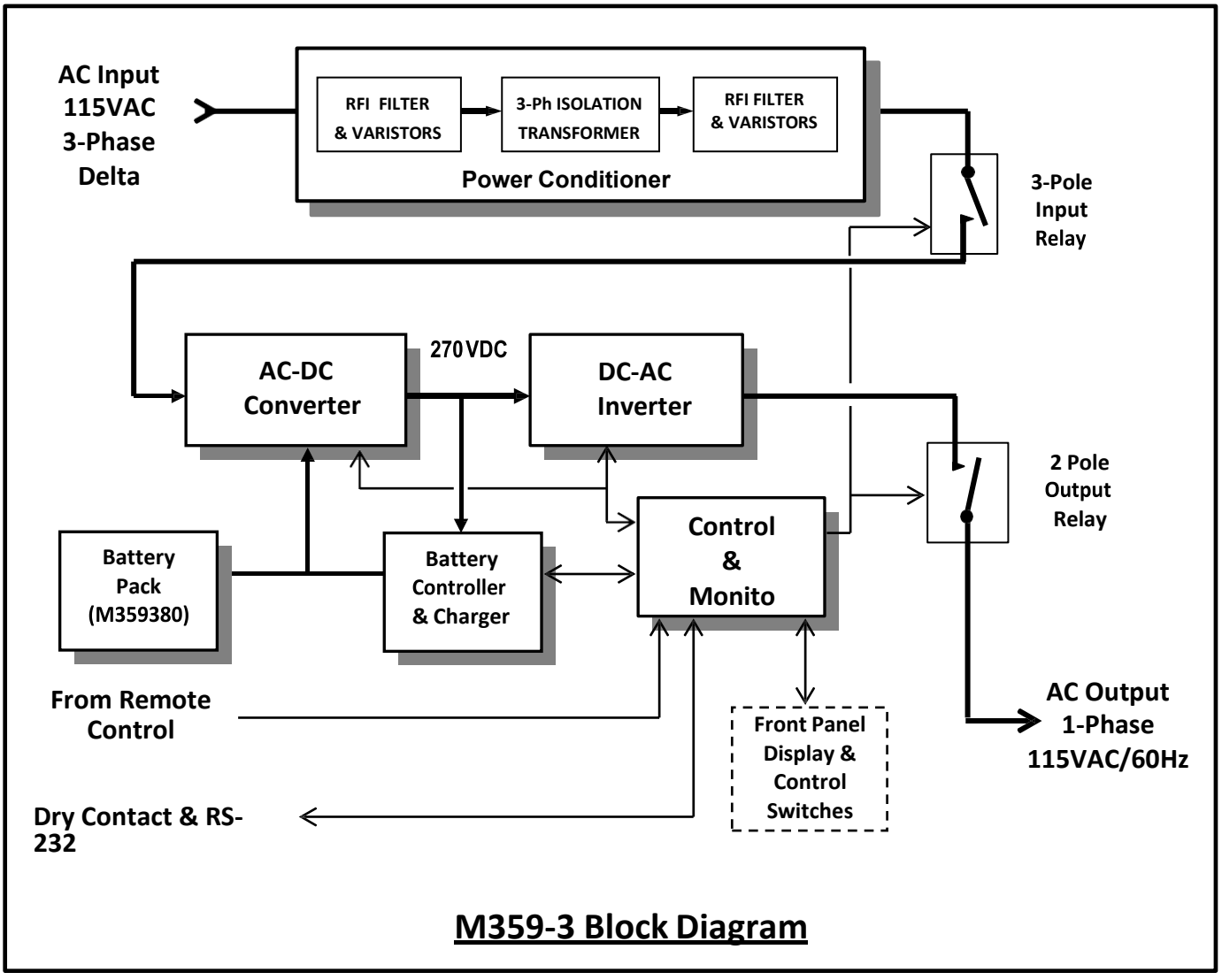
M359-3 2.0KW/2.5KVA, 3-Phase-In, 1- Phase Out UPS for Shipboard Application

Milpower Source M359-3 is a rugged, 19" Rackmount, high performance On-Line UPS, designed for Naval Shipboard and tough industrial applications. It accepts 115VAC/60Hz, 3-Phase (Delta) Shipboard Power and provides an uninterruptable and isolated 115VAC/60Hz Single- phase output.

The main features of the M359-3 are:

- 19" Rack-mount, 3U high and 22" deep.
- A front panel loaded, Plug-in Battery Pack.
- Internal 3-phase, 60Hz Input Isolation Transformer.
- Full Compliance with MIL-STD-1399, Section 300B, Type I Power (115VAC/60Hz).
- Very low Input Current Harmonic content (MIL-STD-1399 compliant).
- Better than 98% Input Power Factor.
- Full galvanic isolation between Input, Chassis GND and Output.
- 115VAC/60Hz, low-distortion sine-wave output, synthesized from a crystal oscillator.
- Over-load, Over-voltage and Over-temperature Protection.
- Immune to MIL-STD-1399, Section 300B 1,000V spikes.
- Complies with MIL-STD-461F.
- Complies with MIL-S-901D (Grade A, Class I &2) and MIL-STD-167-1 (Type I).
- Remote Panel ON/OFF capability.
- Standard Mil-type (metal-shell) circular power connectors.
- RS-232 or Ethernet SNMP v1, v2 or v3 Control and Monitor.
- J-STD-001B and IPC-610A Class-3 Workmanship.
- MIL-I-46058C and IPC-CC-830 Polyurethane conformal coating on PWBs.



M359-3 Block Diagram

Specification

INPUT	***Type***	115VAC/60Hz, 3-Phase Delta, Type I per MIL-STD-1399, Section 300B.
	Voltage Range	0 - 155VAC (L-L), in accordance with MIL-STD-1399, Section 300B.
	Switchover Voltage	Below 103VAC(L-L) the M359 may switch to Battery power. (92VAC @1,800W)
	Frequency	48-64 Hz
	Power Factor & Efficiency	P.F: > 0.98 @ full-load. Efficiency (full-load) is higher than 84%
	Spikes	Withstands the 1,000V Spikes specified by MIL-STD-1399, Section 300B.
	Isolation	Compatible with Ungrounded Shipboard Power. AC Input is isolated from AC Output and chassis (> 10 M Ohm at 600VDC). Less than 0.02µF from each AC Input line to Chassis. Less than 2mA leakage to chassis.
	Current Harmonic Distortion	Less than 2.5% from 2nd to 32nd harmonics and less than 100%/N for harmonics between 32nd and 20kHz (I.A.W. MIL-STD-1399, Section 300B).
	Inrush Current	Limited Per MIL-STD-1399, Section 300B, (less than 50A RMS).
	Input Current	Less than 16Amp (per phase) when loaded by 1,800W. Internally Limited to 20 Amp per Phase during over-load condition
	Power Interrupts	No damage and no Output interrupt for all conditions of MIL-STD-1399 (300B)
OUTPUT	***Voltage***	Single-phase, 115 ±3VAC, Grounded Neutral (Note 1).
	Frequency	60Hz ± 0.2% (digitally synthesized from a crystal oscillator)
	Power Rating	2.0KW/2.5KVA up to +45°C. 1.8KW/2.25KVA up to +55°C (Note 2).
	Waveform	Sinusoidal, THD of 2% (linear load), 6% (non-linear)
	Over-voltage Protection	Automatic shutdown if output voltage exceeds 125Vrms
	Overload Protection & Current Limit	Output protected from overload/short-circuit condition with automatic recovery upon overload removal. Output current is Internally limited to 40 Amp peak.
BATTERY	***Type***	A Front Panel Loaded, Hot-swap Plug-in, encapsulated Battery Pack (Model M359380).
	Holdup Time	10 minutes (minimum) into 1.5KW AC Load.
	Charger	Low ripple, regulated float-charger, with current limiting and temperature compensation. Fully charges the battery within 6 hours (following a full discharge at 1.5 kW).
	Protection	Protected from over-discharge and thermal runaway by internal protection circuit.
	Monitor	The batteries charge level, temperature and health are monitored by the UPS micro-controller.
EMC	***MIL-STD-461F***	CE101, CE102, CS101, CS106, CS114, CS116 RE101, RE102, RS101 and RS103.
	DC Magnetic Field	1600A/m (20 Oersteds) per DOD-STD-1399.

Notes

1. The Output Neutral Grounding Link is accessible to the user and can be removed in order to allow grounding at a user selected location, or in order to obtain a floating output (not recommended).
2. At ambient temperature above 45°C, the maximum steady-state output power should be linearly derated by 20W/25VA per each °C above 45°C, down to 1.8KW/2.25KVA at 55°C. For short term loading (less than 5 minutes) no derating is required.

ENVIRONMENT	***Temperature***	Non-operating: -40 to +72°C (Note 3) Operating: 0 to + 55°C (see Note 2 on previous page)
	Temperature shock	Non-operating, with battery installed: Design to meet MIL-STD-810F, Method 503.4, Procedure I, bidirectional temperature shock between -20°C and +72°C.
	Humidity	Up to 100% RH per MIL-STD-810G, Method 507.5 Proc II.
	Altitude	Non-operating: (Air transport) 40,000 feet.
	Orientation	May be installed at any orientation.
	Mechanical Shock	High-impact shipboard shock IAW MIL-S-901D, Grade A, Class I and II.
	Vibration	Type I Deck Mounted vibration IAW MIL-STD-167-1. Random vibration I.A.W. MIL-STD-810D, Cat. 9, Proc. I (test condition I-3.2.11, Fig. 514.3-34)
	Salt Spray / Fog	Design to meet MIL-STD-810F, Method 509.4 and RTCA/DO-160D, section 14.
INDICATIONS & CONTROLS	***Visual Indications (Front panel)***	10-segment tri-color Bar Graph for load level display. 10-segment Bar Graph for battery charge level display. "Output OK", "Output Fail" and “Standby” status LEDs. "Input OK” and "Input Fail" status LEDs. "On Batt " status LED. "Batt Passed" and "Batt Failed" LEDs for battery self-test. "Low Batt" warning LED. “Overload Shutdown” status LED. "Overtemp warning" and "Overtemp Shutdown" LEDs.
	Test Mode	When Battery-operation Test is invoked, the UPS performs a UPS and battery-test without interrupting the output power (even if the battery fails).
	Audible Alarm	The UPS beeps when operating on battery power or during over-temperature condition. The alarm may be silenced by pressing the "Alarm Off" push-button on the front panel.
	Power Switches	The M359 has two power relays controlled by the Front-panel switches; a 3-pole relay on the input and a 2-pole relay on the output.
	Remote Control	Supports a remote On/Off control by a low-power (28Vdc/0.5A) remotely located control switch.

Notes

3. The non-operating temperature of the Battery Pack is -20 to +72°C therefore UPS with the Battery Pack installed should not be stored below -20°C .
Storing the UPS with the Battery Pack at high temperature for prolonged duration will shorten the battery life.

INTERFACE	***Discrete interface***	Four dry contacts indicating the following conditions: "UPS ON" (Output OK) "Battery Voltage Low" "Input Power Loss" (Battery Operation) "Fault Detect" A "Battery-saving Shutdown" input (via opto-isolator) allows the user to shut down the UPS during Battery-operation. When the AC input recovers the UPS will automatically turn ON.
	Ethernet SNMP Port	RJ-45, CAT-5 SNMP v1, v2 or v3 Port with Server/ Client Monitor Software. Allows monitoring of the UPS (using MIBs). Supports user defined event-triggered shutdown. Supports different shutdown timing for each Client in the net. Supports delayed (after Server shutdown) UPS shutdown.
	Serial Interface	Optional (instead of Ethernet) RS-232 Serial port provides Status messages, accepts User's commands and allows the setting of User-Programmable Options. **RS-232 Status message**: Input OK, Output OK, On Battery, Low Battery, Over-Temperature Warning, Battery Test Passed/Failed, Load Level, Battery Charge Level, status of all User Programmable Options and Failure diagnostic. **RS-232 Commands**: UPS Shutdown, UPS Standby, Initiate Battery Test, Enable/Disable Periodic Battery Test, Enable/Disable Battle Mode, Enable/Disable Audible Alarm, Protection Reset (resets all latching protection circuits), System Reset (forces all User Programmable Options into their default state and resets all latching protection circuits). For the complete set of the available Status messages and Commands, refer to the "UPS_Soft_1" Software Interface Manual. (Available at http://www.milpower.com).
MTBF		150,000 hours (at typical below-deck Naval environment)
SCREENING		Available upon request.
ACOUSTIC NOISE		Less than 54dBA (measured 3 ft from Front Panel, under normal operating conditions).
FUNGUS		Does not support fungus growth, in accordance with MIL-STD-810G, Method 508-6.
WEIGHT and SIZE		137 Pounds. (85 Pounds without the Battery Pack.) 19", 3-U, 22" deep, Rack mount or Hard mount.

How to Order

Order P/N: M359-3 -0 -1 -0 -0 -

Basic Part Number

Special Options

-0	None (STD.)
-1	Reserved: (53711-7147026)
-2	Cadmium Free

Battery Pack Options

(NONE)	With M359380-6 Battery Pack (STD.)
-1 or -NBP	Without a Battery Pack
-2	With M359380-5 (W/Captive Hardware) Battery Pack

Optional Special Hardware

-0	None
-1	With Mating Power Connectors set: (Consult Milpower Source Sale)

Communication Port

-0	RS-232 and Dry-contacts
-1	Ethernet SNMP (v1, v2 or v3), instead of RS-232 (Consult Milpower Source Sale)

Optional Slides & Load Bearing Pins

-0	None
-1	Slides: MPS P/N left side 24-002598, right side 24-002599 Pins: MPS P/N 24-000759 (mate with the UPS back panel's bushings)
-2	Pins only (same as -1, but no slides).