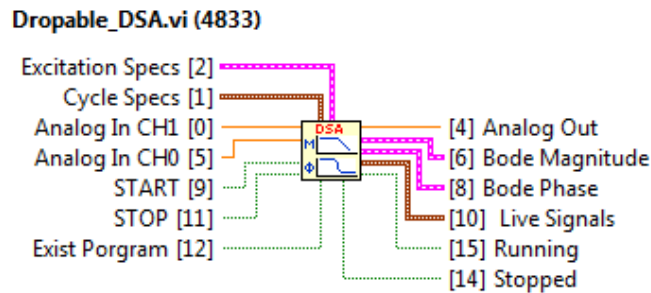## myRIO Dynamic Signal Analyzer Documentation

I) Overview:

    A) The myRIO Dynamic Signal Analyzer (DSA) is designed to be used as a subVI **(Dropable_DSA.vi)** that can be simply dropped into new and/or existing control and/or simulation code to measure a desired frequency response and plot it as the corresponding Bode plots.

    B) DSA Inputs/Outputs:

Dropable_DSA.vi (4833)

Excitation Specs [2]
Cycle Specs [1]
Analog In CH1 [0]
Analog In CH0 [5]
START [9]
STOP [11]
Exist Porgram [12]

[4] Analog Out
[6] Bode Magnitude
[8] Bode Phase
[10] Live Signals
[15] Running
[14] Stopped

       1. Inputs:

          a) Excitation Specs **[Cluster]**

              i) Initial Frequency **[Double]**

                  (1) The lowest frequency of the frequency range which the DSA will measure the bode plot for.

              ii) Final Frequency **[Double]**

                  (1) The highest frequency of the frequency range which the DSA will measure the bode plot for.

              iii) Frequency Units **[Boolean]**

                  (1) Whether the frequency range input is in Hz or rads/sec.

                  (2) TRUE = Hz | FALSE = rads/sec

              iv) Number of Frequencies **[Integer]**

                  (1) The number of logarithmically spaced frequencies to measure the bode plot for.

              v) Sampling Time **[Double]**

                  (1) The time step taking in between each measurement.

                  (2) $Sampling\ Time = 1/Sampling\ Rate$

              vi) Amplitude **[Double]**

                  (1) Amplitude of desired swept sine excitation.

              vii) Offset **[Double]**

                  (1) DC offset of swept sine excitation.

b) Cycle Specs **[Cluster]**

    i) <u>Cycles to Settle</u> **[Integer]**

        (1) The number of cycles of the swept sine wave at each frequency to ignore to let the transient response die out.

    ii) <u>Cycles to Calculate</u> **[Integer]**

        (1) The number of cycles of the sept since wave at each frequency to measure in order to measure the bode plot.

c) <u>Controls</u>:

    i) <u>START</u> **[Boolean]**

        (1) Tells the DSA to initialize and then start.

        (2) TRUE = Start/Restart and initialize the DSA | FALSE = Nothing

    ii) <u>STOP</u> **[Boolean]**

        (1) Tells the DSA to stop and set all analog outputs to zero.

        (2) TRUE = Stop the DSA | FALSE = Nothing

    iii) <u>EXIT PROGRAM</u> **[Boolean]**

        (1) Tells LabVIEW to set all analog outputs to zero and exit the program.

   (2) TRUE = Stop the DSA & execute exit program code | FALSE = Nothing

2. <u>Outputs</u>:

a) Running **[Boolean]**

    i) Signal to show if the DSA is running.

    ii) TRUE = Tells the DSA to keep running (since start is an initialize button) | FALSE = Nothing

b) Stopped **[Boolean]**

    i) Signal to show if the DSA is stopped (Visual counterpart to Running)

    ii) TRUE = Indicates that the DSA has stopped | FALSE = Nothing

c) FINISHED LATE **[Boolean]**

    i) Signal to show if the DSA is running slower than the desired sampling rate.

    ii) TRUE = Indicates the myRIO cannot keep up with the desired sampling rate | FALSE = Nothing

d) Bode Magnitude **[Cluster]**

    i) The magnitude plot of the TF CH1/CH0.

        (1) x = List of Frequencies **[Array of Doubles]**

        (2) y = List of Magnitudes **[Array of Doubles]**

e) Bode Phase **[Cluster]**

    i) The phase plot of the TF CH1/CH0.

        (1) x = List of Frequencies **[Array of Doubles]**

        (2) y = List of Phases **[Array of Doubles]**

C) Example Code

1. Stand-Alone DSA: Example code on how to use the Dropable_DSA.vi inside a timed while loop.
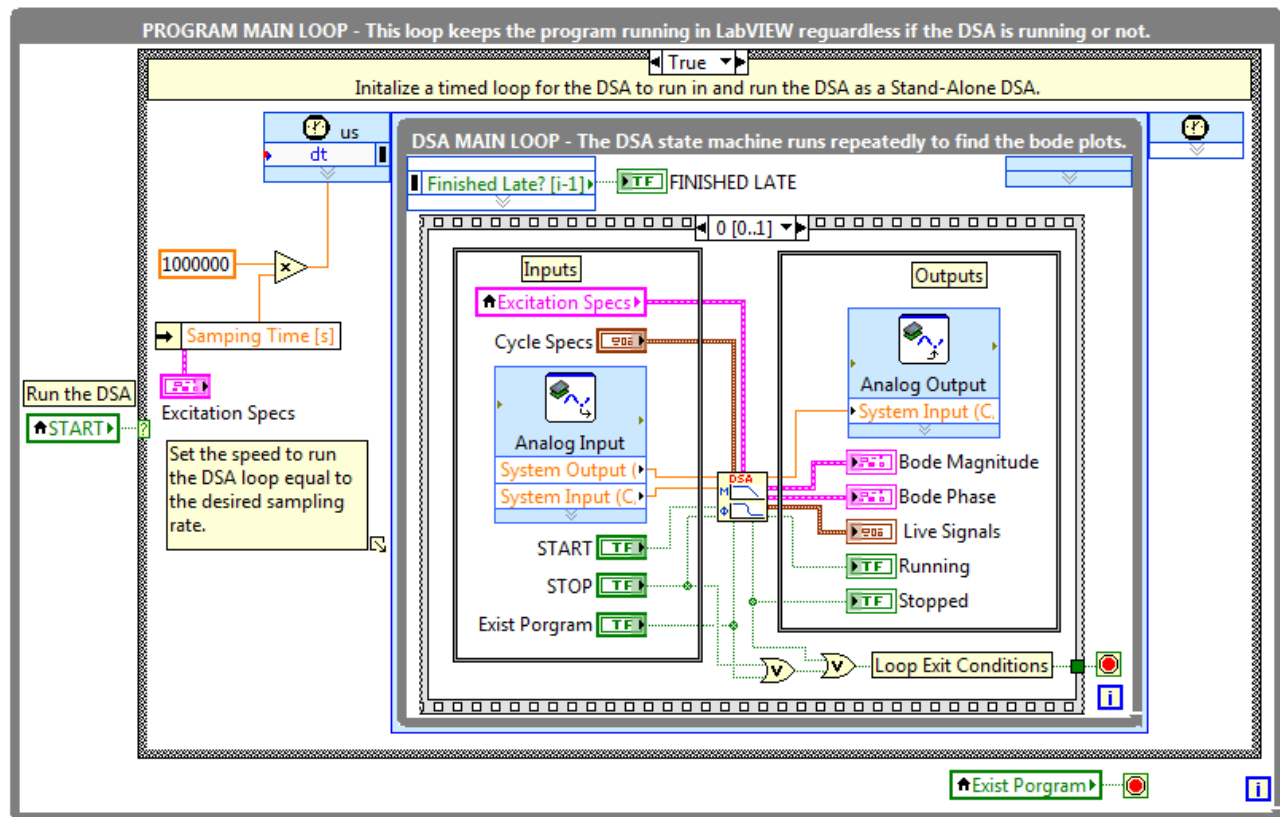
2. Embedded DSA: Example code on how to use the Dropable_DSA.vi with a simulated controller.
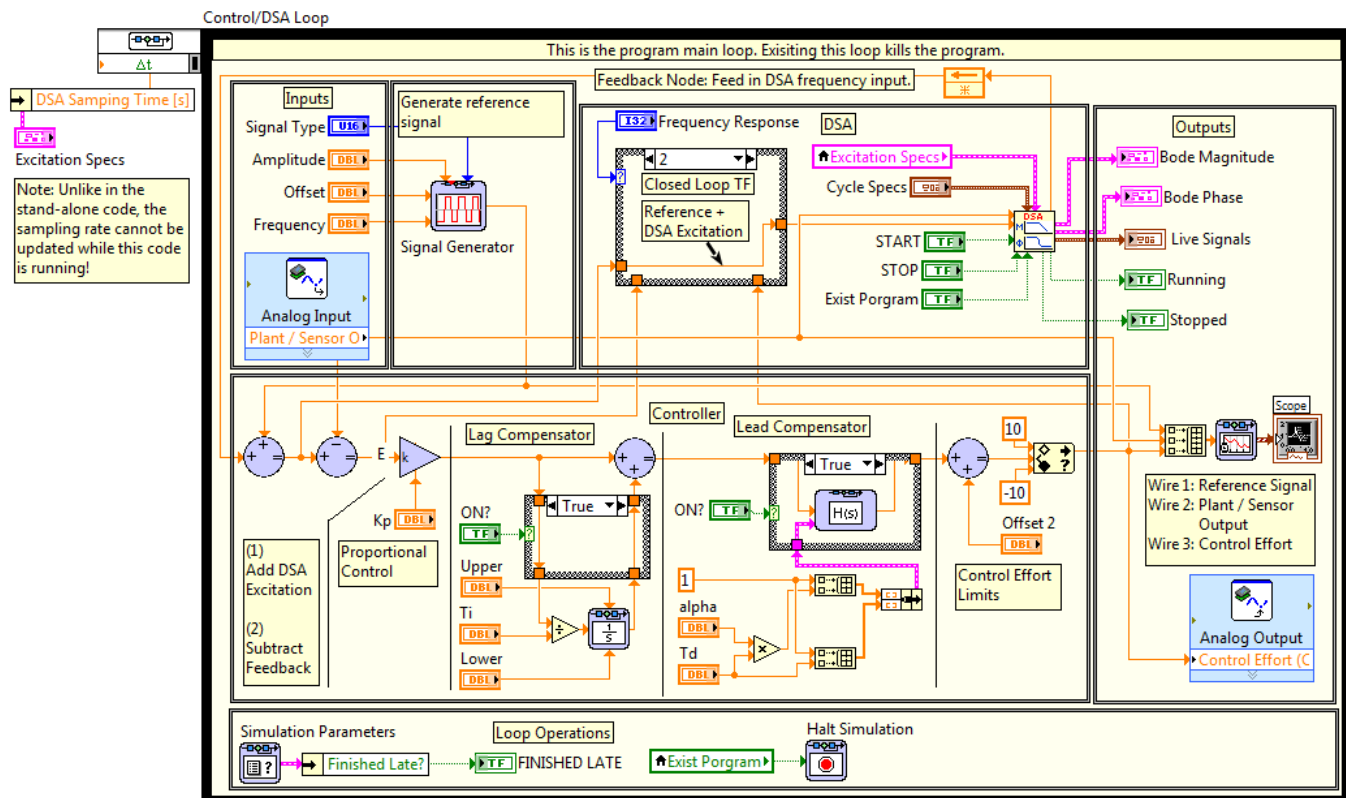
II) Code Internal Structure

    A) For the internal code structure. see the documentation (help) for each subVI.