

Determining Sag Directivity

INTRODUCTION

Voltage sags, or dips are the most common type of power quality (PQ) event. Knowing the directivity of the sag, or where it originated, is very important when trying to locate its source and to ultimately mitigate the problem.

This application note outlines some rules of thumb to help determine the directivity of a voltage sag.

WHAT IS SAG DIRECTIVITY?

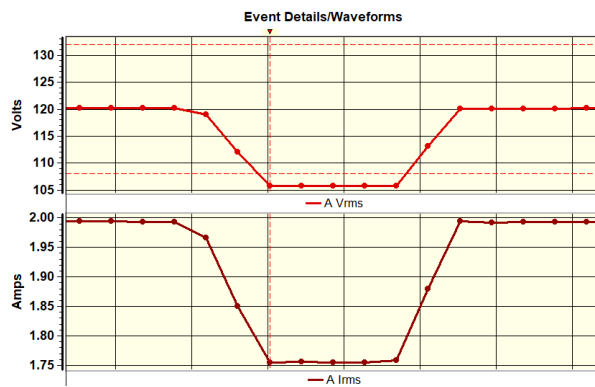
The directivity of a voltage sag is either upstream or downstream from the point in the circuit where the sag was detected. An upstream sag originated on the source side of the power supply - upstream from the monitoring point. A downstream sag originated on the load side - downstream from the monitoring point.

A good example is when measuring at the point of common coupling (PCC) with the utility, which is usually around the utility's billing meter. This is often the first point to monitor during a PQ survey. At this point, an upstream sag originated from the utility and a downstream sag originated within the facility. This clearly determines the lines of responsibility and is crucial in deciding the next steps.

Sag directivity is determined by comparing the relationship of the voltage and the current during the sag.

UPSTREAM SAG

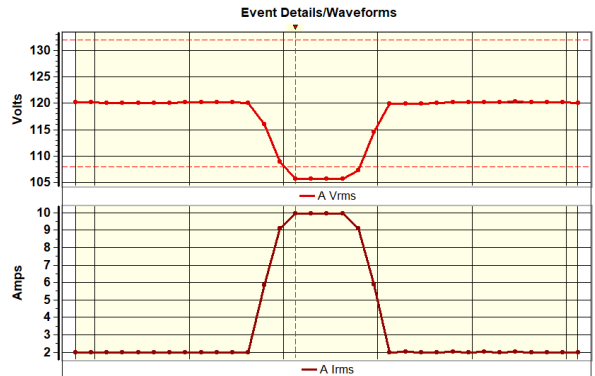
An upstream sag originated upstream, or on the source side of the monitoring point. During an upstream sag, the voltage and current are both reduced, or go to zero. Simply put, no voltage means no current. Examples are relays, breakers, or other protection devices opening, shorts, etc.



DOWNSTREAM SAG

The opposite situation is a downstream, or load based sag. A downstream sag originated on the load side of the monitoring point. When monitoring at the PCC, something in the facility was the source of the sag.

Downstream sags are usually load based, so when comparing the voltage and current they go in opposite directions. The voltage reduction (sag) is coincident with an increase in current. A common example is when energizing a large load such as a motor.



SAG DIRECTIVITY ANSWERMODULE®

Yes, there is an easier way! Many Dranetz instruments, including our [Dranetz HDPQ family](#), include our AnswerModules that automate determining sag directivity and other PQ analysis functions. The Sag Directivity AnswerModule automatically determines the directivity of sags in real time and records the results with the event data. Sag directivity is viewed in the instrument or in our Dran-View 7 software as shown below.

AVrms Instantaneous Sag	
CATEGORY: Short Duration Instantaneous Sag	
Threshold crossed	108.0 V
Magnitude	105.7 V
MaxRMS	107.3 V
Duration	0.041 Sec.
Direction	Downstream