

Configure Your Own

COTS

High Reliability

## EL Series Power Supplies

A higher level of performance



**ARNOLD** **MAGNETICS**

EL SERIES

# EL 2000 SERIES

# CONFIGURE-YOUR-OWN POWER SUPPLY SYSTEM

## FROM STANDARD MODULES!

AC or DC  
INPUT



## 1 OUTPUT SELECTION

Every standard output module may be specified to the exact nominal voltage and maximum current you require. The table of output regulators describes the range of voltages and currents available as standards. Please select the nominal voltage required for each output. All outputs are adjustable  $\pm 5\%$  from nominal by means of an externally accessible potentiometer. Outputs are isolated and may be connected for positive or negative polarity. Ensure your required load is within the maximum current specified. You may have up to eight outputs per power supply.

### OUTPUT REGULATORS

| NOMINAL VDC OUTPUT (V) | MAXIMUM CURRENT OUTPUT (A) | EL-2000 MODEL        | REGULATOR LENGTH (INCHES) | TYPICAL EFFICIENCY (%) | LINE/LOAD REGULATION (% Eo) <sup>3</sup> | V RMS RIPPLE/NOISE (% Eo) |
|------------------------|----------------------------|----------------------|---------------------------|------------------------|--|---------------------------|
| From 2 to 6            | 2                          | ERA-6                | 0.6                       | 80                     | 0.10                                     | 0.15                      |
|                        | 5                          | ERC-6                | 0.6                       | 80                     | 0.20                                     | 0.5                       |
|                        | 10                         | ERF-6                | 0.6                       | 85                     | 0.20                                     | 0.5                       |
|                        | 20                         | ERM-6                | 1.2                       | 85                     | 0.30                                     | 0.5                       |
|                        | 45                         | ERP-6M <sup>1</sup>  | 2.7                       | 80                     | 0.50                                     | 0.5                       |
|                        | 65                         | ERY-6M <sup>1</sup>  | 2.7DW <sup>2</sup>        | 80                     | 0.50                                     | 0.5                       |
| From 6.1 to 18         | 1                          | ERA-18               | 0.6                       | 85                     | 0.05                                     | 0.15                      |
|                        | 3                          | ERC-18               | 0.6                       | 90                     | 0.10                                     | 0.3                       |
|                        | 5                          | ERF-18               | 0.6                       | 90                     | 0.10                                     | 0.3                       |
|                        | 10                         | ERM-18               | 1.2                       | 90                     | 0.15                                     | 0.3                       |
|                        | 15                         | ERP-18M <sup>1</sup> | 2.7                       | 80                     | 0.25                                     | 0.4                       |
|                        | 20                         | ERY-18M <sup>1</sup> | 2.4DW <sup>2</sup>        | 80                     | 0.25                                     | 0.4                       |
| From 18.1 to 30        | 0.5                        | ERA-30               | 0.6                       | 90                     | 0.05                                     | 0.15                      |
|                        | 1.5                        | ERC-30               | 0.6                       | 95                     | 0.10                                     | 0.15                      |
|                        | 2.5                        | ERF-30               | 0.6                       | 95                     | 0.10                                     | 0.15                      |
|                        | 5                          | ERM-30               | 1.2                       | 95                     | 0.10                                     | 0.15                      |
|                        | 10                         | ERP-30M <sup>1</sup> | 2.7                       | 85                     | 0.25                                     | 0.3                       |
|                        | 12                         | ERY-30M <sup>1</sup> | 2.4DW <sup>2</sup>        | 85                     | 0.25                                     | 0.3                       |
| From 30.1 to 130       | 0.5                        | ERB-130              | 0.6                       | 90                     | 0.1                                      | 0.1                       |
|                        | 1                          | ERK-130              | 1.2                       | 90                     | 0.1                                      | 0.1                       |
| From 130.1 to 200      | 0.35                       | ERB-200              | 0.6                       | 95                     | 0.1                                      | 0.1                       |
|                        | 0.70                       | ERK-200              | 1.2                       | 95                     | 0.1                                      | 0.1                       |
| From 200.1 to 300      | 0.15                       | ERB-300              | 0.6                       | 95                     | 0.1                                      | 0.1                       |
|                        | 0.30                       | ERK-300              | 1.2                       | 95                     | 0.1                                      | 0.1                       |

## OPERATING SPECIFICATIONS

- **TEMPERATURE COEFFICIENT:** 0.01%/°C. -55°C to +85°C.
- **OPERATING TEMPERATURE (Baseplate):** -40°C to +85°C (optional -55°C to +85°C)
- **STORAGE TEMPERATURE:** -65°C to +100°C.
- **SHORT CIRCUIT PROTECTION:** All outputs are short circuit protected and feature foldback current limiting. (ERP, ERY straight current limiting).
- **OUTPUT ADJUSTMENT RANGE:** All outputs are adjustable over a plus or minus 5% range.
- **SEMICONDUCTOR JUNCTION TEMPERATURE:** Maximum of 100°C at operating baseplate temperature of +85°C (derating per Navmat P4855-1 and Mil-Std-454J).

■ **ISOLATION:** The inputs, case and outputs are isolated (floating) from each other. Output to case isolation test voltage is the greater of 50VDC or 1.3 x E out. Input to case 500VDC on 115VAC units, 50VDC on DC input units (to 30V). Input to output 250VDC on all units.

### NOTES

1. M—Denotes Master Channel (max. of one per power supply); —10% minimum load (to 5 amps max.) required.
2. DW—Denotes Double Width design only.
3. Line/Load Regulation Band consists of high line to low line and 1/2 load to full load change.
4. Consult Factory.
5. No additional space required for Inrush/Transient Protection.
6. No additional space required for E & T options.
7. Use with EDC, EDD or EDM Input Sections only.
8. @ -55°C; 8.7 DW.  
For 187-265 V operation only; 7.7DW

## 2 INPUT SELECTION

Select the input section, AC or DC, with sufficient power to drive the output modules. This is determined from your worksheet calculations. We have provided conservative data for your analysis. The efficiencies shown in the Output Regulators table may vary with options such as wide input or extended temperature. Our factory applications engineers will be happy to assist you in evaluating various alternative configurations.

### AC INPUT SECTION

| INPUT VOLTAGE RANGE  | EL-2000 MODEL | OUTPUT POWER RATING (WATTS) | MAXIMUM INPUT SECTION LENGTH (INCHES) |
|--|---------------|-----------------------------|---------------------------------------|
| 103-127V<br>47-500 Hz<br>1 $\phi$                                | EDAA          | 100                         | Note 4                                |
|  | EDAB          | 200                         | 6.9                                   |
|  | EDAC          | 300                         | 6.9                                   |
|  | EDAD          | 400                         | 7.2                                   |
| 103-127V<br>340-500Hz<br>1 $\phi$                                | EDAE          | 500                         | 7.2                                   |
|  | EDBA          | 100                         | Note 4                                |
|  | EDBB          | 200                         | 6.6                                   |
|  | EDBC          | 300                         | 6.6                                   |
| 103-127V<br>or<br>207-253V<br>1 $\phi$<br>Strapable<br>47-500 Hz | EDBD          | 400                         | 6.9                                   |
|  | EDBE          | 500                         | 6.9                                   |
|  | EDCA          | 100                         | Note 4                                |
|  | EDCB          | 200                         | Note 4                                |
| 115/200V<br>3 $\phi$ /4W<br>Wye<br>47-500 Hz                     | EDCC          | 300                         | 8.2DW <sup>8</sup>                    |
|  | EDCD          | 400                         | 8.2DW <sup>8</sup>                    |
|  | EDCE          | 580                         | 8.2DW <sup>8</sup>                    |
|  | EDDA          | 100                         | Note 4                                |
| 103-127V<br>47-500 Hz<br>3 $\phi$<br>DELTA                       | EDDB          | 200                         | Note 4                                |
|  | EDDC          | 300                         | 6.9DW <sup>2</sup>                    |
|  | EDDD          | 400                         | 6.9DW <sup>2</sup>                    |
|  | EDDE          | 580                         | 6.9DW <sup>2</sup>                    |
| 103-127V<br>47-500 Hz<br>3 $\phi$<br>DELTA                       | EDEA          | 100                         | Note 4                                |
|  | EDEB          | 200                         | 8.1                                   |
|  | EDEC          | 300                         | 8.1                                   |
|  | EDED          | 400                         | 8.4                                   |
|  | EDEE          | 500                         | 8.4                                   |

### DC INPUT SECTION

| INPUT VOLTAGE RANGE | EL-2000 MODEL | OUTPUT POWER RATING (WATTS) | MAXIMUM INPUT SECTION LENGTH (INCHES) |
|---------------------|---------------|-----------------------------|---------------------------------------|
| 24-30 VDC           | EDHA          | 100                         | Note 4                                |
|                     | EDHB          | 200                         | 6.9 <sup>5</sup>                      |
|                     | EDHC          | 300                         | 6.9 <sup>5</sup>                      |
|                     | EDHD          | 400                         | 8.4 <sup>6</sup>                      |
|                     | EDHE          | 500                         | 8.4 <sup>5</sup>                      |
| 105-125 VDC         | EDKA          | 100                         | Note 4                                |
|                     | EDKB          | 200                         | 5.4 <sup>5</sup>                      |
|                     | EDKC          | 300                         | 5.4 <sup>5</sup>                      |
|                     | EDKD          | 400                         | 5.7 <sup>5</sup>                      |
| 150-170 VDC         | EDLA          | 100                         | Note 4                                |
|                     | EDLB          | 200                         | 5.4 <sup>5</sup>                      |
|                     | EDLC          | 300                         | 5.4 <sup>5</sup>                      |
|                     | EDLD          | 400                         | 5.7 <sup>5</sup>                      |
|                     | EDLE          | 500                         | 5.7 <sup>5</sup>                      |
| 250-280 VDC         | EDMA          | 100                         | Note 4                                |
|                     | EDMB          | 200                         | Note 4                                |
|                     | EDMC          | 300                         | 6.9DW <sup>2</sup> & 6 <sup>5</sup>   |
|                     | EDMD          | 400                         | 6.9DW <sup>2</sup> & 6 <sup>5</sup>   |
|                     | EDMF          | 580                         | 6.9DW <sup>2</sup> & 6 <sup>5</sup>   |



# 3 CASE SELECTION

You have a variety of choices when selecting the package that best fits your space. Just add up your modules (Input Section, Regulators and Options) and pick the case that best fits your system needs.

| Case Size   | Total of Module Lengths (inches) | Base-plate Area      | Maximum Case Dimensions (inches) |           |            | Mounting Holes (inches) |       |       | Final Unit Weight (oz.) | Figure No. |
|---|----------------------------------|----------------------|----------------------------------|-----------|------------|-------------------------|-------|-------|-------------------------|------------|
|   |                                  |                      | Length (L)                       | Width (W) | Height (H) | M                       | N     | Quan. |                         |            |
| ECAA  | 3.2                              | 4.8 in <sup>2</sup>  | 3.5                              | 1.63      | 3.63       | 1.125                   | 2.750 | 4     | 25                      | 1          |
| ECBA  | 4.7                              | 7.1 in <sup>2</sup>  | 5.0                              | 1.63      | 3.63       | 1.125                   | 4.250 | 4     | 35                      | 1          |
| ECCA  | 6.7                              | 10.1 in <sup>2</sup> | 7.0                              | 1.63      | 3.63       | 1.125                   | 2.750 | 6     | 45                      | 1          |
| ECFA  | 8.2                              | 12.4 in <sup>2</sup> | 8.5                              | 1.63      | 3.63       | 1.125                   | 3.500 | 6     | 60                      | 1          |
| ECDA  | 10.2                             | 15.4 in <sup>2</sup> | 10.5                             | 1.63      | 3.63       | 1.125                   | 4.500 | 6     | 70                      | 1          |
| <b>"DOUBLE WIDE" Packages below allow modules to be mounted side by side.</b> |                                  |                      |                                  |           |            |                         |       |       |                         |            |
| ECAB  | 2 x 3.2                          | 9.7 in <sup>2</sup>  | 3.5                              | 3.13      | 3.63       | 2.625                   | 2.750 | 4     | 45                      | 2          |
| ECBB  | 2 x 4.7                          | 14.2 in <sup>2</sup> | 5.0                              | 3.13      | 3.63       | 2.625                   | 4.250 | 4     | 66                      | 2          |
| ECCB  | 2 x 6.7                          | 20.2 in <sup>2</sup> | 7.0                              | 3.13      | 3.63       | 2.625                   | 2.750 | 6     | 82                      | 2          |
| ECFB  | 2 x 8.2                          | 24.8 in <sup>2</sup> | 8.5                              | 3.13      | 3.63       | 2.625                   | 3.500 | 6     | 110                     | 2          |
| ECDB  | 2 x 10.2                         | 30.8 in <sup>2</sup> | 10.5                             | 3.13      | 3.63       | 2.625                   | 4.500 | 6     | 130                     | 2          |
| <b>"TRIPLE WIDE" Packages below allow modules to be mounted three across.</b> |                                  |                      |                                  |           |            |                         |       |       |                         |            |
| ECAC  | 3 x 3.2                          | 14.4 in <sup>2</sup> | 3.5                              | 4.62      | 3.63       | 4.126                   | 2.750 | 4     | 63                      | 2          |
| ECBC  | 3 x 4.7                          | 21.3 in <sup>2</sup> | 5.0                              | 4.62      | 3.63       | 4.126                   | 4.250 | 4     | 90                      | 2          |
| ECCB  | 3 x 6.7                          | 30.3 in <sup>2</sup> | 7.0                              | 4.62      | 3.63       | 4.126                   | 2.750 | 6     | 123                     | 2          |
| ECFC  | 3 x 8.2                          | 37.2 in <sup>2</sup> | 8.5                              | 4.62      | 3.63       | 4.126                   | 3.500 | 6     | 150                     | 2          |
| ECDC  | 3 x 10.2                         | 46.2 in <sup>2</sup> | 10.5                             | 4.62      | 3.63       | 4.126                   | 4.500 | 6     | 186                     | 2          |

**NOTE:** All cases are gold anodized aluminum with turret-style solder terminals and Teflon insulation, 7/16 maximum height, except for ERP and ERY which has 1/4-28 threaded studs with a maximum height of 7/16 standard or 11/16 optional. (select).  
Optional Threaded Terminals have maximum height of 1/2 or 5/8. (select).

FIGURE 1

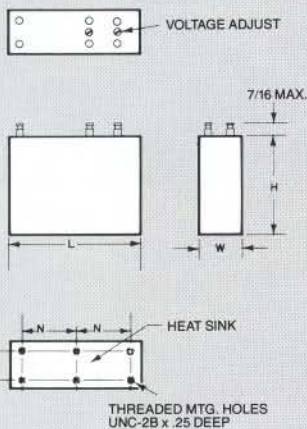
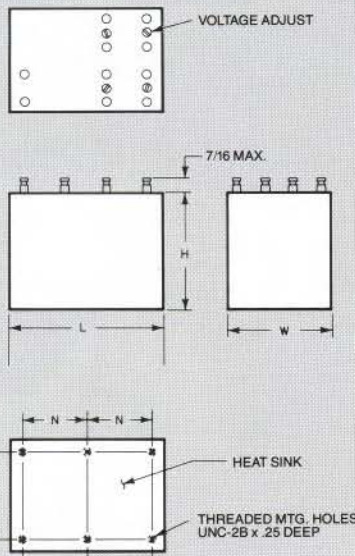


FIGURE 2



## ENVIRONMENTAL SPECIFICATIONS

- **Temperature Range:** Operating Temperature: -40°C to +85°C. Baseplate Temperature. Optional -55°C to +85°C range. Non-Operating Storage Temperature: -65°C to +100°C.
- **High Temperature:** Per MIL-STD-810, Method 501, Procedure II.
- **Low Temperature:** Per MIL-STD-810, Method 502, Procedure I.
- **Temperature-Altitude:** Per MIL-STD-810, Method 504, Procedure I; the following details apply: -40°C to +85°C (and -55°C to +85°C) at Altitude: Sea level to 70,000 ft.
- **Humidity:** Per MIL-STD-810, Method 507, Procedure I.
- **Acceleration:** Per MIL-STD-810, Method 513, Procedure I and II, at a test level of 14 G.
- **Vibration:** Per MIL-STD-810, Method 514, Procedure I, at a test level of 15 G.
- **Shock:** Per MIL-STD-810, Method 516, Procedures I, II, III, V, and VI at a test level of 40 G.

## 4 Contact Factory for assignment of final model number.

**ARNOLD MAGNETICS CORPORATION**  
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Phone: (805) 484-4221 • FAX: (805) 484-4113  
www.amcpower.com

## OPTIONS

| OPTION LETTER | DESCRIPTION   |
|---------------|---|
| EA-V          | <b>Output Over-Voltage Protection</b> —SCR type to 20A. All ERP and ERY use electronic control. 120% ± 10% of nominal E <sub>o</sub> available on all Regulators except ERB and ERK. No additional length required for ERP and ERY. For others, please add 0.6" to length of Regulator. |
| EA-T          | <b>Extended Temperature Operation</b> —-55°C to +85°C. Contact factory for other requirements. Temp. range may affect case size and maximum output current.   |
| EA-E          | <b>Extended Input Voltage</b> —92-138 VAC and 18-36 VDC. For other ranges please contact Factory with your requirements. Input range may affect unit efficiency, case size and maximum output current.  |
| EA-TP         | <b>Input Transient Protection</b> —Conforms to the transient provision of MIL-STD 704A-E as well as MIL-STD-1275 and MIL-STD-1399. For undershoot and dropout contact Factory with specific requirements. Add 0.6" to Input Section length.   |
| EA-R          | <b>Remote Sense</b> —Maintains specified output voltage at remote load. Compensates for a voltage drop of .25V maximum. Available above 10A. Standard on master channels. Add 0.6" to Regulators, except ERP and ERY.   |
| EA-A          | <b>Remote Voltage Adjustment</b> —Terminals are provided for external potentiometer. Add 0.6" to Regulators.  |
| EA-TS         | <b>Over-Temperature Shutdown</b> —Unit will shut off during over-temp and automatically reset within specified range. Add 1.2" to Input Section length.   |
| EA-ST         | <b>Stud-Terminals</b> —8-32 threaded studs are provided for input and output terminations (maximum height of 5/8"). ERP and ERY regulators come standard with 1/4-28 stud terminals. Maximum torque of retaining nut: 15 inch-pound for 8-32 stud; 25 inch-pound for 1/4-28 stud.       |
| EA-H          | <b>Helicoil Mounting Inserts</b> —Locking or free running helicoil inserts are provided. Specify 6-32 or 8-32.  |
| EA-LC         | <b>TTL On/Off Control</b> —Logic signal will turn unit On or Off. Add 0.6" to Input Section length.   |
| EA-D          | <b>Power-Down Signal</b> —TTL signal warns of input power loss prior to outputs falling out of regulation. Add 0.6" to Input Section length.  |
| EA-I          | <b>Inrush Soft Start</b> —Unit inrush limited to 2 times steady state peak current at turn-on (AC only) Add 0.6" to Input Section length.   |
| EA-SX07       | <b>Connector</b> - Circular and D-sub connectors available for input and output(s). Contact factory for details.  |
| EA-SX14       | <b>EMI Filtering</b> - Mil-Std-461C and Mil-Std-461D filtering available for conducted and radiated emissions and susceptibility. Contact factory for details.  |
| EA-SX15       | <b>Hold-up Time</b> - Upon AC power loss, additional hold-up time keeps DC output voltages within regulation for specified period of time. Contact factory for details.   |
| EA-SX44       | <b>Power Factor Correction</b> - Greater than 0.99 Power factor on single phase, 115VAC inputs.   |
| EA-N          | <b>Output Noise Filters</b> - Output noise filter reduce output noise and ripple to specified limits. Contact factory for details.  |
| EA-SX36       | <b>Redundant Operation</b> - Output Or'ing diodes allow two units with identical outputs to be connected in parallel for redundancy.  |
| EA-SP         | <b>Special Case</b> - Low profile and other non-standard cases available. Contact factory for details.  |

## THERMAL INTERFACE

Arnold Magnetics Power Supplies are cooled by conduction. Always use thermal compound during installation. To assure reliability the thermal interface must be designed to maintain specified Baseplate Temperature under worst-case conditions. Heat transfer via forced air or natural convection will be minimal.  
Please consult the Factory to discuss heat-sinking considerations



# RUGGED "COTS" POWER SUPPLIES



## WHY CHOOSE ARNOLD MAGNETICS?

### SAVE SPACE... MINIATURIZED PACKAGES

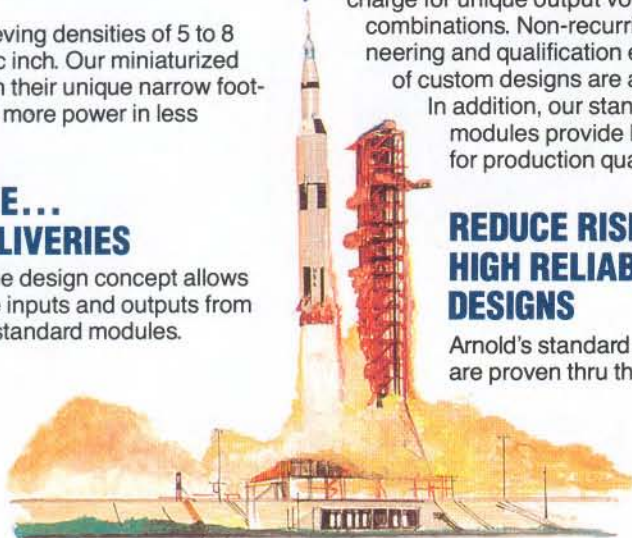
Arnold's complete AC-DC and DC-DC Multi Output Systems are 50% to 75% smaller than previous generation power



supplies, achieving densities of 5 to 8 watts per cubic inch. Our miniaturized packages, with their unique narrow footprints, provide more power in less space.

### SAVE TIME... QUICK DELIVERIES

Arnold's unique design concept allows you to choose inputs and outputs from predesigned standard modules.



You configure your own "custom" multi-output power supply system and get delivery in weeks...even with non-standard voltage combinations.

### SAVE MONEY... LOWER PROGRAM COSTS

With Arnold, there is no additional charge for unique output voltage combinations. Non-recurring engineering and qualification expenses of custom designs are avoided.

In addition, our standard modules provide lower cost for production quantities.

### REDUCE RISK... HIGH RELIABILITY DESIGNS

Arnold's standard modules are proven thru thousands



of hours of failure-free qualification before ever being shipped to our customers. NAVMAT derating and testing methods, along with standardized modular designs, ensure reliability and reduce the risk of failure inherent in new custom circuits or thermal and mechanical package designs.





# CONFIGURE-YOUR-OWN POWER SUPPLY WORKSHEET\*

\*For 7 or more output voltages use separate sheet.

| REGULATOR MODEL                          | VOLTS (Nominal) | AMPS (Maximum)            | OUTPUT POWER  | REGULATOR EFFICIENCY | REGULATOR POWER FROM INPUT SECTION | REGULATOR LENGTH (Include Options)             | PRICE (Include Options)    |
|--|-----------------|---------------------------|---|----------------------|------------------------------------|--|----------------------------|
| 1.                                       | _____ VDC       | _____ A                   | _____ Watts   | _____ %              | _____ Watts                        | _____ Inches                                   | \$ _____                   |
| 2.                                       | _____ VDC       | _____ A                   | _____ Watts   | _____ %              | _____ Watts                        | _____ Inches                                   | \$ _____                   |
| 3.                                       | _____ VDC       | _____ A                   | _____ Watts   | _____ %              | _____ Watts                        | _____ Inches                                   | \$ _____                   |
| 4.                                       | _____ VDC       | _____ A                   | _____ Watts   | _____ %              | _____ Watts                        | _____ Inches                                   | \$ _____                   |
| 5.                                       | _____ VDC       | _____ A                   | _____ Watts   | _____ %              | _____ Watts                        | _____ Inches                                   | \$ _____                   |
| 6.                                       | _____ VDC       | _____ A                   | _____ Watts   | _____ %              | _____ Watts                        | _____ Inches                                   | \$ _____                   |
| <b>TOTAL OUTPUT POWER</b>                |                 |                           | _____ Watts   |                      | _____ Watts                        | _____ Inches                                   | \$ _____                   |
| <b>POWER REQUIRED FROM INPUT SECTION</b> |                 |                           |   |                      |                                    | TOTAL REGULATORS (Include options)             | TOTAL REGULATOR            |
| <b>INPUT SECTION</b>                     | <b>MODEL</b>    | <b>RATED OUTPUT POWER</b> | <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>MUST BE 10% GREATER THAN**</b><br/> <small>**Due to system configuration.</small> </div> |                      |                                    | +  |                            |
| _____                                    | _____           | _____ Watts               |   |                      |                                    | _____ Inches                                   | \$ _____                   |
|  |                 |                           |   |                      |                                    | <b>INPUT SECTION LENGTH</b> (Include Options)  | <b>INPUT SECTION PRICE</b> |
|  |                 |                           |   |                      |                                    | _____ Inches                                   | \$ _____                   |
|  |                 |                           |   |                      |                                    | <small>.Input Section &amp; Regulators</small> | <b>TOTAL PRICE</b>         |
| <b>TOTAL MODULE LENGTH =</b>             |                 |                           |   |                      |                                    | _____ Inches                                   | \$ _____                   |

Select a case size that will accommodate the sum of all Regulators, Options and Input Section.

|                                  |   |                                    |
|----------------------------------|---|------------------------------------|
| TOTAL MODULE LENGTH _____ INCHES | ≥ | CASE _____ CONTAINING _____ INCHES |
|----------------------------------|---|------------------------------------|

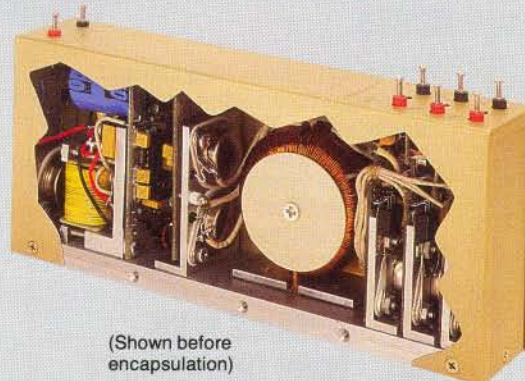
## RELIABILITY...FROM THE INSIDE OUT!

Modular Concept Provides Repeatability

Tantalum Capacitors for High Density

Thermal Management Maintains Safe Operating Temperatures

Established Reliability Components for Higher MTBF



(Shown before encapsulation)

Fully Isolated Output Voltages

Extra Protection Circuitry adds to True Reliability

Conduction Cooled Additional Airflow is Rarely Required

MOSFET Designs for Minimum Switching Losses and Higher Efficiencies

Heavy Brackets Resist Shock/Vibration



Arnold Magnetics Corporation has been producing "COTS", high reliability, high quality, ruggedized, power conversion systems for the aerospace, military and industrial marketplace for over 40 years. Our products are used in hundreds of exacting, severe environment applications and utilize the

latest in switching technology.

Our modern 25,000 sq. ft. facility and up-to-date systems conform to the requirements of MIL-I-45208A. Our personnel are trained to ANSI-J-001B soldering standards and in ESD handling of components per DOD-Std-1686 & MIL-Hdbk-263.



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