

## M2286 SERIES

*3-PHASE AC/DC POWER SUPPLY*



### PRODUCT HIGHLIGHTS

- RUGGEDIZED
- HIGH DENSITY
- SEALED ENCLOSURE
- INPUT RANGE: 100-130V<sub>AC</sub>  
400HZ/3-PHASE
- SINGLE OUTPUT UP TO 2000 W
- CAN PARALLEL UNITS FOR MORE POWER  
UP TO 10KW
- “IDEAL DIODE” ON OUTPUT  
Allows N+1 redundant configuration

Milpower Source M2286 Series is a 2KW AC to DC, ruggedized, high-performance power supply designed for Airborne, Ground Mobile, Ground Fixed and other applications that are characterized by harsh and hostile environment. It is fed from a three-phase 115VAC/400Hz power and provides a well-regulated filtered and protected DC Output.

### **Primary Features:**

- Input voltage range (3-Phase, 115VAC/400Hz) compatible with MIL-STD-704E.
- Designed to meet MIL-STD-461F
- Full galvanic isolation between Input, Chassis GND and Output.
- High efficiency (>88%) and low power dissipation.
- Enable and Inhibit inputs.
- Isolated Power Good signal.
- Up to 5 units can be paralleled (load-share) and supports up to 10KW.
- Low-drop, Blocking-diode on the output allows N+1 redundant configuration.
- Smart Over-voltage (O.V.) protection, will not trip by an O.V. failure of a parallel unit(s).
- Sustains high level of shocks and vibration, salt-fog, blowing rain, sand and dust.
- Sealed enclosure, withstands high-pressure wash-down.
- Circular D38999 connectors.
- J-STD-001B and IPC-610A Class-3 Workmanship.
- Conformal Coating on all PWBs per MIL-I-46058C and IPC-CC-830.

## M2286 SERIES AC/DC POWER SUPPLY

<b>AC Input</b>	<b>Type</b>	3-Phase (3-lines), 115/200VAC, 400Hz Per MIL-STD-704E.
	<b>Voltage Range</b>	Steady-state: 100 to 130VAC (173 to 225VAC Line-to-Line). Transients: 180VAC (312VAC Line-to-Line)/50mS Per MIL-STD-704E. Full performances between 104 to 127VAC (180 to 220VAC Line-to-Line) With AC input below 104 VAC but within MIL-STD-704E normal envelope for 115VAC/400Hz system, output voltage will remain within MIL-STD-704E normal envelope for 28VDC System.
	<b>Frequency</b>	360 to 480Hz
	<b>Power Factor</b>	> 0.92 (at 28V2kW output and 115VAC/400Hz input).
	<b>Missing Phase Protection</b>	No damage by a missing phase. Automatic recovery within 1.5 seconds after input recovery.
<b>DC Output</b>	<b>Nominal Ratings</b>	See Configuration Table 4 below
	<b>Voltage Regulation</b>	±0.5DC, worst case combination of load, line and temperature.
	<b>Remote Sense</b>	Capable of compensating up to 2VDC line drop (round trip). If left open, the point of regulation shifts (automatically) to the output connector.
	<b>Capacitive Load</b>	Will operate with any capacitive load up to 10,000µF.
	<b>Ripple &amp; Noise</b>	Less than 150mVpp (measured with BW of 20MHz on resistive load between 0.5Amp to 72Amp and capacitance of at least 1µF). At very low loads (below 0.5Amp) the ripple may rise but will not exceed 1 V <sub>p-p</sub> .
	<b>Current Limit and Overload Protection</b>	Output current internally limited (clamped) to less than 90 Amp. In case of sustained overload that pulls the output below 20 VDC for more than 200 ms, the output will shut down and attempt to recover every two seconds.
	<b>Over Voltage Protection</b>	In case of an internal failure that causes the output voltage to exceed 32.2 ± 0.5 V, the output will shut down. Externally imposed voltage (such as from a parallel supply) will not trip the protection. Recovery upon toggling the AC input or upon disabling and re-enabling the output voltage.
	<b>Paralleling</b>	Up to 5 units can be paralleled and will share the load's current between them.
	<b>Turn-on Time</b>	Within 200 ms after AC power is applied.
	<b>Reverse Blocking Diode</b>	An internal low-drop MOSFET rectifier in series with the output allows true N+1 redundant configuration.
<b>Control &amp; Indication</b>	<b>Enable Input</b>	Active Low (shorted to RTN Vout, V < 1.5V @ 2mA) enables the output, Open (I<0.5mA @ 5V) disables it. Absolute maximum ratings: -5.0/+15.0V <sup>(1)</sup>
	<b>Inhibit Input</b>	Active Low (shorted to RTN Vout, V < 1.5V @ 2mA) disables the output. Open (I<0.5mA @ 5V) enables it. Absolute maximum ratings: -5.0/+15.0V <sup>(1)</sup>
	<b>BIT Output</b>	Uncommitted collector and emitter of an opto-isolator. Low (V< 0.8 @ 1mA, relative to BIT RTN) indicates normal operation. Open (I< 0.1mA @ 5V) indicates a failure (or inhibited output). Absolute maximum ratings (BIT H to BIT L): -0.5V/+15V.

**Notes:**

1. See Table 3 and Figure 1

### Specifications (Cont.)

<b>Isolation</b>	<b>Input to Chassis, Output and BIT</b>	20 MΩ (Min) at 500 VDC. Dielectric withstanding voltage: 1,000 VDC
	<b>Output to Chassis</b>	20 MΩ (Min) at 200 VDC.
	<b>BIT to Output &amp; Chassis</b>	20 MΩ (Min) at 200 VDC.
<b>Efficiency</b>	88% minimum Room temp, Nominal Input, 28VDC / 2kW output	
<b>Cooling Requirements</b>	The M2286 is a baseplate cooled unit. The user must maintain the baseplate's temperature below +71 °C by thermally attaching it to a suitable heat sink.	
<b>Over Temp Protection</b>	Automatic shutdown when overheated. Automatic recovery when the temperature drops back to normal.	
<b>EMC<sup>(2)</sup></b>	<b>MIL-STD-461F</b>	CE102, CS101, CS114, CS115, CS116, RE102 (with shielded output cable), RS103 and RS105.
	<b>ESD Protection</b>	HBM Class 3 per MIL-STD-1686C.
<b>Environment<sup>(2)</sup></b>	<b>Temperature</b>	<u>Non-operating:</u> -55 °C to +71 °C <u>Operating:</u> -50 °C to +71 °C (see Cooling Requirements above)
	<b>Altitude</b>	Operating/Non-operating: up to 40,000 ft.
	<b>Blowing Sand &amp; Dust</b>	Per MIL-STD-810G, Method 510.5, Proc. I (Blowing Dust) and II (Blowing Sand).
	<b>Rain &amp; Blowing rain</b>	Per MIL-STD-810G, Method 506.5, Procedure I (108 mm/hour, 40mph).
	<b>Salt-fog</b>	Per MIL-STD-810F, Method 509.5
	<b>Humidity</b>	Up to 100% with condensation (MIL-STD-810G, Method 507.5, Procedure I and II).
	<b>Fungus</b>	Does not support fungus growth (MIL-STD-810G, Method 508.6)
	<b>Random Vibration</b>	7.7grms/ 20Hz to 2,000Hz, all axes (MIL-STD-810G, Method 514.6, Figure 514.6E-1)
	<b>Functional Shock</b>	MIL-STD-810G Method 516.6, Procedure I, Saw-tooth, 40g peak, 11ms, 3 shocks in each of 6 orthogonal directions.
	<b>Bench Handling Shock</b>	MIL-STD-810G Method 516.6, Procedure VI
<b>Size and Weight</b>	I.A.W. Milpower Source Drawing 22-2286-0003-00	
<b>Reliability</b>	MTBF>100,000 hours, calculated per MIL-STD-217F Notice 2 at +71 °C baseplate, Ground Fixed environment.	
<b>Connectors</b>	AC Input: D38999/20WD5PN or eq. (For pinout see Table 1) DC Output (and signals): D38999/20WG41SN or eq. (For pinout see Table 2)	

#### Notes:

1. Designed to meet

**Table 1 – Pinout, Input Connector J1**

D38999/20WD5PN or Eq. All pins are AWG#16

Pin No.	Description
A	115VAC Phase A
B	115VAC Phase B
C	115VAC Phase C
D	NC
E	Chassis (Safety) GND

**Table 2- Pinout, Output Connector J2**

(D38999/20WG41SN or Eq.) All pins are AWG #20

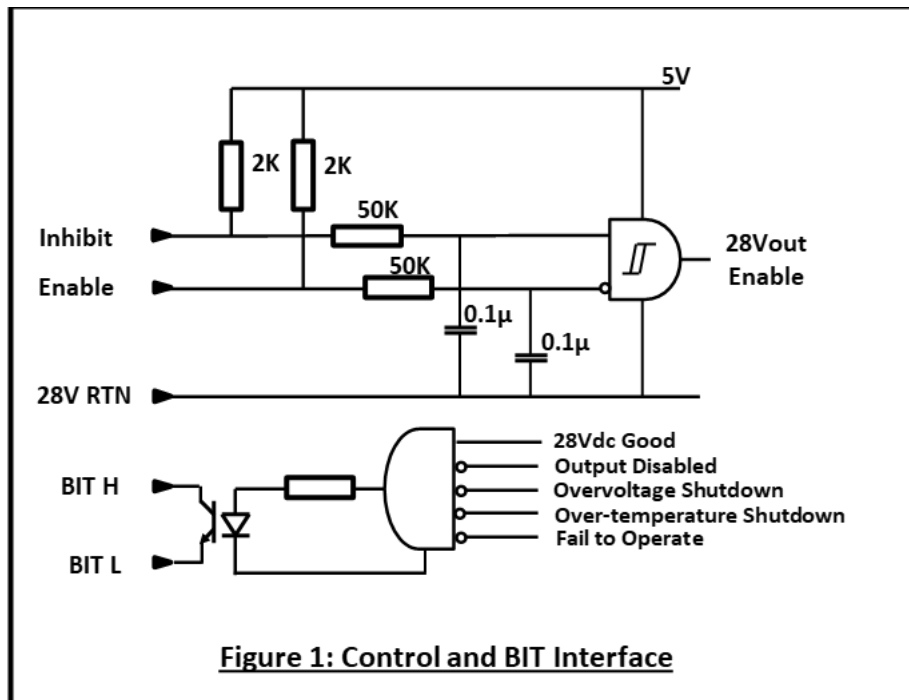
PIN #	Description	PIN #	Description	PIN #	Description
A	+Vout	R	Inhibit	f	RTN Vout
B	+Vout	S	RMT SNS (-)	g	RTN BIT
C	+Vout	T	RMT SNS (+)	h	+Vout
D	+Vout	U	LSC <sup>(3)</sup>	i	+Vout
E	+Vout	V	+Vout	j	+Vout
F	RTN Vout	W	+Vout	k	+Vout
G	RTN Vout	X	+Vout	m	+Vout
H	RTN Vout	Y	+Vout	n	RTN Vout
J	RTN Vout	Z	+Vout	p	RTN Vout
K	RTN Vout	a	+Vout	q	RTN Vout
L	RTN Vout	b	RTN Vout	r	RTN Vout
M	RTN Vout	c	RTN Vout	s	+Vout
N	Enable	d	RTN Vout	t	RTN Vout
P	BIT	e	RTN Vout		

**Notes:**

3. Load- Share Compensation signal. When the LSC signals of all paralleled units are shorted together, the units will equally share the load current between them. A fault (open signal or short to RTN Vout, or any other probable fault in one of the paralleled units) will have a limited effect (less than 3V) on the output voltage.

**Table 3 – Enable/Inhibit Truth Table**

Enable	Inhibit	Output
Short/Low	Open/High	<b>On</b>
Open/High	Don't Care	<b>Off</b>
Don't Care	Short/Low	<b>Off</b>



**Figure 1: Control and BIT Interface**

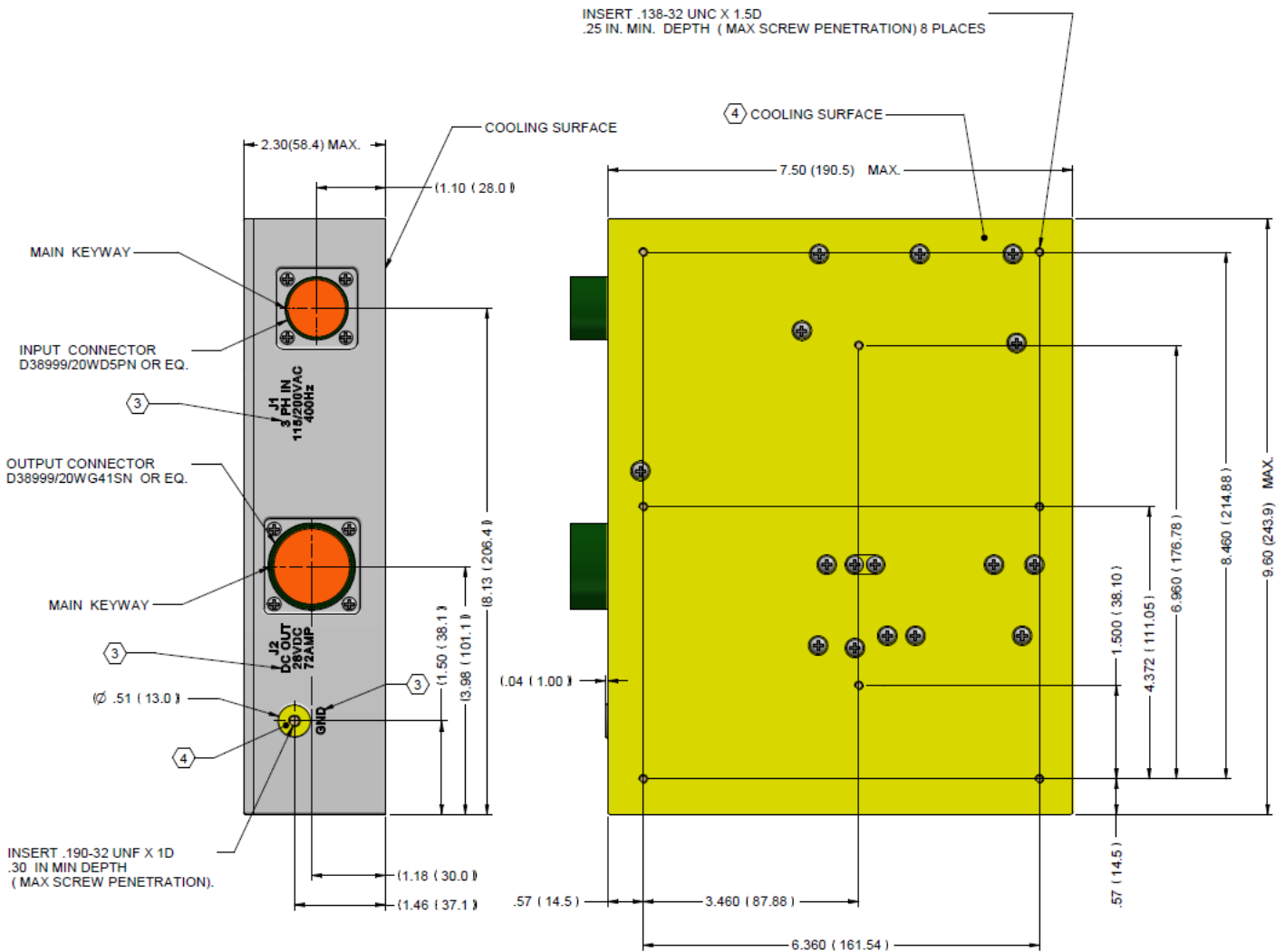
### Application Notes

- 1) The Point of Regulation (POR) of the output is at the connection of the Remote Sense lines (pins T and S of J2). When these pins are left open (not used), the POR moves to the output connector J2.
- 2) To eliminate radiated emission from the DC output and signal lines, they should be twisted and well shielded. (Shielding and twisting of the AC input lines is optional, but the unit will pass RE102 with no-shielding as required by MIL-STD-461).
- 3) When using several M2286 in parallel:
  - a. Connect all the +Vout pins and pin T (RMT SNS +) of all units to a single point on the load.
  - b. Connect all the RTN Vout pins and pin R (RMT SNS -) of all units to a single point on the load.
  - c. Connect together pin U (Load Share Compensation) of all units.
  - d. The proper operation of each of the paralleled unit can be individually tested by toggling its Enable (or Inhibit) input and observing its BIT signal.
  - e. In case of an Overvoltage failure of one of the units, only the failed unit will shut down and its BIT will go High. All other units will not be affected and will continue to support the load.

**Table 4: Configuration Series**

Part Number	Total Power	Input Voltage Range	Output Configuration	Power Factor Correction
M2286100	864W	104-127VAC / 400Hz / 3-Phase	12V @ 72A	No
M2286101	1728W	104-127VAC / 400Hz / 3-Phase	24V @ 72A	No
M2286102	2016W	104-127VAC / 400Hz / 3-Phase	28V @ 72A	No
M2286103	1998W	104-127VAC / 400Hz / 3-Phase	36V @ 55.5A	No

### Outline Drawing:



*Note: Specifications are subject to change without prior notice by the manufacturer.*