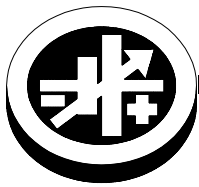


# QUICK START GUIDE



**KEPCO** An ISO 9001 Company.

**BOP 1KW  
SOLAR DEVICE  
TESTER**

## SOLAR DEVICE TESTER USING BOP 1KW

### I — INTRODUCTION

**SCOPE OF MANUAL.** This Quick Start Guide covers the description and operation of the Solar Device Tester demonstration application written in LabView.

**DESCRIPTION.** The Solar Device Tester demonstration application is a simple standalone application that uses the Kepco Solar Device Tester subvi to control the output of the BOP and to take the measurements needed to characterize a solar device. The subvi can be adapted to an overall Test application as needed.

The BOP 1KW is connected directly to the solar device and controlled by the computer. Because measurements are done by the BOP 1KW, external DVMs are not needed. The BOP 1KW changes the output and makes synchronized measurements, and goes on to the next point at a rate of up to 20mS per point. The Solar Device Tester demonstration application uses a LabView subvi to produce an I-V curve that characterizes the solar device (such as solar cells, solar panels, etc.) under test. For accurate voltage measurements remote sensing is recommended (as detailed in the BOP 1KW Operator manual, Section 2).

### II — OPERATION

The user interface included with the Solar Device Tester demonstration application is illustrated in Figure 1. The bottom of Figure 1 shows a typical I-V curve taken by the subvi.

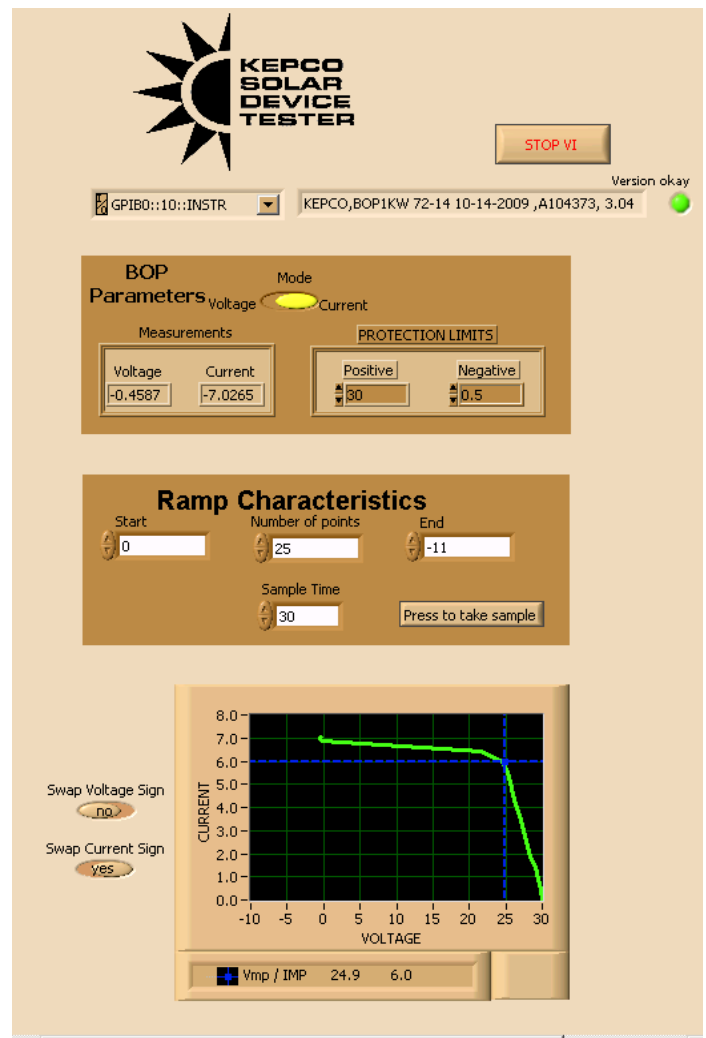
#### USING THE DEMONSTRATION APPLICATION.

The Version OK indicator (at the top of the panel shown in Figure 1) lights green to verify that the BOP firmware supports the demonstration application and the subvi, or red to indicate that the firmware does not support the demonstration application. An upgrade kit to allow older units to support the demonstration application may be purchased at [www.kepcopower.com/bophibuy.htm#upgrade](http://www.kepcopower.com/bophibuy.htm#upgrade).

The BOP Parameters display allows the user to select voltage or current mode by clicking on the Mode switch. The switch is green for voltage and yellow for current.

The start and end points for the sequence of setpoints that will characterize the device are entered under Ramp Characteristics. The Start and End Point units are in Amperes for Current Mode and Volts for Voltage mode. The positive

Protection Limit ensures that the BOP output does not exceed the capacity of the solar device. The negative Protection Limit is normally set close to zero to prevent the solar device from overheating.



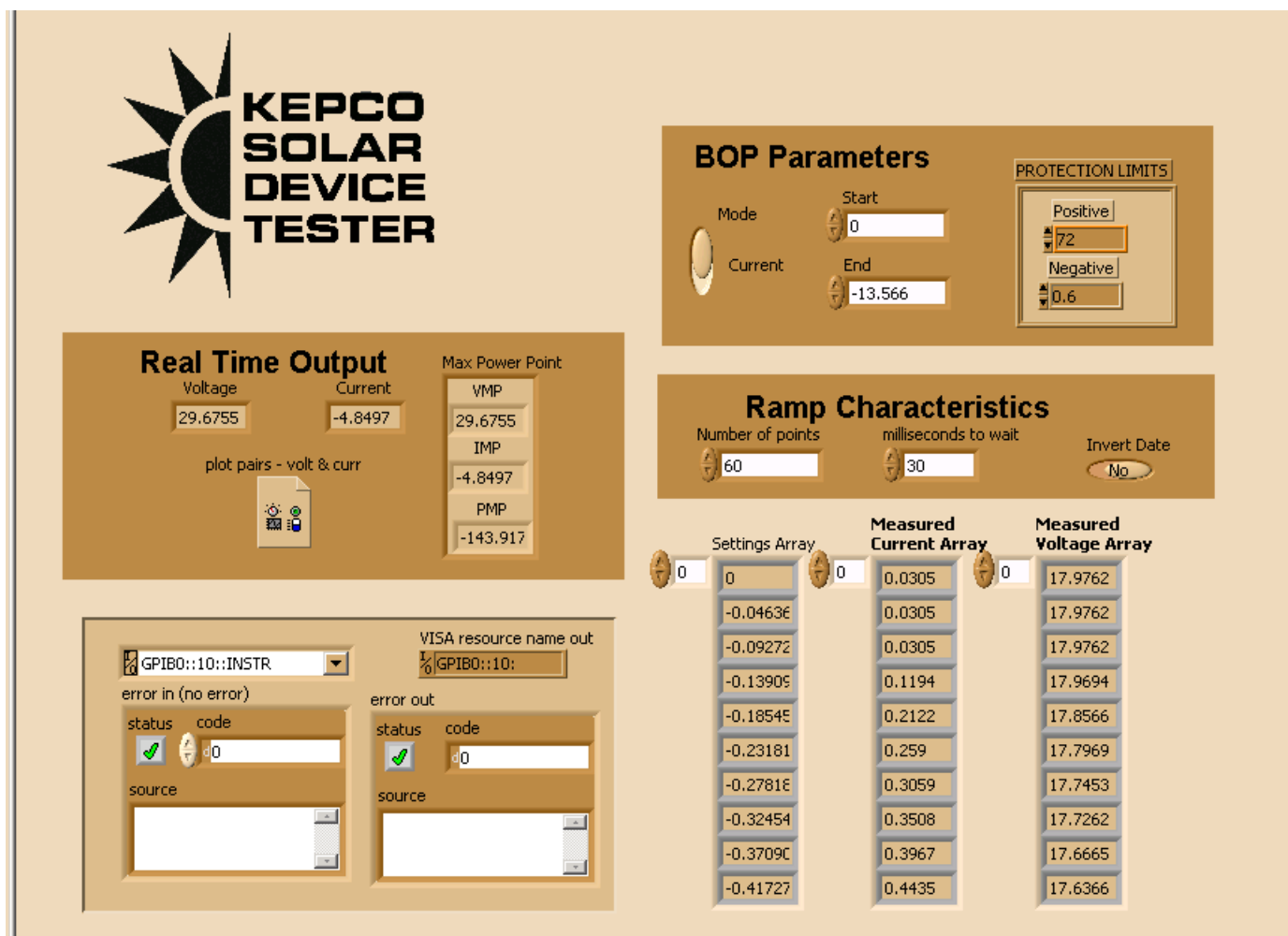
**FIGURE 1. Demonstration Application Interface Showing User Inputs and Rendered I-V Curve Output**

Once the Start and End points are chosen, the user enters the Number of Points, Milliseconds to Wait and whether to swap the sign of the measurements. The number of points

determines the resolution or level of detail of the characterization and can be set to as few as 10 to as many as 40,000 points per I-V Curve. Clicking the Swap Voltage Sign or Swap Current Sign buttons to the left of the I-V curve allows rendering of the I-V curve as preferred for I-V Trace and I-V Dark type tests.

Clicking the Press to Take Sample button causes the application to invoke the subvi which changes the BOP output, creating a linear ramp. At each step, the BOP 1KW provides a measured voltage and current value. While the curve is being taken, the voltage and current values (displayed under BOP Parameters) change, providing status to the user. When the ramp is completed, these measurements are provided as an array, which the application renders as the I-V curve shown in Figure 1. The subvi also provides measured Vmp and Imp, which is graphically marked on the curve with a cursor formed by intersecting vertical and horizontal lines.

**SOLAR DEVICE TESTER SUBVI.** The Solar Device Tester subvi, written in LabView, includes an operator panel (see Figure 2). The subvi may be used as is in an overall Test application. The overall application will typically use the measurement data provided by the Solar Device Tester subvi to produce an I-V curve that characterizes the device, and includes the four key device characteristics: Voltage Maximum Power (Vmp), Current Maximum Power (Imp), Voltage Open Collector (Voc) and Current Short Circuit (Isc) as well as Maximum Power Point (Pmp). The calculated values of Vmp, Imp and Pmp appear under Real Time Output. Isc and Voc are the highest values that appear in the Measured Current and Measured Voltage Arrays, respectively. Figure 1 shows a typical I-V curve characterizing a solar device produced from the data accumulated by the Solar Device Tester subvi.



## FIGURE 2. Solar Device Tester Subvi

The Real Time Output, BOP Parameters and Ramp Characteristics, shown in Figure 2, function as described for the demonstration application. When the subvi is invoked by an application, the subvi calculates a Settings Array as shown in Figure 2. The settings array shows the sequential setpoints for the main channel as determined by the start and end points and the number of points supplied. An arrow to the left of the settings array allows the user to scroll and view each point. To the right of the settings array are the Measured Current and Voltage arrays, showing the measured values at each point from the previous execution of the subvi.

At each point the BOP 1KW main channel is set to a level, and after the user-programmable delay (using the Milliseconds to Wait input under Ramp Characteristics), the subvi requests voltage and current measurements. These requests are made with a single command line to insure the voltage and current measurements are from the same

sample. The programmable delay is adjustable from 20 mS to 2 Seconds. If the BOP 1KW is connected to a solar cell, the best timing has been found to be 25 mS.

When all measurements are completed, the Measure Current and Voltage arrays to the right of the Settings array are updated to show the measured values at each point. (In the demonstration application the two arrays of points are used to update the I-V curve. The Imp and Vmp values update the cursor position.)

At the left, under Real Time Output, the user can monitor the test in progress by viewing the instantaneous outputs of the solar device under test: Voltage and Current. Voltage Maximum Power (Vmp), Current Maximum Power (Imp) and the Maximum Power Point (Pmp) are calculated in real time, and are viewable when the characterization is complete.