

Programmed with a simple default script, Root 1 or Root 2 can be used in conjunction with the Monitor 1 hand-held as a simple stand-alone Go / No-go USB device tester. This application note describes in a few easy steps how to configure this test setup and interpret the results.

Monitor 1 Overview

Monitor 1 is a hand-held device which provides two push-button switches and eight LED displays, four red and four green. It is intended to be used as a simple operator interface for Root 1 or Root 2, either stand-alone or in conjunction with control software on a PC or ATE host. Monitor 1 uses the eight data outputs on the Root tester's control connector to drive its eight LED displays. The Root tester's two trigger inputs are driven from Monitor 1's two push-button switches. Monitor may be used by any interactive user application or RootScript, allowing the user to define the functions of the switches and LEDs to meet his needs.

Root 1 GNG Functions

In order to provide a very simple go / no-go test setup using a Root tester and Monitor 1, a special automated test feature is built into firmware, beginning with firmware revision 2.16 of Root 1, and on all revisions of Root 2. The automated test feature consists of two functions, which can be enabled independently, and which are available in the Root tester's Automatic Mode. The first function is a display mechanism which reports various test conditions for an attached USB device by lighting certain LEDs on the Monitor 1. This function is referred to as GNG-Display.

GNG-Display uses the green and red LEDs on the Monitor 1 to indicate certain conditions with regard to a connected device. Upon detecting a device connect on the root port, the Root tester will issue a USB reset on the port, then attempt to enumerate the device. With GNG-Display enabled and a Monitor 1 attached, the Root tester will light LED Green #1 on the Monitor 1 if the device enumeration is successful. If enumeration fails, LED Red #1 will be lit. In the event that enumeration fails, the Root tester will reset the device and retry its attempt at enumeration. This will happen continuously until the device is successfully enumerated or is disconnected. If the first enumeration attempt fails, and one of the subsequent attempts at enumeration is successful, both LED Red #1 and LED Green #1 will be lit.

For devices which are successfully enumerated, and have USB interrupt IN endpoint defined in their default configuration (e.g., a standard mouse or keyboard), the Root tester will poll those interrupt endpoints at the frequency specified in the device descriptors. If any failure is detected (STALL, IGNORE, CRC error, etc.) in communicating with an interrupt endpoint, LED Red #2 on the Monitor 1 is lit.

Finally, the Root tester monitors the current drawn from the root port Vbus power supply by the connected device. If this current exceeds approximately 600mA, the Root tester automatically shuts off Vbus power in order to prevent damage to itself or to the target device. In this event, LED Red #3 on the Monitor 1 is lit.

The second GNG function is an operator control mechanism, which allows the operator to force a USB Reset condition or to power cycle the USB Vbus power using the push-button switches on Monitor 1. This function is referred to as GNG-Control. With GNG-Control enabled, the operator can force a USB Reset by pressing the red button on Monitor 1, and can force a Vbus power cycle by pressing the white button.

AutoRecovery

AutoRecovery is another Root tester feature which is useful when running a Root tester as a stand-alone device. In the event that the Root tester disables Vbus power as the result of an overcurrent condition, as described above, the tester is then left without power on the USB port, leaving it unable to test another device even after the offending device has been disconnected. Enabling AutoRecovery causes the Root tester to continuously attempt to reenforce Vbus power after an overcurrent fault. This attempt will be made approximately once every two seconds. In the event that the fault condition still exists, the overcurrent shutdown will occur again immediately. In the event that the fault condition is removed, power will remain on, and the Root tester will be prepared to test the next device.

The Default Script

Root 1 and Root 2 can be programmed with a default script. This is a RootScript which is downloaded to the Root tester, then burned into Flash. When the default script is enabled, it will execute automatically whenever the Root tester is powered on. The default script can execute a few commands, then exit to automatic mode, or it can run continuously, depending upon the test requirement. For the purpose of this application note, a default script has been created which turns on USB Vbus power, enables the trigger inputs, enables the GNG-Display and GNG-Control features, and enables AutoRecovery. The script then terminates, allowing the Root tester to run in automatic mode with these features enabled. This script, *gonogo.rs*, is available for download from the RPM web site.

Loading the Default Script

The *gonogo.rs* script can be loaded into the Root tester as the default script using TapRoot. Connect the Root 1 or Root 2 to the PC using the communications cable provided, and power it on. Start TapRoot, select the appropriate COM port and click Connect. A series of messages will be displayed in the Status window indicating that TapRoot is connected to the Root tester. If you are using a Root 1, verify that that firmware revision displayed in the Status window on Connect is 2.16 or higher. If it is not, you will need to download the latest revision of Root 1 firmware from the RPM web site before you proceed.

From the Utilities menu, select Flash Management. In the Flash Management window, from the File menu, select Burn New Script. Browse to find the *gonogo.rs* script (downloaded from RPM web site). In the Current Script Name field, enter a name describing the script (e.g., GoNogo), then click Program. When programming is complete, click Enable to enable the default script.

Once the default script is loaded and enabled,

Connecting Root 1 or Root 2 to Monitor 1 for Testing

Connect the black cable from the "Root 1" port on the Monitor 1 to the control port on the Root 1 or Root 2. Connect the Root tester's power supply to the Root tester and plug it in to apply power.

You are now ready to begin testing devices. The graphic on the last page of this app note shows the various displays and controls which will be at your disposal.

Note that you can also connect the PC host communications cable to the Host port of the Monitor 1 if you want to access the Root tester from TapRoot or another interactive application while retaining Monitor 1 activity.

