

ARB waveform generation function

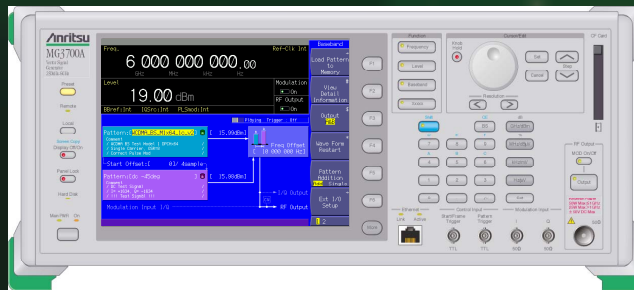
MG3700A
Vector Signal Generator

The standard ARB waveform generation function incorporated --- MATLAB + Simlink ---

Anritsu Corporation

MG3700A

Vector Signal Generator



Dec 2007
Ver 2.00

Why is the ARB waveform generator necessary?

In general evaluation by a signal complying with standards, it is easier to output a signal from a specialized signal generator only by selecting a waveform pattern. The MG3700A Vector Signal Generator incorporates the standard* waveform patterns complying with the existing major communication systems.

*W-CDMA, GSM/EDGE, CDMA2000 1X/1xEV-DO, PDC, PHS, WLAN, AWGN

Of course, however, there is no signal generator that supports the waveform patterns complying with new communication systems whose specifications are under development. Even if the specifications have been formulated, the performance evaluation beyond standards is implemented in the R&D of relatively new communication systems, requiring special waveform patterns as follows.

- Patterns of parameters that do not exist in the specifications
- Patterns of superimposed noise

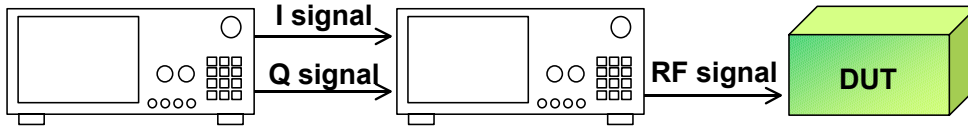
While most of the specialized signal generators cannot generate such waveform patterns, the ARB waveform generator shows its ability by generating waveforms freely.

The MG3700A is an ARB waveform based vector signal generator. **With the standard built-in ARB waveform generation function, a single set of MG3700A can play a role of an ARB waveform generator + a digital signal generator.**

Basic config. by the ARB waveform generator 1/2

◆ Normal configuration

IQ base-band generator, ARB waveform generator, etc. Vector synthesizer, Digital signal generator, etc.



[Current issues]

1. Two sets of signal generators are required.

In order to output the RF signal, an ARB waveform generator needs to output IQ signals. Then, the signals are inputted in a digital signal generator.

2. Troublesome delay adjustment is required.

There is a delay in the I signal and Q signal of an ARB waveform generator. The modulation accuracy deteriorates unless the delay is adjusted.

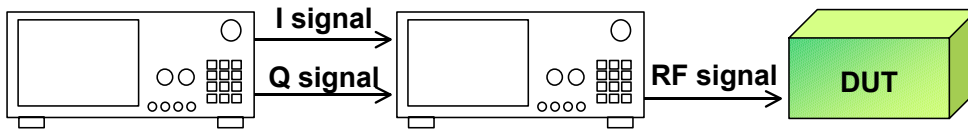
3. External IQ is more susceptible to noise than Internal IQ.

When the External IQ is used, I signal and Q signal are connected by a coaxial cable as in the diagram above, having influence of noise on modulation accuracy.

Basic config. by the ARB waveform generator 2/2

◆ Normal configuration

IQ base-band generator, ARB Waveform generator, etc. Vector synthesizer, Digital signal generator, etc.

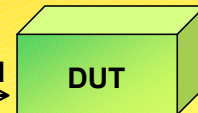


◆ Configuration by MG3700A

MG3700A Vector Signal Generator



RF signal



Merits:

- **Only a single set of SG is required!**
- **No need of IQ delay adjustment!**
- **Internal IQ with good freq. characteristic covers up to 120MHz RF mod. band!**

What is the ARB waveform generation function?

The MG3700A is an ARB waveform based signal generator and **it can generate a variety of waveform patterns from a customer's IQ data, enabling a customer to use them freely.**

The IQ data is generated with a customer's own EDA* tool (e.g. C Language, MATLAB, Microwave Office).

*EDA: Electronic Design Automation

[Procedures]

- EDA tool generates the IQ data(ASCII format).
- IQproducer converts the IQ data into the waveform pattern for MG3700A.
- MG3700A outputs the waveform pattern.

Waveform patterns generated by an EDA tool [can be copied to multiple sets of SG without license]. Therefore, an waveform pattern determined in the R&D phase can be used as a fixed pattern for inspection use in a production line.

◆ Generation of waveform patterns by an EDA tool (e.g. C Language, MATLAB, Microwave Office)

=> License free

◆ Generation of waveform patterns by MX37010xA

=> The mainframe requires a license.

The software runs on a PC without a license and a user can try generating waveform patterns. However, an unlicensed 'mainframe' cannot output signals because it does not recognize waveform patterns.

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ASCII formats that can be converted by MG3700A

The followings are descriptions of each format (ASCII1, ASCII2, ASCII3) that can be entered in Convert.

■ ASCII 1

The ASCII 1 format is composed of a file of waveform patterns before conversion. One line indicates one piece of data. The data is separated by commas in the order of I-phase data, Q-phase data, Marker 1, Marker 2, Marker 3 and RF Gate. "0" or "1" must be specified for Marker 1~3 and RF Gate. Marker 1~3 and RF Gate can be omitted. In this case, however, Marker1~3 is regarded as "0" (LO level), and RF Gate (RF output On) as "1". Also, a line that does not begin with numbers, "+" and "-" is disregarded as a comment line. I-phase data and Q-phase data is decimally described or described with exponents using an "e" or "E", such as "2.0E+3".

// IQ Data

Comment Line

- 0.214178, - 0.984242

- 0.187286, - 1.245890

- 0.073896, - 1.368888

0.091758, - 1.316199

- 0.073896, - 1.368888, 1 # Marker1=1

0.091758, - 1.316199, 0, 1 # Marker2=1

0.248275, - 1.089333, 0, 0, 1 # Marker3=1

0.331432, - 0.729580, 0, 0, 0 # RF output=Off

0.331432, - 0.729580, 0, 0, 1 # Marker1=0, RF output=On

■ ASCII 2

The ASCII 2 format is composed of two files of I-phase data and Q-phase data excluding a Marker data file from ASCII 3. While this format is used, Marker 1~3=0 and RF Gate=1 are specified. Also, Marker output is all "0" and pulse modulation is not used. Therefore, RF output is On in all sample waveform patterns. I-phase data and Q-phase data is decimally described or described with exponents using an "e" or "E", such as "2.0E+3".

■ ASCII 3

The ASCII 3 format is composed of three files of waveform patterns before conversion. I-phase data, Q-phase data and "Marker 1~3 & RF Gate" is divided into three separate files. Marker 1~3 and RF Gate can specify "0" and "1" only. Marker 1~3 and RF Gate can be omitted. In this case, however, Marker1~3 is regarded as "0", and RF Gate as "1". Also, I-phase data, Q-phase data and Marker 1~3 & RF Gate data is combined among the same line numbers in each file where line feeds are inserted by <cr> <lf>. If a comment line is added to the head of any file, the number of lines in the other files must be conformed accordingly by adding a comment line or <cr> <lf> to the head of the file. An error occurs unless the number of lines is conformed between I-phase data and Q-phase data. Even if Marker 1~3 & RF Gate data exists in a line that does not include I-phase data and Q-phase data, the line is regarded as having no data. A data line of the other file, allocated to a line corresponding to the comment line of one file, is disregarded. Also, a line that does not begin with numbers, "+" and "-" is disregarded as a comment line. I-phase data and Q-phase data is decimally described or described with exponents using an "e" or "E", such as "2.0E+3".

File 1 (I-phase data)

// I Data

Comment Line

- 0.214178

- 0.187286

- 0.073896

0.091758

0.248275

0.331432

...

File 2 (Q-phase data)

// Q Data # The

number of lines must

be conformed

accordingly because

two comment lines are

added in I-phase data.

<cr><lf>

- 0.984242

- 1.245890

- 1.368888

- 1.316199

- 1.089333

- 0.729580

File 3 (Marker data)

<cr><lf>

<cr><lf>

<cr><lf> # Marker1~3=0

and RF Gate=1 are

specified for the 3rd and 4th

lines.

<cr><lf>

1 # Corresponds to the 5th

line data of I-phase and Q-

phase data.

0.1

0.0,1

1.0,0,1

...

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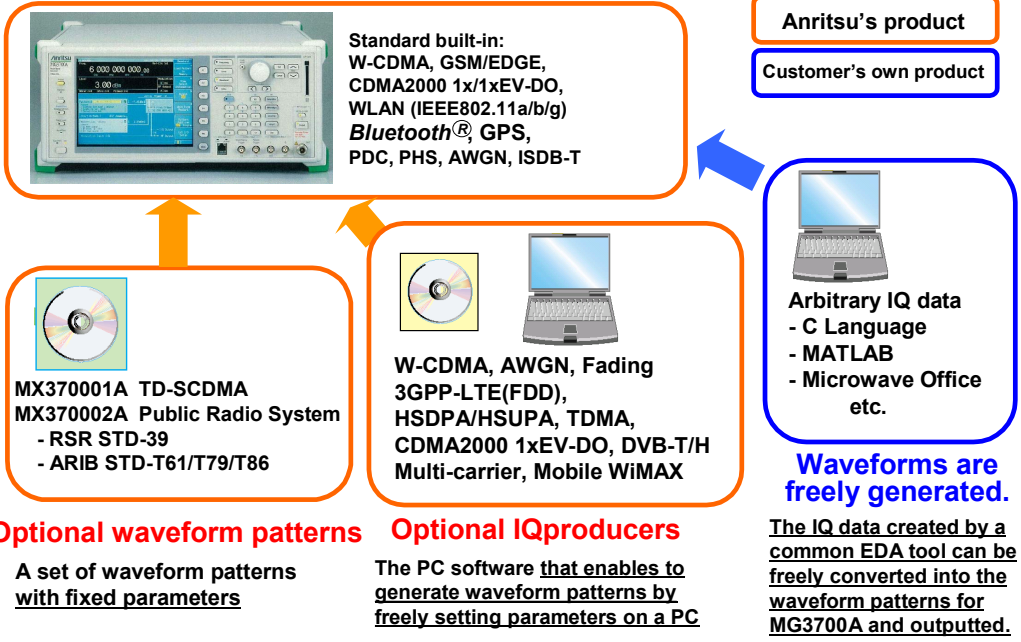
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MG3700A software lineup

Standard waveform patterns

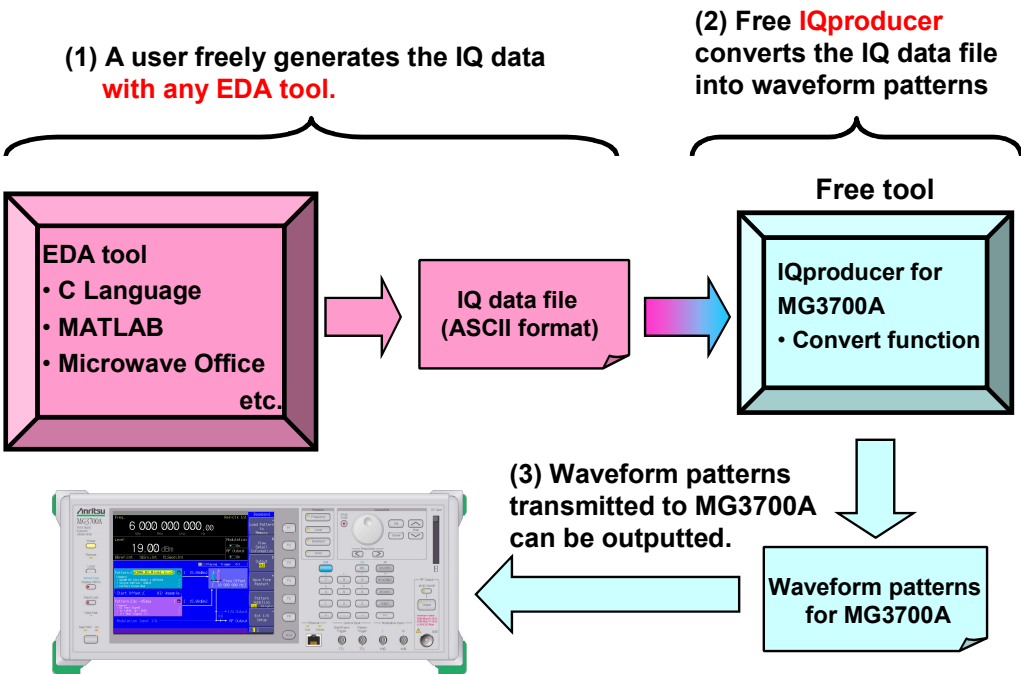


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Free waveform generation: EDA tool



*EDA: Electronic Design Automation

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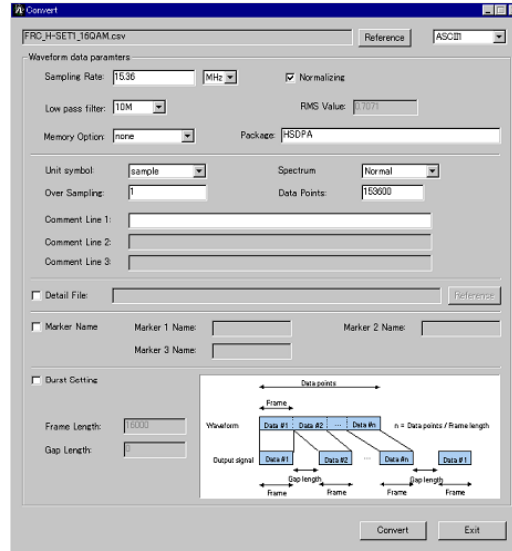
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Free waveform generation: EDA tool

File generation function of IQproducer: File Gen.>Convert

The IQ sample data files in ASCII format programmed by general signal generation software (such as MATLAB) can also be converted to waveform patterns for MG3700A. This enhances the convenience of MG3700A for research/development simulation use, since custom-made waveform pattern files can be freely generated.



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