REMOTE ON/OFF CONNECTIONS FOR THE CA SERIES

- For normal operation, the remote pin should be left open. To disable the converter, pull the remote pin below one volt. Typical current from the remote pin is 2mA pulsed. Open circuit voltage is 5V.
- Input current draw in the disabled mode will vary with input voltage, typically 2mA at low line and 5mA at high line.
- For more information on the CA Series, refer to page 70.

EXTERNAL ADJUSTABLE TRIM FEATURES: CA SERIES DUALS

- Output voltage accuracy is factory trimmed to within ± 1%.
- For calculations, Vout is the total voltage between +Out and -Out. Output voltages will split according to regulation curves.
- If the output voltage is trimmed down to below approximately 2/3 of Vout, the converter will shut down and cycle on/off.
- Output voltage will trim up approximately 10% by shorting trim to -Out.
- For more information on the CA Series, refer to page 70.

REMOTE ON/OFF CONNECTIONS FOR THE SI AND SIW SERIES

- For normal operation, the remote pin should be left open.
- To disable the converter, pull the remote pin below one volt.
- Typical current from the remote pin is 2mA pulsed.
- Input current draw in the disabled mode will vary with input voltage, typically 2mA at low line and 5mA at high line.
- For more information about the SI and SIW Series, refer to pages 56-57 and 62-63.

TECHNIQUES FOR OUTPUT RIPPLE/NOISE MEASUREMENT

- A 0.1 μ F ceramic capacitor across the probe is recommended to suppress radiated noise pick-up.
- When taking ripple/noise measurements, use contact probe tip and ground ring as shown. Using a ground lead will cause false readings. Measurements are taken with output appropriately loaded and all ripple/noise specifications are from D.C. to 20 MHz B.W.

EXTERNAL ADJUSTABLE TRIM FEATURES: CA SERIES SINGLES/TRIPLES

- Output voltage accuracy is factory trimmed to within ± 1%.
- If the output voltage is trimmed down to below approximately 2/3 of Vout, the converter will shut down and cycle on/off (12V and 15V models).
- Output voltage will trim up approximately 10% by shorting trim to common.
- Triple Output Modules: Do not trim up by connecting trim to -12, -15 out. This will result in OVP Zener failure.
- Trimming up will increase overhead voltage on auxiliary regulators and increase internal power dissipation.
- For more information on the CA Series, refer to page 70.

EXTERNAL ADJUSTABLE TRIM FEATURES OF SI/SIW SERIES SINGLES

- Output voltage accuracy is factory trimmed to within ± 1%.
- If the output voltage is trimmed down to below approximately 60% of Vout, the converter will shut down and cycle on/off (15V and 24V models).
- Output voltage will trim up approximately 10%, however, do not short trim pin to -Sense pin on 15V and 24V models as this may cause OVP Zener failure.
- SI and SIW Duals and Triples do not have external trim capabilities.
- For more information about the SI and SIW Series, refer to pages 56-57 and 62-63

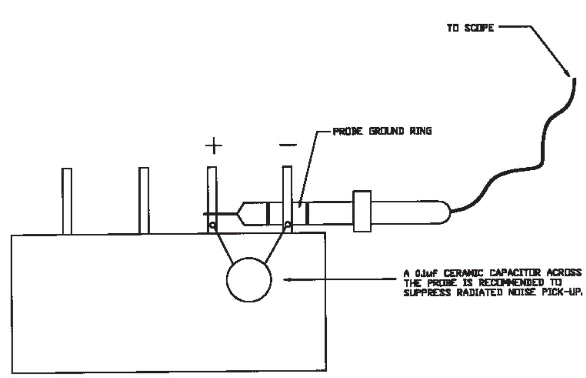
Fusing Notes

The DC/DC converter input line should always be fused in order to ensure protection and safety.

A fuse rated for 150% to 200% of the DC input current (to the supply at full load) should suf fice.

Encapsulated power supplies, in general, do not have internal fuses and an external fuse should be used.

Fast blow or slow blow fuses may be verified with the manufacturer.



Heat Generation and Efficiency

All power converters generate heat. The amount of heat generated depends upon the output power used and the efficiency of the power converter.

Wall's PD and HD Series of DC/DC Converters are efficient to 80% or better at full power depending on output voltage. The power not supplied to the output (PDISS) is wasted as heat. This heat must be removed from the converter to prevent damage to semiconductors, capacitors and other heat sensitive components.

Methods of Thermal Management

Two forms of thermal management include conduction and convection cooling; both relying on the principles of thermal resistance.

Simplified, thermal resistance is a measure of the ability of a material to conduct heat. For ideal operation of converters, the lower the thermal resistance - the more improved heat dissipation and transfer will be.

Conduction Cooling Methods

Through conduction cooling methods, heat is transferred away from the baseplate through an interface material which corrects surface irregularities. One form of this material, commonly known as Kondux, is available in 0.005" sheets; an alternative is thermal grease in the paste form. This material should have a thermal resistance of 0.2°C/Watt maximum.

The baseplate temperature can be calculated by multiplying the thermal resistance of the interface material (R Theta i) by the number of watts being dissipated and adding this to the temperature of the surface to which the baseplate is being attached...either chassis or coldplate.

Convection Cooling Methods

Convection cooling is a process where heat flows from a hotter surface into the surrounding cooler ambient air. The baseplate surface to air thermal resistance is empirically estimated at 5°C/Watt for a 25 watt power dissipation and approximately 10% less for a 37.5 watt power dissipation for the 100/150 watt PD and HD Series.

A dissipation of 25 watts corresponds to an 80% efficiency for a 100 watt model while 37.5 watts corresponds to 80% efficiency for a 150 watt model. The addition of forced air to the system will result in lower thermal resistance of the module baseplate.

Figure 1

Required Air Flow (LFM*)	Baseplate Thermal Resistance (°C/Watt)
Free convection	5.0
200	2.8
400	1.8
600	1.4
800	1.2
1000	1.0

Required air flow to gain a lower thermal resistance.

Thermal Management Using Heatsinks

External Finned Heatsinks

The addition of an external finned heatsink to the converter can dramatically lower the thermal resistance, thereby reducing the temperature rise of the converter. The two most common styles of industry standard extrusions offer lengthwise or crosswise fins...either can be used with Wall's 100 or 150 watt PD or HD Series. A table of thermal resistance for a 0.9" heatsink follows in Figure 2.

Crosswise Fin Heatsink (°/Watt)	Lengthwise Fin Heatsink (°/Watt)	Required Airflow (LFM)
3.00	3.50	Free Convection
1.00	1.79	200
0.72	1.12	400

Thermal Resistance for various external finned heatsinks in 100/150watt units.

EXAMPLE:

The maximum output power attainable can be computed by the formula:

$$\frac{T\,max - T\,ambient}{R\,theta\,sa \quad (^1/_{eff-1})} = P\,out\,max$$

*LFM = Linear Feet per Minute. Note: for figure 4-5, all deratings are based on a 25°C start point with a max baseplate and heatsink temperature of 100°C.

Where R Theta sa is the baseplate, or heatsink resistance (sinked to air), and eff is converter efficiency. From this equation, curves can be derived which will show power derating vs. ambient temperature and heatsink resistance

Thermal Chart Examples

These curves are based on an assumed 80% efficient converter.

Fig. 5: 100 watt converter - Natural Convection

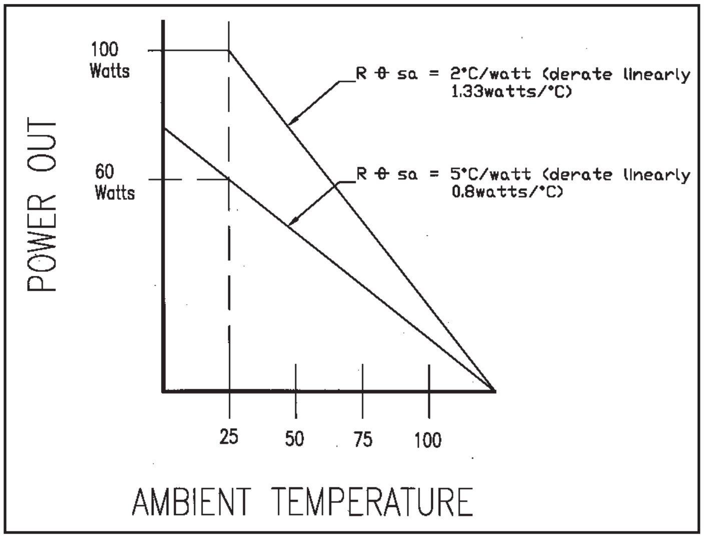
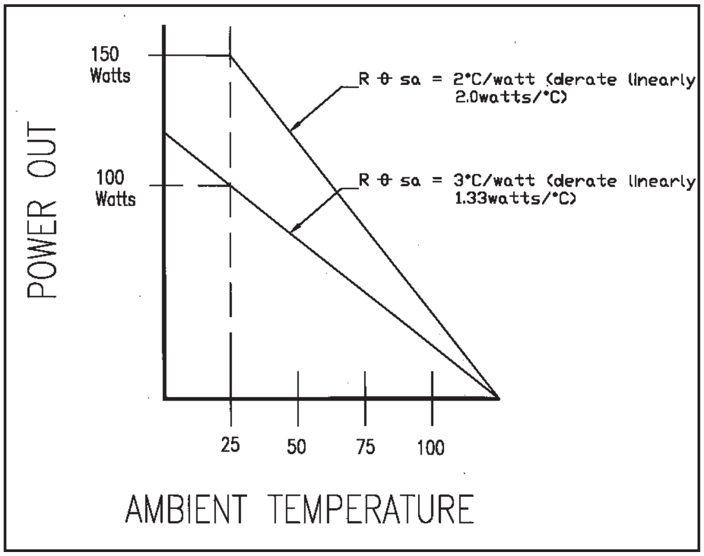


Fig. 6 - 150 watt converter - Natural Convection



This application note applies to CA, QAW, SI, SIW, SP and FE model converters.
These resistor values apply to CA and FE models, for other values consult factory.

Notes on Trim Connections for Converters

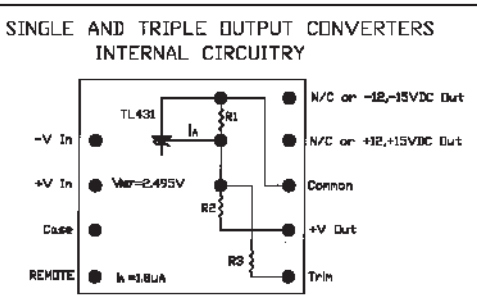
- Output voltage accuracy is factory-trimmed to within 1% of specified output voltage.
- For calculations, Vout is the total voltage between +Vout and -Vout or common. Output voltage will split according to regulation curves.
- If the output voltage is trimmed down below approximately 66% of Vout, the converter will shut down and cycle on/off.
- Output voltage will trim up approximately 10%

Single and Triple Output Converters

Triple Output Models

- Do not trim by connecting trim pin to -12VDC or -15DVDC output pins, this will result in over-voltage protection Zener failure.
- Trimming up will increase overhead voltage on auxiliary regulators and increase internal power dissipation.

Internal Circuitry

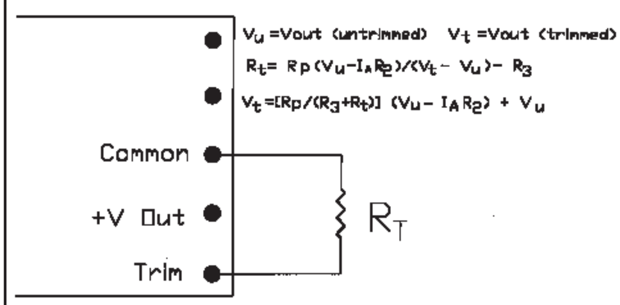


MATRIX OF INTERNAL RESISTOR VALUES

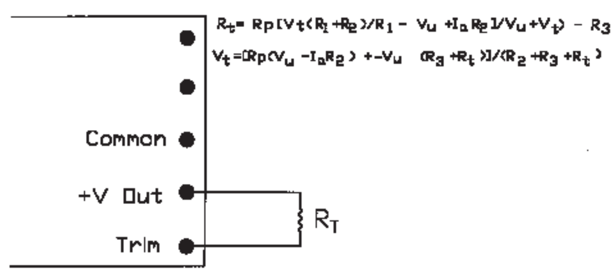
MODEL	VOUT	R_1	R_2	R_3	$Rp=\frac{R_1 R_2}{R_1+R_2}$
SINGLE OR TRIPLE	5V	2.49K OHM 1%	2.49K OHM 1%	10K OHM 5%	1.24K OHM
SINGLE	12V	2.49K OHM 1%	9.53K OHM 1%	20K OHM 5%	1.97K OHM
SINGLE	15V	2.49K OHM 1%	12.4K OHM 1%	20K OHM 5%	2.07K OHM

Trim Connections and Values

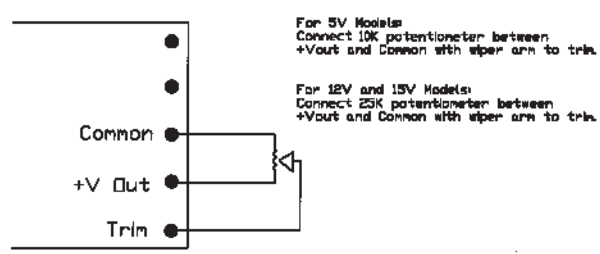
Fixed Methods for Trimming Single and Triple



Fixed Methods for Trimming Single and Triple

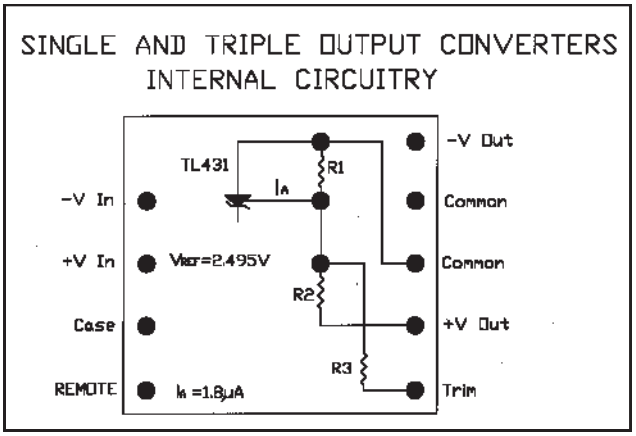


Adjustable Method for trimming Single and Triple Output Converters Up and Down



Dual Output Converters

Internal Circuitry



Bottom View (Pin Side)

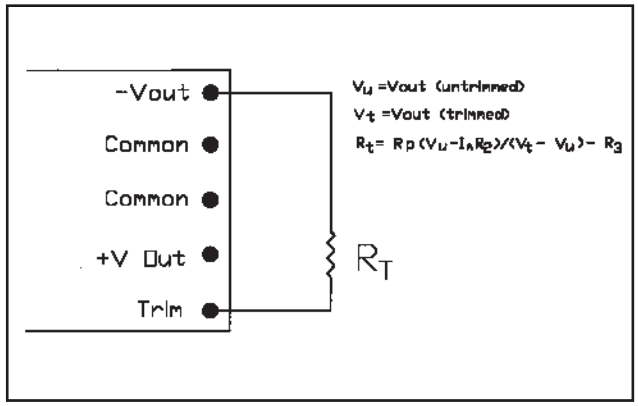
Matrix of Internal Resistor Values

MATRIX OF INTERNAL RESISTOR VALUES

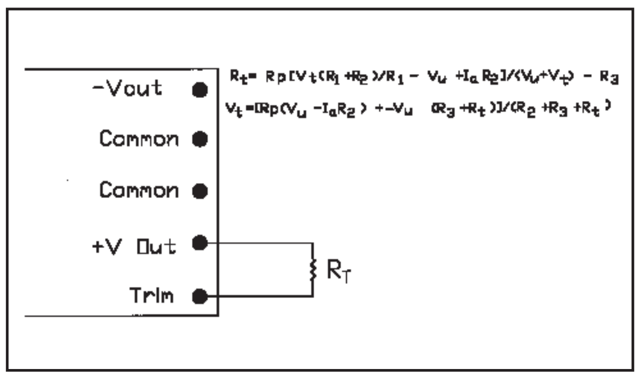
MODEL	VOUT	R_1	R_2	R_3	$R_p = \frac{R_1 R_2}{R_1 + R_2}$
DUAL	+/-12V (24V)	2.49K OHM 1%	21.5K OHM 1%	22K OHM 5%	2.23K OHM
DUAL	+/-15V (30V)	2.49K OHM 1%	27.4K OHM 1%	22K OHM 5%	2.28K OHM

Trim Connections and Values

Fixed Method for Trimming Dual Converters Up



Fixed Method for Trimming Dual Output Converters Down



Adjustable Method for Trimming Dual Converters Up and Down