



Triple Output TWR Models

Unique, Power-Sharing 20 Watt, DC/DC Converters

Features

- Full 20 Watts output power
- Power is "user-allocated" among outputs
- Output voltages: +5V/±12V or +5V/±15V
- Ultra-wide input voltage ranges:
9-36V or 18-72V
- Small packages, 2" x 2" x 0.45"
- No external components required
- Guaranteed 80% efficient
- Fully isolated (750Vdc minimum)
- Input overvoltage shutdown
- Output overvoltage and short-circuit protection
- -25 to +100°C operating temperature
- Shielded cases (with insulated bottoms)
- Modifications and customs available

The 20W triple-output (TWR) models of DATEL's industry-leading XWR Series wide-input-range DC/DC converters each offer a +5V primary output and either ±12V or ±15V auxiliary outputs. "D12" models achieve full rated performance with inputs ranging from 9 to 36 Volts. "D48" models operate over an input range of 18 to 72 Volts. Ultra-wide (4:1) input ranges make these DC/DC's ideal for today's distributed power architectures in demanding aerospace, process-control, computer and telecommunications applications.

Employing a new "power-sharing" architecture, TWR Model triples provide a full 20 Watts of output power under an infinite variety of output-current conditions. The primary +5V output can source any current up to 3 Amps (primary power = 15 Watts); while the auxiliary ±12/15V outputs can provide any currents up to ±500mA (auxiliary power = 12/15 Watts). Devices will supply any combination of primary plus auxiliary power as long as total output power does not exceed 20 Watts. This feature permits designers to select a single device to fulfill any number of different requirements.

These low-cost, high-density, switching DC/DC's derive their outstanding price/performance ratios from their highly efficient, high-frequency, current-mode, circuit topologies; their contemporary SMT-on-ceramic construction techniques; and their recently developed, thermally conductive potting compound.

Each of DATEL's 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 converter and its load. All models are fully isolated (1000Vdc typical) and have 5-sided shielding with non-conductive baseplates permitting pc-card runs to pass beneath the package.

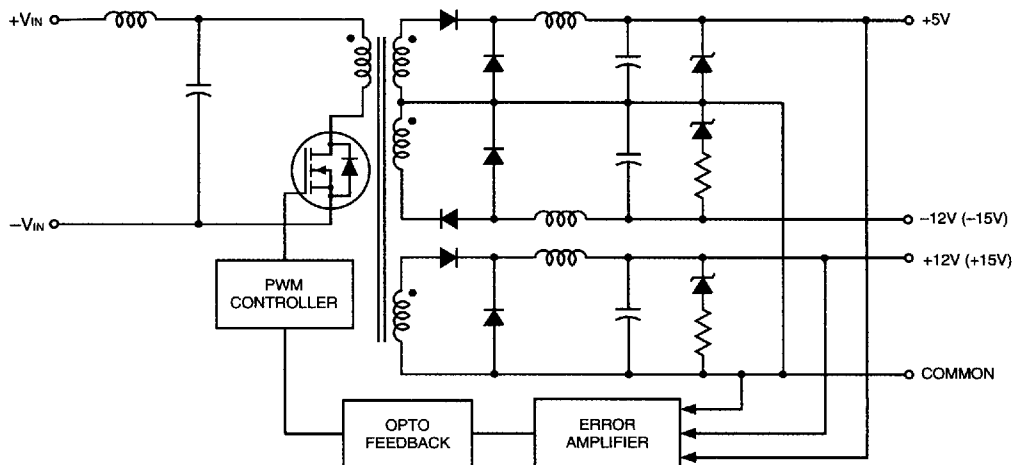


Figure 1. Simplified Schematic

Performance Specifications and Ordering Guide ^①

Model	Output					Input			Efficiency (Min.)	Package (Case, Pinout)
	V _{out} (Volts)	I _{out} (mA)	Ripple/Noise ^② (mVp-p, Max.)	Regulation (Max.)		V _{IN} Nom. (Volts)	Range (Volts)	I _{IN} ^④ (mA)		
				Line	Load ^③					
TWR-5/3000-12/500-D12	+5	3000	85	±1.0%	±2.0%	24	9-36	75/1132	80%	C4, P13
	±12	±500	125	±1.0%	±5.0%					
TWR-5/3000-12/500-D48	+5	3000	85	±1.0%	±2.0%	48	18-72	40/559	81%	C4, P13
	±12	±500	125	±1.0%	±5.0%					
TWR-5/3000-15/500-D12	+5	3000	85	±1.0%	±2.0%	24	9-36	75/1132	80%	C4, P13
	±15	±500	150	±1.0%	±5.0%					
TWR-5/3000-15/500-D48	+5	3000	85	±1.0%	±2.0%	48	18-72	40/559	81%	C4, P13
	±15	±500	150	±1.0%	±5.0%					

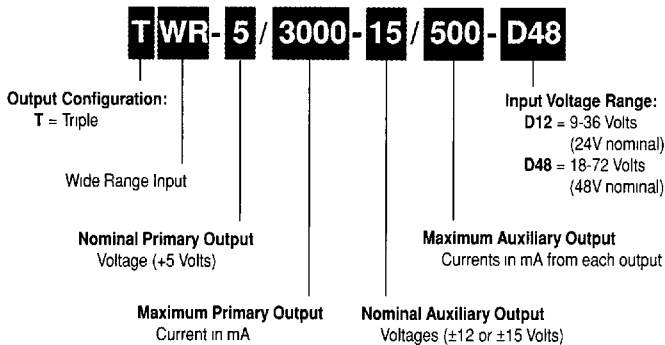
① Typical @ T_A = +25°C under nominal line voltage and "full load" conditions unless otherwise noted. For testing and specification purposes, "full load" is defined as 2.75A on the primary +5V output and ±250/200mA on the auxiliary ±12/15V outputs. This corresponds to a total output power of 19.75W.

② 20MHz bandwidth

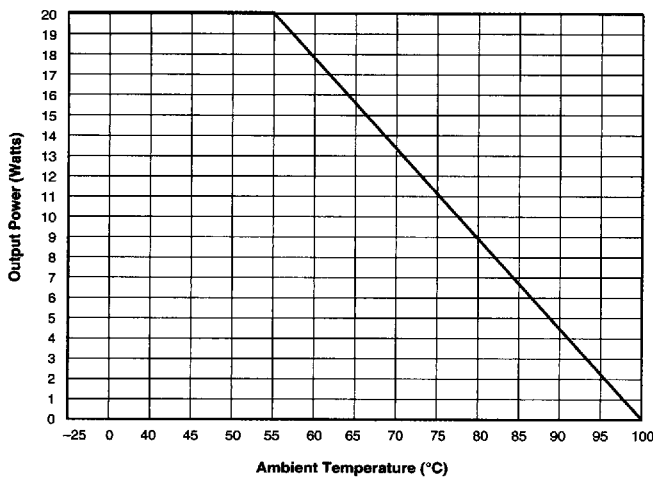
③ For the +5V output, listed spec applies over the 10% to 100% load range. For the ±12/15V outputs, listed spec applies for balanced loads over the 20% to 100% load range.

④ Nominal line voltage, no load/full load conditions

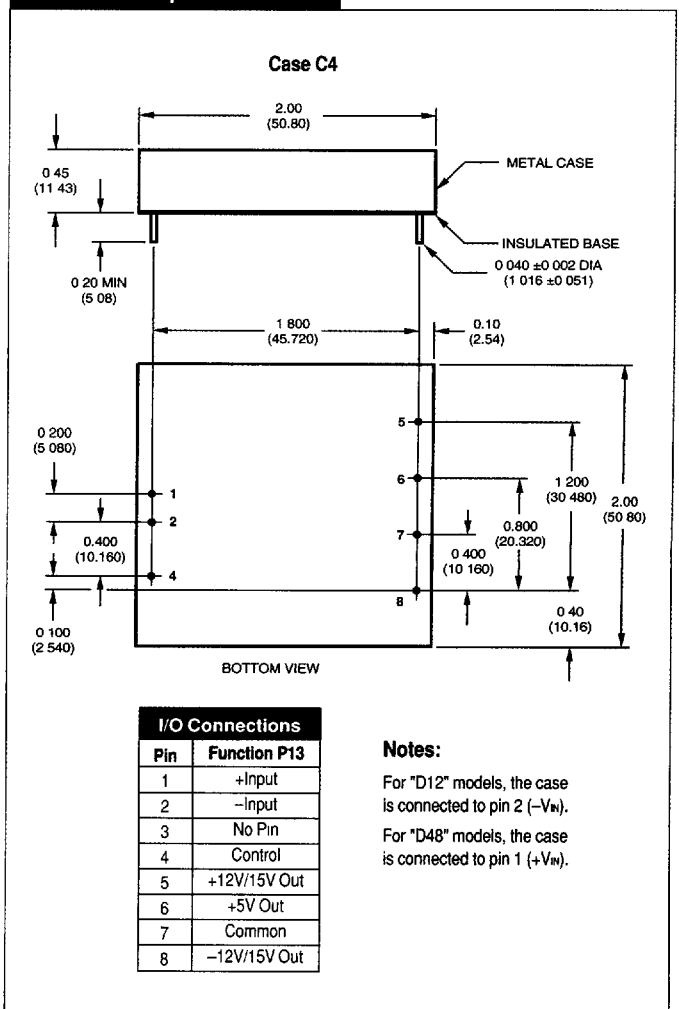
Part Number Structure



Temperature Derating



Mechanical Specifications



Performance/Functional Specifications

Typical @ $T_A = +25^\circ\text{C}$ under nominal line voltage and "full load" conditions unless noted ①

Input	
Input Voltage Range:	
"D12" Models	9-36 Volts (24V nominal)
"D48" Models	18-72 Volts (48V nominal)
Input Current	See Ordering Guide
Input Filter Type ②	Inductive
Overvoltage Shutdown:	
"D12 Models"	40 Volts
"D48 Models"	76 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	$\pm 1\%$
$\pm 12\text{V}$ or $\pm 15\text{V}$ Outputs	$\pm 3\%$
Temperature Coefficient	$\pm 0.02\%$ per $^\circ\text{C}$
Ripple/Noise (20MHz BW) ②	See Ordering Guide
Line/Load Regulation	See Ordering Guide
Efficiency	See Ordering Guide
Isolation Voltage	750Vdc, minimum
Isolation Capacitance	500pF
Current Limiting	Auto-recovery
Overvoltage Protection	Clamp, 2W transorb
Dynamic Characteristics	
Transient Response (50% load step)	200 μsec max. to $\pm 2\%$ of final value
Switching Frequency	165kHz ($\pm 15\text{kHz}$)
Environmental	
Operating Temperature (ambient): ④	
Without Derating	-25 to $+55^\circ\text{C}$
With Derating	to $+100^\circ\text{C}$ (See Derating Curve)
Storage Temperature	-55 to $+125^\circ\text{C}$
Physical	
Dimensions	2" x 2" x 0.45" (51 x 51 x 11.4mm)
Shielding	5-sided ⑤
Case Connections:	
"D12" Models	Pin 2 ($-V_{IN}$)
"D48" Models	Pin 1 ($+V_{IN}$)
Case Material	Corrosion resistant steel with epoxy-based enamel finish
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 but 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 $\pm 250/200\text{mA}$ on the auxiliary $\pm 12/15\text{V}$ outputs. This corresponds to a total output power of 19.75W.

② Application-specific internal input/output filtering can be added on request. Contact DATEL.

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 for -40°C operation. Contact DATEL for details.

⑤ Cases can be provided with 6-sided shielding. Contact DATEL for details.

Absolute Maximum Ratings

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. Storage temperatures have been verified for 168 hours.

Input Voltage:	
"D12" Models	44 Volts
"D48" Models	80 Volts
Input Reverse-Polarity Protection	Current must be $< 6\text{A}$. Brief duration only. Fusing recommended.
Output Overvoltage Protection:	
+5V Output	6.8 Volts, limited duration
$\pm 12\text{V}$ Outputs	± 15 Volts, limited duration
$\pm 15\text{V}$ Outputs	± 18 Volts, limited duration
Output Current	Current limited. Max. current model dependent. Units can withstand continuous output short on any output for 3 minutes.
Storage Temperature	-55 to $+125^\circ\text{C}$
Lead Temperature (soldering, 10sec.)	$+300^\circ\text{C}$

Technical Notes

Filtering and Noise Reduction

All 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 most applications, using values greater than those listed will yield better results.

To Reduce Input Ripple

"D12" Models	20 μF , 50V
"D48" Models	10 μF , 100V

To Reduce Output Ripple

+5V Output	47 μF , 10V, Low ESR
$\pm 12/15\text{V}$ Outputs	33 μF , 20V, Low ESR

In critical, space-sensitive applications, DATEL can easily tailor the internal input/output filtering of these devices to meet your specific requirements. Contact us 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 TWR 20 Watt DC/DC Converters, you should use slow-blow type fuses with values no greater than 4A for "D12" models and 2A for "D48" 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).

(-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

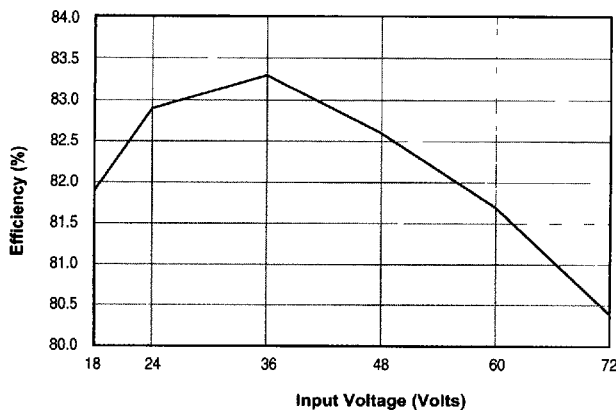
In certain applications employing multiple TWR converters and also demanding minimal noise levels, some improvements may be had by synchronizing the switching of the various converters. The synchronizing clock should be applied to pin 4 (Control) of each device. It should be a square wave with a maximum 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 ($T_A = +25^\circ\text{C}$)

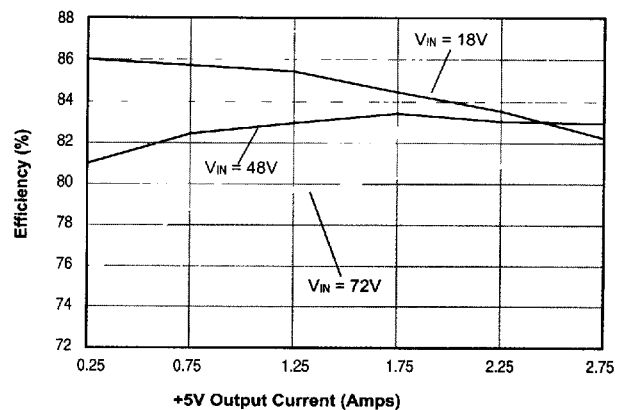
The performance curves below were derived from actual test data for a single model number (TWR-5/3000-12/250-D48). Since all devices in this series have the same circuit architecture, the performance curves are representative for all devices.

Efficiency vs. Input Voltage and Output Load

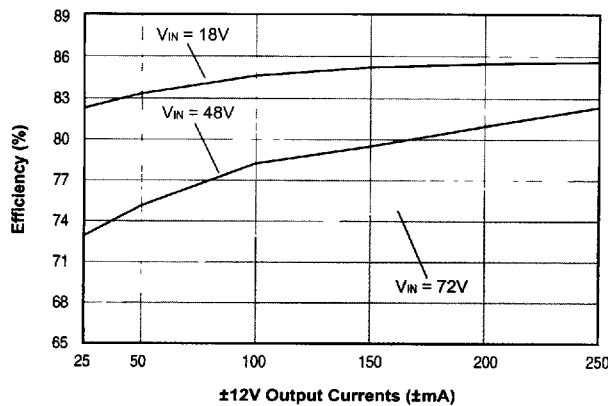
Efficiency vs. Input Voltage
(+5V output loaded @ 2.75A, \pm 12V outputs loaded @ \pm 250mA)



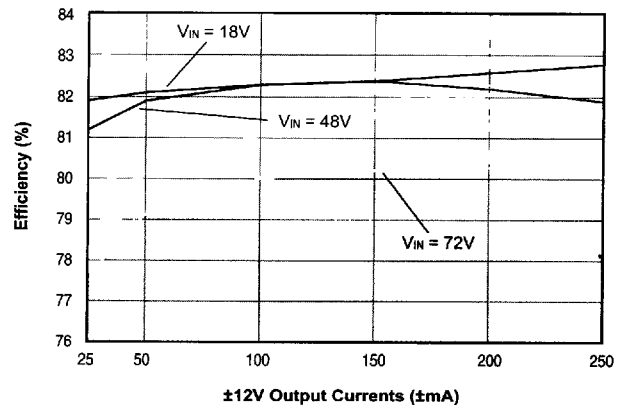
Efficiency vs. +5V Output Loading
(\pm 12V outputs loaded @ \pm 250mA)



Efficiency vs. \pm 12V Output Loading
(+5V output loaded @ 0.55A)

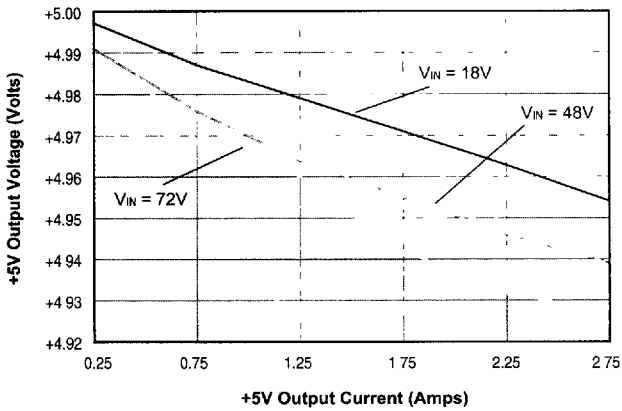


Efficiency vs. \pm 12V Output Loading
(+5V output loaded @ 2.75A)

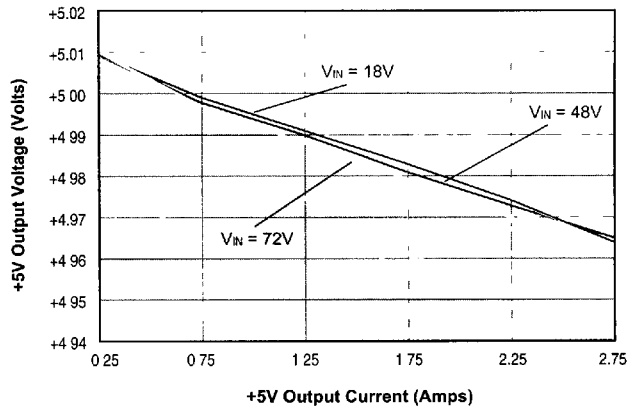


Load Regulation

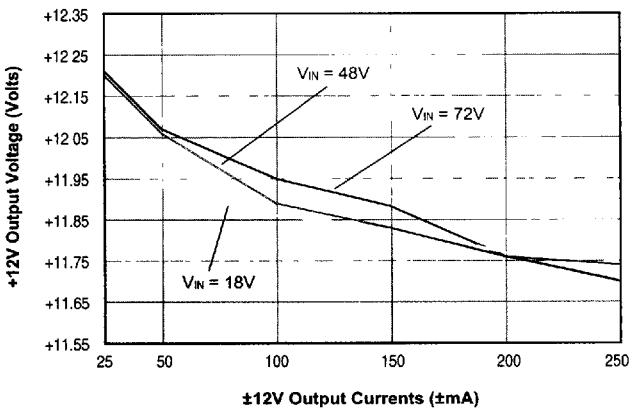
+5V Output Load Regulation
(±12V outputs loaded @ ±25mA)



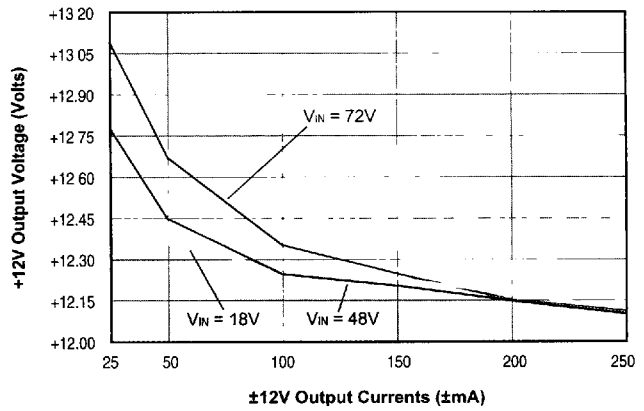
+5V Output Load Regulation
(±12V outputs loaded @ ±250mA)



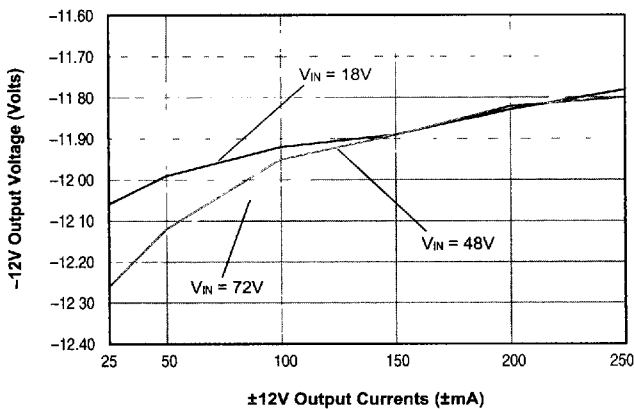
+12V Output Load Regulation
(+5V output loaded @ 0.55A)



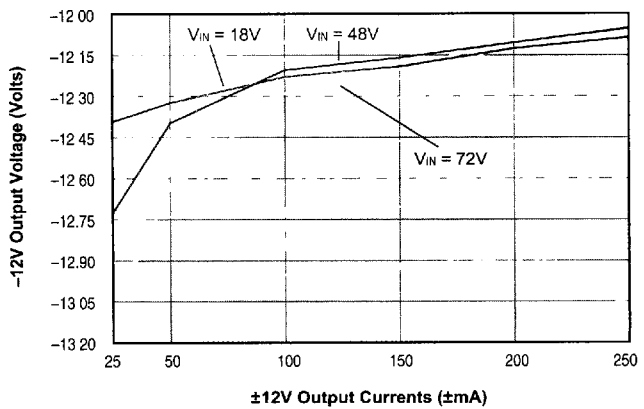
+12V Output Load Regulation
(+5V output loaded @ 2.75A)



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

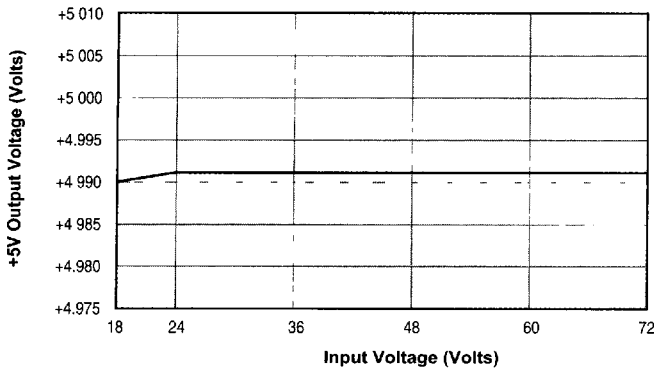


-12V Output Load Regulation
(+5V output loaded @ 2.75A)

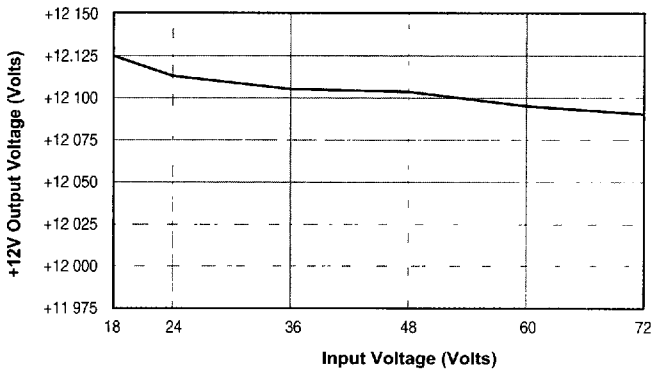


Line Regulation

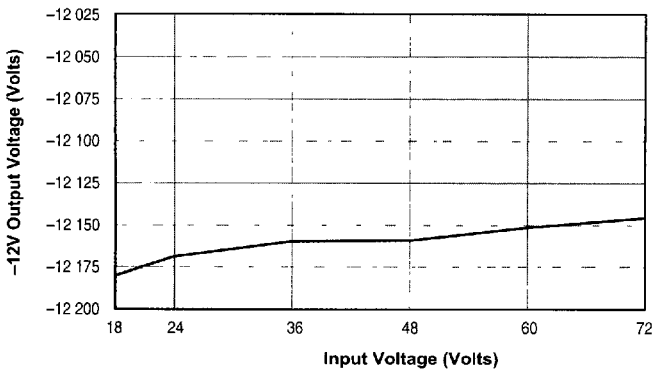
+5V Line Regulation
 (+5V output loaded @ 2.75A, ±12V outputs loaded @ ±250mA)



+12V Line Regulation
 (+5V output loaded @ 2.75A, ±12V outputs loaded @ ±250mA)



-12V Line Regulation
 (+5V output loaded @ 2.75A, ±12V outputs loaded @ ±250mA)

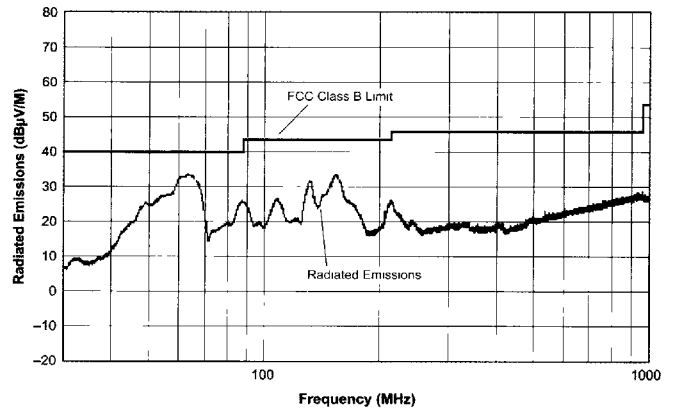


EMI Radiated Emissions

If you're designing with EMC in mind, note that all of DATEL's TWR 20 Watt 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-D12 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-D12 Radiated Emissions

FCC Part 15 Class B, 3 Meters
 Converter Output = +5Vdc @ 800 and ±15Vdc @ ±150mA



TWR-5/3000-15/500-D12 Radiated Emissions

EN 55022 Class B, 10 Meters
 Converter Output = +5Vdc @ 800mA and ±15Vdc @ ±150mA

