SATEC

Powerful Solutions

*expert***meter™**

High Performance Analyzer

PM180

Disturbance Direction Detection

Application Note

BG0636 REV.A1

REVISION HISTORY

A1	May 2021	Initial release

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1 General

The disturbance direction detection function of the PM180 allows identifying and indicating the location of the voltage dip and swell source relative to the monitoring point where the device is installed. This function is available in devices with firmware V31.XX.43 and higher.

1.1 Measurement Techniques

Voltage dips and swells are commonly caused by short circuits, starting a large induction motor or energizing a power transformer.

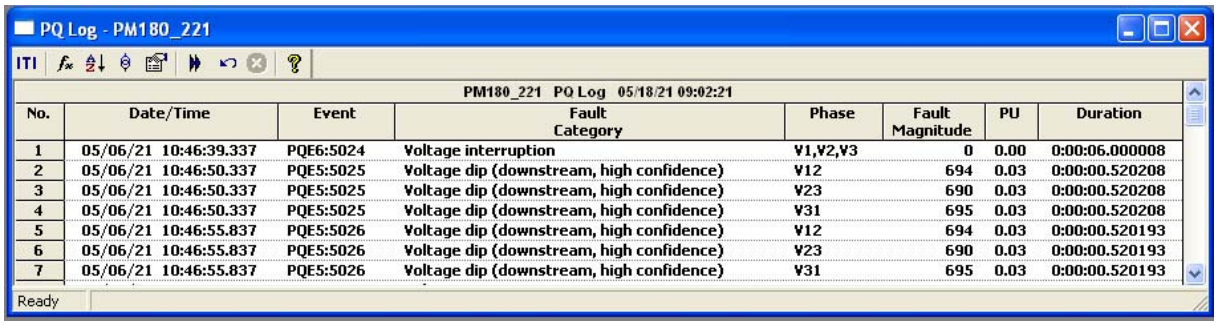
The PM180 uses synchronous voltage and current waveforms recorded before and during an event to determine the location of the disturbance source. Depending on the characteristics of the fault, the device can apply different methods of analyzing the collected data to give the most reliable indication of the direction of the fault.

Symmetrical (three-phase) dips and swells are analyzed using the relative level of the fault or inrush current and the fundamental power angle. Asymmetric (single-phase and two-phase) dips and swells can be analyzed using the negative sequence power angle or, in the case of insufficient information, using the fundamental power angle.

1.2 Disturbance Direction Indication

When disturbance direction detection is enabled in the device (see instructions below), the analysis results are stored along with the dip and swell characteristics in the PQ event log and can be reported using the supplied PAS software tool or via customer application software. See the PM180 Modbus Reference Guide for the information on organizing and accessing the PQ event log data from a client application.

The disturbance direction indication gives the direction of the fault source (downstream or upstream) in relation to the monitoring point and the confidence level of the direction information (high, medium, or low). The picture below shows how the direction of the disturbance is indicated in the PAS PQ event report.



No.	Date/Time	Event	Fault Category	Phase	Fault Magnitude	PU	Duration
1	05/06/21 10:46:39.337	PQE6:5024	Voltage interruption	V1,V2,V3	0	0.00	0:00:06.000008
2	05/06/21 10:46:50.337	PQE5:5025	Voltage dip (downstream, high confidence)	V12	694	0.03	0:00:00.520208
3	05/06/21 10:46:50.337	PQE5:5025	Voltage dip (downstream, high confidence)	V23	690	0.03	0:00:00.520208
4	05/06/21 10:46:50.337	PQE5:5025	Voltage dip (downstream, high confidence)	V31	695	0.03	0:00:00.520208
5	05/06/21 10:46:55.837	PQE5:5026	Voltage dip (downstream, high confidence)	V12	694	0.03	0:00:00.520193
6	05/06/21 10:46:55.837	PQE5:5026	Voltage dip (downstream, high confidence)	V23	690	0.03	0:00:00.520193
7	05/06/21 10:46:55.837	PQE5:5026	Voltage dip (downstream, high confidence)	V31	695	0.03	0:00:00.520193

2 Configuring Disturbance Direction Detection

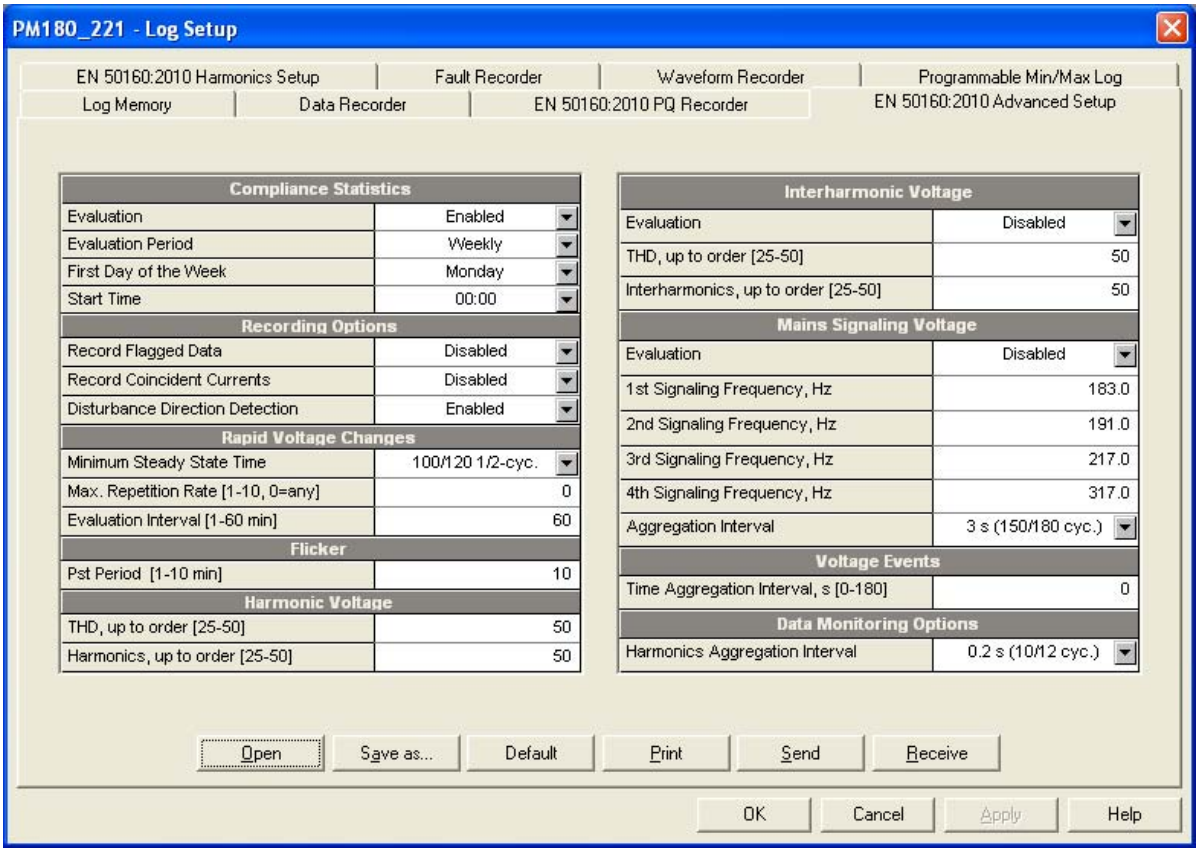
The use of the disturbance direction function does not require special configuration of the device, except for the activation of the disturbance direction indication. Use the supplied PAS software tool to enable or disable this function in your device.

2.1 Enabling Direction Indication in PQ Event Reports

The disturbance direction setting is displayed under the Recording Options section on the Advanced PQ Setup tab for all power quality standards except IEEE 1159 (see the following section).

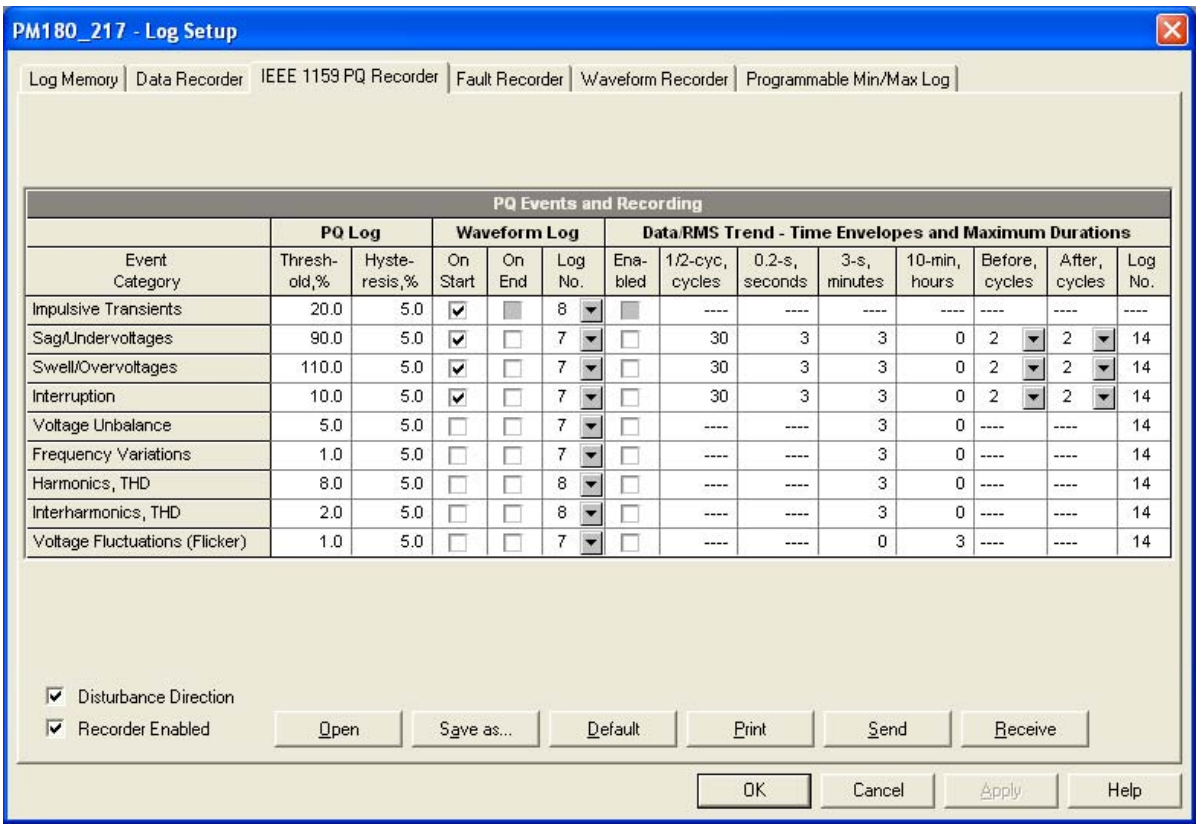
To configure the disturbance direction option, select Memory/Log in the Meter Setup menu and then click on the corresponding Advanced PQ Setup tab. The picture below shows an example of the disturbance direction detection setting in the EN 50160 advanced setup tab.

Set the Disturbance Direction Detection option to “Enabled” to allow disturbance direction indication and send your settings to the device.



2.2 Enabling Direction Indication in IEEE 1159 PQ Reports

To configure the disturbance direction option, select Memory/Log in the Meter Setup menu and then click on the IEEE 1159 Recorder tab. Check the Disturbance Direction checkbox to enable disturbance direction indication and send your settings to the device.


PM180_217 - Log Setup
Log Memory
Data Recorder
IEEE 1159 PQ Recorder
Fault Recorder
Waveform Recorder
Programmable Min/Max Log
PQ Events and Recording
PQ Log
Waveform Log
Data/RMS Trend - Time Envelopes and Maximum Durations
Event Category
Thresh-old,%
Hyste-resis,%
On Start
On End
Log No.
Ena-bled
1/2-cyc, cycles
0.2-s, seconds
3-s, minutes
10-min, hours
Before, cycles
After, cycles
Log No.
Impulsive Transients 20.0 5.0 8 ---- ---- ---- ---- ---- ---- ----
Sag/Undervoltages 90.0 5.0 7 30 3 3 0 2 2 14
Swell/Overvoltages 110.0 5.0 7 30 3 3 0 2 2 14
Interruption 10.0 5.0 7 30 3 3 0 2 2 14
Voltage Unbalance 5.0 5.0 7 ---- ---- 3 0 ---- ---- 14
Frequency Variations 1.0 5.0 7 ---- ---- 3 0 ---- ---- 14
Harmonics, THD 8.0 5.0 8 ---- ---- 3 0 ---- ---- 14
Interharmonics, THD 2.0 5.0 8 ---- ---- 3 0 ---- ---- 14
Voltage Fluctuations (Flicker) 1.0 5.0 7 ---- ---- 0 3 ---- ---- 14
Disturbance Direction
Recorder Enabled
Open
Save as...
Default
Print
Send
Receive
OK
Cancel
Apply
Help