

**REDUNDANT
DC 400W
POWER SUPPLY**
Technical Specifications
TD-DC-400W-MAX

REDUNDANT DC 400W POWER SUPPLY

TECHNICAL SPECIFICATIONS

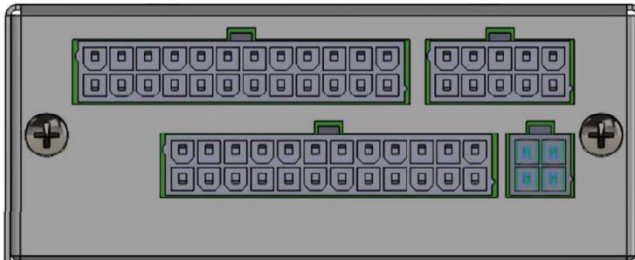
TD-DC-400W-MAX

Model Number : TD-DC-400W-MAX
Efficiency : >90%

	Minimum	Maximum
DC Input Voltage	-36V	-72V
Maximum Output Power		400W

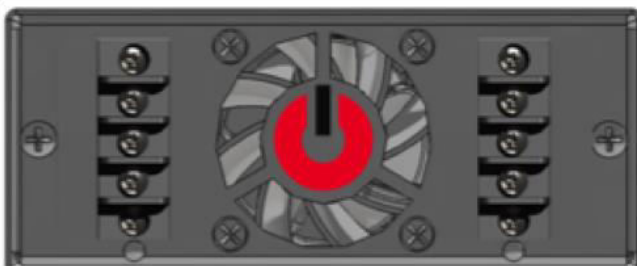
Output	Minimum Load	Maximum Load
12V	0A	33.5A
5V	0A	20A
3.3V	0A	20A
5Vsb	0A	3A
-12V	0A	0.1A

FRONT & REAR



Dimensions:

260mm (L) x 100mm (W) x 40mm (H)



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ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Min	Typ	Max	Unit
Input Voltage: DC continuous operation	$V_{IN,DC}$	-36	-48	-72	Vdc
Maximum Output Power (Main + Stand-by)	$P_{O,max}$	-	-	400	W
Isolation Voltage					
Input to outputs		-	-	1000	Vdc
Input to safety ground		-	-	2500	Vdc
Outputs to safety ground		-	-	NA	Vdc
Ambient Operating Temperature	T_A	0	-	+55	°C
Storage Temperature	T_{STG}	-40	-	+85	°C
Humidity (non-condensing)					
Operating		20	-	90	%
Non-operating		10	-	95	%
Altitude					
Operating		-	-	10,000	feet
Non-operating		-	-	30,000	feet

Table 1.

**REDUNDANT DC 400W
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INPUT SPECIFICATIONS

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC		V_{DC}	-36	-48	-72	Vdc
Maximum Input Current ($I_O = I_{O,max}$, $I_{VSB} = I_{VSB,Max}$)	$V_{DC} = 48V_{DC}$	$I_{I,max}$	-	-	12	A _{RMS}
Standby Input Current (Vcc Off, $I_{VSB} = 0A$)	$V_{DC} = 48V_{DC}$	$I_{I,standby}$	-	-	20	mA _{RMS}
No Load Input Current (Vcc On, $I_O = 0A$, $I_{VSB} = 0A$)	$V_{DC} = 48V_{DC}$	I_{I,no_load}	-	-	20	mA _{RMS}
No Load Input Power (Vcc On, $I_O = 0A$, $I_{VSB} = 0A$)	$V_{DC} = 48V_{DC}$	P_{I,no_load}	-	-	1	W
Input Fuse	Internal Quick Acting 15A, 125V		-	-	15	A
Isolation – Input to Output			-	1000	-	Vdc
Isolation – Input to Chassis			-	2500	-	Vdc
Operating Efficiency @ 25°C	$I_O = I_{O,max}$ $V_{IAC} = 48V_{DC}$	η	-	>90	-	%

Table 2.

**REDUNDANT DC 400W
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OUTPUT SPECIFICATIONS

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Output Regulation	Inclusive of set-point temperature change, warm-up drift and dynamic load	Vcc 12V	11.9	12	12.1	V
		Vcc 5V0	4.9	5	5.1	
		Vcc 3V3	3.2	3.3	3.4	
		Vsb 5V0	4.9	5	5.1	
		Vcc -12V	-11.9	-12	-12.1	
Output Ripple, pk-pk	Measured with a 0.1uf ceramic capacitor in parallel with a 10µF tantalum capacitor, 0 to 20MHz bandwidth	Vcc 12V	-	-	120	mV Pk- Pk
		Vcc 5V0	-	-	50	
		Vcc 3V3	-	-	50	
		Vsb 5V0	-	-	10	
		Vcc -12V	-	-	20	
Output Current	90 - 265Vac	Vcc 12V	0	-	33.5	A
		Vcc 5V0	-	-	20	
		Vcc 3V3	-	-	20	
		Vsb 5V0	0	-	3.0	
		Vcc -12V	0	-	0.1	
Ripple Output Frequency	All	DC-DC			400	kHz
Vcc Minimum Current Share Loading			10	-	-	mA
Vcc Load Capacitance	Start up	-	0	-	8800	µF
Vcc Dynamic Response	10% - 100% load change, slew rate = 1A/µs 12000uF additional load capacitance	±% Vcc	-	-	3	%
		T _s	-	-	-	µSec
Vcc Long Term Stability Max change over 24 hours	After thermal equilibrium (30 mins)	±% Vcc			0.2	%

Table 3.

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SYSTEM TIMING SPECIFICATIONS

Label	Parameter	Min	Typ	Max	Unit
T1	Power-on time	-	-	500	mSec
T2	Rise Time	0.2	-	20	mSec
T3	PWR_OK Delay	100	-	500	mSec
T4	PWR_OK Rise Time		-	10	mSec
T5	AC loss to PWR_OK Hold-up Time	16	-		mSec
T6	PWR_OK inactive to DC loss delay	1	-		mSec

Table 4.

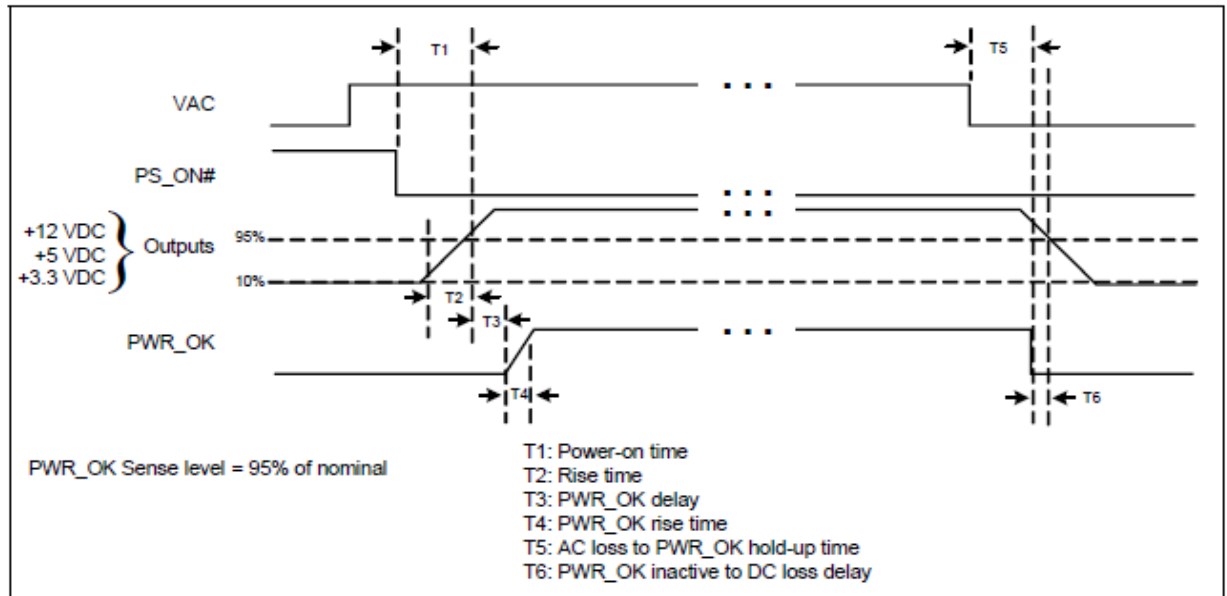


Figure 1.

PROTECTION FUNCTION SPECIFICATIONS

Telcodium power supplies are equipped with an internal non-user serviceable High Rupturing Capacity (HRC) 250 Vac fuse to IEC 127 for fault protection of live lines of AC input.

OUTPUT OVER VOLTAGE PROTECTION / UNDER VOLTAGE PROTECTION (OVP/UVP)

The power supplies over voltage protection will be locally sensed. The power supply will shutdown in a latch off mode after an over voltage condition or under voltage condition. The power supply will restart once the OVP/UVP conditions are cleared. The values are measured at the output of the power supply DC connector.

OVP

Parameter	Nom	Unit
Vcc Output Overvoltage	13.5	V
Standby Output Overvoltage 5.0V	5.5	V

Table 4.

UVP

Parameter	Nom	Unit
Vcc Output Undervoltage	10	V

OVER CURRENT / SHORT CIRCUIT PROTECTION (OCP/SCP)

Telcodium power supplies possess internal current limit circuitry to prevent damage in the event of overload or short circuit.

Parameter	Nom	Unit
Vcc Output Overcurrent	45	A
Standby Output Overcurrent 5.0V	3.5	A

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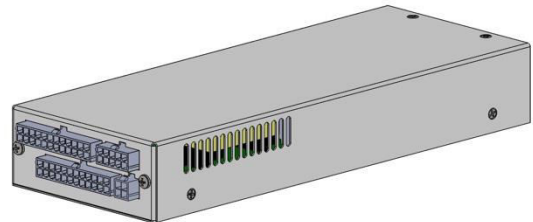
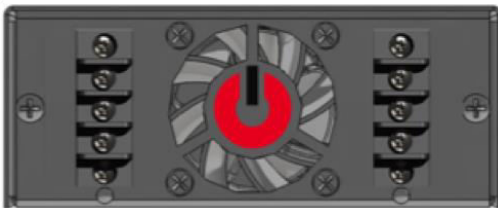
OVER TEMPERATURE PROTECTION (OTP)

The power supply is internally protected against over temperature conditions. In an OTP condition, the power supply will be shutdown with the exception of the 5.0Vsb output. When the power supply temperature drops to within specified limits, the power supply will restore the +12VDC output automatically. The OTP circuit must have built in hysteresis such that the power supply will not oscillate on and off due to temperature recovering conditions. Input ambient OTP should be 5 degC above operating limit. The operating limit is OTP_reset. The power supply restarts 20 seconds after hitting OTP_reset.

ABSOLUTE MAXIMUM RATINGS

As with any electrical equipment, stress in excess of the ratings listed in this spec sheet may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this spec sheet. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply's reliability.

MECHANICAL SPECIFICATIONS



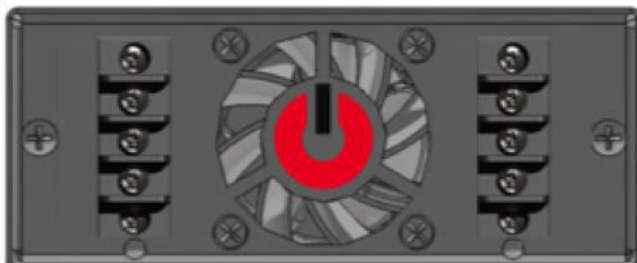
Dimensions (260mm(L) x 100mm (W) x 40mm (H))

WEIGHT

Weight is 3.0 lbs / 1.36kg

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LED INDICATOR DEFINITION



Power Feed 1

Power Feed 2

FAULT LED Status	Condition
Solid Green	Input feed is valid and used as primary
Blinking Green	Input feed is valid and qualified to take over in case of primary feed failure
Solid Yellow	Input feed is being qualified
Solid Amber	Input feed is in fault (current or voltage) and cannot be used
Blinking Amber	Input feed is incompatible with primary and cannot be used
No light	Input feed is not connected
All LEDs Blinking Amber Upon Startup	Internal firmware failure

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SAFETY CERTIFICATIONS

CB Certificate is available on Telcodium website.

Document		Description
UL 60950 No.	(in process)	US and Canada Requirements
CSA 22.2 No. 60950		Information Technology Equipment - Safety - Part 1: General Requirements (Bi-National standard, with UL 60950-1)
EN60950		European Requirements
EN60950 Deviations		International Requirements
CB Certificate and Report		(All CENELEC Countries)

EMI EMISSIONS

Telcodium power supplies have been designed to comply with the Class A limits of EMI requirements of EN55022 (FCC Part 15) and CISPR 22 (EN55022) for emissions and relevant sections of EN61000 (IEC 61000) for immunity. The unit is enclosed inside a metal box, tested at full load using a resistive load.

CONDUCTED EMISSIONS

Parameter	Model	Symbol	Min	Typ	Max	Unit
FCC Part 15, class B	All	Margin	-	-	6	dB
CISPR 22:2006+A1:2007 (EN55022) class B	All	Margin	-	-	6	dB

RADIATED EMISSIONS

Unlike conducted EMI, radiated EMI performance in a system environment may differ drastically from that in a stand-alone power supply. The shielding effect provided by the system enclosure may bring the EMI level from Class A to Class B. It is thus recommended that radiated EMI be evaluated in a system environment. The applicable standard is EN55022 Class A (FCC Part 15). Testing ac-dc converters as a stand-alone component to the exact requirements of EN55022 can be difficult, because the standard calls for 1m leads to be attached to the input and outputs and aligned such as to maximize the disturbance. In such a set-up, it is possible to form a perfect dipole antenna that very few ac-dc converters could pass. However, the standard also states that 'an attempt should be made to maximize the disturbance consistent with the typical application by varying the configuration of the test sample'.

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OPERATING TEMPERATURE

Telcodium power supplies will start and operate within the stated specifications at an ambient temperature range of 0°C to 55°C under all load conditions.

STORAGE AND SHIPPING TEMPERATURE / HUMIDITY

Telcodium power supplies can be stored or shipped at temperatures between -40°C to $+85^{\circ}\text{C}$ and relative humidity from 5% to 95% non-condensing.

Altitude

Telcodium power supplies will operate within specifications at altitudes up to 10,000 feet above sea level. The power supplies will not be damaged when stored at altitudes of up to 30,000 feet above sea level.

Humidity

Telcodium power supplies will operate within specifications when subjected to a relative humidity from 20% to 90% non-condensing. Telcodium power supplies can be stored in a relative humidity range from 5% to 95% non-condensing.

Vibration

Telcodium power supplies do pass the following vibration specifications:

Non-Operating Random Vibration

Acceleration	2.7	gRMS	
Frequency Range	10-2000	Hz	
Duration	20	Mins	
Direction	3 mutually perpendicular axis		
PSD Profile	FREQ	SLOPE	PSD
		dB/oct	g^2/Hz
	10-190 Hz	---	$0.01 \text{ g}^2/\text{Hz}$
	190-210 Hz	-31.213dB/oct	---
	210-2000 Hz	---	$0.003 \text{ g}^2/\text{Hz}$

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Operating Random Vibration

Acceleration	1.0	gRMS
Frequency Range	10-500	Hz
Duration	20	Mins
Direction	3 mutually perpendicular axis	
PSD Profile	<p>FREQ 10-500 Hz</p>	<p>SLOPE dB/oct ---</p>
		<p>PSD g²/Hz 0.002 g²/Hz</p>

Shock

Telcodium power supplies do pass the following shock specifications:

Non-Operating Half-Sine Shock

Acceleration	30	G
Duration	18	Msec
Pulse	Half-Sine	
No. of Shocks	3 shocks on each of the 6 faces	

Table 14

Operating Half-Sine Shock

Acceleration	4	G
Duration	22	Msec
Pulse	Half-Sine	
No. of Shocks	3 shocks on each of the 6 faces	

ROHS

Telcodium endorses the action taken by the European Union in Directive 2011/65/EU concerning the Restriction on Hazardous Substances (RoHS). Our products meet the requirements of the European Union's RoHS Directive (2011/65/EU).

WEEE

Waste Electrical and Electronic Equipment (WEEE) - Product Recycling In support of our environmental goals, Telcodium offers a formal product take-back and recycling program in Europe that complies with the European Union Directive 2002/96/EC on waste electrical and electronics equipment ("WEEE Directive"). Equipment that is returned through this program will be handled in an environmentally safe manner using these processes.

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MTBF

MTBF is >500K Hours (as per Telcordia SR-332, Issue 3, 25C)

POWER AND CONTROL SIGNAL DESCRIPTIONS

DC Input Connector

Screw Terminal Compatibility:

SPAD Terminal



Width max 250mils , Screw size #6 (115mils)

Ring Terminal



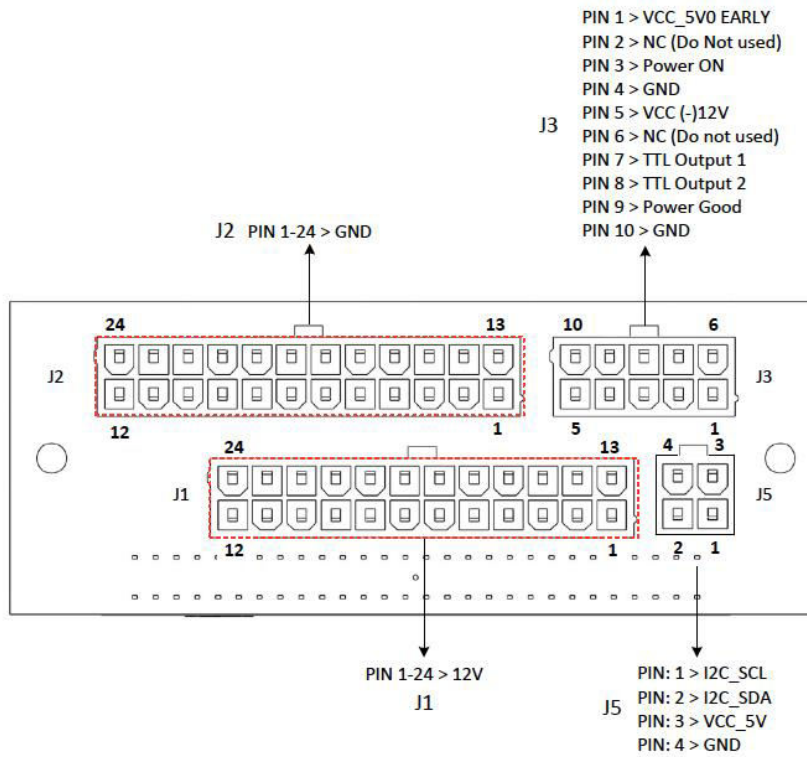
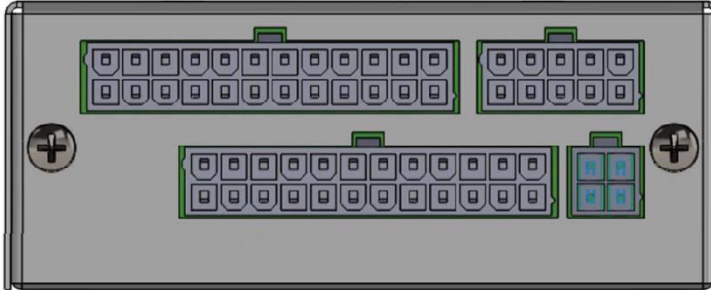
Width max 250 mils , screw size #6 (115mil)

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Output Connectors Definitions



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OUTPUT CONNECTOR - CONTROL SIGNALS

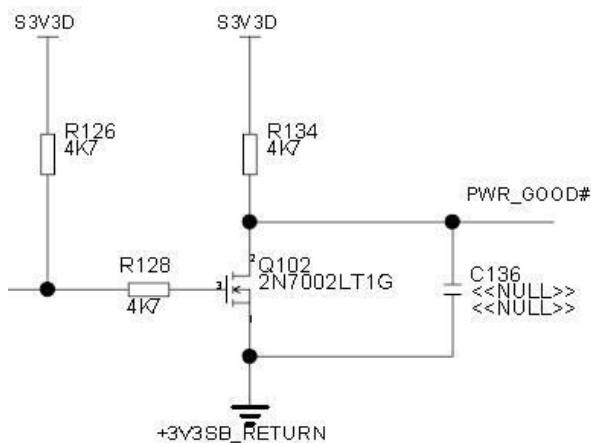
Main Power

Power On – (pin J3-P3)

This signal input pin controls the normal turning ON and Off of the Main Output of the power supply. The output will be enabled when this signal is pulled low, below 0.8 V outputs disabled when pin is driven high or left open.

PWR_GOOD – (pin J3-P9)

PWR_GOOD is a power good signal and will be pulled HIGH by the power supply to indicate that both the outputs are above the regulation limits of the power supply. When any output voltage falls below regulation limits or when AC power has been removed for a sufficiently long time so that power supply operation is no longer guaranteed, PWOK will be de-asserted to a LOW state.



Sense (+),(-) – 3V3 & 5V0

Sense signal for the output of the nominal 3V3 needs to be routed and connected close to the load for having a good regulation (+/- ,10mV) use twisted pair for noise reduction.

Communication Signals

PMBUS – (J5-P1 and J5-P2)

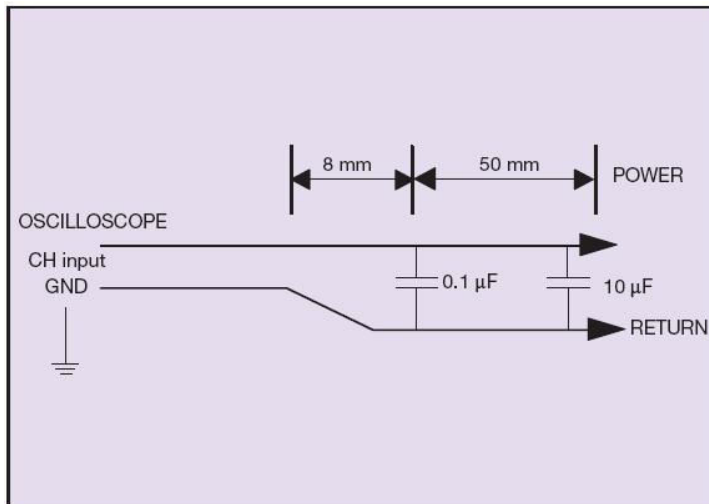
The power supply contains enhanced monitoring and control functions that are implemented via the I²C bus. The I²C functionality (PMBus™ and FRU data) can be accessed via the output connector control signals.

Note:

PMBus™ functionality can be accessed only when the PSU is connected to an active feed. I²C speed is up to 400KHz.

OUTPUT RIPPLE AND NOISE MEASUREMENT

The setup outlined in the diagram below has been used for output voltage ripple and noise measurements on the power supply. When measuring output ripple and noise, a scope jack in parallel with a 0.1uF ceramic chip capacitor, and a 10 uF aluminum electrolytic capacitor should be used. Oscilloscope should be set to 20 MHz bandwidth for this measurement.



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