Introduction

The waveforms shown below are provided for reference and as in insight into the operation of the DPI. The waveforms were captured using a Tektronix TDS3014, a Dip-Proofing Technologies Voltage Sag Simulator, the unit used for the test was a DPI52L1K12. The test setup is shown in Fig 1 below, test points on the diagram are referenced in the caption of each plot to indicate the point at which the waveform was captured.

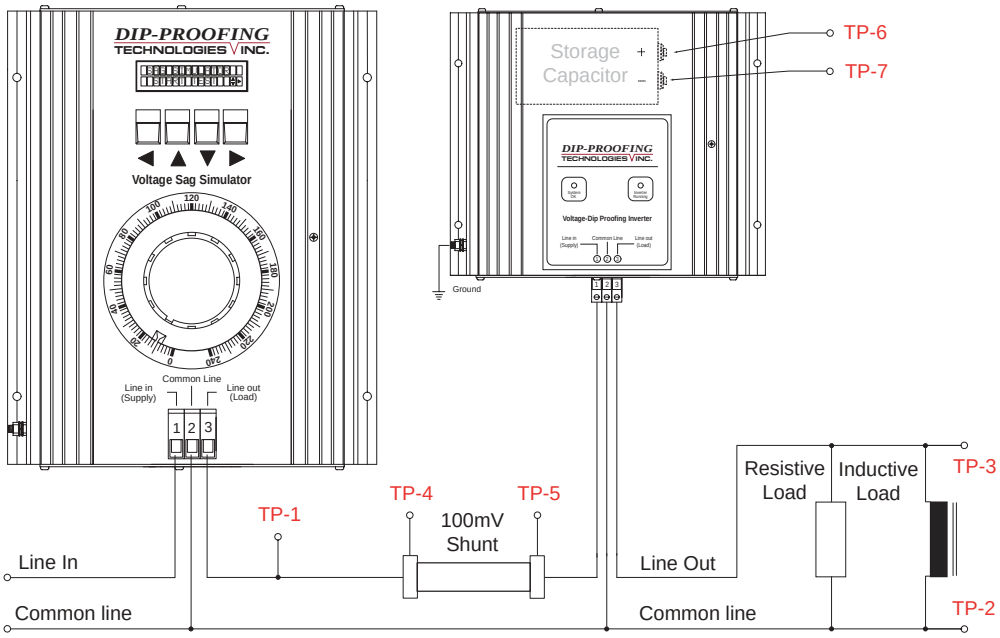
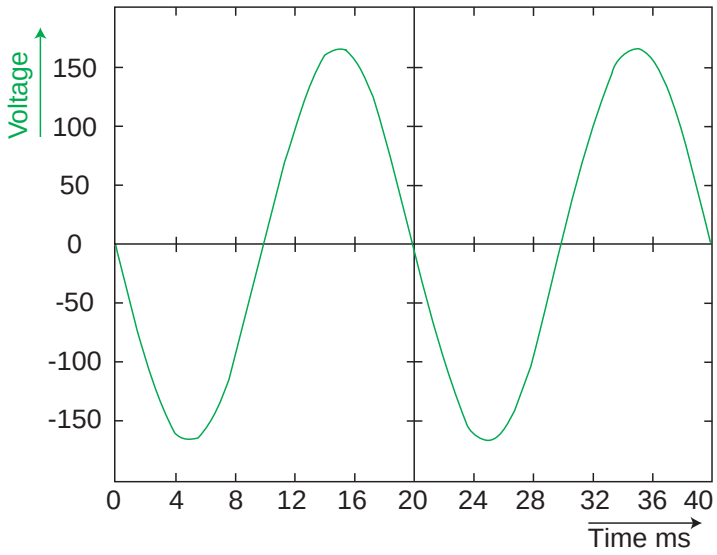


Fig 1

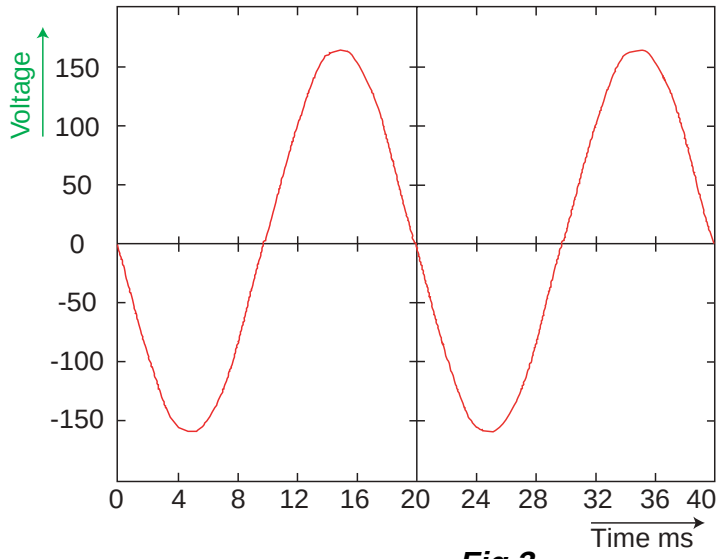
DPI waveform measurement test setup.



This plot shows the supply voltage applied to the DPI input terminals from the Voltage Sag Simulator. The waveform is an undistorted sine wave.

Fig 2

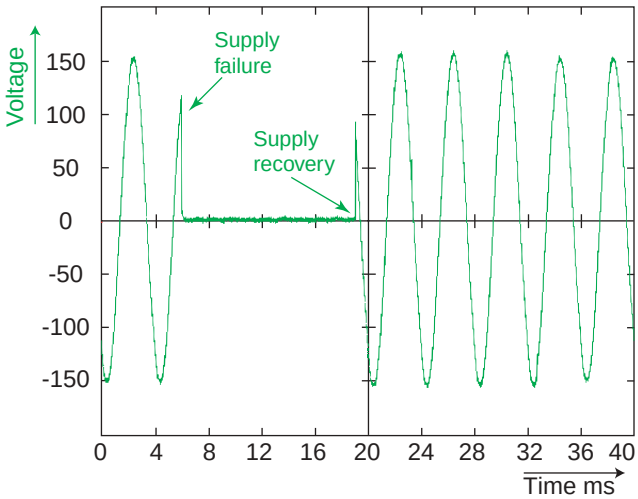
Supply voltage V_{in} TP1 - TP2.



This plot shows the DPI output voltage under load. The static switch is turned on and the supply voltage is healthy. The inverter is in standby mode.

Fig 3

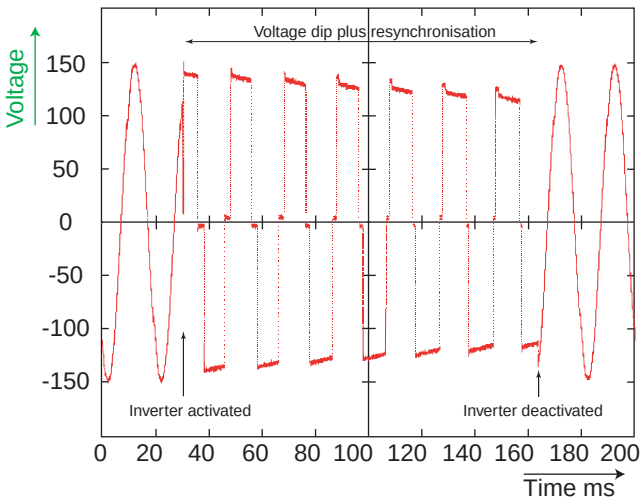
DPI output voltage V_{out} TP3 - TP2.



This plot shows a supply voltage failure generated using the Voltage Sag Simulator. The duration of the interruption is 63ms.

Fig 4

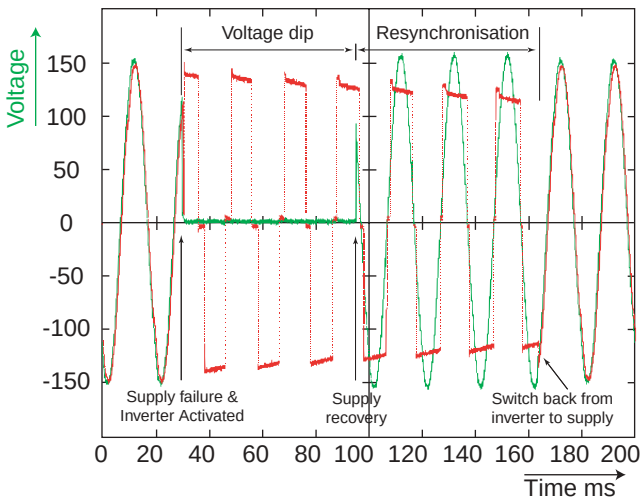
Supply voltage failure V_{in} TP1 - TP2.



This plot shows the DPI output voltage before during and after a supply voltage interruption. The DPI is heavily loaded to show the inverter regulation method. The stepped square wave becomes wider as the storage capacitors discharge thus maintaining the RMS value of the output.

Fig 5

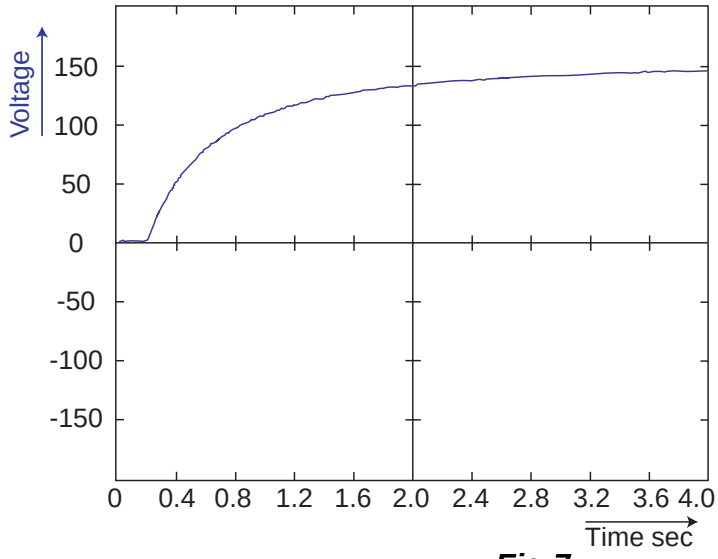
DPI output voltage during sag V_{out} TP3 - TP2.



This plot shows the DPI input & output voltage during an interruption. It can be seen that the transfer to inverter power is very fast (<700µS). When the supply recovers the inverter output is synchronised with the supply before the load is switched back and the inverter is deactivated. The resynchronisation period is in this example 3.5 cycles.

Fig 6

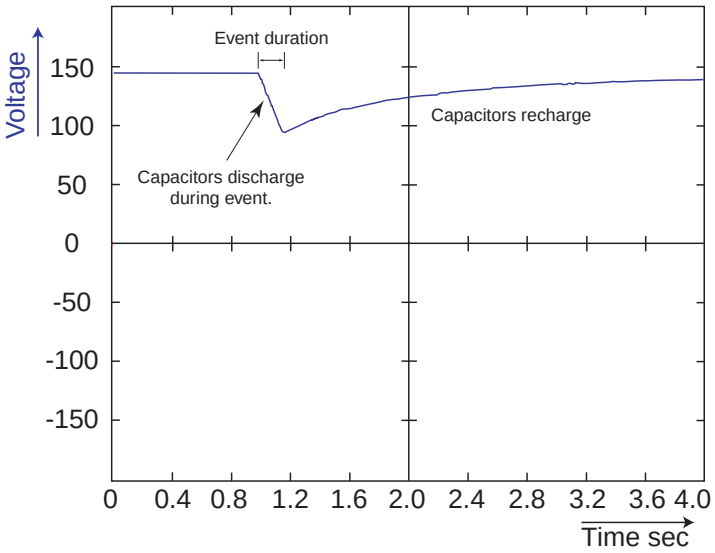
DPI Input & Output voltage during an interruption TP1 - TP2 & TP3 - TP2.



The energy storage capacitor charges from zero volts when the DPI is first connected to the supply. Charging takes around twoseconds and the maximum DC voltage on the capacitor terminals will be Vsupply x 1.41.

Fig 7

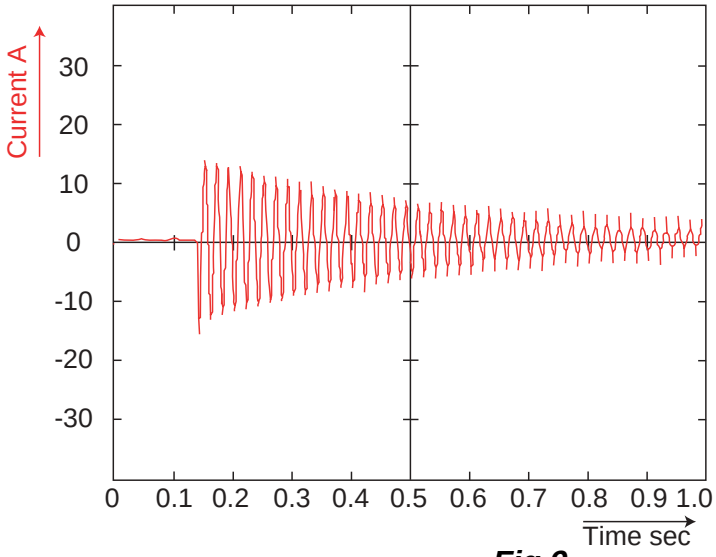
Capacitor voltage during charging TP6 - TP7.



When the DPI detects a voltage sag or outage the load is disconnected from the supply and power is supplied by the DPI inverter. This energy is drawn from the storage capacitor and it begins to discharge. When the supply recovers the storage capacitor is recharged from the supply. A discharge/charge cycle is shown on the left.

Fig 8

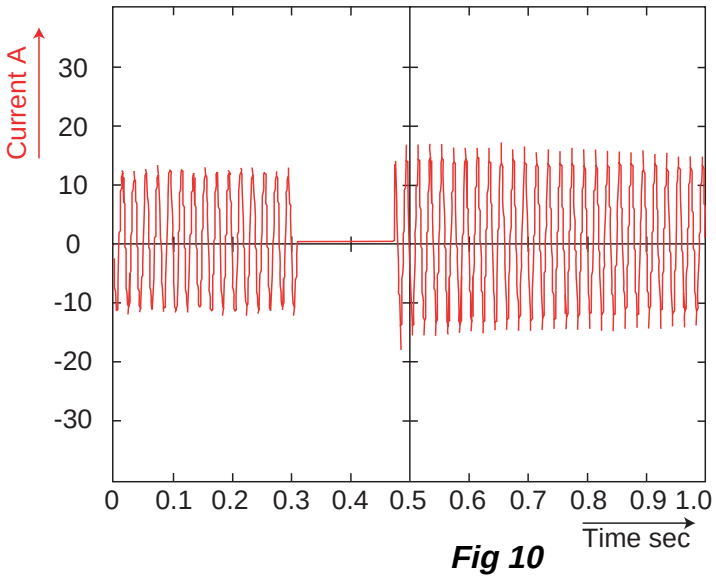
Capacitor discharge and charge during & after a sag TP6 - TP7.



When the DPI is first connected the storage capacitor is completely discharged. Current is drawn from the supply to charge the capacitor. The charging current is at its maximum for the first few cycles and then drops off rapidly as the capacitor voltage rises. The maximum charging current is limited internally by the DPI.

Fig 9

DPI inrush current at switch on TP4 - TP5.



During normal operation the DPI supplies current to the load. When a sag is detected the load is disconnected from the supply and powered by the storage capacitor and inverter. When the supply recovers the load is switched back and the capacitor recharges. For a short time the charging current is added to the load current.

Fig 10

DPI input current before during & after a sag TP4- TP5.