

## Output Considerations

### Cross Regulation of Dual Outputs

MDI's full featured dual output DC-DC Converters are normally regulated from the positive output to the negative output rail. Therefore, a dual 12 V output unit is actually a 24 V converter with a center tap. A dual 5 VDC unit is actually a 10 VDC unit with a center tap.

Since the voltage from end to end is tightly regulated, the voltage at the tap can and must move if the load is unbalanced. The reason for this is the impedances of the power conversion train and the output filters.

This data for a dual 15 VDC output part shows that the balanced half to full load regulation is 0.14%. Assuming 30 ohms as the per unit load resistance, the DC-DC Converter's per unit output impedance is .0029. The impedance of the center tap is approximately .0114 per unit for small deviations about a fully loaded condition. However, when the load unbalance is severe, the output voltages deviate by a much greater amount. The reason for this is that at heavier loads, more averaging of the power waveform takes place. At light loads, from under 10%, ranging to no load, more peak detecting takes place.

This is why a dual output voltage converter is not recommended for use at lighter than a 90%/10% load unbalance unless a relatively large load unbalance can be tolerated.

In many applications, there is a severe load unbalance, or two outputs of differing voltage are required. In these applications, a conventional dual output part cannot be used.

There are two ways to overcome this situation (that occurs under extreme unbalanced load conditions) by constructing a full featured DC-DC Converter to special order. The first technique is to construct a dual output part made from a triple output design. The high current output is then the sole main regulated output. The lighter current output is derived from one of the linear regulated outputs. The second linear regulated output is not used.

The second technique is to construct a converter that balances output impedances closely to the load unbalance. This includes matching transformer and inductor resistances as well as diode drops, etc., so that the desired voltages are produced regardless of the load unbalance.

MDI full featured hybrid DC-DC Converters with dual output can be produced with the same polarity. For example, a dual output part can be constructed to produce +5 VDC and +3.3 VDC. Another example is a converter that produces +12 VDC and +5 VDC.

Positive Load	Negative Load	+ 15VDC Output	-15VDC Output	Total Output
1.0A	1.0A	14.942	-14.953	29.957
1.0A	0.75A	14.907	-14.996	29.903
1.0A	0.5A	14.865	-15.054	29.919
1.0A	0.25A	14.813	-15.125	29.983
1.0A	0.0A	13.499	-16.458	29.957
0.5A	1.0A	15.036	-14.871	29.907
0.5A	0.75A	15.003	-14.915	29.918
0.5A	0.5A	14.96	-14.968	29.928
0.5A	0.25A	14.915	-15.035	29.95
0.5A	0.0A	14.188	-15.783	29.971