Amphenol
MILITARY HIGH SPEED

M1326103 Series
AC/DC POWER SUPPLY

DESCRIPTION:
The M1326103 military power supply is a rugged AC to DC converter. It accepts an AC input range from 85 to 265VAC, 50/60/400Hz and provides a single DC output from 3.3V to 300V, up to 1000W, with custom outputs available. Designed to meet military standards MIL-STD-704, MIL-STD-810, MIL-STD-461.

FEATURES

- Convection cooled
- Extremely rugged
- Universal input range
- Input / Output isolation
- High Power Factor
- Internal EMI filters
- Remote sense option
- Remote Inhibit option
- Inrush current limiter
- Fixed switching freq. (250 kHz)
- Non-latching protections:
    - oInput under-voltage lockout
    - oShort-circuit/overload
    - oOutput over-voltage
    - oOver temperature

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HOW TO ORDER

Part Number	Input		Output	
	Voltage range	Frequency	Voltage	Current
CF-02EM1326103	85-265VAC/ Single phase	50/60/400Hz	28VDC	36A

PRODUCT SPECIFICATIONS:

AC Input	single-phase 85 to 265VAC / 50 to 400Hz Operates from a 115 VAC / 400 Hz source IAW MIL-STD704E	
Output Voltage Regulation	Up to ±1% (no load to full load, –40 to +71°C, over normal input voltage range).	
Ripple and Noise	Up to 1% of output voltage without external capacitance. (Values are usually much lower - depends on output voltage).	
DC Output	Voltage range:	3.3 to 300VDC
	Current range:	0 to 80A
	Power range:	0 to 1 000 W
Efficiency	85% ± 2% typical (nominal input voltage, 28V output, full load, room temperature)	
Isolation	Input to Output:	1000 VDC
	Input to Case:	1000 VDC
	Output to Case:	200 VDC
EMC	Designed to meet MIL-STD461G† CE101, CE102, CS101, CS114, CS115, CS116, RE101, RE102, RS101, RS103	
Turn-On Transient	No voltage overshoot during power-on.	

PROTECTIONS		
Input	Inrush Current Limiter	
	Catastrophic Failure Protection	Internal fuses included to protect the system from a catastrophic failure within the power supply. The fuses are rated not to engage due to any combination of normal operation conditions.
	Under-Voltage Lock-Out	The converter may shut down to protect itself in case input voltage falls below 75VAC ± 5VAC.
Output	Over-Voltage Protection	oActive circuit shuts output down in case output voltage exceeds 110% ± 5% of nominal voltage. Automatic recovery when output voltage returns to normal range. oPassive protection (transorb) at output, selected 20% ± 10% above nominal voltage.
	Overload / Short Circuit	Output shuts down and restarts periodically (hiccup) in case output current exceeds maximum current by 20% ± 10% until fault removed.
General	Over Temperature Protection	Shutdown if internal baseplate temp. exceeds +105°C ± 5°C. Automatic recovery upon cool down to below +95°C ± 5°C

Environmental Conditions Designed to Meet MIL-STD-810G		
Ambient Temperature	Operating:	–40°C to +71°C
	Storage:	–55 °C to +125°C
Humidity	Method 507.5	Up to 95% RH
Rain	Method 506.5, Procedure I (Rain and blowing rain)	Rainfall rate: 0.846 mm/min (2 in/hr)
		Wind velocity: 30 knots, with up to 60 knots gusts
		Exposure duration: one hour
Altitude Method 500.5	Procedure I (Storage/Air tranport):	up to 40 000 ft.
	Procedure II (Operation/Air Cariage):	up to 15000 ft.
Salt Fog	Method 509.5	
Sand and Dust	Method 510.5	Procedure I (Blowing dust)
		Procedure II (Blowing sand)
Ingress Protection	IP-67 option available	
Vibration	Method 514.6, Procedure I	Category 24 – General minimum integrity exposure
Shock	Method 516.6, Procedure I	20 g / 11 ms terminal peak sawtooth shock pulse

RELIABILITY
150,000 hours, calculated IAW MIL-HDBK-217F Notice 2 at +45°C ambient, Ground Fix environment.

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GENERAL ARCHITECTURE:

The CF-02EM1326103 accepts universal AC input voltage between 85 to 265 VAC, 50 to 400 Hz and generates an isolated, well-regulated and protected DC voltage.

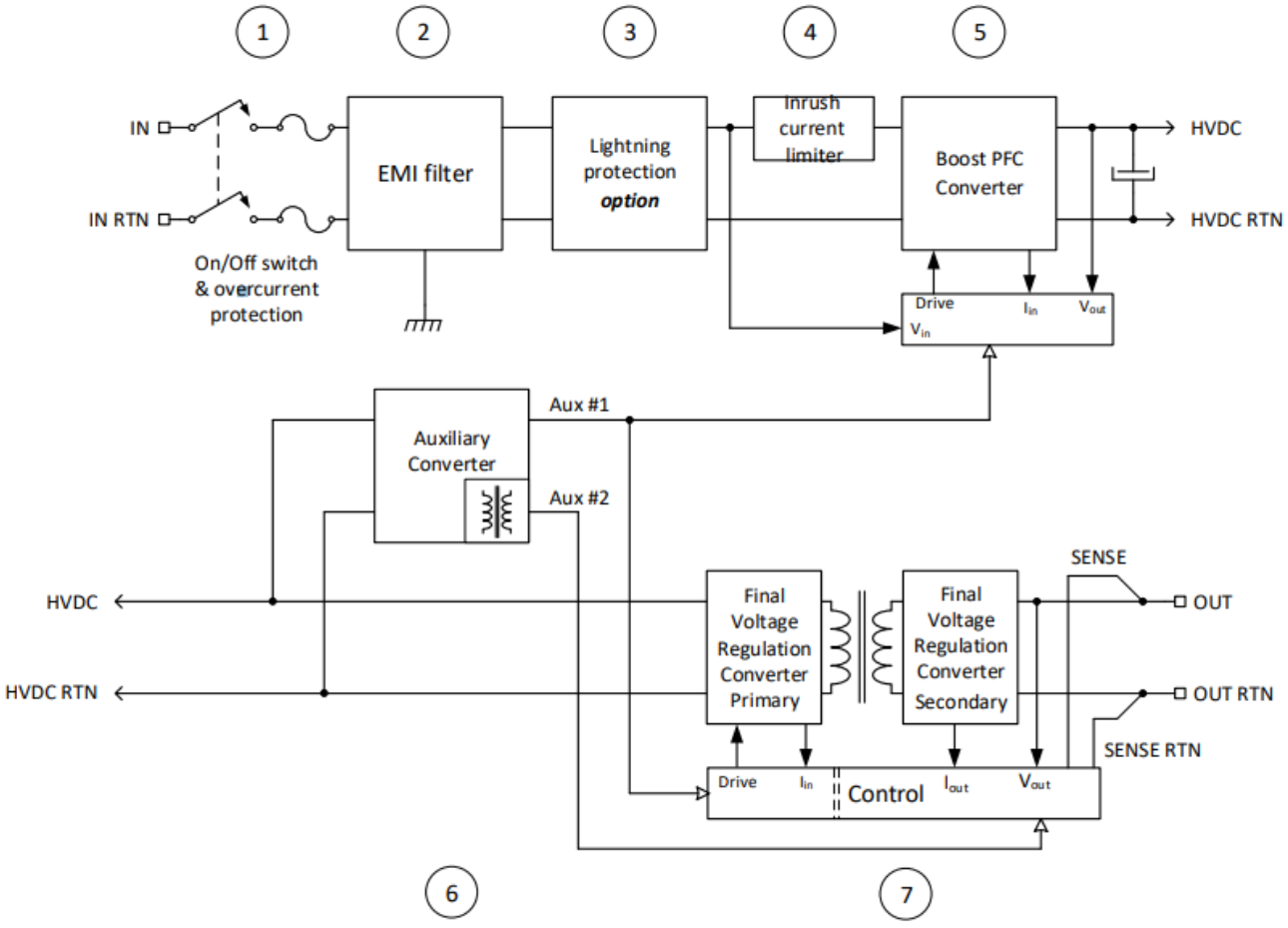
The unit is built from the following blocks:

1. Input stage, which includes an input AC power switch, input current protection and EMI filter (lightning protection optional – consult factory for more information).

2. High power factor AC/DC converter

3. Auxiliary converter for housekeeping voltages.

4. Isolated DC/DC converter.



1. Input stage, EMI filter and protections

The input stage is composed of an AC on/off switch and an over-current protection mechanism, followed by an EMI filter that includes MOV surge arrestors (for low power spikes only. Lightning protection option available – see more information below).

1
The **AC switch** allows an easy and simple disconnection of the power supply from the input AC line.
Fuses/weak-links are used as means of protection against shorted input stage components. The only scenario that may result in an open fuse is a catastrophic failure of the unit, which requires the replacement of the input AC/DC stage.

2
The **EMI filter** is designed to meet MIL-STD-461G CE102 conducted emissions limits. Since the unit is enclosed within a six-wall aluminum chassis, the entire assembly forms a Faraday cage configuration that attenuates the radiated emission from the unit to well below the MIL-STD-461G RE102 radiated emissions limits. Highfrequency filters (differential and common-mode) on the input and on each of the outputs attenuate the conducted high frequency emission of unit's I/Os, allowing the host system (with the aid of shielding around the cables) to successfully pass the system-level radiated emission test. The same filters and shielded enclosure also reduce the susceptibility of the unit to external radiation and conducted interference (MIL-STD-461G CS101, CS114, CS115, CS116 and RS103).

3
A **lightning protection** circuit can be included as an option, to protect the power supply from repetitive fast transients and bursts IAW EN61000-4-4, and from lightning, IAW EN61000-4-5. Depending on the specific configuration, the addition of this circuit may increase the power supply's size. Consult factory for more information.

2. High power factor AC/DC converter with inrush current limiter

The AC/DC converter converts the AC input (85 to 265V at 50 to 400Hz) to a semiregulated, non-isolated high voltage (400V). This stage comprises two sub-stages:

4

The **inrush current limiter** circuit limits the initial charge-up current of the inter-stage bulk capacitance.

5

The **high power factor AC/DC converter** shapes the average input current draw, by changing the inter-stage output voltage in synchronization with the momentary input voltage, input current and output current. By doing so, the power supply is able to present a resistor-like load to the generator at nominal conditions.
The advantages of using a power factor correction circuit are numerous. It provides a better utilization of the generator/alternator by not waisting energy for creation of reactive power; it increases overall efficiency; it decreases low frequency distortion; and it provides better utilization of the inter-stage bulk capacitance for attenuation of the input voltage ripple.
The output of the PFC converter is a semi-regulated and protected (i.e. over-current and over-voltage protection) high voltage DC bus.

3. Auxiliary converter

6

The different stages in the power supply use several housekeeping voltages, generated by a separate converter, feeding off the high voltage DC. This converter generates non-isolated and isolated vol final output voltage is generated by an isolated, well-regulated and protected (from over-current, short-circuit and over-voltage) DC/DC converter.

4. Final voltage regulation DC/DC converter

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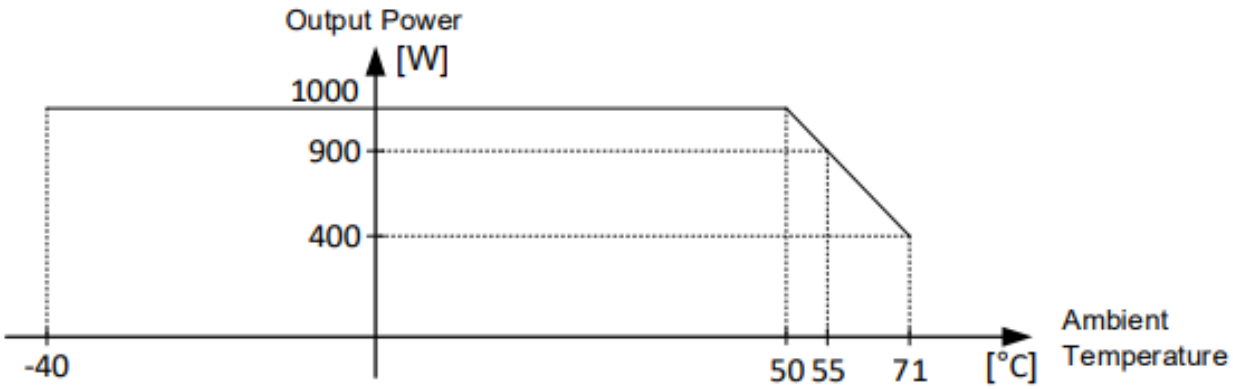
The final output voltage is generated from the high voltage DC bus by an isolated, well-regulated and protected (from over current, short-circuit and over-voltage) DC/DC converter. The output voltage goes through a final EMI filter before reaching the output connector, to further decrease the output voltage ripple, and assist in radiated emission suppression to meet MIL-STD-461G RE102.

Power derating curve: Output power vs. ambient temperature

The power supply is capable of delivering up to 1000W to the load, in perfect conditions. However, when operating in elevated ambient temperature, the power output should be de-rated according to the following curve:

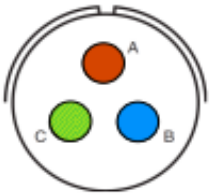


This curve should be used as a reference only. The power supply's efficiency is affected by the input voltage, output voltage, output current and switching frequency. Convection efficacy is affected by the ambient temperature, altitude and total available air volume; there can be additional out-of-unit heat that can increase the power supply's temperature via incoming radiation. Consult factory for actual expected values in your application.

Pin Assignment – Option 1

Input Connector (J1):
Connector type: AIB2-20-3PS or eq. with lanyard tied protection cap.
Mating connector type: AIB6-20-3SS or eq

Pin #	Function	
A	LINE	
B	NEUTRAL	
C	SAFETY GND	

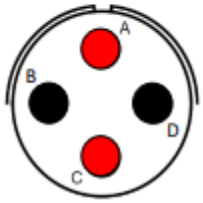


Output Connector (J2):

Connector type: MS3470W14-4S or eq. with lanyard tied protection cap.
Mating connector type: MS3476W14-4P or eq.

Pin #	Function	P	
A	OUTPUT	+	
B	OUTPUT RTN	–	

Pin #	Function	P	
C	OUTPUT	+	
D	OUTPUT RTN	–	

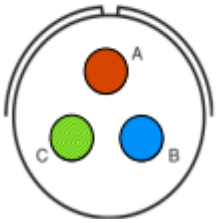


Note:
1. Other connector options available – consult factory
2. All pins with identical function/designation should be connected together for best performance.
3. In models with no SENSE/SENSE RTN pins, the output voltage is regulated at the OUTPUT/OUTPUT RTN pins. Since no remote sense compensation is available in these cases, some voltage drop across the output harness is to be expected, dependent on the output current and harness wires resistance. Output harness should be designed in accordance.

Pin Assignment – Option 2

Input Connector (J1):
Connector type: GTS030-20-3P-025 or eq. with lanyard tied protection cap.
Mating connector type: GTS06-20-3S-025 or eq.

Pin #	Function	
A	LINE	
B	NEUTRAL	
C	SAFETY GND	

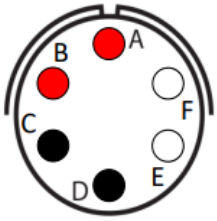


Output Connector (J2):

Connector type: MS3112E10-6S or eq. with lanyard tied protection cap.
Mating connector type: MS3116E10-6P or eq.

Pin #	Function	P	
A	OUTPUT	+	
B	OUTPUT	+	
C	OUTPUT RTN	–	

Pin #	Function	P	
D	OUTPUT RTN	–	
E	N/C		
F	N/C		



Note:

1. Other connector options available – consult factory
2. All pins with identical function/designation should be connected together for best performance.
3. In models with no SENSE/SENSE RTN pins, the output voltage is regulated at the OUTPUT/OUTPUT RTN pins. Since no remote sense compensation is available in these cases, some voltage drop across the output harness is to be expected, dependent on the output current and harness wires resistance. Output harness should be designed in accordance.

Functions and Signals

SAFETY GND (connector J1, pin C)

This pin is connected internally to the power supply's chassis. Connect this pin to system's safety ground to allow a low resistance ground fault current path.

GND (chassis thread)

The **GND** thread allows an additional low resistance connection of unit's chassis to system ground, for a visual second safety path for ground fault current.

BIT (panel mount red LED)

The BIT notifies the user whether the output voltage is within normal range or not.
If the LED is on (red light visible), the output voltage is within normal range.
If the LED is off, the output voltage is below normal range.

Optional additional signals **(not available in standard version - consult factory for details)**

SENSE

The SENSE line is used to achieve accurate voltage regulation at load terminals.
To use this feature, connect this pin directly to load's positive terminal.
If this function is not required, short SENSE pin to OUTPUT pins as close as possible to the unit.

SENSE RTN

The **SENSE RTN** line is used to achieve accurate voltage regulation at load terminals.
To use this feature, connect this pin directly to load's negative terminal.
If this function is not required, short SENSE RTN pin to OUTPUT RTN pins as close as possible to the unit.
Note: The use of remote sense has a limit of voltage dropout between the converter's output and the load's terminals of approximately 5% of nominal output voltage.

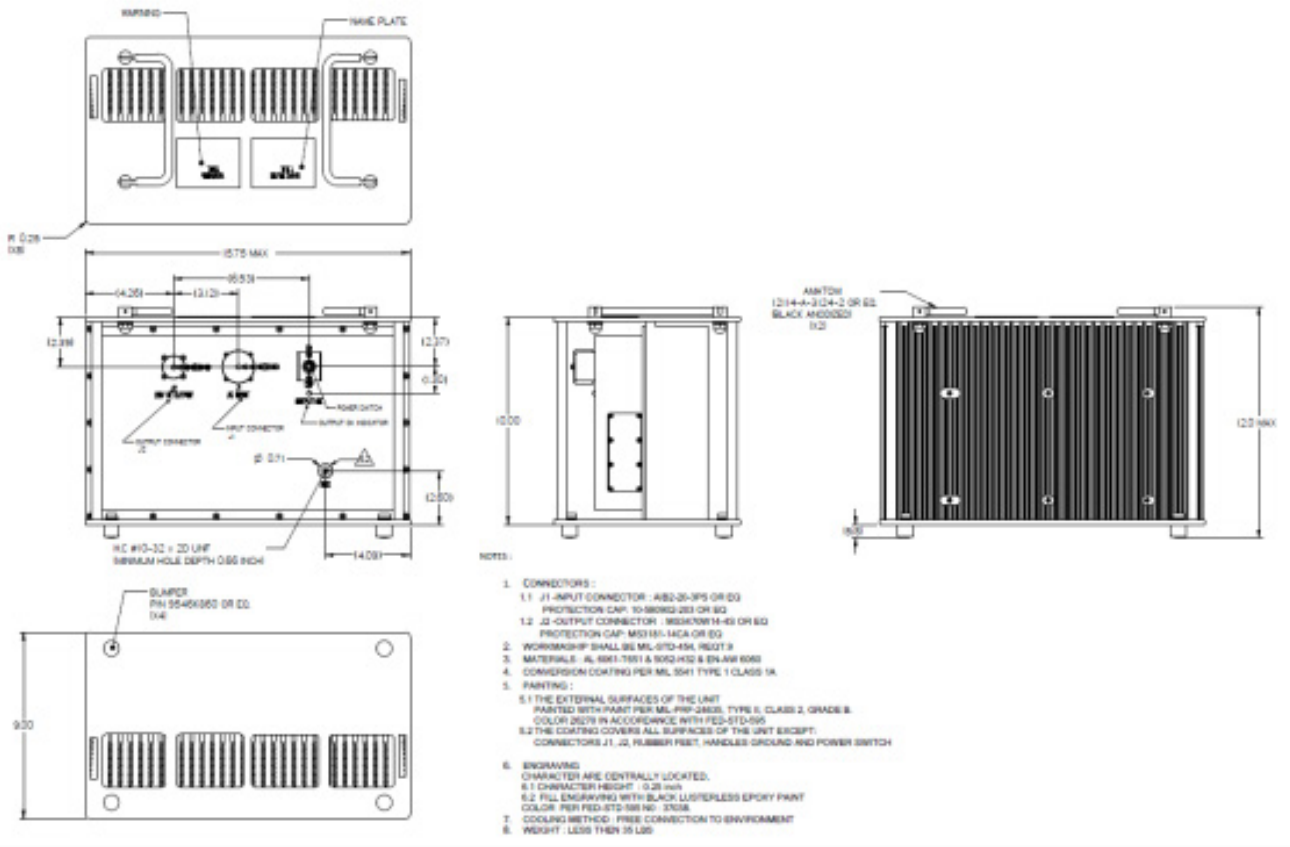
INHIBIT

The **INHIBIT** signal is used to turn the power supply ON and OFF.
TTL "1"or OPEN – Power supply active (output turned on).
TTL "0" or SHORT to Signal RTN – Power supply inhibited (output turned off).
If this function is not required, leave this pin unconnected.
This signal is referenced to SIGNAL RTN.

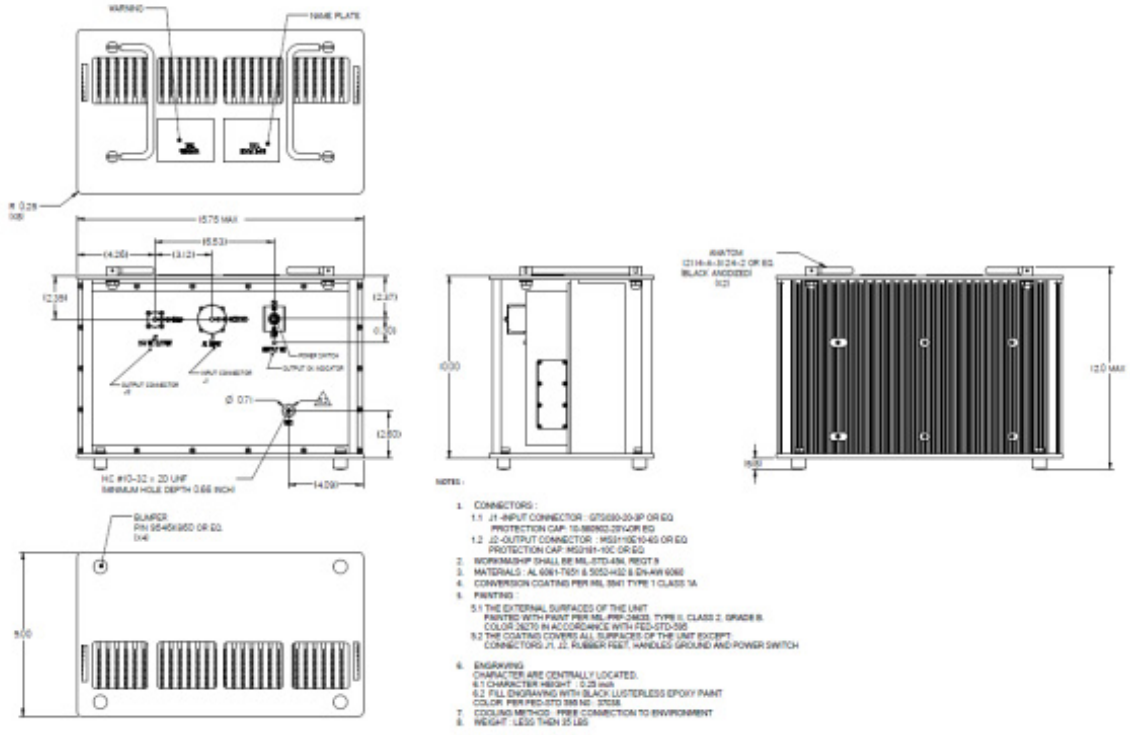
SIGNAL RTN

INHIBIT signal is referenced to this pin.
This pin is floating from both input and output.

Outline Drawing – Option 1



Outline Drawing – Option 2



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