SWITCHERS

The *world's largest* manufacturer of high power switching regulated power supplies—whose only product line is high power switchers—announces

The NEW "MIGHTY MITES"

(MM) Series *

The most dramatic and revolutionary breakthrough ever made in the power supply industry.

- **Most comprehensive line of switchers ever developed** — one, two, three, four, five and six outputs.
- **Most watts/in.^{3}** — up to 2.26 watts/in.^{3} — more than 2 times denser than competitive switchers; 5 to 6 times denser than conventional linears.
- **Most efficient** — up to 80% efficient.
- **Most economical** — less than 60¢/watt in quantity.

*Patent Pending

- **Most reliable** — only LH Research guarantees all models for two years.
- **Most modular** — any pc board may be removed and re-installed in less than two minutes.
- **Smallest size** — 5V - 75 amp model is only 5" x 4" x 12"; 5V - 150 amp 5" x 5" x 12.75".
- **Lightest weight** — up to 62 watts/lb.
- **All models designed to meet UL 478.**

LH "MIGHTY MITES"

16 models with the most advanced specs in the industry.

Efficiency
Up to 80%.

Input
115VAC ±10% 47-63 Hz.
or 230VAC ±10% 47-63 Hz.
115/230VAC ±10% 47-63 Hz optional.

Output
(see listings under individual models)
Any output between 2 volts and 70 volts available. Contact factory.

Line Regulation
0.4% on primary output over entire input range.
0.2% on 2nd, 3rd and 4th.

Load Regulation
0.4% from no load to full load.

Note: Multiple output supplies require a minimum of 10% load on main output to maintain voltage on minor outputs.

Interaction
0.1% maximum.

Ripple and Noise
1% P-P or 50 MV.

Over-voltage Protection
Standard on primary output, factory set at 125% ±5%. OVP available for other outputs as an option.

Overshoot and Undershoot
2% maximum deviation for a 25% load change at 5A/μs.

Response Time
200 μs to 1% after a 25% load change at 5A/μs.

Drop Out Time
Supply will remain in regulation for 15 ms after removal of nominal AC power.

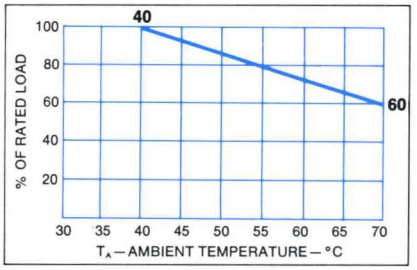
Current Limit
All outputs have "fold-back" current limiting. Constant current limiting available as an option.

Temperature Coefficient
±.02%/°C.

Storage Temperature
−55°C to 85°C.

Operating Temperature
0°C to 70°C (see derating curve).

Power Derating Curve



Minimum Load
Zero for single output models; 10% on primary output for multiple output models.

Output Polarity
Single output models:
Either output terminal may be grounded or left floating up to 100V off chassis ground.

Multiple output models:
Outputs of these supplies are floating and independent and may be referenced as desired up to 100V off chassis ground.

Input Connections
AC input is provided through a heavy duty non-breakable terminal block.

Output Connections
Primary outputs that have ratings up to 375 watts use nickel plated ¼ x 20 studs. Primary outputs that have ratings up to 750 watts have nickel plated 5/16 x 18 studs. Other outputs on multiple supplies are provided through a heavy duty non-breakable terminal block.

Output Adjustment
All outputs have voltage adjustment potentiometers accessible from the front panel. Current limit and OVP adjustments are internal and factory set.

Standard Features

- *Remote sense on primary outputs.* Compensation for up to 250 MV load cable loss can be accommodated. Remote sense is also provided on 2nd and 3rd outputs of 2 and 3 output supplies.
- *Internal thermal switch.* Will turn off the power supply in case of overheating.
- *Input RFI line filter.* Independent LC section on each side of the AC line.
- *Reverse voltage protection.* All outputs have reverse voltage protection up to 100% of rated current on primary outputs. 3 amps average on all other outputs.
- *Limited inrush current.* AC input inrush current is limited to 2½ times normal running current when averaged over one cycle.
- *Automatic internal sensing.* Internal sensing is automatic through resistors if the sense lines are opened.

Optional Features

- *Power fail detection.* Upon AC removal, power fail signal will drop to a logic zero at least 10 ms before loss of DC output. This signal is referenced to the (−) output stud.
- *Remote on-off.* The power supply output(s) can be activated by customer supplied switch or transistor circuit. (Consult factory for further details.)
- *Master/slave parallel.* Up to 10 single output units can be paralleled. Advantages are: current sharing between units to within 10%. Voltage adjustment made at master unit. All supplies switch at the same frequency.
- *Straight paralleling.* (no master) Single output supplies are available with constant current overload to allow reliable turn on when units are to be used in straight parallel.
- *Special AC inputs.* Units can be built with wider AC input ranges to give added protection against brown out.
- *DC inputs.* Most MM Series units can be configured for 28, 48, and 120 VDC.

Look how the "Mighty Mites" compare against competitive switchers.*

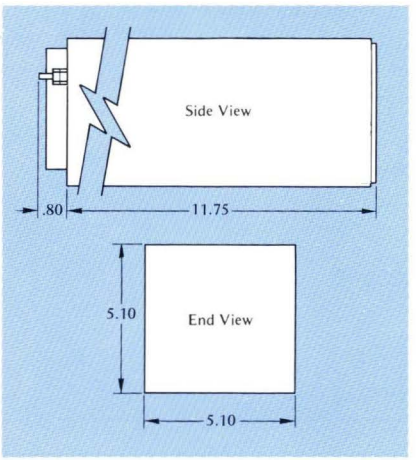
	ACDC	ACME	H-P	PIONEER	POWERTECH	SORENSON	TRIO	LH
Power/Watts	500	500	500	500	600	500	500	750
Cost	$595	$605	$650	$595	$625	$650	$650	$590
Size (in.^{3})	523	397	507	480	400	525	461	331
Cost/Watt**	$1.19	$1.21	$1.30	$1.19	$1.04	$1.30	$1.30	$.78
Watt/in.^{3}	.96	1.25	.98	1.04	1.5	.95	1.08	2.26

*Specifications and prices based on published information. **Based on single unit price.

MM-300 One output, 750 watts

5V, 150 amps
12V, 62 amps
15V, 50 amps
18V, 41 amps
24V, 31 amps

Price $590.00, 1 to 9 supplies



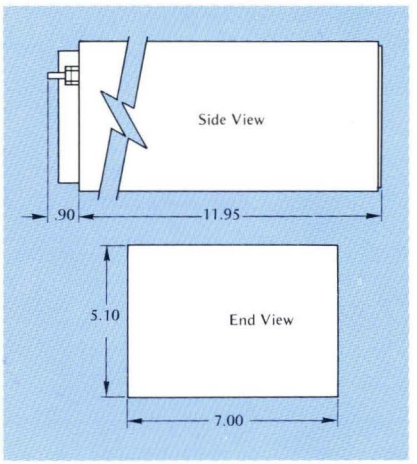
MM-420 Two outputs, 750 watts

Primary voltage:
5V, 150 amps

2nd voltage: (these voltages also available at twice the current ratings shown).
2V, 12 amps
5V, 12 amps
12V, 10 amps
15V, 10 amps
18V, 8 amps
24V, 5 amps

Total wattage of all outputs not to exceed 750 watts

Price $650.00, 1 to 9 supplies



MM-430 Three outputs, 750 watts

Primary voltage:
5V, 150 amps

2nd and 3rd voltages:
± 5V, 12 amps
±12V, 10 amps
±15V, 10 amps
±18V, 8 amps
±24V, 5 amps

Total wattage of all outputs not to exceed 750 watts

Price $695.00, 1 to 9 supplies

MM-440 Four outputs, 750 watts

Primary voltage:
5V, 150 amps

2nd voltage:
2V, 12 amps
5V, 12 amps
12V, 10 amps
15V, 10 amps
18V, 8 amps
24V, 5 amps

3rd and 4th voltages:
5V, 5 amps
12V, 5 amps
15V, 5 amps
18V, 4 amps
24V, 3 amps

Total wattage of all outputs not to exceed 750 watts

Price $745.00, 1 to 9 supplies

MM-450 Five outputs, 750 watts

Primary voltage:
5V, 150 amps

2nd, 3rd, 4th and 5th voltages, any combination of the following:
5V, 5 amps
12V, 5 amps
15V, 5 amps
18V, 4 amps
24V, 3 amps

Total wattage of all outputs not to exceed 750 watts

Price $775.00, 1 to 9 supplies

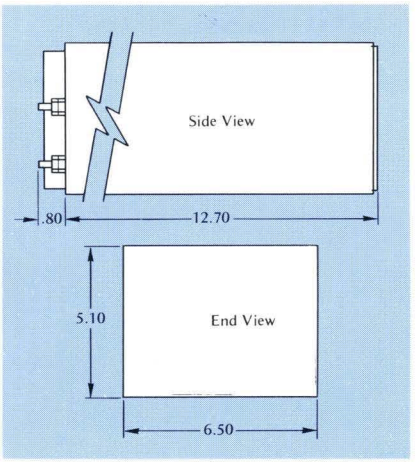
Prices and specifications are subject to change without notice.

MM-520 "Dual" — Two 375 - watt outputs, 750 watts total

No. 1 and No. 2 primary voltages, any combination of the following:

2V, 75 amps	15V, 25 amps
5V, 75 amps	18V, 21 amps
12V, 31 amps	24V, 15 amps

Price $750.00, 1 to 9 supplies



MM-630 Three outputs, 750 watts: 2 high power and 1 low power

No. 1 and No. 2 primary voltages, any combination of the following:

2V, 75 amps	12V, 31 amps
5V, 75 amps	15V, 25 amps

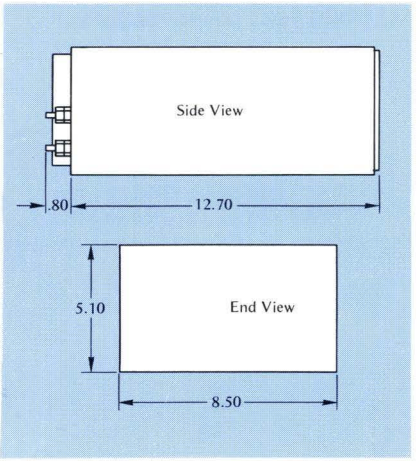
3rd voltage*: (these voltages also available at twice the current ratings shown)

2V, 12 amps	15V, 10 amps
5V, 12 amps	18V, 8 amps
12V, 10 amps	24V, 5 amps

Total wattage of all outputs not to exceed 750 watts

*Third voltage plus the No. 1 primary cannot exceed 375 watts.

Price $810.00, 1 to 9 supplies



MM-640 Four outputs: 2 high power and 2 low power, 750 watts total

No. 1 and No. 2 primary voltages, any combination of the following:

2V, 75 amps	12V, 31 amps
5V, 75 amps	15V, 25 amps

3rd and 4th voltages*, any combination of the following:

2V, 12 amps	15V, 10 amps
5V, 12 amps	18V, 8 amps
12V, 10 amps	24V, 5 amps

Total wattage of all outputs not to exceed 750 watts

*Combination of third voltage and the No. 1 primary cannot exceed 375 watts.

*Combination of fourth voltage and the No. 2 primary cannot exceed 375 watts.

Price $855.00, 1 to 9 supplies

MM-650 Five outputs: 2 high power and 3 low power, 750 watts total

No. 1 and No. 2 primary voltages, any combination of the following:

2V, 75 amps	12V, 31 amps
5V, 75 amps	15V, 25 amps

3rd voltage*:

2V, 12 amps	15V, 10 amps
5V, 12 amps	18V, 8 amps
12V, 10 amps	24V, 5 amps

4th and 5th voltages*, any combination of the following:

5V, 5 amps	18V, 4 amps
12V, 5 amps	24V, 3 amps
15V, 5 amps	

Total wattage of all outputs not to exceed 750 watts

*Combination of third voltage and the No. 1 primary cannot exceed 375 watts.

*Combination of fourth and fifth voltages and the No. 2 primary cannot exceed 375 watts.

Price $905.00, 1 to 9 supplies

MM-660 Six outputs: 2 high power and 4 low power, 750 watts total

No. 1 and No. 2 primary voltages, any combination of the following:

2V, 75 amps	12V, 31 amps
5V, 75 amps	15V, 25 amps

3rd, 4th, 5th and 6th voltages*, any combination of the following:

5V, 5 amps	18V, 1 amp
12V, 5 amps	24V, 1 amp
15V, 5 amps	

Total wattage of all outputs not to exceed 750 watts

*Combination of third and fourth voltages and the No. 1 primary cannot exceed 375 watts.

*Combination of fifth and sixth voltages and the No. 2 primary cannot exceed 375 watts.

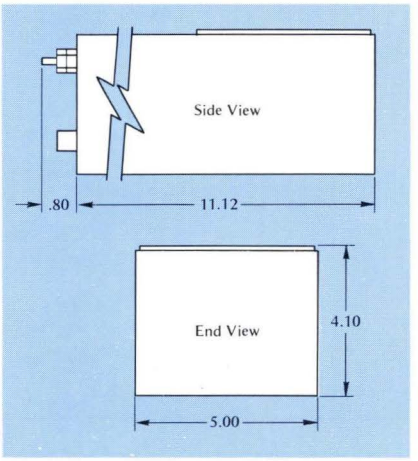
Price $935.00, 1 to 9 supplies

Prices and specifications are subject to change without notice.

MM-100 One output, 375 watts

5V, 75 amps
12V, 31 amps
15V, 25 amps
18V, 21 amps
24V, 15 amps

Price $445.00, 1 to 9 supplies



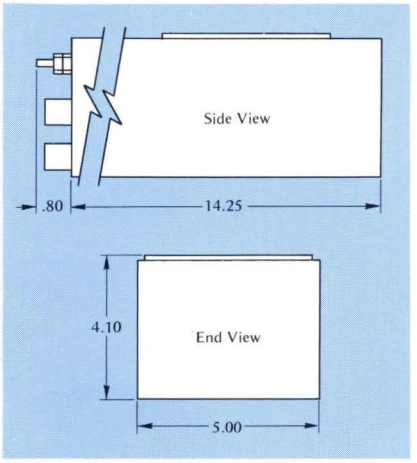
MM-220 Two outputs, 375 watts

Primary voltage:
5V, 75 amps

2nd voltage:
2V, 12 amps
5V, 12 amps
12V, 10 amps
15V, 10 amps
18V, 8 amps
24V, 5 amps

Total wattage of all outputs not to exceed 375 watts

Price $495.00, 1 to 9 supplies



MM-230 Three outputs, 375 watts

Primary voltage:
5V, 75 amps

2nd and 3rd voltages:
±12V, 8 amps
±15V, 8 amps
±18V, 6 amps

Total wattage of all outputs not to exceed 375 watts

Price $530.00, 1 to 9 supplies

MM-240 Four outputs, 375 watts

Primary voltage:
5V, 75 amps

2nd voltage:
2V, 12 amps
5V, 12 amps
12V, 10 amps
15V, 10 amps
18V, 8 amps
24V, 5 amps

3rd and 4th voltages, any combination of the following:
5V, 5 amps
12V, 3 amps
15V, 3 amps
18V, 2 amps
24V, 2 amps

Total wattage of all outputs not to exceed 375 watts

Price $565.00, 1 to 9 supplies

MM-250 Five outputs, 375 watts

Primary voltage:
5V, 75 amps

2nd, 3rd, 4th and 5th voltages, any combination of the following:
2V, 5 amps
5V, 5 amps
12V, 3 amps
15V, 3 amps
18V, 3 amps
24V, 2 amps

Total wattage of all outputs not to exceed 375 watts

Price $595.00, 1 to 9 supplies

Prices and specifications are subject to change without notice.

MM-730 "Flat Pak" — Three outputs, 375 watts

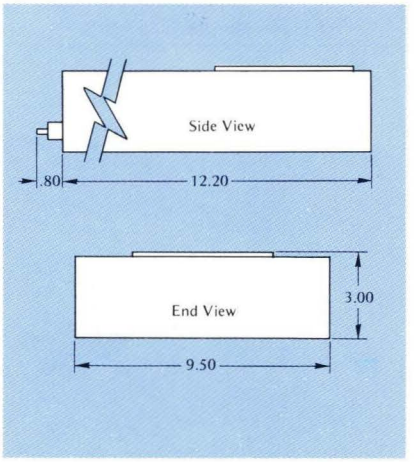
Primary voltage:
5V, 75 amps

2nd and 3rd voltages:

± 2V, 12 amps	±15V, 10 amps
± 5V, 12 amps	±18V, 8 amps
±12V, 10 amps	±24V, 5 amps

Total wattage of all outputs not to exceed 375 watts

Price $530.00, 1 to 9 supplies



How to order MM Series Switchers

MM X X X — X — X X X X X — X

- MM — Series
- X X X — Model Number
- X — No. 1 Primary Voltage (See Table I.)
- X — No. 2 Primary Voltage (See Table I. If no No. 2 primary voltage leave X.)
- X — Second Output Voltage*
- X — Third Output Voltage*
- X — Fourth Output Voltage*
- X — Fifth Output Voltage*
- X — Sixth Output Voltage*
- X — Option Letter Designation (See Table II.)

*For *each* output which needs over-voltage protection (where it is not standard) add the letter Y immediately following the output voltage code, i.e. 1Y, 3Y, etc.

TABLE I.
OUTPUT VOLTAGE CODE

0=2 VOLTS	3=15 VOLTS
1=5 VOLTS	4=18 VOLTS
2=12 VOLTS	5=24 VOLTS

TABLE II.
OPTION ORDER CODE

O=REMOTE ON-OFF
P=POWER-FAIL DETECTION
C=CONSTANT CURRENT LIMITING

Typical example: MM 661 — 1 — 1Y2Y3Y5-P

The above Model Number describes a MM 660 Series Switcher with

a 5-Volt No. 1 primary output voltage,
a 5-Volt No. 2 primary output voltage,
a 5-Volt second output voltage with over-voltage protection,
a 12-Volt third output voltage with over-voltage protection,
a 15-Volt fourth output voltage with over-voltage protection,
a 24-Volt fifth output voltage *without* over-voltage protection,
and the power-fail detection option.

LH RESEARCH

L H Research, Inc., 2052 S. Grand Ave., Santa Ana, Calif. 92705 • (714) 546-5279