Generation and Measurement of signals using Function Generator and Programmable Counter

Step-By-Step Application Guide

Products:
- R&S® HMF2550
- R&S® HM8123

The purpose of this document is to allow participant to practice and navigate some of the key features of R&S® HM8123 Programmable Counter and R&S® HMF2550 Function Generator. By completing the exercise, user should learn how to demo some of the key feature of both the equipment and explains some of the concepts and settings. The document is separated into two part, with the first part explaining the main controls of each instrument. The second part of the document contains the lab exercise with the R&S® HMF2550 generating a signal and R&S® HM8123 programmable counter measuring the generated signal.
## History

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<th>Date</th>
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<th>Version</th>
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<tr>
<td>01.06.2016</td>
<td>Heng Wee Boo</td>
<td>first version</td>
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1 Introduction of Operating Elements

R&S® HM8123 Programmable Counter

Front panel of R&S® HM8123

1. POWER (Pushbutton)
2. GATE (LED)
   The GATE LED will be on for the duration of the gate time and synchronization time, i.e. for the duration of one complete measurement.
3. REMOTE (LED and pushbutton)
4. Display (LCD)
5. Display (LCD)
6. ENTER (pushbutton)
7. SELECT (pushbutton)
8. ▲▼◄► pushbuttons
9. Rotating knob
   Knob for entering parameters
10. GATE TIME (pushbutton)
11. LEVEL B (pushbutton)
12. LEVEL A (pushbutton)
13. 1 : 10 pushbutton
   Input attenuator, total attenuation 100 times.
14. DC (pushbutton)
   Selects the coupling of the corresponding channel.
   Button DC lit = DC coupling
   Button DC dark = AC coupling
15. Slope (pushbutton)
16. 1 : 10 pushbutton
   Input attenuator, total attenuation 100 times.
17. 50 Ω (pushbutton)
18. LP 50 kHz (pushbutton)
19. TRIG (LED)
20. INPUT A (BNC connectors)
21. AUTO TRIG (pushbutton)
22. INPUT B (BNC connectors)
23. TRIG (LED)
24. INPUT C (SMA connector)
25. RESET / V (pushbutton)
26. TRIG / GHz/s (pushbutton)
27. HOLD / mV (pushbutton)
R&S® HMF2550 Arbitrary Generator

1. **POWER** - Power switch turns the instrument on/off
2. **Display (TFT)** - All parameters including the current waveform are shown concurrently
3. **Interactive Softkeys** - Direct access of all relevant functions
4. **Numerical keyboard** - Setting of all operating parameters with respective units
5. **SWEEP** - Selection of the parameters for sweep mode
6. **MOD** - Modulation modes
7. **BURST** - Add user defined period to the waveform depending on internal or external trigger signal
8. **MENU** - Open the menu options
9. **Arrow buttons** - Cursor keys for shifting the cursor to the position to be changed, increase/decrease value of the selected parameter
10. **Rotary knob** - Knob to adjust the values / confirm settings by pushing the knob
11. **OUTPUT** - Turn on/off the output
12. **OFFSET** - Add a user defined DC voltage to the signal output
13. **INVERT** - Inverses the pulse signal output
14. **REM/TRIG** - Toggling between front panel and remote operation or force trigger
15. **USB stick port** - USB stick port for storing parameters and load waveforms
16. **Signal functions** - Selection of the signal: sine wave, square wave, triangle, pulse, arbitrary
2  Exercise

Creating a Sine Signal using R&S®HMF2550 Arbitrary Generator. (CW Signal)

Equipment Needed:
1. R&S®HM2550

Instrument Settings:
1. Power on the R&S®HM2550
2. Select the signal to be a Sine signal by pressing on the Panel keys
3. Configure the signal parameters as shown in screen shot below

![Screen Shot of Signal Parameters]

- Frequency: 10.000 000 0 MHz
- Amplitude: 1.000 V
- Offset: 0.000 V
Measuring the given signal using R&S®HMF2550 Programmable Counter

Equipment Needed:
- R&S®HM8123 Programmable Counter
- 2x BNC – BNC RF Cables

Instrument Settings:
1. Power on the R&S®HM8123 Programmable Counter
2. Connect the signal output of R&S®HMF2550 to Input A of R&S®HM8123
3. Click on the OUTPUT key of R&S®HM2550
4. Press Reset on R&S®HM8123

Question 1
What is the measured frequency of the signal? Is it at 10 MHz? If not, why?

Question 2
What is the measured frequency of the signal now? Can you explain the reason why change in measured values.

Question 3
Connect 10 MHz Reference Out (R&S®HMF2550) to 10 MHz Reference In (R&S®HM8123)
6. Press SELECT (Menu) -> Select Reference->Reference->External (Using arrows and ENTER (menu))

Question 4
Please feel free to try changing the Frequency output of R&S®HMF2550 and observe the measurement result on R&S®HM8123
8. Explore on other features of both R&S®HMF2550 and R&S®HM8123
Summary

This short exercise shows how two instruments can be used to demonstrate the functionality of both instruments. It also illustrates the importance of setting references between the source and measuring instruments to improve the measurement result.
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