

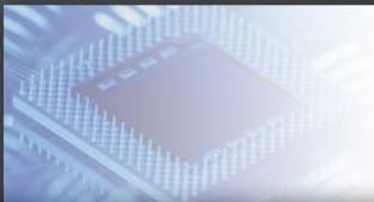
KE26XXB Pulsed Sweep Single

KEITHLEY



A GREATER MEASURE OF CONFIDENCE

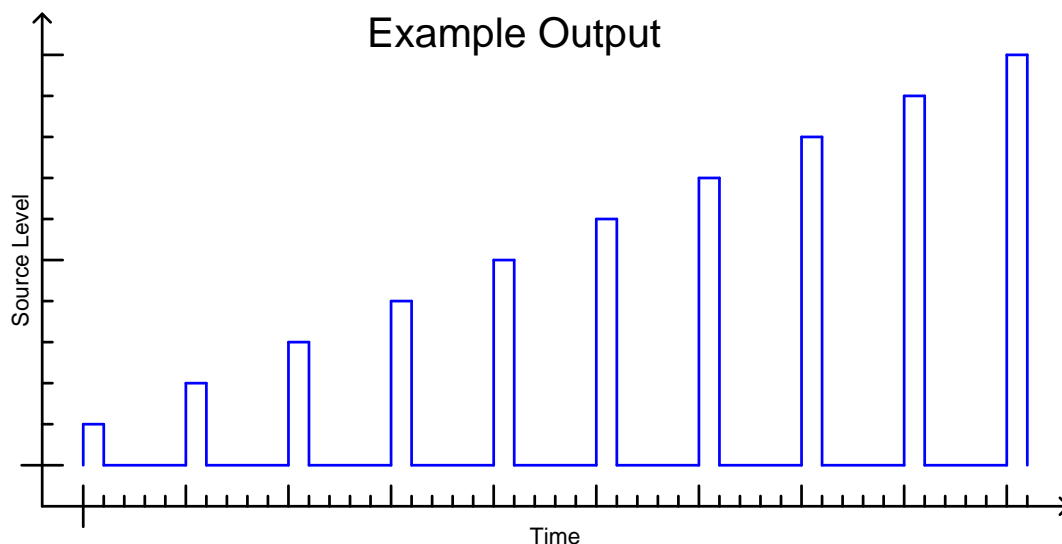
This example demonstrates how to output a pulsed sweep on a single SMU channel of a Keithley Series 2600B System SourceMeter instrument.



Example Overview

This example is designed to demonstrate how to output a pulsed sweep on a single SMU channel. This script performs a linear sweep but can easily be modified to perform log or list sweeps. There are two functions contained in this script. One function performs a pulsed voltage sweep while the other performs a pulsed current sweep.

At the conclusion of the sweeps the data is returned to the Instrument console in a format that is compatible for copy and paste into Microsoft Excel.





Example Requirements

- Equipment Needed:
 - 1x Series 2600B SourceMeter instrument



Script Functions

This script's functions allow the parameters of the test to be adjusted without rewriting and re-running the script. To execute the test, call the test function from the instrument console, passing in the appropriate values as parameters.

Functions Contained in this script:

```
PulsedSweepVSingle(start, stop, numPoints, pulseWidth, pulsePeriod, limitI, nplc, remoteSense)
```

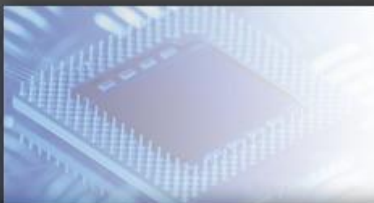
- Outputs a linear pulsed sweep sourcing voltage

```
PulsedSweepISingle(start, stop, numPoints, pulseWidth, pulsePeriod, limitV, nplc, remoteSense)
```

- Outputs a linear pulsed sweep sourcing current

Notes:

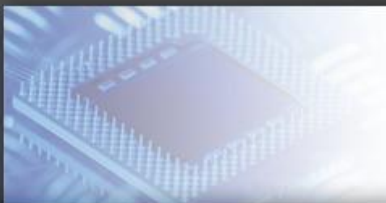
After calling these functions you will need to press the TRIG button on the instrument front panel to start the sweep. The code can easily be modified for the sweep to trigger off other sources as well.



PulsedSweepVSingle()

```
PulsedSweepVSingle(start, stop, numPoints, pulseWidth, pulsePeriod, limitI, nplc, remoteSense)
```

Parameter	Units	Description
start	Volts	The source level of the first point in the sweep
stop	Volts	The source level of the last point in the sweep
numPoints	n/a	The number of points in the sweep
pulseWidth	Seconds	The width of the pulse
pulsePeriod	Seconds	The time from the start of one pulse to the next
limitI	Amps	The source limit value
nplc	n/a	The number of power line cycles over which the measurement will be integrated
remoteSense	n/a	Setting to true enables remote sensing (4-Wire Kelvin)



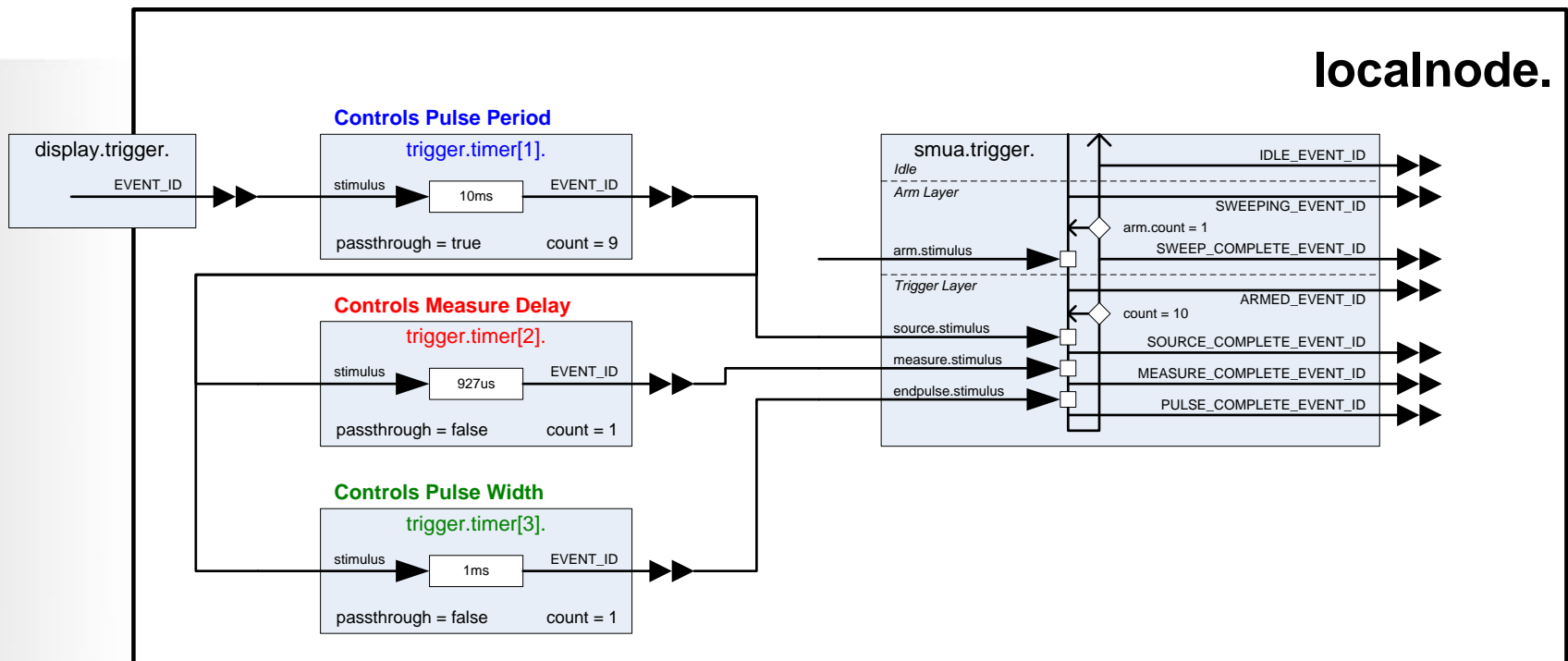
PulsedSweepISingle()

```
PulsedSweepISingle(start, stop, numPoints, pulseWidth, pulsePeriod, limitV, nplc, remoteSense)
```

Parameter	Units	Description
start	Amps	The source level of the first point in the sweep
stop	Amps	The source level of the last point in the sweep
numPoints	n/a	The number of points in the sweep
pulseWidth	Seconds	The width of the pulse
pulsePeriod	Seconds	The time from the start of one pulse to the next
limitV	Volts	The source limit value
nplc	n/a	The number of power line cycles over which the measurement will be integrated
remoteSense	n/a	Setting to true enables remote sensing (4-Wire Kelvin)

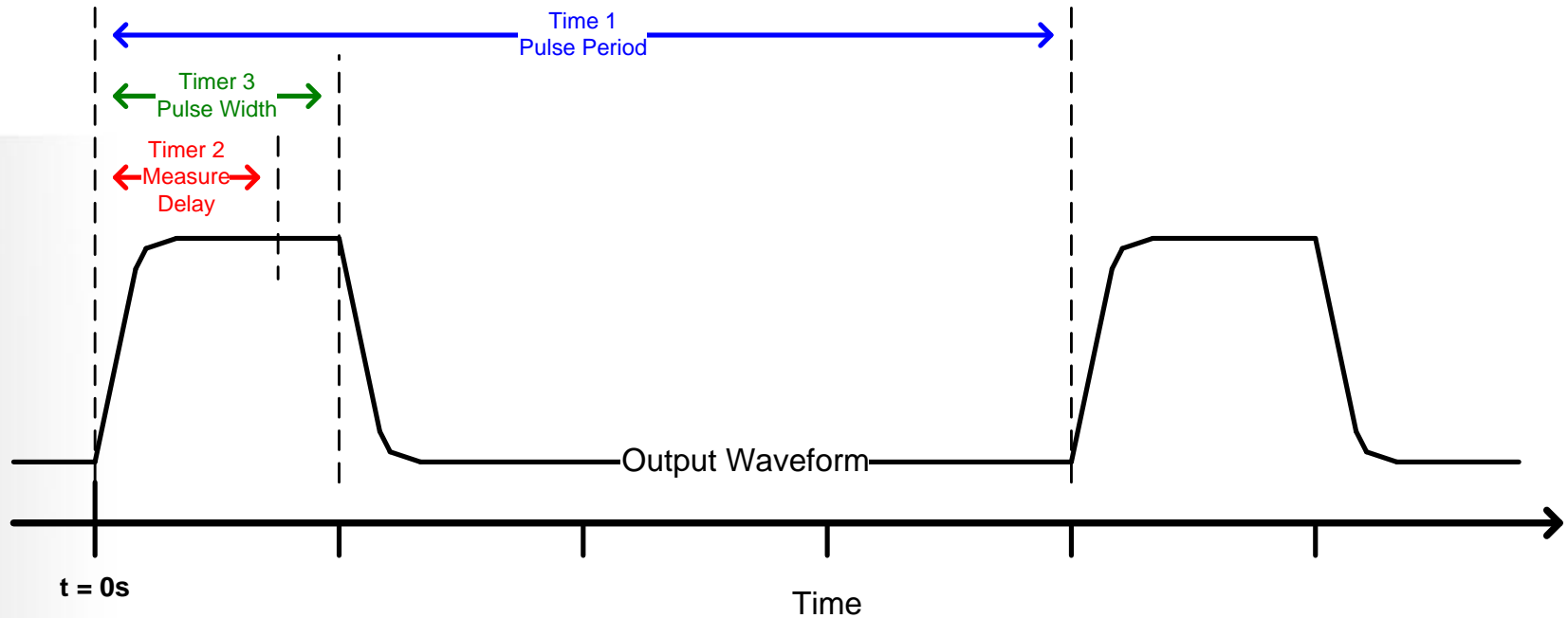
Pulse Sweep Single Trigger Model Diagram

The following trigger model was used to implement the pulsed sweep





Trigger Model Details



- **Timer 1** - Controls pulse period
- **Timer 2** - Controls measure delay
- **Timer 3** - Controls pulse width



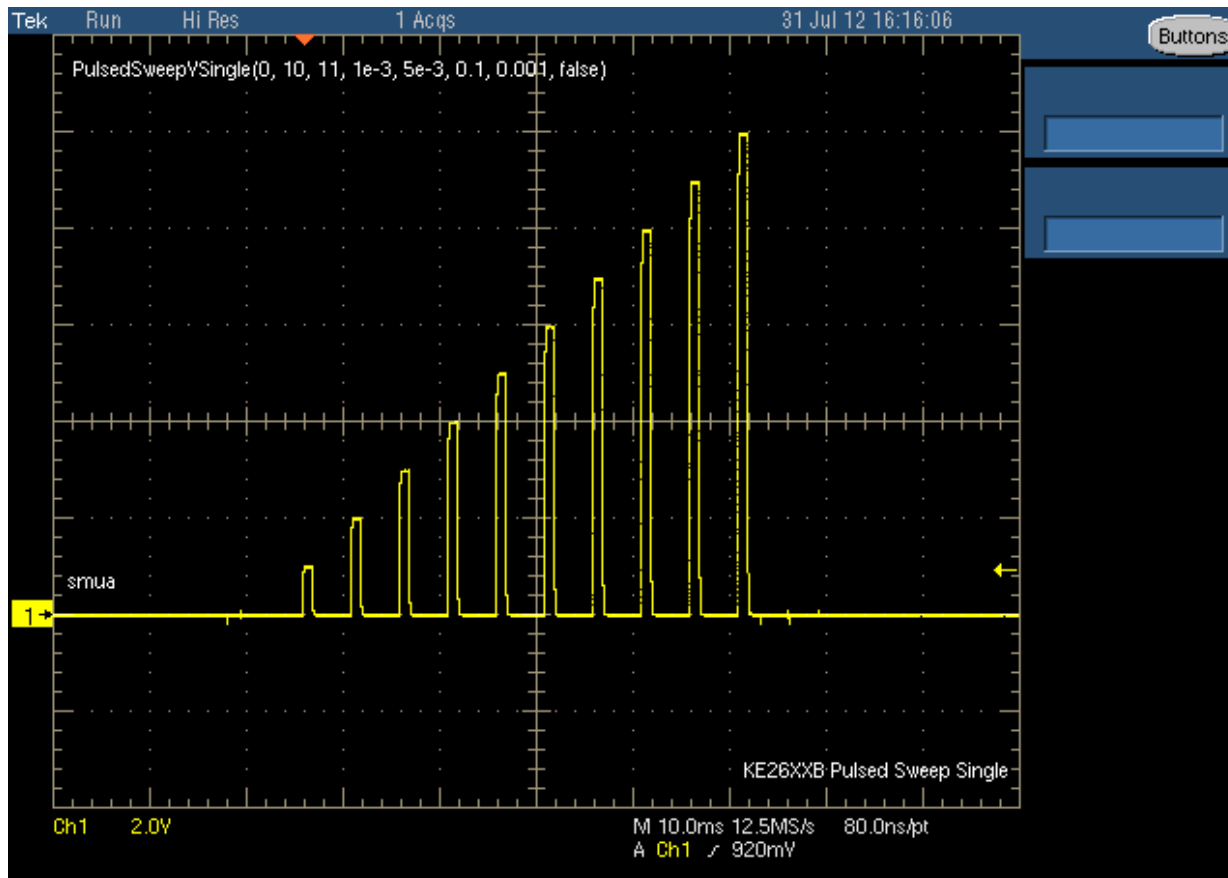
Trigger Model Details (continued)

- Display Trigger
 - Sweep execution begins when the TRIG button on the instrument's front panel is pressed.



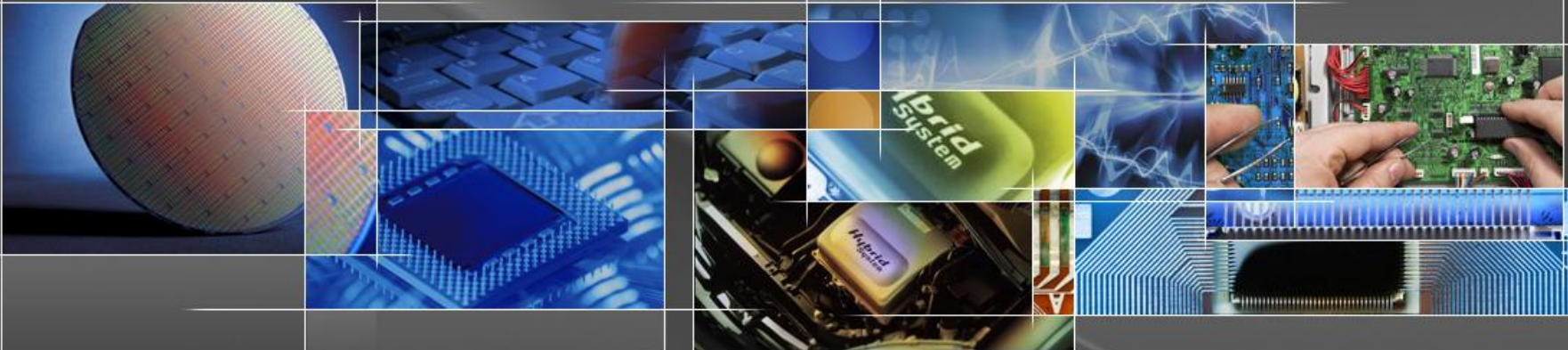
Example Output

```
PulsedSweepVSingle(0, 10, 11, 1e-3, 5e-3, 0.1, 0.001, false)
```



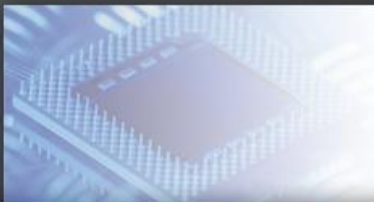
KE26XXB Pulsed Sweep Dual

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This example demonstrates how to output pulsed sweeps simultaneously on both SMU channels of a dual channel Keithley Series 2600B System SourceMeter instrument.

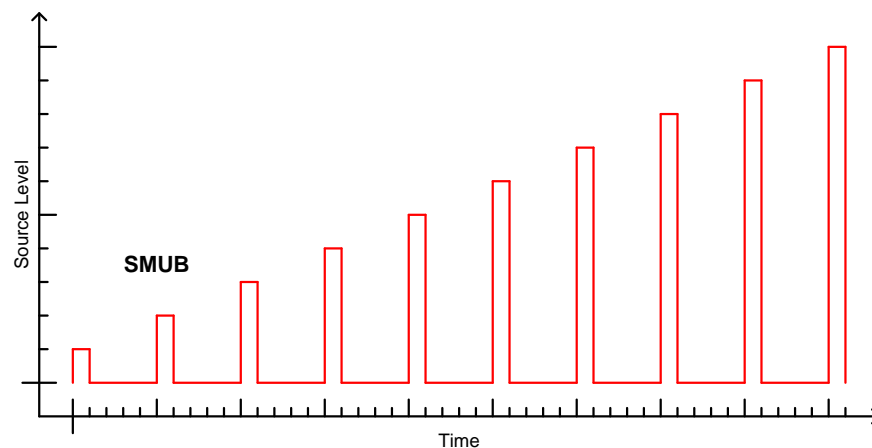
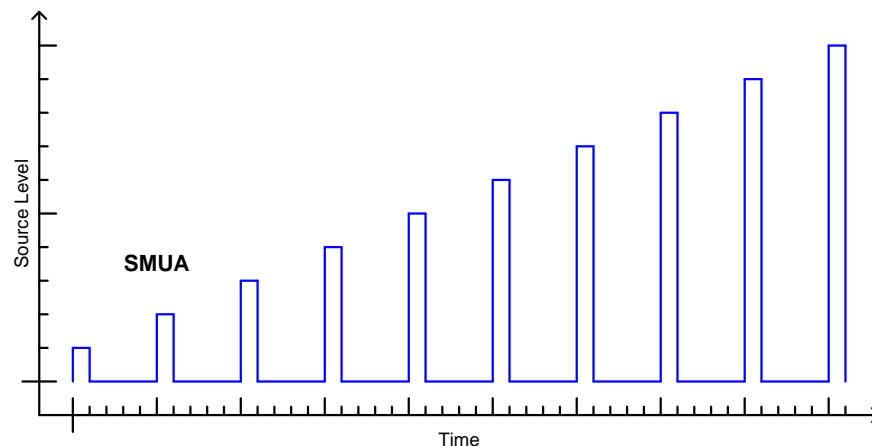


Example Overview

This example demonstrates how to synchronize pulsed sweeps between two SMU channels on a dual channel Series 2600B SourceMeter instrument. This example performs linear sweeps but can easily be modified to perform log or list sweeps. This example also programs both SMUs to source the same levels however, this can also easily be modified for each SMU to output different levels.

There are two functions contained in this example script. One function outputs pulsed voltage sweeps while the other performs pulsed current sweeps.

At the conclusion of the sweeps the data is returned to the instrument console in a format that is compatible for copy and paste into Microsoft Excel.





Example Requirements

- Equipment Needed:
 - 1x Dual channel Series 2600B SourceMeter instrument



Script Functions

This script's functions allow the parameters of the test to be adjusted without rewriting and re-running the script. To execute the test, call the test function from the instrument console, passing in the appropriate values as parameters.

Functions Contained in this script:

```
PulsedSweepVDual(start, stop, numPoints, pulseWidth, pulsePeriod, limitI, nplc, remoteSense)
```

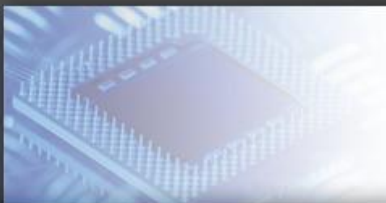
- Outputs dual linear pulsed sweeps sourcing voltage

```
PulsedSweepIDual(start, stop, numPoints, pulseWidth, pulsePeriod, limitV, nplc, remoteSense)
```

- Outputs dual linear pulsed sweeps sourcing current

Notes:

After calling these functions you will need to press the TRIG button on the instrument front panel to start the sweep. The code can easily be modified for the sweep to trigger off other sources as well.



PulsedSweepVDual()

```
PulsedSweepVDual(start, stop, numPoints, pulseWidth, pulsePeriod, limitI, nplc,  
remoteSense)
```

Parameter	Units	Description
start	Volts	The source level of the first point in the sweep
stop	Volts	The source level of the last point in the sweep
numPoints	n/a	The number of points in the sweep
pulseWidth	Seconds	The width of the pulse
pulsePeriod	Seconds	The time from the start of one pulse to the next
limitI	Amps	The source limit value
nplc	n/a	The number of power line cycles over which the measurement will be integrated
remoteSense	n/a	Setting to true enables remote sensing (4-Wire Kelvin)



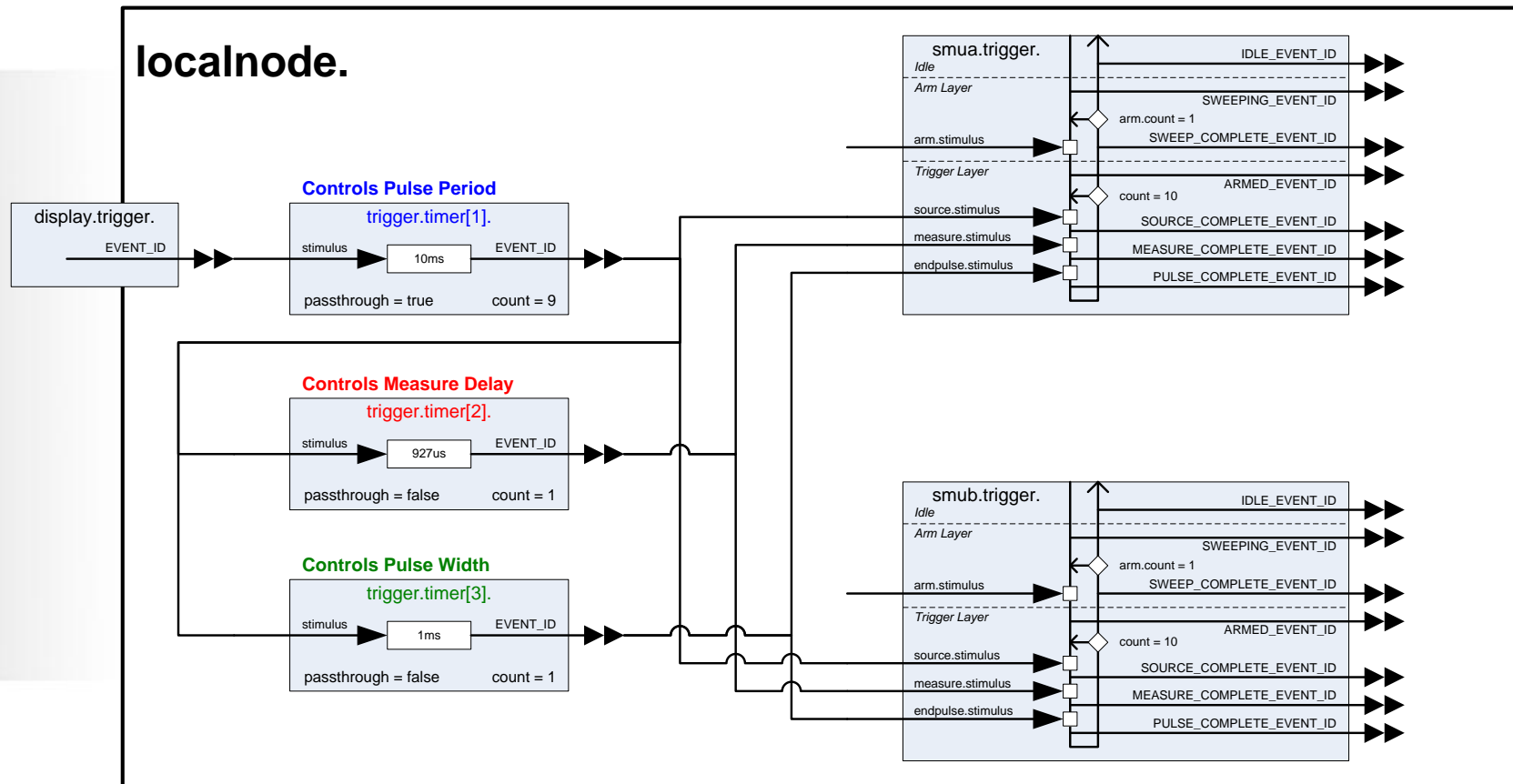
PulsedSweepIDual()

```
PulsedSweepIDual(start, stop, numPoints, pulseWidth, pulsePeriod, limitV, nplc,  
remoteSense)
```

Parameter	Units	Description
start	Amps	The source level of the first point in the sweep
stop	Amps	The source level of the last point in the sweep
numPoints	n/a	The number of points in the sweep
pulseWidth	Seconds	The width of the pulse
pulsePeriod	Seconds	The time from the start of one pulse to the next
limitV	Volts	The source limit value
nplc	n/a	The number of power line cycles over which the measurement will be integrated
remoteSense	n/a	Setting to true enables remote sensing (4-Wire Kelvin)

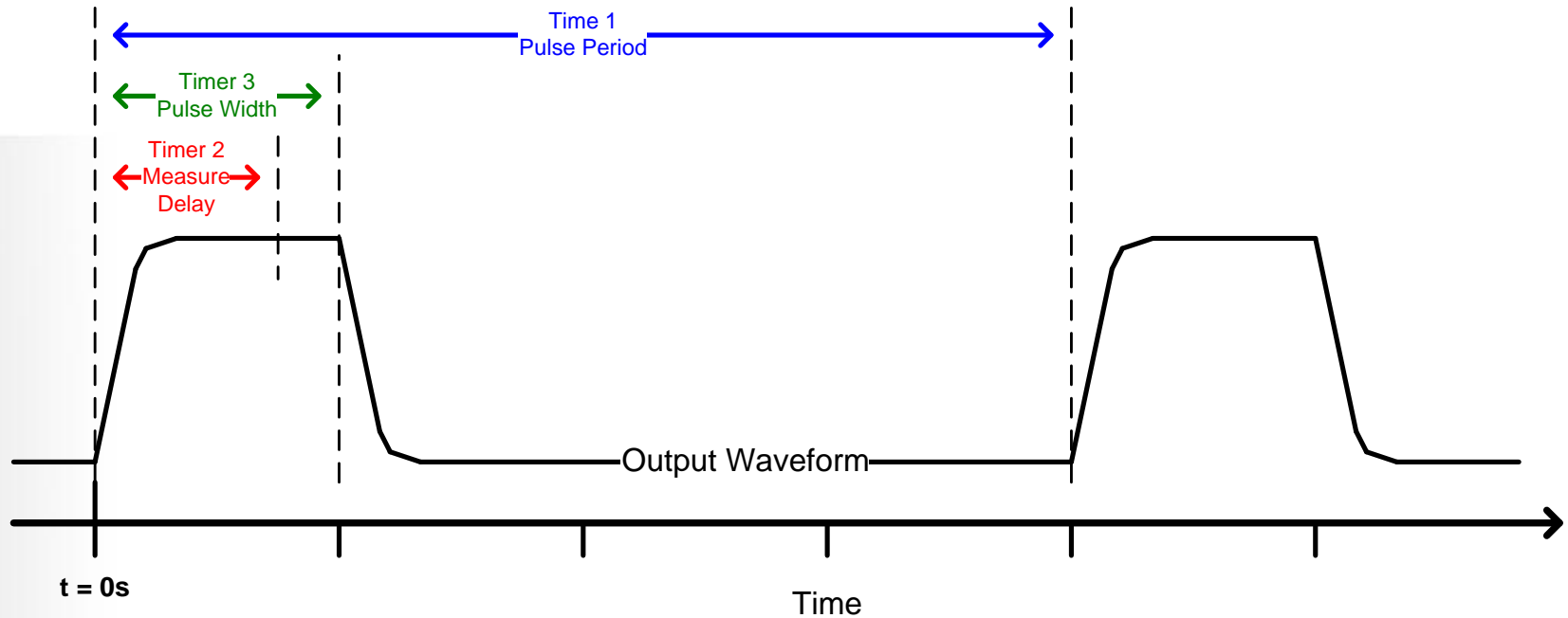
Pulse Sweep Dual Trigger Model Diagram

The following trigger model was used to implement the pulsed sweep

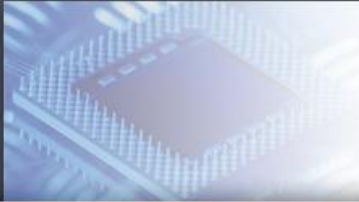




Trigger Model Details

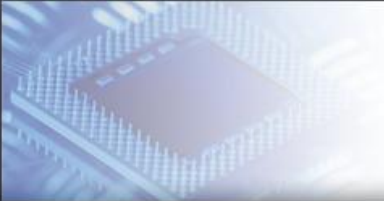


- **Timer 1** - Controls pulse period
- **Timer 2** - Controls measure delay
- **Timer 3** - Controls pulse width



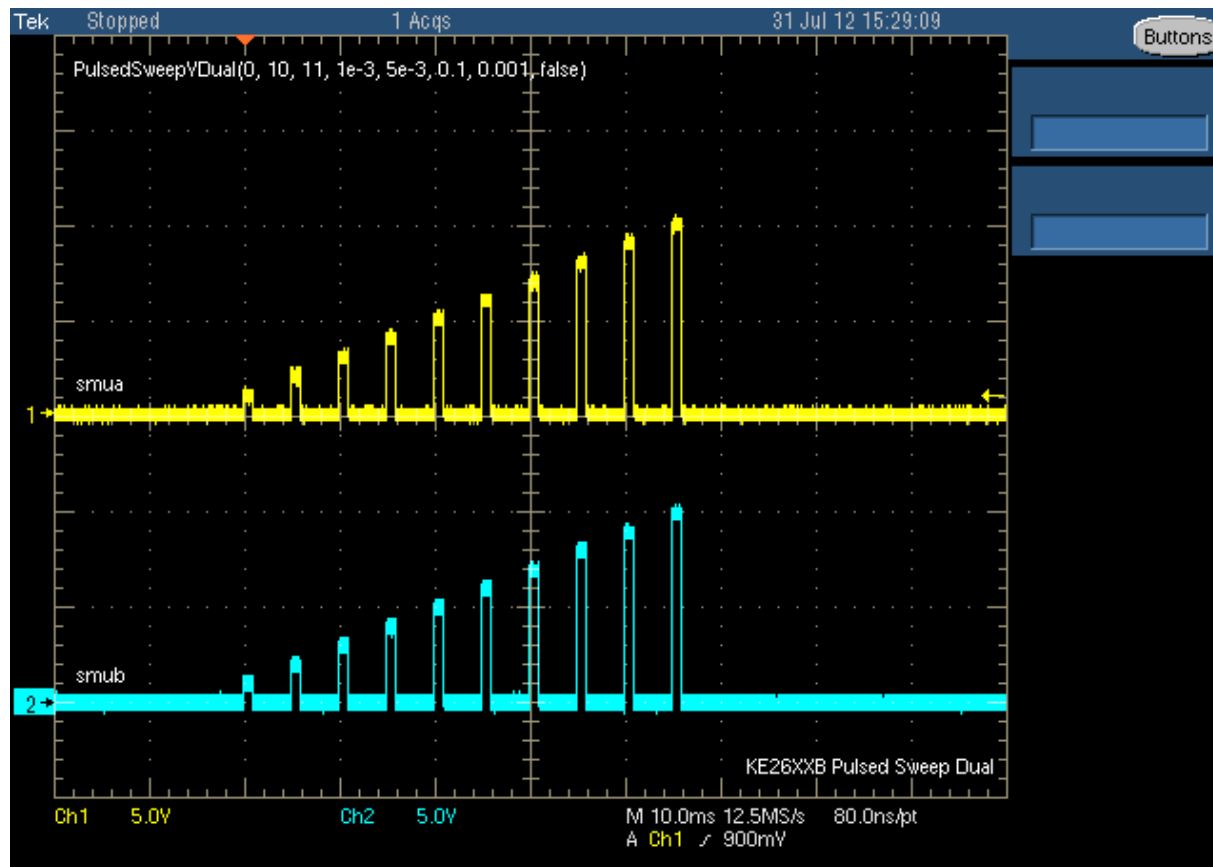
Trigger Model Details (continued)

- Display Trigger
 - Sweep execution begins when the TRIG button on the instrument's front panel is pressed.
- Because the SMU actions of both SMU channels are triggered off the same set of timers, all SMU actions will be synchronized between the two channels.



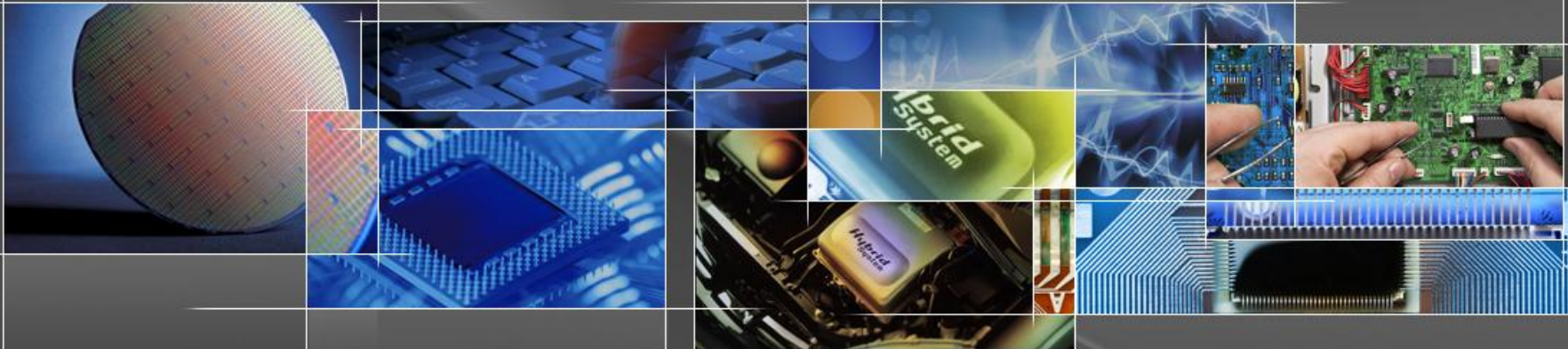
Example Output

```
PulsedSweepVDual(0, 10, 11, 1e-3, 5e-3, 0.1, 0.001, false)
```



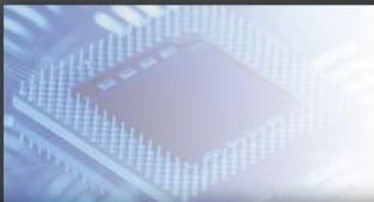
KE26XXB Pulsed Sweep Quad

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This example demonstrates how to output pulsed sweeps simultaneously on four SMU channels of two dual channel Keithley Series 2600B System SourceMeter instruments.



Example Overview

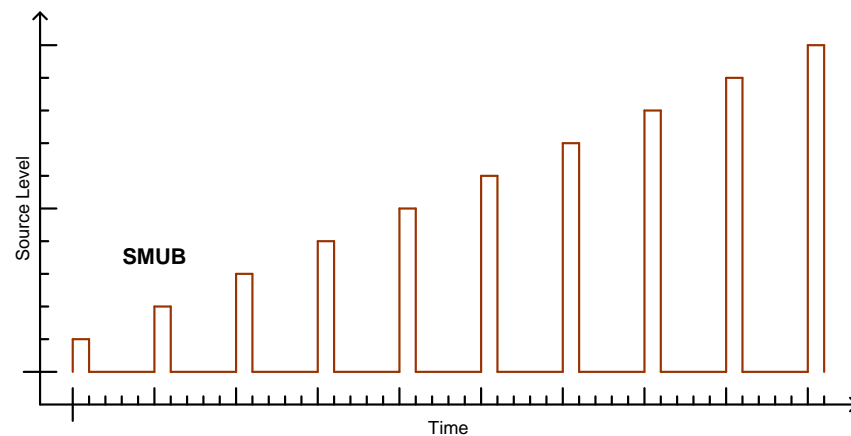
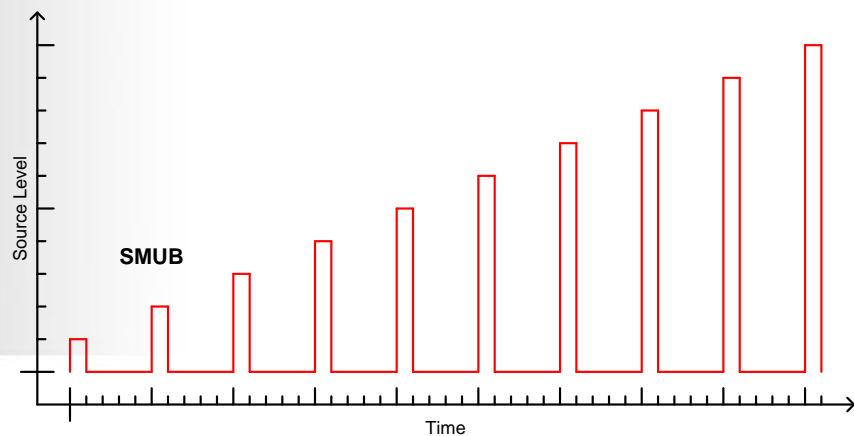
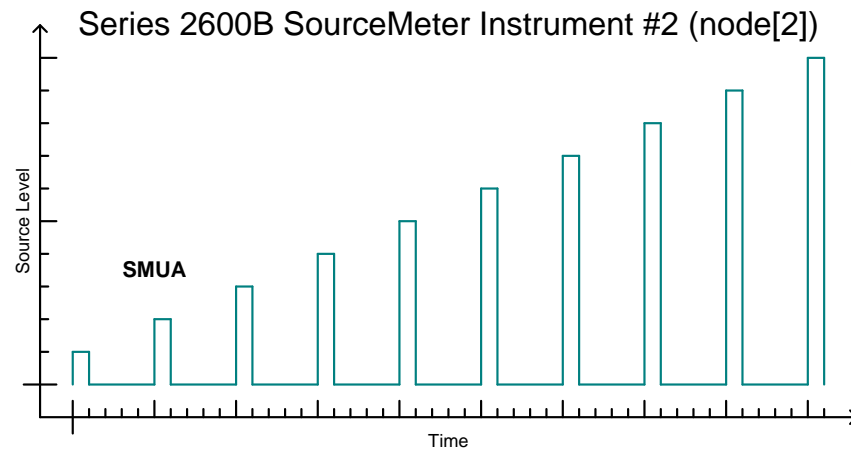
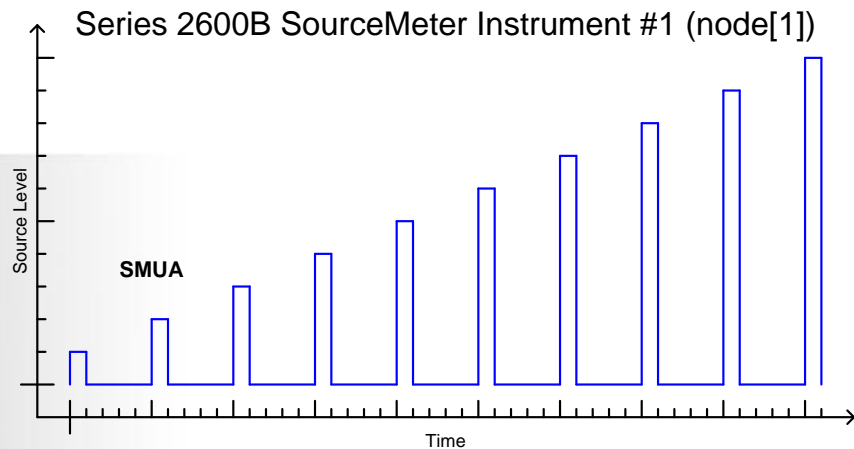
This example demonstrates how to synchronize pulsed sweeps between multiple SMU channels on multiple Series 2600B SourceMeter instruments. It is written to control four SMU channels within two dual channels Series 2600B SourceMeter instruments and can easily be expanded to support additional Series 2600B SourceMeter instruments. This example script performs linear sweeps but can easily be modified to perform log or list sweeps. It also programs all SMUs to source the same levels however, this can also easily be modified for each SMU to output different levels.

There are two functions contained in this script. One function performs pulsed voltage sweeps while the other performs pulsed current sweeps.

At the conclusion of the sweeps the data is returned to the instrument console in a format that is compatible for copy and paste into Microsoft Excel.



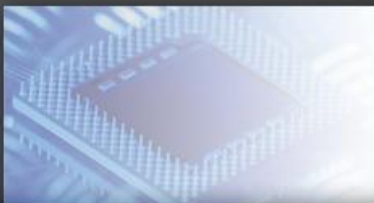
Example Output





Example Requirements

- Equipment Needed:
 - 2x Dual channel Series 2600B SourceMeter instruments
 - 1x TSP-Link Cable
- TSP-Link Node Assignments:
 - 26XXA #1: Node 1 (Master Node)
 - 26XXA #2: Node 2



Script Functions

This script's functions allow the parameters of the test to be adjusted without rewriting and re-running the script. To execute the test, call the test function from the instrument console, passing in the appropriate values as parameters.

User Functions Contained in this script:

```
PulsedSweepVQuad(start, stop, numPoints, pulseWidth, pulsePeriod, limitI, nplc, remoteSense)
```

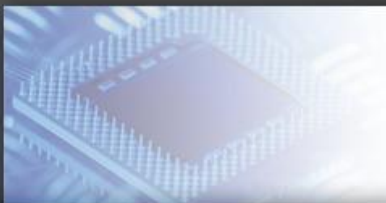
- Outputs quad linear pulsed sweeps sourcing voltage

```
PulsedSweepIQuad(start, stop, numPoints, pulseWidth, pulsePeriod, limitV, nplc, remoteSense)
```

- Outputs quad linear pulsed sweeps sourcing current

Notes:

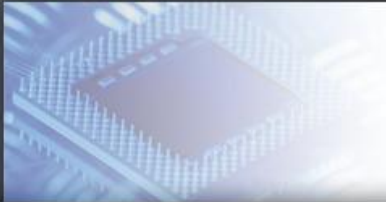
After calling these functions you will need to press the TRIG button on the instrument front panel to start the sweep. The code can easily be modified for the sweep to trigger off other sources as well.



PulsedSweepVQuad()

```
PulsedSweepVQuad(start, stop, numPoints, pulseWidth, pulsePeriod, limitI, nplc,  
remoteSense)
```

Parameter	Units	Description
start	Volts	The source level of the first point in the sweep
stop	Volts	The source level of the last point in the sweep
numPoints	n/a	The number of points in the sweep
pulseWidth	Seconds	The width of the pulse
pulsePeriod	Seconds	The time from the start of one pulse to the next
limitI	Amps	The source limit value
nplc	n/a	The number of power line cycles over which the measurement will be integrated
remoteSense	n/a	Setting to true enables remote sensing (4-Wire Kelvin)



PulsedSweepIQuad()

```
PulsedSweepIQuad(start, stop, numPoints, pulseWidth, pulsePeriod, limitV, nplc,  
remoteSense)
```

Parameter	Units	Description
start	Amps	The source level of the first point in the sweep
stop	Amps	The source level of the last point in the sweep
numPoints	n/a	The number of points in the sweep
pulseWidth	Seconds	The width of the pulse
pulsePeriod	Seconds	The time from the start of one pulse to the next
limitV	Volts	The source limit value
nplc	n/a	The number of power line cycles over which the measurement will be integrated
remoteSense	n/a	Setting to true enables remote sensing (4-Wire Kelvin)



Utility Functions

This script contains additional functions that are called by the user functions to help configure the test by performing the repetitive configuration operations. These functions are utilitarian in nature and are not designed to be called by the user.

Utility Functions Contained in this script:

`ConfigVSMU(nodenum, smu, start, stop, numPoints, limitI, nplc, remoteSense)`

- Configures the SMU settings of a given SMU on a given node to output a pulsed voltage sweep.

`ConfigISMU(nodenum, smu, start, stop, numPoints, limitV, nplc, remoteSense)`

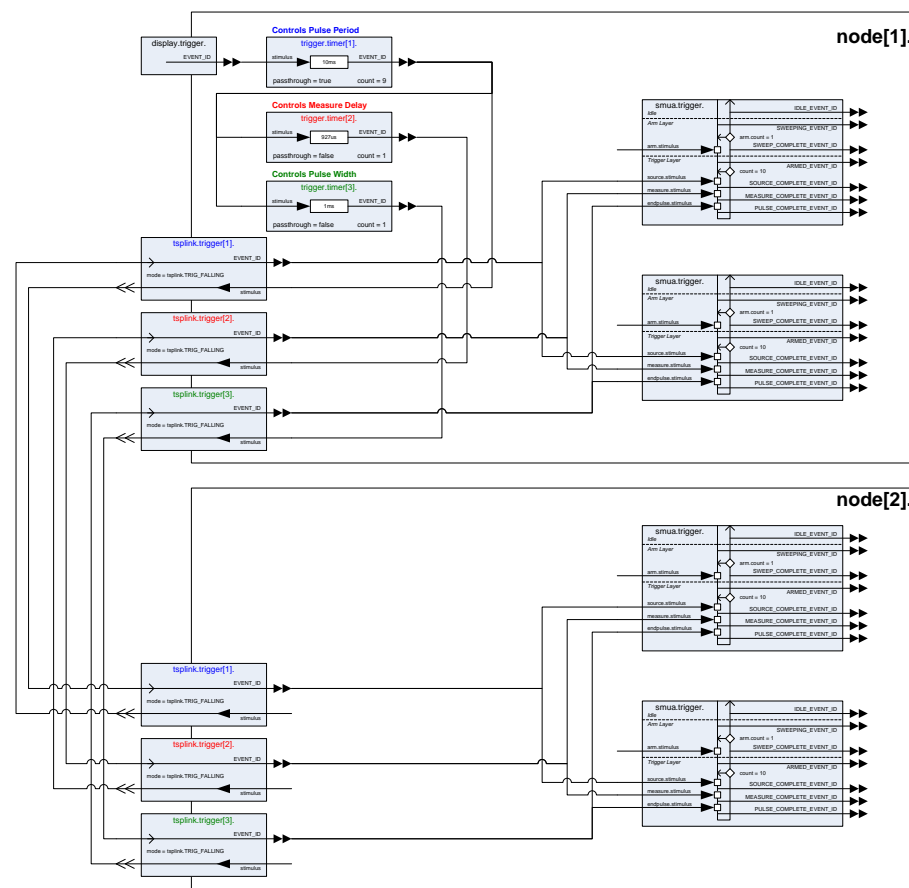
- Configures the SMU settings of a given SMU on a given node to output a pulsed current sweep.

`ConfigTSPLinkTriggers(nodenum)`

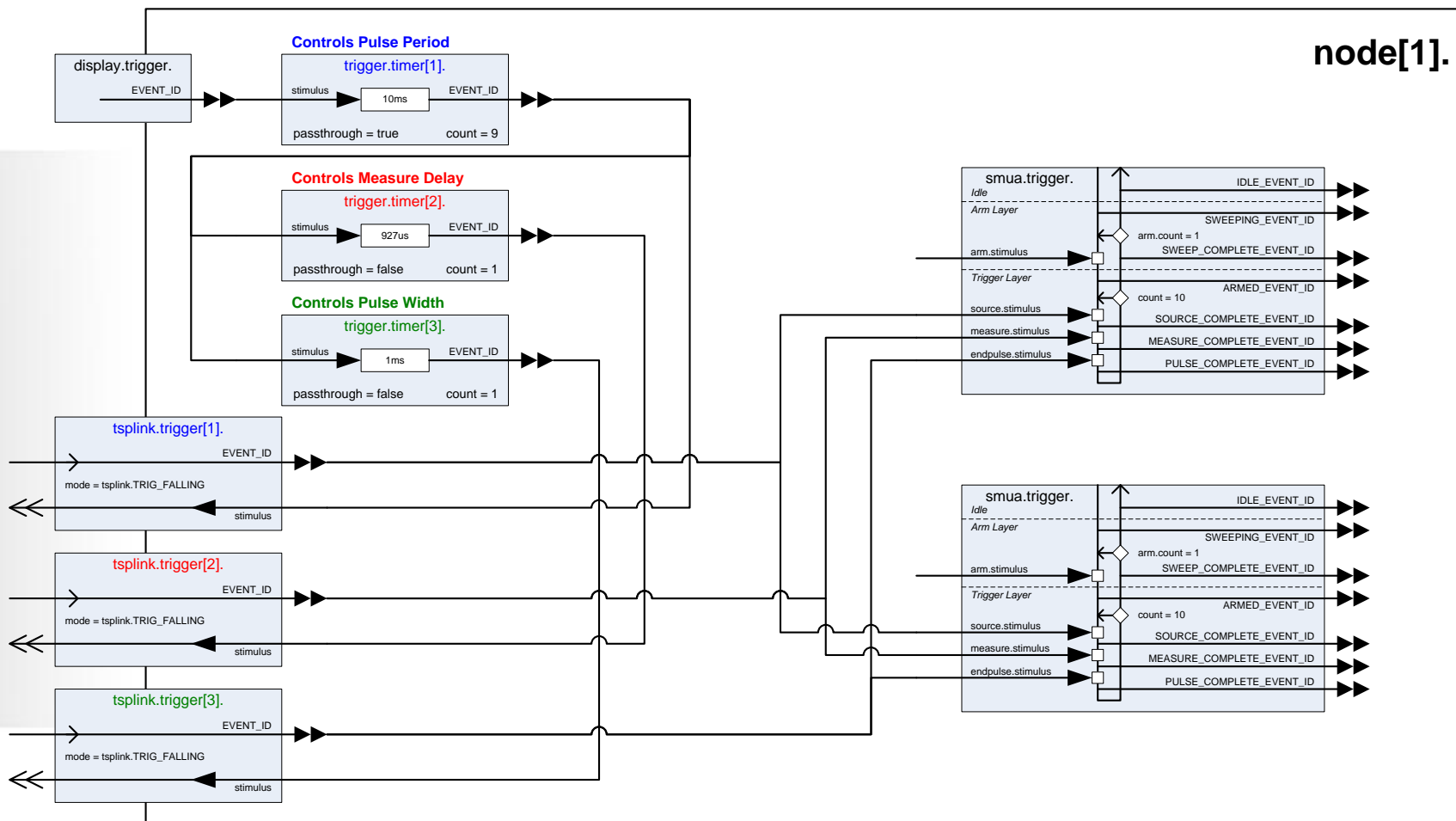
- Configures the TSP-Link triggers of a given node as falling edge triggers.

Pulse Sweep Quad Trigger Model Diagram

- The trigger model on the right was used to implement the pulsed sweep.
- Timers on node[1] control the pulse timing for all SMU channels.
- Trigger signals between the SourceMeter instruments (node[1] and node[2]) are sent via TSP-Link to synchronize the SMU actions.
- Larger images of each node's trigger model are on the following slides.

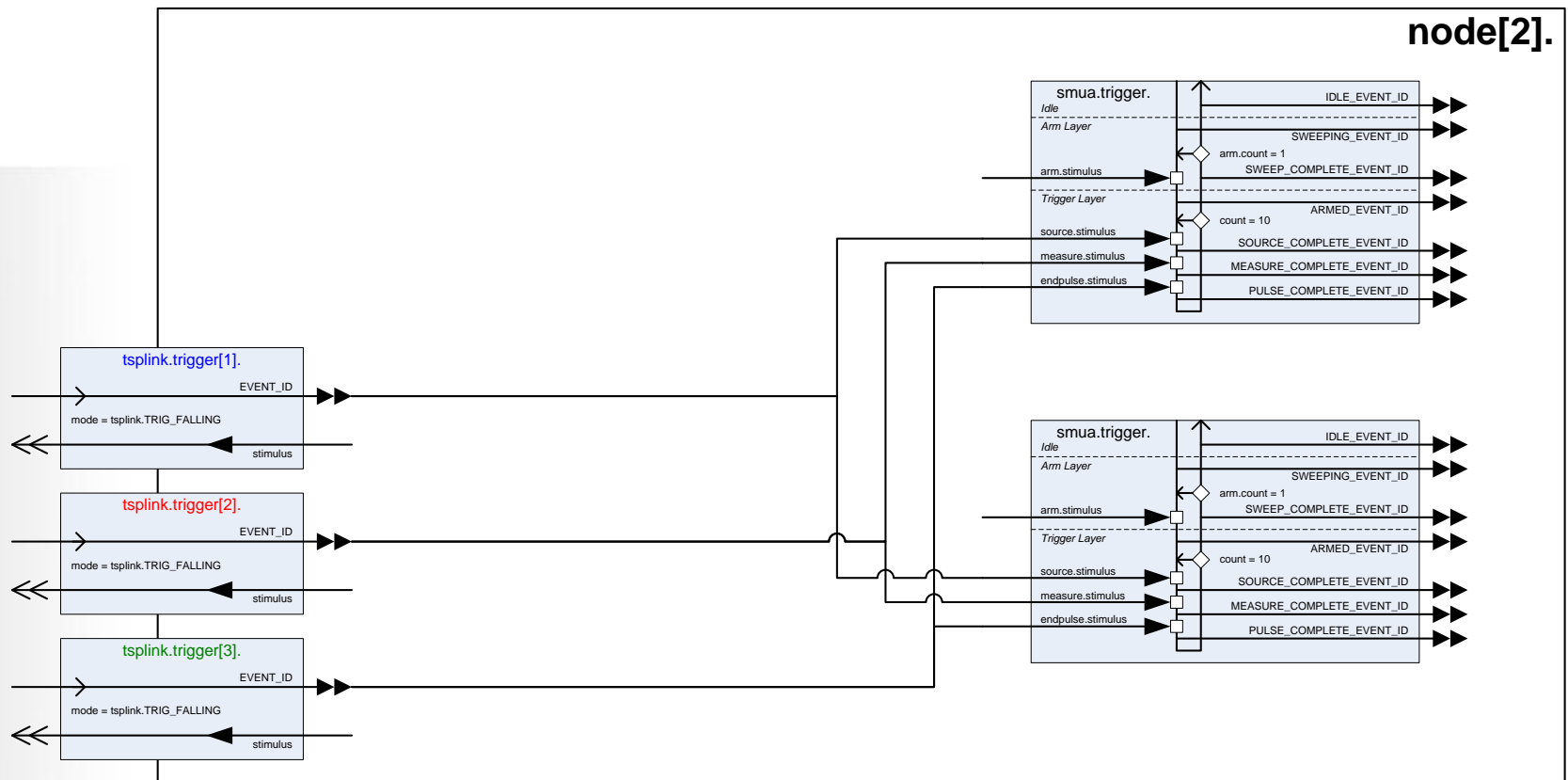


node[1] Trigger Model





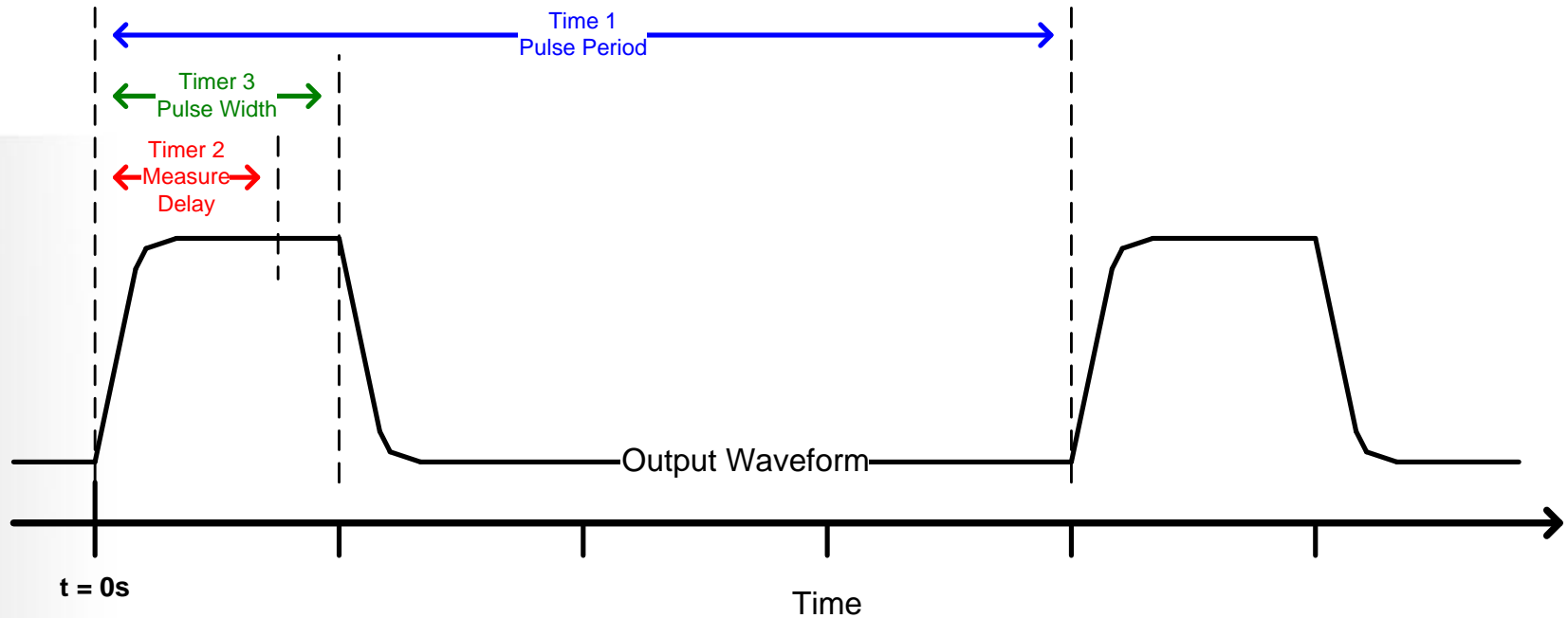
node[2] Trigger Model



- Additional Series 2600B SourceMeter instruments can easily be added by connecting them via TSP-Link and programming their trigger models with the same trigger model as node[2].



Trigger Model Details



- **Timer 1** - Controls pulse period
- **Timer 2** - Controls measure delay
- **Timer 3** - Controls pulse width



Trigger Model Details (continued)

- Display Trigger
 - Sweep execution begins when the TRIG button on the front panel of node 1 (TSP-Link Master Node) is pressed.
- Because the SMU actions of all SMU channels are triggered off the same TSP-Link triggers, all SMU actions will be synchronized between all four channels.



Example Output

```
PulsedSweepVQuad(0, 10, 11, 1e-3, 5e-3, 0.1, 0.001, false)
```

