

A - SERIES

Triple Output High-Reliability, Power-Sharing 20 Watt, DC/DC Converters

Among the three families of triple-output DC/DC converters in DATEL's new A-Series, the 20W 2" x 2" devices are distinguished by their unique "power-sharing" architecture. This feature enables devices to deliver the full 20 Watts of output power under a variety of output-loading conditions. Each unit's primary +5V output can source any current up to 3 Amps (primary power = 15W); while its auxiliary $\pm 12/15V$ outputs can source currents up to $\pm 500mA$ (auxiliary power = 12/15W). Devices deliver any combination of primary plus auxiliary power as long as the total output power does not exceed 20 Watts. This feature enables designers to select a single device to fulfill any number of different requirements.

As members of DATEL's new A-Series, the 20W triples exhibit both low cost and outstanding long-term reliability. Their design combines straightforward circuit topologies, the newest components, proven SMT-on-pcb construction methods, and highly repeatable automatic-assembly techniques. Their superior durability is substantiated by a rigorous in-house qualification program that includes HALT (Highly Accelerated Life Testing).

Each device has a +5V primary output and either $\pm 12V$ or $\pm 15V$ auxiliary outputs. "D12A" models achieve fully rated performance with inputs ranging from 9 to 36 Volts. "D48A" models operate over an input range of 18-75 Volts.

These full-featured triples have non-latching output current limiting, input overvoltage shutdown, input reverse-polarity protection, and output overvoltage clamping to protect both the power converters and their loads.

Features

- Low cost! Highly reliable!
- Full 20 Watts output power
- Power "user-allocated" among outputs
- Proven SMT-on-pcb construction
- Qual tested; HALT tested; EMC tested
- Output voltages: +5V/ $\pm 12V$ or +5V/ $\pm 15V$
- Ultra-wide input voltage ranges:
9-36V or 18-75V
- Designed to meet UL1950 and EN60950 (basic insulation)
- CE mark available (75V-input models)
- Small packages, 2" x 2" x 0.45"
- Fully isolated, 1500Vdc guaranteed
- Guaranteed efficiencies to 82%
- -40 to +100°C operating temperature
- Modifications and customs for OEM's

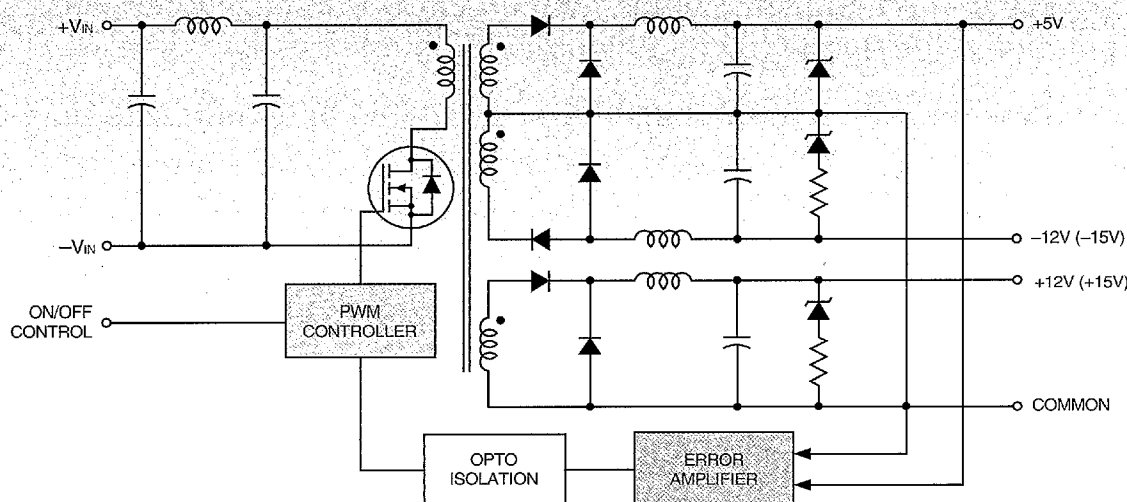


Figure 1. Simplified Schematic

Performance Specifications and Ordering Guide ^①

| Model | OUTPUT | | | | | | INPUT | | | Efficiency | | Package (Case, Pinout) |
|------------------------|-----------------------------|--------------------------|---------------|------|-------------------|--------|---------------------------------|------------------|---------------------------|------------|------|------------------------------|
| | V _{OUT} (Volts) | I _{OUT} (mA) | R/N (mVp-p) ② | | Regulation (Max.) | | V _{IN} Nom. (Volts) | Range (Volts) | I _{IN} ④ (mA) | Min. | Typ. | |
| | | | Typ. | Max. | Line | Load ③ | | | | | | |
| TWR-5/3000-12/500-D12A | +5 | 3000 | 50 | 100 | ±1.0% | ±2.0% | 24 | 9-36 | 75/1118 | 81% | 82% | C4, P13 |
| | ±12 | ±500 | 75 | 125 | ±1.0% | ±5.0% | | | | | | |
| TWR-5/3000-12/500-D48A | +5 | 3000 | 50 | 100 | ±1.0% | ±2.0% | 48 | 18-75 | 40/559 | 82% | 83% | C4, P13 |
| | ±12 | ±500 | 75 | 125 | ±1.0% | ±5.0% | | | | | | |
| TWR-5/3000-15/500-D12A | +5 | 3000 | 50 | 100 | ±1.0% | ±2.0% | 24 | 9-36 | 75/1118 | 81% | 82% | C4, P13 |
| | ±15 | ±500 | 75 | 150 | ±1.0% | ±5.0% | | | | | | |
| TWR-5/3000-15/500-D48A | +5 | 3000 | 50 | 100 | ±1.0% | ±2.0% | 48 | 18-75 | 40/559 | 81% | 82% | C4, P13 |
| | ±15 | ±500 | 75 | 150 | ±1.0% | ±5.0% | | | | | | |

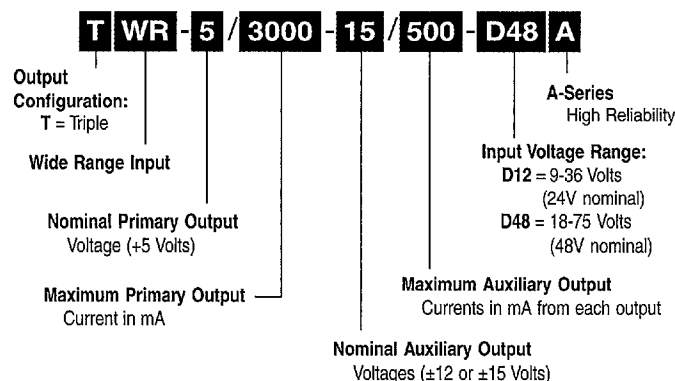
① Typical @ T_A = +25°C under nominal line voltage and full-load conditions unless otherwise noted. For testing and specification purposes, "full load" is defined as 2.75A on the primary +5V output and ±250/200mA on the auxiliary ±12/15V outputs. This corresponds to a total output power of 19.75W.

② Ripple/Noise (R/N) measured over a 20MHz bandwidth.

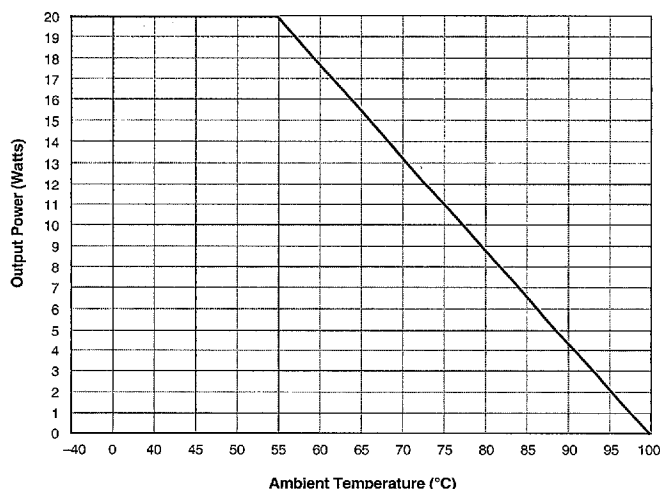
③ For the +5V output, listed spec applies over the 10% to 100% load range. For the ±12/15V outputs, listed spec applies for balanced loads over the 20% to 100% load range.

④ Nominal line voltage, no-load/full-load conditions.

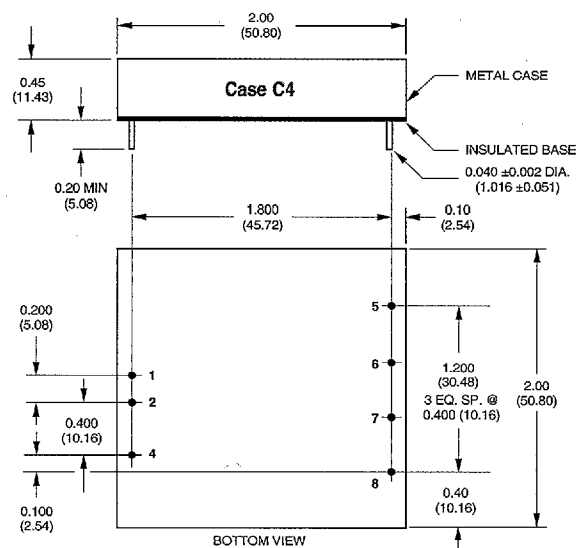
PART NUMBER STRUCTURE



TEMPERATURE DERATING



MECHANICAL SPECIFICATIONS



I/O Connections

| Pin | Function P13 |
|-----|----------------|
| 1 | +Input |
| 2 | -Input |
| 3 | No Pin |
| 4 | On/Off Control |
| 5 | +12V/15V Out |
| 6 | +5V Out |
| 7 | Common |
| 8 | -12V/15V Out |

Notes:

For "D12A" models, the case is connected to pin 2 (-V_{IN}).

For "D48A" models, the case is connected to pin 1 (+V_{IN}).

Performance/Functional Specifications

Typical @ T_A = +25°C under nominal line voltage and "full-load" conditions, unless noted. ①

| INPUT | |
|--|---|
| Input Voltage Range: | |
| "D12A" Models | 9-36 Volts (24V nominal) |
| "D48A" Models | 18-75 Volts (48V nominal) |
| Input Current | See Ordering Guide |
| Input Filter Type ② | Pi |
| Overvoltage Shutdown: | |
| "D12A" Models | 40 Volts |
| "D48A" Models | 80 Volts |
| Reverse-Polarity Protection | Yes (Instantaneous, 6A maximum) |
| On/Off (Sync.) Control (Pin 4) ③ | TTL high = off, low (or open) = on |
| OUTPUT | |
| V _{out} Accuracy (50% loads): | |
| +5V Output | ±1% |
| ±12V or ±15V Outputs | ±3% |
| Temperature Coefficient | ±0.02% per °C |
| Ripple/Noise (20MHz BW) ② | See Ordering Guide |
| Line/Load Regulation | See Ordering Guide |
| Efficiency | See Ordering Guide |
| Isolation Voltage ④ | 1500Vdc, minimum |
| Isolation Capacitance | 500pF |
| Current Limiting | Auto-recovery |
| Overvoltage Protection | Zener/transorb clamps, magnetic feedback |
| DYNAMIC CHARACTERISTICS | |
| Transient Response (50% load step) | 300µsec max. to ±2% of final value |
| Switching Frequency | 165kHz (±15kHz) |
| ENVIRONMENTAL | |
| Operating Temperature (ambient): | |
| Without Derating | -40 to +55°C |
| With Derating | to +100°C (See Derating Curve) |
| Storage Temperature | -40 to +105°C |
| PHYSICAL | |
| Dimensions | 2" x 2" x 0.45" (51 x 51 x 11.4mm) |
| Shielding | 5-sided |
| Case Connections: | |
| "D12A" Models | Pin 2 (-V _{IN}) |
| "D48A" Models | Pin 1 (+V _{IN}) |
| Case Material | Corrosion resistant steel with non-conductive, epoxy-based, black enamel finish and plastic baseplate |
| Pin Material | Brass, solder coated |
| Weight | 2.7 ounces (77 grams) |

① These converters require 10% min. loading on their primary output and 20% min. loading on their auxiliary outputs to maintain specified regulation. Operation under no-load conditions will not damage the devices; however they may not meet all listed specifications. For testing and specification purposes, "full load" is defined as 2.75A on the primary +5V output and ±250/200mA on the auxiliary ±12/15V outputs. This corresponds to a total output power of 19.75W.

② Application-specific internal input/output filtering can be recommended or perhaps added internally upon request. Contact DATEL Applications Engineering for details.

③ Applying a voltage to the Control pin when no input power is applied to the converter can cause permanent damage to the converter.

④ Devices can be screened or modified for higher guaranteed isolation voltages. Contact DATEL Applications Engineering for details.

ABSOLUTE MAXIMUM RATINGS

| | |
|---------------------------------------|--|
| Input Voltage: | |
| "D12" Models | 44 Volts |
| "D48" Models | 88 Volts |
| Input Reverse-Polarity Protection | Current must be <6A. Brief duration only. Fusing recommended. |
| Output Overvoltage Protection | |
| +5V Output | 6.8 Volts, limited duration |
| ±12V Outputs | ±15 Volts, limited duration |
| ±15V Outputs | ±18 Volts, limited duration |
| Output Current | Current limited. Max. currents are model dependent. Units can withstand a continuous output short on any output for 3 minutes. |
| Storage Temperature | -40 to +105°C |
| Lead Temperature (soldering, 10 sec.) | +300°C |

These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied.

TECHNICAL NOTES

Filtering and Noise Reduction

All A-Series TWR 20 Watt DC/DC Converters achieve their rated ripple and noise specifications without the use of external input/output capacitors. In critical applications, input/output noise may be further reduced by installing electrolytic capacitors across the input terminals and/or low-ESR tantalum or electrolytic capacitors across the output terminals. Output capacitors should be connected between their respective output pin (pin 5, 6 or 8) and Common (pin 7). The caps should be located as close to the power converters as possible. Typical values are listed below. In many applications, using values greater than those listed will yield better results.

To Reduce Input Ripple

| | |
|---------------|------------|
| "D12A" Models | 20µF, 50V |
| "D48A" Models | 10µF, 100V |

To Reduce Output Ripple

| | |
|-----------------|--------------------|
| +5V Output | 47µF, 10V, Low ESR |
| ±12/15V Outputs | 33µF, 20V, Low ESR |

In critical, space-sensitive applications, DATEL may be able to tailor the internal input/output filtering of these units to meet your specific requirements. Contact our Applications Engineering Group for additional details.

Input Fusing

Certain applications and/or safety agencies may require the installation of fuses at the inputs of power conversion components. For DATEL A-Series TWR 20 Watt DC/DC Converters, you should use slow-blow type fuses with values no greater than 4A for "D12A" models and 2A for "D48A" models.

On/Off Control

The On/Off Control pin (pin 4) may be used for remote on/off operation. A TTL logic high (+2 to +5 Volts, 250 μ A max.) applied to pin 4 disables the converter. A TTL logic low (0 to +0.8 Volts, 70 μ A max.), or no connection, enables the converter. Control voltages should be referenced to pin 2 (-Input). Applying a voltage to the Control pin when no input power is applied to the converter can cause permanent damage to the converter.

Synchronization

In critical applications employing multiple switching DC/DC converters, it may be desirable to intentionally synchronize the switching of selected converters (so the system noise can be reduced with notch filtering) or to purposely desynchronize the converters (to lessen the current-carrying requirements on intermediate dc buses). For multiple A-Series Converters, an external clock can be applied to pin 4 (Control) of each device. It should be a square wave with a maximum 1 μ sec "high" duration and an amplitude between +2V and +5V (see On/Off Control) referenced to pin 2 (-Input). The frequency of the synchronizing clock should be higher than that of any individual converter. Therefore, it should be 185kHz \pm 5kHz.

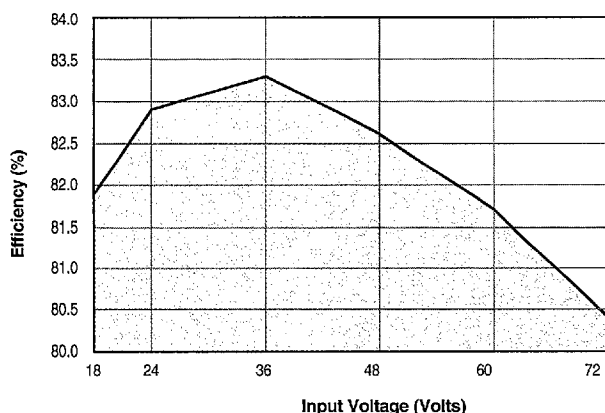
Typical Performance Curves ($T_A = +25^\circ\text{C}$)

The performance curves below were derived from actual test data for a single model number (TWR-5/3000-12/250-D48). Since all devices in this series have the same circuit architecture, the performance curves are representative for all devices.

EFFICIENCY VS. INPUT VOLTAGE AND OUTPUT

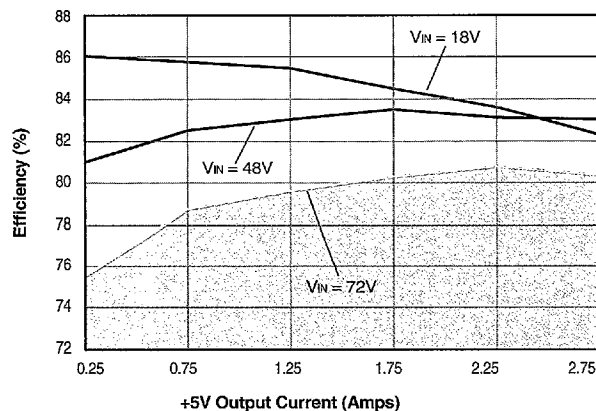
Efficiency vs. Input Voltage

(+5V output loaded @ 2.75A, $\pm 12\text{V}$ outputs loaded @ $\pm 250\text{mA}$)



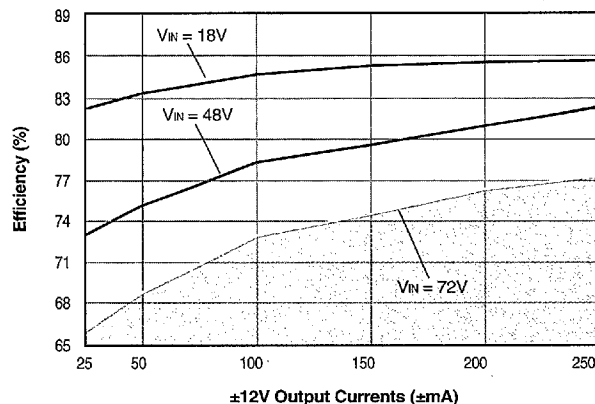
Efficiency vs. +5V Output Loading

($\pm 12\text{V}$ outputs loaded @ $\pm 250\text{mA}$)



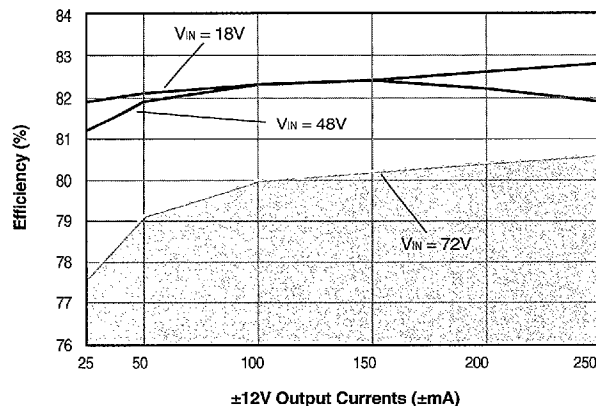
Efficiency vs. $\pm 12\text{V}$ Output Loading

(+5V output loaded @ 0.55A)



Efficiency vs. $\pm 12\text{V}$ Output Loading

(+5V output loaded @ 2.75A)



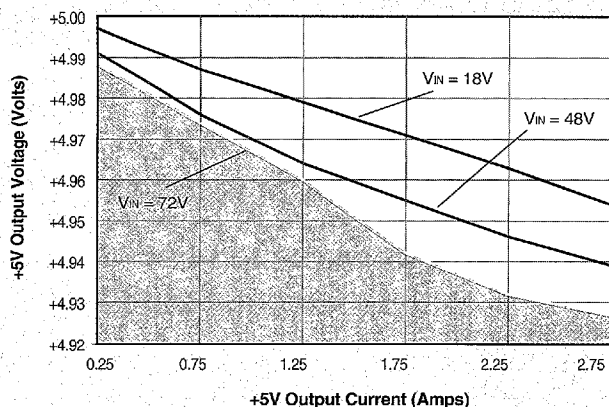
2651561 0004160 700

DATEL, Inc., 11 Cabot Boulevard, Mansfield, MA 02048-1151 (USA)

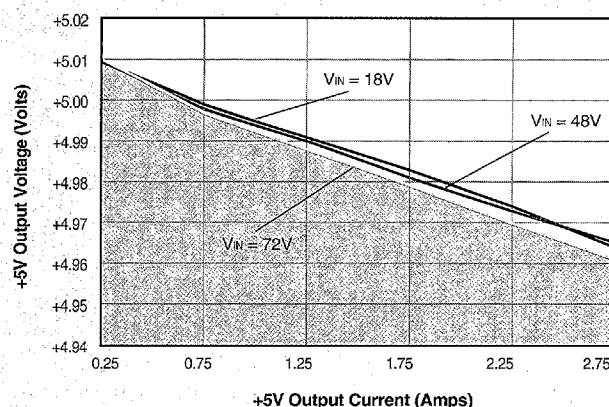
Tel: (508)339-3000, (800)233-2765 Fax: (508)339-6356 • Email: sales@datel.com • Internet: www.datel.com

LOAD REGULATION

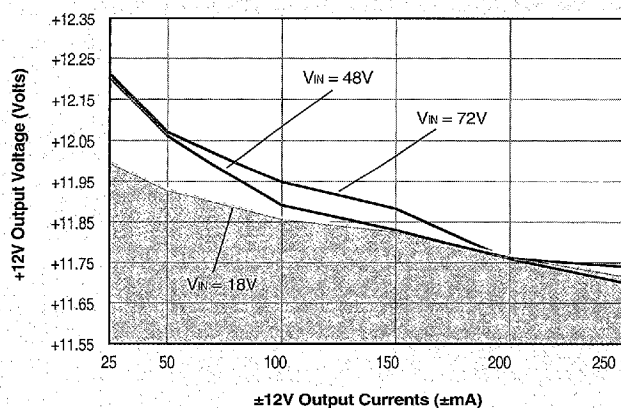
+5V Output Load Regulation
($\pm 12V$ outputs loaded @ $\pm 25mA$)



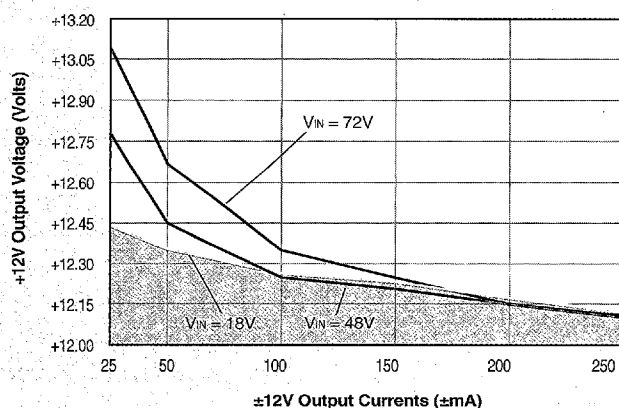
+5V Output Load Regulation
($\pm 12V$ outputs loaded @ $\pm 250mA$)



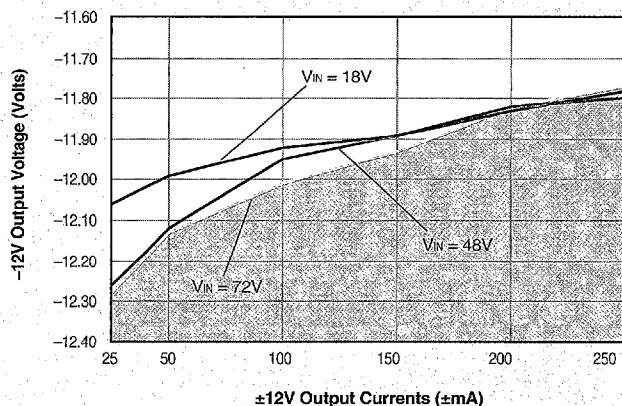
+12V Output Load Regulation
(+5V output loaded @ 0.55A)



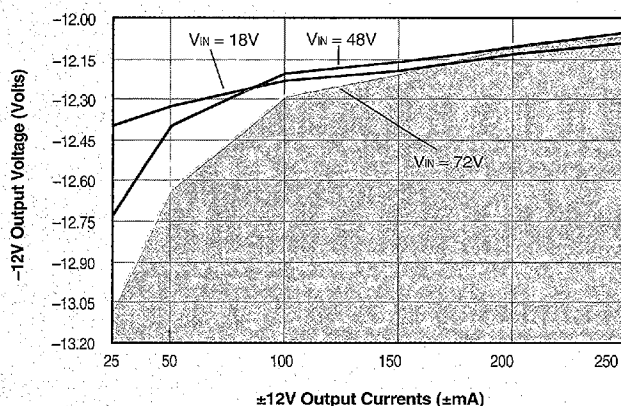
+12V Output Load Regulation
(+5V output loaded @ 2.75A)



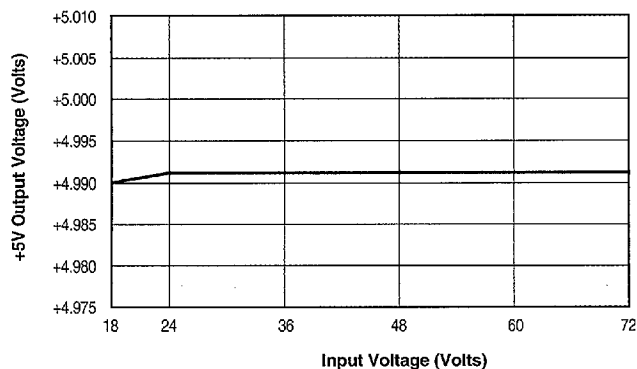
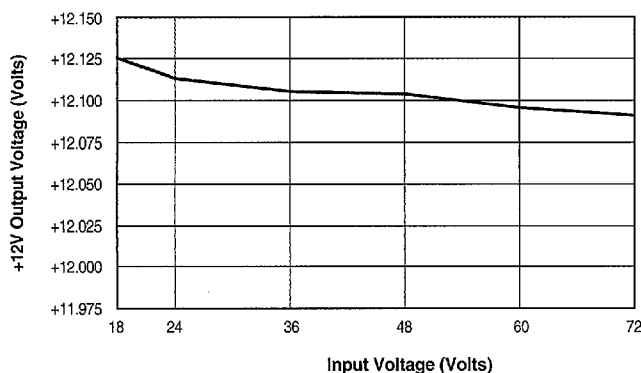
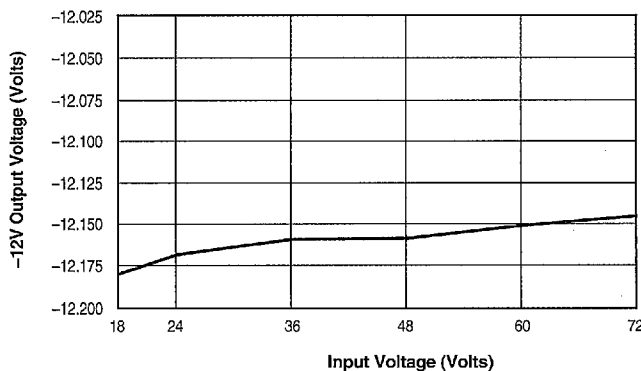
-12V Output Load Regulation
(+5V output loaded @ 0.55A)



-12V Output Load Regulation
(+5V output loaded @ 2.75A)

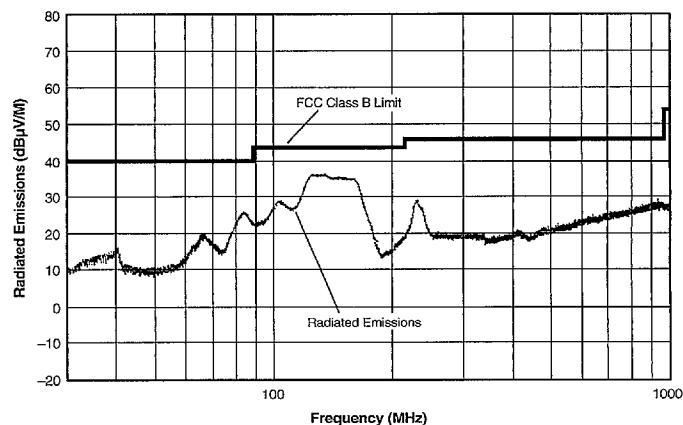
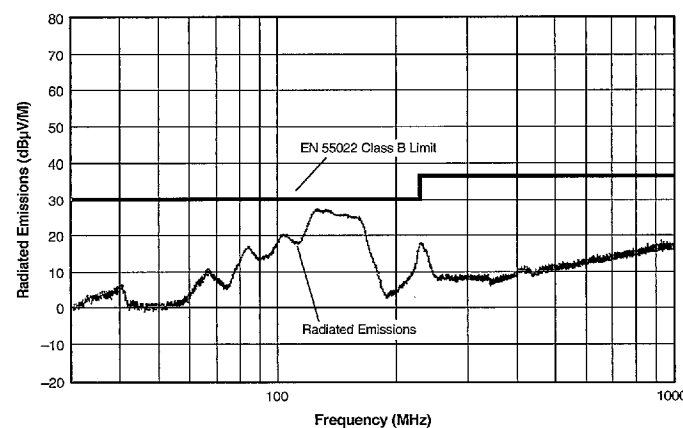


LINE REGULATION

+5V Line Regulation(+5V output loaded @ 2.75A, $\pm 12\text{V}$ outputs loaded @ $\pm 250\text{mA}$)**+12V Line Regulation**(+5V output loaded @ 2.75A, $\pm 12\text{V}$ outputs loaded @ $\pm 250\text{mA}$)**-12V Line Regulation**(+5V output loaded @ 2.75A, $\pm 12\text{V}$ outputs loaded @ $\pm 250\text{mA}$)

EMI RADIATED EMISSIONS

If you're designing with EMC in mind, note that all of DATEL's TWR 20 Watt A-Series DC/DC Converters have been characterized for radiated and conducted emissions in our new EMI/EMC laboratory. Testing is conducted in an EMCO 5305 GTEM test cell utilizing EMCO automated EMC test software. Radiated emissions are tested to the limits of FCC Part 15, Class B and CISPR 22 (EN 55022) Class B. Correlation to other specifications can be supplied upon request. Radiated emissions plots to FCC and CISPR 22 for model TWR-5/3000-15/500-D12A appear below. Its performance is typical of all models in the Series. Published EMC test reports are available for each model number. Contact DATEL's Applications Engineering for details.

TWR-5/3000-15/500-D12A Radiated Emissions**FCC Part 15 Class B, 3 Meters**Converter Output = +5Vdc @ 2.7A and $\pm 15\text{Vdc}$ @ $\pm 450\text{mA}$ **TWR-5/3000-15/500-D12A Radiated Emissions****EN 55022 Class B, 10 Meters**Converter Output = +5Vdc @ 2.7A and $\pm 15\text{Vdc}$ @ $\pm 450\text{mA}$ 

2651561 0004162 583

DATEL, Inc., 11 Cabot Boulevard, Mansfield, MA 02048-1151 (USA)

Tel: (508)339-3000, (800)233-2765 Fax: (508)339-6356 • Email: sales@datel.com • Internet: www.datel.com