Vector Signal Generator
MG3710A
## Vector Signal Generator MG3710A Features

### Key Performance and Functions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency range:</strong></td>
<td>[Option]</td>
</tr>
<tr>
<td>100 kHz to 2.7/4.0/6.0 GHz</td>
<td></td>
</tr>
<tr>
<td><strong>Wide vector modulation bandwidth</strong></td>
<td>160 MHz* /120 MHz (Internal baseband generator)</td>
</tr>
<tr>
<td><strong>Sampling Rate</strong></td>
<td>20 kHz to 200 MHz* /160 MHz</td>
</tr>
<tr>
<td><strong>SSB Phase noise</strong></td>
<td>$&lt;$ −140 dBc/Hz nominal (100 MHz, 20-kHz offset, CW)$&lt;$ −131 dBc/Hz typ. (1 GHz, 20-kHz offset)</td>
</tr>
<tr>
<td><strong>ACLR performance</strong></td>
<td>−71 dBc (W-CDMA, TestModel1, 64DPCH, 2 GHz)</td>
</tr>
<tr>
<td><strong>High power output</strong></td>
<td>[Opt-041/071] +23 dBm (CW, 400 MHz to 3 GHz)</td>
</tr>
<tr>
<td><strong>Fast switching speed</strong></td>
<td>$&lt;$ 600 µs (List/Sweep Mode)</td>
</tr>
<tr>
<td><strong>High level accuracy</strong></td>
<td>$±0.5$ dB (Absolute level accuracy)</td>
</tr>
<tr>
<td></td>
<td>$±0.2$ dB typ. (Linearity)</td>
</tr>
<tr>
<td><strong>Multi RF output</strong></td>
<td>[option]</td>
</tr>
<tr>
<td>Two RF outputs @ RF x 2</td>
<td></td>
</tr>
<tr>
<td>Baseband signal combine function @ RF x 1</td>
<td></td>
</tr>
<tr>
<td><strong>Large-capacity baseband memory</strong></td>
<td>[option]</td>
</tr>
<tr>
<td>64/256/1024 Msamples</td>
<td></td>
</tr>
<tr>
<td><strong>BER test function</strong></td>
<td>[Opt-021]</td>
</tr>
<tr>
<td>Input Bit Rate: 100 bps to 40 Mbps</td>
<td></td>
</tr>
</tbody>
</table>

### Supports Various Communication Systems

**Pre-installed Waveform Patterns:**
- LTE-FDD/TDD (E-TM1.1 to E-TM3.3),
- W-CDMA/HSDPA, GSM/EDGE, PDC, PHS,
- CDMA2000 1x/1xEV-DO, AWGN,
- WLAN (IEEE802.11a/11b/11g), Mobile WiMAX,
- Bluetooth®, GPS,
- Digital Broadcast (ISDB-T/BS/CS/CATV)

**Waveform Patterns** [Software & license optional]
- DFS Radar Pattern [for TELEC/FCC]
- DFS(ETSI) Waveform Pattern
- ISDB-Tmm/ISDB-Tsb Waveform Pattern

**IQproducer** [Software license optional]

**Waveform generation software**
- 3GPP LTE/LTE-Advanced (FDD),
- 3GPP LTE/LTE-Advanced (TDD),
- HSDPA/HSUPA, W-CDMA, TD-SCDMA,
- WLAN 11ac/a/b/g/n/j/p, Mobile WiMAX,
- TDMA (PDC, PHS, ARIB, etc.)
- CDMA2000 1xEV-DO, DVB-T/H,
- Multi-carrier, Fading

**AWGN generator** [Opt-049/079]

**AM/FM/φM/PM Functions** [Standard]

**Additional analog modulation input option** (Opt-050/080)
- Supports modulation by external signal input.

*: Supports firmware version 2.00.00 and later.
Only when using MX370111A WLAN IQproducer and MX370111A-002 802.11ac (160 MHz) option.
Supports Various Communication Systems

Pre-installed waveform patterns

- LTE-FDD/TDD (E-TM1.1 to 3.3)
- W-CDMA, GSM/EDGE,
- CDMA2000 1x/1xEV-DO
- WLAN (IEEE802.11a/b/g)
- Mobile WiMAX, AWGN,
  Bluetooth®, GPS, PDC, PHS,
  Digital Broadcast (ISDB-T/BS/CS/CATV)

Anritsu product

Customer's item

Any IQ data
- C language
- MATLAB
- Microwave Office etc.

The waveform patterns are arbitrarily generated.

Waveform Pattern [option]

- DFS Radar Pattern (for TELEC, FCC)
- DFS (ETSI) Waveform Pattern
- ISDB-Tmm/ISDB-Tsb Waveform Pattern

Waveform patterns with fixed parameters

IQproducer [Option]

PC application software to generate waveform patterns by setting parameters at PC

IQ sample data files (in ASCII format) programmed by using general EDA (Electronic Design Automation) tools such as MATLAB® can also be converted to waveform patterns for MG3710A. And a custom-made waveform pattern file can be generated arbitrarily.
Basic Performance (1/5)

**Frequency Range [Option]**
100 kHz to 2.7/4.0/6.0 GHz
[1stRF: Opt-032/034/036]
[2ndRF: Opt-062/064/066]
The MG3710A supports two built-in vector signal generators with two RF units (1stRF and optional 2ndRF).

Not only different frequencies but also different levels and waveform patterns can be set independently at each SG while each is tracking the other.
1: Supported frequency bands cannot be changed after shipment.
2: IQ input/output is supported only by SG1 (1stRF) and requires Opt-017.

**Wide Vector Modulation Bandwidth:**
160 MHz*/120 MHz
(using internal baseband signal generator)

**Sampling Rate:** 20 kHz to 200 MHz*/160 MHz
An RF modulation bandwidth of 160 MHz is supported using internal baseband signal generation.

*: Supports firmware version 2.00.00 and later.
Only when using MX370111A WLAN IQproducer and MX370111A-002 802.11ac (160 MHz) option.

**Level Accuracy:**
Absolute level accuracy: ±0.5 dB
Linearity: ±0.2 dB typ.

**SSB Phase Noise**
<-140 dBc/Hz nominal (100 MHz, 20 kHz offset, CW)
<-131 dBc/Hz typ. (1 GHz, 20 kHz offset, CW)
<-125 dBc/Hz typ. (2 GHz, 20 kHz offset, CW)
Basic Performance (2/5)

RF Vector Modulation Bandwidth: Performance Graph

Vector Modulation Bandwidth (Using Internal baseband generator)

I/Q bandwidth plot using optional internal baseband generator
(Internal Channel Corrections ON)

I/Q bandwidth plot using optional internal baseband generator
Basic Performance (3/5)

Level Accuracy: Performance Graph

Frequency Characteristics

Level accuracy at -112 dBm

Linearity

Relative level accuracy at 850 MHz initial power +10 dBm

- Mean
- Upper std dev (1 sigma)
- Lower std dev (1 sigma)
SSB phase noise is an important performance index for signal generators. For example, when using a signal generator for the following purposes, it is important to pre-confirm that the signal generator performance satisfies the measurement specifications.

- Communications with narrow bandwidth of several kHz
- OFDM Signals with narrow subcarrier gap
- CW interference waveforms

**Frequency: 60/150/260/400 MHz**
(Mod = On, with Opt-002, Phase Noise Optimization < 200 kHz)

**Frequency: 850 MHz, 1/1.9/2.2/3.5/5.8 GHz**
(Mod = On, with Opt-002, Phase Noise Optimization < 200 kHz)
Basic Performance (5/5)

SSB Phase Noise: Impact on Adjacent Channel Leakage Power

[Example of Measurement: ACLR for Narrow band system]
(Example) Frequency: 400 MHz, Channel Spacing: 6.25 kHz, Channel BW: 4.8 kHz

Conventional Anritsu model (MG3700A)

L1: -71.1 dBc  U1: -71.4 dBc

MG3710A

L1: -77.7 dBc  U1: -79.0 dBc

Example: Performance not warranted. Data actually measured by randomly selected measuring instruments.
Top-class ACLR performance supports measurement closer to the DUT original ACLR performance. High ACLR performance increases margin specifications and improves measurement stability and yield.

**Top-class ACLR**

-71 dBc*

Conventional Anritsu model (MG3700A)

-63 dBc typ.

**MG37xxA**

-71 dBc*

*: At W-CDMA, TestModel1, 64DPCH, 2 GHz
Evaluation of base station amplifiers, etc., requires excellent adjacent channel leakage power (ACLR) performance. Normally, the signal from the vector signal generator is inserted to an amplifier, and the amplifier output signal ACLR characteristics, etc., are measured with a spectrum analyzer. Instruments for these measurements require high ACLR performance.

**Measurement Example: ACLR**

<table>
<thead>
<tr>
<th>W-CDMA 1 carrier</th>
<th>W-CDMA 4 carrier</th>
<th>LTE-FDD 1 carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Test Model 1 64DPCH)</td>
<td>(Test Model 1 64DPCH x 4 carrier)</td>
<td>(E-TM1.1 BW = 20 MHz)</td>
</tr>
<tr>
<td>Vector Signal Generator MG3710A</td>
<td>Signal Analyzer MS269xA</td>
<td></td>
</tr>
<tr>
<td>U1: –73.3 dBC</td>
<td>U1: –66.4 dBC</td>
<td>U1: –66.7 dBC</td>
</tr>
</tbody>
</table>

Example: Performance not warranted. Data actually measured by randomly selected measuring instruments.
In conventional measurement systems, path loss is increased by the various external equipment. An external amp is required when the output of the general signal source is insufficient. The MG3710A High Power Extension option supports signals required for measuring path loss. It eliminates the cost of an external amp, supports stable level accuracy measurements and reduces risk of damage to the DUT from the external amp.
High Power Output (2/2)

**High-Power Extension Option**

**High Power Extension for 1stRF [Opt-041]**
**High Power Extension for 2ndRF [Opt-071]**

These options expand the MG3710A RF output upper limit.

Generally, an external amplifier is used when managing path losses occurring in measurement systems as well as when the signal generator has inadequate output power, such as when inputting high-level modulation signals for evaluating amp distortion. In these cases, not only must the external amp output accuracy be assured, but it must also be checked with a power meter each time the frequency and level change. Moreover, sometimes operating mistakes when using an external amp can damage the device under test (DUT). The MG3710A High Power Extension options output the signal level required by the DUT without requiring compensation for path losses. In addition, the assured accuracy range supports stable measurements. And finally, there is no risk of unexpected damage to the DUT even when used at the output setting limit.

### Assured level accuracy at high levels (CW)

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Standard</th>
<th>Opt-041/071</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kHz ≤ f &lt; 10 MHz</td>
<td>+5 dBm</td>
<td>+5 dBm</td>
</tr>
<tr>
<td>10 MHz ≤ f &lt; 50 MHz</td>
<td>+10 dBm</td>
<td>+10 dBm</td>
</tr>
<tr>
<td>50 MHz ≤ f &lt; 400 MHz</td>
<td>+13 dBm</td>
<td>+20 dBm</td>
</tr>
<tr>
<td>400 MHz ≤ f ≤ 3 GHz</td>
<td>+13 dBm</td>
<td>+23 dBm</td>
</tr>
<tr>
<td>3 GHz &lt; f ≤ 4 GHz</td>
<td>+20 dBm</td>
<td>+20 dBm</td>
</tr>
<tr>
<td>4 GHz &lt; f ≤ 5 GHz</td>
<td>+13 dBm</td>
<td>+13 dBm</td>
</tr>
<tr>
<td>5 GHz &lt; f ≤ 6 GHz</td>
<td>+11 dBm</td>
<td>+11 dBm</td>
</tr>
</tbody>
</table>
Low-Power Output
Reverse Input Power Protection

**Low-Power Extension**

Low Power Extension for 1stRF [Opt-042]
Low Power Extension for 2ndRF [Opt-072]

This option expands the MG3710A RF output lower limit.

The lower limit of the standard level setting range –110 dBm.

Adding this option expands the limit to –144 dBm.

Refer to the appended data sheet for the level accuracy.

**Reverse Input Power Protection**

Reverse Power Protection for 1stRF [Opt-043]
Reverse Power Protection for 2ndRF [Opt-073]

This option protects the 1stRF and 2ndRF signal output connector from reverse input power.

**Maximum Reverse Input Power:**

- **DC:** ±50 Vdc max.
- **AC:** 20 W nom. (1 MHz < f ≤ 2 GHz)
  10 W nom. (2 GHz < f ≤ 6 GHz)

Installing Opt-043/073 does not provide 100% assured protection against damage from reverse input power, so take care not to impress reverse input power whenever possible.

Installing Opt-043/073 lowers ACLR performance. Refer to the appended data sheet for details.

**Level Setting Range**

<table>
<thead>
<tr>
<th>Option</th>
<th>Setting Range [dBm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>without Opt-043/073</td>
</tr>
<tr>
<td>Standard</td>
<td>–110 to +17</td>
</tr>
<tr>
<td>With Opt-041/071</td>
<td>–110 to +30</td>
</tr>
<tr>
<td>With Opt-042/072</td>
<td>–144 to +17</td>
</tr>
<tr>
<td>With Opt-041/071 &amp; Opt-042/072</td>
<td>–144 to +30</td>
</tr>
</tbody>
</table>
Choice of Reference Oscillators

Pre-installed Reference Oscillator
Aging Rate $\pm 1 \times 10^{-7}/\text{day}, \pm 1 \times 10^{-6}/\text{year}$
Temperature stability $\pm 2.5 \times 10^{-6} (5^\circ \text{ to } 45^\circ \text{C})$

High Stability Reference Oscillator [Opt-002]
Aging Rate $\pm 1 \times 10^{-8}/\text{day}, \pm 1 \times 10^{-7}/\text{year}$
Temperature stability $\pm 2 \times 10^{-8} (5^\circ \text{ to } 45^\circ \text{C})$
Start-up characteristics* $\pm 5 \times 10^{-7} (2 \text{ minutes after power on})$
$\pm 5 \times 10^{-8} (5 \text{ minutes after power on})$

Rubidium Reference Oscillator [Opt-001]
Aging Rate $\pm 1 \times 10^{-10}/\text{month}$
Temperature stability $\pm 2 \times 10^{-9} (5^\circ \text{ to } 45^\circ \text{C})$
Start-up characteristics* $\pm 1 \times 10^{-9} (7.5 \text{ minutes after power on})$

*Compared to frequency after 24-h warm-up, at 23°C

Three reference oscillator options are supported. Select the High-Stability Reference Oscillator option [Opt-002] when requiring high accuracy, depending on the measurement conditions; for even higher accuracy, select the Rubidium Reference Oscillator option [Opt-001]. However, if external high-accuracy reference signals are available, selecting the standard reference oscillator option helps reduce unnecessary costs.
High-Speed Switching (1/2)

Fast switching speed
Frequency & Amplitude
<600 µs

Switching target: Frequency, amplitude, waveform data
Switching timing: External trigger, dwell time, remote command, panel operation

The MG3710A supports high-speed switching in the sweep/list mode separately from normal remote control. It is ideal for production lines requiring short test times.
High-Speed Switching (2/2)

**Sweep/List mode**

**Sweep mode**
In this mode, the dwell time per point or number of points is split between the frequency range and level range (Start/Stop). This mode is used when matching dwell time per point and frequency/level steps.

**List mode**
In this mode, the frequency, level and dwell time can be set for each of up to 500 points. This mode is used when wanting to set any dwell time, and frequency/level step per point.

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**Frequency Range**
- 2 to 1000 (Sawtooth)
- 2 to 500 (Triangle)

**Level Range**
- Points: 2 to 1000 (Sawtooth)
- 2 to 500 (Triangle)

**Dwell Time**
- 100 µs to 16 s

**Step Shape Type**
- SawTooth
- Triangle

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**Example:**
- Points: 10; Dwell Time: 500 µs
- Points: 5; Dwell Time: Random
The MG3710A supports two separate built-in RF outputs (option). The frequency can be selected from 2.7/4.0/6.0 GHz. The two RF outputs can be set to different frequencies, levels and waveform data/CW. As a result, there is no need for two expensive vector signal generators.
One Unit Supports Two Separate RF Outputs

The MG3710A supports two separate built-in RF outputs (option). Each can output a different frequency, level, and waveform data/CW and is ideal for Rx tests using two frequency offset signals that cannot be set using the baseband combine function.

Example: LTE + WLAN, LTE + Bluetooth, ISDB-T + WLAN, etc.

Multi-system Rx characteristics tests

Wanted signal

Interference signal

DUT

Receiver Test

RF2

Isolator

RF1

Isolator

Example: LTE + WLAN, LTE + Bluetooth, ISDB-T + WLAN, etc.

One unit supports Two RF outputs
Wanted signal + Interference signal

Cuts costs
One Unit Supports Two Separate RF Outputs (3/3)

This is convenient in the R&D phase for evaluating interference between two different systems using different frequency bands.

For example, considering WLAN 11b/g as the wanted signal, LTE-FDD, LTE-TDD, W-CDMA, GSM, etc., mobile signals are interference waveforms. Usually, this requires hardware and software costs for a second separate signal generator to create these interference signals. However, selecting one MG3710A model with different frequencies for the 1stRF and 2ndRF outputs supports efficient interference waveform testing using WLAN+LTE-FDD, ISDB-T+W-CDMA signals under realistic service conditions at greatly reduced total costs.

1: Supported frequency bands cannot be changed after shipment.

2: IQ input/output is supported only by SG1 (1stRF) and requires Opt-017.
Local Signal I/O as MIMO Signal Source

Phase adjustment and local signal synchronization

Universal Input/Output [Opt-017]

This option installs connectors for the following I/O signals on the main-frame rear panel, supporting local frequency sync for MIMO applications.

- Baseband Reference Clock Input/Output
- Sweep Output (only supports SG1)
- Local Signal Input/Output

* Bundled with J1539A AUX Conversion Adapter for Opt-017/117 to use rear-panel AUX connector.

The Sync Multi SG function shares local signals, baseband clocks and trigger signals between multiple MG3710A units to output phase coherency signals with synchronized signal output timing. An 8x8 MIMO test system can be configured from one Master and three Slave MG3710A units.

- Synchronization mode: Master, Slave, SG1 & 2
- No. of Slaves: 1 to 3
- Slave position: 1 to 3
- Local synchronization: On/Off
- IQ phase adjustment: −360 to +360 deg, resolution 0.01 deg
- IQ output delay: −400 to 400 ns, resolution 1 ps

Refer to the Application Note for details. [Adjusting MIMO Phase Coherence using Vector Signal Generator]
The MG3710A has two waveform memories for each RF output for setting and outputting different waveform data. One RF outputs the combined wanted + interference signals for the baseband bandwidth.
Combination of Baseband Signal Function

The Combination of Baseband Signal option installs two waveform memories for either the 1stRF (or 2ndRF) SG to combine two waveform patterns as the baseband for output, eliminating the need for two separate and expensive vector signal generators.

**Level Setting**
- Setting Range: -80 to +80 dB
- Resolution: 0.01 dB

**Frequency Offset Setting**
- Setting Range: -80 MHz to +80 MHz
- Resolution: 1 Hz

**CW Selection**
- A: Pattern A center
- B: Pattern B center
- Baseband DC: Centered at baseband DC position

**Time offset Setting Range**
- Setting Range: 0 ~ pattern B sampling data count – 1

**Combination of Baseband Signal Example**
One RF Outputs Wanted + Interference Signals (3/6)

[Combination of Baseband Signal Function Example]

Wanted Signal + Modulated Interference Signal

Parameters:
- Frequency offset: 5 MHz
- Level offset: –63 dB
- Center carrier: Wanted signal = Memory A

MG3710A Settings for Wanted Signal + Modulated Interference Signal

MG3710A Settings for Wanted Signal + Modulated Interference Signal (Spectrum)
One RF Outputs Wanted + Interference Signals (4/6)

[Combination of Baseband Signal Function Example]

**Wanted Signal**
+ Delayed Signal

Parameters:
- Frequency offset: 0 Hz
- Level offset: 15 dB
- Time offset (Delay): 30 µs

**MG3710A Settings for Wanted Signal + Delayed Signal**

- **Frequency offset**: 0 Hz
- **Level offset**: 15 dB
- **Time offset (Delay)**: 30 µs

![Image of MG3710A settings](image)

**Delay Time**

- **30 us**
- **-15 dB**

![Graph showing wanted signal + delayed signal with delay profile](image)
The conventional MG3700A only supports combination of two waveform patterns at the same sampling rate in memory A and memory B. The sampling rate of the two waveform patterns must be matched in advance using Multi-Carrier IQproducer (MX370104A).

Combining two signals with the MG3710A rate matching function performs combination by matching the sampling rates and data point counts automatically, eliminating a great deal of time and effort matching the waveform pattern sampling rates before waveform combination.
One RF Outputs Wanted + Interference Signals (6/6)

[Rate Matching Function]

[Baseband Signal Combine Function Example]

Example:
- Bluetooth DH1: Sampling Rate 12 MHz
- WLAN 11a 54 Mbps: Sampling Rate 40 MHz

Yellow: MG3710A
Blue: Anritsu conventional model (MG3700A)

Note: With the conventional MG3700A, the sampling rates are pre-matched using the Adjust Rate function of Multi-Carrier IQproducer.
One RF Outputs Wanted + AWGN Signals (1/2)

AWGN Generator

AWGN for 1stRF [Opt-049]
AWGN for 2ndRF [Opt-079]

This option adds internally generated AWGN to wanted signals. The On/Off button switches the AWGN output.

When there is no carrier, only AWGN is output (ARB = Off).

Select AWGN On/Off

Noise Bandwidth
AWGN Flat Bandwidth part

Carrier Level

Noise (AWGN) Level
(Enabled when no wanted signal)

Carrier/Noise Ratio
Setting Range: –40 to +40 dB
Resolution: 0.01 dB

C/N Set Signal
Sets change target when setting C/N Ratio
Carrier: Changes carrier (fixed AWGN)
Noise: Changes AWGN (fixed carrier)
Constant: Fixes output level and change carrier and AWGN

Example of AWGN Generator
One RF Outputs Wanted + AWGN Signals (2/2)

Example: Wanted Signal + AWGN

Example: AWGN only

When adding AWGN to the wanted signal, Noise Level on the screen displays the noise level in the wanted signal band.

When outputting only AWGN, Noise Level on the screen displays the set noise bandwidth level. In the above setting example, it is the power in the 7.68 MHz band.
Large Memory Cuts Measurement Times (1/2)

Example: Testing with many waveforms with different bandwidths and parameters
Testing with waveforms for many systems with multi-system terminals

With large waveform memory
1. Switch loaded waveform data instantaneously
2. Load multiple test waveforms → Reduce number of reloads → Cuts time

Reduce reload ▶️ Cuts test time

The MG3710A can save up to 1024 Msa (4 GB) per one RF output. Memory size is one of the most important specifications for an arbitrary waveform signal generator. Large memory can load multiple waveform data, cutting reload and measurement times.
Large Memory Cuts Measurement Times (2/2)

ARB Memory Upgrade

64 Msample for 1stRF [with 1stRF]
ARB Memory Upgrade 256 Msample for 1stRF [Opt-045]
ARB Memory Upgrade 1024 Msample for 1stRF [Opt-046]
64M sample for 2ndRF [with 2ndRF]
ARB Memory Upgrade 256 Msample for 2ndRF [Opt-075]
ARB Memory Upgrade 1024 Msample for 2ndRF [Opt-076]

Memory size is the most important specification for arbitrary waveform memory. If the memory is small, large waveform patterns cannot be handled and the number of cases when multiple waveform patterns cannot be loaded increases. When this happens, the time to reload another waveform pattern wastes evaluation time and lowers efficiency.

1stRF (Opt-032/034/036)

<table>
<thead>
<tr>
<th>Combination of Baseband Signal (Opt-048)</th>
<th>ARB Memory Upgrade 256 Msample for 1stRF [Opt-045]</th>
<th>ARB Memory Upgrade 1024 Msample for 2ndRF [Opt-046]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>without Opt-045/046</td>
<td>with Opt-045</td>
</tr>
<tr>
<td></td>
<td>with Opt-046</td>
<td></td>
</tr>
<tr>
<td>Without Opt-048</td>
<td>64 Msa x 1 pc</td>
<td>256 Msa x 1 pc</td>
</tr>
<tr>
<td>With Opt-048*2</td>
<td>64 Msa x 2 pcs</td>
<td>256 Msa x 2 pcs</td>
</tr>
<tr>
<td></td>
<td>128 Msa x 1 pc</td>
<td>512 Msa x 1 pc</td>
</tr>
</tbody>
</table>

2ndRF (Opt-062/064/066)

<table>
<thead>
<tr>
<th>Combination of Baseband Signal (Opt-078)</th>
<th>ARB Memory Upgrade 256 Msample for 2ndRF [Opt-075]</th>
<th>ARB Memory Upgrade 1024 Msample for 2ndRF [Opt-076]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>without Opt-075/076</td>
<td>with Opt-075</td>
</tr>
<tr>
<td></td>
<td>with Opt-076</td>
<td></td>
</tr>
<tr>
<td>Without Opt-078</td>
<td>64 Msa x 1 pc</td>
<td>256 Msa x 1 pc</td>
</tr>
<tr>
<td>With Opt-078*2</td>
<td>64 Msa x 2 pcs</td>
<td>256 Msa x 2 pcs</td>
</tr>
<tr>
<td></td>
<td>128 Msa x 1 pc</td>
<td>512 Msa x 1 pc</td>
</tr>
</tbody>
</table>

*1: The maximum size per waveform pattern supported by the MG3710A varies with the IQproducer version.

*2: The Combination of Baseband Signal option supports two arbitrary waveform memories and can either set two different waveform patterns or combine them in one memory to support one large waveform pattern.
Pressing the on-screen button toggles instantly between the Hardware Block Chart and the ARB Info screens. The Hardware Block Chart is a quick-and-easy way to grasp the status of each block (ARB, AWGN, I/Q, Analog Mod, Pulse Mod, Local) at a glance.

The ARB Info screen displays more details about the ARB/AWGN block showing the baseband signal combine status of memory A + memory B, memory A + AWGN, etc.
# Two Signal Flowcharts (2/2)

## Hardware Block Chart Display Contents (explanation)

<table>
<thead>
<tr>
<th>No.</th>
<th>Display Example</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ARB On Out On</td>
<td>ARB</td>
<td>ARB block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On/Off</td>
<td>Indicates On/Off of ARB (function to generate modulated signals with arbitrary waveform patterns).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Out:</td>
<td>Indicates On/Off of the arbitrary waveform pattern output.</td>
</tr>
<tr>
<td>2</td>
<td>AWGN On</td>
<td>AWGN</td>
<td>AWGN block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On/Off</td>
<td>Indicates On/Off of AWGN addition.</td>
</tr>
<tr>
<td>3</td>
<td>Analog Mod</td>
<td>Analog Modulation</td>
<td>AM/FM/AM</td>
</tr>
<tr>
<td></td>
<td>AM+FMM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I/Q</td>
<td>I/Q</td>
<td>I/Q block</td>
</tr>
<tr>
<td></td>
<td>Src: Internal/</td>
<td></td>
<td>Indicates the I/Q signal source.</td>
</tr>
<tr>
<td></td>
<td>Analog I/Q In</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Out: RF/</td>
<td></td>
<td>Indicates the output destination for baseband signals.</td>
</tr>
<tr>
<td></td>
<td>Analog I/Q Out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Local Oscillator</td>
<td>Local Oscillator</td>
<td>Src: Int/Ext/Sync</td>
</tr>
<tr>
<td></td>
<td>Src: Ext/Out</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Out: ---/OnOff</td>
<td></td>
<td>Indicates On/Off of the Local signal external output.</td>
</tr>
<tr>
<td>6</td>
<td>Pulse Mod On</td>
<td>Pulse Mod</td>
<td>Pulse Modulation block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On/Off</td>
<td>Indicates On/Off of Pulse modulation.</td>
</tr>
<tr>
<td>7</td>
<td>---</td>
<td></td>
<td>Indicates that inputs from two function blocks of the left side and bottom side are combined and output to the function block of the right side.</td>
</tr>
<tr>
<td>8</td>
<td>---</td>
<td></td>
<td>Indicates that the input Local signal from the bottom side is modulated with the input signal from the left side and output to the function block of the right side.</td>
</tr>
<tr>
<td>9</td>
<td>---</td>
<td></td>
<td>Indicates the RF Output is On.</td>
</tr>
<tr>
<td>10</td>
<td>Analog I/Q Out</td>
<td></td>
<td>Indicates the Analog I/Q signal is set to the external output.</td>
</tr>
</tbody>
</table>

## Hardware Block Chart (explanation)

<table>
<thead>
<tr>
<th>No.</th>
<th>Display Example</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Analog I/Q In</td>
<td></td>
<td>Indicates the Analog I/Q signal is set to the external input.</td>
</tr>
<tr>
<td>12</td>
<td>LO In (For SG1)</td>
<td></td>
<td>Indicates the SG1 Local signal source is set to Ext (input from the rear LO Input connector). SG1 (For SG2)</td>
</tr>
<tr>
<td>13</td>
<td>LO Out (For SG2)</td>
<td></td>
<td>Indicates the SG1 Local signal external output setting is On and the signal is output to SG2. If SG2 is not installed, “LO Out” (output from the rear LO Output connector) is displayed.</td>
</tr>
<tr>
<td></td>
<td>LO Out (For SG2)</td>
<td></td>
<td>Indicates the Local signal external output setting (output from the rear LO Output connector) is On.</td>
</tr>
<tr>
<td>14</td>
<td>---</td>
<td></td>
<td>Click to switch Hardware Block Chart and ARB Info display.</td>
</tr>
</tbody>
</table>
Analog IQ Input/Output [Opt-018]

This option adds analog IQ input and output connectors to the front and rear panels, respectively.

**[1] I/Q signal Source**
- I/Q signal with the internal baseband

**[2] Output destination for BB signals**
- Signal input from analog I/Q In connector (SG1 can only be selected when Opt-018 is installed.)
- Output RF signal
- Output I/Q signal
  - SG1 can only be selected when Opt-018 is installed.
  - *The RF output signal is CW.*

**[3] Baseband in-band correction**
- Enable/Disables baseband in-band correction.
  - When it is set to On, the in-band flatness is improved.
  - However, the switching time for the frequency and pattern change becomes longer because the correction filter recalculation time and filter passing time become longer. If the in-band characteristics are not important, setting this function to Off supports high-speed operation. This function is disabled at CW output.

**[4] I/Q Calibration**
- Executes calibration for the IQ gain balance, Origin offset and IQ quadrature angle.
  - DC: Executes optimal adjustment with currently specified frequency (default). For other frequency points, the existing correction value is used without change.
  - Full: Executes calibration with range of all frequencies.

**[5] Switching mode for RF bandwidth**
- Off: Harmonics distortion characteristic has priority (Default).
- On: In-band flatness has priority. This function allows using the maximum modulation bandwidth with low frequency. (The harmonics cut filter is disabled.)
**[6] Analog I/Q Input Adjustments**

- **I-phase Offset**
  Range: -100 mV to +100 mV

- **Q-phase Offset**
  Range: -100 mV to +100 mV

**[7] Analog I/Q Output Adjustments**

- **I-phase level adjustment**
  Range: 0 to 120%

- **Q-phase level adjustment**
  Range: 0 to 120%

- **I/Q Common Offset**
  Range: -2.5 to +5 V

- **I-phase differential offset**
  Range: -50 mV to +50 mV

- **Q-phase differential offset**
  Range: -50 mV to +50 mV

**[8] Internal Baseband Adjustments**

- **I-phase offset**
  Range: -20 to +20%

- **Q-phase offset**
  Range: -20 to +20%

- **Gain Balance**
  Range: -1 to +1 dB

- **Quadrature angle of I/Q phase**
  Range: -10 to +10 deg

- **I/Q phase adjustment**
  Range: -360 to +360 deg

- **I/Q phase time difference**
  Range: -800 ns to +800 ns

- **I/Q output timing**
  Range: -400 ns to +400 ns

*1: Resolution 0.01 deg

*2: Resolution 1 ps
This option installs a BER measurement function for measuring error rates between 100 bps and 40 Mbps using the DUT demodulated Data/Clock/Enable signals. The results are displayed on the MG3710A screen.
Built-in BER Measurement Function (2/4)

BER Measurement Example

**Measure Mode**
- Single: Measures selected data patterns until result reaches specified number of bits or specified number of error bits.
- Continuous: Repeats single measurements (default).
- Endless: Measures data until result reaches upper limit of measurement count bit.

**Count Mode**
- Data: Specifies number of measurement bits (default).
- Error: Specifies number of measurement error bits.

**Data Type**
- PN9/11/15/20/23, ALL1, ALL0, Alternate (0101...), User Data, PN9fix/11fix/15fix/20fix/23fix

**Measure Mode**
- Error Rate
  - Error Rate: 1.000E-002, 1%
  - Error Count: 569 / 56900

**Count Mode**
- BER Test Start or Stop
- Clears measurement result
- Measure Mode
- Count Mode

Measurement bit

Error Rate

Error Bit

Built-in BER Measurement Function (3/4)

[PN Fix pattern]

At BER measurement, special PN patterns called PN_Fix patterns can be used. A PN Fix pattern consists of repeated parts of PN patterns, and PN patterns with a shorter length than 1 cycle.

Even when the PN data part of the waveform pattern output from the MG3710A has no periodicity, BER measurement is supported by selecting PN Fix at the BER measurement function.

![Diagram showing PN Fix pattern concept]

\[ \text{PN Fix pattern length} = (2^{x-1}) \times N + y \text{ bit} \]

\[ \text{PNx} \times N (N = 0, 1, 2, \ldots) \]

- **Initial Pattern**

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Initial Pattern Setting Range</th>
<th>Resolution</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN9Fix</td>
<td>0000000000 to 1111111111 (9 bits)</td>
<td>1</td>
<td>1FF</td>
</tr>
<tr>
<td>PN11Fix</td>
<td>000000000000 to 111111111111 (11 bits)</td>
<td>1</td>
<td>7FF</td>
</tr>
<tr>
<td>PN15Fix</td>
<td>000000000000000000 to 111111111111111111 (15 bits)</td>
<td>1</td>
<td>7FFF</td>
</tr>
<tr>
<td>PN20Fix</td>
<td>000000000000000000000000 to 1111111111111111111111111111 (20 bits)</td>
<td>1</td>
<td>FFFFF</td>
</tr>
<tr>
<td>PN23Fix</td>
<td>0000000000000000000000000000 to 111111111111111111111111111111 (23 bits)</td>
<td>1</td>
<td>7FFFFF</td>
</tr>
</tbody>
</table>

- **Pattern Length**

**Setting Range:** 96 to 134217728 bit (0 \times 80000000)

**Resolution:** 1 bit
Built-in BER Measurement Function (4/4)

[User Defined Pattern]

The BER measurement can use a user-defined pattern, which is an arbitrary binary string that is 8- to 1024 bits long and consists of a data bit string to determine whether synchronization is established plus a data bit string used as measurement data. A PC can be used to create a user-defined pattern in text file format. Load the file from USB memory or MG3710A internal hard disk.

Length: 8 to 1024 (Binary)
Extension: ******.bpn
Saved Folder: *:¥Anritsu¥MG3710A¥User Data¥BERT BitPattern

Example of User-Defined Pattern
Supports Two USB Type Power Sensor (1/4)

Supports two USB power sensors max.

USB Power Sensor [Sold Separately]

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency Range</th>
<th>Dynamic Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA24104A*</td>
<td>600 MHz to 4 GHz</td>
<td>+3 to +51.76 dB</td>
</tr>
<tr>
<td>MA24105A</td>
<td>350 MHz to 4 GHz</td>
<td>+3 to +51.76 dB</td>
</tr>
<tr>
<td>MA24106A</td>
<td>50 MHz to 6 GHz</td>
<td>-40 to +23 dB</td>
</tr>
<tr>
<td>MA24108A</td>
<td>10 MHz to 8 GHz</td>
<td>-40 to +20 dB</td>
</tr>
<tr>
<td>MA24118A</td>
<td>10 MHz to 18 GHz</td>
<td>-40 to +20 dB</td>
</tr>
<tr>
<td>MA24126A</td>
<td>10 MHz to 26 GHz</td>
<td>-40 to +20 dB</td>
</tr>
</tbody>
</table>

Level Offset: -100 to +100 dB
Average: 1 to 2048
Unit: dBm, W
COM Port: 2 to 8

*: MA24104A has been discontinued. Replacement model is MA24105A.

Up to two USB power sensors can be connected to the MG3710A to display the measurement results on the MG3710A screen.

Power Meter Measurement Screen
Supports Two USB Type Power Sensor (2/4)

[Power Meter Setting]

COM Port: 2 to 8
Model: MA24104A, MA24105A, MA24106A, MA24108A, MA24118A, MA24126A.
Zero Sensor: Zero adjusts for power sensor

Measurement Frequency:
Channel Freq (See Table 1.)
Select Level Offset On/Off
Level Offset Value
Range: -100 to +100 dB
Resolution: 0.01 dB
Select Averaging On/Off
Average Count
Range: 1 to 2048
Resolution: 1
Measurement Units
dBm, W

Table 1: Measurement Frequency Setting Range

<table>
<thead>
<tr>
<th>Power Sensor</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Resolution</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA24104A</td>
<td>600 MHz</td>
<td>4 GHz</td>
<td>1 kHz</td>
<td>1 GHz</td>
</tr>
<tr>
<td>MA24105A</td>
<td>350 MHz</td>
<td>4 GHz</td>
<td>100 kHz</td>
<td>1 Hz</td>
</tr>
<tr>
<td>MA24106A</td>
<td>50 MHz</td>
<td>6 GHz</td>
<td>1 kHz</td>
<td>1 GHz</td>
</tr>
<tr>
<td>MA24108A</td>
<td>10 MHz</td>
<td>8 GHz</td>
<td>100 kHz</td>
<td>1 Hz</td>
</tr>
<tr>
<td>MA24118A</td>
<td>10 MHz</td>
<td>18 GHz</td>
<td>100 kHz</td>
<td>1 Hz</td>
</tr>
<tr>
<td>MA24126A</td>
<td>10 MHz</td>
<td>26 GHz</td>
<td>100 kHz</td>
<td>1 Hz</td>
</tr>
</tbody>
</table>
Supports Two USB Type Power Sensor (3/4)

[Checking Com Port]

1. Display Windows Device Manager
   - [F2: Channel A Setup] or [F4: Channel B Setup]
   - > [F1: Connection Settings]
   - > [F3: Open Device Manager]

2. Check Ports (COM & LPT)
[Correction Table Creation Function]

This function supports creating a correction table for specified frequency range, such as pass-loss using USB power sensor.

This function can be used from [Level]. It cannot be used when a USB power sensor is not connected.

[Top] > [Level] > (P.2)[F2: Configure Correction] > [F5: Use Power Sensor]

**Frequency Setting Range**

<table>
<thead>
<tr>
<th>Power Sensor</th>
<th>Minimum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA24104A</td>
<td>600 MHz</td>
</tr>
<tr>
<td>MA24105A</td>
<td>350 MHz</td>
</tr>
<tr>
<td>MA24106A</td>
<td>150 MHz</td>
</tr>
<tr>
<td>MA24108A</td>
<td>10 MHz</td>
</tr>
<tr>
<td>MA24118A</td>
<td>10 MHz</td>
</tr>
</tbody>
</table>

**Level Offset Setting**

Sets loss/gain correction values included in measurement path.
Setting Range: −100 to +100 dB
Resolution: 0.01 dB

**No. of Measurement Point for Correction Data**

Setting Range: 2 to 4096

**Average of Correction Data**

Setting Range: 1 to 2048
AM/FM/\(\phi\)M/PM (1/6)

**AM/FM/\(\phi\)M/PM**

This function executes analog modulation (AM/FM/\(\phi\)M) for modulated signals created using a CW signal or ARB. When using with a low output frequency, the impact of the second harmonic wave cut filter may degrade the characteristics of the high-frequency wave.

Pulse modulation is executed at any frequency and timing setting. Pulse modulation using external input signals is also supported. The RF Gate function, which runs in tandem with the waveform pattern and the pulse modulation, can be applied simultaneously, and pulse modulation is executed because of OR.

![Example of Analog Modulation Block Chart Screen (ARB = On, AM = On)](image)
AM/FM/ΦM/PM (2/6)

Additional Analog Modulation Input [Opt-050/080]

Adding additional analog modulation input options (Opt-050/080) extends to two internal modulation sources (AM/FM/ΦM) and one external modulation source supporting simultaneous two-signal modulation.

- AM + FM
- AM + ΦM
- Internal 1 + Internal 2
- Internal + External

* FM + ΦM does not support.

[Opt.050/080 installed]
INT2/INT4
- Sine
- Triangle
- Square
- Ramp
(Positive/Negative)
AM/PM/ΦM/PM (3/6)

AM Setting Screen

Select AM On/Off

Select AM Modulation Scale
Lin: Linear format
Exp: Exponential format (Log)

AM Depth (Lin):
Range: 0 to 100%
Resolution: 0.1%

AM Depth (Log):
Range: 0 to 10 dB
Resolution: 0.1 dB

AM Rate:
Range: 0.1 Hz to 50 MHz
Resolution: 0.1 Hz

AM Image (Lin)

AM Image (Log)
AM/FM/ϕM/PM (4/6)

FM/ϕM Setting Screen

Select FM On/Off

FM Deviation:
- Range: 0 Hz to 40 MHz or (50 MHz-FM Rate)
- Resolution: 0.1 Hz

FM Rate:
- Range: 0.1 Hz to 40 MHz or (50 MHz-FM Deviation)
- Resolution: 0.1 Hz

Select ϕM On/Off

ϕM Deviation:
- Range: 0 to 160 rad or (40 MHz/ϕM Rate) rad
- Resolution: 0.1 Hz

ϕM Rate:
- Range: 0.1 Hz to 40 MHz or (40 MHz/ϕM Deviation)
- Resolution: 0.1 Hz

FM Image

ϕM Image
PM Setting Screen

Select PM On/Off

Pulse Source:
(See next slide.)

Pulse Rate:
Range: 0.1 Hz to 10 MHz
Resolution: 0.1 Hz

Pulse Period:
Range: 10 ns to 20 s
Resolution: 10 ns

Pulse Delay from trigger:
Range: 0 to 20 s – Pulse Width
Resolution: 10 ns

Pulse Width:
Range: 10 ns to Pulse Period*1
10 ns to 20 s – Pulse Delay*2
Resolution: 10 ns

Delay time from first to second Pulse:
Pulse 2 Delay
Range: 0s to 20s – Pulse 2 Width – Pulse Delay
Resolution: 10ns

Second pulse width: Pulse 2 Width
Range: 10 ns to 20 s – Pulse 2 Delay – Pulse Delay
Resolution: 10 ns

*1: When Pulse Source is [Free run] or [Gated]
*2: When Pulse Source is [Triggered], [Adjustable], [Doublet] or [Trigger Doublet].
PM: Pulse Source

Square
Internal freerun pulse string with 50% of duty cycle. The period is set with Pulse Rate.

Freerun
Internal freerun pulse string (Default) The period and pulse width are set with Pulse Period and Pulse Width.

Triggered
Generates the pulse in synchronization with the trigger event. The delay time after the trigger event and pulse width are set with Pulse Delay and Pulse Width.

Adjustable Doublet
Generates two pulses in synchronization with the trigger event. The delay time after the trigger event and pulse width are set with Pulse Delay and Pulse 2 Delay, and Pulse Width and Pulse 2 Width. The second pulse delay is based on the first pulse rise.

Gated
Generates the internal pulse string. However, pulses are valid only when the trigger is being input. The period and pulse width are set with Pulse Period and Pulse Width.

Ext Pulse
Generates the pulse signal in synchronization with the external trigger signal.
Simple Touch-Panel Operation

Touching the easy-to-use GUI with hierarchical menus fetches related function and numeric input keys for simple fast settings.

For Modulation (Mode) Screen

Frequency Setting

Level Setting

Waveform pattern Selection Screen

Power Meter Function Screen

BER Function Screen
Security

2ndaryHDD [Opt-011]

This option is useful for saving sensitive waveform pattern data, etc., used at evaluation that cannot be allowed to leave the laboratory, workplace, factory, etc. The 2ndary HDD can be removed from/installed in the rear-panel slot when wanting to keep this saved data secure when the MG3710A is sent for service, used by third parties, etc.

The 2ndary HDD does not include an OS. It is for user data backup.

CPU/Windows7 Upgrade Retrofit [Opt-181]

The standard OS in MG3710A units ordered until May 2018 is Windows XP. (A few MG3710A units with Opt-029 (sales discontinued) have Windows7 (Professional) installed.)

The OS of these MG3710A units can be upgraded to Window 7 (WES7) using Opt-181. Moreover, changing to a faster CPU at the same time as using Opt-181 also shortens the time required to generate waveform patterns using IQproducer installed in the MG3710A.

Note: The standard OS in MG3710A units shipped after June 2018 is Windows 7 (WES7). Due to license restrictions, this option cannot be installed in MG3710A units with the Opt-313 Removable HDD (sales discontinued) installed.
Remote Control

GPIB
Conforms to IEEE488.1/IEEE488.2 standard
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2

Ethernet
Conforms to VXI-11 protocol using TCP/IP
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0

USB
Conforms to USBTMC-USB488 protocol
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0n

The MG3710A has GPIB, Ethernet and USB interfaces as standard. The following functions are supported via these interfaces:

- Control of all functions, except power switch
- Reading of all status conditions and settings
- Interrupts and serial polls

The interface to be used is determined automatically according to the communication start command received from the external controller (PC) while in Local status. It enters Remote status when the interface is determined. "Remote" on the front panel goes off in the Local status and lights up in the Remote status.

To change the interface, the MG3710A must enter Local status again. Press "Local" on the front panel to enter Local status, then send a command via the desired interface.
Vector Signal Generator MG3710A

Waveform Generation Software

IQproducer Introduction

Some of these functions require a separate charged license.
IQproducer Functions

IQproducer is PC software for generating waveform patterns mainly for the MG3710A. There are four types. Some require a paid option license (license in below [ ]).

For the waveform pattern generation function (black), refer to the “IQproducer catalog” or each Product Introduction.

This explains IQproducer basic functions (blue).

**System (Cellular)**
- LTE FDD [MX370108A]
- LTE-Advanced FDD Option [MX370108A-001]
- LTE TDD [MX370110A]
- LTE-Advanced FDD Option [MX370110A-001]
- HADPA/HSUPA DL/UL [MX370101A]
- TD-SCDMA [MX370112A]
- W-CDMA DL/UL [MX370103A]
- 1xEV-DO FWD/RVS [MX370103A]

**System (Non-Cellular)**
- WLAN [MX370111A]
- 802.11ac (160 MHz) Option [MX370111A-001]
- Mobile WiMAX [MX370105A]
- DVB-T/H [MX370106A]

**General Purpose**
- TDMA [MX370102A]
- Multi-Carrier [MX370104A]
- Fading [MX370107A]
- Convert
- Clipping
- AWGN

**Simulation & Utility**
- CCDF, FFT, Time Domain Transfer & Setting Panel/Wizard
Convert function

This function converts waveform patterns for the MG3710A based on three types of data files.

The waveform pattern bit width can be selected as 14, 15, or 16 bits.

<table>
<thead>
<tr>
<th>Bit Width</th>
<th>Specifiable RMS Value Range</th>
<th>Usable Marker Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 bit</td>
<td>1 to 8191</td>
<td>Marker 1 to 3, RF Gate</td>
</tr>
<tr>
<td>15 bit</td>
<td>1 to 16383</td>
<td>Marker 1, RF Gate</td>
</tr>
<tr>
<td>16 bit</td>
<td>1 to 32767</td>
<td>None</td>
</tr>
</tbody>
</table>

The specifiable bit widths differ for each conversion file format as follows.

<table>
<thead>
<tr>
<th>Input File Format</th>
<th>Selectable Bit Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII1</td>
<td>14/15/16 bit</td>
</tr>
<tr>
<td>ASCII2</td>
<td>15/16 bit</td>
</tr>
<tr>
<td>ASCII3</td>
<td>14/15 bit</td>
</tr>
<tr>
<td>MS269x/MS2830A Digitizer</td>
<td>14/15/16 bit</td>
</tr>
<tr>
<td>MG3710/MS269x/MS2830A (to MG3700)</td>
<td>14 bit</td>
</tr>
<tr>
<td>MG3700/MS269x/MS2830A (to MG3710)</td>
<td>14 bit</td>
</tr>
<tr>
<td>MG3710/MG3700A/MS2830A (to MS269x)</td>
<td>14 bit</td>
</tr>
<tr>
<td>MG3710/MG3700A/MS269x (to MS2830A)</td>
<td>14 bit</td>
</tr>
</tbody>
</table>

(1) ASCII-format IQ data created by other general-purpose EDA [Electronic Design Automation] tools, such as MATLAB, can be converted into MG3700A waveform pattern files.

(2) Data files captured with Anritsu Signal Analyzer MS269xA and the capture function of the Signal Analyzer MS2830A can be converted to waveform pattern files used by the MG3710A.

(3) Waveform patterns created by other Anritsu vector signal generators (MG3700A, MS269xA-020, MS2830A-020/021) can be converted to waveform pattern files used by the MG3710A and vice versa.
IQproducer (3/11)

Convert Function

Input file selection

Sampling rate
Range: 20 kHz to 160 MHz

File format
(See previous slide.)

Normalizing
Sets amplitude value for converting waveform pattern to RMS (Root Mean Square), which is a standard waveform pattern used for MG3710A.

Package name

Comment

Convert Setting Screen
IQproducer (4/11)

Convert Function: ASCII 1, 2, 3 format
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, - 0.729580,0,0,0,0 # 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 to 3 & RF Gate” is divided into three separate files. Marker 1~3 and RF Gate can specify “0” and “1” only. Marker 1 to 3 and RF Gate can be omitted. In this case, however, Marker1 to 3 is regarded as “0”, and RF Gate as “1”. Also, I-phase data, Q-phase data and Marker 1 to 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 to 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)  File 2 (Q-phase data)  File 3 (Marker data)
// I Data
Comment Line
- 0.214178
- 0.187286
- 0.073896
- 0.091758
- 0.248275
- 0.331432
...<cr><lf>
- 0.984242
- 1.245890
- 1.368888
- 1.316199
- 1.089333
- 0.729580
...
Clipping function

This function performs clipping for a waveform pattern generated by each signal generation application. Filter, bandwidth, and number of repetitions are set to generate a clipped waveform pattern.

Clipping is used when restricting the input signal peak, such as at amplifier evaluation.

In addition, it can also be used to filter unwanted signals at the adjacent channel for Rx test interference patterns.

Clipping Setting Screen

- **Input File**: Selects waveform pattern for clipping
- **Repetition**: Repeat count for clipping and filtering
  - Setting Range: 1 to 20
  - Resolution: 1
- **Threshold Level**: Level for clipping
  - Setting Range: 0 to 20 dB
  - Resolution: 0.1 dB
- **Filter Type**: Ideal, None, Nyquist, Root Nyquist, Gaussian
- **Bandwidth**: Setting Range: Sampling Rate/1000 or 0.001 ~ Sampling Rate
- **Roll Off/BT**: (Enabled for Nyquist, Root Nyquist, Gaussian)
  - Setting Range: 0.10 to 1.00
  - Resolution: 0.01

Clipping is used when restricting the input signal peak, such as at amplifier evaluation. In addition, it can also be used to filter unwanted signals at the adjacent channel for Rx test interference patterns.
**CCDF Function**

The Complementary Cumulative Distribution Function (CCDF) of a waveform pattern generated by a signal generation application can be displayed.

In a CCDF graph, the signal peak/average power is displayed on the x-axis, and the cumulative probability that the signal peak/average power is equal to or less than the value on the x-axis is displayed on the y-axis. As a result, the distribution of peak powers of various modulation signals are displayed on the screen. This is convenient for estimating the output waveform distortion characteristics when a generated signal is input from the MG3710A to a power amplifier or other devices.
FFT Function

The Fast Fourier Transform (FFT) of the waveform pattern are displayed as a graph using the Blackman-Harris window function.

FFT Screen

Waveform Patterns
Select up to 4 waveform patterns.
Time Domain Function

The waveform pattern generated by each signal generation application is displayed as a time domain graph. When “I, Q, Marker” is selected from the Graph Type drop-down, the time domain waveform of the I-phase, Q-phase, and marker data of the selected waveform pattern are displayed. When “Power, Marker” is selected, the time domain waveform of the marker data and the power based on the rms value (in the wvi file) of the selected waveform pattern are displayed.

Time Domain Screen

Graph Type: I,Q, Marker

Graph Type: Power, Marker
Time Domain: Marker Edit

A new waveform pattern can be created by reading an existing waveform pattern and editing the marker data and name using this function.
**Transfer & Setting Function**

When changing the MG3710A network setting to DHCP Off and connecting the MG3710A and PC using a LAN crossover cable, restart the MG3710A after changing the network setting before connecting the LAN cable.

**Steps:**
1. Input the MG3710A IP address.
2. Connect to the instrument.
3. Navigate to the Advanced settings.

*Image showing the connection process.*

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**LAN Crossover Cable**

PC

MG3710A

Input MG3710A IP address.
Transfer & Setting: Operation

- Transfers file
- Deletes file
- Connects/Disconnects
- Installs license key
- Loads and clears waveform pattern in waveform memory
- Starts waveform pattern output

PC side

MG3710A side