No parallel required |
| 12 | Modules 1 & 2 |
| 13 | Modules 1 to 3 |
| 14 | Modules 1 to 4 |
| 23 | Modules 2 & 3 |
| 24 | Modules 2 to 4 |
| 25 | Modules 2 to 5 |
| 34 | Modules 3 & 4 |
| 35 | Modules 3 to 5 |
| 40 | Modules 1 & 2, 3 & 4 |

| Series Option Codes | |
|---|---|
| Code | Description |
| 00 | No series required |
| 12 | Modules 1 & 2 |
| 13 | Modules 1 to 3 |
| 23 | Modules 2 & 3 |
| 24 | Modules 2 to 4 |
| 40 | Modules 1 & 2, 3 & 4 |

| Other Option Codes | |
|---|---|
| Code | Description |
| **01** | **Reverse Air** |
| **02** | **Global Enable - Logic 1** |
| 03 | Option 01 & 02 |
| **04** | **Global DC OK - Logic 1** |
| 05 | Option 01 & 04 |
| 06 | Option 02 & 04 |
| 07 | Option 01, 02 & 04 |
| **08** | **Global AC OK - Logic 1** |
| 09 | Option 01 & 08 |
| 10 | Option 02 & 08 |
| 11 | Option 01, 02 & 08 |
| 12 | Option 04 & 08 |
| 13 | Option 01, 04 & 08 |
| 14 | Option 02, 04 & 08 |
| 15 | Option 01, 02, 04 & 08 |

### Step 1

To configure your fleXPower unit, select the required output power and application type. fleXPower chassis are available in five industrial and five medical power formats, detailed above.

### Step 2

fleXPower can accommodate up to seven modules, resulting in an extensive range of output combinations. However, as all modules are designed to fit across either two or three slots in the chassis, configuration is very simple. Select the appropriate modules for your output requirements, ensuring that all modules will fit in the chassis. Insert three-slot modules first, then the lowest voltage for same module width. Follow with 2 slot single output, lowest voltage to highest voltage, then 2 slot multi output, ordered alphabetically a-z.

### Step 3

Add any required options. These are grouped into three types; parallel options, series options and other options. The standard signal set for each chassis includes Global Inhibit, Global DC OK and Global AC OK, each having logic 0 operation. Optionally a logic 1 operating version of each is available along with reverse air flow.

## Example

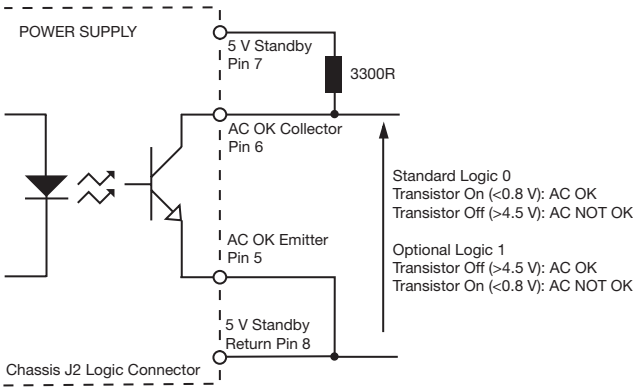
X7-3C3L2C-0023

X7 - 700 W industrial chassis, 10 module slots available.
3C - 3.3 V @ 60.0 A. Three slot width module.
3L - 15.0 V @ 20.0 A. Three slot width module.
2C - 3.3 V @ 40.0 A. Two slot width module.
00 - No parallel option.
23 - Modules 2 and 3 in series to give 18.3 V @ 20.0 A.

## Global AC OK/Power Fail

Global AC OK is an open collector signal providing a minimum of 5 ms warning of loss of output regulation. The signal is fully isolated and the collector and emitter must be connected externally.

Maximum sink current 2 mA, maximum voltage 20 V.

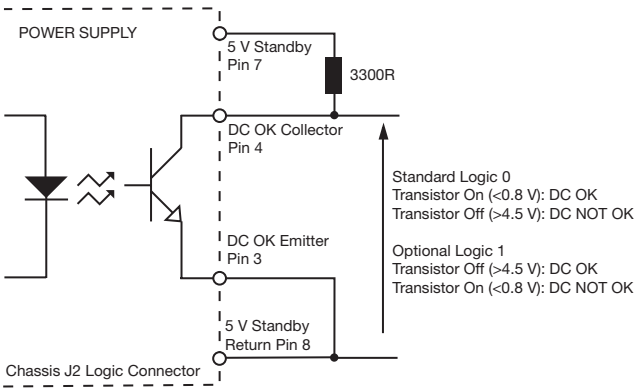



## Global DC OK

Global DC OK is an open collector signal providing warning that the output voltage has fallen below 90% of nominal. The signal is fully isolated and the collector and emitter must be connected externally.

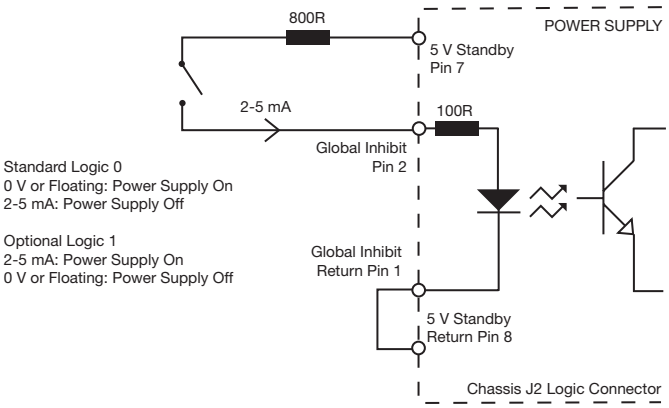
Maximum sink current 2 mA, maximum voltage 20 V.

On Dual output module, DC OK monitors V1 output only



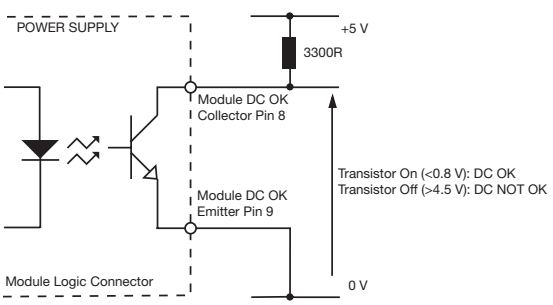

## Global Inhibit

Global Inhibit is an isolated control signal which can turn the power supply off by supplying 2 to 5mA into the pin. Global Enable option available, see 'Other Option Codes' table.




## Module DC OK

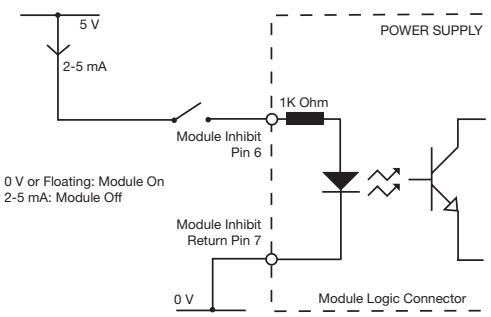
Module DC OK is a nominal "ON" floating collector and emitter transistor of an optocoupler, which provides a warning of the loss of output regulation on the main output of the module.




Maximum sink current 2 mA, maximum voltage 20 V.

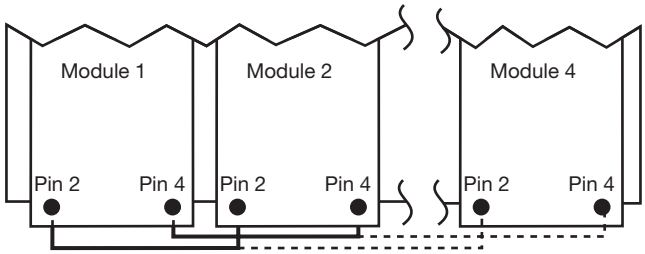
## Module Inhibit

Module Inhibit signal is an isolated control signal which can turn the module off by supplying 2 to 5 mA into the pin.



## Current Share

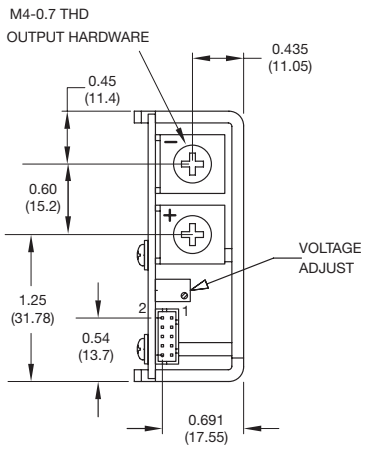
Connecting pins 2 and 4 of like voltage modules (4 maximum) within the same chassis or separate chassis will force the current to share between the outputs. Different slot width modules can share.




# Module Mechanical Details

## Single Output

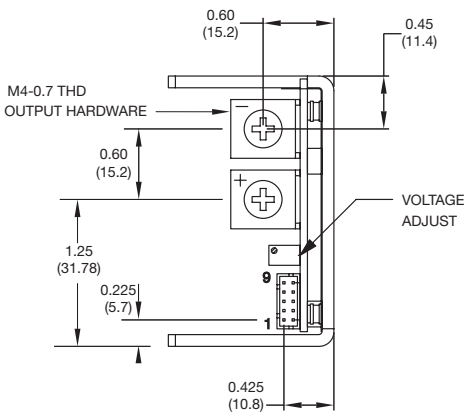
### 2 Slot Modules




**Notes**

1. All dimensions in inches (mm).
2. Weight: 0.48 lb (218 g) approx.
3. Mating plug: JST p/n PHDR-10VS.
4. Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.

### 3 Slot Modules



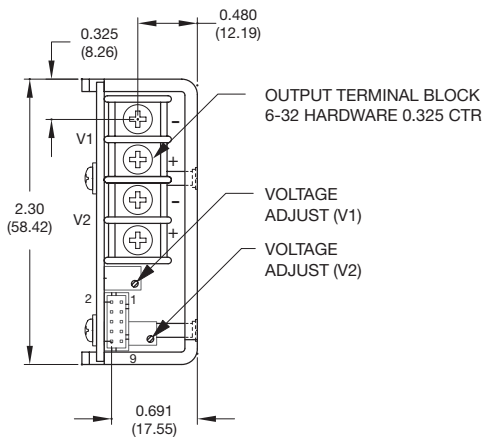

**Notes**

1. All dimensions in inches (mm).
2. Weight: 0.74 lb (335 g) approx.
3. Mating plug: JST p/n PHDR-10VS.
4. Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.

| Single Output: Module Logic Connector Pinouts | |
|---|---|
| **Pin** | **Function** |
| 1 | Sense + |
| 2 | Sense - |
| 3 | V Prog |
| 4 | I Share |
| 5 | Not used |
| 6 | Inhibit |
| 7 | Module Inhibit Return |
| 8 | DC OK Collector |
| 9 | DC OK Emitter |
| 10 | Not used |

## Dual Output

### 2 Slot Modules




**Notes**

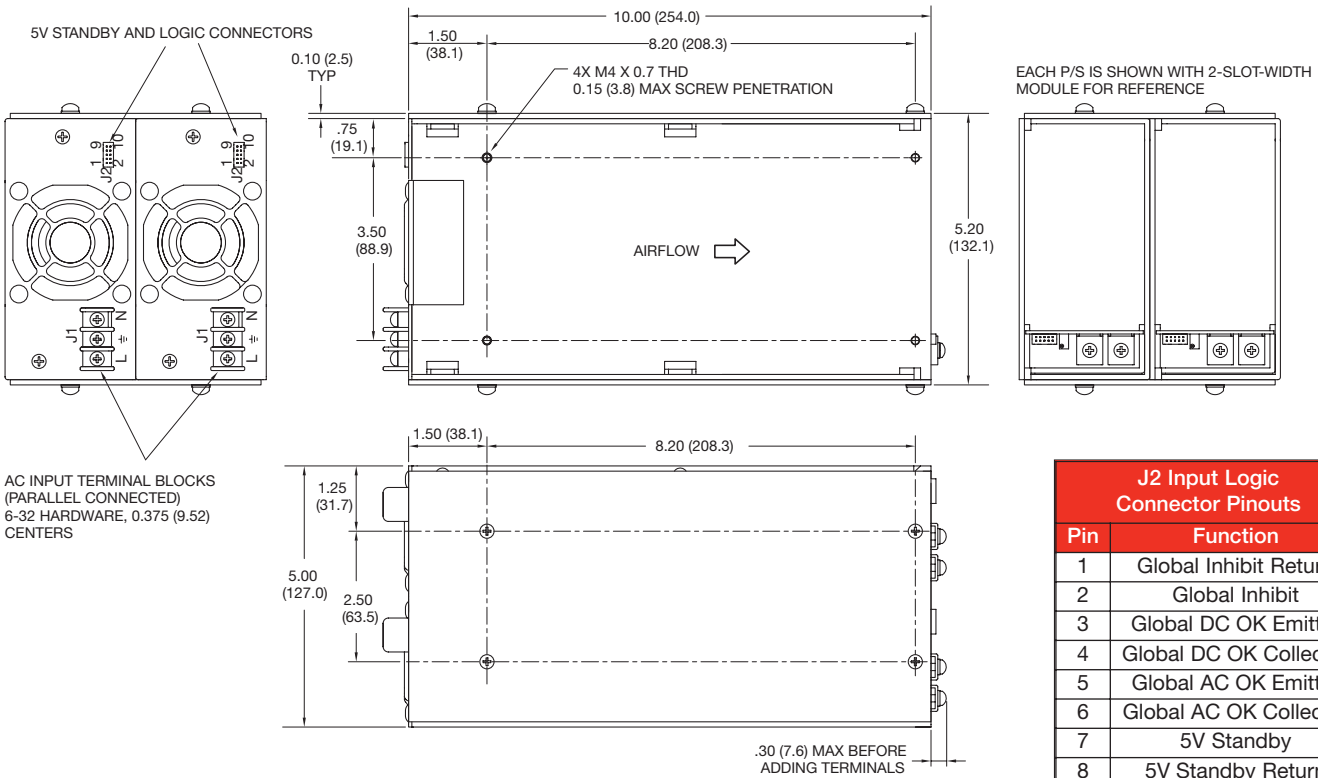
1. All dimensions in inches (mm).
2. Weight: 0.48 lb (218 g) approx.
3. Mating plug: JST p/n PHDR-10VS.
4. Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.

| Dual Output: Module Logic Connector Pinouts | |
|---|---|
| **Pin** | **Function** |
| 1 | V1 Sense + |
| 2 | V1 Sense - |
| 3 | Not used |
| 4 | Not used |
| 5 | V2 Sense + |
| 6 | Inhibit |
| 7 | Module Inhibit Return |
| 8 | DC OK Collector |
| 9 | DC OK Emitter |
| 10 | V2 Sense - |

# Chassis Mechanical Details

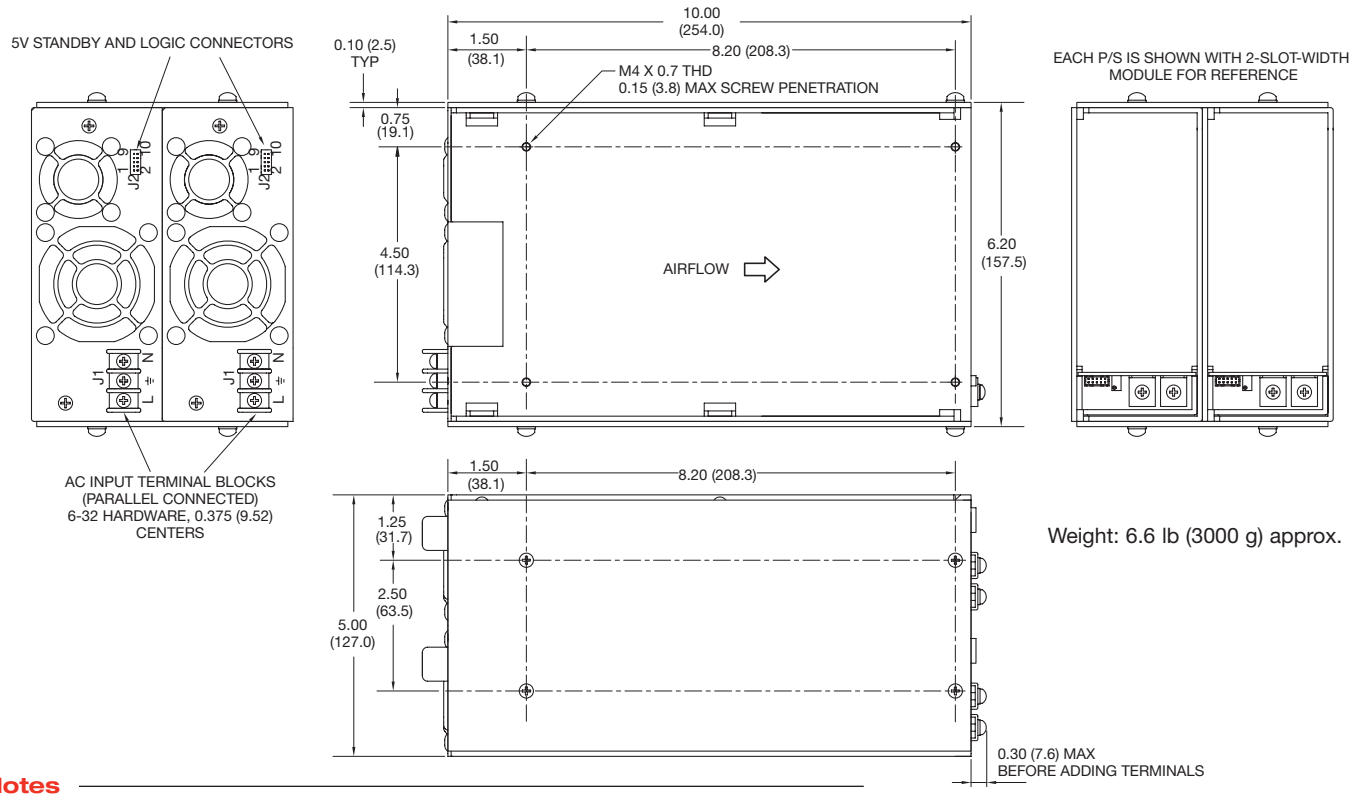
## 800 (1200)[4] Watt X4DD & XM4DD Chassis
## 1000 (1400)[4] Watt X5DD & XM5DD Chassis
## 1400 (1800)[4] Watt X7DD & XM7DD Chassis

Weight: 5.5 lb (2500 g) approx.




| J2 Input Logic Connector Pinouts | |
|---|---|
| Pin | Function |
| 1 | Global Inhibit Return |
| 2 | Global Inhibit |
| 3 | Global DC OK Emitter |
| 4 | Global DC OK Collector |
| 5 | Global AC OK Emitter |
| 6 | Global AC OK Collector |
| 7 | 5V Standby |
| 8 | 5V Standby Return |
| 9 | Inhibit Sum |
| 10 | VCC Return |

## 1800 (2200)[4] Watt X9DD & XM9DD Chassis




Weight: 6.6 lb (3000 g) approx.

## Notes

1. All dimensions in inches (mm).
2. Mating plug: JST p/n PHDR-10VS.
3. Contact: 26-22 AWG JST p/n SPHD-001T-P0.5.
4. High line only (180-264 VAC).