MG3633A
Synthesized Signal Generator
Operation Manual

14th Edition

For safety and warning information, please read this manual before attempting to use the equipment. Keep this manual with the equipment.
Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

Symbols used in manual

DANGER ⚠️ This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

WARNING ⚠️ This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

CAUTION ⚠️ This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.
1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the advice in the operation manual is not followed there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.

2. IEC 61010 Standard
   The IEC 61010 standard specifies four categories to ensure that an instrument is used only at locations where it is safe to make measurements. This instrument is designed for measurement category I (CAT I). DO NOT use this instrument at locations specified as category II, III, or IV as defined below.
   Measurement category I (CAT I):
   Secondary circuits of a device that is not directly connected to a power outlet.
   Measurement category II (CAT II):
   Primary circuits of a device that is directly connected to a power outlet, e.g., portable tools or home appliance.
   Measurement category III (CAT III):
   Primary circuits of a device (fixed equipment) to which power is supplied directly from the distribution panel, and circuits running from the distribution panel to power outlet.
   Measurement category IV (CAT IV):
   Building service-line entrance circuits, and circuits running from the service-line entrance to the meter or primary circuit breaker (distribution panel).
For Safety

**WARNING**

3. To ensure that the instrument is earthed, always use the supplied 3-pin power cord, and insert the plug into an outlet with an earth terminal. If power is supplied without earthing the equipment, there is a risk of receiving a severe or fatal electric shock or causing damage to the internal components.

4. This equipment cannot be repaired by the operator. **DO NOT** attempt to remove the equipment covers or unit covers or to disassemble internal components. Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

5. The performance-guarantee seal verifies the integrity of the equipment. To ensure the continued integrity of the equipment, only Anritsu service personnel, or service personnel of an Anritsu sales representative, should break this seal to repair or calibrate the equipment. If the performance-guarantee seal is broken by you or a third party, the performance of the equipment cannot be guaranteed. Be careful not to break the seal by opening the equipment or unit covers.

6. This equipment should always be positioned in the correct manner. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock. Always set up the equipment in a position where the power switch can be reached without difficulty.

7. **DO NOT** short the battery terminals and never attempt to disassemble the battery or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak. This fluid is poisonous. **DO NOT** touch the battery fluid, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.
CAUTION

1. Always remove the mains power cable from the power outlet before replacing blown fuses. There is a risk of electric shock if fuses are replaced with the power cable connected. Always use new fuses of the type and rating specified on the rear panel of the instrument. There is a risk of fire if a fuse of a different rating is used.

   T5A250V indicates a time-lag fuse.

2. Keep the power supply and cooling fan free of dust.
   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

3. Use two or more people to lift and move this equipment, or use a trolley. There is a risk of back injury, if this equipment is lifted by one person.

4. This instrument is designed for an industrial environment. In a residential environment this instrument may cause radio interference in which case the user may be required to take adequate measures.
Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories, including the National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault, under the condition that this warranty is void when:

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding, earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Anritsu Corporation Contact

In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.
Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.
Crossed-out Wheeled Bin Symbol


For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product’s useful life to arrange disposal in accordance with your initial contract and the local law.
CE Conformity Marking

Anritsu affixes the CE conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking

1. Product Model
   Model: MG3633A Synthesized Signal Generator

   LVD: Directive 2006/95/EC

3. Applied Standards
   • EMC: Emission: EN 61326-1: 2006 (Class A)
     Immunity: EN 61326-1: 2006 (Table 2)

   Performance Criteria*
   IEC 61000-4-2 (ESD) B
   IEC 61000-4-3 (EMF) A
   IEC 61000-4-4 (Burst) B
   IEC 61000-4-5 (Surge) B
   IEC 61000-4-6 (CRF) A
   IEC 61000-4-11 (V dip/short) B, C

*: Performance Criteria
   A: During testing, normal performance within the specification limits.
   B: During testing, temporary degradation, or loss of function or performance which is self-recovering.
   C: During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.
Harmonic current emissions:
EN 61000-3-2: 2006 (Class A equipment)
• LVD: EN 61010-1: 2001 (Pollution Degree 2)

4. Authorized representative
Name: Loic Metais
   European Quality Manager
   ANRITSU S.A. France
Address, city: 16/18 Avenue du Québec SILIC 720 Zone de Courtaboeuf
            91951 Les Ulis Cedex
Country: France
C-tick Conformity Marking

Anritsu affixes the C-tick mark on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

C-tick marking

N274

1. Product Model
   Model: MG3633A Synthesized Signal Generator

2. Applied Standards
   EMC: Emission: EN 61326-1: 2006 (Class A equipment)
Power Line Fuse Protection

For safety, Anritsu products have either one or two fuses in the AC power lines as requested by the customer when ordering.

Single fuse:  A fuse is inserted in one of the AC power lines.

Double fuse:  A fuse is inserted in each of the AC power lines.

Example 1:  An example of the single fuse is shown below:

![Fuse Holder]

Example 2:  An example of the double fuse is shown below:

![Fuse Holders]
TABLE OF CONTENTS

1. For Safety .............................................. iii

2. MG3633A
   Synthesized Signal Generator
   Operation Manual

3. MG3633A
   Synthesized Signal Generator
   GP-IB Operation Manual
(Blank)
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 GENERAL</td>
<td>1-1</td>
</tr>
<tr>
<td>1.1 Product Outline</td>
<td>1-1</td>
</tr>
<tr>
<td>1.2 Operation Manual</td>
<td>1-2</td>
</tr>
<tr>
<td>1.3 Composition</td>
<td>1-3</td>
</tr>
<tr>
<td>1.3.1 Standard composition</td>
<td>1-3</td>
</tr>
<tr>
<td>1.3.2 Options</td>
<td>1-4</td>
</tr>
<tr>
<td>1.4 Optional Accessories and Peripheral Equipment</td>
<td>1-5</td>
</tr>
<tr>
<td>1.5 Specifications</td>
<td>1-7</td>
</tr>
<tr>
<td>2 PRECAUTION</td>
<td>2-1</td>
</tr>
<tr>
<td>2.1 Installation Precautions</td>
<td>2-1</td>
</tr>
<tr>
<td>2.1.1 Installation site environmental conditions</td>
<td>2-1</td>
</tr>
<tr>
<td>2.1.2 Rack mounting</td>
<td>2-2</td>
</tr>
<tr>
<td>2.2 Power Supply Safety Measures</td>
<td>2-2</td>
</tr>
<tr>
<td>2.2.1 Connecting the Power cord</td>
<td>2-2</td>
</tr>
<tr>
<td>2.2.2 Fuse replacement</td>
<td>2-3</td>
</tr>
<tr>
<td>3 PANEL LAYOUT AND PREPARATION</td>
<td>3-1</td>
</tr>
<tr>
<td>3.1 Layout and Function of Controls</td>
<td>3-1</td>
</tr>
<tr>
<td>3.2 Power On</td>
<td>3-11</td>
</tr>
<tr>
<td>3.2.1 ~LINE ON/OFF on rear panel</td>
<td>3-11</td>
</tr>
<tr>
<td>3.2.2 POWER ON/STBY on front panel</td>
<td>3-12</td>
</tr>
<tr>
<td>3.3 Preparation Before Operation</td>
<td>3-13</td>
</tr>
<tr>
<td>3.3.1 Using internal reference oscillator</td>
<td>3-13</td>
</tr>
<tr>
<td>3.3.2 Using external reference oscillator</td>
<td>3-15</td>
</tr>
</tbody>
</table>
SECTION 4 OPERATING INSTRUCTIONS ................................. 4-1
4.1 Using the Data Keys, Rotary Knob, and
INCREMENT [\] [\_] Keys for Data Setting ............... 4-1
4.1.1 Setting using the data keys ......................... 4-2
4.1.2 Setting using the rotary knob .................. 4-4
4.1.3 Setting using INCREMENT [\] [\_] ............... 4-5
4.2 Setting Carrier Frequency ............................... 4-6
4.2.1 Example: setting the frequency
using the data keys ................................ 4-6
4.2.2 Example: setting frequency
using the rotary knob ............................ 4-7
4.2.3 Example: setting frequency
using INCREMENT [\] [\_] ..................... 4-7
4.2.4 Displaying relative frequency .................. 4-8
4.3 Setting Output Level .................................. 4-13
4.3.1 EMF voltage display and terminated
voltage display .................................... 4-13
4.3.2 Example: setting output levels
using the data keys ............................ 4-14
4.3.3 Example: setting output levels
using the rotary knob .......................... 4-15
4.3.4 Example: setting output levels
using INCREMENT [\] [\_] ..................... 4-19
4.3.5 Displaying relative level ....................... 4-20
4.3.6 Turning output level ON/OFF ................ 4-25
4.3.7 Operating reverse power protection
circuit (RPP) ..................................... 4-26
4.4 Outline of Modulation Setting ....................... 4-28
4.4.1 Outline of modulation setting procedure .... 4-28
4.4.2 Selecting modulation input mode ............... 4-33
4.4.3 Selecting internal modulation frequency .. 4-34
4.4.4 External modulation ............................ 4-35
4.4.5 Modulation signal output ...................... 4-35
4.5 Setting AF Frequency .................................. 4-36
4.5.1 Reading AF frequency ............................ 4-36
4.5.2 Example: setting AF frequency using the data keys ........................................... 4-38
4.5.3 Example: setting AF frequency using the rotary knob ........................................ 4-38
4.5.4 Example: setting AF frequency using INCREMENT [\] [\|] .................................. 4-39
4.6 Setting FM Modulation ................................................................. 4-40
4.6.1 Example: setting frequency deviation using the data keys ................................ 4-41
4.6.2 Example: setting frequency deviation using the rotary knob ............................. 4-43
4.6.3 Example: setting frequency deviation using INCREMENT [\] [\|] ...................... 4-44
4.6.4 Calibrating carrier frequency at DC-FM modulation .................................... 4-44
4.7 Setting AM Modulation ................................................................. 4-45
4.7.1 Example: setting AM modulation factor using the data keys ............................ 4-46
4.7.2 Example: setting AM modulation factor using the rotary knob ........................ 4-48
4.7.3 Setting modulation factors using INCREMENT [\] [\|] .................................. 4-48
4.8 Setting QM Modulation ................................................................. 4-49
4.8.1 Example: setting phase deviation using the data keys ..................................... 4-50
4.8.2 Example: setting phase deviation using the rotary knob .................................. 4-52
4.8.3 Example: setting phase deviation using INCREMENT [\] [\|] ...................... 4-53
4.9 Memory ...................................................................................... 4-54
4.9.1 FREQ memory ......................................................................... 4-54
4.9.2 FUNCTION memory ................................................................. 4-62
4.9.3 Protecting memory contents ............................................................... 4-68
4.9.4 Deleting memory contents ............................................................................ 4-68
4.10 Setting Sweep Function .............................................................. 4-69
4.10.1 Outline .................................................................................... 4-69
4.10.2 Sweep mode ............................................................................. 4-72
4.10.3 Carrier frequency/output level/AF frequency sweep ............................................. 4-73
4.10.4 Setting FREQ memory and FUNCTION memory sweep ............................................. 4-93
4.10.5 MARKER ............................................. 4-104
4.10.6 Presetting sweep ............................................. 4-104
4.10.7 Output connectors related to sweep function ............................................. 4-105
4.11 Special Functions ............................................. 4-106
4.11.1 Special function status ............................................. 4-112
4.11.2 Initial setting (SP00) ............................................. 4-114
4.11.3 Bell ON/OFF (SP02/01) ............................................. 4-116
4.11.4 Terminated and open-circuit voltage (EMF) display of output level (SP04/03) ...................... 4-117
4.11.5 Output level limiter ON/OFF (SP06/05) ............................................. 4-119
4.11.6 Output level offset mode ON/OFF (SP08/07) ............................................. 4-120
4.11.7 Frequency offset mode ON/OFF (SP12/11) ............................................. 4-122
4.11.8 FREQ-memory protect ON/OFF (SP14/13) ............................................. 4-123
4.11.9 FUNCTION-memory protect ON/OFF (SP16/15) ............................................. 4-123
4.11.10 FM OSC : Automatic switching/MIDDLE fixed/ SIDE fixed (SP17/18/19) ...................... 4-124
4.11.11 ØM OSC : Automatic switching/MIDDLE fixed/ WIDE fixed (SP20/21/22) ...................... 4-125
4.11.12 FM/ØM : POLARITY NORMAL/INVERT (SP23/24) ............................................. 4-126
4.11.13 FM/ØM : INT/EXT deviation fixed (SP25/26/27) ............................................. 4-127
4.11.14 INT MOD : NORMAL/ + DC applied/ – DC applied/ ± DC external control (SP30/31/32/33) .......... 4-134
4.11.15 MOD OUTPUT : Automatic switching/INT fixed/ AM EXT fixed/FM-ØM EXT fixed (SP35/36/37/38) ............................................. 4-135
4.11.16 Sweep blanking output : Positive/negative logic (SP43/44) ............................................. 4-135
4.11.17 FUNCTION-memory sweep : sweep output pattern 1/pattern 2 (SP45/46) ...................... 4-136
4.11.18 Trigger (SP56/57/58) ............................................. 4-137
4.11.19 GP-IB : Talker data with/without header (SP60/61) ............................................. 4-145
4.11.20 GP-IB : Address setting (SP62) ............................................. 4-145
4.11.21 GP-IB : Address display (SP63) ............................................. 4-145
4.11.22 GP-IB : ONLY mode (SP64 to 68) ...................... 4-146
4.11.23 SRQ MASK (SP70 to 80) ............................. 4-146
4.11.24 FREQ-memory clear (SP81) ......................... 4-146
4.11.25 FUNCTION-memory clear (SP82) .................... 4-146
4.11.26 Option display (SP83) .............................. 4-147
4.11.27 Output level correction :
   Normal/CAL data 1 (option 07)/CAL data 2
   (option 07) (SP86/87/88) .............................. 4-147
4.12 STATUS .................................................. 4-148
4.12.1 Status messages related to all functions .......... 4-156
4.12.2 UNCAL ................................................. 4-160
4.13 Panel Lock .............................................. 4-162
4.14 Message Display by 7-Segment Display ............. 4-163

SECTION 5 MEASUREMENT ....................................... 5-1
5.1 Measuring Sensitivity .................................... 5-1
5.1.1 Measuring 20 dB NQ sensitivity ..................... 5-1
5.1.2 Measuring 12 dB SINAD sensitivity .................. 5-3
5.2 Measuring One-Signal Selectivity ..................... 5-4
5.2.1 Using 20 dB NQ method to measure
   FM receiver selectivity ............................... 5-5
5.2.2 Measuring spurious response ....................... 5-7
5.3 Measuring Two-Signal Selectivity ..................... 5-9
5.3.1 Measuring blocking effect of FM receiver ......... 5-9
5.3.2 Measuring cross-modulation characteristics ...... 5-12

SECTION 6 PERFORMANCE TESTS .............................. 6-1
6.1 Introduction ............................................. 6-1
6.2 Equipment Required for Performance Tests ............ 6-1
6.3 Performance Tests ....................................... 6-2
6.3.1 Output frequency .................................... 6-2
6.3.2 Output-level frequency characteristic .......... 6-3
6.3.3 Output-level accuracy ................................ 6-5
6.3.4 FM deviation and FM distortion ................. 6-8
6.3.5 AM modulation factor and AM distortion .......... 6-9
6.4 Service ............................................. 6-11

SECTION 7 CALIBRATION ..................................... 7-1
7.1 Calibration ............................................ 7-1
7.2 Equipment Required for Calibration ................. 7-1
7.3 Calibration ............................................ 7-1
7.3.1 Reference oscillator frequency calibration using frequency standard ......................... 7-2
7.3.2 Reference oscillator frequency accuracy calibration using counter ..................... 7-4

SECTION 8 STORAGE AND TRANSPORTATION .............. 8-1
8.1 Daily Servicing and Preventive Maintenance ........ 8-1
8.2 Storage Precautions ................................. 8-1
8.2.1 Precautions before storage ....................... 8-1
8.2.2 Recommended storage conditions ................. 8-2
8.3 Repacking and Transportation ......................... 8-2
8.3.1 Repacking .......................................... 8-2
8.3.2 Transportation .................................... 8-2

APPENDIX A PANEL LAYOUT ............................... A-1
Fig. A-1 .................................................. A-3
Fig. A-2 .................................................. A-4

APPENDIX B PULSE MODULATOR ......................... B-1
MA1610A

APPENDIX C FREQUENCY-RESPONSE COMPENSATION ........... C-1
SOFTWARE
MX5126B/MX5251B
SECTION 1
GENERAL

This section provides an outline of this manual and describes the standard composition, optional accessories, peripheral devices for expanding its functions and the specifications of the MG3633A Synthesized Signal Generator.

TABLE OF CONTENTS

1.1 Product Outline ......................................................... 1-1
1.2 Operation Manual ....................................................... 1-2
1.3 Composition ............................................................. 1-3
   1.3.1 Standard composition ........................................... 1-3
   1.3.2 Options .......................................................... 1-4
1.4 Optional Accessories and Peripheral Equipment ................. 1-5
1.5 Specifications .......................................................... 1-7

1 - i
SECTION 1
GENERAL

1.1 Product Outline

The MG3633A Synthesized Signal Generator is designed for use in R&D and testing of quasi-microwave band mobile communications, digital mobile communications, mobile satellite communications, satellite broadcasting, radio LANs and for various other analog and digital radio equipment. The MG3633A also has excellent basic performance in regards to frequency resolution, switching speed, signal purity, and output level accuracy as well as various modulation functions. The MG3633A performs amplitude, frequency, and phase modulation functions in the frequency range of 0.01 to 2700 MHz. Since the maximum output level is as large as +17 dBm, it is also used for various local signal sources.

The MG3633A is provided with versatile sweep functions for carrier frequency, output level, and modulation frequency parameters so that it can perform sweeping suitable for both the measured object and measuring equipment.

The MG3633A is also equipped with two memory functions: a FREQ memory to store up to 1000 carrier frequencies and a FUNCTION memory to store up to 100 panel setting conditions.
1.2 Operation Manual

This operation manual contains eight sections and three appendixes. The format and outline of each section is described below.

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GENERAL</td>
<td>Description of the MG3633A (standard configuration, specifications), optional accessories and peripheral equipment, and outline of operation manual.</td>
</tr>
<tr>
<td>2</td>
<td>PRECAUTION</td>
<td>Operations to be performed before powering-up the MG3633A</td>
</tr>
<tr>
<td>3</td>
<td>PANEL LAYOUT AND PREPARATION</td>
<td>Layout, function and method of preparative operation of components such as keys, connectors, knobs, and indicators on both the front and rear panels.</td>
</tr>
<tr>
<td>4</td>
<td>OPERATING INSTRUCTIONS</td>
<td>Details of manual operation (local operation) of the front and rear panels. (Except for remote control by GP-IB)</td>
</tr>
<tr>
<td>5</td>
<td>MEASUREMENT</td>
<td>Methods for measuring sensitivity and selectivity of receivers as typical measurement examples using a signal generator</td>
</tr>
<tr>
<td>6</td>
<td>PERFORMANCE TEST</td>
<td>Measuring instrument setup, and procedures required for performance testing</td>
</tr>
<tr>
<td>7</td>
<td>CALIBRATION</td>
<td>Measuring instrument setup, and procedures required for calibration</td>
</tr>
<tr>
<td>8</td>
<td>STORAGE AND TRANSPORTATION</td>
<td>Daily maintenance, long period storage, re-packing and transportation</td>
</tr>
<tr>
<td>APPENDIX A</td>
<td>For easy reference while proceeding through this manual, front and rear-panel illustrations are located in fold-out pages at the back of this manual.</td>
<td></td>
</tr>
<tr>
<td>APPENDIX B</td>
<td>MA1610A Pulse Modulator operation manual</td>
<td></td>
</tr>
<tr>
<td>APPENDIX C</td>
<td>Operation manual for Frequency-Response Compensation Software (option 07) MX5126B/MX5251B</td>
<td></td>
</tr>
</tbody>
</table>

Note: For GP-IB, see separate GP-IB manual.
1.3 Composition

This paragraph describes the standard configuration of the MG3633A and the options for expanding its functions.

1.3.1 Standard composition

The standard configuration of the MG3633A is listed in the table below.

<table>
<thead>
<tr>
<th>Item</th>
<th>No.</th>
<th>Model number/Order number</th>
<th>Name</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument</td>
<td>1</td>
<td>MG3633A</td>
<td>Synthesized Signal Generator</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Accessories supplied</td>
<td>2</td>
<td>J0025A 50Ω coaxial cable</td>
<td></td>
<td>1</td>
<td>Approx. 1m (S-5DWP-5D2W-S-5DWP), for RF output cable</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>J0127A 50Ω coaxial cable</td>
<td></td>
<td>1</td>
<td>Approx. 1m (BNC-P-RG-58A/U-BNC-P), for modulation signal cable</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>Power cord</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>F0012 (3.15A) or F0013 (5A)</td>
<td>AC fuse</td>
<td>2</td>
<td><em><strong>A (T</strong></em>A250V)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>W0504AE</td>
<td>Operation manual</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
1.3.2 Options

MG3633A options (sold separately) are listed in the table below.

<table>
<thead>
<tr>
<th>Option No.</th>
<th>Model number/Order number</th>
<th>Name</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>MG3633A-01</td>
<td>Reference crystal oscillator</td>
<td>Frequency: 10 MHz&lt;br&gt;Start-up characteristics:&lt;br&gt;( \leq 7 \times 10^{-8} \text{/day (after 30-minute operation)} )&lt;br&gt;Start-up characteristics:&lt;br&gt;( \leq 3 \times 10^{-8} \text{/day (after 60-minute operation)} )&lt;br&gt;Aging rate:&lt;br&gt;( \leq 5 \times 10^{-9} \text{/day (after 24-hour operation)} )&lt;br&gt;Temperature characteristics:&lt;br&gt;( \leq \pm 5 \times 10^{-8} \text{ (at 0(^\circ) to 50(^\circ)C)} )</td>
</tr>
<tr>
<td>02</td>
<td>MG3633A-02</td>
<td>Reference crystal oscillator</td>
<td>Frequency: 10 MHz&lt;br&gt;Start-up characteristics:&lt;br&gt;( \leq 2 \times 10^{-8} \text{/day (after 60-minute operation)} )&lt;br&gt;Aging rate:&lt;br&gt;( \leq 2 \times 10^{-9} \text{/day (after 24-hour operation)} )&lt;br&gt;Temperature characteristics:&lt;br&gt;( \leq \pm 1.5 \times 10^{-8} \text{ (at 0(^\circ) to 50(^\circ)C)} )</td>
</tr>
<tr>
<td>03</td>
<td>MG3633A-03</td>
<td>Reference crystal oscillator</td>
<td>Frequency: 10 MHz&lt;br&gt;Aging rate:&lt;br&gt;( \leq 5 \times 10^{-10} \text{/day (after 48-hour operation)} )&lt;br&gt;Temperature characteristics:&lt;br&gt;( \leq \pm 5 \times 10^{-9} \text{ (at 0(^\circ) to 50(^\circ)C)} )</td>
</tr>
<tr>
<td>04</td>
<td>MG3633A-04</td>
<td>Rear RF output</td>
<td>SMA connector&lt;br&gt;The rear RF output cannot share the connector with the front RF output.</td>
</tr>
<tr>
<td>07</td>
<td>MX5126B</td>
<td>Frequency-response compensation software</td>
<td>Used with PACKET II e, III, III's Computer and ML4803A Power Meter (Appendix C)</td>
</tr>
<tr>
<td>07</td>
<td>MX5251B</td>
<td>Frequency-response compensation software</td>
<td>Used with PACKET V Computer and ML4803A Power Meter (Appendix C)</td>
</tr>
</tbody>
</table>
1.4 Optional Accessories and Peripheral Equipment

The major optional accessories and peripheral equipment for the MG3633A are listed below. The items listed are sold separately.

<table>
<thead>
<tr>
<th>Model number/Order number</th>
<th>Name</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP51A</td>
<td>Impedance Conversion Pad</td>
<td>For matching the MG3633A impedance to that of the measuring system (0 to 200 MHz). MP51A (from a 75Ω system to a 50Ω system) MP52A (from a 50Ω system to a 75Ω system)</td>
</tr>
<tr>
<td>MP52A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP614A</td>
<td>50Ω↔75Ω Impedance Transformer</td>
<td>For matching the MG3633A impedance to that of a 75Ω measuring device (10 to 1200 MHz)</td>
</tr>
<tr>
<td>Z-164A</td>
<td>T-pad</td>
<td>For measuring two-signal characteristics, Z-164A for 50Ω, Z-164B for 75Ω</td>
</tr>
<tr>
<td>Z-164B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP659A</td>
<td>Four-port Junction Pad</td>
<td>For measuring three-signal characteristics</td>
</tr>
<tr>
<td>MP721□</td>
<td>Fixed Attenuator</td>
<td>Nominal attenuations: 3, 6, 10 to 60 dB (10 dB steps), covering the frequency range of DC to 12.4 GHz. For level adjustment and improvement of impedance characteristics.</td>
</tr>
<tr>
<td>B0043</td>
<td>Rack mount kit</td>
<td></td>
</tr>
<tr>
<td>Model number/Order number</td>
<td>Name</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>MG442A</td>
<td>Synthesized Level Generator</td>
<td>For external modulation signal 10 Hz ~ 20 MHz</td>
</tr>
<tr>
<td>MS2602A</td>
<td>Spectrum Analyzer</td>
<td>For automated transmitter/receiver measurements 50 Hz ~ 5.5 GHz</td>
</tr>
<tr>
<td>MS616B</td>
<td>Modulation Analyzer</td>
<td>For automated transmitter/receiver measurements 150 kHz ~ 3 GHz</td>
</tr>
<tr>
<td>ML422A/B/C</td>
<td>Selective Level Meter</td>
<td>For highly-accurate testing of transmission characteristics 20 Hz ~ 30 MHz</td>
</tr>
<tr>
<td>MA1610A</td>
<td>Pulse Modulator</td>
<td>For generating a pulse-modulated RF signal (Appendix B)</td>
</tr>
<tr>
<td>PACKET V</td>
<td>Personal Technical Computer</td>
<td>A controller for remote control of the MG3633A via GP-IB</td>
</tr>
<tr>
<td>MH055B</td>
<td>GP-IB Extender</td>
<td>For converting the GP-IB interface to serial interface.</td>
</tr>
<tr>
<td>MS010A</td>
<td>Multi Function Selector</td>
<td>Controlled by PTA or personal computer via GP-IB. Used as a scanner.</td>
</tr>
<tr>
<td>MB24A</td>
<td>Portable Test Rack</td>
<td>Supports 100 kg.</td>
</tr>
</tbody>
</table>
### 1.5 Specifications

The MG3633A specifications are listed below.

#### Specifications (1/8)

<table>
<thead>
<tr>
<th>Carrier frequency</th>
<th>Range</th>
<th>10 kHz to 2700 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>0.01 Hz</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>Same as that for the reference oscillator</td>
<td></td>
</tr>
</tbody>
</table>

#### Internal reference oscillator *1

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>10 MHz</td>
</tr>
<tr>
<td>Start-up characteristics</td>
<td>After 30-minute operation: $\leq 1 \times 10^{-7}$/day</td>
</tr>
<tr>
<td></td>
<td>After 60-minute operation: $\leq 5 \times 10^{-8}$/day</td>
</tr>
<tr>
<td>Aging rate</td>
<td>After 24-hour operation: $\leq 2 \times 10^{-8}$/day</td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>$\pm 5 \times 10^{-8}$ (0° to 50°C)</td>
</tr>
</tbody>
</table>

| External reference signal input  | 10 MHz, TTL level, BNC connector on rear panel |
| Reference signal output          | 10 MHz, TTL level, BNC connector on rear panel |
| Switching time                   | Elapsed time from last command until frequency has stabilized to within $\pm 500$ Hz of set frequency during remote operation: $\leq 10$ ms |

#### Output level

<table>
<thead>
<tr>
<th>Range</th>
<th>$-143$ to $+23$ dBm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>dBm, dB, V, mV, µV</td>
</tr>
<tr>
<td>(Terminated and open voltages are selected in units of dBµ, V, mV or µV by special function.)</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1 dB</td>
</tr>
<tr>
<td>Frequency response</td>
<td>$\leq \pm 0.5$ dB referred to 0 dBm (&lt;1280 MHz)</td>
</tr>
<tr>
<td></td>
<td>$\leq \pm 1$ dB referred to 0 dBm ($\geq 1280$ MHz)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level accuracy</th>
<th>Frequency (Output level)</th>
<th>10 kHz to &lt;1280 MHz</th>
<th>$\geq 1280$ MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+17.1$ to $+23$ dBm</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$\pm 15.1$ to $+17$ dBm</td>
<td>$\pm 1$ dB</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$-122.9$ to $+15$ dBm</td>
<td>$\pm 1$ dB</td>
<td>$\pm 2$ dB</td>
<td>-</td>
</tr>
<tr>
<td>$-132.9$ to $-123$ dBm</td>
<td>$\pm 3$ dB</td>
<td>$\pm 4$ dB</td>
<td>-</td>
</tr>
<tr>
<td>$-143$ to $-133$ dBm</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*1 Aging rates up to $5 \times 10^{-10}$/day are available as option.
### Specifications (2/8)

<table>
<thead>
<tr>
<th>Output level (Cont.)</th>
<th>Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50Ω, N-type connector</td>
</tr>
<tr>
<td></td>
<td>VSWR: $\leq 1.5$ ($&lt; 1280$ MHz, $\leq -3$ dBm)</td>
</tr>
<tr>
<td></td>
<td>$\leq 1.8$ ($\geq 1280$ MHz, $\leq -3$ dBm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Switching time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elapsed time from last command until output level is stabilized during remote operation:</td>
</tr>
<tr>
<td>$\leq 25$ ms (at LEVEL NORMAL mode)</td>
</tr>
<tr>
<td>$\leq 80$ ms (when setting level is crossing over $-59$ dBm, at LEVEL NORMAL mode)</td>
</tr>
<tr>
<td>$\leq 5$ ms/0.1 dB (at LEVEL CONTINUOUS mode)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interference radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 1 \mu$V (Terminated with 50Ω load, measured 25 mm from front panel with a two-turn 25 mm diameter loop antenna. Interference is greater during sweep.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signal purity</th>
<th>Spurious</th>
</tr>
</thead>
<tbody>
<tr>
<td>At $+7$ dBm, CW mode:</td>
<td>$f_c$: carrier frequency</td>
</tr>
<tr>
<td>Harmonics (2nd, 3rd)</td>
<td>$\leq -30$ dBc (at $\geq 100$ kHz)</td>
</tr>
<tr>
<td>Sub-harmonics ($f_c/2, 3f_c/2, 5f_c/2, 7f_c/2$)</td>
<td>None (at $&lt; 1280$ MHz)</td>
</tr>
<tr>
<td></td>
<td>$\leq -30$ dBc (at $\geq 1280$ MHz)</td>
</tr>
<tr>
<td>Non-harmonics</td>
<td>$\leq -80$ dBc ($f_c &lt; 640$ MHz, $\geq 10$ kHz offset)</td>
</tr>
<tr>
<td></td>
<td>$\leq -74$ dBc ($640$ MHz $\leq f_c &lt; 1280$ MHz, $\geq 10$ kHz offset)</td>
</tr>
<tr>
<td></td>
<td>$\leq -68$ dBc ($f_c \geq 1280$ MHz, $\geq 10$ kHz offset)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SSB phase noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>At $+7$ dBm, CW mode and 0° to 35°C:</td>
</tr>
<tr>
<td>Offset frequency</td>
</tr>
<tr>
<td>$1$ kHz</td>
</tr>
<tr>
<td>$10$ kHz $\leq f_c &lt; 40$ MHz</td>
</tr>
<tr>
<td>$40$ MHz $\leq f_c &lt; 300$ MHz</td>
</tr>
<tr>
<td>$300$ MHz $\leq f_c &lt; 600$ MHz</td>
</tr>
<tr>
<td>$600$ MHz $\leq f_c &lt; 1100$ MHz</td>
</tr>
<tr>
<td>$1100$ MHz $\leq f_c &lt; 2400$ MHz</td>
</tr>
<tr>
<td>$2400$ MHz $\leq f_c$</td>
</tr>
</tbody>
</table>

Floor noise: $\leq -145$ dBc/Hz (at 40 MHz $\leq f_c < 1100$ MHz, $+7$ dBm, CW mode)

<table>
<thead>
<tr>
<th>Residual AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 0.02$% rms at $\geq 150$ kHz (demodulation band: 300 Hz to 3 kHz)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Residual FM</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 0.8$ Hz RMS at $&lt; 1280$ MHz (demodulation band: 300 Hz to 3 kHz)</td>
</tr>
<tr>
<td>$\leq 4$ Hz RMS at $&lt; 1280$ MHz (demodulation band: 50 Hz to 20 kHz)</td>
</tr>
</tbody>
</table>
## Specifications (3/8)

<table>
<thead>
<tr>
<th>Amplitude modulation</th>
<th>Range</th>
<th>0 to 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td></td>
<td>0.1%</td>
</tr>
<tr>
<td>Internal modulation frequency</td>
<td>Fixed frequency</td>
<td>400 Hz, 1 kHz</td>
</tr>
<tr>
<td></td>
<td>Variable frequency</td>
<td>0.1 Hz to 100 kHz, 0.1 Hz resolution</td>
</tr>
<tr>
<td></td>
<td>Frequency accuracy</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± (5% of indicated value + 2%)</td>
<td>[at ≥ 250 kHz, ≤ ± 7 dBm, 0 to 90% and internal 1 kHz]</td>
</tr>
</tbody>
</table>

### Frequency response

<table>
<thead>
<tr>
<th>Frequency response</th>
<th>At ≥ + 7 dBm, ≤ ± 1 dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower modulation frequency limit</td>
<td>20 Hz (EXT AC mode)</td>
</tr>
<tr>
<td>Upper modulation frequency limit</td>
<td>Modulation factor</td>
</tr>
<tr>
<td>Carrier frequency</td>
<td>0.25 MHz ≤ f_c &lt; 0.5 MHz</td>
</tr>
<tr>
<td></td>
<td>0.5 MHz ≤ f_c &lt; 80 MHz</td>
</tr>
<tr>
<td></td>
<td>80 MHz ≤ f_c</td>
</tr>
</tbody>
</table>

### External modulation

| Input level | Approx. 2V_{p-p} / 600Ω |
| Input impedance | Nominal 600Ω |

### Distortion

- ≤ 1% (at ≥ 1 MHz, ≤ +7 dBm, internal 1 kHz, 30%)
- ≤ 3% (at ≥ 1 MHz, ≤ +7 dBm, internal 1 kHz, 80%)
- ≤ 3% (at 250 kHz ≤ f_c < 1 MHz, < +7 dBm, internal 1 kHz, 30%)
- ≤ 10% (at 250 kHz ≤ f_c < 1 MHz, < +7 dBm, internal 1 kHz, 80%)

### Incidental FM

- < 200 Hz peak (at ≥ 250 kHz, ≤ +7 dBm, internal 1 kHz, 30%, demodulation band 0.3 to 3 kHz)
### Specifications (4/8)

<table>
<thead>
<tr>
<th>Frequency Modulation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 to 400 kHz (1 MHz ≤ f_c &lt; 40 MHz)</td>
</tr>
<tr>
<td></td>
<td>0 to 100 kHz (40 MHz ≤ f_c &lt; 80 MHz)</td>
</tr>
<tr>
<td></td>
<td>0 to 200 kHz (80 MHz ≤ f_c &lt; 160 MHz)</td>
</tr>
<tr>
<td></td>
<td>0 to 400 kHz (160 MHz ≤ f_c &lt; 320 MHz)</td>
</tr>
<tr>
<td></td>
<td>0 to 800 kHz (320 MHz ≤ f_c &lt; 640 MHz)</td>
</tr>
<tr>
<td></td>
<td>0 to 1.6 MHz (640 MHz ≤ f_c &lt; 1280 MHz)</td>
</tr>
<tr>
<td></td>
<td>0 to 3.2 MHz (1280 MHz ≤ f_c)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resolution</th>
<th>10 Hz (0 to 9.99 kHz deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100 Hz (10 to 99.9 kHz deviation)</td>
</tr>
<tr>
<td></td>
<td>1 kHz (100 to 999 kHz deviation)</td>
</tr>
<tr>
<td></td>
<td>10 kHz (1 to 3.2 MHz deviation)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal Modulation Frequency</th>
<th>Fixed frequency</th>
<th>400 Hz, 1 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Variable frequency</td>
<td>0.1 to 100 kHz, 0.1 Hz resolution</td>
</tr>
<tr>
<td></td>
<td>Frequency accuracy</td>
<td>100 ppm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>± (5% of indicated value + 20 Hz), (Internal 1 kHz)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Frequency Response</th>
<th>±1 dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>EXT AC mode: 20 Hz to 100 kHz</td>
</tr>
<tr>
<td></td>
<td>EXT DC mode: DC to 100 kHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External Modulation</th>
<th>Input level</th>
<th>Approx. 2V_p-p/600Ω, polarity may be changed using special function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input Impedance</td>
<td>Nominal 600Ω</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distortion</th>
<th>≤ 1% (Internal 1 kHz, 3.5 kHz deviation)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Incidental AM</th>
<th>≤ 0.4% (Internal 1 kHz, 22.5 kHz deviation, 0.3 to 3 kHz demodulation band)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Carrier Frequency Accuracy in DC-FM mode</th>
<th>±500 Hz during 30 minutes at 2 hours after calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[at &lt;1280 MHz, &lt;10 kHz deviation]</td>
</tr>
<tr>
<td>Specifications (5/8)</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td></td>
</tr>
<tr>
<td>0 to 80 rad (1 MHz ≤ f_c &lt; 40 MHz)</td>
<td></td>
</tr>
<tr>
<td>0 to 20 rad (40 MHz ≤ f_c &lt; 80 MHz)</td>
<td></td>
</tr>
<tr>
<td>0 to 40 rad (80 MHz ≤ f_c &lt; 160 MHz)</td>
<td></td>
</tr>
<tr>
<td>0 to 80 rad (160 MHz ≤ f_c &lt; 320 MHz)</td>
<td></td>
</tr>
<tr>
<td>0 to 160 rad (320 MHz ≤ f_c &lt; 640 MHz)</td>
<td></td>
</tr>
<tr>
<td>0 to 320 rad (640 MHz ≤ f_c &lt; 1280 MHz)</td>
<td></td>
</tr>
<tr>
<td>0 to 640 rad (1280 MHz ≤ f_c)</td>
<td></td>
</tr>
<tr>
<td>Besides radian, deg unit is also possible for phase deviation display. However, max. 999 deg.</td>
<td></td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td></td>
</tr>
<tr>
<td>0.01 rad (0 to 9.99 rad deviation)</td>
<td></td>
</tr>
<tr>
<td>0.1 rad (10 to 99.9 rad deviation)</td>
<td></td>
</tr>
<tr>
<td>1 rad (100 to 640 rad deviation)</td>
<td></td>
</tr>
<tr>
<td><strong>Internal modulation frequency</strong></td>
<td></td>
</tr>
<tr>
<td>Fixed frequency 400 Hz, 1 kHz</td>
<td></td>
</tr>
<tr>
<td>Variable frequency 0.1 Hz to 100 kHz, 0.1 Hz resolution</td>
<td></td>
</tr>
<tr>
<td>Frequency accuracy 100 ppm</td>
<td></td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td></td>
</tr>
<tr>
<td>± (10% of indicated value + 0.05 rad) [at Internal 1 kHz]</td>
<td></td>
</tr>
<tr>
<td><strong>Frequency response</strong></td>
<td></td>
</tr>
<tr>
<td>± 1 dB</td>
<td></td>
</tr>
<tr>
<td>Frequency range EXT AC mode: 20 Hz to 5 kHz</td>
<td></td>
</tr>
<tr>
<td>EXT DC mode: DC to 5 kHz</td>
<td></td>
</tr>
<tr>
<td><strong>External modulation</strong></td>
<td></td>
</tr>
<tr>
<td>Input level Approx. 2V_p-p/600Ω, polarity may be changed using special function</td>
<td></td>
</tr>
<tr>
<td>Input impedance Nominal 600Ω</td>
<td></td>
</tr>
<tr>
<td><strong>Distortion</strong></td>
<td></td>
</tr>
<tr>
<td>≤ 1% (Internal 1 kHz, 5 rad deviation)</td>
<td></td>
</tr>
<tr>
<td><strong>Internal modulation signal</strong></td>
<td></td>
</tr>
<tr>
<td>Frequency range 400 Hz, 1 kHz (fixed)</td>
<td></td>
</tr>
<tr>
<td>0.1 Hz to 100 kHz (variable)</td>
<td></td>
</tr>
<tr>
<td>DC voltage signals equivalent peak values of internal modulating sine-wave can be applied as a modulating signal using the special function.</td>
<td></td>
</tr>
<tr>
<td>Resolution 0.1 Hz</td>
<td></td>
</tr>
<tr>
<td>Frequency accuracy 100 ppm</td>
<td></td>
</tr>
<tr>
<td><strong>Distortion</strong></td>
<td></td>
</tr>
<tr>
<td>≤ 0.03% (fixed 400 Hz and 1 kHz)</td>
<td></td>
</tr>
<tr>
<td>≤ 0.3% (variable 20 Hz to 50 kHz)</td>
<td></td>
</tr>
<tr>
<td><strong>Memory function</strong></td>
<td></td>
</tr>
<tr>
<td>Frequency memory 1000 carrier frequencies (store/recall)</td>
<td></td>
</tr>
<tr>
<td>Function memory 100 panel settings (store/recall)</td>
<td></td>
</tr>
</tbody>
</table>
## Specifications (6/8)

<table>
<thead>
<tr>
<th>Sweep function</th>
<th>Sweep pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sweep mode</strong></td>
<td><strong>Carrier frequency, output level, AF frequency</strong></td>
</tr>
<tr>
<td>Pattern</td>
<td>Carrier frequency</td>
</tr>
<tr>
<td>Start/stop</td>
<td>✓</td>
</tr>
<tr>
<td>Center/span</td>
<td>✓</td>
</tr>
<tr>
<td>Entering number of steps</td>
<td>✓</td>
</tr>
<tr>
<td>Entering step size</td>
<td>✓</td>
</tr>
<tr>
<td>LOG 1%</td>
<td>✓</td>
</tr>
<tr>
<td><em>(2)</em> Span: Max. 20 dB</td>
<td></td>
</tr>
<tr>
<td><em>(3)</em> 0.1 dB step size only</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Frequency memory</th>
<th>Function memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous address</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Random address</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Continuous, random mixed</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Maximum number of steps</td>
<td>*4 20</td>
<td>*4 20</td>
</tr>
<tr>
<td><em>(4)</em> One continuous address setting is counted as 3 steps.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sweep time</th>
<th>Carrier frequency sweep (at CW): 2 ms/step to 600 s/step</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carrier frequency sweep (at FM/ΦM): 3 ms/step to 600 s/step</td>
</tr>
<tr>
<td></td>
<td>Output level sweep: 1 ms/step to 600 s/step</td>
</tr>
<tr>
<td></td>
<td>AF frequency sweep: 1 ms/step to 600 s/step</td>
</tr>
<tr>
<td></td>
<td>Settable range: 0.1 ms/step to 600 s/step, resolution 0.01 ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other function</th>
<th>Marker</th>
</tr>
</thead>
<tbody>
<tr>
<td>One movable marker, output from MARKER on rear panel</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other function</th>
<th>Sweep signal output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staircase (≈ saw-tooth waveform), output from SWEEP OUTPUT on front panel</td>
<td></td>
</tr>
<tr>
<td>Start point: 0V, Stop point: 10 V</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other function</th>
<th>Modulation signal output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulation signal is output when modulating</td>
<td></td>
</tr>
<tr>
<td>Output level: Approx. 2 V pp/600Ω</td>
<td></td>
</tr>
</tbody>
</table>
### Specifications (7/8)

<table>
<thead>
<tr>
<th></th>
<th>Simultaneous modulation is possible in combinations shown below.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INT AM</td>
</tr>
<tr>
<td>EXT φM</td>
<td>✓</td>
</tr>
<tr>
<td>INT φM</td>
<td></td>
</tr>
<tr>
<td>EXT FM</td>
<td>✓</td>
</tr>
<tr>
<td>INT FM</td>
<td></td>
</tr>
<tr>
<td>EXT AM</td>
<td>✓</td>
</tr>
</tbody>
</table>

*5 Uses same internal modulation frequency
*6 Different deviation settings are possible for INT and EXT modulations (using special function).

<table>
<thead>
<tr>
<th>Other function</th>
<th>Relative value display</th>
<th>Carrier frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Output level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other function</th>
<th>Continuously variable output level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuously variable within a ±10 dB range of the set level</td>
</tr>
<tr>
<td></td>
<td>Step size: 0.1 dB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other function</th>
<th>Trigger function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Previously programmed operation procedure can be started by a trigger input through its input terminal (on rear panel, BNC connector, TTL level) or GP-IB.</td>
</tr>
<tr>
<td></td>
<td>Maximum program steps for triggered operation: 99 steps</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other function</th>
<th>Memory backup</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Last settings are stored when power is turned off. The following contents are not backed-up: data during key input and GP-IB transfer, remote status, and trigger program execution status.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other function</th>
<th>GP-IB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All functions except POWER switch, PANEL LOCK key and LOCAL key can be controlled. Talk-only and listen-only modes are provided.</td>
</tr>
<tr>
<td></td>
<td>Interface: SH1, AH1, T5, L3, TE0, LE0, SR1, RL1, PP0, DC1, DT1, C0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other function</th>
<th>Reverse power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum reverse input power</td>
</tr>
<tr>
<td></td>
<td>50W (&lt;1000 MHz), 25W (≥1000 MHz), ±50 Vdc</td>
</tr>
</tbody>
</table>
### Specifications (8/8)

<table>
<thead>
<tr>
<th>General</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature, rated range of use</td>
<td>0° to 50°C</td>
</tr>
<tr>
<td>Power</td>
<td>**Vac +10%/-15% (max. 250 Vac), 47.5 to 63 Hz, ≦270 VA</td>
</tr>
<tr>
<td>Conducted disturbance</td>
<td>EN 61326-1: 2006 (Class A)</td>
</tr>
<tr>
<td>Radiated disturbance</td>
<td>EN 61326-1: 2006 (Class A)</td>
</tr>
<tr>
<td>Harmonic Current Emission</td>
<td>EN 61000-3-2: 2006 (Class A)</td>
</tr>
<tr>
<td>Electrostatic Discharge</td>
<td>EN 61326-1: 2006 (Table 2)</td>
</tr>
<tr>
<td>Electromagnetic Field Immunity</td>
<td>EN 61326-1: 2006 (Table 2)</td>
</tr>
<tr>
<td>Fast Transient / Burst</td>
<td>EN 61326-1: 2006 (Table 2)</td>
</tr>
<tr>
<td>Surge</td>
<td>EN 61326-1: 2006 (Table 2)</td>
</tr>
<tr>
<td>Conducted RF</td>
<td>EN 61326-1: 2006 (Table 2)</td>
</tr>
<tr>
<td>Voltage Dips / Short Interruptions</td>
<td>EN 61326-1: 2006 (Table 2)</td>
</tr>
<tr>
<td>Dimensions &amp; mass</td>
<td>177H × 426W × 451D mm, ≦32 kg</td>
</tr>
</tbody>
</table>
SECTION 2
PRECAUTION

This section describes the preparatory work which must be performed before using the MG3633A Synthesized Signal Generator and the precautions relating to (1) installation and (2) power supply. For GP-IB cable connection, address setting, etc, see Separate GP-IB manual.

TABLE OF CONTENTS

2.1 Installation Precautions ........................................ 2-1
  2.1.1 Installation site environmental conditions .................. 2-1
  2.1.2 Rack mounting .............................................. 2-2
2.2 Power Supply Safety Measures ................................. 2-2
  2.2.1 Connecting the Power Cord ................................. 2-2
  2.2.2 Fuse replacement ............................................ 2-3
SECTION 2
PRECAUTION

2.1 Installation Precautions
This paragraph describes the MG3633A Synthesized Signal Generator installation precautions and mechanical assembly procedure for mounting the MG3633A in a rack.

2.1.1 Installation site environmental conditions

(1) Location to avoid
The MG3633A operates normally at ambient temperatures of 0° to 50°C. However, for best performance, do not use or store it in locations where:

- It may be subjected to strong vibrations
- It may be exposed to extreme humidity or dust
- It may be exposed to direct sunlight
- It may be exposed to explosive gases

To maintain stable measurement for a long time, in addition to meeting the conditions listed above, the MG3633A should be used at stable room temperatures and where the AC line voltage fluctuations are small.

CAUTION: If the MG3633A is used at room temperature after being used or stored at a low temperature for a long time, condensation may occur inside the instrument which could cause short circuiting. Always ensure that the MG3633A is thoroughly dry before turning on the power.

(2) Fan clearance
To prevent excessive temperature increase inside the MG3633A, a cooling fan is mounted on the rear panel. Leave a space of at least 10 cm between the rear panel and walls, peripheral devices, obstructions, etc. so that air flow is not obstructed. Do not use the MG3633A on its side.
2.1.2 Rack mounting

To mount the MG3633A in a rack, the optional rack mounting kit (sold separately) is necessary. Order the rack mounting kit by using the order number B0043. Mounting instructions are supplied with the kit.

2.2 Power Supply Safety Measures

The MG3633A operates normally on a **Vac +10% to 15%, 47.5 to 63 Hz power supply. Turn on the AC power only after taking precautions against the following hazards.

- Electric shock
- Damage due to the abnormal power supply voltage
- Earth current

Therefore, observe the following safety measures before supplying AC power.

2.2.1 Connecting the Power Cord

Check that the POWER switch on the rear panel is turned off. Insert the power plug into an outlet, and connect the other end to the power inlet on the rear panel. To ensure that the instrument is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with a ground terminal.

**WARNING:** If the power cord is connected without the instrument grounded, there is a risk of receiving a fatal electric shock. In addition, the peripheral devices connected to the instrument may be damaged.

When connecting to the power supply, DO NOT connect to an outlet without a ground terminal. Also, avoid using electrical equipment such as an extension cord or a transformer.

**CAUTION:** If an emergency arises causing the instrument to fail or malfunction, disconnect the instrument from the power supply by either turning off the POWER switch on the rear panel, or by pulling out the power cord or the power inlet.

When installing the instrument, place the instrument so that an operator may easily operate the POWER switch.

If the instrument is mounted in a rack, a power switch for the rack or a circuit breaker may be used for power disconnection.

It should be noted that, the power switch on the front ~LINE of the instrument is a standby switch, and cannot be used to cut the main power.
2.2.2 Fuse replacement

The MG3633A is supplied with two fuses rated as described below.

The relationship between power supply voltage and current rating is shown below.

<table>
<thead>
<tr>
<th><strong>Vac</strong></th>
<th>***A (Time lag type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 V/110 to 115 V/120 to 127 V</td>
<td>5 A</td>
</tr>
<tr>
<td>200 V/220 to 230 V/240 V</td>
<td>3.15 A</td>
</tr>
</tbody>
</table>

The fuses are to be loaded inside the fuse holders.

If a fuse blows, locate the cause before replacing.

**WARNING:**

- Before replacing a fuse, turn off the POWER switch and unplug the power cord from the AC outlet. Never replace a fuse with the power cord connected.
- Before turning on the power after replacing a fuse, check the protective grounding described in paragraph 2.2.1 and check that the AC supply voltage is suitable. There may be an electric shock hazard if the power is turned on without the protective grounding. If the AC supply voltage is unsuitable, the equipment may be damaged. The fuse replacement procedure is described below.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the POWER switch on the front panel to STBY and the ~LINE switch on the rear panel to OFF, and unplug the power cord from the AC outlet.</td>
</tr>
<tr>
<td>2</td>
<td>Turn the fuse-holder cap counterclockwise and remove the cap together with the fuse.</td>
</tr>
<tr>
<td>3</td>
<td>Remove the blown fuse from the cap and replace it with a spare fuse of the same rating.</td>
</tr>
<tr>
<td>4</td>
<td>Refit the cap and turn it clockwise until it will turn no further.</td>
</tr>
</tbody>
</table>

**CAUTION:** If there are no spare fuses, check that the replacement you obtain is of the same type, rated voltage and current as the original.

- If the fuse is not the same type, it may not fit the holder, contact may be poor, or the fusing time may be too long.
- If the rated voltage and current of the replacement fuse are too high and trouble reoccurs, the new fuse may not blow and the instrument could catch fire.
SECTION 3
PANEL LAYOUT AND PREPARATION

This section describes the control functions on the MG3633A front and rear panels and provides preparative instructions. As a reference, front and rear panel fold-out illustrations are located in APPENDIX A.

TABLE OF CONTENTS

3.1 Layout and Function of Controls ........................................ 3-1
3.2 Power On ................................................................. 3-11
  3.2.1 ~LINE ON/OFF on rear panel ..................................... 3-11
  3.2.2 POWER ON/STBY on front panel ................................. 3-12
3.3 Preparation Before Operation ......................................... 3-13
  3.3.1 Using internal reference oscillator ............................... 3-13
  3.3.2 Using external reference oscillator .............................. 3-15
### SECTION 3
**PANEL LAYOUT AND PREPARATION**

#### 3.1 Layout and Function of Controls

The front and rear panels are illustrated in a fold-out located on the last pages of this operation manual as Figs. A-1 and A-2 in APPENDIX A.

For easy reference, numbers in the following table correspond with control layout on the front and rear panel illustrations.

<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image" alt="STATUS" /></td>
<td>[STATUS] key: When [STATUS] is pressed while its corresponding LED is blinking, an error message is indicated on the FREQUENCY display.</td>
</tr>
<tr>
<td>2</td>
<td><img src="image" alt="MODULATION" /></td>
<td>Displays the AM modulation factor (%). UNCAL LED lights at AM UNCAL.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Resolution digit" /></td>
<td>Resolution digit MONITOR LED</td>
</tr>
<tr>
<td>3</td>
<td><img src="image" alt="MODULATION" /></td>
<td>Displays the FM frequency deviation or ØM phase deviation. UNCAL LED lights at FM and ØM UNCAL.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Resolution digit" /></td>
<td>Resolution digit MONITOR LED</td>
</tr>
</tbody>
</table>
| 4   | ![MODULATION](image) | The keys in this section are used to set the FM or ØM modulation input mode at FM or ØM. FM or ØM mode is selected with a header key [FM/ØM] (22).  
- [INT] key:  
  - Sets the internal modulation mode.  
- [EXT AC] key:  
  - Sets to the external modulation AC mode.  
- [EXT DC] key:  
  - Sets to the external modulation DC mode.  
- [ON/OFF] key:  
  - Turns off the FM or ØM modulation. When the key is pressed again, the mode returns to the previously set status.  
- [FREQ CAL] key:  
  - When [EXT DC] is pressed after pressing [SHIFT] in the EXT DC mode, the carrier frequency can be calibrated. |
<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>INT MOD FREQ</td>
<td>[INT MOD FREQ] key: Selects the internal modulation frequency. Every time it is pressed, the frequency is switched in the order of AF, 1 kHz, and 400 Hz.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image" alt="INT MOD FREQ" /></td>
</tr>
<tr>
<td>6</td>
<td>RELATIVE FREQ CUR FREQ DISPLAY</td>
<td>[RELATIVE FREQ] key: Used for displaying the relative frequency. [CUR FREQUENCY] key: Used to display the real frequency when the relative frequency is displayed. Press [SHIFT], then [RELATIVE FREQ]. While it is pressed, the real frequency continues to be displayed.</td>
</tr>
<tr>
<td>7</td>
<td><img src="image" alt="Frequency Display" /></td>
<td>Displays the carrier frequency or AF frequency, which are also used to display various error messages, etc. MONITOR LED is mainly used to announce a resolution digit, which is also used to monitor the number of the memory sweep step and the special function code.</td>
</tr>
<tr>
<td>No.</td>
<td>Label</td>
<td>Explanation</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 8   | **DATA ENTRY**         | - [0] to [9], [●], and [–] keys: Used for setting the numeric data.  
     |                         | - [GHz/dBm], [MHz/dBμ], [kHz/mV], and [Hz/μV] keys: Sets appropriate units after data is set. |
|     | 7 8 9                  |                                                       |
|     | 4 5 6                  |                                                       |
|     | 1 2 3                  |                                                       |
|     | 0 ● –                  |                                                       |
| 9   | [RELATIVE LEVEL] key:  | Used for displaying the relative output level.        |
|     | [CUR LEVEL DISPLAY] key: Used to display the real output level when the relative output level is displayed. Press [SHIFT], then [RELATIVE LEVEL].  
<pre><code> |                                                       | While it is pressed, the real output level continues to be displayed. |
</code></pre>
<p>| 10  | OUTPUT LEVEL           | Displays the output level                             |
|     | + 0.0000               |                                                       |
|     | dBM V dBμ mV dB µV     |                                                       |
|     | CONT EMF               |                                                       |
|     | UNCAL                  |                                                       |
|     | Resolution digit       |                                                       |
|     | MONITOR RED            |                                                       |
| 11  | [RESET] key:           | Resets the amount changed with the rotary knob (12) and INCREMENT keys (13). |
|     | [REF DISPLAY] key:      | Used to indicate the last value set with the data key or the reference value in the RELATIVE mode. Press [SHIFT], then [RESET]. While it is pressed, the value continues to be displayed. |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 12  | ![Resolution Knob](image) | - **Rotary knob:** Varies the displayed resolution digit corresponding to the Resolution digit MONITOR LED lighting in the display.  
- **[RESOLUTION] key:** Sets resolution selected using the rotary knob. The resolution digit is indicated in the Resolution digit MONITOR LED.  
- **[LEVEL NORMAL] key:** Returns output level to NORMAL mode. Press [SHIFT], then RESOLUTION [<].  
- **[LEVEL CONTINUOUS] key:** Sets output level to CONTINUOUS mode. Press [SHIFT], then RESOLUTION [>].  
- **[HOLD] key:** Invalidates rotary knob operation. LED lights to indicate HOLD mode. |
<p>| 13  | <img src="image" alt="Increment Knob" /> | - <strong>[INCREMENT] key:</strong> Increments or decrements the set data with a value set using [INCR SET] when the header key (21, 22) is set. However, this set value is incremented or decremented by 10% at AM and by 10 times or 1/10 at FM and ØM. |
| 14  | <img src="image" alt="Output" /> | <strong>OUTPUT:</strong> Outputs 0.01 to 2700 MHz, $-143$ to $+23$ dBm signal with 50Ω output impedance |
| 15  | <img src="image" alt="Reverse Power" /> | <strong>REVERSE POWER:</strong> Blinks if the reverse power protection (RPP) circuit operates due to reverse power input. |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 16  | ![RF OFF/ON]
|     | OUTPUT | - [RF OFF/ON] key: Turns off the output level. When it is pressed again, the output level before turning off is obtained. LED lights to indicate OFF setting. |
|     | ![RPP RESET] | - [RPP RESET] key: When the reverse power protection (RPP) circuit operates due to the reverse power input, pressing this key releases RPP operation and returns to the normal status. Press [SHIFT], then [RF OFF/ON]. |
| 17  | ![MEMO]
|     | ![FREQ FUNCTION] | The keys in this section are used to operate the memory function. |
|     | ![STORE RECALL] | - [FREQ] key: Sets FREQ-memory mode. |
|     | | - [FUNCTION] key: Sets FUNCTION-memory mode. |
|     | | Either FREQ memory or FUNCTION memory is always set. |
|     | | - [STORE] key: Used as a data storage delimiter. Press this key after inputting an address. |
|     | | - [RECALL] key: Used as a data recall delimiter. Press this key after inputting an address. |
| 18  | ![SWEEP PATTERN]
|     | ![START STOP SPAN MEMORY] | The keys in this section are used to set the sweep patterns. |
|     | | - [START] key: Sets the START-STOP sweep and also serves as a header key to set the START point. |
|     | | - [STOP] key: Header key to set stop point. |
|     | | - [SPAN] key: Sets the CENTER-SPAN sweep and also serves as a header key to set the SPAN value. |
|     | | - [MEMORY] key: Sets the memory sweep. |
| 19  | ![SWEEP STEP]
<p>|     | ![STEP N STEP SIZE 1% TIME/STEP] | The keys in this section are used to set the sweep steps. |
|     | | - [STEP N] key: Sets the sweep mode which specifies the number of steps. Also serves as a header key to set the number of steps. |
|     | | - [STEP SIZE] key: Sets the sweep mode which specifies the STEP SIZE and also serves as a header key to set the STEP SIZE |
|     | | - LOG [1%] key: Sets the LOG sweep |
|     | | - [TIME/STEP] key: Header key to set the sweep time. |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>![INCR SET]</td>
<td>• [INCR SET] key: Header key to set the increment value when increment operation is performed with the [INCREMENT] (13).</td>
</tr>
</tbody>
</table>
| 21  | ![FUNCTION] | • [FREQ] key: Header key for setting the carrier frequency. When LED on the [FREQ] lights, the numeric data key, [INCREMENT], and rotary knob are operated only for setting the carrier frequency. For sweep operation, it also selects the carrier frequency sweep.  
  • [LEVEL] key: Header key for setting the output level. When LED on the [LEVEL] lights, the numeric data key, [INCREMENT] and the rotary knob are operated only for setting the output level. For sweep operation, it also selects the output level sweep.  
  • [AF] key: Header key for setting the AF frequency. When LED on the [AF] lights, the numeric data key, [INCREMENT] and rotary knob are operated only for setting the AF frequency. For sweep operation, it also selects the AF-frequency sweep. |
| 22  | ![AM/FM/ØM] | • [AM] key: Header key for setting the AM modulation factor. When LED on the [AM] lights, the numeric data key, [INCREMENT] and rotary knob are operated only for setting the AM modulation factor. Pressing this key turns on AM modulation.  
  • [FM] key: Header key for setting the FM frequency deviation. When LED on the [FM] lights, the numeric data key, [INCREMENT] and rotary knob are operated only for setting the FM frequency deviation. Pressing this key turns on FM modulation.  
  • [ØM] key: Header key for setting the ØM phase deviation. When LED on the [ØM] lights, the numeric data key, [INCREMENT] and rotary knob are operated only for setting the ØM phase deviation. Pressing this key turns on the ØM modulation. |
<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>SHIFT</td>
<td>● [SHIFT] key: To select the blue-character key function on the front panel, press [SHIFT] before pressing the required blue-character key.</td>
</tr>
<tr>
<td>24</td>
<td>SPECIAL</td>
<td>● [SPECIAL] key: To expand function in addition to the functions indicated on the front panel key, enter a two-digit numeric code after pressing [SPECIAL]. (This is called a special function.)</td>
</tr>
<tr>
<td>25</td>
<td>SWEEP OUTPUT</td>
<td>● [SWEEP OUTPUT] key: Outputs a 0 to 10 V staircase-sawtooth wave synchronous with the sweeping output.</td>
</tr>
</tbody>
</table>
| 26  | AM INPUT MODULATION FM/ΩM INPUT OUTPUT | ● AM INPUT: AM external modulation input terminal. Input the level so that the LEVEL indicator green LED may light.  
● FM/ΩM INPUT: FM/ΩM external modulation input terminal. Input the level so that the LEVEL indicator green LED may light.  
● OUTPUT: Output terminal for monitoring the modulation signal. The output signal differs depending on the modulation setting. |
| 27  | SWEEP AUTO SINGLE MANUAL MARKER OFF | The keys in this section are used to set the sweep modes.  
● [AUTO] key: Activates a repeated sweep with the preset sweep pattern.  
● [SINGLE] key: Activates a single sweep with the preset sweep pattern.  
● [MANUAL] key: Performs step-up or step-down sweep set manually with the rotary knob or [INCREMENT].  
● [OFF] key: Stops sweeping.  
● [MARKER] key: When [MANUAL] is pressed after pressing [SHIFT] in AUTO or SINGLE mode, the marker is turned ON and the marker signal is output from the rear panel MARKER connector. |
<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td><img src="image" alt="POWER switch" /></td>
<td>• <strong>POWER switch</strong>: When this switch is set to the <strong>ON</strong> position, power is supplied to the MG3633A. When this switch is set to the <strong>STBY</strong> position, power is supplied only to the stable reference crystal oscillator circuit.</td>
</tr>
<tr>
<td>29</td>
<td><img src="image" alt="PANEL LOCK" /></td>
<td>• <strong>[PANEL LOCK]</strong> key: Invalidates all operating instructions from the front panel. While the panel is locked, the panel lock LED is lit. When it is pressed again, the panel lock is released.</td>
</tr>
<tr>
<td>30</td>
<td><img src="image" alt="REMOTE" /></td>
<td>• <strong>[LOCAL]</strong> key: Shifts the <strong>REMOTE</strong> status to the <strong>LOCAL</strong> status. The trigger program can be stopped by pressing this key during trigger program execution.</td>
</tr>
</tbody>
</table>
| 31  | ![AM modulation keys](image) | The keys in this section are used to set the AM modulation input mode at AM. AM mode is selected with a header key **[AM]** (22).  
• **[INT]** key: Sets the internal modulation mode.  
• **[EXT AC]** key: Sets the external modulation AC mode.  
• **[EXT DC]** key: Sets the external modulation DC mode.  
• **[ON/OFF]** key: Turns on/off the AM modulation. |
| 32  | ![I/O connectors](image) | I/O connectors for the reference signal  
• **REF OUTPUT**: Internal 10 MHz reference oscillator output connector.  
• **REF INPUT**: Reference signal input connector, used usually to input the 10 MHz signal output from the **REF OUTPUT** connector using a U link. It can also be used to input an external reference signal. An external reference signal 10 MHz of TTL level can be used. |
<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 33  | SWEEP STATUS | The connectors in this section are used as auxiliary output connector related to sweeping.  
- SWEEP STATUS: Status signal output connector indicating that sweeping is executed. "H" level is obtained during sweep execution.  
- MARKER: Used for the marker function. When the current point and the marker point match, a positive pulse is generated.  
- SRQ: Used for SRQ output when marker is OFF. A negative pulse is output when an SRQ is generated.  
- BLANKING: A positive pulse is generated at each sweep step. The pulse polarity can be changed to negative using the special function. |
| 34  | MARKER (SRQ) | GP-IB: With GP-IB remote control, the GP-IB interface bus is connected to this connector. In the remote mode, the front panel REMOTE LED lights. |
| 35  | BLANKING | ~LINE: Power switch on the power-transformer primary side. This switch turns on and off all power to the MG3633A (including the reference oscillator). |
| 36  | | ~LINE, 47.5-63Hz VA MAX AC power inlet  
Fuse holders for two 300mA fuses |
<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>![Ground Symbol]</td>
<td>Ground this frame ground (FG) terminal to prevent accidental electric shock.</td>
</tr>
<tr>
<td>38</td>
<td>![Diagram]</td>
<td>Exhausts heat from the MG3633A. Leave a space of at least 10 cm between the fan and other device.</td>
</tr>
<tr>
<td>39</td>
<td>![Trigger Symbol]</td>
<td>• TRIGGER: Connector to input the program start pulse when the trigger function is used. When the negative logic pulse is input, the preset trigger program is performed at the falling edge of the pulse.</td>
</tr>
<tr>
<td>40</td>
<td>![AUX Symbol]</td>
<td>• AUX: Power source for MA1610A Pulse Modulator</td>
</tr>
<tr>
<td>41</td>
<td>![Buffer Output Symbol]</td>
<td>• BUFFER OUTPUT: Outputs the buffered TTL-level external reference signal or the internal reference signal input into the REF INPUT.</td>
</tr>
<tr>
<td>42</td>
<td>![Output Symbol]</td>
<td>• OUTPUT (OPT): This is the SMA-type connector which is used to output the RF signal from the rear panel. It is provided when specifying the option 04, and when an output connector on the front panel is not provided.</td>
</tr>
</tbody>
</table>
3.2 Power On

This paragraph describes the power switches on the front and rear panels and their relationship to each other.

- ~LINE ON/OFF on the rear panel
- POWER ON/STBY on the front panel

3.2.1 ~LINE ON/OFF on rear panel

Before turning on the power to the MG3633A, ground the instrument as described in paragraph 2.2.1, then plug the power cord into an AC inlet.

**WARNING:** If the power is turned on without the frame grounded, there is a danger of electric stock. When a 3-pole (grounded type 2-pole) AC outlet is not available, always connect the rear panel frame ground (FG) terminal to earth potential.

**CAUTION:** If the AC line voltage is incorrect, the instrument may be damaged. Before turning on the power to the MG3633A, check that the AC line voltage is **V + 10% / - 15%**.

![Fig. 3-1 Rear-Panel POWER Switch](image)

- **ON:** When the front-panel POWER switch is ON, power is supplied to all the MG3633A circuits and the MG3633A enters ready status. When the front-panel POWER switch is set to STBY, AC power is supplied only to the internal reference crystal oscillator circuit to warm it up. The STBY LED on the front-panel POWER switch is lit.

- **OFF:** The AC power is turned off even if the front-panel POWER switch is set to the ON.
3.2.2 POWER ON/STBY on front panel

The POWER switch on the front panel is used when the ~LINE switch on the rear panels set to ON.

**Note:** Succeeding pages describe the status with the rear-panel ~LINE switch set to ON unless otherwise specified except when all the MG3633A circuits must be turned off.

![Diagram of POWER Switch]

**STBY:** At STBY when the rear-panel ~LINE switch is ON, power is supplied only to the reference crystal oscillator circuit and the STBY LED is lit.

**ON:** When the rear-panel ~LINE switch is ON, LED is lit and power is supplied to all the MG3633A circuits and the MG3633A enters the ready state.

Fig. 3-2 Front-Panel POWER Switch
3.3 Preparation Before Operation
This paragraph details the necessary preparations for operation of the MG3633A.

- Using the internal reference oscillator
- Using an external reference oscillator

3.3.1 Using internal reference oscillator
The reference oscillator must be warmed-up before using the MG3633A.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground the rear-panel FG terminal when the power cord is 2-pole (no ground) type.</td>
</tr>
<tr>
<td>2</td>
<td>Before plugging the power cord into an AC outlet, check that the AC line voltage is correct.</td>
</tr>
<tr>
<td>3</td>
<td>After checking that the rear-panel ~LINE switch is set to OFF and the front-panel POWER switch is set to STBY, plug the power cord into the AC outlet.</td>
</tr>
<tr>
<td>4</td>
<td>Set the rear-panel ~LINE switch to ON. (The internal reference oscillator circuit will be energized and the oscillator will be warmed-up. Always warm-up the oscillator properly for stable measurement.) The times required to warm-up the reference oscillator is listed in the table below.</td>
</tr>
</tbody>
</table>

Reference Crystal Oscillator Stability

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard model</th>
<th>Option 01</th>
<th>Option 02</th>
<th>Option 03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-up characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After 30-minute operation</td>
<td>(\leq 1 \times 10^{-7}/\text{day})</td>
<td>(\leq 7 \times 10^{-8}/\text{day})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After 60-minute operation</td>
<td>(\leq 5 \times 10^{-6}/\text{day})</td>
<td>(\leq 3 \times 10^{-6}/\text{day})</td>
<td>(\leq 2 \times 10^{-5}/\text{day})</td>
<td></td>
</tr>
<tr>
<td>Aging rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(After 24-hour operation)</td>
<td>(\leq 2 \times 10^{-8}/\text{day})</td>
<td>(\leq 5 \times 10^{-8}/\text{day})</td>
<td>(\leq 2 \times 10^{-9}/\text{day})</td>
<td>(\leq 5 \times 10^{-10}/\text{day}) (after 48-hour operation)</td>
</tr>
<tr>
<td>Crystal oscillator stability against ambient temperature variations</td>
<td>(\leq 5 \times 10^{-8})</td>
<td>(\leq 5 \times 10^{-8})</td>
<td>(\leq 1.5 \times 10^{-8})</td>
<td>(\leq 5 \times 10^{-9})</td>
</tr>
</tbody>
</table>
5  Set the front-panel POWER switch to ON.
(The initial display of 10 MHz and 0 dBm is obtained at the first power-on because the
MG3633A, when shipped from the factory, is set to a 10 MHz output frequency and a 0
dBm output level. When power-on, the previous settings are displayed.
To obtain initial settings, execute SP00 (paragraph 4.11.2).)

Note:  When the internal reference oscillator is used, check that the rear-panel RFF OUTPUT and
RFF INPUT connectors are connected with the U-link.
If the U-link is not connected, the UNCAL LED in the FREQUENCY display lights and the
[STATUS] LED blinks to indicate that the reference signal is not input. At this time, when
[STATUS] is pressed, the error message (no std input) is displayed.
3.3.2 Using external reference oscillator

An external reference oscillator can be used instead of the internal device. To use an external oscillator, make the initial POWER ON settings as described previously, then follow the procedure below.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check that the external reference oscillator frequency output is 10 MHz ±100 Hz.</td>
</tr>
<tr>
<td>2</td>
<td>Check that the output from the external reference oscillator is at the TTL level.</td>
</tr>
<tr>
<td>3</td>
<td>Remove the U link and connect the external reference oscillator output to the REF INPUT connector.</td>
</tr>
</tbody>
</table>

![Diagram](image)

- Remove the U link and apply the 10 MHz external reference oscillator output to this REF INPUT connector.
**Note:** If the [STATUS] LED blinks and the UNCAL LED in the FREQUENCY display lights after an external reference oscillator has been connected, the MG3633A is not synchronized with the external reference oscillator signal. Press [STATUS] and read the error message to check the cause. If “no Std input” is displayed, the external reference oscillator input level is not appropriate.

![no Std input](image)

If “Std unlock” is displayed, the external reference oscillator input frequency is not set within the accuracy of 10 MHz ±100 Hz.

![Std unlock](image)

The MG3633A outputs a buffered 10 MHz reference frequency from the BUFFER OUTPUT connector. It is used to synchronize the MG3633A frequency with that of other devices.

**Note:** Be sure to put the BNC cover to the BUFFER OUTPUT (BNC) connector when the 10 MHz buffered output is not used.
SECTION 4
OPERATING INSTRUCTIONS

The MG3633A Synthesized Signal Generator can be operated directly or by GP-IB remote control. The operation and function of hand controls on the front and rear panels are described in this section. For a description of the GP-IB remote system, refer to the separate GP-IB manual.

TABLE OF CONTENTS

4.1 Using the Data Keys, Rotary Knob, and INCREMENT [\^] [\checkmark] Keys for Data Setting ......................................................... 4-1
4.1.1 Setting using the data keys .............................................. 4-2
4.1.2 Setting using the rotary knob .......................................... 4-4
4.1.3 Setting using INCREMENT [\^] [\checkmark] ............................. 4-5
4.2 Setting Carrier Frequency .................................................. 4-6
4.2.1 Example: setting the frequency using the data keys .......... 4-6
4.2.2 Example: setting frequency using the rotary knob .......... 4-7
4.2.3 Example: setting frequency using INCREMENT [\^] [\checkmark] .... 4-7
4.2.4 Displaying relative frequency ........................................... 4-8
4.3 Setting Output Level ....................................................... 4-13
4.3.1 EMF voltage display and terminated voltage display .......... 4-13
4.3.2 Example: setting output levels using the data keys .......... 4-14
4.3.3 Example: setting output levels using the rotary knob ....... 4-15
4.3.4 Example: setting output levels using INCREMENT [\^] [\checkmark] .......... 4-19
4.3.5 Displaying relative level .................................................. 4-20
4.3.6 Turning output level ON/OFF ......................................... 4-25
4.3.7 Operating reverse power protection circuit (RPP) ........... 4-26
4.4 Outline of Modulation Setting ........................................... 4-28
  4.4.1 Outline of modulation setting procedure .................. 4-28
  4.4.2 Selecting modulation input mode ......................... 4-33
  4.4.3 Selecting internal modulation frequency ................. 4-34
  4.4.4 External modulation ........................................... 4-35
  4.4.5 Modulation signal output .................................... 4-35

4.5 Setting AF Frequency ............................................... 4-36
  4.5.1 Reading AF frequency .......................................... 4-36
  4.5.2 Example: setting AF frequency using the data keys .... 4-38
  4.5.3 Example: setting Af frequency using the rotary knob ... 4-38
  4.5.4 Example: setting AF frequency using INCREMENT [ \ ] [ ] 4-39

4.6 Setting FM Modulation ............................................. 4-40
  4.6.1 Example: setting frequency deviation using the data keys 4-41
  4.6.2 Example: setting frequency deviation using the rotary knob 4-43
  4.6.3 Example: setting frequency deviation using INCREMENT [ \ ] [ ] 4-44
  4.6.4 Calibrating carrier frequency at DC-FM modulation .... 4-44

4.7 Setting AM Modulation ............................................. 4-45
  4.7.1 Example: setting AM modulation factor using the data keys 4-46
  4.7.2 Example: setting AM modulation factor using the rotary knob 4-48
  4.7.3 Setting modulation factors using INCREMENT [ \ ] [ ] ... 4-48

4.8 Setting ΩM Modulation ............................................. 4-49
  4.8.1 Example: setting phase deviation using the data keys ... 4-50
  4.8.2 Example: setting phase deviation using the rotary knob .. 4-52
  4.8.3 Example: setting phase deviation using INCREMENT [ \ ] [ ] 4-53

4.9 Memory .............................................................. 4-54
  4.9.1 FREQ memory .................................................. 4-54
  4.9.2 FUNCTION memory ............................................ 4-62
4.9.3 Protecting memory contents .................................. 4-68
4.9.4 Deleting memory contents ................................. 4-68

4.10 Setting Sweep Function ........................................... 4-69
  4.10.1 Outline ....................................................... 4-69
  4.10.2 Sweep mode .................................................. 4-72
  4.10.3 Carrier frequency/output level/AF frequency sweep ... 4-73
  4.10.4 Setting FREQ memory and FUNCTION memory sweep .. 4-93
  4.10.5 MARKER ....................................................... 4-104
  4.10.6 Presetting sweep ............................................. 4-104
  4.10.7 Output connectors related to sweep function .......... 4-105

4.11 Special Functions .................................................. 4-106
  4.11.1 Special function status ...................................... 4-112
  4.11.2 Initial setting (SP00) ....................................... 4-114
  4.11.3 Bell ON/OFF (SP02/01) ..................................... 4-116
  4.11.4 Terminated and open-circuit voltage (EMF) display
         of output level (SP04/03) ................................ 4-117
  4.11.5 Output level limiter ON/OFF (SP06/05) .................. 4-119
  4.11.6 Output level offset mode ON/OFF (SP08/07) ............ 4-120
  4.11.7 Frequency offset mode ON/OFF (SP12/11) ............... 4-122
  4.11.8 FREQ-memory protect ON/OFF (SP14/13) ................. 4-123
  4.11.9 FUNCTION-memory protect ON/OFF (SP16/15) ............. 4-123
  4.11.10 FM OSC : Automatic switching/MIDDLE fixed/
           SIDE fixed (SP17/18/19) ................................ 4-124
  4.11.11 ØM OSC : Automatic switching/MIDDLE fixed/
           WIDE fixed (SP20/21/22) ................................ 4-125
  4.11.12 FM/ØM : POLARITY NORMAL/INVERT (SP23/24) ........ 4-126
  4.11.13 FM/ØM : INT/EXT deviation fixed (SP25/26/27) ........ 4-127
  4.11.14 INT MOD : NORMAL/ + DC applied/ – DC applied/
           ± DC external control (SP30/31/32/33) ............... 4-130
  4.11.15 MOD OUTPUT : Automatic switching/INT fixed/
           AM EXT fixed/FM-ØM EXT fixed (SP35/36/37/38) ....... 4-131
4.11.16  Sweep blanking output:
Positive/negative logic (SP43/44) ......................... 4-131
4.11.17  FUNCTION-memory sweep:
sweep output pattern 1/pattern 2 (SP45/46) ............... 4-132
4.11.18  Trigger (SP56/57/58) .................................. 4-133
4.11.19  GP-IB : Talker data with/without header (SP60/61) .... 4-141
4.11.20  GP-IB : Address setting (SP62) .......................... 4-141
4.11.21  GP-IB : Address display (SP63) ......................... 4-141
4.11.22  GP-IB : ONLY mode (SP64 to 68) ....................... 4-142
4.11.23  SRQ MASK (SP70 to 80) ................................ 4-142
4.11.24  FREQ-memory clear (SP81) .............................. 4-142
4.11.25  FUNCTION-memory clear (SP82) .......................... 4-142
4.11.26  Option display (SP83) ................................... 4-143
4.11.27  Output level correction:
Normal/CAL data 1 (option 07)/CAL data 2 (option 07)
(SP86/87/88) .................................................. 4-143
4.12  STATUS ............................................................. 4-144
4.12.1  Status messages related to all functions .................. 4-152
4.12.2  UNCAL ......................................................... 4-156
4.13  Panel Lock ....................................................... 4-158
4.14  Message Display by 7-Segment Display ...................... 4-159
SECTION 4
OPERATING INSTRUCTIONS

4.1 Using the Data Keys, Rotary Knob, and INCREMENT [\^] [\_] Keys for Data Setting

This paragraph explains the general data setting method using the data keys, rotary knob, and INCREMENT [\^] [\_] Keys. This method is used to set the carrier frequency, output level, AF frequency, AM, FM, and \(\Omega\)M.

Examples are described in other paragraphs corresponding to each item.

Trying to set a value outside the allowable range will result in the [STATUS] LED blinking, and the redisplaying of the value immediately prior to the incompatible input. When a new header or value is input again, the [STATUS] LED will go out. If [STATUS] is pressed while the [STATUS] LED is blinking, the error message 03 is generated on the FREQUENCY display. (When [STATUS] is released, both message and LED go out.)

<table>
<thead>
<tr>
<th>DATA</th>
<th>Err</th>
<th>03</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHz</td>
<td>Mhz</td>
<td>kHz</td>
</tr>
</tbody>
</table>

The error message 03 is displayed if an attempt is made to set a MG3633A function item exceeding the specified range. Attention should be given to the MG3633A specifications for setting range (paragraph 4.12.1 [3]).

When deviation is incorrectly set to exceed the maximum value of the frequency on FM/\(\Omega\)M setting, the [STATUS] LED blinks. Pressing the key displays the error message on the FREQUENCY display and the maximum deviation on the MODULATION display.

Since the MG3633A displays various messages using a 7-segment code, meanings of messages may not be apparent. See paragraph 4.14 for details for definitions of these codes.
4.1.1 Setting using the data keys

Press header key, numeric keys, and unit key in this sequence to set carrier frequency, output level, AF frequency, AM, FM, and \( \mathbb{S} \)M. When the unit key is pressed, the set value is output. When the header key is pressed, the display does not change.

Each time numerical data is entered via the numeric keys, the corresponding value is displayed successively from the leftmost digit. The input decimal point is also displayed while the data is being input.

**Notes:**

1. When the following operation is performed, the previous value is re-displayed without setting the new value.
   - When the unit key is pressed without inputting numerical data.
   - When a key other than a unit key is pressed while or after the numerical data is input.
   - When the number of numerical data of AM/FM/\( \mathbb{S} \)M exceeds three digits.

2. When a header key is pressed, the corresponding LED is lit to indicate that the item can be set. While this LED is lit, the item can be set sequentially by repeating an input of the numerical data and units. The header need not be input at each setting. The header LED goes out when another header key is pressed.

3. If a digit lower than the minimum resolution is attempted to be set, the digit is truncated.

4. When a unit key (mV, \( \mu \)V, dBm, and dBu for output level/rad and deg for \( \mathbb{S} \)M) is pressed without inputting numerical data, the output value remains unchanged but the displayed units changes. However, when [mV] or [\( \mu \)V] is pressed, a suitable unit (mV, \( \mu \)V, or V) is automatically selected and displayed.
   Also, for more than 17.5 rad, the value does not changed to the value in degrees.

5. When [mV] or [\( \mu \)V] is selected during level setting, the appropriate unit among \( \mu \)V, mV, and V is selected automatically and displayed. For an example, when 3603 \( \mu \)V is input, 3.60 mV is displayed. Minimum resolution is always 0.1 dB irrespective of unit.

6. Leading 0 and ending 0 can be omitted.
<table>
<thead>
<tr>
<th>Item</th>
<th>Key Strokes</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carrier frequency</strong></td>
<td>[FREQ]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.000 010 000 00</td>
<td>to 2.700 000 000 00</td>
</tr>
<tr>
<td></td>
<td>0.010 000 00</td>
<td>to 2.700.000 000 00</td>
</tr>
<tr>
<td></td>
<td>10.000 00</td>
<td>to 2.700 000 000 00</td>
</tr>
<tr>
<td></td>
<td>10 000.00</td>
<td>to 2 700 000 000.00</td>
</tr>
<tr>
<td><strong>Output level</strong></td>
<td>[LEVEL]</td>
<td></td>
</tr>
<tr>
<td><strong>Output level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>– 143.0 to 23.0</td>
<td>[dBm]</td>
</tr>
<tr>
<td></td>
<td>– 30.0 (– 36.0) to 136.0 (130)</td>
<td>[dBμ]</td>
</tr>
<tr>
<td></td>
<td>1000 to 6320 (3160)</td>
<td>[mV] Displays 1.00V to 6.32 (3.16)V.</td>
</tr>
<tr>
<td></td>
<td>100 to 999</td>
<td>[mV]</td>
</tr>
<tr>
<td></td>
<td>99.9 to 10.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.99 to 1.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 to 999</td>
<td>[μV]</td>
</tr>
<tr>
<td></td>
<td>99.9 to 10.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.99 to 1.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.032 (0.016) to 0.999</td>
<td></td>
</tr>
<tr>
<td><strong>AF frequency</strong></td>
<td>[AF]</td>
<td></td>
</tr>
<tr>
<td><strong>AF frequency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.000 000 000 1</td>
<td>to 0.000 100</td>
</tr>
<tr>
<td></td>
<td>0.000 000 1</td>
<td>to 0.100</td>
</tr>
<tr>
<td></td>
<td>0.000 1</td>
<td>to 100</td>
</tr>
<tr>
<td></td>
<td>0.1</td>
<td>to 100 000</td>
</tr>
<tr>
<td><strong>FM</strong></td>
<td>[FM]</td>
<td></td>
</tr>
<tr>
<td><strong>FM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.000 000 00</td>
<td>to 0.003 20</td>
</tr>
<tr>
<td></td>
<td>0.000 00</td>
<td>to 3.20</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>to 3 200</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>to 3 200 000</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td>[AM]</td>
<td></td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0 to 100</td>
<td>[%]</td>
</tr>
<tr>
<td><strong>ΩM</strong></td>
<td>[ΩM]</td>
<td></td>
</tr>
<tr>
<td><strong>ΩM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0 to 9.99</td>
<td>[rad]</td>
</tr>
<tr>
<td></td>
<td>10.0 to 99.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 to 640</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0 to 99.9</td>
<td>[deg]</td>
</tr>
<tr>
<td></td>
<td>100 to 999</td>
<td></td>
</tr>
</tbody>
</table>
4.1.2 Setting using the rotary knob

Press a header key to select the item to be set and RESOLUTION [\(^\wedge\)] [\(\vee\)] to set rotary-knob resolution digit. Then turn the rotary knob to set carrier frequency, output level, AF frequency, AM, FM, and ΩM.

The resolution digit is indicated by two MONITOR LEDs.

Notes: 1. Holding rotary knob with [HOLD]

- When [HOLD] is pressed, the [HOLD] LED lights and the value remains unchanged even if the rotary knob is turned.
- When [HOLD] is pressed again, the [HOLD] LED goes out and the rotary-knob hold is released. Even if another header is pressed, the hold state does not change.

2. [RESET/REF DISPLAY] functions

- The amount adjusted and set by the rotary knob can be canceled and the original value (set with the data keys) returned by pressing [RESET/REF DISPLAY].
- While [RESET/REF DISPLAY] is pressed after pressing [SHIFT], the original value is displayed. (When released, [SHIFT] turns off.)

3. When the output level is changed from 999 μV to 1000 μV, the units are automatically changed from μV (999 μV) to mV (1.00 mV). The minimum resolution is also changed from 1 μV to 10 μV. As described above, the output level units and resolution depend on the output level value.

4. When voltage output level or modulation factor/deviation is decreased using the rotary knob, only one resolution digit MONITOR LED at the left most position may light. This indicates that the rotary-knob resolution exceeds the most upper digit of the display. So, turning the rotary knob counterclockwise does not decrease the set value any more. To decrease the value, minimize the rotary-knob resolution.

5. When the step time for a 1 dB step setting is shortened by 100 msec with the rotary knob, the programmable attenuator will not respond to this rapidly control signal.

<table>
<thead>
<tr>
<th>Item</th>
<th>Header</th>
<th>Resolution Digit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier frequency</td>
<td>[FREQ]</td>
<td>0.01 Hz to 10 MHz</td>
<td></td>
</tr>
<tr>
<td>Output level</td>
<td>[LEVEL]</td>
<td>0.1, 1, 10 dB</td>
<td>NORMAL mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 dB fixed (Within ±10 dB range)</td>
<td>CONTINUOUS mode</td>
</tr>
<tr>
<td>AF frequency</td>
<td>[AF]</td>
<td>0.1 Hz to 10 kHz</td>
<td></td>
</tr>
<tr>
<td>FM</td>
<td>[FM]</td>
<td>0.01 kHz to 1 MHz</td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>[AM]</td>
<td>0.1, 1, 10%</td>
<td></td>
</tr>
<tr>
<td>ΩM</td>
<td>[ΩM]</td>
<td>0.01 to 100 rad 0.1 to 100 deg</td>
<td></td>
</tr>
</tbody>
</table>
4.1.3 Setting using INCREMENT [∧] [√]

Press a header key to select the item to be set, and then [INCR SET]/numeric keys/unit key in this sequence to set increment value.

Press INCREMENT [∧] [√] to increase or decrease the set value. Hold it down to change continuously.

When [INCR SET] is pressed, the FREQUENCY (for carrier and AF frequencies)/OUTPUT LEVEL (for level) display changes to the message \( i \cap c \rightarrow (\text{INCR}) \). Each time numerical data is entered via the numeric keys, the corresponding value is displayed successively from the leftmost digit. When the unit key is pressed, the display returns to the header display. Hold [INCR SET] down for approx. 0.5 second or more to display and check the increment value. When [INCR SET] is released, the display returns to the header display.

Notes: 1. AM increment value is 10% (fixed).

2. FM/ΩM increment value is fixed.
   Pressing [∧] or [√] makes FM/ΩM value 10 or 1/10 times the set value.

   Truncating and recovering digits:

   When scaling down the frequency/phase deviation by a factor of ten, non-significant digits are truncated. However, when the deviation is gained scaled-up, the original digits are recovered.

   (Example: \( 3.55 \text{ kHz (or rad)} \rightarrow 0.35 \text{ kHz (or rad)} \rightarrow 0.03 \text{ kHz (or rad)} \rightarrow 1/10 \text{ or } 1/10 \times 0 \text{ kHz (or rad)} \rightarrow 0.35 \text{ kHz (or rad)} \rightarrow 3.55 \text{ kHz (or rad)} \times 10 \))

3. [RESET/REF DISPLAY] functions
   - The adjusted amount set by INCREMENT [∧] [√] can be canceled and the original value (set with the data keys) returned by pressing [RESET/REF DISPLAY].
   - While [RESET/REF DISPLAY] is pressed and held after pressing [SHIFT], the original value is displayed. (When released, [SHIFT] turns off.)

4. Level is incremented in dB only.

<table>
<thead>
<tr>
<th>Item</th>
<th>Header</th>
<th>Increment Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier frequency</td>
<td>[FREQ]</td>
<td>0.01 Hz to 2.7 GHz</td>
<td></td>
</tr>
<tr>
<td>Output level</td>
<td>[LEVEL]</td>
<td>0.1 dB to 166.0 dB</td>
<td>If display unit is ( \mu \text{V}, \text{mV} ) or ( \text{V} ); incremented in dB only.</td>
</tr>
<tr>
<td>AF frequency</td>
<td>[AF]</td>
<td>0.1 Hz to 99.999 9 kHz</td>
<td></td>
</tr>
<tr>
<td>FM</td>
<td>[FM]</td>
<td>[∧] : \times 10 \text{ times}</td>
<td></td>
</tr>
<tr>
<td>ΩM</td>
<td>[ΩM]</td>
<td>[√] : \times 1/10 \text{ times}</td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td></td>
<td>10% (fixed)</td>
<td></td>
</tr>
</tbody>
</table>
4.2 Setting Carrier Frequency

The MG3633A is equipped with three different types of controls for setting carrier frequency (paragraph 4.1).

- Data keys
- Rotary Knob
- INCREMENT [\^][\_\_\_\_\_\_\_] keys

4.2.1 Example: setting frequency using the data keys

Example: Set the frequency to 360.3 MHz using the following four methods.

<table>
<thead>
<tr>
<th>Method</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ FREQ ] [ 0 ] [ • ] [ 3 ] [ 6 ] [ 0 ] [ 3 ] [ GHz/dBm ]</td>
</tr>
<tr>
<td>2</td>
<td>[ FREQ ] [ 3 ] [ 6 ] [ 0 ] [ • ] [ 3 ] [ MHz/dBp ]</td>
</tr>
<tr>
<td>3</td>
<td>[ FREQ ] [ 3 ] [ 6 ] [ 0 ] [ 3 ] [ 0 ] [ 0 ] [ kHz/mV ]</td>
</tr>
<tr>
<td>4</td>
<td>[ FREQ ] [ 3 ] [ 6 ] [ 0 ] [ 3 ] [ 0 ] [ 0 ] [ 0 ] [ 0 ] [ Hz/µV ]</td>
</tr>
</tbody>
</table>

* When the [FREQ] LED is already lit, the [FREQ] need not be pressed here.
### 4.2.2 Example: setting frequency using the rotary knob

Example: Set the frequency to 360.3 MHz. Adjust the frequency using the rotary knob at 10 Hz resolution to set to the precise value.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[FREQ] Select frequency setting mode. (The [FREQ] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[3] [6] [0] [●] [3] [MHz/dBp] Set frequency to 360.3 MHz.</td>
</tr>
<tr>
<td>3</td>
<td>RESOLUTION [◁] or [▷] Press RESOLUTION [&lt;] or [&gt;] until the resolution digit MONITOR LED of the FREQUENCY display lights at 10 Hz digit.</td>
</tr>
<tr>
<td>4</td>
<td>ROTARY KNOB</td>
</tr>
</tbody>
</table>

* When the [FREQ] LED is already lit, [FREQ] need not be pressed here.

### 4.2.3 Example: setting frequency using INCREMENT [▲] [▼]

Example: Set the center frequency to 360.3 MHz, then increase and decrease the frequency in 12.5 kHz steps.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[FREQ] Select frequency setting mode. (The [FREQ] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[3] [6] [0] [●] [3] [MHz/dBp] Set frequency to 360.3 MHz.</td>
</tr>
<tr>
<td>3</td>
<td>[INCR SET] [1] [2] [●] [5] [kHz/mV] Set increment value to 12.5 kHz</td>
</tr>
<tr>
<td>4</td>
<td>[↗] Press [▲] once. The 360.3 MHz setting increases in value by 12.5 kHz to become 360.3125 MHz.</td>
</tr>
<tr>
<td>5</td>
<td>[↘] Press [▼] once. The 360.3125 MHz setting decreases in value by 12.5 kHz to become 360.3 MHz.</td>
</tr>
</tbody>
</table>

*When the [FREQ] LED is already lit, [FREQ] need not be pressed here.*
4.2.4 Displaying relative frequency

(1) Setting relative-frequency display mode

When [RELATIVE FREQ] is pressed while an output frequency is shown on the FREQUENCY display, the display value is set to 0. This is the relative frequency display reference value 0. At this time, the [RELATIVE FREQ] LED lights to notify the relative frequency display mode.

If [RELATIVE FREQ] is pressed when the header [FREQ] is not selected, the header [FREQ] is automatically selected from another header.

The actual output frequency in the relative-frequency display mode can be obtained using the following equation.

Actual output frequency = Frequency when [RELATIVE FREQ] pressed + Current relative value displayed.

(2) Checking the actual output frequency in the relative-frequency display mode

When an output frequency check is required in the relative frequency display mode, press and hold [RELATIVE FREQ/CUR FREQ DISPLAY] after pressing [SHIFT]. The actual output frequency is displayed while key is pressed and is returned to the relative frequency display when released.

Example: Set the center frequency to 10.7 MHz and adjust the setting in ±1 kHz steps using INCREMENT [\(\wedge\)][\(\vee\)].

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ FREQ ]</td>
</tr>
<tr>
<td></td>
<td>Select frequency setting mode. (The [FREQ] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[1] [0] [●] [7] [MHz/dBμ]</td>
</tr>
<tr>
<td>3</td>
<td>[RELATIVE FREQ CUR FREQ DISPLAY]</td>
</tr>
</tbody>
</table>
Step | Procedure
--- | ---
4 | Set increment value to 1 kHz. Check that the data is input before pressing the unit key.

5 | Press unit key. (The increment value is set to 1 kHz and the display is returned to the relative frequency display.)

6 | Press [\] once. (10.7 MHz increases by 1 kHz and +1 kHz is displayed.)

7 | Press [SHIFT] then press and hold [RELATIVE FREQUENCY DISPLAY]. (10.7 MHz +1 kHz = 10.701 MHz is monitored while pressed.)

8 | Press [\] twice. (10.701 MHz decreases by 2 kHz. Therefore, reference value "0" = 10.7 MHz decreases by 1 kHz.)
Example 2: Set the center frequency to 360.3 MHz and adjust the setting by ±25 kHz using the rotary knob at 1 kHz resolution.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[FREQ] Select frequency setting mode. (The [FREQ] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>3 6 0 • 3 [MHz/µHz] Set center frequency to 360.3 MHz.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Frequency Setting" /></td>
</tr>
<tr>
<td>3</td>
<td>RESOLUTION [ ] or [ ] Press [&lt;] or [&gt;] until 1 kHz resolution is obtained at the resolution digit MONITOR LED to obtain rotary knob resolution of 1 kHz.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Resolution Setting" /></td>
</tr>
<tr>
<td>4</td>
<td>[RELATIVE FREQ CUR FREQ DISPLAY] Set relative-frequency display mode. (The [RELATIVE FREQ] LED comes on and reference value “0” is displayed for 360.3 MHz.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Relative Frequency Setting" /></td>
</tr>
<tr>
<td>5</td>
<td>ROTARY KNOB • Set to 360.3 MHz + 25 kHz by turning the rotary knob clockwise until +25 kHz is obtained.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Rotary Knob Positive" /> • Set to 360.3 MHz - 25 kHz by turning the rotary knob counterclockwise until -25 kHz is obtained.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Rotary Knob Negative" /></td>
</tr>
</tbody>
</table>
Example 3: Set the center frequency to 500 MHz and adjust the setting by ±10 MHz with the data keys, and fine tune using the rotary knob at 10 Hz resolution.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Select frequency setting mode. (The [FREQ] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>Set the center frequency to 500 MHz.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="5000000000.00 MHz" /></td>
</tr>
<tr>
<td></td>
<td>MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
<tr>
<td>3</td>
<td>To obtain a rotary knob resolution of 10 Hz, press [&lt;] or [&gt;] until 10 Hz resolution is obtained at the resolution digit MONITOR LED.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="5000000000.00 MHz" /></td>
</tr>
<tr>
<td></td>
<td>MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
<tr>
<td>4</td>
<td>Select relative-frequency display mode. (The [RELATIVE FREQ] LED comes on and reference value of “0” is displayed for 500 MHz.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="0.00 MHz" /></td>
</tr>
<tr>
<td></td>
<td>MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
<tr>
<td>5</td>
<td>Set 510 MHz as 500 MHz + 10 MHz.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="1000000000.00 MHz" /></td>
</tr>
<tr>
<td></td>
<td>MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
<tr>
<td>6</td>
<td>Fine tune using 10 Hz resolution.</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>7</td>
<td>[4] [9] [0] [MHz/dBµ]</td>
</tr>
</tbody>
</table>

Note: When [RESET/REF DISPLAY] is pressed in the relative-frequency display mode in which a relative value (not 0) is displayed, the value is returned to the reference value “0” frequency. This does not exit the relative frequency display mode. When [RESET/REF DISPLAY] is pressed and held after pressing [SHIFT], the actual frequency of the reference frequency is displayed (the frequency set when the relative frequency display mode is selected).

(3) Exiting the relative frequency display mode

Press [RELATIVE FREQ] again to exit the relative frequency display mode. The [RELATIVE FREQ] LED goes out to indicate the mode is disengaged. At this time, the output frequency is that which was displayed just before the relative frequency display mode is exited.

Note: When [RESET/REF DISPLAY] is pressed after the relative frequency display mode is exited, the frequency returns to the last value set with the data keys before selecting the relative-frequency display mode. It does not return to the one set with the data keys during the relative frequency display mode.
4.3 Setting Output Level

The MG3633A is equipped with three different types of controls for setting output levels (paragraph 4.1).

- Data keys
- Rotary Knob
- INCREMENT [∧][∨] keys

4.3.1 EMF voltage display and terminated voltage display

The MG3633A displays the output level in the following units:

- Output levels for power are displayed in dBm units.
- Output levels for voltage are displayed in dBµV, V, mV, and µV units.
- Relative output levels are displayed in dB

For the voltage unit display, EMF (open-circuit) voltage display or terminated voltage display can be selected. The EMF voltage display and terminated voltage display are switched using special functions, as follows.

1. EMF voltage display
   
   \[
   \text{[ SPECIAL ][ 0 ][ 3 ]}
   \]

2. Terminated voltage display
   
   \[
   \text{[ SPECIAL ][ 0 ][ 4 ]}
   \]

The MG3633A is powered-up in an EMF voltage unit, which was set at the factory.
The letters “EMF” are indicated below the units on the OUTPUT LEVEL display (paragraph 4.11.4.).
### 4.3.2 Example: setting output level using the data keys

Example: Set the output level to \(-15.2\) dBm.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ LEVEL ] Select output level setting mode. (The [LEVEL] LED comes on. The output level display still shows the previously set status.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="0.0 dBm" /></td>
</tr>
<tr>
<td>2</td>
<td>[-] [1] [5] [•] [2] Input the desired output level data. The values input are displayed starting from the leftmost digit of the display.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="15.2 dBm" /></td>
</tr>
<tr>
<td>3</td>
<td>[ GHz/dBm ] Complete the data entry by pressing appropriate unit key.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="15.2 dBm" /></td>
</tr>
</tbody>
</table>
4.3.3 Example: setting output level using the rotary knob

There are two general procedures for setting output level with the rotary knob.

<table>
<thead>
<tr>
<th>NORMAL mode</th>
<th>CONTINUOUS mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>This method involves changing and setting output levels in a range of values using the rotary knob. The resolution of the knob can be set as follows.</td>
<td>Pressing [SHIFT], then RESOLUTION [&gt;] (LEVEL CONTINUOUS) enters the CONTINUOUS mode. When CONTINUOUS mode is initiated, a 0.1 dB level resolution is automatically set. In this mode the rotary knob can be used to vary the output level over a continuous set of values in a range of ±10 dB of that which was set when the mode was entered. The advantage to this method of selecting operating parameters is that it enables variable adjustment of output level while preventing the output level from sudden changes by fixing the attenuator within the ±10 dB range.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the resolution to the 0.1, 1, or 10 dB digit by pressing RESOLUTION [&lt;] or [&gt;].</td>
</tr>
<tr>
<td>2</td>
<td>Turn the rotary knob to change and set the output level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To set a CONTINUOUS mode at 0.1 dB digit resolution, press [SHIFT] and then press the RESOLUTION [&gt;] (LEVEL CONTINUOUS).</td>
</tr>
<tr>
<td>2</td>
<td>Turn the rotary knob to change and set the output level continuously within ±10 dB from the current output level.</td>
</tr>
</tbody>
</table>
(1) Setting output level during NORMAL mode

Example 1: Set the output level to 0 dBm, and adjust and set the values by using the rotary knob at 1 dB resolution.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[ LEVEL ] Select output level setting mode. (The [LEVEL] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[ 0 ] [ GHz/dBm ] Set 0 dBm.</td>
</tr>
<tr>
<td>3</td>
<td>RESOLUTION [ &lt;&lt; ] or [ &gt;&gt; ] Press RESOLUTION [ &lt; ] or [ &gt; ] until the resolution digit MONITOR LED, of the OUTPUT LEVEL display, lights the 1 dB digit.</td>
</tr>
<tr>
<td>4</td>
<td>ROTARY KNOB Make fine adjustments at 1 dB resolution.</td>
</tr>
</tbody>
</table>

* When the [LEVEL] LED is already lit, [LEVEL] need not be pressed.

Example 2: Set the output level to 980 μV and then to 1.10 mV using the rotary knob at minimum resolution.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ LEVEL ] Select output level setting mode. (The [LEVEL] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[ 9 ] [ 8 ] [ 0 ] [ Hz/μV ] Set 980 μV.</td>
</tr>
<tr>
<td>3</td>
<td>RESOLUTION [ &gt;&gt; ] Press RESOLUTION [ &gt; ] until the right end resolution digit MONITOR LED of the OUTPUT LEVEL display lights (1 μV digit).</td>
</tr>
<tr>
<td>4</td>
<td>ROTARY KNOB Turn the rotary knob clockwise until the output level is 1.10 mV.</td>
</tr>
</tbody>
</table>
(2) Setting output level during CONTINUOUS mode

Set the output level with [LEVEL], [SHIFT], [/>LEVEL CONTINUOUS], numerical data keys, unit key, RESOLUTION [/>LEVEL CONTINUOUS], and the rotary knob, as described below.

(a) Selecting CONTINUOUS mode

```
[SHIFT] [LEVEL CONTINUOUS]
```

Press [SHIFT] and [/>LEVEL CONTINUOUS] to select CONTINUOUS mode.

When the output level is set to CONTINUOUS mode, it can be varied continuously using the rotary knob within ±10 dB from the level at the time when the CONTINUOUS mode is set. The resolution is fixed at 0.1 dB (for μV, mV, or V unit, the lowest digit of the output level display is selected). The LED “CONT” comes on below the unit on the OUTPUT LEVEL display to indicate the CONTINUOUS mode.

(b) Exiting CONTINUOUS mode

```
[SHIFT] [LEVEL NORMAL]
```

To exit CONTINUOUS mode, press [SHIFT] and then RESOLUTION [<LEVEL NORMAL] and the system is returned to NORMAL mode. As a result, the output level is set to the current output level again and the resolution returns to the digit position indicated immediately before CONTINUOUS mode was selected.

Note:

- When data keys are pressed during CONTINUOUS mode to reset output level, the output level is reset immediately after a momentary level loss. The CONTINUOUS mode restarts at the reset level.
- When INCREMENT [▲] or [▼] is pressed during CONTINUOUS mode to set the output level, both the current level and that at the time when the CONTINUOUS mode was set are increased by the increment value after a momentary level loss.
- When [RESET/REF DISPLAY] is pressed during CONTINUOUS mode, the output level returns to that which was indicated when the CONTINUOUS mode was set. The CONTINUOUS mode is not released.
- When [RESET/REF DISPLAY] is pressed after exiting CONTINUOUS mode, the output level returns to the last level which was set with the data keys before the CONTINUOUS mode was selected. The output level does not return to the one set with the data keys during the CONTINUOUS mode.

Example: Set CONTINUOUS mode to −10 dBm output level with a 1 dB resolution, and change its level by −5 dB. Then exit the CONTINUOUS mode.
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press [SHIFT]. (The [SHIFT] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>Press [&gt;] . (The [SHIFT] LED goes out and the “CONT” LED of the OUTPUT LEVEL display is lit. At this time the resolution is set to 0.1 dB. Thus the CONTINUOUS mode is obtained.)</td>
</tr>
<tr>
<td>3</td>
<td>Turn the rotary knob counterclockwise until –15.0 dBm is obtained.</td>
</tr>
<tr>
<td>4</td>
<td>Press [SHIFT]. (The [SHIFT] LED comes on.)</td>
</tr>
<tr>
<td>5</td>
<td>Press [&lt;] . (The [SHIFT] LED goes out, and the resolution digit MONITOR LED of the OUTPUT LEVEL display is lit at 1 dB digit, and the “CONT” LED goes out. Thus the CONTINUOUS mode is exited, the NORMAL mode is obtained, and the resolution is returned to 1 dB.)</td>
</tr>
</tbody>
</table>
4.3.4 Example: setting output level using INCREMENT \(\vee\) \(\wedge\)

Example 1: Set the output level to 0 dBm and then decrease its output level in 6 dB steps from 0 dBm to -60 dBm.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[ LEVEL ] Select output level setting mode. (The [LEVEL] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[ 0 ] [ GHz/dBm ] Set 0 dBm.</td>
</tr>
<tr>
<td>3</td>
<td>[ INCR SET ] [ 6 ] [ dB ] Set increment value to 6 dB.</td>
</tr>
<tr>
<td>4</td>
<td>INCREMENT (\vee) Press (\vee) 10 times. (The output level is decreased from 0 dBm to -60 dBm in 6 dB steps.)</td>
</tr>
</tbody>
</table>

* When the [LEVEL] LED is already lit, [LEVEL] need not be pressed.
Example 2: Set the output level to 1 mV and then increase its output level in 10 dB steps from 1 mV to 1 V.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[LEVEL] Select output level setting mode. (The [LEVEL] LED comes on)</td>
</tr>
<tr>
<td>2</td>
<td>[1][kHz/mV] Set to 1 mV</td>
</tr>
<tr>
<td>3</td>
<td>[INCR SET] [1][0][dB] Set the increment value to 10 dB</td>
</tr>
<tr>
<td>6</td>
<td>INCREMENT[→] Press [→] 6 times (The output level can be increased up to 1 V in steps as a factor of 3.16 [√10, 10 dB].)</td>
</tr>
<tr>
<td></td>
<td>1.00 mV</td>
</tr>
<tr>
<td></td>
<td>3.16 mV</td>
</tr>
<tr>
<td></td>
<td>10.0 mV</td>
</tr>
<tr>
<td></td>
<td>31.6 mV</td>
</tr>
<tr>
<td></td>
<td>100 mV</td>
</tr>
<tr>
<td></td>
<td>316 mV</td>
</tr>
<tr>
<td></td>
<td>1.00 V</td>
</tr>
</tbody>
</table>

4.3.5 Displaying relative level

(1) Setting relative-level display mode

When [RELATIVE LEVEL] is pressed while an output level is displayed on the OUTPUT LEVEL display, the value is set to 0 dB. That level becomes the relative-level-mode reference value 0 dB. At this time, the [RELATIVE LEVEL] LED is lit to indicate the relative-level display mode.

When [RELATIVE LEVEL] is pressed with the header [LEVEL] not selected, the header [LEVEL] is automatically selected by moving header from other key.

The actual output level at the relative-level display mode can be obtained using the following equation.

Actual output level = Output level when [RELATIVE FREQ] pressed + Current relative value displayed

When the relative-level display mode is selected even if the output level unit before setting the relative-level display mode is V, mV, or μV; the unit changes to dB.

Level setting with [INCREMENT] is possible.
(2) Checking actual output level during relative-level display mode

When the actual output level requires checking during the relative-level display mode, continue to press the [RELATIVE LEVEL/CUR LEVEL DISPLAY] after pressing [SHIFT]. The actual output level is displayed while this key is pressed, and when released, the relative output level is displayed again.

Example 1: Set $-10$ dBm to the relative-level-mode reference value 0 dB, then set its relative level to $-5$ dB by rotary knob at 1 dB resolution, and check the actual output level.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[ LEVEL ] Select output level setting mode. (The [LEVEL] LED comes on.)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>[ - ] [ 1 ] [ 0 ] [ GHz/dbm ] Set to $-10$ dBm</td>
</tr>
<tr>
<td></td>
<td>$-\quad 10.0$ dBm</td>
</tr>
<tr>
<td>3</td>
<td>[ RELATIVE FREQ CUR FREQ DISPLAY ] Press [RELATIVE LEVEL]. (The [RELATIVE LEVEL] LED comes on and the reference value “0 dB” is displayed for $-10$ dBm.)</td>
</tr>
<tr>
<td></td>
<td>$\div \quad 0.0$ dB</td>
</tr>
<tr>
<td>4</td>
<td>RESOLUTION [ ( \text{ } ) or [ ] ] Press [( \text{ } )] or [ ] until 1 dB resolution is obtained at the resolution digit MONITOR LED.</td>
</tr>
<tr>
<td></td>
<td>$\div \quad 0.0$ dB</td>
</tr>
<tr>
<td>5</td>
<td>ROTARY KNOB Turn the rotary knob counterclockwise until $-5$ dB is obtained.</td>
</tr>
<tr>
<td></td>
<td>$-\quad 5.0$ dB</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>6</td>
<td>Press [SHIFT]. (The [SHIFT] LED is lit.)</td>
</tr>
</tbody>
</table>
| 7    | Press and hold [RELATIVE LEVEL]. \((-10 \, \text{dBm} - 5 \, \text{dB} = -15 \, \text{dBm}\) can be monitored while it is pressed. When released, the relative level is displayed again and the [SHIFT] LED goes out.\) | \[
- 15.0 \, \text{dBm}
\] |

* When the [LEVEL] LED is already lit, [LEVEL] need not be pressed.

Example 2: Set 1 mV to the relative-level-mode reference value 0 dB, then increase its relative level in 6 dB steps from 0 dB to 60 dB, and check the actual output level.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>Select output level setting mode. (The [LEVEL] LED comes on.)</td>
</tr>
</tbody>
</table>
| 2    | Set 1 mV. | \[
1.00 \, \text{mV}
\] |
| 3    | Press [RELATIVE LEVEL]. (The [RELATIVE LEVEL] LED comes on and reference value “0 dB” is displayed for 1 mV.) | \[
0.0 \, \text{dB}
\] |
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>[ INCRI  ] [ 6 ] Set the increment value to 6 dB. Check that the data is input before pressing the unit key.</td>
</tr>
<tr>
<td></td>
<td>![Image of 6]</td>
</tr>
<tr>
<td>5</td>
<td>[ dB ] Press a unit key. (The increment value is set to 6 dB and the display is returned to the relative-output level display.)</td>
</tr>
<tr>
<td></td>
<td>![Image of dB]</td>
</tr>
<tr>
<td>6</td>
<td>[ INCREMENT ] [ △ ] Press [△] 10 times. (The relative level increases by 6 dB from 0 dB to 60 dB.)</td>
</tr>
<tr>
<td></td>
<td>![Image of 60 dB]</td>
</tr>
<tr>
<td>7</td>
<td>[ SHIFT ] [ RELATIVE LEVEL CUR LEVEL DISPLAY ] Press [SHIFT], then press and hold [RELATIVE LEVEL]. (1 mV × 1000 (60 dB) = 1 V can be monitored while it is pressed.)</td>
</tr>
<tr>
<td></td>
<td>![Image of 1.00 V]</td>
</tr>
</tbody>
</table>

* When the [LEVEL] LED is already lit, the [LEVEL] need not be pressed.
Example 3: Set 100 μV to the relative-level-mode reference value of 0 dB, and set 3.16 mV with the data keys to find the level increase in dB units.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1* [LEVEL]</td>
<td>Select the output level setting mode. (The [LEVEL] LED comes on.).</td>
</tr>
<tr>
<td>2 [1] [0] [0] [Hz/μV]</td>
<td>Set the output level to 100 μV.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="100 μV" /></td>
</tr>
<tr>
<td>3 [RELATIVE LEVEL CUR LEVEL DISPLAY]</td>
<td>Press [RELATIVE LEVEL]. (The [RELATIVE LEVEL] LED comes on and the reference value of “0 dB” is displayed for 100 μV.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="0 dB" /></td>
</tr>
<tr>
<td>4 [3] [●] [1] [6] [kHz/mV]</td>
<td>Set the output level to 3.16 mV. (The increase from 100 μV is displayed in the unit of dB immediately after the unit key is pressed.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Increase = 30.0 dB" /></td>
</tr>
</tbody>
</table>

* When the [LEVEL] LED is already lit, the [LEVEL] need not be pressed.

**Note:** When [RESET/REF DISPLAY] is pressed in the relative-level display mode, a value (reference level) is displayed which corresponds to that which was set at the time the mode was engaged. However, the system is kept in the relative level display mode. When [RESET/REF DISPLAY] is pressed and held after pressing [SHIFT], the reference level is displayed.

(3) Exiting relative-level display mode

Press [RELATIVE LEVEL] again to exit the relative-level display mode. The [RELATIVE LEVEL] LED goes out to indicate the relative-level display mode is disengaged.

The output level at this time is the output level indicated immediately before the relative-level display mode is exited. The unit returns to the one which was set just before the relative-level display mode was selected.
**Note:** When [RESET/REF DISPLAY] is pressed after the relative-level display mode is disengaged, the output level returns to that which was set with the data keys immediately before the relative-level display mode was selected. It does not return to the one set with the data keys during the relative-level output display mode.

### 4.3.6 Turning output level ON/OFF

The output level can be turned on and off using [RF OFF/ON].

Example: Set the output level to \(-30\) dBm, then turn off \(-30\) dBm, and turn it on again.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>Select output level setting mode. (The [LEVEL] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>([-]) ([3]) ([0]) ([\text{GHz/\text{dBm}}]) Set (-30) dBm.</td>
</tr>
<tr>
<td></td>
<td>[-30.0] dBm</td>
</tr>
<tr>
<td>3</td>
<td>([\text{RF OFF/ON}}) Press [RF OFF/ON]. (The [RF OFF/ON] LED comes on and the OUTPUT LEVEL display displays “OFF” to turn off the output level.)</td>
</tr>
<tr>
<td></td>
<td>(\text{OFF})</td>
</tr>
<tr>
<td>4</td>
<td>([\text{RF OFF/ON}}) Press [RF OFF/ON]. (The [RF OFF/ON] LED goes out and the OUTPUT LEVEL display displays “(-30.0) dBm” again.</td>
</tr>
<tr>
<td></td>
<td>([-30.0] dBm</td>
</tr>
</tbody>
</table>

* When the [LEVEL] LED is already lit, the [LEVEL] need not be pressed here.
The output level OFF can also be released by following the three procedures described below.

(1) Releasing output level OFF using data key

The output level OFF can be released by pressing the [LEVEL] and unit key. The OUTPUT LEVEL display after releasing is displayed in the unit of the pressed unit key.

When the [LEVEL], numeric keys, and unit key are pressed, the output level OFF can be released and the new output level can be set.

(2) Releasing output level OFF using rotary knob

When the rotary knob is turned either clockwise or counterclockwise by one click with the [LEVEL] LED lit, the output level OFF can be released. When it is turned by two clicks or more, the usual rotary knob operation is obtained.

(3) Releasing output level OFF using INCREMENT [\^] [\v]

When either INCREMENT [\v] or [\^] is pressed once, the output level OFF can be released. When it is pressed the second time or thereafter, the usual INCREMENT operation is obtained.

Note: The programmable output attenuator is set to maximum attenuation in the output level OFF setting, and the ALC output circuit enters a status where the output level is minimized. Therefore, – 143 dBm or less is output with the 50Ω impedance.

4.3.7 Operating reverse power protection circuit (RPP)

The MG3633A is provided with a reverse power protection (RPP) circuit in the output section to protect the internal circuit from excessive reverse power. When the RPP operates, the REVERSE POWER and the [STATUS] LEDs blink. Press [SHIFT] and then [RF OFF/ON]/[RPP RESET] to release the operation of the RPP circuit.

CAUTION:  
- Since RPP circuit uses a mechanical switch, the contact may be worn out and damaged if excess reverse power is applied repeatedly. Therefore, do not apply reverse power repeatedly.
- Never release the RPP circuit with reverse power applied, otherwise it will cause trouble with the RPP circuit.
- The RPP circuit can protect internal circuits against reverse power surges of up to 50 Vdc, 50W (to 1 GHz), and 25W (1 to 2.7 GHz). Never apply a reverse power exceeding these limits.
- Since the OUTPUT connector is opened while the RPP circuit is operating, care should also be taken not to damage the transmitter or the device under test.
- When the output level is increased to approx. +20 dBm or more while the connected load is mismatched (open or short-circuited), the RPP circuit may operate as a result of its own signal reflection. In this case, match the output load correctly or reduce the output level before resetting the RPP circuit.
While [STATUS] is pressed and the RPP circuit is operating, the following message is generated on the FREQUENCY display.

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(rPP on)
4.4 Outline of Modulation Setting

The MG3633A is provided with AM, FM and ØM modulation functions, and simultaneous modulation is also possible as shown in the table below.

![Diagram of Combined Modulations]

- The simultaneous modulation in which the same modulation frequency is used.

〇: Enabled
×: Disengaged

A 400 Hz (low distortion), 1 kHz (low distortion), or AF (0.1 Hz to 100 kHz) oscillator can be selected as the internal modulation oscillator.

4.4.1 Outline of modulation setting procedure

There are two different procedures for setting MG3633A modulation functions.

- Setting procedure starting from FUNCTION (header) key:
  Turn on the desired modulation function using the FUNCTION (header) key, then set the modulation factor/deviation, select the modulation input mode, and select the internal modulation frequency.

- Setting procedure starting from MODULATION (input mode) key:
  Set the required modulation input mode using the MODULATION (input mode) key, then select the modulation function, set the modulation factor/deviation, and select the internal modulation frequency.
The modulation function is set to the status immediately before the preceding modulation function is turned off.

(1) Setting procedure starting from FUNCTION (header) key
Make a setting according to the following procedure.

(a) AM setting

[ INT ]
(Internal modulation)

[ EXT AC ]
(External modulation AC-coupled)

[ EXT DC ]
(External modulation DC-coupled)

[ INT ] + [ EXT AC ]
/Internal modulation and external modulation AC-coupled

[ INT ] + [ EXT DC ]
/Internal modulation and external modulation DC-coupled

Select the internal modulation frequency.

The modulation input mode and modulation factor previously entered is set.

[ AM ]
(AM is set.)

Numerical data + [ % ]

RESOLUTION \[ \leftarrow \]  ROTARY KNOB
Set modulation factor

RESOLUTION \[ \rightarrow \]

INCREMENT \[ \uparrow \] (10% UP)

INCREMENT \[ \downarrow \] (10% DOWN)
(b) FM/ΩM setting

Numerical data + [Hz/μV]
Numerical data + [kHz/mV]
Numerical data + [MHz/dBm]
RESOLUTION [ ⍟ ]
RESOLUTION [ ⌠ ]

Set frequency deviation.

INCIMENT [+ ] (× 10)
INCIMENT [− ] (÷ 10)

FM/ΩM

The modulation input mode and deviation set previously are set.

[ FM/ΩM ]
(FM is set.)

[ INT ]
(Internal modulation)

[ EXT AC ]
(External modulation AC-coupled)

[ EXT DC ]
(External modulation DC-coupled)

[ INT ] + [ EXT AC ]
(Internal modulation and external modulation AC-coupled)

[ INT ] + [ EXT DC ]
(Internal modulation and external modulation DC-coupled)

Select modulation input mode.

[ SHIFT ] + [ FM/ΩM ]
(ΩM is set.)

Numerical data + [ rad ]
Numerical data + [ deg ]
RESOLUTION [ ⍟ ]
RESOLUTION [ ⌠ ]

ROTARY KNOB

Set phase deviation.

Note: FM and ΩM modulation functions cannot be operated at the same time.
(2) Setting procedure starting from MODULATION (input mode) key
Make a setting according to the following procedure.

(a) AM setting

AM modulation factor is made to the last set one. However, the modulation input mode is set to that selected in this setting.

AM is set and the previously entered modulation factor is set.

Numerical data + [%]

RESOLUTION [←]
RESOLUTION [→]

ROTARY KNOB

INCREMENT [↕] (10% UP)
INCREMENT [↔] (10% DOWN)

Set modulation factor.

AM is set.

[AM]

(AM is set.)

[EXT AC]
(External modulation AC-coupled)

[EXT DC]
(External modulation DC-coupled)

[INT] + [EXT AC]
(internal modulation and external modulation AC-coupled)

[INT] + [EXT DC]
(internal modulation and external modulation DC-coupled)

Select the modulation input mode.

INT MOD FREQ
AF
1kHz
400Hz

Select internal modulation frequency.
(b) **FM/ØM setting**

When the previous setting was FM (or ØM), the FM (or ØM) with the previous frequency (or phase) deviation is set.

When the previous setting was ØM or FM, perform this operation to change ØM to FM or to change the FM frequency deviation.

FM frequency deviation is made to the last set one. The rotary knob resolution is also set to the last set position.

- **Numerical data + [Hz/μV]**
- **Numerical data + [kHz/mV]**
- **Numerical data + [MHz/dBμ]**

---

**RESOLUTION [←]**

**RESOLUTION [→]**

**ROTARY KNOB**

**INCREMENT [↑] (× 10)**

**INCREMENT [▼] (+ 10)**

Set frequency deviation.

---

**Numerical data + [rad]**

**Numerical data + [deg]**

---

**RESOLUTION [←]**

**RESOLUTION [→]**

**ROTARY KNOB**

**INCREMENT [↑] (× 10)**

**INCREMENT [▼] (+ 10)**

Set phase deviation.

---

When the previous setting was FM or ØM, perform this operation to change FM to ØM, or to change the ØM phase deviation. When the previous setting was FM, start this operation to change FM to ØM or ØM phase deviation.

---

**Note:** FM and ØM function cannot be operated at the same time.
(3) Ending modulation function

To turn off AM function, press [ON/OFF] in the AM section.

To turn off FM or $\varnothing$M function, press [ON/OFF] in the FM/$\varnothing$M section.

When the AM section [ON/OFF] or FM/$\varnothing$M section [ON/OFF] is pressed again, it is returned to the status set before turning off the modulation function.

The appropriate modulation input mode can be turned off by pressing the input mode key ([INT], [EXT AC], [EXT DC]) whose LED is lit for previously-set modulation input. When all the modulation input mode key LEDs are turned off, all of the modulation function is automatically turned off. In this case, when the modulation header key ([AM] or [FM/$\varnothing$M]) LED in the FUNCTION section is lit, the LED goes out, and the [FREQ] LED is lit to enter the frequency setting mode.

4.4.2 Selecting modulation input mode

There are three types of modulation input modes as shown below.

1. INT mode: Modulation signals are applied using the internal oscillators [400 Hz fixed (low distortion), 1 kHz fixed (low distortion), and 0.1 Hz to 100 kHz variable].

2. EXT AC mode: Modulation signals are applied using the signal supplied via each MODULATION INPUT connector on the front panel. The input-signal DC component is cut by a capacitor.

3. EXT DC mode: Modulation signals are applied using the signal supplied via each MODULATION INPUT connector on the front panel. The input signal is directly connected to the modulation circuit without passing through a capacitor. This enables DC modulation.

Single or simultaneous modulation is possible according to the following combination.

- Single modulation only in INT mode
- Single modulation only in EXT AC mode
- Single modulation only in EXT DC mode
- Simultaneous modulation in INT and EXT AC modes
- Simultaneous modulation in INT and EXT DC modes

Note: When a simultaneous modulation in INT and EXT modes is performed, total deviation is the sum of the INT and EXT deviations. Take care not to exceed the maximum deviation.
This modulation input mode is set using the input mode keys shown below.

When appropriate key is pressed, the pressed-key LED is lit and the modulation input mode is turned on.
When the key lighting LED is pressed again, the LED goes out and the modulation input mode is turned off. Both EXT AC and EXT DC cannot be turned on at the same time. The one pressed later is turned on.

The modulation function is turned off. When pressed again, modulation setting condition before turning it off is recovered. However, when the modulation function OFF is obtained by turning off all the modulation input modes (INT, EXT AC, EXT DC), it remains OFF even if this key is pressed.

4.4.3 Selecting internal modulation frequency

There are three kinds of internal modulation frequencies as shown below.

- 400 Hz (400 Hz fixed, low distortion)
- 1 kHz (1 kHz fixed, low distortion)
- AF (0.1 Hz to 100 kHz, resolution: variable to 0.1 Hz)

Only when the modulation input mode is set to the INT mode, can the internal modulation frequency be set from among these three kinds.
4.4.4 External modulation

For external AM/FM/ØM modulation, select [EXT AC] or [EXT DC] and apply an approx. 2 Vp-p/600Ω external modulation signal to the AM or FM/ØM INPUT connector.

The modulation signal frequency range is:
- EXT AC ... 20 Hz to 50 kHz (AM), 100 kHz (FM), 5 kHz (ØM)
- EXT DC ... DC to 50 kHz (AM), 100 kHz (FM), 5 kHz (ØM)

The external modulation signal level must be adjusted to an appropriate level using the LEVEL indicator on the right of the INPUT connector.

![LEVEL adjustment diagram]

When the external modulation signal frequency is approx. 100 Hz or less, adjust the level so that △ and ▼ lamps are lit alternately around □ lamp. When both EXT AC or EXT DC and INT modes are set, modulation can be applied with a signal obtained by summing-up the internal and external modulation signals.

4.4.5 Modulation signal output

The currently applied modulation signal is output from the MODULATION OUTPUT connector on the front panel for monitoring. The INT modulation signal is output at INT and EXT AC or EXT DC simultaneous modulation. The FM or ØM modulation signal is output at AM and FM or ØM simultaneous modulation. The modulation signal output are as follows:

<table>
<thead>
<tr>
<th>AM</th>
<th>FM/ØM</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT</td>
<td>EXT</td>
</tr>
<tr>
<td>INT</td>
<td>AM-EXT</td>
</tr>
<tr>
<td>INT</td>
<td>INT</td>
</tr>
<tr>
<td>INT</td>
<td>FM/ØM EXT</td>
</tr>
</tbody>
</table>

Single modulation

In the case of external modulation, the output level is almost the same as the input level of the external modulation signal. In the case of internal modulation, it is approx. 2 Vp-p. Use special functions (c.f. 35 to 38) to output a desired external or internal modulation signal.

(See paragraph 4.11.15)
4.5 Setting AF Frequency

The MG3633A is equipped with three different types of controls for setting AF variable oscillator frequencies.

- Data keys
- Rotary Knob
- INCCREMENT $[\vee][\wedge]$ keys

**Note:** The AF frequency setting is basically the same as that of the carrier frequency, but the relative frequency cannot be displayed. The [RELATIVE FREQ) becomes an invalid key.

4.5.1 Reading AF frequency

Since the AF frequency share the same FREQUENCY display with the carrier frequency, select the indication contents by pressing [AF].

The [AF] LED is lit and the AF frequency is displayed on the FREQUENCY display. Characters “AF” are displayed on the leftmost FREQUENCY display to indicate the AF frequency.

When header [LEVEL], [AM], or [FM/ØM] keys are pressed, the [FREQ] or [AF] LED goes out, but the contents of the FREQUENCY display do not change.
Example: Set the carrier frequency to 510 MHz, then display the previously-set 23 kHz frequency.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Select frequency setting mode. (The [FREQ] LED comes on.)</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Set 510 MHz.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Frequency Setting" /></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Press [AF]. (The AF frequency is displayed. The [AF] LED is lit.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="AF Frequency Display" /></td>
</tr>
</tbody>
</table>

*When the [FREQ] LED is already lit, the [FREQ] need not be pressed here.*
4.5.2 Example: setting AF frequency using the data keys
Example: Set AF frequency to 12.3 kHz. Four methods are described below.

<table>
<thead>
<tr>
<th>Method</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[AF] [0] [●] [0] [0] [0] [0] [1] [2] [3] [GHz/dBm]</td>
</tr>
<tr>
<td>2</td>
<td>[AF] [0] [●] [0] [1] [2] [3] [MHz/dBμ]</td>
</tr>
<tr>
<td>3</td>
<td>[AF] [1] [2] [●] [3] [kHz/mV]</td>
</tr>
<tr>
<td>4</td>
<td>[AF] [1] [2] [3] [0] [0] [Hz/μV]</td>
</tr>
</tbody>
</table>

HEADER | DATA | UNIT

4.5.3 Example: setting AF frequency using the rotary knob
Example: Set the AF frequency to 400 Hz, then increase and decrease the AF at 0.1 Hz resolution.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[AF]</td>
</tr>
<tr>
<td></td>
<td>Select AF frequency setting mode. (The [AF] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[4] [0] [0] [Hz/μV]</td>
</tr>
<tr>
<td></td>
<td>Set 400 Hz AF frequency.</td>
</tr>
<tr>
<td>3</td>
<td>RESOLUTION [ ► ]</td>
</tr>
<tr>
<td></td>
<td>Press RESOLUTION [►] until the resolution digit MONITOR LED of the FREQUENCY display lights at 0.1 Hz digit.</td>
</tr>
<tr>
<td>8</td>
<td>ROTARY KNOB</td>
</tr>
<tr>
<td></td>
<td>Change the AF frequency continuously and set it.</td>
</tr>
</tbody>
</table>

*When the [AF] LED is already lit, the [AF] need not be pressed here.
### 4.5.4 Example: setting AF frequency using INCREMENT [\(\wedge\)] [\(\vee\)]

Example: Set the AF frequency to 400 Hz, then increase or decrease it in 100 Hz steps.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[ AF ]</td>
</tr>
<tr>
<td>2</td>
<td>[ 4 ] [ 0 ] [ 0 ] [ Hz/µV ]</td>
</tr>
<tr>
<td>3</td>
<td>[ INCR SET ] [ 1 ] [ 0 ] [ 0 ] [ Hz/µV ]</td>
</tr>
<tr>
<td>4</td>
<td>[ (\wedge) ]</td>
</tr>
<tr>
<td>5</td>
<td>[ (\vee) ]</td>
</tr>
</tbody>
</table>

*When [AF] LED is already lit, [AF] need not be pressed.*
4.6 Setting FM Modulation

The MG3633A is provided with the following three different procedures to set FM frequency deviation (paragraph 4.1).

- Data keys
- Rotary knob
- INCREMENT [✓] and [✓]

(1) Frequency deviation setting range

Frequency deviation setting range: 0 Hz to 3.2 MHz.

The maximum frequency deviation (not UNCAL) depends on the carrier frequency range as shown in the table below.

<table>
<thead>
<tr>
<th>Carrier frequency range</th>
<th>Maximum frequency deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>f &lt; 40 MHz</td>
<td>400 kHz</td>
</tr>
<tr>
<td>40 MHz ≤ f &lt; 80 MHz</td>
<td>100 kHz</td>
</tr>
<tr>
<td>80 MHz ≤ f &lt; 160 MHz</td>
<td>200 kHz</td>
</tr>
<tr>
<td>160 MHz ≤ f &lt; 320 MHz</td>
<td>400 kHz</td>
</tr>
<tr>
<td>320 MHz ≤ f &lt; 640 MHz</td>
<td>800 kHz</td>
</tr>
<tr>
<td>640 MHz ≤ f &lt; 1280 MHz</td>
<td>1.60 MHz</td>
</tr>
<tr>
<td>1280 MHz ≤ f</td>
<td>3.20 MHz</td>
</tr>
</tbody>
</table>

(2) Minimum resolution of the frequency deviation

The minimum resolution of the frequency deviation depends on the frequency deviation range, as follows:

<table>
<thead>
<tr>
<th>Frequency deviation range</th>
<th>Minimum resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 9.99 kHz</td>
<td>0.01 kHz</td>
</tr>
<tr>
<td>10.0 to 99.9 kHz</td>
<td>0.1 kHz</td>
</tr>
<tr>
<td>100 to 999 kHz</td>
<td>1 kHz</td>
</tr>
<tr>
<td>1.00 to 3.20 MHz</td>
<td>10 kHz</td>
</tr>
</tbody>
</table>
### 4.6.1 Example: setting frequency deviation using the data keys

Example: Set both the internal modulation AF frequency and the frequency deviation to 800 Hz. Then, set the internal modulation frequency to 400 Hz and the frequency deviation to 3.5 kHz.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Setting AF frequency to 800 Hz</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>[ AF ] Select AF frequency setting mode. (The [AF] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[ 8 ] [ 0 ] [ 0 ] [ Hz/µV ] Set AF frequency to 800 Hz.</td>
</tr>
</tbody>
</table>

![AF 800.0](attachment:image.png)

**Setting frequency deviation to 800 Hz**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>[ FMI/ØM ] Select FM deviation setting mode. (The [AF] LED goes out and the left (FM side) LED above the [FMI/ØM] is lit.</td>
</tr>
<tr>
<td>4</td>
<td>[ 8 ] [ 0 ] [ 0 ] [ Hz/µV ] Set FM frequency deviation to 800 Hz. (The MODULATION display indicates the deviation in kHz, as below.)</td>
</tr>
</tbody>
</table>

![FM 0.80 kHz](attachment:image.png)

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>[ FMI/ØM ] Press each key to light the [INT] LED only. (The FM modulation input mode is set only to the INT mode. Only INT mode is selected at initialization.)</td>
</tr>
</tbody>
</table>

[ INT ] [ EXT AC ] [ EXT DC FREQ CAL ]
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Press [INT MOD FREQ] repeatedly until the [AF] LED is lit. (The internal modulation frequency is set to AF.)</td>
</tr>
<tr>
<td>7</td>
<td>Setting frequency deviation to 3.5 kHz</td>
</tr>
<tr>
<td></td>
<td>[3] [●] [5] [kHz/mV]</td>
</tr>
<tr>
<td></td>
<td>The frequency deviation is set to 3.5 kHz.</td>
</tr>
<tr>
<td>8</td>
<td>Setting modulation frequency to 400 Hz</td>
</tr>
<tr>
<td></td>
<td>Press [INT MOD FREQ] repeatedly until 400 Hz LED is lit. (The internal modulation frequency is set to 400 Hz.)</td>
</tr>
</tbody>
</table>
### 4.6.2 Example: setting frequency deviation using the rotary knob

Example: Set frequency deviation to 95 kHz and internal modulation frequency to 1 kHz. Then, vary the frequency deviation up to 105 kHz by using the rotary knob at minimum resolution.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ FM/ΩM ] Select frequency deviation setting mode. (The left FM side LED above the [FM/ΩM] is lit.)</td>
</tr>
<tr>
<td>2</td>
<td>[9] [5] [kHz/mV] Set frequency deviation to 95 kHz.</td>
</tr>
<tr>
<td>3</td>
<td>[ FM/ΩM ] [ INT ] [ EXT AC ] [ EXT DC FREQ CAL ] Press each key to light the [INT] LED only. (The FM modulation input mode is set only to the INT mode. Only INT mode is also selected at initialization.)</td>
</tr>
<tr>
<td>4</td>
<td>[ INT MOD FREQ ] Press [INT MOD FREQ] repeatedly until the [INT] LED only is lit. (The internal modulation frequency is set to 1 kHz. 1 kHz is also set at initialization.)</td>
</tr>
<tr>
<td>5</td>
<td>RESOLUTION [ ] Press RESOLUTION [&gt;] until the resolution digit MONITOR LED of the MODULATION display is lit at the right end digit (0.1 kHz digit).</td>
</tr>
<tr>
<td>6</td>
<td>ROTARY KNOB Turn the rotary knob clockwise until the frequency deviation is 105 kHz.</td>
</tr>
</tbody>
</table>

*When the left FM side LED above the [FM/ΩM] is already lit, the [FM/ΩM] need not be pressed here.*
4.6.3 Example: setting frequency deviation using INCREMENT [\(\wedge\)] [\(\vee\)]

Example: Set the frequency deviation to 350 Hz. Then, increase the frequency in multiples of ten until it becomes 35 kHz.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[FM/ΩM]</td>
</tr>
<tr>
<td></td>
<td>Select frequency deviation setting mode.</td>
</tr>
<tr>
<td></td>
<td>(The left FM side LED above the [FM/ΩM] is lit.)</td>
</tr>
<tr>
<td>2</td>
<td>[3] [5] [0] [HzμV]</td>
</tr>
<tr>
<td></td>
<td>Set frequency deviation to 350 Hz.</td>
</tr>
<tr>
<td>2</td>
<td>INCREMENT[(\Rightarrow)]</td>
</tr>
<tr>
<td></td>
<td>Press INCREMENT [(\wedge)] twice.</td>
</tr>
<tr>
<td></td>
<td>(The frequency deviation increases to 35 kHz)</td>
</tr>
<tr>
<td></td>
<td>(350 Hz (\rightarrow) 3.5 kHz (\rightarrow) 35 kHz)</td>
</tr>
</tbody>
</table>

*When the left FM side LED above the [FM/ΩM] is already lit, [FM/ΩM] need not be pressed.

4.6.4 Calibrating carrier frequency at DC-FM modulation

DC-FM modulation can be obtained by eliminating a portion of the PLL circuit. Therefore, both frequency accuracy and stability are generally deteriorated compared to that obtained in CW and AC-FM modes. The MG3633A is provided with a frequency calibration function so that frequency accuracy is also obtained in the DC-FM mode. The frequency is calibrated automatically when [EXT-DC] is pressed under FM mode. To calibrate the frequency during EXT-DC FM mode, press [SHIFT] then press [EXT DC/FREQ CAL]. At this time, the following appears on the FREQUENCY display.

```
--- F-CAL ---
```

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Frequency calibration takes approx. 0.2 second. FM modulation cannot be applied during that time.
4.7 Setting AM Modulation

The MG3633A is equipped with three different types of controls for setting AM modulation (paragraph 4.1).

- Data keys
- Rotary knob
- INCREMENT \([\wedge]\) [\(\vee\)] keys

**Note:** AF frequency can be set up to 100 kHz. However, maximum AF frequency is limited as shown below to satisfy AM specification.

<table>
<thead>
<tr>
<th>Carrier frequency (MHz)</th>
<th>0 to 30</th>
<th>30.1 to 80</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 (\leq f_c &lt; 0.5)</td>
<td>5 kHz</td>
<td>5 kHz</td>
</tr>
<tr>
<td>0.5 (\leq f_c &lt; 80)</td>
<td>20 kHz</td>
<td>10 kHz</td>
</tr>
<tr>
<td>(80 \leq f_c)</td>
<td>50 kHz</td>
<td>20 kHz</td>
</tr>
</tbody>
</table>
### 4.7.1 Example: setting AM modulation factor using the data keys

Example: Set internal modulation frequency to 1 kHz and AM modulation factor to 30%. Then, change the internal modulation frequency to 800 Hz and the AM modulation factor to 55%.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Setting AM modulation factor to 30%</strong></td>
<td></td>
</tr>
<tr>
<td>1 [AM]</td>
<td>Select AM modulation setting mode. (The [AM] LED is lit.)</td>
</tr>
<tr>
<td>2 [3] [0] [%]</td>
<td>Set AM modulation factor to 30%.</td>
</tr>
<tr>
<td><img src="image" alt="30.0%" /></td>
<td></td>
</tr>
<tr>
<td>3 [INT] [EXT AC] [EXT DC]</td>
<td>Press each key to light the [INT] LED only. (The AM modulation input mode is set only to the INT mode. Only the INT mode is also selected at initialization.)</td>
</tr>
</tbody>
</table>

### Setting modulation frequency to 1 kHz

4 [INT MOD FREQ] Press [INT MOD FREQ] repeatedly until the 1 kHz LED is lit. (The internal modulation frequency is set to 1 kHz [low distortion]. It is also set to 1 kHz at initialization.)

| INT MOD FREQ AF 3kHz 400Hz | |

### Setting modulation frequency to AF 800 Hz

5 [AF] Select AM frequency setting mode. (The [AM] LED goes out and the [AF] LED is lit. The FREQUENCY display indicates AF frequency.)

---

4 - 46
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>[8] [0] [0] [Hz/µV] Set AF frequency to 800 Hz.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="AF 800.0" /></td>
</tr>
</tbody>
</table>

Setting AM modulation factor to 55%

7    | [AM] Select AM modulation factor setting mode. (The [AF] LED goes out and the [AM] LED is lit.)

8    | [5] [5] [%] Set AM modulation factor to 55%.

9    | [INT MOD FREQ] Press [INT MOD FREQ] repeatedly until [AF] LED is lit. (The internal modulation frequency is set to AF frequency. The [AF] LED is lit.)

<table>
<thead>
<tr>
<th>INT MOD FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF</td>
</tr>
<tr>
<td>1kHz</td>
</tr>
<tr>
<td>400Hz</td>
</tr>
</tbody>
</table>
### 4.7.2 Example: setting AM modulation factor using the rotary knob

Example: Set AM to 50%, then vary it up to 55% in 1% steps.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[ AM ]</td>
</tr>
<tr>
<td>2</td>
<td>[ 5 ] [ 0 ] [ % ]</td>
</tr>
<tr>
<td>3</td>
<td>RESOLUTION [ ⩽ ] or [ ⩾ ]</td>
</tr>
<tr>
<td>4</td>
<td>ROTARY KNOB</td>
</tr>
</tbody>
</table>

- **Select AM modulation factor setting mode.** (The [AM] LED is lit.)
- **Set AM modulation factor to 50%**.
- **Press RESOLUTION [ ⩽ ] or [ ⩾ ] until the resolution digit MONITOR LED of the MODULATION display is lit at the 1% digit.**
- **Turn the rotary knob clockwise until the AM modulation factor becomes 55%**.

*When the [AM] LED is already lit, [AM] need not be pressed.*

### 4.7.3 Setting modulation factors using INCREMENT [∧] [∨]

Example: Set AM at 30%, then vary it up to 100% in 10% steps.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>[ AM ]</td>
</tr>
<tr>
<td>2</td>
<td>[ 3 ] [ 0 ] [ % ]</td>
</tr>
<tr>
<td>3</td>
<td>INCREMENT [ ∧ ]</td>
</tr>
</tbody>
</table>

- **Select AM modulation factor setting mode.** (The [AM] LED is lit.)
- **Set AM modulation factor to 30%**.
- **Press INCREMENT[∧] 7 times to increase the AM modulation factor to 100% in 10% steps.**

*When the [AM] LED is already lit, the [AM] need not be pressed.*

4 - 48
4.8 Setting ØM Modulation

The MG3633A is equipped with three different types of controls for setting ØM modulation (paragraph 4.1).
- Data keys
- Rotary Knob
- INCREMENT [∧][∨] keys

(1) Phase-deviation range

Phase-deviation range is 0 to 640 rad. (0 to 999 in degrees units)

The maximum phase deviation within specifications depends on the carrier frequency range and modulation frequency as shown in the table below.

<table>
<thead>
<tr>
<th>Carrier frequency</th>
<th>Maximum phase deviation [rad] *</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f &lt; 40 \text{ MHz} )</td>
<td>80</td>
</tr>
<tr>
<td>( 40 \text{ MHz} \leq f &lt; 80 \text{ MHz} )</td>
<td>20</td>
</tr>
<tr>
<td>( 80 \text{ MHz} \leq f &lt; 160 \text{ MHz} )</td>
<td>40</td>
</tr>
<tr>
<td>( 160 \text{ MHz} \leq f &lt; 320 \text{ MHz} )</td>
<td>80</td>
</tr>
<tr>
<td>( 320 \text{ MHz} \leq f &lt; 640 \text{ MHz} )</td>
<td>160</td>
</tr>
<tr>
<td>( 640 \text{ MHz} \leq f &lt; 1280 \text{ MHz} )</td>
<td>320</td>
</tr>
<tr>
<td>( 1280 \text{ MHz} \leq f )</td>
<td>640</td>
</tr>
</tbody>
</table>

*: At 5 kHz modulation frequency

Note: AF frequency can be set up to 100 kHz.
However, the maximum AF frequency is 5 kHz to satisfy ØM specifications.
(2) Minimum phase deviation resolution

The minimum phase deviation resolution depends on the phase deviation range, as follows.

<table>
<thead>
<tr>
<th>Phase deviation range</th>
<th>Minimum resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 9.99 rad</td>
<td>0.01 rad</td>
</tr>
<tr>
<td>10.0 to 99.9 rad</td>
<td>0.1 rad</td>
</tr>
<tr>
<td>100 to 640 rad</td>
<td>1 rad</td>
</tr>
<tr>
<td>0 to 99.9 deg</td>
<td>0.1 deg</td>
</tr>
<tr>
<td>100 to 999 deg</td>
<td>1 deg</td>
</tr>
</tbody>
</table>

4.8.1 Example: setting phase deviation using the data keys

Example: Set internal modulation AF frequency to 800 Hz and the phase deviation to 100 rads. Then, set the internal modulation frequency to 400 Hz and the phase deviation to 3.5 rads.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ AF ] Select AF frequency setting mode. (The [AF] LED comes on.)</td>
</tr>
<tr>
<td>2</td>
<td>[ 8 ] [ 0 ] [ 0 ] [ Hz/μV ] Set AF frequency to 800 Hz.</td>
</tr>
</tbody>
</table>

Setting AF frequency to 800 Hz

3    [ SHIFT ] Press [SHIFT]. (The [SHIFT] LED is lit.)

Setting phase deviation to 100 rads

4    [ FM/ΩM ] Select phase deviation setting mode. (The [AF] and [SHIFT] LEDs are lit and the right ΩM side LED above the [FM/ΩM] is lit.)
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>[ 1 ] [ 0 ] [ 0 ] [ rad ] Select a phase deviation of 100 rads.</td>
</tr>
<tr>
<td>6</td>
<td>[ INT ] [ EXT AC ] [ EXT DC FREQ CAL ] Press each key to light the [INT] LED only. (The ΘM input mode is set only to the INT mode. Only INT mode is also selected at initialization.)</td>
</tr>
<tr>
<td>7</td>
<td>[ INT MOD FREQ ] Press [INT MOD FREQ] repeatedly until the [AF] LED is lit. (The internal modulation frequency is set to AF.)</td>
</tr>
</tbody>
</table>

**Setting phase deviation to 3.5 rad**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>[ 3 ] [ • ] [ 5 ] [ rad ] Set phase deviation to 3.5 rads.</td>
</tr>
</tbody>
</table>

**Setting the modulation frequency to 400 Hz.**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>[ INT MOD FREQ ] Press [INT MOD FREQ] repeatedly until 400 Hz LED is lit. (The internal modulation frequency is set to 400 Hz.)</td>
</tr>
</tbody>
</table>

- INT MOD FREQ
  - AF
  - 1kHz
  - 400Hz

4 - 51
4.8.2 Example: setting phase deviation using the rotary knob

Example: Set phase deviation to 9.5 rad and internal modulation frequency to 1 kHz, then vary it up to 10.5 rad at minimum resolution.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1* [SHIFT]</td>
<td>Press [SHIFT]. (The [SHIFT] LED is lit.)</td>
</tr>
<tr>
<td>2 [FM/ØM]</td>
<td>Select phase deviation setting mode. (The [SHIFT] LED goes out and the right ØM side LED above the [FM/ØM] is lit.)</td>
</tr>
<tr>
<td>4</td>
<td>Press each key to light the [INT] LED only. (The ØM input mode is set only to the INT mode. Only INT mode is also selected at initialization.)</td>
</tr>
<tr>
<td>5 [INT MOD FREQ]</td>
<td>Press [INT MOD FREQ] repeatedly until the 1 kHz LED is lit. (The internal modulation frequency is set to 1 kHz. It is also set to 1 kHz at initialization.)</td>
</tr>
<tr>
<td>6 RESOLUTION [&gt;]</td>
<td>Press RESOLUTION [&gt;] until the resolution digit MONITOR LED of the MODULATION display is lit for the right end digit (0.01 rad digit).</td>
</tr>
<tr>
<td>7 ROTARY KNOB</td>
<td>Turn the rotary knob clockwise until the phase deviation is 10.5 rad.</td>
</tr>
</tbody>
</table>

*When the right ØM side LED above the [FM/ØM] is already lit, [SHIFT] and [FM/ØM] need not be pressed.
### 4.8.3 Example: setting phase deviation using INCREMENT [\(\wedge\)] [\(\vee\)]

Example: Set the phase deviation to 0.35 rad, then increase by a multiple of 10 until it becomes 35 rad.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>Press [SHIFT]. (The [SHIFT] LED is lit.)</td>
</tr>
<tr>
<td>2</td>
<td>Select phase deviation setting mode. (The [SHIFT] LED goes out and the right ΩM side LED above the [FM/ΩM] is lit.)</td>
</tr>
<tr>
<td>3</td>
<td>Set phase deviation to 0.35 rad.</td>
</tr>
<tr>
<td>4</td>
<td>Press INCREMENT [(\wedge)] twice. (The phase deviation increases up to 35 kHz in 10-time steps (0.35→3.5→35).)</td>
</tr>
</tbody>
</table>

*When the right ΩM side LED above the [FM/ΩM] is already lit, [SHIFT] and [FM/ΩM] need not be pressed.
4.9 Memory

There are two types of memories. A FREQ memory is used to store carrier frequencies. A FUNCTION memory stores all front panel settings.

A 10 MHz and initial parameter setting is stored in the FREQ and FUNCTION memories, respectively before other information is stored.

4.9.1 FREQ memory

The FREQ memory can store up to 1000 carrier frequencies. The memory addresses is 0 to 999.

(1) Storing

Press MEMORY [FREQ] to enter the FREQ memory mode, then store the currently-set frequency at the specified address by pressing the numeric key (for memory address) and [STORE].

(2) Recalling

Press MEMORY [FREQ] to enter the FREQ memory mode, then recall the frequency stored in the specified address by pressing the numeric key (for memory address) and [RECALL].

Notes: 1. When a numeric other than a 1 to 3 digit integer is input as a memory address, the [STATUS] LED blinks to notify an inappropriate address setting when [STORE] or [RECALL] is pressed. At this time, when [STATUS] is pressed, the following error message is displayed.

```
    DATA   ERR  03

MHz

MONITOR  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
```

(data error 03)

2. When [STORE] is pressed without inputting a memory address, the current frequency is stored in the FREQ memory addressed 0.
When [RECALL] is pressed without inputting memory address, the contents of FREQ memory addressed 0 is recalled.
This is useful for temporarily storing the current frequency.
Example: Store 10 MHz in FREQ-memory address 1, 15 MHz in address 2, and 20 MHz in address 3, then recall 15 MHz from address 2.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[FREQ]</td>
</tr>
<tr>
<td>2*</td>
<td>[FREQ]</td>
</tr>
<tr>
<td>3</td>
<td>[1] [0] [MHz/µ]</td>
</tr>
<tr>
<td>4</td>
<td>[1]</td>
</tr>
<tr>
<td>5</td>
<td>[STORE]</td>
</tr>
<tr>
<td>6</td>
<td>[1] [5] [MHz/µ]</td>
</tr>
</tbody>
</table>

*When the [FREQ] LED is already lit, the [FREQ] need not be pressed.*
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 [2]</td>
<td>Input FREQ-memory address “2”.</td>
</tr>
</tbody>
</table>
| 8 [STORE] | Press [STORE].  
(15 MHz is stored in address 2.) |
| 9 [2] [0] [MHz/μHz] | Set 20 MHz. |
| 10 [3] | Input FREQ memory address “3”. |
| 11 [STORE] | Press [STORE].  
(20 MHz is stored in address 3.)  
(With the above operations, the memory store is completed. The current frequency is 20 MHz set last.) |
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 [2]</td>
<td>Input FREQ memory address &quot;2&quot;.</td>
</tr>
<tr>
<td>13 [RECALL]</td>
<td>Press [RECALL]. (15 MHz stored at address 2 is recalled and displayed.)</td>
</tr>
</tbody>
</table>

(3) Store using auto-address mode

By setting start and stop addresses, the frequencies can be stored in a series of memory address without the need of specifying each address. After pressing the [FREQ] in the FUNCTION section, perform the following operations to set the start and stop addresses.

- Key operations for setting start address

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press [START] in the SWEEP PATTERN section.</td>
</tr>
<tr>
<td>2</td>
<td>Press numeric keys (start address).</td>
</tr>
<tr>
<td>3</td>
<td>Press [FREQ] in the MEMORY section.</td>
</tr>
</tbody>
</table>

- Key operations for setting stop address

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press [STOP] in the SWEEP PATTERN section.</td>
</tr>
<tr>
<td>2</td>
<td>Press numeric keys (stop address).</td>
</tr>
<tr>
<td>3</td>
<td>Press [FREQ] in the MEMORY section.</td>
</tr>
</tbody>
</table>
When stop address setting is completed, auto-address mode is obtained automatically. By pressing [STORE] in the MEMORY section, the frequencies are stored sequentially from the start address. At this time the display is as follows:

![Diagram]

When the memory address to be stored reaches the stop address, a buzzer sounds and the MG3633A returns to the normal display. If a memory-address specification store is performed or if a key inputting is not performed for approx. 30 seconds or more during the auto-address store, the auto-address store mode is released and the MG3633A returns to the usual operation status.

When the MG3633A is set to the auto-address store mode, it is changed to FREQ-memory mode even if it is set at the FUNCTION-memory mode before the setting.

When a series of frequency-memory contents stored in the auto-address mode are required to be recalled continuously, the FREQ-memory sweep is useful (paragraph 4.10.3).

Example: Store 50 frequencies from 900 MHz in 12.5 kHz steps in FREQ-memory addresses 51 to 100.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ FREQ ]</td>
</tr>
<tr>
<td></td>
<td>Select frequency setting mode. (The [FREQ] LED is lit.)</td>
</tr>
<tr>
<td>2</td>
<td>[ 9 ] [ 0 ] [ 0 ] [ MHz/dBμ ]</td>
</tr>
<tr>
<td>3</td>
<td>[ INCR SET ] [ 1 ] [ 2 ] [ ]</td>
</tr>
<tr>
<td></td>
<td>[ 5 ] [ kHz/mV ]</td>
</tr>
</tbody>
</table>

![Example Display]
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>[START] Select start address setting mode. (The [START] LED is lit.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="START Fr" /></td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="5" /></td>
</tr>
<tr>
<td>6</td>
<td>[FREQ] (In the MEMORY section) Press MEMORY [FREQ]. (The start address 51 is input. The [START] LED goes out and the current frequency is displayed.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="900000000000" /></td>
</tr>
<tr>
<td>7</td>
<td>[STOP] Select stop address setting mode.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Stop Fr" /></td>
</tr>
<tr>
<td>8</td>
<td>[1] [0] [0] Key-input stop address 100.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="100" /></td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>9</td>
<td>[FREQ] (In the MEMORY section) Press MEMORY [FREQ]. (The stop address 100 is input.) The display is as follows:</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Display Diagram" /></td>
</tr>
<tr>
<td>10</td>
<td>[STORE] Press [STORE]. (900 MHz is stored in FREQ-memory address 51.)</td>
</tr>
<tr>
<td>11</td>
<td>INCREMENT [(\Rightarrow)] Increase frequency by 12.5 kHz.</td>
</tr>
<tr>
<td>12</td>
<td>[STORE] Press [STORE]. (900.0125 MHz is stored in FREQ-memory address 52.)</td>
</tr>
<tr>
<td>13</td>
<td>Continue the procedure of pressing INCREMENT [(\Rightarrow)] and [STORE] to store frequencies in addresses 53 to 99.</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
| 14   | INCREMENT [↑]  
Increase frequency by 12.5 kHz. |
| 15   | [STORE]  
Press [STORE].  
(900.6125 MHz is stored in FREQ-memory address 100. A buzzer also sounds and the auto-address mode is released. The normal display is obtained.) |
4.9.2 FUNCTION memory

The FUNCTION memory can store up to 100 panel conditions. The memory addresses are 0 to 99.

(1) Storing

Press MEMORY [FUNCTION] to enter the FUNCTION memory mode, then store the current panel conditions at the specified address by pressing numeric key (for memory address) and [STORE].

(2) Recalling

Press the MEMORY [FUNCTION] to enter the FUNCTION memory mode, then recall the panel conditions stored in the specified address by pressing numeric key (for memory address) and [RECALL].

**Notes:**

1. When a numeric other than a 1 to 2 digit integer is input as a memory address, the [STATUS] LED blinks to notify an inappropriate address setting when [STORE] or [RECALL] is pressed. At this time, when [STATUS] is pressed, the following error message is displayed. When [STATUS] is released, both message and light are turned off.

```
+-------------------+
| d a t a  E r r  0 3 |
+-------------------+
| Hz  MHz kHz Hz    |
| MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 |
+-------------------+
```

(data error 03)

2. When [STORE] is pressed without inputting a memory address, the current panel conditions are stored in the FUNCTION memory addressed 0.

When [RECALL] is pressed without inputting a memory address, the contents of the FUNCTION memory addressed 0 are recalled.

This is useful for temporarily storing the current panel conditions.

Example: Store the three panel conditions mentioned below in FUNCTION memory addresses 12, 13, and 14, then recall the contents at address 12.

<table>
<thead>
<tr>
<th>Address</th>
<th>Frequency</th>
<th>Output level</th>
<th>Modulation</th>
<th>Modulation input</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>12 MHz</td>
<td>−20 dBm</td>
<td>AM 50%</td>
<td>INT AF 800 Hz</td>
</tr>
<tr>
<td>13</td>
<td>520 MHz</td>
<td>10 dBm</td>
<td>FM 100 kHz</td>
<td>INT 1 kHz</td>
</tr>
<tr>
<td>14</td>
<td>1.5 GHz</td>
<td>−30 dBm</td>
<td>FM 100 kHz</td>
<td>INT 1 kHz+EXT AC</td>
</tr>
</tbody>
</table>

4-62
### Setting panel conditions for address 12

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[SPECIAL] [0] [0] Initial setting (See paragraph 4.11.2 for details)</td>
</tr>
<tr>
<td>2</td>
<td>[FREQ] [1] [2] [MHz/dBµ] Set 12 MHz.</td>
</tr>
<tr>
<td>3</td>
<td>[LEVEL] [-] [2] [0] [GHz/dBm] Set -20 dBm.</td>
</tr>
<tr>
<td>4</td>
<td>[AM] [5] [0] [%] Set AM 50%</td>
</tr>
<tr>
<td>5</td>
<td>[AF] [8] [0] [0] [Hz/µV] Set AF 800 Hz.</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>6</td>
<td>Press [INT MOD FREQ] repeatedly until the [AF] LED is lit.</td>
</tr>
<tr>
<td>7</td>
<td>Select FUNCTION memory mode. (The [FUNCTION] LED is lit.)</td>
</tr>
<tr>
<td>8</td>
<td>Input FUNCTION memory address 12.</td>
</tr>
<tr>
<td>9</td>
<td>Press [STORE]. (The current panel conditions are stored in address 12.)</td>
</tr>
</tbody>
</table>

**Setting panel conditions for address 13**

<table>
<thead>
<tr>
<th>10</th>
<th>[FREQ] [5] [2] [0] [MHz/dBm] Set 520 MHz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>[LEVEL] [1] [0] [GHz/dBm] Set 10 dBm.</td>
</tr>
</tbody>
</table>

4 - 64
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Set FM 100 kHz.</td>
</tr>
<tr>
<td>13</td>
<td>Turn off AM and set FM INT.</td>
</tr>
<tr>
<td>14</td>
<td>Press [INT MOD FREQ] repeatedly until the 1 kHz LED is lit.</td>
</tr>
<tr>
<td>15</td>
<td>Input FUNCTION memory address 13.</td>
</tr>
<tr>
<td>16</td>
<td>Press [STORE]. (The current panel conditions are stored in address 13.)</td>
</tr>
</tbody>
</table>
Setting panel conditions for address 14

17  
Set 1.5 GHz.

18  
Set –30 dBm.

19  
Input FUNCTION-memory address “14”.

20  
Press [STORE].
(The current panel conditions are stored in address 14.)

With the operation above, the memory store is completed.
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>[1] [2]</td>
</tr>
<tr>
<td></td>
<td>Input FUNCTION memory address “12”.</td>
</tr>
<tr>
<td></td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
</tbody>
</table>

22 [RECALL]

Press [RECALL].
(Contents of FUNCTION memory address 12 is recalled and the following setting is made.)

Since the FREQUENCY display shows the AF frequency at storage, (Steps 5 and 9), the AF frequency is displayed after recalling.

![Image](image2.png)

4 - 67
4.9.3 Protecting memory contents

When the following operation is performed, the contents of the FREQ and FUNCTION memories cannot be deleted or rewritten.

- FREQ memory protection: [SPECIAL] [1] [4]
- FUNCTION memory protection: [SPECIAL] [1] [6]

Perform the following operation to release this protection.

- FREQ memory protection release: [SPECIAL] [1] [3]
- FUNCTION memory protection release: [SPECIAL] [1] [5]

When an attempt is made to store or delete during memory protection, the [STATUS] LED blinks to indicate that the memory is being protected. When [STATUS] is pressed at this time, the following error message is displayed.

```
MEM  Err  01
```

(memo err 01)

Memory protection is not discarded even if initialization ([SPECIAL][0][0]) is performed.
The memory protection is released at factory shipment.

4.9.4 Deleting memory contents

The entire contents of the FREQ and FUNCTION memories can be deleted with the following operation.

- Delete FREQ memory contents: [SPECIAL] [8] [1]
  (The contents of all memories becomes 10 MHz.)

- Delete FUNCTION memory contents: [SPECIAL] [8] [2]
  (The contents of all memories becomes the status at initialization [paragraph 4.11.2].)

While the memory contents are being protected, the memory contents cannot be deleted. Release protection before deleting it.

Even if the initialization is performed regardless of the presence of memory protection, FREQ and FUNCTION memory contents are protected and do not change.
4.10 Setting Sweep Function

4.10.1 Outline

The MG3633A is provided with three different sweep modes: AUTO, SINGLE, and MANUAL. The START-STOP (linear and log) and CENTER-SPAN (linear only) sweep patterns are prepared for the carrier frequency, output level, and AF frequency. Also, there are FREQ-memory sweep and FUNCTION-memory sweep to be swept in any address order.
The following flow pattern outlines the MG3633A key operations for sweeping.

```
[ FREQ ]
    | [ START ] + Numeric key + Unit key
    |   [ STOP ] + Numeric key + Unit key
    |   [ LOG 1% ]
    |   [ SPAN ] + Numeric key + Unit key
    |   [ STEP SIZE ] + Numeric key + Unit key
    |   [ STEP N ] + Numeric key + [ POINT ]

[ LEVEL ]
    | [ START ] + Numeric key + Unit key
    |   [ STOP ] + Numeric key + Unit key
    |   [ LOG 1% ]
    |   [ SPAN ] + Numeric key + Unit key
    |   [ STEP SIZE ] + Numeric key + Unit key
    |   [ STEP N ] + Numeric key + [ POINT ]

[ AF ]
    | [ START ] + Numeric key + Unit key
    |   [ STOP ] + Numeric key + Unit key
    |   [ LOG 1% ]
    |   [ SPAN ] + Numeric key + Unit key
    |   [ STEP SIZE ] + Numeric key + Unit key
    |   [ STEP N ] + Numeric key + [ POINT ]

[ FREQ ]
    | [ MEMORY ] + Sweep address setting + [ POINT ]

[ FUNCTION ]
    | [ AUTO ]
    | [ SINGLE ]
    | [ MANUAL ]
    | ROTARY KNOB
    | INCREMENT [ ▶ ]
    | INCREMENT [ ▼ ]
```
Outlining sweep start and stop

- Prior to starting sweep operations, when any header key for FUNCTION [FREQ], [LEVEL], or [AF] is set (frequency, level, or AF sweep) or the [MEMORY] LED in the SWEEP PATTERN section is lit (memory sweep), the sweep is ready for operation.
- If not, sweep fails to start and the [STATUS] LED blinks to indicate that the sweep is not possible.
- When an other header key is pressed during sweep, the sweep stops and settings corresponding to the pressed header key are obtained. When the header key performing the sweep is pressed again, the sweep is resumed.
- When [OFF] in the SWEEP section is pressed, the sweep stops and all the SWEEP section LEDs go out.

Outlining operation of SWEEP PATTERN section keys

In the SWEEP PATTERN section keys, the [START], [SPAN], and [MEMORY] LEDs are lit at START-STOP sweep (linear and log), CENTER-SPAN sweep (linear only), and FREQ/FUNCTION memory sweep, respectively.

When the [FREQ], [LEVEL], and [AF] headers are not set, the above-mentioned LEDs are not lit and the [STATUS] LED blinks to indicate the setting is not possible when [START] or [SPAN] is pressed.

Operating the SWEEP STEP section keys

In the SWEEP STEP section keys, [STEP N], [STEP SIZE], and [LOG 1%] LEDs are lit at step number specified linear sweep, step size specified linear sweep, and log 1% sweep, respectively.

When any header of [FREQ] and [AF] is not set or when the SWEEP PATTERN [MEMORY] LED is lit, the above-mentioned LEDs are not lit and the [STATUS] LED blinks to indicate the setting is not possible if the [STEP N], [STEP SIZE], and [LOG 1%] are pressed.

Confirming parameters

When each key in the SWEEP PATTERN and SWEEP STEP sections continues to be pressed for approx. 0.5 second or more, the current set value is displayed. When the key is released after display, it is returned to the previous sweep pattern and sweep step. The same operation is possible during sweeping without interrupting sweeping.
4.10.2 Sweep mode

Three types of sweep modes can be selected: AUTO, SINGLE, and MANUAL.

(1) AUTO mode

When [AUTO] is pressed, the [AUTO] LED blinks and the sweep is repeated as specified (sweep start to the sweep end value) until [OFF] is pressed. When [AUTO] is pressed during sweep, the sweep is suspended. When pressed again, the sweep is resumed from that point.

(2) SINGLE mode

When [SINGLE] is pressed, the [SINGLE] LED blinks and the single sweep is performed as specified with each parameter from the sweep start value to the sweep end value.

When [SINGLE] is pressed during sweeping, the sweep is suspended. When pressed again, the sweep is resumed from that point.

(3) MANUAL mode

When [MANUAL] is pressed, the [MANUAL] LED is lit and the manual sweep using the rotary knob and INCREMENT [\(\vee\)] [\(\wedge\)] can be performed as specified with each parameter from the sweep start value to the sweep end value.

(4) Stopping sweep

When a set SWEEP [AUTO] or [SINGLE] is pressed during auto or single sweep, the sweep is suspended to enter the manual mode.

The rotary knob or INCREMENT [\(\vee\)] [\(\wedge\)] permits manual sweep to be performed during suspension.

When [AUTO] or [SINGLE] is pressed during suspension, the sweep is resumed in that AUTO or SINGLE sweep mode from the current point.

When SWEEP [OFF] is pressed, the sweep is completed and all the SWEEP section key LEDs go out.

When any one of the SWEEP section keys is pressed after the sweep is completed, the sweep is started again from the sweep start point.
4.10.3 Carrier frequency/output level/AF frequency sweep

Note: When the output level sweep is set, the output level automatically enters the CONTINUOUS mode (paragraph 4.3.3). Therefore, the sweep range is within 20 dB and the STEP SIZE is 0.1 dB fixed (the lowest digit of the display for units of µV, mV, and V).

(1) START-STOP sweep

Press [START] to set START-STOP sweep mode.

This is a sweep method in which the START and STOP values are set to sweep between them. After pressing a header FUNCTION [FREQ]/[LEVEL]/[AF], set the START and STOP values as follows.

<table>
<thead>
<tr>
<th>Item</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier</td>
<td>0 Hz \leq \text{START} &lt; \text{STOP} \leq 2.7 GHz</td>
</tr>
<tr>
<td>frequency</td>
<td>\uparrow 10 kHz (for log sweep)</td>
</tr>
<tr>
<td>Output level</td>
<td>-143 dBm \leq \text{START} &lt; \text{STOP} \leq +23 dBm</td>
</tr>
<tr>
<td>AF frequency</td>
<td>0.1 Hz \leq \text{START} &lt; \text{STOP} \leq 100 kHz</td>
</tr>
</tbody>
</table>

- Setting START value: [START], numeric keys, unit key
- Setting STOP value: [STOP], numeric keys, unit key

When [START] is pressed, the [START] LED is lit to indicate that the START-STOP sweep pattern is obtained.
While [START] or [STOP] is held down for approx. 0.5 second or more, the set START or STOP value is displayed. When released, it is returned to its previous status.

The sweep step interval can be selected from the following three types.
- Specifying linear-sweep STEP number N

A linear sweep is performed in the carrier and AF frequencies STEP numbered N from the START value to the STOP value. To set STEP number N, press [STEP N], numeric keys (1 or more, integer for N), and POINT[Hz/µV] in this order.

In LOG sweep, STEP number N is automatically determined and [STEP N] has no relation.
• Specifying linear sweep STEP SIZE

A linear sweep is performed in the carrier and AF frequencies step interval specified as STEP SIZE, from the START value to the value just before exceeding the STOP value.

To set STEP SIZE, press [STEP SIZE], numeric keys (for STEP SIZE value), and unit key in this order. 

(0.01 Hz ≤ STEP SIZE ≤ 2.7 GHz)

<table>
<thead>
<tr>
<th>Item</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier frequency</td>
<td>0.01 Hz ≤ STEP SIZE ≤ 2.7 GHz</td>
</tr>
<tr>
<td>AF frequency</td>
<td>0.1 Hz ≤ STEP SIZE ≤ 99.999 9 kHz</td>
</tr>
</tbody>
</table>

• LOG sweep (1% fixed)

A LOG sweep is performed on the carrier and AF frequencies in steps increasing by a factor of 1.01 so as not to exceed the STOP value. To set LOG sweep, press [LOG 1%].

While the [LOG 1%] is pressed, the number of sweep steps in the LOG sweep is displayed on the FREQUENCY display.

[STEP N] and [STEP SIZE] have no relation to the LOG sweep.

Level cannot be swept in LOG mode.

To terminate LOG sweep, press [STEP N] or [STEP SIZE] to set linear sweep.

In CENTER-SPAN mode, LOG sweep cannot be performed.

\[
\text{Note: When either STEP N or STEP SIZE is set in linear sweep, the other set value is changed to the value which satisfies the following equation.}
\]

\[
\text{STEP N × STEP SIZE = Sweep width (\text{START} – \text{STOP}) or SPAN}
\]

4 - 74
(2) CENTER-SPAN sweep

Press [SPAN] to set CENTER-SPAN sweep mode.

This is a sweep method in which the width specified as SPAN is swept with the center value set using the data keys.

In LOG sweep, this mode cannot be selected. To exit LOG sweep and enter this mode, press [STEP N] or [STEP SIZE] to set linear mode and then press [SPAN].

After pressing a header FUNCTION [FREQ]/[LEVEL]/[AF], set the SPAN as follows.

<table>
<thead>
<tr>
<th>Item</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier frequency</td>
<td>0.02 Hz ≤ SPAN ≤ 2.7 GHz</td>
</tr>
<tr>
<td>Output level</td>
<td>0.2 dB ≤ SPAN ≤ 20 dB</td>
</tr>
<tr>
<td>AF frequency</td>
<td>0.2 Hz ≤ SPAN ≤ 99.9999 kHz</td>
</tr>
</tbody>
</table>

- Setting SPAN: [SPAN], numeric keys, and unit key

When [SPAN] is pressed, the [SPAN] LED is lit to indicate that the CENTER-SPAN sweep pattern is obtained.

While [SPAN] is being pressed for approx. 0.5 second or more, the SPAN is displayed. When released, it is returned to previous status.

The step interval can be specified from the following two types.

- Specifying linear sweep STEP number N

A linear sweep is performed in the carrier and AF frequencies STEP numbered N from the CENTER-SPAN/2 to CENTER + SPAN/2 with a center value set by the data keys.

To set STEP number N, press [STEP N], numeric keys (1 or more, integer for N), and POINT[Hz/μV] in this order.

- Specifying linear sweep STEP SIZE

A linear sweep is performed in the carrier and AF frequencies step interval specified as STEP SIZE, from the CENTER-SPAN/2 up to the value not exceeding CENTER + SPAN/2 with the center value set using data keys.

To set STEP SIZE, press [STEP SIZE], numeric keys, and unit key in this order.
<table>
<thead>
<tr>
<th>Item</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier frequency</td>
<td>0.01 Hz ≤ STEP SIZE ≤ 2.7 GHz</td>
</tr>
<tr>
<td>AF frequency</td>
<td>0.1 Hz ≤ STEP SIZE ≤ 99.999 Hz kHz</td>
</tr>
</tbody>
</table>

**Note:** In the CENTER-SPAN sweep, the CENTER value is set with the data keys. When the value moved with the rotary knob or INCREMENT [\(\wedge\)] [\(\vee\)] is required as the CENTER value, press [SHIFT] and then [SPAN].

(3) Setting sweep time (TIME/STEP)

After pressing a header key and [START] or [SPAN], press [TIME/STEP], numeric keys, and unit key in this order to set sweep time.

![Sweep Time Display](image)

Displayed before pressing numeric keys.

The sweep time set here represents the time per step, not entire SPAN time.
The sweep time is common to all the sweep patterns.
Sweep time range is 100 μs to 600 s with a resolution of 10 μs.

(4) Examples

Example 1: Perform a SINGLE sweep from 1 to 100 MHz in 50 steps over a 100 ms sweep time.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ FREQ ]</td>
</tr>
</tbody>
</table>

Select frequency setting mode.
(The FUNCTION [FREQ] LED is lit.
The FREQUENCY display remains unchanged.)

![Frequency Display](image)
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 [START]</td>
<td>Select START frequency setting mode. (The [START] LED is lit.)</td>
</tr>
<tr>
<td>3 [1]</td>
<td>Press [1].</td>
</tr>
<tr>
<td>4 [MHz/dBµ]</td>
<td>Press [MHz]. (The START frequency is set to 1 MHz and the FREQUENCY display returns to the previous 10 MHz display.)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting STOP frequency</td>
<td></td>
</tr>
<tr>
<td>5 [STOP]</td>
<td>Select STOP frequency setting mode.</td>
</tr>
<tr>
<td>6 [1][0][0]</td>
<td>Press [1][0][0].</td>
</tr>
<tr>
<td>7 [MHz/dBµ]</td>
<td>Press [MHz]. (The STOP frequency is set to 100 MHz and the FREQUENCY display returns to the previous 10 MHz display.)</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Setting STEP frequency</strong></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Select STEP frequency setting mode. (The [STEP N] LED is lit.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="STEP N" /></td>
</tr>
<tr>
<td>9</td>
<td>Press [5][0].</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="5" /></td>
</tr>
<tr>
<td>10</td>
<td>Press [POINT]. (The number of steps is set to 50 and the FREQUENCY display returns to the previous 10 MHz display.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="10" /></td>
</tr>
<tr>
<td><strong>Setting sweep time</strong></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Select sweep time setting mode.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="SLOPE TIME" /></td>
</tr>
<tr>
<td>12</td>
<td>Press [1][0][0].</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="10" /></td>
</tr>
<tr>
<td>13</td>
<td>Press [msec]. (The sweep time is set to 100 ms and the FREQUENCY display returns to the previous 10 MHz display.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="10" /></td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Confirming set value</strong></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Press and hold. <strong>[START]</strong> Confirm the START frequency.</td>
</tr>
<tr>
<td>15</td>
<td>Press and hold. <strong>[STOP]</strong> Confirm the STOP frequency.</td>
</tr>
<tr>
<td>16</td>
<td>Press and hold. <strong>[STEP N]</strong> Confirm the number of steps.</td>
</tr>
<tr>
<td>17</td>
<td>Press and hold. <strong>[TIME/STEP]</strong> Confirm the sweep time.</td>
</tr>
</tbody>
</table>

### Confirming set value

- **[START]**: Press and hold.
- **[STOP]**: Press and hold.
- **[STEP N]**: Press and hold.
- **[TIME/STEP]**: Press and hold.

### Confirm the START frequency.

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Confirm the STOP frequency.

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Confirm the number of steps.

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Confirm the sweep time.

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
18  [ SINGLE ]  
(Step 18: Press [SINGLE]. The [SINGLE] mode sweep starts. The [SINGLE] LED blinks.)

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Press [SINGLE]</td>
</tr>
<tr>
<td></td>
<td>(The SINGLE mode sweep starts. The [SINGLE] LED blinks.)</td>
</tr>
</tbody>
</table>

---

### Monitor Display

<table>
<thead>
<tr>
<th>Frequency</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>298 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>496 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>694 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>980 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Step 18: Press [SINGLE]. The [SINGLE] mode sweep starts. The [SINGLE] LED blinks.)

(Step 18: [SINGLE] mode sweep stops at 100 MHz and the [SINGLE] LED goes out.)
Example 2: Perform AUTO sweep from 1 to 500 MHz in LOG 1% and sweep time 200 ms.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 1    | [FREQ] Select frequency setting mode.  
(The FUNCTION [FREQ] LED is lit.  
The FREQUENCY display remains unchanged.) |
|      | ![Frequency Setting](image) |
| 2    | [START] Select START frequency setting mode.  
(The [START] LED is lit.) |
|      | ![Start Frequency Setting](image) |
| 3    | [1] Press [1]. |
|      | ![Press 1](image) |
| 4    | [MHz/dBµ] Press [MHz].  
(The START frequency is set to 1 MHz  
and the FREQUENCY display returns to the previous 10 MHz display.) |
<p>|      | <img src="image" alt="Press MHz" /> |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>[STOP] Select STOP frequency setting mode.</td>
</tr>
<tr>
<td>6</td>
<td>[5] [0] [0] Press [5][0][0].</td>
</tr>
<tr>
<td>7</td>
<td>[MHz/\text{dB}] Press [MHz]. (The STOP frequency is set to 500 MHz and the FREQUENCY display returns to the previous 10 MHz display.)</td>
</tr>
</tbody>
</table>

**Setting LOG 1%**

<p>| 8    | [LOG 1%] Press [LOG 1%]. (The sweep pattern is set to LOG 1%. The [LOG 1%] LED is lit). |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Setting sweep time</strong></td>
</tr>
<tr>
<td>9</td>
<td>[ TIME/STEP ]</td>
</tr>
<tr>
<td></td>
<td>Select sweep time setting mode.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Sweep Time Setting Mode" /></td>
</tr>
<tr>
<td>10</td>
<td>[2] [0] [0]</td>
</tr>
<tr>
<td></td>
<td>Press [2][0][0].</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Frequency Setting Mode" /></td>
</tr>
<tr>
<td>11</td>
<td>[msec]</td>
</tr>
<tr>
<td></td>
<td>Press [msec]. (The sweep time is set to 200 ms and the FREQUENCY display returns to the previous 10 MHz display.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Frequency Setting Mode" /></td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>12</td>
<td>Press [AUTO].</td>
</tr>
<tr>
<td></td>
<td>(The AUTO mode sweep starts. The [AUTO] LED blinks.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 - 84
Example 3: Perform the single sweep from –20 to –5 dBm in a 50 ms sweep time.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 1    | [LEVEL] Select level setting mode. (The [LEVEL] LED is lit. The OUTPUT LEVEL display remains unchanged.)  
|      | ![dBm 0.0](image) |
|      | **Setting START level** |
| 2    | [START] Select START level setting mode. (The [START] LED is lit.)  
|      | ![START](image) |
| 3    | [−][2][0] Press [−][2][0].  
|      | ![−20](image) |
| 4    | [GHz/dBm] Press [dBm]. (The START level is set to –20 dBm and the OUTPUT LEVEL display returns to the previous 0 dBm display.)  
<p>|      | <img src="image" alt="dBm 0.0" /> |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Setting STOP level</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>[ STOP ]  Select STOP level setting mode.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="STOP" /></td>
</tr>
<tr>
<td>6</td>
<td>[ - ] [5]  Press [ - ] [5].</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="5" /></td>
</tr>
<tr>
<td>7</td>
<td>[ MHz/dBμ ]  Press [dBm].  (The STOP level is set to –5 dBm and the OUTPUT LEVEL display returns to the previous 0 dBm display.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="0.0 dBm" /></td>
</tr>
<tr>
<td><strong>Setting sweep time</strong></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>[ TIME/STEP ]  Select sweep time setting mode.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Sweep Time" /></td>
</tr>
<tr>
<td>9</td>
<td>[ 5 ] [0]  Press [5][0].</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="50" /></td>
</tr>
<tr>
<td>10</td>
<td>[ msec ]  Press [msec].  (The sweep time is set to 50 ms and the FREQUENCY display returns to the previous frequency setting.)</td>
</tr>
</tbody>
</table>
11 [SINGLE]

Press [SINGLE].
(The sweep starts in SINGLE mode.
The [SINGLE] LED blinks.)

- 20.0 dBm
- 19.9 dBm
- 19.8 dBm
- 19.7 dBm

The sweep stops at -5 dBm and the [SINGLE] LED goes out.
Example 4: Set carrier frequency to 1 GHz and FM deviation to 3.5 kHz, then perform the AF AUTO mode sweep from AF 100 Hz to AF 100 kHz in LOG 1% and 10 ms sweep time.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[ FREQ ] [1] [ GHz/dBm ] Set to 1 GHz.</td>
</tr>
<tr>
<td></td>
<td><img src="1GHz.png" alt="Image" /></td>
</tr>
<tr>
<td>2</td>
<td>[ FM/Ω ] [3] [ • ] [5] [ kHz/mV ] Set FM deviation to 3.5 kHz.</td>
</tr>
<tr>
<td></td>
<td><img src="3.5kHz.png" alt="Image" /></td>
</tr>
<tr>
<td>3</td>
<td><strong>FM/Ω</strong> [ INT ] [ EXT AC ] [ EXT DC ] [ FREQ CAL ] Press each key to light the [INT] LED only. (The FM modulation input mode is set only to the INT mode.)</td>
</tr>
<tr>
<td>4</td>
<td>[ INT MOD FREQ ] Press [INT MOD FREQ] repeatedly until the [AF] LED is lit. (The internal modulation frequency is set to AF.)</td>
</tr>
<tr>
<td></td>
<td><img src="INT.MOD.FREQ.png" alt="Image" /></td>
</tr>
<tr>
<td>5</td>
<td>[ AF ] Select AF frequency setting mode. (The [AF] LED is lit and the FREQUENCY display shows the current AF frequency.)</td>
</tr>
<tr>
<td></td>
<td><img src="AF.png" alt="Image" /></td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>6</td>
<td>[START]</td>
</tr>
<tr>
<td></td>
<td>Select START AF frequency setting mode.</td>
</tr>
<tr>
<td></td>
<td>(The [START] LED is lit.)</td>
</tr>
<tr>
<td>7</td>
<td>[1] [0] [0]</td>
</tr>
<tr>
<td>8</td>
<td>[Hz/μV]</td>
</tr>
</tbody>
</table>

**Setting STOP AF frequency**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>[STOP]</td>
</tr>
<tr>
<td></td>
<td>Select STOP AF frequency setting mode.</td>
</tr>
<tr>
<td>10</td>
<td>[1] [0] [0]</td>
</tr>
<tr>
<td>11</td>
<td>[kHz/mV]</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td><strong>Setting sweep time</strong></td>
</tr>
<tr>
<td>12</td>
<td>[TIME/STEP]</td>
</tr>
<tr>
<td></td>
<td>Select sweep time setting mode.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Sweep Time Table" /></td>
</tr>
<tr>
<td>13</td>
<td>[1] [0]</td>
</tr>
<tr>
<td></td>
<td>Press [1][0].</td>
</tr>
<tr>
<td>14</td>
<td>[msec]</td>
</tr>
<tr>
<td></td>
<td>Press [msec]. (The sweep time is set to 10 ms and the FREQUENCY display returns to the current AF frequency 1000 Hz display.)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="AF Table" /></td>
</tr>
<tr>
<td></td>
<td><strong>Setting LOG 1%</strong></td>
</tr>
<tr>
<td>15</td>
<td>[LOG 1%]</td>
</tr>
<tr>
<td></td>
<td>Set sweep pattern to LOG 1%. (The [LOG 1%]LED is lit.)</td>
</tr>
</tbody>
</table>
16  [AUTO]

Press [AUTO]
(The sweep starts in AUTO mode.
The [AUTO] LED blinks.)

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Press [AUTO]</td>
</tr>
</tbody>
</table>

(The sweep starts in AUTO mode.
The [AUTO] LED blinks.)

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 0 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 0 1 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 0 2 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 0 3 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 0 4 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>(con't)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>98 789.7</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>99 777.6</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AF</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 10</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
4.10.4 Setting FREQ memory and FUNCTION memory sweep

This is a sweep method in which the carrier frequencies and panel setting conditions stored in the FREQ memory and FUNCTION memory, respectively, are recalled at random, continuously, or in a combination thereof.

**Note:** The maximum number of sweep steps for a FREQ or FUNCTION memory is 20.
To monitor the current number of the memory sweep step, the resolution-digit MONITOR LED is used as a step number MONITOR LED. When sweep is performed on the 15 memories shown in the figure, the number of the lit MONITOR LEDs is 12. This is described below. For a continuous sweep, irrespective of the number of sweep addresses, only three MONITOR LEDs are lit. (i.e. one corresponding to start address, another indicating sweep, and another LED to signal STOP address.)

### (1) Random-address sweep

This is a method in which the FREQ or FUNCTION memory addresses are set in any chosen order and they are recalled in the same order.

After pressing MEMORY [FREQ] or [FUNCTION], set the addresses by pressing keys, as follows.

[MEMORY], numeric keys (memory address), [,], numeric keys (memory address), [,], ...., [,], numeric keys (memory address), POINT[Hz/μV]
(2) Continuous address sweep

This is a method in which continuous addresses of FREQ or FUNCTION memory are recalled sequentially.

After pressing MEMORY [FREQ] or [FUNCTION], set the addresses by pressing keys, as follows.

[MEMORY], numeric keys (start address), [..].[..], numeric keys (stop address), POINT[Hz/µV].

(Press [..] twice!)

(3) Combining random and continuous address sweep

The continuous address sweep (underlined) can be incorporated into the random address sweep. Set the addresses by pressing keys, as follows.

[MEMORY], numeric keys (memory address), [..], numeric keys (start address), [..].[..], numeric keys (stop address), [..], numeric keys (memory address), [..], numeric keys (memory address), POINT[Hz/µV]

The input data is displayed left-justified on the FREQUENCY display. When the data reaches the right end of the display, the display scrolls to the left thereafter. The MONITOR LED is also lit to indicate which step is now being input. This MONITOR LED serves as a display which announces which step is now being swept during the sweeping.

As the keys are pressed, the FREQUENCY display contents are changed as shown below.

<table>
<thead>
<tr>
<th>Key operation</th>
<th>FREQUENCY Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ MEMORY ]</td>
<td>![Display 1]</td>
</tr>
<tr>
<td>[1] [●]</td>
<td>![Display 2]</td>
</tr>
<tr>
<td>[5] [●]</td>
<td>![Display 3]</td>
</tr>
<tr>
<td>[8] [●]</td>
<td>![Display 4]</td>
</tr>
</tbody>
</table>

4 - 94
### Key operation

<table>
<thead>
<tr>
<th>Key operation</th>
<th>FREQUENCY Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>[2] [●] [●] [●] [9]</td>
<td><img src="image" alt="Frequency Display" /></td>
</tr>
<tr>
<td>[●] [1] [3] [●] [6] [●] [8] [●] [1] [0] [●]</td>
<td><img src="image" alt="Frequency Display" /></td>
</tr>
<tr>
<td>[7] [●]</td>
<td><img src="image" alt="Frequency Display" /></td>
</tr>
<tr>
<td>[3] [0]</td>
<td><img src="image" alt="Frequency Display" /></td>
</tr>
</tbody>
</table>

### (4) Setting sweep time (TIME/STEP)

#### (a) FREQ-memory sweep time

After pressing MEMORY [FREQ] and SWEEP PATTERN [MEMORY], press [TIME/STEP], numeric keys (sweep time), and unit key in this order to set sweep time. The sweep time set here represents the time per one step. The sweep time is common to all the sweep patterns. The sweep time range is 100 μs to 600s and the resolution is 10 μs.

#### (b) FUNCTION-memory sweep time

Independent FUNCTION memory sweep times (set time) are input with panel settings before they are stored in the FUNCTION memory.

- Input set times for function memory addresses without sweep function, as follows.
  
  Press SWEEP PATTERN [MEMORY] and MEMORY [FUNCTION] and then press [TIME/STEP], numeric keys (set time), and unit key in this order.

- When panel settings containing any sweep of FREQ, LEVEL, or AF sweep, the set times automatically become the sweep times automatically.

The FUNCTION memory sweep performs a SINGLE mode sweep and proceeds to the next step address.
(5) Confirming a memory sweep address

To confirm the address setting in the memory sweep, press and hold [MEMORY] when the MEMORY [FREQ] or [FUNCTION] LED is lit. Then, the set addresses placed between the letters “F” are displayed repeatedly on the FREQUENCY display (shifting from right to left) while [MEMORY] is pressed.

The MONITOR LED also displays the number of steps.

![Diagram of address settings and frequency display]

2.528F2.528F2

GHz MHz kHz Hz

MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Number of steps
(6) Examples

Example 1: Store 1 MHz, 2 MHz, 3 MHz, ..., 100 MHz to address 1, 2, 3, ..., 100, respectively, and perform a manual FREQ sweep in the 1, 5, 98, 15 to 40, and 50 address order.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[FREQ] [1] [MHz/dBµ] (MEMORY [FREQ] [1] [STORE] section) 1 MHz→address 1</td>
</tr>
<tr>
<td></td>
<td>[2] [MHz/dBµ] Setting 2 MHz</td>
</tr>
<tr>
<td></td>
<td>[3] [STORE] 2 MHz→address 2</td>
</tr>
<tr>
<td></td>
<td>[3] [MHz/dBµ] Setting 3 MHz</td>
</tr>
<tr>
<td></td>
<td>[3] [STORE] 3MHz→address 3</td>
</tr>
<tr>
<td></td>
<td>⋮</td>
</tr>
<tr>
<td></td>
<td>[1] [0] [0] [MHz/dBµ] Setting 100 MHz</td>
</tr>
<tr>
<td></td>
<td>[1] [0] [0] [STORE] 100 MHz→address 100</td>
</tr>
</tbody>
</table>

2  [MEMORY ]
Select FREQ memory sweep address setting mode. (The SWEEP PATTERN [MEMORY] LED is lit.)

3  [1] [●] [5] [●] [9] [8] [●] [1] [5] [●] [●] [4] [0] [●] [5] [0]
Input the FREQ memory sweep addresses. (The input data is input left-justified on the FREQUENCY display.)
4  [ POINT ]

Press [POINT]. (The FREQ-memory sweep address is set and the FREQUENCY display returns to the previous 100 MHz display.)

5  [ MANUAL MARKER ]

Set MANUAL mode sweep. (The [MANUAL] LED is lit and the FREQ memory address contents which is input first are recalled.)

6  ROTARY KNOB
(up)

or

INCREMENT  [ ]
(Up direction)

Perform MANUAL sweep in a forward or backward direction of the address order by turning rotary knob or pressing INCREMENT [ ] or [ ].
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>ROTARY KNOB (down)</td>
</tr>
<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>INCREMENT [햋]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monitor</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

Values:

- 15,000,000,000 Hz
- 16,000,000,000 Hz
- 17,000,000,000 Hz
- 18,000,000,000 Hz
- 39,000,000,000 Hz
- 40,000,000,000 Hz
- 50,000,000,000 Hz
Example 2: Repeat the following panel settings.

Address 1: 10-second settings of 455 kHz, 0 dBm, AM 30%, and INT MOD FREQ 1 kHz
Address 2: Settings of 455 kHz, 0 dBm, modulation OFF, SPAN 50 kHz, STEP 1 kHz, and TIME/STEP 20 ms sweep
Address 3: 20-second settings of 10.7 MHz, −10 dBm, FM 100 kHz, and INT MOD FREQ 1 kHz
Address 4: Settings of 10.7 MHz, −10 dBm, modulation OFF, SPAN 1 MHz, STEP 20 kHz, and TIME/STEP 50 ms sweep

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 [ SPECIAL ] [ 0 ] [ 0 ]</td>
<td>Initialization (For details, see paragraph 4.11.2.)</td>
</tr>
<tr>
<td>2 [ FUNCTION ]</td>
<td>Set FUNCTION memory mode. (The [FUNCTION] LED is lit.)</td>
</tr>
</tbody>
</table>

### Setting address-1 contents

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 [ LEVEL ] [ 0 ] [ GHz/Dbm ]</td>
<td></td>
</tr>
<tr>
<td>5 [ AM ] [ 3 ] [ 0 ] [ % ]</td>
<td></td>
</tr>
<tr>
<td>6 [ TIME/STEP ] [ 1 ] [ 0 ] [ sec ]</td>
<td></td>
</tr>
<tr>
<td>7 [ 1 ] [ STORE ]</td>
<td></td>
</tr>
</tbody>
</table>
### Step 8

**Setting address-2 contents**

Set different contents from that of address 1.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>AM ON/OFF</td>
</tr>
<tr>
<td>9</td>
<td>SPAN [5] [0] [kHz/mV]</td>
</tr>
<tr>
<td>10</td>
<td>STEP SIZE [1] [kHz/mV]</td>
</tr>
<tr>
<td>11</td>
<td>TIME/STEP [2] [0] [msec]</td>
</tr>
<tr>
<td>12</td>
<td>AUTO</td>
</tr>
<tr>
<td>13</td>
<td>[2] [STORE]</td>
</tr>
</tbody>
</table>

### Step 14

**Setting address-3 contents**

The header [FREQ] LED is lit.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>SWEEP OFF</td>
</tr>
<tr>
<td>15</td>
<td>[1] [0] [●] [7] [MHz/dBµ]</td>
</tr>
<tr>
<td>16</td>
<td>LEVEL [ - ] [1] [0] [GHz/dBm]</td>
</tr>
<tr>
<td>17</td>
<td>FM/ΩM [1] [0] [0] [kHz/mV]</td>
</tr>
<tr>
<td>18</td>
<td>TIME/STEP [2] [0] [sec]</td>
</tr>
<tr>
<td>19</td>
<td>[3] [STORE]</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>Setting address-4 contents</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>[ FM/ΩM ON/OFF ]</td>
</tr>
<tr>
<td>21</td>
<td>[ SPAN ] [ 1 ] [ MHz/DBμ ]</td>
</tr>
<tr>
<td>22</td>
<td>[ STEP SIZE ] [ 2 ] [ 0 ] [ kHz/mV ]</td>
</tr>
<tr>
<td>23</td>
<td>[ TIME/STEP ] [ 5 ] [ 0 ] [ msec ]</td>
</tr>
<tr>
<td>24</td>
<td>[ AUTO ]</td>
</tr>
<tr>
<td>25</td>
<td>[ 4 ] [ STORE ]</td>
</tr>
</tbody>
</table>
Setting FUNCTION memory sweep address

26  [ SWEEP OFF ]

Stop sweeping.

An example of an output frequency display when sweep stops.

27  [ MEMORY ]

Select FUNCTION memory sweep address setting mode (The [MEMORY] LED is lit.)

28  [ 1 ] [ • ] [ • ] [ 4 ]

Input FUNCTION memory sweep address. (The data is input left-justified on the FREQUENCY display.)

29  [ POINT ]

Press [POINT]. (The FUNCTION memory sweep address is set and the FREQUENCY display returns to the 10.62 MHz display at step 26.)

Starting FUNCTION memory sweep

30  [ AUTO ]

Start sweeping in AUTO mode. (The [AUTO] LED blinks.)
4.10.5 MARKER

A marker signal can be output from the MARKER connector on the rear panel by performing the following operation during sweeping in the AUTO or SINGLE mode.

- Press [SHIFT] and then [MANUAL MARKER] to turn on the marker function.
- Use the rotary knob or INCREMENT (\(^{\uparrow}\) \(^{\downarrow}\)) to set the marker point. The marker-point frequency for frequency sweep or the marker-point level for level sweep is displayed on the FREQUENCY or OUTPUT LEVEL display, respectively.
- When the actual sweep point and the marker-set point match, the positive pulse signal (TTL) is output from the MARKER connector on the rear panel.
- To disengage marker function, press [SHIFT], then press [MANUAL MARKER].
- The marker function cannot be turned on in the MANUAL mode. If an attempt is made to turn on the function, the [STATUS] LED blinks. At this time, when the [STATUS] is pressed, the following error message is displayed.

<table>
<thead>
<tr>
<th>Sweep Err</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweep</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

- When the marker function is turned on for the first time during sweeping, the marker point is set to the sweep start point. When the marker function which was turned off is turned on again, the previous marker is recovered.
- When the SWEEP PATTERN or SWEEP STEP parameter is changed during sweeping, the marker is set to the point closest to the marker point before change. If the closest point are two at the same distance, the marker is set to the lower point.

4.10.6 Presetting sweep

When sweep is not performed, the re-start sweep point can be set forcibly to the start or stop point in the currently-set sweep pattern.

(1) Presetting to start point

Press [SHIFT], then press [START].

(2) Presetting to stop point

Press [SHIFT], then press [STOP].
4.10.7 Output connectors related to sweep function

Sweep-function output connectors are explained below.

1. **SWEEP OUTPUT** on front panel
   
   Outputs a 0 to 10V stair case sawtooth waveform synchronized with sweeping.

2. **SWEEP STATUS** on rear panel

   Outputs sweep status signal (high level during sweeping).

3. **MARKER** on rear panel

   Outputs a positive pulse when the current point coincides with the marker point at marker function ON.

4. **BLANKING** on rear panel

   Outputs a pulse when sweep steps. The pulse polarity is selected using SP43 for positive pulse and SP44 for negative pulse.

Output timing of these signals are shown below using an example of frequency AUTO sweep from \( f_0 \) to \( f_5 \) with STEP N = 6 and marker point at \( f_3 \).
4.11 Special Functions

Special function can be set by pressing [SPECIAL] and inputting two-digit codes (00 to 99). The special function codes are listed in the table on the following page.

<table>
<thead>
<tr>
<th>Key operation</th>
<th>FREQUENCY display</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ SPECIAL ]</td>
<td>![Image of display]</td>
</tr>
<tr>
<td>[ 0 ]</td>
<td>![Image of display]</td>
</tr>
<tr>
<td>[ 1 ]</td>
<td>![Image of display]</td>
</tr>
</tbody>
</table>

When the second digit is pressed, the special function is also set.
<table>
<thead>
<tr>
<th>Contents</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initialization</td>
<td>00</td>
</tr>
<tr>
<td>Bell : Bell OFF</td>
<td>01</td>
</tr>
<tr>
<td>Bell : Bell ON *</td>
<td>02</td>
</tr>
<tr>
<td>Output level : Open-circuit voltage display (EMF) *</td>
<td>03</td>
</tr>
<tr>
<td>Output level : Terminated voltage display</td>
<td>04</td>
</tr>
<tr>
<td>Output level : Limiter OFF *</td>
<td>05</td>
</tr>
<tr>
<td>Output level : Limiter ON</td>
<td>06</td>
</tr>
<tr>
<td>Output level : Offset mode OFF *</td>
<td>07</td>
</tr>
<tr>
<td>Output level : Offset mode ON</td>
<td>08</td>
</tr>
<tr>
<td>Frequency : Offset mode OFF *</td>
<td>11</td>
</tr>
<tr>
<td>Frequency : Offset mode ON</td>
<td>12</td>
</tr>
<tr>
<td>FREQ memory : Protect OFF *</td>
<td>13</td>
</tr>
<tr>
<td>FREQ memory : Protect ON</td>
<td>14</td>
</tr>
<tr>
<td>FUNCTION memory : Protect OFF *</td>
<td>15</td>
</tr>
<tr>
<td>FUNCTION memory : Protect ON</td>
<td>16</td>
</tr>
<tr>
<td>FM OSC. : Automatic switching*</td>
<td>17</td>
</tr>
<tr>
<td>FM OSC. : Middle fixed</td>
<td>18</td>
</tr>
<tr>
<td>FM OSC. : Wide fixed</td>
<td>19</td>
</tr>
<tr>
<td>ØM OSC. : Automatic switching*</td>
<td>20</td>
</tr>
<tr>
<td>ØM OSC. : Middle fixed</td>
<td>21</td>
</tr>
<tr>
<td>ØM OSC. : Wide fixed</td>
<td>22</td>
</tr>
<tr>
<td>FM/ØM : Polarity normal *</td>
<td>23</td>
</tr>
<tr>
<td>FM/ØM : Polarity invert</td>
<td>24</td>
</tr>
<tr>
<td>FM/ØM : INT/EXT deviation fixed release *</td>
<td>25</td>
</tr>
<tr>
<td>FM/ØM : INT deviation fixed</td>
<td>26</td>
</tr>
<tr>
<td>FM/ØM : EXT deviation fixed</td>
<td>27</td>
</tr>
</tbody>
</table>

* denotes initial status
<table>
<thead>
<tr>
<th>Contents</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT MOD : Normal *</td>
<td>30</td>
</tr>
<tr>
<td>INT MOD : + DC applied</td>
<td>31</td>
</tr>
<tr>
<td>INT MOD : − DC applied</td>
<td>32</td>
</tr>
<tr>
<td>INT MOD : ± DC external control</td>
<td>33</td>
</tr>
<tr>
<td>MOD OUTPUT : Automatic switching*</td>
<td>35</td>
</tr>
<tr>
<td>MOD OUTPUT : INT fixed</td>
<td>36</td>
</tr>
<tr>
<td>MOD OUTPUT : AM EXT fixed</td>
<td>37</td>
</tr>
<tr>
<td>MOD OUTPUT : FM/ØM EXT fixed</td>
<td>38</td>
</tr>
<tr>
<td>Sweep blanking output : Positive logic*</td>
<td>43</td>
</tr>
<tr>
<td>Sweep blanking output : Negative logic</td>
<td>44</td>
</tr>
<tr>
<td>FUNCTION memory sweep : Sweep output pattern 1*</td>
<td>45</td>
</tr>
<tr>
<td>FUNCTION memory sweep : Sweep output pattern 2</td>
<td>46</td>
</tr>
</tbody>
</table>

* denotes initial status
<table>
<thead>
<tr>
<th>Contents</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output level limiter value header</td>
<td>51</td>
</tr>
<tr>
<td>Output level offset value header</td>
<td>52</td>
</tr>
<tr>
<td>Frequency offset value header</td>
<td>53</td>
</tr>
<tr>
<td>Trigger program: Setting</td>
<td>56</td>
</tr>
<tr>
<td>Trigger program: Clear</td>
<td>57</td>
</tr>
<tr>
<td>Trigger program: Start</td>
<td>58</td>
</tr>
<tr>
<td>Contents</td>
<td>Code</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>GP-IB: Talker data with header *</td>
<td>60</td>
</tr>
<tr>
<td>GP-IB: Talker data without header</td>
<td>61</td>
</tr>
<tr>
<td>GP-IB: Address setting</td>
<td>62</td>
</tr>
<tr>
<td>GP-IB: Address display</td>
<td>63</td>
</tr>
<tr>
<td>GP-IB: Only mode OFF</td>
<td>64</td>
</tr>
<tr>
<td>GP-IB: Frequency talk-only-mode ON</td>
<td>65</td>
</tr>
<tr>
<td>GP-IB: Output level talk-only-mode ON</td>
<td>66</td>
</tr>
<tr>
<td>GP-IB: Frequency/Output level talk-only-mode ON</td>
<td>67</td>
</tr>
<tr>
<td>GP-IB: Listen only mode ON</td>
<td>68</td>
</tr>
<tr>
<td>SRQ: ALL MASK *</td>
<td>70</td>
</tr>
<tr>
<td>SRQ: ERROR MASK OFF</td>
<td>71</td>
</tr>
<tr>
<td>SRQ: BUSY/READY MASK OFF</td>
<td>72</td>
</tr>
<tr>
<td>SRQ: MALFUNCTION MASK OFF</td>
<td>73</td>
</tr>
<tr>
<td>SRQ: SELF TEST MASK OFF</td>
<td>74</td>
</tr>
<tr>
<td>SRQ: SUSPENSION MASK OFF</td>
<td>75</td>
</tr>
<tr>
<td>SRQ: DATA ERROR MASK OFF</td>
<td>76</td>
</tr>
<tr>
<td>SRQ: TRIGGER PROGRAM END MASK OFF</td>
<td>77</td>
</tr>
<tr>
<td>SRQ: SWEEP END MASK OFF</td>
<td>78</td>
</tr>
<tr>
<td>SRQ: MARKER POSITION MASK OFF</td>
<td>79</td>
</tr>
<tr>
<td>SRQ: STRINGS END MASK OFF</td>
<td>80</td>
</tr>
</tbody>
</table>

* denotes initial status
Table 4-1  Special Functions  (5/5)

<table>
<thead>
<tr>
<th>Contents</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQ memory: Clear</td>
<td>81</td>
</tr>
<tr>
<td>FUNCTION memory: Clear</td>
<td>82</td>
</tr>
<tr>
<td>Option display</td>
<td>83</td>
</tr>
<tr>
<td>Output level correction : Normal *</td>
<td>86</td>
</tr>
<tr>
<td>Output level correction : (CAL data 1) (Option 07)</td>
<td>87</td>
</tr>
<tr>
<td>Output level correction : (CAL data 2) (Option 07)</td>
<td>88</td>
</tr>
</tbody>
</table>

* denotes initial status
4.11.1 Special function status

To check special function setting, press [SPECIAL], numeric key 1 to 5, and [STATUS] in this order. While [STATUS] is pressed and held, the set special function code is displayed on the MONITOR LED below the FREQUENCY display.

The following example shows initialized status codes of 02, 03, 05, 07, 11, 13, 15, 17, 20, 23, 25, 30, 35, 43, 45, 60, 70, and 86.

Press [SPECIAL] [1] [STATUS] to check SP01 to 20.

Press [SPECIAL] [2] [STATUS] to check SP21 to 40.

Press [SPECIAL] [3] [STATUS] to check SP41 to 60.
Press [SPECIAL][4][STATUS] to check SP61 to 80.

Press [SPECIAL][5][STATUS] to check SP81 to 99.
### 4.11.2 Initial setting (SP00)

To set the panel settings and operating system values to initial status, press [SPECIAL], [0], and [0] in this order:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header</td>
<td>FREQ</td>
</tr>
<tr>
<td>Rotary knob HOLD</td>
<td>OFF</td>
</tr>
<tr>
<td>Carrier frequency</td>
<td>10 MHz</td>
</tr>
<tr>
<td>Carrier frequency increment value</td>
<td>1 MHz</td>
</tr>
<tr>
<td>Carrier frequency resolution</td>
<td>10 kHz digit</td>
</tr>
<tr>
<td>RELATIVE FREQ</td>
<td>OFF</td>
</tr>
<tr>
<td>Frequency offset value</td>
<td>0 Hz</td>
</tr>
<tr>
<td>Output level</td>
<td>0 dBm</td>
</tr>
<tr>
<td>Output level increment value</td>
<td>1 dB</td>
</tr>
<tr>
<td>Output level resolution</td>
<td>0.1 dB digit</td>
</tr>
<tr>
<td>CONTINUOUS mode</td>
<td>OFF</td>
</tr>
<tr>
<td>RELATIVE LEVEL</td>
<td>OFF</td>
</tr>
<tr>
<td>RF ON/OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Output level offset value</td>
<td>0 dB</td>
</tr>
<tr>
<td>Output level limiter value</td>
<td>−10 dBm</td>
</tr>
<tr>
<td>AF frequency</td>
<td>1 kHz</td>
</tr>
<tr>
<td>AF frequency increment value</td>
<td>100 Hz</td>
</tr>
<tr>
<td>AF frequency resolution</td>
<td>100 Hz</td>
</tr>
<tr>
<td>FM/ΩM</td>
<td>FM</td>
</tr>
<tr>
<td>FM modulation</td>
<td>OFF</td>
</tr>
<tr>
<td>FM frequency deviation</td>
<td>3.5 kHz</td>
</tr>
</tbody>
</table>
FM frequency deviation resolution: Second digit
FM input mode: INT
FM INT MOD FREQ: 1 kHz

AM modulation: OFF
AM modulation factor: 30%
AM modulation factor resolution: 1 % digit
AM input mode: INT
AM INT MOD FREQ: 1 kHz

ØM modulation: OFF
ØM phase deviation: 1 rad
ØM phase deviation resolution: Second digit
ØM input mode: INT
ØM INT MOD FREQ: 1 kHz

MEMORY mode: FREQ memory

Sweep mode: OFF

Carrier frequency sweep pattern: START-STOP
Carrier frequency sweep step: LIN-STEP N
Start frequency: 1 MHz
Stop frequency: 100 MHz
Span frequency: 1 MHz
Number of frequency steps: 990
Frequency step size: 100 kHz

Output-level sweep pattern: START-STOP
Start level: −35 dBm
Stop level: −25 dBm
Span level: 10 dB
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF frequency sweep pattern</td>
<td>START-STOP</td>
</tr>
<tr>
<td>AF frequency sweep step</td>
<td>LIN-STEP N</td>
</tr>
<tr>
<td>Start AF frequency</td>
<td>100 Hz</td>
</tr>
<tr>
<td>Stop AF frequency</td>
<td>100 kHz</td>
</tr>
<tr>
<td>Span AF frequency</td>
<td>1 kHz</td>
</tr>
<tr>
<td>Number of AF frequency steps</td>
<td>999</td>
</tr>
<tr>
<td>AF frequency step size</td>
<td>100 Hz</td>
</tr>
<tr>
<td>FREQ memory sweep</td>
<td>(No data)</td>
</tr>
<tr>
<td>Sweep time</td>
<td>5 ms / step</td>
</tr>
<tr>
<td>FUNCTION memory sweep</td>
<td>(No data)</td>
</tr>
<tr>
<td>FUNCTION memory set time</td>
<td>1 s / step</td>
</tr>
<tr>
<td>Special function</td>
<td>See Table 4-1 of special function</td>
</tr>
</tbody>
</table>

### 4.11.3 Bell ON/OFF (SP02/01)

Special Function 02/01 give an alarm bell on/off.

1. [SPECIAL] [0] [1] Turns off the bell.
2. [SPECIAL] [0] [2] Turns on the bell.
4.11.4 Terminated and open-circuit voltage (EMF) display of output level (SP04/03)

Special Function 04 gives a terminated output voltage display by pressing [SPECIAL] [0] [4]. Special Function 03 gives an open-circuit (EMF) voltage display by pressing [SPECIAL] [0] [3].

Terminated voltage ↔ open-circuit (EMF) voltage conversion changes alone display without changing the actual output level. When the open-circuit (EMF) voltage is displayed, the “EMF” LED is lit on the display.

Even if SP03 or 04 is input when the unit is dBm, the display does not change. When the unit is dBµ, V, mV or µV, the display changes to the open-circuit (EMF) or terminated voltage display.

Example:  Unit conversion to dBµ or mV at the output level of 0 dBm

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>dBm→dBµ conversion</td>
</tr>
<tr>
<td>2</td>
<td>[ LEVEL ] [ 0 ] [ GHz/dBm ]</td>
</tr>
<tr>
<td></td>
<td>0.0 dBm</td>
</tr>
<tr>
<td>3</td>
<td>[ MHz/dBµ ]</td>
</tr>
<tr>
<td></td>
<td>113.0 dBµ</td>
</tr>
<tr>
<td></td>
<td>EMF</td>
</tr>
<tr>
<td>4</td>
<td>[ SPECIAL ] [ 0 ] [ 4 ]</td>
</tr>
<tr>
<td></td>
<td>107.0 dBµ</td>
</tr>
<tr>
<td></td>
<td>Terminated→EMF voltage display</td>
</tr>
<tr>
<td>5</td>
<td>[ SPECIAL ] [ 0 ] [ 3 ]</td>
</tr>
<tr>
<td></td>
<td>113.0 dBµ</td>
</tr>
<tr>
<td></td>
<td>EMF</td>
</tr>
<tr>
<td>6</td>
<td>[ kHz/mV ]</td>
</tr>
<tr>
<td></td>
<td>447 mV</td>
</tr>
<tr>
<td></td>
<td>EMF</td>
</tr>
<tr>
<td>7</td>
<td>[ SPECIAL ] [ 0 ] [ 4 ]</td>
</tr>
<tr>
<td></td>
<td>224 mV</td>
</tr>
</tbody>
</table>

4 - 117
• Relationship between open-circuit (EMF) voltage and terminated voltage

When 1 mW power is applied to an external 50Ω terminated load, the relationship between open-circuit (EMF) voltage and terminated voltage is as shown below:

![Diagram showing the relationship between open-circuit (EMF) voltage and terminated voltage]

<table>
<thead>
<tr>
<th>Voltage unit display</th>
<th>Power unit display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open-circuit (EMF) voltage</td>
<td>447 mV 113 dBµ</td>
</tr>
<tr>
<td>Terminated voltage</td>
<td>224 mV 107 dBµ</td>
</tr>
<tr>
<td>(Open/Terminated) display ratio</td>
<td>2 6 dB</td>
</tr>
</tbody>
</table>

Open-circuit (EMF) voltage or terminated voltage is displayed for the voltage unit.

Note: When voltage conversion between EMF and terminated voltages is performed, conversion error may occur due to internal calculations based on dBm. However, actual output level is the same.
4.11.5 Output level limiter ON/OFF (SP06/05)

Special Function 06/05 limit the maximum value of output level.

1. \[ \text{SPECIAL} \] \{ 0 \} \{ 6 \}  Output level limiter ON
2. \[ \text{SPECIAL} \] \{ 0 \} \{ 5 \}  Output level limiter OFF

The upper limit value of the output level is set as follows:

\[ \text{SPECIAL} \] \{ 5 \} \{ 1 \}, numeric keys (upper limit value), unit key

- The range and resolution is the same as those for output level.
- When the output level limiter is turned on, the output level cannot be raised above the level set for the upper limit value. Thus, devices which are easily affected by excessive input are protected.
- If the output level (at the time the output level limiter is turned on) exceeds the upper limit value, the output is automatically adjusted to the upper limit value.
- The upper limit value can be set even while the output level limiter is turned off.
4.11.6 Output level offset mode ON/OFF (SP08/07)

Special Function 08/07 are ON/OFF controls for the output level offset mode.

1. \([\text{SPECIAL}] \ [0] \ [8]\)  Turns on the output level offset mode.
2. \([\text{SPECIAL}] \ [0] \ [7]\)  Turns off the output level offset mode.

The output level offset value is set as follows:
\([\text{SPECIAL}] \ [5] \ [2]\), numeric keys (offset value), \([\text{dB}]\)

Offset value unit is dB only, the units V, mV or \(\mu\)V cannot be input as the offset value.

Example: Confirm the output level display when the offset value is set to +10 dB after the output level is set to −100 dBm.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 1    | \([\text{LEVEL}] \ [-] \ [1] \ [0] \ [0]\)  
\([\text{GHz/dBm}]\)  
Set to −100 dBm.  
\(-100.0 \text{ dBm}\) |
| 2    | \([\text{SPECIAL}] \ [5] \ [2]\)  
Input the output level offset value header.  
OFFSET |
| 3    | \([1] \ [0]\)  
Input the +10 dB offset data. Check the input data displayed before pressing the unit key.  
10 |
| 4    | \([\text{dB}]\)  
Press [dB]. (The offset value is set to +10 dB and the OUTPUT LEVEL display returns to the current output level display.)  
\(-100.0 \text{ dBm}\) |
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 5    | [SPECIAL] [0] [8]  
**Turn on the offset mode.**  
\((-100\ \text{dBm} + 10\ \text{dB} = -90\ \text{dBm} \text{ is displayed.})** |
| 6    | [SPECIAL] [0] [7]  
**Turn off the offset mode.** |

**Note:** The offset value range is from −166 to 166 dB.  
When the actual output level exceeds the output level range, errors may result.  
The offset value can be set even while the offset mode is turned off.  
When the units are V, mV, or µV, the offset is applied after the unit is automatically converted to dBµ.
4.11.7 Frequency offset mode ON/OFF (SP12/11)

Special Function 12/11 give a carrier frequency offset mode ON/OFF control.

1. \( \text{[SPECIAL]} \ [1] \ [2] \) Turns on the frequency offset mode.
2. \( \text{[SPECIAL]} \ [1] \ [1] \) Turns off the frequency offset mode.

The frequency offset value is set as follows:

\( \text{[SPECIAL]} \ [5] \ [3] \), numeric keys (offset value), unit key

Example: Confirm the frequency display when the offset value is set to \(-1.5\) kHz after the frequency is set to 750 MHz.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( \text{[FREQ]} \ [7] \ [5] \ [0] \ [MHz/dB] )</td>
</tr>
<tr>
<td></td>
<td>Set to 750 MHz.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Frequency Display" /></td>
</tr>
</tbody>
</table>

| 2    | \( \text{[SPECIAL]} \ [5] \ [3] \)  |
|      | Input frequency offset value header. |
|      | ![Frequency Offset](image) |

<p>| 3    | ( [-] \ [1] \ [•] \ [5] )  |
|      | Input (-1.5) kHz offset data. Check the input data displayed before pressing unit key. |
|      | <img src="image" alt="Decimal Display" /> |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Press [kHz/mV]. (The offset value is set to $-1.5$ kHz and the FREQUENCY display returns to the current frequency.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Setting</th>
<th>Monitor Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHz</td>
<td>kHz</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td>10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Turn on the offset mode. (750 MHz $-1.5$ kHz = 749.9985 MHz displayed.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Setting</th>
<th>Monitor Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHz</td>
<td>kHz</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td>10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Turn off the offset mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency Setting</th>
<th>Monitor Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHz</td>
<td>kHz</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td>10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
</tbody>
</table>

**Note:** The offset value range is from $-2.7$ GHz to 2.7 GHz. When the actual frequency exceeds the frequency range, error may result. The offset value can be set even while the offset mode is turned off.

**4.11.8 FREQ-memory protect ON/OFF (SP14/13)**

See paragraph 4.9.3.

**4.11.9 FUNCTION-memory protect ON/OFF (SP16/15)**

See paragraph 4.9.3.
4.11.10 FM OSC: Automatic switching/MIDDLE fixed/WIDE fixed (SP17/18/19)

There are three types of FM modulation oscillators: NARROW, MIDDLE, and WIDE deviation devices.

Usually, automatic switching is performed as shown below according to the carrier frequency and frequency deviation.

The three oscillators each have different modulation characteristics. Therefore, when changing the oscillator will affect measurement results, the oscillator to be used must be fixed using Special Function 18/19. In this case, the maximum frequency deviation is that of the fixed oscillator.

1. [SPECIAL] [1] [7] The FM oscillator is set to automatic switching.

2. [SPECIAL] [1] [8] The FM oscillator is fixed to the MIDDLE oscillator. Even if the frequency deviation is decreased, it is not switched to the NARROW oscillator. The maximum frequency deviation is 1/4 of the value obtained at the automatic switching.

3. [SPECIAL] [1] [9] The FM oscillator is fixed to the WIDE oscillator. Even if the frequency deviation is decreased, it is not switched to the NARROW or MIDDLE oscillator. The maximum frequency deviation is the same value obtained at automatic switching.
4.11.11 ØM OSC: Automatic switching/MIDDLE fixed/WIDE fixed (SP20/21/22)

There are three types of ØM modulation oscillators: NARROW, MIDDLE, and WIDE deviation devices. Usually, automatic switching is performed (as shown below) according to the carrier frequency and phase deviation.
The three oscillators each have different modulation characteristics. Therefore, when changing the oscillator will affect measurement results, the oscillator to be used must be fixed using Special Function 21/22. In this case, the maximum phase deviation is that of the fixed oscillator.

1. [SPECIAL] [2] [0] The ØM oscillator is set to automatic switching.

2. [SPECIAL] [2] [1] The ØM oscillator is fixed to the MIDDLE oscillator. Even if the phase deviation is decreased, it is not switched to the NARROW oscillator. The maximum phase deviation is 1/4 of the value obtained at the automatic switching.

3. [SPECIAL] [2] [2] The ØM oscillator is fixed to the WIDE oscillator. Even if the phase deviation is decreased, it is not switched to the NARROW or MIDDLE oscillator. The maximum phase deviation is the same value obtained at the automatic switching.

4.11.12 FM/ØM : POLARITY NORMAL/INVERT (SP23/24)

1. [SPECIAL] [2] [3] Modulation is applied without inverting the polarity of the EXT FM/ØM input signal.

2. [SPECIAL] [2] [4] Modulation is applied with inverting the polarity of the EXT FM/ØM input signal.
4.11.13  FM/ΩM : INT/EXT deviation fixed (SP25/26/27)

Special Function 25 (initial status) produces the same frequency or phase deviation for FM or ΩM internal and external simultaneous modulation.

Special Function 26/27 produce different frequency or phase deviation for FM or ΩM internal and external simultaneous modulation.

1.  [SPECIAL] [2] [5]: Sets the same frequency or phase deviation for both internal and external deviations.

2.  [SPECIAL] [2] [6], Numeric keys, unit key: Sets and fixes the internal frequency or phase deviation. After fixing internal deviation, set the external frequency or phase deviation which is displayed.

3.  [SPECIAL] [2] [7], Numeric keys, unit key: Sets and fixes the external frequency or phase deviation. After fixing external deviation, set the internal frequency or phase deviation which is displayed.

Notes: 1. Fixing the frequency or phase deviation which was set last is valid.

2. Either the internal or external deviation can be fixed. When either internal or external FM/ΩM deviation is fixed, the other not-fixed deviation is displayed. When the not-fixed deviation is off, MODULATION display indicates OFF.

3. When the internal or external deviation is fixed, the deviation which is not fixed has the same fixed decimal point display and digit setting as that for the fixed deviation. For example, when the internal deviation is fixed to 75 kHz, the external one is a maximum 99.9 kHz and the minimum resolution is 0.1 kHz.

4. INT/EXT deviation fixed status remains unchanged even when FM and ΩM is switched back and forth. The deviation fixed when FM/ΩM is switched is as follows:
   • When the FM frequency deviation is at FM fix (Hz) → μ
     The ΩM phase deviation is fixed to ΩM fix (rad) = FM fix/5000.
   • When the ΩM phase deviation is fixed at ΩM fix (rad) → μ
     The FM frequency deviation is fixed to FM fix (Hz) = ΩM fix × 5000.
### Table 4-2  FM Variable Range at Fixed INT/EXT

<table>
<thead>
<tr>
<th>Carrier frequency</th>
<th>Fixed frequency deviation (kHz)</th>
<th>Non-fixed frequency deviation/setting resolution (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;40 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.00 to 0.50</td>
<td>0 to 0.50 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.51 to 5.00</td>
<td>0 to 5.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>5.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>0 to 10.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>10.1 to 20.0</td>
<td>0 to 20.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>20.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0 to 100 / 1</td>
</tr>
<tr>
<td></td>
<td>101 to 400</td>
<td>0 to 400 / 1</td>
</tr>
<tr>
<td>40 to &lt;80 MHz</td>
<td>0.00 to 0.50</td>
<td>0 to 0.50 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.51 to 5.00</td>
<td>0 to 5.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>5.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>0 to 10.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>10.1 to 25.0</td>
<td>0 to 25.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>25.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0 to 100 / 1</td>
</tr>
<tr>
<td>80 to &lt;160 MHz</td>
<td>0.00 to 0.50</td>
<td>0 to 0.50 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.51 to 5.00</td>
<td>0 to 5.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>5.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>0 to 10.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>10.1 to 50.0</td>
<td>0 to 50.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>50.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0 to 200 / 1</td>
</tr>
<tr>
<td>160 to &lt;320 MHz</td>
<td>0.00 to 0.50</td>
<td>0 to 0.50 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.51 to 5.00</td>
<td>0 to 5.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>5.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>0 to 10.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>10.1 to 20.0</td>
<td>0 to 20.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>20.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0 to 100 / 1</td>
</tr>
<tr>
<td></td>
<td>101 to 400</td>
<td>0 to 400 / 1</td>
</tr>
<tr>
<td>320 to &lt;640 MHz</td>
<td>0.00 to 0.50</td>
<td>0 to 0.50 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.51 to 5.00</td>
<td>0 to 5.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>5.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>0 to 10.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>10.1 to 20.0</td>
<td>0 to 20.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>20.1 to 40.0</td>
<td>0 to 40.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>40.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100 to 200</td>
<td>0 to 200 / 1</td>
</tr>
<tr>
<td></td>
<td>201 to 800</td>
<td>0 to 800 / 1</td>
</tr>
</tbody>
</table>

4 - 128
Table 4-2  FM Variable Range at Fixed INT/EXT (Cont’d)

<table>
<thead>
<tr>
<th>Carrier frequency</th>
<th>Fixed frequency deviation (kHz)</th>
<th>Non-fixed frequency deviation/ setting resolution (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>640 to &lt;1280 MHz</td>
<td>0.00 to 0.50</td>
<td>0 to 0.50 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.51 to 5.00</td>
<td>0 to 5.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>5.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>0 to 10.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>10.1 to 20.0</td>
<td>0 to 20.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>20.1 to 40.0</td>
<td>0 to 40.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>40.1 to 80.0</td>
<td>0 to 80.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>80.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100 to 400</td>
<td>0 to 400 / 1</td>
</tr>
<tr>
<td></td>
<td>401 to 999</td>
<td>0 to 999 / 1</td>
</tr>
<tr>
<td></td>
<td>1000 to 1600</td>
<td>0 to 1600 / 10</td>
</tr>
<tr>
<td>( \geq 1280 \text{ MHz} )</td>
<td>0.00 to 0.50</td>
<td>0 to 0.50 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.51 to 5.00</td>
<td>0 to 5.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>5.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>0 to 10.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>10.1 to 20.0</td>
<td>0 to 20.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>20.1 to 40.0</td>
<td>0 to 40.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>40.1 to 80.0</td>
<td>0 to 80.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>80.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100 to 160</td>
<td>0 to 160 / 1</td>
</tr>
<tr>
<td></td>
<td>161 to 800</td>
<td>0 to 800 / 1</td>
</tr>
<tr>
<td></td>
<td>801 to 999</td>
<td>0 to 999 / 1</td>
</tr>
<tr>
<td></td>
<td>1000 to 3200</td>
<td>0 to 3200 / 10</td>
</tr>
<tr>
<td>Carrier frequency</td>
<td>Fixed frequency deviation (kHz)</td>
<td>Non-fixed frequency deviation/setting resolution (kHz)</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>&gt;40 MHz</td>
<td>0.00 to 0.10</td>
<td>0 to 0.10 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.11 to 1.00</td>
<td>0 to 1.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>1.01 to 2.00</td>
<td>0 to 2.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>2.01 to 4.00</td>
<td>0 to 4.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>4.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0 to 20.0</td>
<td>0 to 20.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>20.1 to 80.0</td>
<td>0 to 80.0 / 0.1</td>
</tr>
<tr>
<td>40 to &lt;80 MHz</td>
<td>0.00 to 0.10</td>
<td>0 to 0.10 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.11 to 1.00</td>
<td>0 to 1.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>1.01 to 5.00</td>
<td>0 to 5.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>5.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0 to 20.0</td>
<td>0 to 20.0 / 0.1</td>
</tr>
<tr>
<td>80 to &lt;160 MHz</td>
<td>0.00 to 0.10</td>
<td>0 to 0.10 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.11 to 1.00</td>
<td>0 to 1.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>1.01 to 2.00</td>
<td>0 to 2.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>2.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
<td>0 to 10.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>10.0 to 40.0</td>
<td>0 to 40.0 / 0.1</td>
</tr>
<tr>
<td>160 to 320 MHz</td>
<td>0.00 to 0.10</td>
<td>0 to 0.10 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.11 to 1.00</td>
<td>0 to 1.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>1.01 to 2.00</td>
<td>0 to 2.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>2.01 to 4.00</td>
<td>0 to 4.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>4.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0 to 20.0</td>
<td>0 to 20.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>20.1 to 80.0</td>
<td>0 to 80.0 / 0.1</td>
</tr>
<tr>
<td>320 to &lt;640 MHz</td>
<td>0.00 to 0.10</td>
<td>0 to 0.10 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.11 to 1.00</td>
<td>0 to 1.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>1.01 to 2.00</td>
<td>0 to 2.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>2.01 to 4.00</td>
<td>0 to 4.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>4.01 to 8.00</td>
<td>0 to 8.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>8.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0 to 40.0</td>
<td>0 to 40.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>40.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100 to 160</td>
<td>0 to 160 / 1</td>
</tr>
<tr>
<td>Carrier frequency</td>
<td>Fixed frequency deviation (kHz)</td>
<td>Non-fixed frequency deviation/setting resolution (kHz)</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>640 to &lt;1280 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.00 to 0.10</td>
<td>0 to 0.10 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.11 to 1.00</td>
<td>0 to 1.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>1.01 to 2.00</td>
<td>0 to 2.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>2.01 to 4.00</td>
<td>0 to 4.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>4.01 to 8.00</td>
<td>0 to 8.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>8.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0 to 16.0</td>
<td>0 to 16.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>16.1 to 80.0</td>
<td>0 to 80.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>80.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100 to 320</td>
<td>0 to 320 / 1</td>
</tr>
<tr>
<td>≥ 1280 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.00 to 0.10</td>
<td>0 to 0.10 / 0.01</td>
</tr>
<tr>
<td></td>
<td>0.11 to 1.00</td>
<td>0 to 1.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>1.01 to 2.00</td>
<td>0 to 2.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>2.01 to 4.00</td>
<td>0 to 4.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>4.01 to 8.00</td>
<td>0 to 8.00 / 0.01</td>
</tr>
<tr>
<td></td>
<td>8.01 to 9.99</td>
<td>0 to 9.99 / 0.01</td>
</tr>
<tr>
<td></td>
<td>10.0 to 16.0</td>
<td>0 to 16.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>16.1 to 32.0</td>
<td>0 to 32.0 / 0.1</td>
</tr>
<tr>
<td></td>
<td>32.1 to 99.9</td>
<td>0 to 99.9 / 0.1</td>
</tr>
<tr>
<td></td>
<td>100 to 160</td>
<td>0 to 160 / 1</td>
</tr>
<tr>
<td></td>
<td>161 to 640</td>
<td>0 to 640 / 1</td>
</tr>
</tbody>
</table>
Example: Fix the FM internal frequency deviation to 3.5 kHz and change the FM external (AC) frequency deviation from 1 to 5 kHz at 0.01 kHz resolution.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press each key to light both the [INT] and [EXT AC] LEDs. (FM modulation input mode is set to the INT and EXT AC simultaneous modulation mode.)</td>
</tr>
<tr>
<td>2</td>
<td>Enters the internal deviation fixing mode.</td>
</tr>
<tr>
<td>3</td>
<td>Input data for internal frequency deviation fixing.</td>
</tr>
<tr>
<td>4</td>
<td>Press unit key. (The internal frequency deviation is fixed to 3.5 kHz, and the external frequency deviation is displayed.)</td>
</tr>
</tbody>
</table>

Note: For external fixing mode.
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>[FMΩM] [1] [kHz/mV]</td>
</tr>
<tr>
<td></td>
<td><img src="chart" alt="1.00 kHz" /></td>
</tr>
<tr>
<td>6</td>
<td>RESOLUTION [&gt;]</td>
</tr>
<tr>
<td></td>
<td><img src="chart" alt="1.00 kHz" /></td>
</tr>
<tr>
<td>7</td>
<td>ROTARY KNOB</td>
</tr>
<tr>
<td></td>
<td><img src="chart" alt="5.00 kHz" /></td>
</tr>
</tbody>
</table>
4.11.14 INT MOD : NORMAL/ + DC applied/ – DC applied/ ± DC external control (SP30/31/32/33)

When the INT modulation input mode is selected during FM, AM, or ΩM modulation, Special Functions 31/32 superimpose the DC voltage corresponding to the internal modulation sine wave signal ± peak value on the signal itself. This shifts the zero crossing value of the modulation signal to either the + or – values of the DC voltage. Special Function 33 permits selection of the voltage polarity by external TTL control signal, which allows you to determine whether the zero crossing value of the modulation signal will be shifted to the positive or negative DC value.

1. [SPECIAL] [3] [0] Sets the internal modulation sine wave signal to normal status (1 kHz, 400 Hz, or AF signal)

2. [SPECIAL] [3] [1] Superimposes the DC voltage corresponding to the sine wave + peak internal modulation signal on to the internal modulation signal.
   
   At FM: The carrier frequency shifts in the higher direction by the displayed frequency deviation amount.
   
   At AM: The output level increases by the displayed modulation factor (%) amount.

   \[
   \text{Increase in output level} = 20 \log_{10} \left( \frac{\text{AM mod. factor} + 100}{100} \right)
   \]

   At ΩM: The phase of the carrier frequency leads by the displayed phase deviation amount.

3. [SPECIAL] [3] [2] Superimposes the DC voltage corresponding to the sine wave – peak internal modulation signal on to the internal modulation signal. The MODULATION display indicates a negative value.
   
   At FM: The carrier frequency shifts in the lower direction by the displayed frequency deviation amount.
   
   At AM: The output level decreases by the displayed modulation factor (%) amount.

   \[
   \text{Decrease in output level} = 20 \log_{10} \left( \frac{-\text{AM mod. factor} + 100}{100} \right)
   \]

   At ΩM: The phase of the carrier frequency lags by the displayed phase deviation amount.
4. [SPECIAL] [3] [3] Switches the plus and minus peak voltages to be superimposed in synchronization with an external TTL control signal.

At FM: The binary FSK signal is obtained.
At AM: The PAM signal is obtained.
At ØM: The binary PSK signal is obtained.

The external control signal is input on the TTL level from the AM INPUT of the MODULATION. At this time AM EXT DC and EXT AC cannot be set. (When EXT DC or EXT AC is on, it is forcibly turned off.)

![Diagram of AM control]

H level: Superimposes + peak voltage
L level: Superimposes – peak voltage

When the external control signal is L level, the minus (−) mark lights on the MODULATION display.

4.11.15 MOD OUTPUT: Automatic switching/INT fixed/AM EXT fixed/FM·ØM EXT fixed (SP35/36/37/38)

The modulation signal output from the MOD OUTPUT connector is usually switched automatically according to the modulation setting status (SP35), but Special Functions 36/37/38 produce any desired modulation signal regardless of the modulation setting status.

1. [SPECIAL] [3] [5] Switches the modulation output automatically.
2. [SPECIAL] [3] [6] Outputs the internal modulation signal.
3. [SPECIAL] [3] [7] Outputs the AM external modulation signal.
4. [SPECIAL] [3] [8] Outputs the FM or ØM external modulation signal.

4.11.16 Sweep blanking output: Positive /negative logic (SP43/44)

Special Functions 43/44 switch the BLANKING output logic on the rear panel.

1. [SPECIAL] [4] [3] Obtains positive logic
2. [SPECIAL] [4] [4] Obtains negative logic
4.11.17  FUNCTION-memory sweep : sweep output pattern 1/pattern 2 (SP45/46)

Special Functions 45/46 select the SWEEP OUTPUT signal pattern when a sweep function is included in a FUNCTION memory to execute the FUNCTION memory sweep.

1.  [SPECIAL] [4] [5]  Outputs the SWEEP OUTPUT according to the FUNCTION memory sweep setting. SWEEP OUTPUT does not change while a sweep is being executed in a FUNCTION memory.

2.  [SPECIAL] [4] [6]  SWEEP OUTPUT occurs during a FUNCTION memory sweep.
4.11.18 Trigger (SP56/57/58)

Special functions 56/57/58 start the preset trigger program through the GP-IB or TRIGGER connector (on the rear panel) from an external device. The trigger pulse is TTL negative logic. The trigger program can be edited with panel key data except for the [LOCAL], [PANEL LOCK], [STATUS], [SPECIAL], [MANUAL], rotary knob, and POWER switch. Up to 99-step programs may be created.


2.  [SPECIAL] [5] [7]  Erases the trigger program.

3.  [SPECIAL] [5] [8]  Starts the trigger program. (Used to check trigger program.)

Each time panel key data is entered while the trigger program is edited, address and key cords (corresponding to panel keys, shown on the next page) are automatically displayed on the FREQUENCY display.

Note: SWEEP [AUTO] has the same cord as that of [SINGLE]. Trigger program interprets [AUTO] as [SINGLE] to prevent the program from repeating sweep forever.
Example: Use trigger to start a single-mode sweep with a 10.7 MHz center frequency, 1 MHz span, 10kHz step size, and a 200 ms time/step.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 1    | **[SPECIAL] [2] [0]**  
Set the mode for programming the trigger program. |
| 2    | **[FREQ]**  
Press [FREQ]. |
| 3    | **[1]**  
Press [1]. |
| 4    | **[0]**  
Press [0]. |
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 5    | [●] [7] [MHz/µV] [SPAN] [1]  
      | [MHz/µV] [STEP SIZE] [1] [0] [kHz/mV]  
      | [TIME/STEP] [2] [0] [0] [msec]  
      | [SINGLE] |

Press [●].

![Trigger Settings](image)

Press [SINGLE].

![Trigger Settings](image)

6  [STATUS]

Terminates the mode for programming the trigger program.
The contents of the trigger program can be checked with the following key operation.

\[
[\text{SPECIAL}] \ [5] \ [6] \ [\text{STATUS}] \ \\
\text{Press and hold.}
\]

The key code is displayed sequentially from address code 01.

```
\begin{array}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\text{GhZ} & \text{MHz} & \text{kHz} & \text{Hz} \\
\hline
\text{MONITOR} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 & 19 & 20 \\
\hline
\end{array}
```

```
\begin{array}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\text{GhZ} & \text{MHz} & \text{kHz} & \text{Hz} \\
\hline
\text{MONITOR} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 & 19 & 20 \\
\hline
\end{array}
```

```
\begin{array}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\text{GhZ} & \text{MHz} & \text{kHz} & \text{Hz} \\
\hline
\text{MONITOR} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 & 19 & 20 \\
\hline
\end{array}
```

```
\begin{array}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\text{GhZ} & \text{MHz} & \text{kHz} & \text{Hz} \\
\hline
\text{MONITOR} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 & 19 & 20 \\
\hline
\end{array}
```

- When the trigger program is set again, clear the trigger data by pressing [SPECIAL] [5] and [7].
- When the key input follows [SPECIAL] [5] and [6] without clearing the data, the program can be edited following the address programmed up to then.
- The [HOLD] of the panel key data, when executed, means to halt the trigger.
  The trigger program halted with the [HOLD] position is resumed at the next trigger pulse.
• Key input from the panel is disabled during trigger program execution. However, trigger program execution can be halted by pressing [LOCAL].

• If an error occurs during trigger program execution, the trigger program is halted and the [STATUS] LED lights. When [STATUS] is pressed at this time, the following error message is displayed on the FREQUENCY display.

```
Error** ABC**

GHz MHz kHz Hz
MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
```

Status code Address of trigger program where error occurred

• If there is no key input for approx. 30 seconds while the trigger program is edited, the trigger program is released and the MG3633A returns to normal operating status.
4.11.19 GP-IB : Talker data with/without header (SP60/61)

Special Functions 60/61 select if the data has header when the MG3633A becomes a talker.

1. [SPECIAL] [6] [0] Gives data with header.

4.11.20 GP-IB : Address setting (SP62)

Special Function 62 sets a GP-IB address.

[SPECIAL] [6] [2] [∗] [∗] Input a two-digit number after pressing [SPECIAL] [6] [2].

GP-IB address

Example: Set GP-IB address to “07”.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[SPECIAL] [6] [2]</td>
</tr>
<tr>
<td>2</td>
<td>[0]</td>
</tr>
<tr>
<td>3</td>
<td>[7]</td>
</tr>
</tbody>
</table>

The FREQUENCY display returns to the original display immediately after the second digit is input.

The GP-IB address setting range is 00 to 30. The GP-IB address is set to 03 at factory-shipment.

4.11.21 GP-IB : Address display (SP63)

Special Function 63 displays set GP-IB address.

[SPECIAL] [6] [3]

Press and hold.
4.11.22 GP-IB: ONLY mode (SP64 to 68)
Special Functions 65 to 68 allow the MG3633A to operate in ONLY mode. (See the separate GP-IB manual for the only-mode details.)
2. [SPECIAL] [6] [5] Sets the frequency talk only mode.
3. [SPECIAL] [6] [6] Sets the output level talk only mode.
4. [SPECIAL] [6] [7] Sets both the frequency and output level talk only mode.
5. [SPECIAL] [6] [8] Sets the listen only mode.

4.11.23 SRQ MASK (SP70 to 80)
Special Functions 70 to 80 give SRQ mask functions.
1. [SPECIAL] [7] [0] Masks all SRQs.
2. [SPECIAL] [7] [1] Turns off error mask.
11. [SPECIAL] [8] [0] Turns off strings-end mask.

4.11.24 FREQ-memory clear (SP81)
See paragraph 4.9.4.

4.11.25 FUNCTION-memory clear (SP82)
See paragraph 4.9.4.
4.11.26 Option display (SP83)

Special Function 83 produces the option setting display using the MONITOR LED of the FREQUENCY display.

```
[ SPECIAL ] [ 8 ] [ 3 ]
```

Press and hold.

Reference crystal oscillator 1
Reference crystal oscillator 2
Reference crystal oscillator 3
Rear-panel RF output (04)
USER CAL (07)

The corresponding MONITOR LED is lit when an option is mounted.

4.11.27 Output level correction : Normal/CAL data 1 (option 07)/CAL data 2 (option 07) (SP86/87/88)

Special Functions 86/87/88 select the correction data of the output-level frequency characteristic.

1. [ SPECIAL ] [ 8 ] [ 6 ] Sets output level compensation to normal status to correct the output level at the OUTPUT connector on the front panel.

2. [ SPECIAL ] [ 8 ] [ 7 ] Corrects the output level with user CAL data 1.

3. [ SPECIAL ] [ 8 ] [ 8 ] Corrects the output level with user CAL data 2.

User-determined correction data can be written for the user CAL data 1 and 2 using a power meter and a GP-IB controller when option 07 is fitted. This is used to determine the output level at the cable end, etc. At factory-shipment, the data is written for user CAL data 1 and 2 so that the output level is maximum for all the frequency ranges.

For writing user CAL data 1 and 2, refer to operation manual (Appendix C) for explanation of user CAL option.
4.12 STATUS

When an attempt is made to set a function item outside the prescribed range, the [STATUS] LED blinks.

If [STATUS] is pressed at this time, a status (error) message is shown on the FREQUENCY display while the key is pressed.

Status messages and codes are listed in the following table.

<table>
<thead>
<tr>
<th>DATA</th>
<th>Err</th>
<th>03</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHz</td>
<td>MHz</td>
<td>kHz</td>
</tr>
<tr>
<td>MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Status Messages and Codes (1/7)

<table>
<thead>
<tr>
<th>Function</th>
<th>Contents</th>
<th>Message</th>
<th>Status code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL FUNCTION</td>
<td>Number of input data digits overflow</td>
<td></td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>Error input</td>
<td></td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>Data setting over-range</td>
<td></td>
<td>03</td>
</tr>
<tr>
<td></td>
<td>Unit error</td>
<td></td>
<td>04</td>
</tr>
<tr>
<td>MODULATION</td>
<td>INT MOD FREQ selected in INT MOD OFF status</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>AM EXT AC/DC selected at SP33</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Maximum frequency/phase deviation exceeded at SP26 and 27</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>FREQ CAL performed at FM EXT DC OFF</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

**Table:**
- **Function**: The columns under 'Function' list the different functions or conditions that can trigger status messages.
- **Contents**: The contents column details the specific conditions or errors.
- **Message**: The message column contains the format or code of the status message.
- **Status code**: The status code column lists the code or identifier for each status message.
### Status Messages and Codes (2/7)

<table>
<thead>
<tr>
<th>Function</th>
<th>Contents</th>
<th>Message</th>
<th>Status code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMORY</td>
<td>Storing and clearing at memory-protect</td>
<td><img src="image" alt="Error 01" /></td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Error at memory recall</td>
<td><img src="image" alt="Error 02" /></td>
<td>22</td>
</tr>
<tr>
<td>Function</td>
<td>Contents</td>
<td>Message</td>
<td>Status code</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SWEEP</td>
<td>START=STOP</td>
<td><img src="image1" alt="Image of SWEEP Err 01" /></td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STOP-START &lt; STEP SIZE</td>
<td><img src="image2" alt="Image of SWEEP Err 02" /></td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPAN &lt; STEP SIZE</td>
<td><img src="image3" alt="Image of SWEEP Err 03" /></td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CENTER — — SPAN 2 &lt; lower limit</td>
<td><img src="image4" alt="Image of SWEEP Err 04" /></td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CENTER + — SPAN 2 &gt; upper limit</td>
<td><img src="image5" alt="Image of SWEEP Err 05" /></td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOG sweep START×1.01 &gt; STOP</td>
<td><img src="image6" alt="Image of SWEEP Err 06" /></td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Memory-sweep data format error</td>
<td><img src="image7" alt="Image of SWEEP Err 07" /></td>
<td>37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of FREQ memory sweep steps overflow</td>
<td><img src="image8" alt="Image of SWEEP Err 08" /></td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of FUNCTION-memory sweep steps overflow</td>
<td><img src="image9" alt="Image of SWEEP Err 09" /></td>
<td>39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GHz MHz kHz Hz</td>
<td></td>
</tr>
</tbody>
</table>
### Status Messages and Codes (4/7)

<table>
<thead>
<tr>
<th>Function</th>
<th>Contents</th>
<th>Message</th>
<th>Status Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWEEP</td>
<td>Sweep step set in output-level sweep mode</td>
<td><strong>Sweep Err 10</strong></td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Marker on at manual sweep</td>
<td><strong>Sweep Err 11</strong></td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Sweep mode and sweep start set except for FREQ, OUTPUT LEVEL and AF</td>
<td><strong>Sweep Err 12</strong></td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>LOG 1% set with CENTER-SPAN sweep</td>
<td><strong>Sweep Err 13</strong></td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>[STOP–START] N &lt;minimum resolution</td>
<td><strong>Sweep Err 14</strong></td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>[STOP level–START level] &gt;20 dB</td>
<td><strong>Sweep Err 15</strong></td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Without data for memory sweep</td>
<td><strong>Sweep Err 16</strong></td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>LOG sweep over-range</td>
<td><strong>Sweep Err 17</strong></td>
<td>47</td>
</tr>
<tr>
<td>Function</td>
<td>Contents</td>
<td>Message</td>
<td>Status code</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------</td>
<td>---------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SPECIAL FUNCTION</td>
<td>Special function not registered</td>
<td><img src="image" alt="Image" /></td>
<td>51</td>
</tr>
<tr>
<td>OPTION</td>
<td>Unavailable option set</td>
<td><img src="image" alt="Image" /></td>
<td>56</td>
</tr>
<tr>
<td>GP-IB</td>
<td>Read error</td>
<td><img src="image" alt="Image" /></td>
<td>61</td>
</tr>
<tr>
<td>Function</td>
<td>Contents</td>
<td>Message</td>
<td>Status code</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------</td>
<td>----------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>HARDWARE ERROR</td>
<td>No reference input signal</td>
<td><img src="image" alt="No Std inPut" /></td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>Reference signal unlock</td>
<td><img src="image" alt="Std unLock" /></td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>Abnormal output level</td>
<td><img src="image" alt="Alc Abnormal" /></td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>RPP operation</td>
<td><img src="image" alt="RPP on" /></td>
<td>74</td>
</tr>
</tbody>
</table>

If there are two or more hardware errors, they are displayed each time the [STATUS] is pressed in the order of the smaller error-code number first.

When status codes 71 and 72 occur, UNCAL in the FREQUENCY display is lit.

When the status codes 73 and 74 occur, UNCAL in the OUTPUT LEVEL display is lit.
### Status Messages and Codes (7/7)

<table>
<thead>
<tr>
<th>Function</th>
<th>Contents</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNCAL</td>
<td>LEVEL</td>
<td><img src="image" alt="LEVEL uncAL" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor: (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)</td>
</tr>
<tr>
<td></td>
<td>FM</td>
<td><img src="image" alt="FM uncAL" /></td>
</tr>
<tr>
<td></td>
<td>AM</td>
<td><img src="image" alt="AM uncAL" /></td>
</tr>
<tr>
<td></td>
<td>ØM</td>
<td><img src="image" alt="Phase uncAL" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor: (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Status is always set during UNCAL. If another error occurs, that error has priority.

If there are two or more UNCALs, they are displayed each time [STATUS] is pressed in the order: LEVEL, FM, ØM, and AM.
4.12.1 Status messages related to all functions

When incompatible data input is attempted, the [STATUS] LED lights.
The new data is not set and the data remains as it was.
The [STATUS] LED is turned off by pressing [STATUS] or when any key other than data or unit keys is pressed.

(1) DATA ERROR 01 (status code 01)

When the number of data digits input is excessive, the [STATUS] LED lights.

- Items displayed on FREQUENCY display
  Carrier frequency: 13 or more digits (except ± sign)
  AF: 10 or more digits

- Item displayed on OUTPUT LEVEL display
  Output level: 5 or more digits (excluding ± sign)

- Items displayed on MODULATION display
  Modulation factor and deviation: 4 or more digits

(2) DATA ERROR 02 (status code 02)

An error occurs and the [STATUS] LED lights when the input data is as follows:

- When [–] is pressed other than before numeric data input
- When [●] is pressed two or more times during data input
- When [–] is pressed during AM, FM, and ØM modulation factor setting

(3) DATA ERROR 03 (status code 03)

When an input value exceeds the data setting range shown on the next page, the [STATUS] LED lights when the units key is pressed. The [STATUS] LED also lights when the range is exceeded when turning the rotary knob or [INCREMENT] keys.
# Data Setting Ranges (1/2)

<table>
<thead>
<tr>
<th>Item</th>
<th>Setting range</th>
<th>Condition</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier frequency</td>
<td>0 Hz</td>
<td>2.7 GHz</td>
<td></td>
</tr>
<tr>
<td>Incremental frequency</td>
<td>0.01 Hz</td>
<td>2.7 GHz</td>
<td></td>
</tr>
<tr>
<td><strong>Output level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output level</td>
<td>\ [-143 \text{dBm} \atop -30 \text{dB}_u \atop -36 \text{dB}_u \atop 0.016 \mu\text{V}] \atop [+23 \text{dBm} \atop +136 \text{dB}_u \atop +130 \text{dB}_u \atop 3.16 \text{V}] } &amp; In SP04 &amp; The upper limit becomes the output level limit at SP06.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental output level</td>
<td>0.1 dB</td>
<td>166 dB</td>
<td></td>
</tr>
<tr>
<td><strong>AF frequency</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AF frequency</td>
<td>0.1 Hz</td>
<td>100 kHz</td>
<td></td>
</tr>
<tr>
<td>AF incremental frequency</td>
<td>0.1 Hz</td>
<td>99.999 \text{kHz}</td>
<td></td>
</tr>
<tr>
<td><strong>Modulation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FM frequency deviation</td>
<td>0 Hz</td>
<td>3.2 MHz</td>
<td></td>
</tr>
<tr>
<td>AM modulation factor</td>
<td>0 %</td>
<td>100 %</td>
<td></td>
</tr>
<tr>
<td>ØM phase deviation</td>
<td>0 rad \atop 0 \text{deg}</td>
<td>640 rad \atop 999 deg</td>
<td></td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FREQUENCY memory address</td>
<td>0 \atop 999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUNCTION memory address</td>
<td>0 \atop 99</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Frequency sweep</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>START/STOP frequency</td>
<td>0 Hz</td>
<td>2.7 GHz</td>
<td></td>
</tr>
<tr>
<td>SPAN frequency</td>
<td>0.02 Hz</td>
<td>2.7 GHz</td>
<td></td>
</tr>
<tr>
<td>Number of frequency STEPs</td>
<td>1</td>
<td>2700 000 000 00</td>
<td></td>
</tr>
<tr>
<td>Frequency STEP SIZE</td>
<td>0.01 Hz</td>
<td>2.7 GHz</td>
<td></td>
</tr>
<tr>
<td>Frequency sweep time</td>
<td>0.1 ms</td>
<td>600 s</td>
<td></td>
</tr>
<tr>
<td><strong>Output level sweep</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>START / STOP level</td>
<td>\ [-143 \text{dBm} \atop -30 \text{dB}_u \atop -36 \text{dB}_u \atop 0.016 \mu\text{V}] \atop [+23 \text{dBm} \atop +136 \text{dB}_u \atop +130 \text{dB}_u \atop 3.16 \text{V}] } &amp; In SP04 &amp; The upper limit becomes the output level limit at SP06.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPAN level</td>
<td>0.2 dB</td>
<td>20 dB</td>
<td></td>
</tr>
<tr>
<td>Output level sweep time</td>
<td>0.1 ms</td>
<td>600 s</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Setting range</td>
<td>Conditions</td>
<td>Remarks</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------------------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Lower limit</td>
<td>Upper limit</td>
<td></td>
</tr>
<tr>
<td>AF frequency sweep</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>START/STOP AF frequency</td>
<td>0.1 Hz</td>
<td>100 kHz</td>
<td></td>
</tr>
<tr>
<td>SPAN AF frequency</td>
<td>0.2 Hz</td>
<td>99.9999 kHz</td>
<td></td>
</tr>
<tr>
<td>Number of AF frequency points</td>
<td>1</td>
<td>999 999</td>
<td></td>
</tr>
<tr>
<td>AF frequency STEP SIZE</td>
<td>0.1 Hz</td>
<td>99.9999 kHz</td>
<td></td>
</tr>
<tr>
<td>AF frequency sweep time</td>
<td>0.1 ms</td>
<td>600 s</td>
<td></td>
</tr>
<tr>
<td>Special function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier frequency offset</td>
<td>-2.7 GHz</td>
<td>2.7 GHz</td>
<td></td>
</tr>
<tr>
<td>Output level offset</td>
<td>-166 dB</td>
<td>166 dB</td>
<td></td>
</tr>
<tr>
<td>Output level limit</td>
<td>-143 dBm</td>
<td>+23 dBm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-30 dBu</td>
<td>+136 dBu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.032 µV</td>
<td>6.32 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-36 dBu</td>
<td>+130 dBu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.016 µV</td>
<td>3.16 V</td>
<td></td>
</tr>
<tr>
<td>GP-IB address</td>
<td>00</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

4 - 158
(4) **UNIT ERROR (status code 04)**

The [STATUS] LED lights in the following cases.

1. When a key other than the suitable unit key is pressed during or after the numerical data is input

The unit keys suitable for each setting item are listed.

<table>
<thead>
<tr>
<th>Setting item</th>
<th>Unit key</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>dB sec</td>
</tr>
<tr>
<td></td>
<td>GHz/dB</td>
</tr>
<tr>
<td>Carrier frequency</td>
<td>○</td>
</tr>
<tr>
<td>Incremental frequency</td>
<td>○</td>
</tr>
<tr>
<td>Output level</td>
<td>○</td>
</tr>
<tr>
<td>Incremental output level</td>
<td>○</td>
</tr>
<tr>
<td>AF frequency</td>
<td>○</td>
</tr>
<tr>
<td>Incremental AF frequency</td>
<td>○</td>
</tr>
<tr>
<td>FM frequency deviation</td>
<td>×</td>
</tr>
<tr>
<td>AM modulation factor</td>
<td>×</td>
</tr>
<tr>
<td>ØM phase deviation</td>
<td>×</td>
</tr>
<tr>
<td>START/STOP frequency</td>
<td>○</td>
</tr>
<tr>
<td>SPAN frequency</td>
<td>○</td>
</tr>
<tr>
<td>Frequency STEP SIZE</td>
<td>○</td>
</tr>
<tr>
<td>START/STOP level</td>
<td>○</td>
</tr>
<tr>
<td>SPAN level</td>
<td>○</td>
</tr>
<tr>
<td>START/STOP AF frequency</td>
<td>○</td>
</tr>
<tr>
<td>SPAN AF frequency</td>
<td>○</td>
</tr>
<tr>
<td>AF frequency STEP SIZE</td>
<td>○</td>
</tr>
<tr>
<td>Number of sweep points</td>
<td>×</td>
</tr>
<tr>
<td>Sweep time</td>
<td>○</td>
</tr>
<tr>
<td>Carrier frequency offset</td>
<td>○</td>
</tr>
<tr>
<td>Output level offset</td>
<td>○</td>
</tr>
<tr>
<td>Output level limit</td>
<td>○</td>
</tr>
<tr>
<td>Output level at offset mode</td>
<td>○</td>
</tr>
</tbody>
</table>

○ : Suitable  
× : Unsuitable

2. When trying to convert a 17.5 rad or more phase deviation to “deg” display in ØM modulation mode.
4.12.2 UNCAL

When a setting is made for values in a range where performance cannot be guaranteed, the [STATUS] LED lights.

In each UNCAL area shown below, the oblique line extent and the border line of the area marked with the thick solid line are UNCAL areas.

The blank space and the border line of the area marked with the fine solid line are not UNCAL areas.

When an UNCAL conditions exists, the UNCAL LED is lit.

(1) UNCAL area for output level (status code 91)
(a) At CW, FM, and ΩM

(b) At AM
Note: When LEVEL UNCAL is lit, one of the following two status messages appears.

**LEVEL uncAL**: Level accuracy is not guaranteed. However, level approximate to the indicated value is output.

**ALC Abnormal**: Amplifier output ability is exceeded, and the actual output level is less than the indicated value. During this status, output level cannot be increased any more.

(2) UNCAL area for FM frequency deviation (status code 92)

Frequency deviation (kHz)

(3) UNCAL area for AM modulation factor (status code 93)

Modulation factor (%)

---

4 - 161
(4) UNCAL area for ØM phase deviation (status code 94)

Phase deviation (rad)

4.13 Panel Lock

All the key and rotary knob inputs except the POWER switch, [LOCAL], and [PANEL LOCK] are disabled. When the [PANEL LOCK] is pressed, the LED lights and panel lock is engaged. When it is pressed again, the LED goes off and the panel lock status is disengaged.
4.14 Message Display by 7-Segment Display

Since the MG3633A displays various messages using a 7-segment display, the message may sometimes be undecipherable.

The following table is a list of definitions for messages generated in the 7-segment displays.

<table>
<thead>
<tr>
<th>Actual character</th>
<th>7 Segments</th>
<th>Actual character</th>
<th>7 Segments</th>
<th>Actual character</th>
<th>7 Segments</th>
<th>Actual character</th>
<th>7 Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>@</td>
<td>2</td>
<td>P</td>
<td>6</td>
<td>SPACE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>A</td>
<td>2</td>
<td>Q</td>
<td>6</td>
<td>!</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>B</td>
<td>3</td>
<td>R</td>
<td>7</td>
<td>&quot;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>C</td>
<td>4</td>
<td>S</td>
<td>8</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>D</td>
<td>5</td>
<td>T</td>
<td>9</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>E</td>
<td>6</td>
<td>U</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>F</td>
<td>7</td>
<td>V</td>
<td>&amp;</td>
<td>&amp;</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>G</td>
<td>8</td>
<td>W</td>
<td>(</td>
<td>(</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>H</td>
<td>9</td>
<td>X</td>
<td>)</td>
<td>)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>I</td>
<td>:</td>
<td>Y</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>:</td>
<td>-</td>
<td>J</td>
<td>;</td>
<td>Z</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>;</td>
<td>-</td>
<td>K</td>
<td>&lt;</td>
<td>[</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>&lt;</td>
<td>-</td>
<td>L</td>
<td>=</td>
<td>\</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>=</td>
<td>-</td>
<td>M</td>
<td>&gt;</td>
<td>]</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>&gt;</td>
<td>-</td>
<td>N</td>
<td>?</td>
<td>_</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>?</td>
<td>-</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
At data input related to carrier frequency

<table>
<thead>
<tr>
<th>FREQ incr</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

FREQ INCR Frequency increment

At data input related to output level

<table>
<thead>
<tr>
<th>incr</th>
</tr>
</thead>
</table>

INCR Output level increment

<table>
<thead>
<tr>
<th>OFF</th>
</tr>
</thead>
</table>

OFF At RF OFF

At data input related to AF frequency

<table>
<thead>
<tr>
<th>AF incr</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

AF INCR AF-frequency increment

At modulation input

<table>
<thead>
<tr>
<th>F-CAL</th>
</tr>
</thead>
</table>

F-CAL During EXT DC FM frequency calibration

At data input related to sweep

<table>
<thead>
<tr>
<th>START Fr</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONITOR</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

START FR START frequency

<table>
<thead>
<tr>
<th>STOP Fr</th>
</tr>
</thead>
</table>

STOP FR STOP frequency

<table>
<thead>
<tr>
<th>SPAN Fr</th>
</tr>
</thead>
</table>

SPAN FR SPAN frequency
STEP FR N  Number of frequency STEPS

STEP SIZE FR  Frequency STEP SIZE

LOG N  Number of LOG sweep steps (only for checking)

STRT  START level

STOP  STOP level

SPAN  SPAN level

START AF  START AF frequency

STOP AF  STOP AF frequency

SPAN AF  SPAN AF frequency

STEP AF N  Number of AF frequency STEPS
STEP SIZE AF
AF LOG N
MEMO ADDR
Sweep Time
Func Time

Related to Special Functions

+0 SP Code
LIM
OFST
FREQ OFFSET

STEP SIZE AF  AF frequency STEP SIZE
AF LOG N  Number of AF frequency LOG sweep steps (only for checking)
MEMO ADDR  Memory address
Sweep Time  Sweep time
Func Time  FUNCTION-memory set time

+0 SP Code  See paragraph 4.11.1
LIM  Output level limit
OFST  Output level offset
FREQ OFFSET  Frequency offset
**FM**

**INT**

FM/ØM: INT deviation fixed

**EXT**

FM/ØM: EXT deviation fixed

---

**TRIG 01 30**

See paragraph 4.11.18

---

**ERROR 01 AT20**

See paragraph 4.11.18

---

**GP-IB Add**

GP-IB address

---

**GP-IB Add 03**

GP-IB address display

---

**OPTION**

See paragraph 4.11.26
Related to status

DATA ERR 01

UNIT ERR

MOD ERR 01

MEMO ERR 01

SWEEP ERR 01

NO SP CODE

NO OPTION

GPIB ERR

NO STD INPUT

STD UNLOCK
<table>
<thead>
<tr>
<th>Parameter</th>
<th>GHz</th>
<th>MHz</th>
<th>kHz</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALC Abnormal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RPP on</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Level uncAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FM uncAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AM uncAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phase uncAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ALC ABNORMAL**

**RPP ON**

**LEVEL UNCAL**

**FM UNCAL**

**AM UNCAL**

**PHASE UNCAL**
SECTION 5
MEASUREMENT

In this section it is explained - through the use of typical measurement situations - how receiver sensitivity and selectivity can be evaluated using the MG3633A Synthesized Signal Generator (SG).

TABLE OF CONTENTS

5.1 Measuring Sensitivity ........................................... 5-1
    5.1.1 Measuring 20 dB NQ sensitivity .......................... 5-1
    5.1.2 Measuring 12 dB SINAD sensitivity ...................... 5-3

5.2 Measuring One-Signal Selectivity ............................. 5-4
    5.2.1 Using 20 dB NQ method to measure
         FM receiver selectivity .................................. 5-5
    5.2.2 Measuring spurious response ............................ 5-7

5.3 Measuring Two-Signal Selectivity ............................. 5-9
    5.3.1 Measuring blocking effect of FM receiver ............... 5-9
    5.3.2 Measuring cross-modulation characteristics .......... 5-12
For all the procedures described in this section, the MG3633A is assumed to be in an initial powered-up setting (SP00).

5.1 Measuring Sensitivity

The sensitivity of a receiver is the minimum signal input level required to obtain the rated signal output. At this time, the signal level, noise level, and signal distortion of the receiver output are handled as follows:

(1) AM receiver

Sensitivity is defined as the minimum standard modulated carrier voltage required to obtain the rated signal output at the specified S/N ratio.

For example, the minimum 60%-modulated carrier input voltage required to obtain a 50 mW signal output with a 20 dB S/N, is 10 μV.

(2) FM receiver

Sensitivity is defined as the minimum standard deviated carrier voltage required to obtain the rated output at the specified S/N ratio and distortion (SINAD) (for example, –12 dB SINAD for the 400 MHz band). In addition, another measure of sensitivity is the minimum carrier voltage required to suppress receiver noise output by 20 dB when no signal is being received. This is called the 20 dB noise quieting (NQ) sensitivity.

This paragraph explains how to measure the 20 dB NQ sensitivity and 12 dB SINAD sensitivity.

5.1.1 Measuring 20 dB NQ sensitivity

The 20 dB noise quieting (NQ) sensitivity is the minimum carrier input voltage required to suppress the receiver noise output by 20 dB when no signal is being input. Obtain the noise output before suppression by using the volume controller of the low-frequency amplification stage of the receiver so that the rated signal output can be obtained.
(1) Setup

![Diagram of setup](image)

**Fig. 5-1  20 dB NQ Sensitivity Measurement**

(2) Measurement procedures

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the MG3633A to 154.45 MHz as shown below.</td>
</tr>
<tr>
<td>2</td>
<td>Set the frequency deviation of the MG3633A to 70% of the specified maximum frequency deviation. If the specified maximum frequency deviation is 5 kHz, for example, set the frequency deviation of the SG to 3.5 kHz. Also, set the internal modulation frequency to 1 kHz.</td>
</tr>
<tr>
<td>3</td>
<td>Set the MG3633A output to an adequate level (30 dBµ or more), then supply the signal to the receiver.</td>
</tr>
<tr>
<td>4</td>
<td>Tune the receiver to 154.45 MHz (so that level meter (LM) deflection is maximum). Adjust the volume controller of the low-frequency amplification stage of the receiver so that the rated output can be obtained from the receiver according to the LM indication.</td>
</tr>
<tr>
<td>5</td>
<td>Turn the MG3633A output OFF. Also, turn the squelch of the receiver OFF.</td>
</tr>
<tr>
<td>6</td>
<td>Use LM to measure the noise output of the receiver, and set the meter indication to 0 dB.</td>
</tr>
</tbody>
</table>
7. Set MG3633A modulation to OFF. Set MG3633A output to ON.

8. Operate the INCREMENT [\] [\] and rotary knob in the MG3633A to adjust output level so that the LM indicates \(-20\) dB. The value read on the OUTPUT LEVEL display of the MG3633A is the 20 dB NQ sensitivity.

5.1.2 Measuring 12 dB SINAD sensitivity

SINAD sensitivity is defined as the maximum SG output level at which the distortion does not exceed a specified standard (In Japan it is \(-12\) dB for the 400 MHz band). The SINAD is determined by reducing SG output from a maximum level - while measuring distortion - until the demodulated receiver output of the standard modulation signal meets the distortion specification.

1) Setup

Fig. 5-2 12 dB SINAD Sensitivity Measurement

2) Measurement procedures

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the MG3633A to 465.05 MHz as shown below.</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A to 70% of the specified maximum frequency deviation. If the specified maximum frequency deviation is 5 kHz, for example, set the MG3633A to 3.5 kHz. Also, set the internal modulation frequency to 1 kHz.</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>3</td>
<td>Set the MG3633A output to an adequate level (30 dBμ or more), then supply it to the receiver.</td>
</tr>
<tr>
<td>4</td>
<td>Turn receiver squelch OFF, then tune the receiver to receive a frequency of 465.05 MHz (so that KNM deflection is maximized). Adjust receiver volume controller of the low frequency amplification stage so that the rated receiver output can be obtained according to the KNM indication.</td>
</tr>
<tr>
<td>5</td>
<td>Operate the INCREMENT [∧] [∨] and rotary knob of the MG3633A to adjust output level so that the SINAD indication value of the KNM is – 12 dB. The value read on the OUTPUT LEVEL display of the MG3633A is the 12 dB SINAD sensitivity.</td>
</tr>
</tbody>
</table>

### 5.2 Measuring One-Signal Selectivity

One-signal selectivity measurements are performed when both the desired and undesired signals are weak and when the receiver will operate in the linear range of the amplifier. When the SG signal is inputting to the receiver, selectivity is measured as the voltage ratio (desired/undesired) necessary to produce equivalent receiver outputs when the SG signal is alternated between desired and undesired signals. In this selectivity measurement, the pass band-width, attenuation, and spurious response are measured.
5.2.1 Using 20 dB NQ method to measure FM receiver selectivity

The figure on the left shows the selectivity characteristics of the 146 to 162 MHz band single-channel receiver. The specifications are as follows:

- **Pass bandwidth:**
  The width of 6 dB selectivity is 20 kHz (± 10 kHz) or more.

- **Attenuation:**
  The width of 70 dB selectivity is 50 kHz (± 25 kHz) or less.

Therefore, using the 20 dB NQ method, these selectivity are measured as follows:

- **Pass bandwidth:**
  Obtained from the frequency width obtained by increasing the SG output level to 6 dB higher than the 20 dB NQ sensitivity, and adjusting the SG frequency so that the receiver output will be the same as the 20 dB NQ level again.

- **Attenuation:**
  Obtained in the same way as above except for increasing the SG output level by 70 dB instead of 6 dB.

* Curve must not overlap the shaded region. Solid-line curve is acceptable, the dashed-line curve is unacceptable.

(1) **Setup**

![Diagram of setup](image)

**Fig. 5-3 Using 20 dB NQ Method to Measure Selectivity**
(2) **Measurement procedures 1 -- Pass bandwidth**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the frequency and output level of the MG3633A, and FM RX in the same way as in 20 dB NQ sensitivity measurement (see paragraph 5.1.1).</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A to the relative level mode; set the output level resolution to 1 dB.</td>
</tr>
<tr>
<td>3</td>
<td>Turn the rotary knob clockwise to increase the output level of the MG3633A to 6 dB higher than the 20 dB NQ sensitivity.</td>
</tr>
<tr>
<td>4</td>
<td>Set the MG3633A output frequency resolution to 1 kHz.</td>
</tr>
<tr>
<td>5</td>
<td>Turn the rotary knob counterclockwise to lower the frequency and obtain a value where the 20 dB NQ level is indicated on the LM again.</td>
</tr>
<tr>
<td>6</td>
<td>Set the MG3633A to the relative frequency mode.</td>
</tr>
<tr>
<td>7</td>
<td>Turn the rotary knob clockwise to increase the frequency and obtain the frequency where the 20 dB NQ level is indicated on the LM again. The value on the MG3633A FREQUENCY display is the pass bandwidth.</td>
</tr>
</tbody>
</table>

(3) **Measurement procedures 2 -- Attenuation**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the frequency and output level of the MG3633A, and FM RX in the same way as in the 20 dB NQ sensitivity measurement (see paragraph 5.1.1).</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A to relative level mode; set output level resolution to 10 dB.</td>
</tr>
<tr>
<td>3</td>
<td>Turn the rotary knob clockwise to increase the output level of the MG3633A to 70 dB higher than the 20 dB NQ sensitivity.</td>
</tr>
<tr>
<td>4</td>
<td>Set the MG3633A output frequency resolution to 1 kHz.</td>
</tr>
<tr>
<td>5</td>
<td>Turn the rotary knob counterclockwise to lower the frequency and obtain the frequency where the 20 dB NQ level is indicated on the LM again.</td>
</tr>
<tr>
<td>6</td>
<td>Set the MG3633A to the relative frequency mode.</td>
</tr>
<tr>
<td>7</td>
<td>Turn the rotary knob clockwise to increase the frequency and obtain the frequency where the 20 dB NQ level is indicated on the LM again. The value on the MG3633A FREQUENCY display is the 70 dB attenuation bandwidth.</td>
</tr>
</tbody>
</table>
5.2.2 Measuring spurious response

Spurious sensitivity is low when there is a large difference between receiver output derived from source signals of a desired modulated signal compared with that from an undesired modulated signal source of spurious frequency. To measure the spurious response, adjust SG spurious frequency output so that both receiver outputs are equivalent. The difference between the SG spurious and desired output levels is the spurious sensitivity.

Assuming the desired signal frequency to be \( f_d \), receiver IF frequency to be \( f_i \), and receiver local frequency to be \( f_L \), the spurious frequency \( f_s \) is:

- Image frequency interference
  \[ f_s = f_L \pm f_i = f_d \pm 2f_i \]

- Harmonic interference:
  \[ f_s = f_L \pm f_i/2, \quad f_s = n f_d \pm f_i/2 \]
  When a signal is received that causes the frequency difference from the receiver local frequency to be \( f_i/2 \), the second harmonic of \( f_i/2 \) component becomes the IF frequency and interference occurs.

- Local frequency harmonic interference:
  \[ f_s = n f_L \pm f_i \]

An example for \( f_d = 154.450 \) MHz, \( f_s = f_d + 2f_i \), and \( f_i = 10.7 \) MHz is given here.

(1) Setup

![Diagram of spurious sensitivity measurement system](image)

**Fig. 5-4 Spurious Sensitivity Measurement**
(2) Measurement procedures

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the MG3633A to the desired frequency $f_d = 154.45$ MHz.</td>
</tr>
</tbody>
</table>
| 2    | Set the frequency deviation of the MG3633A to 70% of the specified maximum frequency deviation.  
If the specified maximum frequency deviation is 5 kHz, for example, set the frequency deviation of the MG3633A to 3.5 kHz. Also, set the internal modulation frequency to 1 kHz. |
| 3    | Set the output level of the MG3633A high enough (usually, to $–83$ dBm or more), then input it to the receiver. |
| 4    | Tune the receiver to receive the 154.45 MHz signal (so LM deflection is maximum). Adjust the volume control for low frequency amplification (at the first stage, if possible) so that the rated output level can be obtained from the receiver according to the LM indication. |
| 5    | Set the MG3633A to the relative frequency mode. |
| 6    | Input spurious frequency ($f_s = f_d + 2f_i$) signal from the MG3633A to the receiver while keeping the receiver setting condition and the MG3633A modulation frequency and frequency deviation as is.  
For changing the MG3633A frequency to the spurious frequency, set $2 \times f_i = 2 \times 10.7$ MHz in the relative frequency mode, as follows. |
| 7    | Set the MG3633A to the relative level mode. |
| 8    | Set the MG3633A output level resolution to 1 dB. |
| 9    | Operate the INCREMENT [\(\lor\)] [\(\land\)] and rotary knob of the MG3633A to adjust the output level so that the LM indicates the same value as the rated output in step 4.  
The value on the MG3633A OUTPUT LEVEL display is the spurious sensitivity. |
5.3 Measuring Two-Signal Selectivity

In the one-signal selectivity measurements, the input signal level must be changed from around 0 dBμ up to around 100 dBμ to measure selectivity using a fixed output level receiver.

Because of the necessary large changes in SG output level, it is difficult for receiver amplifiers to produce a linear response over the entire range. Usually, amplifiers response is linear over an range of 20 or 30 dB. For a larger changes, however, sensitivity for high-level input diminishes due to saturation of the amplifier, among other factors, which causes errors in the measurement values.

Two-signal selectivity (or effective selectivity) measurement is more suited to actual receiver conditions. This selectivity can indicate the interference separation capability of the receiver. That is, it indicates the maximum allowable input level of the undesired signal for suppressing the interference signal in the receiver output down to a fixed value while still maintaining reception of the desired signal. The following items are included.

1. Blocking effect
2. Cross-modulation characteristics
3. Inter-modulation characteristics

Items 1 and 2 above are explained in this section.

5.3.1 Measuring blocking effect of FM receiver

The blocking effect is characterized by the relationship of frequency separation (Δf) between desired and undesired non-modulated input signals on the same receiver output noise. Below, a graph shows the typical relationship between Δf and the input level for the undesired signal when the receiver output level is kept constant and the desired signal input is maintained at 6 dB higher than the 20 dB NQ sensitivity level. As is expected, as Δf becomes small, the level of the undesired signal input must be drastically reduced to maintain the same receiver output noise level.

![Diagram](image)

The following example is a measurement where the desired signal is 154.450 MHz and the undesired signal is ±40 kHz × n apart from the desired signal.
(1) Setup

MG3633A 1 (For desired signal)

MG3633A 2 (For undesired signal)

Fig. 5-5 Two-signal Selectivity Measurement

(2) Measurement procedures

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the MG3633A-2 output to OFF.</td>
</tr>
<tr>
<td>2</td>
<td>Set the frequency and output level of the MG3633A-1, and FM RX in the same way as in 20 dB NQ sensitivity (see paragraph 5.1.1). Assume the noise level to be ( V_N ) dB at this time.</td>
</tr>
<tr>
<td>3</td>
<td>Set the MG3633A-1 output to OFF. Set the frequency and output level of the MG3633A-2, and FM RX in the same way as in 20 dB NQ sensitivity. (the noise level is ( V_N ) dB at this time.)</td>
</tr>
<tr>
<td>4</td>
<td>Set the MG3633A-2 output to OFF and the MG3633A-1 output to ON again.</td>
</tr>
<tr>
<td>5</td>
<td>Set the MG3633A-1 to the relative level mode. Set the output level resolution to 1 dB.</td>
</tr>
<tr>
<td>6</td>
<td>Turn the rotary knob of the MG3633A-1 clockwise to increase the output level by 6 dB higher than the 20 dB NQ sensitivity.</td>
</tr>
<tr>
<td>7</td>
<td>Hold the MG3633A-1 in the status of step 6. Set the MG3633A-2 output to ON and set it to the relative frequency mode.</td>
</tr>
<tr>
<td>8</td>
<td>Set the MG3633A-2 to the relative level mode and set the output level resolution to 1 dB.</td>
</tr>
</tbody>
</table>
Set the increment frequency $\Delta F$ of the MG3633A-2 to 40 kHz.

Adjust the rotary knob of the MG3633A-2 to increase the output level so that the noise output of the receiver is $V_N$ dB in step 2, each time the INCREMENT [ $\triangledown$ ] is pressed. At this time, the value indicated by the OUTPUT LEVEL display of MG3633A-2 is the undesired signal input level (dB) separated by $\Delta F \times n$ from the desired signal.

Reset MG3633A-2 to the desired signal frequency of 154.450 MHz. (The same frequency as in steps 2 and 3.)

Also, reset the MG3633A-2 output level to the level at the time when the relative level mode was set in step 8.

Adjust the rotary knob of the MG3633A-2 to increase the output level so that the noise output level of the receiver is $V_N$ dB in step 2, each time the INCREMENT [ $\triangledown$ ] is pressed. At this time, the value indicated by the OUTPUT LEVEL display of MG3633A-2 is the undesired signal input level (dB) separated by $-\Delta F \times n$ from the desired signal.

From steps 10 and 12, the following blocking characteristics are obtained.
5.3.2 Measuring cross-modulation characteristics

Cross-modulation is evaluated in terms of the effect of an undesired modulated signal on the receiver output with a separate non-modulated desired signal. When the undesired and desired signals are close in frequency, demodulated signal appears at the receiver output. The cross-modulation is indicated by the undesired modulated input level when the receiver output level is a level lower than the rated output level by a specified amount. The rated output is obtained when a modulated signal is output free of interference.

When a relatively high-level modulated undesired signal is received with a non-modulated desired signal, non-linear operation of the receiver results in modulation of the desired signal, a phenomena known as cross modulation.

(1) Setup

Figure 5-5 in paragraph 5.3.1 shows the required setup. Measuring AM signal is explained.

In the measurement procedure below, it is assumed that the desired signal is 1500 kHz and that the undesired signal is \(\pm 5\, \text{kHz}\times n\) apart from the desired signal.

(2) Measurement procedures

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the MG3633A-2 output (for undesired signal) to OFF.</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A-1 frequency (for the desired signal) to 1500 kHz.</td>
</tr>
<tr>
<td>3</td>
<td>Set the AM modulation factor of the MG3633A-1 to 30% and the internal modulation frequency to 400 Hz.</td>
</tr>
<tr>
<td>4</td>
<td>Tune the receiver to 1500 kHz (so LM deflection is maximum). Set the AGC of the receiver to OFF and adjust the receiver to optimum status.</td>
</tr>
<tr>
<td>5</td>
<td>Operate the INCREMENT ([\vee]) ([\wedge]) and rotary knob of the MG3633A-1 to adjust output level so that the LM indicates the rated signal output.</td>
</tr>
<tr>
<td>6</td>
<td>Assume the value of the MG3633A-1 OUTPUT LEVEL display in step 5 to be (E_1) dB(\mu).</td>
</tr>
<tr>
<td>7</td>
<td>Set the MG3633A-1 modulation to OFF. Set the MG3633A-2 output to ON.</td>
</tr>
<tr>
<td>8</td>
<td>Set the MG3633A-2 to 1500 kHz.</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>9</td>
<td>Set the MG3633A-2 output level so that it is the same as the MG3633A-1 output level (E1 dBμ) in step 6.</td>
</tr>
<tr>
<td>10</td>
<td>Set the modulation factor and modulation frequency of the MG3633A-2 to 30% and 400 Hz, respectively, in the same way as for the MG3633A-1 in step 3.</td>
</tr>
<tr>
<td>11</td>
<td>Operate the rotary knob of the MG3633A-2 to adjust output level so that the receiver output is 20 dB less than the rated signal output in step 5 (this is the cross-modulation characteristic when the undesired signal frequency is the same as the desired signal frequency). Assume the output level of the MG3633A-2 at that time is E2 dBμ. Assume the level 20 dB (1/10) less than the rated output is V5 dB.</td>
</tr>
<tr>
<td>12</td>
<td>Set the MG3633A-2 to the relative frequency and relative level modes, and set the output level resolution to 1 dB.</td>
</tr>
<tr>
<td>13</td>
<td>Set increment step frequency ΔF of the MG3633A-2 to 5 kHz.</td>
</tr>
<tr>
<td>14</td>
<td>Adjust the rotary knob of the MG3633A-2 to increase the output level so that the noise output level of the receiver is V5 dB in step 11, each time the INCREMENT [∧] is pressed. At this time, the value indicated by the OUTPUT LEVEL display of MG3633A-2 is the undesired-signal input level (dB) at ΔF×n apart from the desired signal.</td>
</tr>
<tr>
<td>15</td>
<td>Reset the MG3633A-2 frequency to the desired-signal frequency 1500 kHz. Also, reset the MG3633A-2 output level to the level at the time when the relative level mode was set in step 12.</td>
</tr>
<tr>
<td>Step</td>
<td>Procedure</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>16</td>
<td>Adjust the rotary knob of the MG3633A-2 to increase the output level so that the noise output level of the receiver is $V_S$ dB in step 11, each time INCREMENT [✓] is pressed. At this time, the value indicated by the OUTPUT LEVEL display of MG3633A-2 is the undesired-signal input level (dB) at $-\Delta F \times n$ apart from the desired signal.</td>
</tr>
</tbody>
</table>

From steps 14 and 16, the following selectivity characteristic for cross-modulation are obtained.

![Diagram showing selectivity characteristic](image)
SECTION 6
PERFORMANCE TESTS

This section describes MG3633A Synthesized Signal Generator performance tests.

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Introduction</td>
<td>6-1</td>
</tr>
<tr>
<td>6.2</td>
<td>Equipment Required for Performance Tests</td>
<td>6-1</td>
</tr>
<tr>
<td>6.3</td>
<td>Performance Tests</td>
<td>6-2</td>
</tr>
<tr>
<td>6.3.1</td>
<td>Output frequency</td>
<td>6-2</td>
</tr>
<tr>
<td>6.3.2</td>
<td>Output-level frequency characteristic</td>
<td>6-3</td>
</tr>
<tr>
<td>6.3.3</td>
<td>Output-level accuracy</td>
<td>6-5</td>
</tr>
<tr>
<td>6.3.4</td>
<td>FM deviation and FM distortion</td>
<td>6-8</td>
</tr>
<tr>
<td>6.3.5</td>
<td>AM modulation factor and AM distortion</td>
<td>6-9</td>
</tr>
<tr>
<td>6.4</td>
<td>Service</td>
<td>6-11</td>
</tr>
</tbody>
</table>
SECTION 6
PERFORMANCE TESTS

6.1 Introduction

The procedures contained in paragraph 6.3.1 through 6.3.5 can be used to carry out: performance inspections upon receiving the MG3633A; routine maintenance inspections; and performance tests after repair or adjustment. Since checks are performed on the unit during normal system operation, no internal adjustments are necessary. Test important operating systems regularly as a method of preventive maintenance.

**Note:** The MG3633A warmup time can be as long as 24 hours, depending on the test item. For some test items, warm-up the instrument for at least 30 minutes and test the performance after the MG3633A has stabilized.

The warmup time of the test equipment must also be considered before making any measurements. For the highest measurement accuracy, in addition to the above, tests must be made at room temperature, the AC line voltage must be stable, and noise, vibration, dust and humidity must not be a problem.

6.2 Equipment Required for Performance Tests

Table 6-1 lists the equipment required for performance test.

<table>
<thead>
<tr>
<th>Test item</th>
<th>Test equipment</th>
<th>Required performance*</th>
<th>Recommended model (Anritsu)</th>
<th>Reference paragraph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output frequency</td>
<td>Frequency counter</td>
<td>10 kHz to 2.7 GHz</td>
<td>MF1603A</td>
<td>6.3.1</td>
</tr>
<tr>
<td>Output-level frequency</td>
<td>Power meter</td>
<td>100 kHz to 3 GHz</td>
<td>ML4803A</td>
<td>6.3.2</td>
</tr>
<tr>
<td>characteristic</td>
<td>-30 dBm to +20 dBm</td>
<td></td>
<td>MA4601A</td>
<td></td>
</tr>
<tr>
<td>Output level</td>
<td>Level and attenuation</td>
<td>100 kHz to 1.3 GHz</td>
<td>ME642A</td>
<td>6.3.3</td>
</tr>
<tr>
<td>accuracy</td>
<td>calibrator</td>
<td>-20 dBm to +130 dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-amplifier</td>
<td>100 kHz to 1200 MHz</td>
<td></td>
<td>MH648A</td>
<td></td>
</tr>
<tr>
<td>FM frequency deviation</td>
<td>Modulation analyzer</td>
<td>150 kHz to 2.7 GHz</td>
<td>MS616B</td>
<td>6.3.4</td>
</tr>
<tr>
<td>AM modulation factor</td>
<td>Modulation analyzer</td>
<td>150 kHz to 2.7 GHz</td>
<td>MS616B</td>
<td>6.3.5</td>
</tr>
<tr>
<td>Modulation distortion</td>
<td>Distortion meter</td>
<td>20 Hz to 100 kHz</td>
<td></td>
<td>6.3.4, 6.3.5</td>
</tr>
</tbody>
</table>

* Only part of the performance that covers the test item measurement range is listed.
6.3 Performance Test

This paragraph describes performance test procedures for:
1. Output frequency
2. Output-level frequency characteristics
3. Output-level accuracy
4. FM deviation and FM distortion
5. AM modulation factor and AM distortion

6.3.1 Output frequency

This tests if the set frequency is being output normally.

(1) Test specifications
- Frequency range 10 kHz to 2700 MHz
- Setting resolution 0.01 Hz

(2) Test equipment
- Frequency counter

(3) Setup

![Diagram](image)

Fig. 6-3 Output Frequency
(4) Test procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect the standard frequency output (10 MHz) of the frequency counter to the external standard input (REF INPUT) of the MG3633A.</td>
</tr>
<tr>
<td>2</td>
<td>Connect the MG3633A output to the frequency counter input as shown in Fig. 6-3.</td>
</tr>
<tr>
<td>3</td>
<td>Set the MG3633A output level to +7 dBm.</td>
</tr>
<tr>
<td>4</td>
<td>Set the MG3633A to any frequency.</td>
</tr>
<tr>
<td>5</td>
<td>Check that the frequency counter reading is the same as the set value.</td>
</tr>
<tr>
<td>6</td>
<td>Change the frequency and repeat the test.</td>
</tr>
</tbody>
</table>

(5) Test precautions
The counter reading may include a ±1 count error.

6.3.2 Output-level frequency characteristic

(1) Test specifications
\[ \leq \pm 0.5 \text{ dB referred to } 0 \text{ dBm} \quad (\leq 1280 \text{ MHz}) \]
\[ \leq \pm 1 \text{ dB referred to } 0 \text{ dBm} \quad (\geq 1280 \text{ MHz}) \]

(2) Test equipment
- Power meter: 10 kHz to 2700 MHz
(3) Setup

Fig. 6-4 Output-Level Frequency Characteristic

(4) Test procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turn off the MG3633A output level and zero-adjust the power meter.</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A output level to 0 dBm.</td>
</tr>
<tr>
<td>3</td>
<td>Set the MG3633A to the frequency to be measured (for example, the table below).</td>
</tr>
<tr>
<td>4</td>
<td>Set the calibration factor of the power meter sensor and read the output level.</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency</th>
<th>10 kHz</th>
<th>100 kHz</th>
<th>1 MHz</th>
<th>10 MHz</th>
<th>100 MHz</th>
<th>200 MHz</th>
<th>500 MHz</th>
<th>1000 MHz</th>
<th>1500 MHz</th>
<th>2000 MHz</th>
<th>2500 MHz</th>
<th>2700 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level deviation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(5) Test precautions

The MG3633A output-level frequency characteristic is specified at the OUTPUT connector on the SP86 (NORMAL correction). Therefore, when making measurements, connect the power sensor directly to the OUTPUT connector.
6.3.3 Output-level accuracy

(1) Test specifications

<table>
<thead>
<tr>
<th>Output level</th>
<th>10 kHz to (&lt;1280) MHz</th>
<th>(\geq 1280) MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>+17.1 to +23 dBm</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>±15.1 to +17 dBm</td>
<td>±1 dB</td>
<td>–</td>
</tr>
<tr>
<td>–122.9 to +15 dBm</td>
<td>±1 dB</td>
<td>±2 dB</td>
</tr>
<tr>
<td>–132.9 to –123 dBm</td>
<td>±3 dB</td>
<td>±4 dB</td>
</tr>
<tr>
<td>–143 to –133 dBm</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

(2) Test equipment

- Level and attenuation calibrator
  10 kHz to 2700 MHz
- Preamplifier
  10 kHz to 2700 MHz, gain 30 dB

(3) Setup

![Diagram of test setup](image)

Fig. 6-5 Output-Level Accuracy
(4) **Test procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the MG3633A to the measurement frequency and set the output level to $+13 \text{ dBm}$.</td>
</tr>
<tr>
<td>2</td>
<td>Set a level and attenuation calibrator to the same frequency as the MG3633A and set the meter indication to 0 with the ATT and fine-adjustment control.</td>
</tr>
<tr>
<td>3</td>
<td>Attenuate the MG3633A output level in accordance with the table below. At the same time, change ATT of the calibrator by the same amount and read the deviation of the calibrator meter indication at that time.</td>
</tr>
<tr>
<td>4</td>
<td>Repeat Step 3 until the MG3633A output level reaches $-113 \text{ dBm}$.</td>
</tr>
<tr>
<td>5</td>
<td>Next, insert a preamplifier between the MG3633A and calibrator to increase the input level to the calibrator for easy testing.</td>
</tr>
<tr>
<td>6</td>
<td>Set the meter indication to the same value as before the preamplifier was inserted, with the calibrator ATT and fine-adjustment control.</td>
</tr>
<tr>
<td>7</td>
<td>Attenuate the MG3633A output level again down to $-133 \text{ dBm}$. At the same time, change the calibrator ATT by the same amount and read the deviation of the calibrator meter indication at that time.</td>
</tr>
</tbody>
</table>

(5) **Test precautions**

For frequencies that the calibrator cannot measure, use a mixer and local signal generator to convert to measurable ones.
<table>
<thead>
<tr>
<th>MG3633A set frequency</th>
<th>100 kHz</th>
<th>1350 MHz</th>
<th>2700 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>+13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−103</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−113</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−123</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−133</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.3.4 FM deviation and FM distortion

(1) Test specifications

Range:  
- 0 to 400 kHz (1 MHz \( \leq f_c < 40 \) MHz)
- 0 to 100 kHz (40 MHz \( \leq f_c < 80 \) MHz)
- 0 to 200 kHz (80 MHz \( \leq f_c < 160 \) MHz)
- 0 to 400 kHz (160 MHz \( \leq f_c < 320 \) MHz)
- 0 to 800 kHz (320 MHz \( \leq f_c < 640 \) MHz)
- 0 to 1.6 MHz (640 MHz \( \leq f_c < 1280 \) MHz)
- 0 to 3.2 MHz (1280 MHz \( \leq f_i \))

Resolution:  
- 10 Hz (0 to 9.99 kHz deviation)
- 100 Hz (10 to 99.9 kHz deviation)
- 1 kHz (100 to 999 kHz deviation)
- 10 kHz (1 to 3.2 MHz deviation)

Accuracy:  
\( \pm (5\% \text{ of indicated value} + 20 \text{ Hz}) \) (Internal 1 kHz)

Distortion:  
\( \leq 1\% \) (Internal 1 kHz, 3.5 kHz deviation)

(2) Test equipment

- Modulation analyzer
- Distortion meter

(3) Setup

![Diagram of test equipment setup]

Fig. 6-6 FM Deviation and FM Distortion
(4) Test procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set the MG3633A output level to +7 dBm.</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A frequency to the measurement frequency.</td>
</tr>
<tr>
<td>3</td>
<td>Turn on the MG3633A FM. (If AM and ΦM are on, turn them off.) Set FM INT and modulation frequency to 1 kHz.</td>
</tr>
<tr>
<td>4</td>
<td>Set the MG3633A FM frequency deviation.</td>
</tr>
<tr>
<td>5</td>
<td>Read the modulation analyzer indication to test the FM frequency deviation.</td>
</tr>
<tr>
<td>6</td>
<td>Change the MG3633A FM frequency deviation and repeat the test.</td>
</tr>
<tr>
<td>7</td>
<td>Set the MG3633A FM frequency deviation to 3.5 kHz.</td>
</tr>
<tr>
<td>8</td>
<td>Test the modulation-analyzer demodulated-output distortion with the distortion meter.</td>
</tr>
</tbody>
</table>

(5) Test precautions

- Test FM deviation at the modulation-analyzer for a 0.3 to 3 kHz demodulation-bandwidth.
- If a modulation analyzer with a large residual FM is used, when the FM deviation is small, distortion measurement will be adversely affected. Therefore, use a modulation analyzer with a small residual FM.

6.3.5 AM modulation factor and AM distortion

(1) Test specifications

- Range: 0% to 100%
- Accuracy: ± (5% of indicated value + 2%) (at ≥ 250 kHz, ≤ +7 dBm, 0 to 90% and internal 1 kHz)
- Distortion: ≤ 1% (at ≥ 1 MHz, < +7 dBm, internal 1 kHz, 30%) ≤ 3% (at ≥ 1 MHz, < +7 dBm, internal 1 kHz, 80%) ≤ 3% (at 250 kHz ≤ fc < 1 MHz < +7 dBm, internal 1 kHz, 30%) ≤ 10% (at 250 kHz ≤ fc < 1 MHz < +7 dBm, internal 1 kHz, 80%)
(2) Test equipment
- Modulation analyzer
- Distortion meter

(3) Setup

![Diagram of test equipment]

**Fig. 6-7 AM Modulation Factor and AM Distortion**

(4) Test procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AM modulation-factor accuracy</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Set the MG3633A output level to +7 dBm.</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A frequency to the test frequency.</td>
</tr>
<tr>
<td>3</td>
<td>Turn on the MG3633A AM mode. (If FM and ΦM are on, turn them off.) Set AM INT and modulation frequency to 1 kHz.</td>
</tr>
<tr>
<td>4</td>
<td>Set the MG3633A AM modulation factor.</td>
</tr>
<tr>
<td>5</td>
<td>Read the modulation-analyzer indication to test the AM modulation factor.</td>
</tr>
<tr>
<td>6</td>
<td>Change the MG3633A AM modulation factor and repeat the test.</td>
</tr>
<tr>
<td></td>
<td><strong>AM Modulation-factor distortion</strong></td>
</tr>
<tr>
<td>7</td>
<td>Set the MG3633A AM modulation factor to 30% and 80%.</td>
</tr>
<tr>
<td>8</td>
<td>Test the modulation-analyzer demodulated-output distortion with the distortion meter.</td>
</tr>
</tbody>
</table>
(5) Test precautions

For AM modulation-factor accuracy test, set the modulation-analyzer demodulation bandwidth to 0.3 to 3 kHz, and for AM distortion measurement, set the demodulation bandwidth to 0.3 to 15 kHz or 0.3 to 20 kHz.

6.4 Service

When the instrument is damaged or does not operate normally, contact the sales agent or ANRITSU for repair.

When requesting repair, please specify the following:

(a) Instrument name and the serial No. on the rear panel
(b) Trouble symptoms
(c) Name and office of person(s) to be contacted during or after repair
SECTION 7
CALIBRATION

This section describes the MG3633A Synthesized Signal Generator calibration.

TABLE OF CONTENTS

7.1 Calibration ......................................................... 7-1
7.2 Equipment Required for Calibration ............................... 7-1
7.3 Calibration ......................................................... 7-1
  7.3.1 Reference oscillator frequency calibration using frequency standard ................................................. 7-2
  7.3.2 Reference oscillator frequency accuracy calibration using counter ................................................. 7-4
SECTION 7
CALIBRATION

7.1 Calibration

The MG3633A internal reference oscillator frequency must be calibrated periodically about once or twice a year.

If an item does not satisfy the specifications at calibration, contact the ANRITSU service department.

7.2 Equipment Required for Calibration

Table 8-1 lists the calibration equipment.

<table>
<thead>
<tr>
<th>Test item</th>
<th>Test equipment</th>
<th>Required performance*</th>
<th>Recommended model (Anritsu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference oscillator frequency accuracy</td>
<td>Oscilloscope</td>
<td>50 MHz, external trigger possible</td>
<td></td>
</tr>
<tr>
<td>Frequency counter</td>
<td>10 kHz to 2.7 GHz</td>
<td></td>
<td>MF1603A</td>
</tr>
<tr>
<td>Frequency standard</td>
<td>10 MHz, $\pm 1 \times 10^{-10}$/day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Only part of the performance that covers the test item measurement range is listed.

7.3 Calibration

The MG3633A internal reference oscillator frequency is calibrated.

The calibrated specifications are as follows.

<table>
<thead>
<tr>
<th>Reference oscillator</th>
<th>Frequency</th>
<th>Aging rate</th>
<th>Temperature characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type</td>
<td>10 MHz</td>
<td>$2 \times 10^{-8}$/day</td>
<td>$\pm 5 \times 10^{-8}$ (0°C to 50°C)</td>
</tr>
<tr>
<td>Option 01</td>
<td>10 MHz</td>
<td>$5 \times 10^{-9}$/day</td>
<td>$\pm 5 \times 10^{-8}$ (0°C to 50°C)</td>
</tr>
<tr>
<td>Option 02</td>
<td>10 MHz</td>
<td>$2 \times 10^{-9}$/day</td>
<td>$\pm 1.5 \times 10^{-8}$ (0°C to 50°C)</td>
</tr>
<tr>
<td>Option 03</td>
<td>10 MHz</td>
<td>$5 \times 10^{-10}$/day</td>
<td>$\pm 5 \times 10^{-9}$ (0°C to 50°C)</td>
</tr>
</tbody>
</table>
7.3.1 Reference oscillator frequency calibration using frequency standard

This paragraph describes calibration when options 01 to 03 are installed.

Since the MG3633A 10 MHz reference oscillator stability is $\pm 2 \times 10^{-8}$/day or less, a standard signal generator, which either receives a standard signal or receives a color television subcarrier (signal locked to a rubidium atomic standard) and generates a signal locked to this signal, is used as the frequency standard.

(1) Setup

![Diagram of MG3633A oscillator with setup instructions]

Fig. 7-1 Reference Oscillator Frequency Calibration using Frequency Standard
(2) **Procedure**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set up the equipment as shown in Fig. 7-1 in a room at 23° ± 5°C.</td>
</tr>
<tr>
<td>2</td>
<td>To warm-up the MG3633A reference oscillator, set the POWER switch to STBY and leave the MG3633A in that state for 24 hours.</td>
</tr>
<tr>
<td>3</td>
<td>After 24 hours, set the MG3633A POWER switch to ON.</td>
</tr>
<tr>
<td>4</td>
<td>Apply the standard frequency signal to the oscilloscope external trigger input. Also, apply the 10 MHz reference output signal from the BUFFER OUTPUT connector on the MG3633A rear panel to the oscilloscope vertical axis X.</td>
</tr>
<tr>
<td>5</td>
<td>Adjust the oscilloscope so that the input waveform can be observed. When the input waveform on the oscilloscope moves to the right or left and is not synchronized, the reference oscillator frequency does not match the standard frequency.</td>
</tr>
<tr>
<td>6</td>
<td>Adjust the potentiometer inside the reference oscillator calibration-hole under the MG3633A top cover shown in Fig. 7-1 so that the input waveform on the oscilloscope does not move to the left or right.</td>
</tr>
</tbody>
</table>
7.3.2 Reference oscillator frequency accuracy calibration using counter

This paragraph describes calibration when Options 01 to 03 are not installed: that is, for the standard instrument.

(1) Setup

![Diagram of MG3633A and frequency counter]

Fig. 7-2 Reference Oscillator Frequency Calibration Using Frequency Counter

(2) Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setup the equipment as shown in Fig. 7-2.</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A frequency to 1000 MHz.</td>
</tr>
<tr>
<td>3</td>
<td>Set the frequency counter resolution to 10 Hz or less.</td>
</tr>
<tr>
<td>4</td>
<td>While reading the frequency with the frequency counter, adjust the potentiometer under the MG3633A top cover shown in Fig. 7-2 with a screwdriver so that the frequency counter reads 1000 MHz.</td>
</tr>
</tbody>
</table>
SECTION 8
STORAGE AND TRANSPORTATION

This section describes daily maintenance, storage, and transportation of the MG3633A.

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>Daily Servicing and Preventive Maintenance</td>
<td>8-1</td>
</tr>
<tr>
<td>8.2</td>
<td>Storage Precautions</td>
<td>8-1</td>
</tr>
<tr>
<td>8.2.1</td>
<td>Precautions before storage</td>
<td>8-1</td>
</tr>
<tr>
<td>8.2.2</td>
<td>Recommended storage conditions</td>
<td>8-2</td>
</tr>
<tr>
<td>8.3</td>
<td>Repacking and Transportation</td>
<td>8-2</td>
</tr>
<tr>
<td>8.3.1</td>
<td>Repacking</td>
<td>8-2</td>
</tr>
<tr>
<td>8.3.2</td>
<td>Transportation</td>
<td>8-2</td>
</tr>
</tbody>
</table>
SECTION 8
STORAGE AND TRANSPORTATION

8.1 Daily Servicing and Preventive Maintenance

To prevent degradation of the performance of the MG3633A, the MG3633A should be operated correctly under the specified conditions. Calibration and performance tests should also be performed routinely.

The regular servicing method and interval are shown in Table 8-1.

<table>
<thead>
<tr>
<th>Table 8-1 Regular Servicing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
</tr>
<tr>
<td>Soiling</td>
</tr>
<tr>
<td>• Before long-term storage</td>
</tr>
<tr>
<td>• When used in dusty locations</td>
</tr>
<tr>
<td>Dust</td>
</tr>
<tr>
<td>• When noticeable dust and dirt have accumulated inside cabinet</td>
</tr>
<tr>
<td>Lubrication</td>
</tr>
<tr>
<td>Loose screws</td>
</tr>
<tr>
<td>When detected</td>
</tr>
</tbody>
</table>

* Do not use acetone or benzene; the paint finish may be damaged.

8.2 Storage Precautions

This paragraph describes the precautions to take when storing the MG3633A for a long time.

8.2.1 Precautions before storage

1. Wipe any dust and fingermarks off the cabinet.
2. Check the performance as described in SECTION 6 to confirm that the MG3633A operates normally.
3. The maximum and minimum storage temperature range is 60° to −20°C. The maximum humidity is 90%.
8.2.2 Recommended storage conditions
In addition to meeting the conditions listed in paragraph 8.2.1, the MG3633A should preferably be stored where:

1. Temperature is 0° to 30°C
2. Humidity is 40% to 80%
3. Temperature and humidity are stable

Before using the MG3633A after storage, check the performance as described in SECTION 6.

8.3 Repacking and Transportation
When transporting the MG3633A over long distances, observe the precautions described below.

8.3.1 Repacking
Use the original packing materials. If the original packing materials were thrown away or destroyed, repack the MG3633A as follows:

1. Install the protective covers (B0020) over the front and rear panels.
2. Wrap the MG3633A in plastic or similar material.
3. Obtain a cardboard, wood, or aluminum box 10 to 15 cm larger than the MG3633A on all sides.
4. Put the MG3633A in the center of the box and fill the surrounding space with shock absorbent material.
5. Secure the box with twine, tape, or bands.

Note: It is easy to repack the MG3633A if the original packing materials are saved.

8.3.2 Transportation
Transport the MG3633A under the storage conditions recommended in paragraph 8.2.2.
APPENDIX A
PANEL LAYOUT

The front and rear panels are shown in Figs. A-1 and A-2 respectively. The numbers of the keys, connectors, and displays correspond to those described in this manual.

Fig. A-1 .......................................................... A-3
Fig. A-2 .......................................................... A-4
Fig. A-1 Front Panel
MA1610A
Pulse Modulator
Operation Manual

ANRITSU CORPORATION
# TABLE OF CONTENTS

SECTION 1  GENERAL ................................................. B-7

SECTION 2  COMPOSITION AND SPECIFICATIONS ................. B-9
2.1  Standard Composition ................................ B-9
2.2  Specifications ............................................. B-10

SECTION 3  OPERATION ............................................. B-11
3.1  Caution on Handling .................................... B-11
3.1.1  Power supply connection ............................... B-11
3.1.2  Operating and storage conditions ................. B-11
3.1.3  Maximum applied level ................................. B-12
3.2  Explanation of Controls ................................. B-12
3.3  Operation ................................................ B-13

SECTION 4  PRINCIPLES OF OPERATION ......................... B-15

SECTION 5  PERFORMANCE CHECK ............................... B-17
5.1  Introduction .............................................. B-17
5.2  Preparation of Measurement ............................. B-17
5.2.1  Equipment required for performance test ........ B-17
5.2.2  Preparation ............................................ B-17
5.3  ON/OFF ratio and Insertion Loss Tests ............... B-18
5.3.1  Specifications .......................................... B-18
5.3.2  Setup .................................................. B-18
5.3.3  Procedure ............................................ B-19
5.4  Modulated Waveform Test ............................... B-19
5.4.1  Specifications .......................................... B-19
5.4.2  Setup .................................................. B-20
5.4.3  Procedure ............................................ B-21
SECTION 1
GENERAL

The MA1610A Pulse Modulator is used in combination with the MG3633A Synthesized Signal Generator for obtaining high-speed pulse modulation waveforms.

Output can be ON/OFF speedly by logic of modulation input signal (TTL level, 50Ω termination) for carrier frequency at range in 10 kHz to 2.7 GHz.

The power source required for MA1610A operation is supplied from the AUX terminal on the MG3633A rear panel.
SECTION 2
COMPOSITION AND SPECIFICATIONS

Table 2-1 describes the standard composition and Table 2-2 lists the specifications of the MA1610A, respectively.

2.1 Standard Composition

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument</td>
<td>MA1610A Pulse Modulator</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Accessories supplied</td>
<td>50Ω coaxial cable</td>
<td>1</td>
<td>S-5DWP [ ] 0.3m 5D2W [ ] S-5DWP</td>
</tr>
<tr>
<td>Power cord</td>
<td></td>
<td>1</td>
<td>1m in length</td>
</tr>
<tr>
<td>Operation manual</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
### 2.2 Specifications

<table>
<thead>
<tr>
<th>Table 2-2 Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency range</strong></td>
</tr>
<tr>
<td><strong>ON/OFF ratio</strong></td>
</tr>
<tr>
<td><strong>Insertion loss</strong></td>
</tr>
<tr>
<td><strong>Risetime</strong></td>
</tr>
<tr>
<td><strong>Falltime</strong></td>
</tr>
<tr>
<td><strong>Minimum pulse width</strong></td>
</tr>
<tr>
<td><strong>Maximum pulse rate frequency</strong></td>
</tr>
<tr>
<td><strong>Maximum delay time</strong></td>
</tr>
<tr>
<td><strong>Video feedthrough</strong></td>
</tr>
<tr>
<td><strong>Overshoot/ringing</strong></td>
</tr>
<tr>
<td><strong>RF input/output</strong></td>
</tr>
<tr>
<td><strong>Pulse input</strong></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
</tr>
<tr>
<td><strong>Ambient temperature, rated range of use</strong></td>
</tr>
<tr>
<td><strong>Dimensions and weight</strong></td>
</tr>
</tbody>
</table>
SECTION 3
OPERATION

3.1 Caution on Handling

3.1.1 Power supply connection

The MA1610A is normally operated using power supplied from the rear panel AUX terminal of the MG3633A. (Refer to Fig. 3-1.)

![Diagram showing power supply connection between MA1610A and MG3633A](image)

Fig. 3-1 Power Supply Connection

**CAUTION:**
1. Always supply the power for the MA1610A from the MG3633A using the supplied power cord.
2. Be sure to connect power supply cord correctly.

3.1.2 Operating and storage conditions

The MA1610A is designed to operate normally at ambient temperatures of 0° to 50°C.

Do not use or store the instrument in locations where it may be exposed to:

1. Severe vibration
2. Extreme humidity or dust
3. Direct sunlight
4. Explosive gases

**CAUTION:** If the instrument is operated at room temperature after being used or stored for a long period at low temperatures, condensation may occur and cause short-circuiting. To prevent this, do not turn the power on until the instrument is completely dry.
3.1.3 Maximum applied level

**CAUTION:** Fire may result if more than +23 dBm (200 mW) and 3.5 Vdc are applied to the MA1610A RF input/output terminal from an external source.

3.2 Explanation of Controls

External view and control functions are described in Fig. 3-2 below.

---

**Fig. 3-2 External View and Control Functions**
3.3 Operation

The MA1610A is set up together with the MG3633A.

Figure 3-3 shows setup.

![Diagram of setup showing connections between MG3633A and MA1610A]

**Fig. 3-3 Setup**

The MA1610A PULSE INPUT is terminated at 50Ω. A pulse generator that can drive a 50Ω load should be used. The greater the carrier signal level (MG3633A output level) input to the MA1610A, the less effective the video feedthrough. When required that the modulated output level is made low, it is recommended to attenuate it with a PAD after modulation is made by the MA1610A. A carrier level attenuation is not recommended.
SECTION 4
PRINCIPLES OF OPERATION

The pulse modulator is a high-speed analog switch which controls, by binary digital signals, the output ON/OFF of the high-frequency carrier signal.

When the PULSE INPUT signal is “H” at TTL level, the switches are actuated to change the signal flow from RF INPUT to RF OUTPUT.

When the PULSE INPUT signal is “L” level, the switches are actuated to connect both RF INPUT and RF OUTPUT to the 50Ω terminators, respectively (refer to Fig. 4-1 below).

![Fig. 4-1 MA1610A Block Diagram](image-url)
Figure 4-2 shows the relationship between a digital signal applied to the PULSE INPUT and the consequent modulated waveform.

Fig. 4-2 Relationship Between Digital Signal Applied to PULSE INPUT and Consequent Modulated Waveform
SECTION 5
PERFORMANCE CHECK

5.1 Introduction
This section describes how to test electrical performance of the MA1610A in accordance with the specifications described in SECTION 2.

Performance tests are conducted upon receiving an instrument, after repair, or during periodic calibration.

5.2 Preparation of Measurement

5.2.1 Equipment required for performance test
Table 5-1 lists the equipment required for performance test.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Required performance</th>
<th>Recommended model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectrum analyzer</td>
<td>A level of 10 kHz to 2.7 GHz can be measured.</td>
<td>MS612A (Anritsu)</td>
</tr>
<tr>
<td>Oscilloscope</td>
<td>50Ω termination mode provided. Waveforms more than 200 MHz and two phenomena can be measured.</td>
<td></td>
</tr>
<tr>
<td>Pulse generator</td>
<td>Pulses with a repetition frequency more than 10 MHz and a minimum pulse-width of less than 10 ns can be generated.</td>
<td>MG418A (Anritsu)</td>
</tr>
<tr>
<td>DC power source</td>
<td>0 to +5V and 500 mA can be output.</td>
<td></td>
</tr>
</tbody>
</table>

5.2.2 Preparation
Supply power from the MG3633A AUX terminal to the MA1610A DC INPUT using the supplied power cord. This instrument meets these specifications in a temperature range of 0° to 50°C.
5.3 ON/OFF Ratio and Insertion Loss Tests

5.3.1 Specifications

ON/OFF ratio: \( \geq 60 \text{ dB} \) (\(<1000 \text{ MHz}\))
\( \geq 40 \text{ dB} \) (\(\geq 1000 \text{ MHz}\))

Insertion loss: \( \leq 2 \text{ dB} \) (\(<1000 \text{ MHz}\))
\( \leq 3.5 \text{ dB} \) (\(\geq 1000 \text{ MHz}\))

5.3.2 Setup

Set up as shown in Fig. 5-1.
Check ON/OFF ratio and insertion loss values over the entire frequency range.

![Fig. 5-1 Setup](image)
5.3.3 Procedure

Procedure of ON/OFF ratio and insertion loss tests is as follows:

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set up connection as indicated with the dotted line of Fig. 5-1.</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A to measuring frequency and the output level to +7 dBm.</td>
</tr>
<tr>
<td>3</td>
<td>Measure RF OUTPUT with the spectrum analyzer as S (dBm).</td>
</tr>
<tr>
<td>4</td>
<td>Set up connections as indicated with solid lines in Fig. 5-1.</td>
</tr>
<tr>
<td>5</td>
<td>Apply +5 Vdc to the MA1610A PULSE INPUT.</td>
</tr>
<tr>
<td>6</td>
<td>Measure RF OUTPUT with the spectrum analyzer as XO ON (dBm).</td>
</tr>
<tr>
<td>7</td>
<td>Set the dc voltage to zero.</td>
</tr>
<tr>
<td>8</td>
<td>Measure the output with the spectrum analyzer as XOFF (dBm).</td>
</tr>
<tr>
<td>9</td>
<td>Calculate ON/OFF ratio and insertion loss according to the following formula.</td>
</tr>
<tr>
<td></td>
<td>ON/OFF ratio = XO ON - XOFF (dB)</td>
</tr>
<tr>
<td></td>
<td>Insertion loss = S - XO ON (dB)</td>
</tr>
<tr>
<td>10</td>
<td>Change the measured frequency and repeat steps 1 through 9.</td>
</tr>
</tbody>
</table>

5.4 Modulated Waveform Test

5.4.1 Specifications

- Risetime ≤ 15 ns
- Falltime ≤ 5 ns
- Maximum delay time ≤ 40 ns
- Video feedthrough ≤ 50 m Vp-p
- Overshoot/ringing ≤ 20%
5.4.2 Setup

Set up as shown in Fig. 5-2.

Check the modulated waveform by observing with an oscilloscope.

![Fig. 5-2 Setup]
5.4.3 Procedure

Procedure of modulated waveform test is as follows:

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set up as shown in Fig. 5-2.</td>
</tr>
<tr>
<td>2</td>
<td>Set the MG3633A to a frequency of 100 MHz and an output level of +7 dBm.</td>
</tr>
<tr>
<td>3</td>
<td>Set the repetition frequency of the pulse generator to 10 MHz, the pulse-width to 20 ns and the output level to TTL level (0 to +5V).</td>
</tr>
<tr>
<td>4</td>
<td>For both CH1 and CH2 of the oscilloscope, set the input mode to DC and 50Ω, and apply a trigger to rise edge of CH2.</td>
</tr>
<tr>
<td>5</td>
<td>Adjust the oscilloscope so that a waveform can be seen as shown in Fig. 4-2 and measure Tr, Tf, Td, Vrf and Vor and obtain rise/fall times, delay time and overshoot/ringing.</td>
</tr>
<tr>
<td>6</td>
<td>Set the MG3633A output to OFF and measure a video feedthrough Vf.</td>
</tr>
</tbody>
</table>
SECTION 6
CLEANING AND STORAGE

6.1 Cleaning
Always disconnect the power cable before cleaning the cabinet.

To clean the external cabinet:

- Use a soft, dry cloth for wiping off.
- Use a cloth moistened with diluted neutral cleaning liquid if the instrument is very dirty or before long-term storage.

After ensuring that the cabinet has been thoroughly dried, use a soft, dry cloth for wiping off.

- If loose screws are found, tighten them with the appropriate tools.

CAUTION

Never use benzene, thinner, or alcohol to clean the external cabinet; it may damage the coating, or cause deformation or discoloration.

6.2 Storage
This paragraph describes the precautions to take for long-term storage of the MA1610A Pulse Modulator.

6.2.1 Precautions before storage
(1) Before storage, wipe dust, finger-marks, and other dirt off the MA1610A.

(2) Avoid storing the MA1610A where:
    1) It may be exposed to direct sunlight or high dust levels.
    2) It may be exposed to high humidity.
    3) It may be exposed to active gases.
    4) It may be exposed to extreme temperatures (\(< -20^\circ C\) or \(> 60^\circ C\)) or high humidity (\(\geq 90\%\)).

6.2.2 Recommended storage precautions
The recommended storage conditions are as follows:

- Temperature .......................... 0 to 30°C
- Humidity .............................. 40% to 80%
- Stable temperature and humidity over 24-hour period
APPENDIX C
FREQUENCY-RESPONSE
COMPENSATION SOFTWARE
MX5126B/MX5251B
( Blank )
MX5126B/MX5251B
Frequency-Response Compensation Software
Software Operation Manual

ANRITSU CORPORATION

C-3
# TABLE OF CONTENTS

1. GENERAL .......................................................... C-7

2. PREPARATION .................................................. C-8
   2.1 Equipment .................................................. C-8
   2.2 Setup ....................................................... C-8
   2.3 Preparation ............................................... C-9

3. OPERATION PROCEDURE ..................................... C-10

4. ERROR MESSAGE ................................................. C-15

5. USE OF COMPENSATION DATA ................................. C-16
1. GENERAL

Although the MG3633A has compensation data written at shipment so that the output-level frequency response is flat at the output connector, another data area is available for writing two more sets of compensation data.

The Frequency-Response Compensation Software MX5126B (for PACKET II e, III, and III s)/MX5251B (for PACKET V) measures the level at a device terminal (a cable end for example) with a GP-IB controller and a power meter, calculates compensation data from the level measurements so that the frequency response at the measurement point is flat, and writes the data into the MG3633 data compensation area all automatically.

The written data can be selected by special functions SP86 to 88.

<table>
<thead>
<tr>
<th>Compensation data area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NORMAL</strong></td>
</tr>
<tr>
<td>The frequency response is compensated for at the output connector. This is selected by special function 86. The compensation data cannot be rewritten.</td>
</tr>
<tr>
<td><strong>USER CAL 1</strong></td>
</tr>
<tr>
<td>Compensation data that maximizes the output level is written. This is selected by special function 87. The compensation data can be rewritten by using the Frequency-Response Compensation Software.</td>
</tr>
<tr>
<td><strong>USER CAL 2</strong></td>
</tr>
<tr>
<td>Compensation data that maximizes the output level is written. This is selected by special function 88. The compensation data can be rewritten by using the Frequency-Response Compensation Software.</td>
</tr>
</tbody>
</table>
2. PREPARATION

2.1 Equipment Required

The following equipment is required to execute the Frequency-Response Compensation Software.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PACKET II, III, III s or V</td>
<td>Personal technical computer (GP-IB controller) (MX5216B for PACKET II/III/III s, MX5251B for PACKET V)</td>
</tr>
<tr>
<td>ML4803A</td>
<td>Power meter</td>
</tr>
<tr>
<td>MA4601A</td>
<td>Power sensor (100 kHz to 5.5 GHz, –30 to +20 dBm)</td>
</tr>
</tbody>
</table>

2.2 Setup

![Diagram of setup](image)

Fig. 2-1 Setup
<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 1    | Set the MG3633A GP-IB address to 3 as follows:  
After turning on the MG3633A power, press the following keys.  
\[
\text{[SPECIAL] [6] [2]} \quad \text{[0] [3]}  
\]  
GP-IB address setting code  
GP-IB address  
| 2    | Set the ML4803A GP-IB address to 1 as shown in the following figures:  
\[
\begin{array}{c}
\text{GP-IB} \\
\text{TALK ONLY} \\
\text{ON} \\
\text{OFF} \\
\text{ADDRESS} \\
\hline
\text{5} & \text{4} & \text{3} & \text{2} & \text{1}
\end{array}
\]  
| 3    | Connect the Personal Computer to the MG3633A and the ML4803A with GP-IB cables.  
| 4    | Connect the MA4601A to the ML4803A by using a sensor connecting cord.  

### 2.3 Preparation

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
</table>
| 1    | Connect each instrument as shown in Fig. 2-1.  
| 2    | Insert the program floppy disk into FD drive [0] of the PACKET II e/III s or [A] of the PACKET V.  
| 3    | Confirm that each instrument is connected correctly; turn on the MG3633A and ML4803A, and warm them up for approx. 30 minutes or more.  
| 4    | Turn on the Personal Computer.  
(The program loads and starts automatically.)  

**Notes:**

1. If using the PACKET VH, turn on the power while pressing [SHIFT] and [F1] at the same time. These keys must be pressed and held until the drive [A] LED is lit.  
2. Since this program controls the equipment (except for the power sensor) by GP-IB, do not press the MG3633A and ML4803A panel keys.
3. OPERATION PROCEDURE

[Step 1]

Immediately after the program starts, the following messages are displayed on the screen.

```
**********************************************************************
**  MG3633A Frequency-Response Compensation Software  **
**  **
**********************************************************************

USER CAL 1 ------ 1
USER CAL 2 ------ 2
```

Select compensation data area in which to write (1 or 2).

**Fig. 3-1 Compensation Data Area Selection Screen**

USER CAL 1 ⋯ Writes compensation data to this area. This data is used by SP87.
USER CAL 2 ⋯  Writes compensation data to this area. This data is used by SP88.
Press [1] or [2], then press [RETURN].
[Step 2]

When the compensation data area has been selected, the following message is displayed on the screen.

```
******** MA4681A Power-Sensor CAL FACTOR ********

REFERENCE CAL FACTOR = .100dB

FREQUENCY CAL FACTOR
----------------------
.1MHz .000dB
.3MHz .000dB
1.0MHz .000dB
3.0MHz .000dB
10.0MHz .000dB
30.0MHz .000dB
50.0MHz .000dB
100.0MHz .000dB
300.0MHz .000dB
1000.0MHz .000dB
2000.0MHz .000dB
3000.0MHz .000dB

Read and enter power sensor REFERENCE CAL FACTOR (0 to 1dB)
```

Fig. 3-2 Power-Sensor CAL FACTOR Entry Screen

Read the REFERENCE CAL FACTOR for the power sensor to be used and the CAL FACTOR at each frequency, then enter the values, and press [RETURN].

Example: [0] [.] [0] [8] [RETURN]

Each time a value is entered, the displayed value is replaced by the entered value and then the CAL FACTOR for the next entry becomes ready.

```
REFERENCE CAL FACTOR value
```

When all the CAL FACTOR values have been entered, the following message is displayed in the guidance area.

```
Sensor CAL FACTORs OK? Yes/No (Y/N)
```

If the currently displayed CAL FACTOR is correct, press [Y] and [RETURN].

If the currently displayed CAL FACTOR is incorrect, press [N] and [RETURN], and enter a new CAL FACTOR.

C - 11
[Step 3]

After completing entry of the CAL FACTORs for the power sensor, the following message is displayed on the screen.

**Fig. 3-3 Power Sensor Calibration Screen**

As the message indicates, connect the MA4601A to the ML4803A CAL OUTPUT, and press [RETURN].

The following message are displayed in the guidance area and power sensor calibration is carried out.

```
********** Calibrating sensor zero point **********
```

Approx. 7 seconds

```
********** Calibrating sensor sensitivity **********
```

Approx. 3 seconds
[Step 4]

When power sensor calibration is complete, the following message is displayed on the screen.

Connect the MA4601A to the MG3633A (OUTPUT), then press [RETURN].

**Fig. 3-4 Frequency Response Compensation Screen**

As the message indicates, connect the MA4601A to the desired compensation point (a cable and for example) and press [RETURN].

The following messages are displayed in sequence in the guidance area, and frequency-response compensation starts.

- ************ Setting EEPROM address ************
  Approx. 7 seconds

- ******** Calculating EEPROM initial data ********
  Approx. 3 seconds

- ******** Writing EEPROM initial data (400) ********
  Approx. 45 seconds

- ********* Measuring level (first time) *********
  Approx. 3 minutes
Calculating compensation data (first time)  
Approx. 2 minutes

Writing compensation data (first time)  
Approx. 1 minute

Measuring level (second time)  
Approx. 3 minutes

Calculating compensation data (second time)  
Approx. 2 minutes

Writing compensation data (second time)  
Approx. 1 minute

When the frequency-response compensation is complete, the following messages are displayed on the screen and the program is terminated.

MG3633A Frequency-Response Compensation Software  
10:30:00--------- Compensation start  
10:46:10--------- Compensation end  
Compensation data writing completed.

Fig. 3-5  Compensation Completion Screen

Note:  Do not forcibly stop the program during execution.  If it is stopped, abnormal compensation data will be written; so compensate again.
4. **ERROR MESSAGE**

If any of the error messages shown below are displayed during frequency-response compensation, remove the cause and then follow the message instructions.

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input data value incorrect</td>
<td>A value other than 0 to 1 dB has been input for the power sensor CAL FACTOR.</td>
<td>After the error message disappears, enter again.</td>
</tr>
<tr>
<td>Input data format incorrect</td>
<td>A value other than numeric values has been entered for the power sensor CAL FACTOR.</td>
<td>After the error message disappears, enter again.</td>
</tr>
<tr>
<td>GP-IB connection incorrect. Check and then press [RETURN].</td>
<td>The GP-IB cable is connected incorrectly, or either the MG3633A or ML4803A GP-IB address is incorrect, or either the MG3633A or ML4803A is in only mode, or another device with the same GP-IB address is connected.</td>
<td>Set the GP-IB address correctly, connect the GP-IB cable securely, and press [RETURN].</td>
</tr>
<tr>
<td>Cannot compensate because attenuation too large. Retry/Quit (R/Q)</td>
<td>The attenuation between the MG3633A output connector and compensation is too large.</td>
<td>Cannot compensate. Change the compensation point, then press [R] and [RETURN]. Also, when compensation stops, press [Q] and [RETURN].</td>
</tr>
</tbody>
</table>

**Note:** The max. compensation range is 5 dB.
5. USE OF COMPENSATION DATA

To use compensation data that has been written in the MG3633A compensation data area by the Frequency-Response Compensation Software, enter the special function code by the panel keys or GP-IB as follows:

For using normal compensation data (compensation for OUTPUT connector)

[SPECIAL] [8] [6]  (GP-IB code: SP86)

For using compensation data written to USER CAL 1

[SPECIAL] [8] [7]  (GP-IB code: SP87)

For using compensation data written to USER CAL 2

[SPECIAL] [8] [8]  (GP-IB code: SP88)

Note: When the MG3633A is initialized ([SPECIAL] [0] [0]), [SPECIAL] [8] [6] is executed automatically and the compensation becomes NORMAL.
MG3633A
Synthesized Signal Generator
GP-IB Operation Manual

ANRITSU CORPORATION
TABLE OF CONTENTS

SECTION 1  GENERAL ......................................................... 1-1

SECTION 2  SPECIFICATIONS ................................. 2-1
2.1  GP-IB Interface Functions .......................... 2-1
2.2  Device Message ................................. 2-2

SECTION 3  PRECAUTIONS BEFORE USING GP-IB 3-1
3.1  Connecting and Disconnecting GP-IB Cable 3-1
3.2  Setting and Confirming GP-IB Address 3-1

SECTION 4  DEVICE-MESSAGE GENERAL FORMAT 4-1
4.1  Comments on Device Message 4-1
4.2  Device-Message General Format 4-2
4.3  Explaining Each Device Message Element 4-2

SECTION 5  FORMAT OF MG3633A DEVICE MESSAGE 5-1
5.1  Format of Control Message 5-1
5.2  Format of Data Request Message 5-3
5.3  Format of Talker Output Message 5-4

SECTION 6  DETAILS OF DEVICE MESSAGES 6-1
6.1  Setting Frequency .......................... 6-1
6.2  Data Request Message for Frequency 6-4
6.3  Setting Output Level ........................ 6-7
6.4  Data Request Messages for Output Level 6-12
6.5  Setting AM Modulation ....................... 6-15
6.6  Setting FM Modulation ....................... 6-18
6.7  Setting ØM Modulation ....................... 6-21
6.8  Setting Fixed Data for Frequency and Phase Deviations 6-24
6.9 Data Request Messages for AM/FM/ΩM modulation ........................................ 6-25
6.10 Setting AF Modulation Frequency ........................................... 6-31
6.11 Data Request Messages for AF Modulation Frequency .................................................. 6-34
6.12 Executing Frequency Sweep ................................................... 6-36
6.13 Data Request Messages for Frequency Sweep ........................................... 6-41
6.14 Executing Output Level Sweep .................................................. 6-44
6.15 Data Request Messages for Output Level Sweep ........................................... 6-48
6.16 Executing AF Frequency Sweep .................................................. 6-51
6.17 Data Request Messages for AF Frequency Sweep ........................................... 6-55
6.18 Executing Frequency Memory Sweep .............................................. 6-58
6.19 Data Request Messages for Frequency Memory Sweep ............................................. 6-61
6.20 Executing Function Memory Sweep .............................................. 6-63
6.21 Data Request Messages for Function Memory Sweep ............................................. 6-66
6.22 Setting Sweep Time .................................................................. 6-68
6.23 Data Request Messages for Sweep Time ........................................... 6-69
6.24 Executing Memory Function ....................................................... 6-71
6.25 Executing Special Functions ....................................................... 6-72
6.26 Data Request Messages for Special Function ........................................... 6-73
6.27 Setting Trigger Program ............................................................ 6-76
6.28 Data Request Message for Trigger Program ........................................... 6-77
6.29 Data Request Messages for Error Status and Option Settings ........................................... 6-78
6.30 High-Speed Data Transfer .......................................................... 6-80
SECTION 1
GENERAL

The MG3633A Synthesized Signal Generator is equipped with a General Purpose Interface Bus (GP-IB) interface as standard. The GP-IB is an interface bus for measurements performed in accordance with Institute of Electrical and Electronic Engineers (IEEE-488) or International Electrotechnical Commission (IEC-625) standards.

The MG3633A has the following GP-IB functions.

1. Control of all functions except for POWER switch, [LOCAL], and [PANEL LOCK]
2. Reads all setting conditions
3. Displays the GP-IB address on the FREQUENCY display
4. Interrupt and serial polling functions
5. Configures and automatic measuring system by combining the MG3633A with a personal computer and other measuring instruments.

Explanations in this operation manual are based on program examples using the Anritsu.

PACKET V  Personal Technical Computer

Notes:

1. For data setting range for the GP-IB, see paragraph 4.12.1 (3) in the separate operation manual.
2. For GP-IB details, refer to the GP-IB BASIC GUIDE (sold separately from ANRITSU).
SECTION 2
SPECIFICATIONS

2.1 GP-IB Interface Functions

The following table lists GP-IB interface functions for the MG3633A.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Interface function</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH1</td>
<td>All source handshake functions provided</td>
<td>Data sendable</td>
</tr>
<tr>
<td>AH1</td>
<td>All accept handshake functions provided</td>
<td>Data receivable</td>
</tr>
<tr>
<td>T5</td>
<td>Basic talker function provided</td>
<td>Talker function provided</td>
</tr>
<tr>
<td></td>
<td>Serial polling function provided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Talk only function provided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Talker release function by MLA provided</td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>Basic listener function provided</td>
<td>Listener function provided</td>
</tr>
<tr>
<td></td>
<td>Listen only function provided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Listener release function by MTA provided</td>
<td></td>
</tr>
<tr>
<td>TE0</td>
<td>Address extension talker function not provided</td>
<td>Neither talker nor listener provided with function to extend up to secondary address</td>
</tr>
<tr>
<td>LE0</td>
<td>Address extension listener function not provided</td>
<td></td>
</tr>
<tr>
<td>SR1</td>
<td>All service request functions provided</td>
<td>Interrupt function provided</td>
</tr>
<tr>
<td>RL1</td>
<td>All remote/local functions provided</td>
<td>Local lockout function provided</td>
</tr>
<tr>
<td>PP0</td>
<td>Parallel polling function not provided</td>
<td></td>
</tr>
<tr>
<td>DC1</td>
<td>All device clear function provided</td>
<td>All functions made SP00 initial condition</td>
</tr>
<tr>
<td>DT1</td>
<td>Device trigger function provided</td>
<td></td>
</tr>
<tr>
<td>C0</td>
<td>Control function not provided</td>
<td>Control function not provided</td>
</tr>
</tbody>
</table>
2.2 Device Messages

The MG3633A device messages consist of four types listed below.

- Data request messages
- Status message
- Control messages
- Special function messages

They are listed on a table in the following page:
**Note:** For these message details, see SECTION 6. APPENDIX A lists the device messages in alphabetical order. APPENDIX B lists the special function codes in numerical order.

### GP-IB Data Request Messages (1/2)

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFOA, FCOA, FROA</td>
<td>Frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FISOA</td>
<td>Step (incremental) frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>EOSOA</td>
<td>Offset frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>RLFOA</td>
<td>Relative frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>REFOA</td>
<td>Reference frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>OLOA, APOA</td>
<td>Output level</td>
<td>dBm, dB, V</td>
</tr>
<tr>
<td>OISOA</td>
<td>Step (incremental) output level</td>
<td>dB</td>
</tr>
<tr>
<td>OOSOA</td>
<td>Offset output level</td>
<td>dBm, dB, V</td>
</tr>
<tr>
<td>OLOMA</td>
<td>Output level limit value</td>
<td>dB</td>
</tr>
<tr>
<td>RLOOA</td>
<td>Relative output level</td>
<td>dBm, dB, V</td>
</tr>
<tr>
<td>REOOG</td>
<td>Reference output level</td>
<td>dBm, dB, V</td>
</tr>
<tr>
<td>AFOA</td>
<td>AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>AISOA</td>
<td>Step (incremental) AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>RAFOA</td>
<td>Reference AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FM0A</td>
<td>FM frequency deviation</td>
<td>Hz</td>
</tr>
<tr>
<td>RFMOA</td>
<td>Reference FM frequency deviation</td>
<td>Hz</td>
</tr>
<tr>
<td>AMOA</td>
<td>AM modulation factor</td>
<td>%</td>
</tr>
<tr>
<td>RAMOA</td>
<td>Reference AM modulation factor</td>
<td>%</td>
</tr>
<tr>
<td>PHMOA</td>
<td>$\Omega M$ phase deviation</td>
<td>rad, deg</td>
</tr>
<tr>
<td>RPHOA</td>
<td>Reference $\Omega M$ phase deviation</td>
<td>rad, deg</td>
</tr>
<tr>
<td>IND0A</td>
<td>FM/$\Omega M$ internal frequency/phase deviation</td>
<td>Hz, rad, deg</td>
</tr>
<tr>
<td>EXDOA</td>
<td>FM/$\Omega M$ external frequency/phase deviation</td>
<td>Hz, rad, deg</td>
</tr>
<tr>
<td>FSAOA</td>
<td>Start frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FSBOA</td>
<td>Stop frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FSPOA</td>
<td>Span frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FSNOA</td>
<td>Number of frequency points</td>
<td>PT</td>
</tr>
<tr>
<td>FSZ0A</td>
<td>Frequency step size</td>
<td>Hz</td>
</tr>
<tr>
<td>OSAOA</td>
<td>Start output level</td>
<td>dBm, dB, V</td>
</tr>
<tr>
<td>OSOBA</td>
<td>Stop output level</td>
<td>dBm, dB, V</td>
</tr>
<tr>
<td>OSPOA</td>
<td>Span output level</td>
<td>dB</td>
</tr>
<tr>
<td>OSNOA</td>
<td>Number of output level points</td>
<td>PT</td>
</tr>
<tr>
<td>ASAOA</td>
<td>Start AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>ASBOA</td>
<td>Stop AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>ASPOA</td>
<td>Span AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>ASN0A</td>
<td>Number of AF frequency points</td>
<td>PT</td>
</tr>
<tr>
<td>ASZ0A</td>
<td>AF frequency step size</td>
<td>Hz</td>
</tr>
</tbody>
</table>
### GP-IB Data Request Messages (2/2)

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRNOA</td>
<td>Number of frequency memory sweep points</td>
<td>PT</td>
</tr>
<tr>
<td>FRMOA</td>
<td>Frequency memory sweep address</td>
<td>PT</td>
</tr>
<tr>
<td>FUNOA</td>
<td>Number of function memory sweep points</td>
<td>PT</td>
</tr>
<tr>
<td>FUMOA</td>
<td>Function memory sweep address</td>
<td>PT</td>
</tr>
<tr>
<td>SWTOA</td>
<td>Sweep time</td>
<td>sec</td>
</tr>
<tr>
<td>FTOA</td>
<td>Function memory sweep time</td>
<td>sec</td>
</tr>
<tr>
<td>TRGOA</td>
<td>Trigger program</td>
<td>None</td>
</tr>
<tr>
<td>SPAOA</td>
<td>Special function status (01 to 20)</td>
<td>None</td>
</tr>
<tr>
<td>SPBOA</td>
<td>Special function status (21 to 40)</td>
<td>None</td>
</tr>
<tr>
<td>SPCOA</td>
<td>Special function status (41 to 60)</td>
<td>None</td>
</tr>
<tr>
<td>SPDOA</td>
<td>Special function status (61 to 80)</td>
<td>None</td>
</tr>
<tr>
<td>SPEOA</td>
<td>Special function status (81 to 99)</td>
<td>None</td>
</tr>
<tr>
<td>STSOA</td>
<td>Error status</td>
<td>None</td>
</tr>
<tr>
<td>OPTO A</td>
<td>Option set status</td>
<td>None</td>
</tr>
<tr>
<td>B5</td>
<td>Center frequency</td>
<td>None</td>
</tr>
<tr>
<td>B6</td>
<td>Frequency memory data</td>
<td>None</td>
</tr>
<tr>
<td>B7</td>
<td>Front panel setting condition</td>
<td>None</td>
</tr>
<tr>
<td>B8</td>
<td>Function memory data</td>
<td>None</td>
</tr>
</tbody>
</table>

**Note:** “CFOA” is set at initialization.

Once data is requested by a data request message, it remains valid until other message is issued. The units of the output level and ΩM are determined by the current units when requested (mV or μV units are automatically determined when V is specified. For examples, 0.01 V → 10 mV and 0.0001 V → 100 μV.)
### Status Message Line Assignment

The status meaning of the lower 4 bits (bit 3 to bit 0) depends on the value (1 or 0) of the error bit (bit 5) sent on the line.

#### When error bit is 1

<table>
<thead>
<tr>
<th>Line Data</th>
<th>DIO8</th>
<th>DIO7</th>
<th>DIO6</th>
<th>DIO5</th>
<th>DIO4</th>
<th>DIO3</th>
<th>DIO2</th>
<th>DIO1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>∗</td>
<td>∗</td>
<td>Error</td>
<td>Busy</td>
<td>Malfunc-</td>
<td>Self test</td>
<td>Suspended</td>
<td>Data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>tion error</td>
<td></td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
</tr>
<tr>
<td>0</td>
<td>∗</td>
<td>∗</td>
<td>No Error</td>
<td>Ready</td>
<td>No mal-</td>
<td>No self</td>
<td>No suspend-</td>
<td>No data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>service request</td>
<td></td>
<td>function</td>
<td>test error</td>
<td>ed error</td>
<td>error</td>
</tr>
</tbody>
</table>

| Sending | 0 | 1/0 | 1 | 1/0 | 1/0 | 1/0 | 1/0 | 1/0 |

#### When error bit is 0

<table>
<thead>
<tr>
<th>Line Data</th>
<th>DIO8</th>
<th>DIO7</th>
<th>DIO6</th>
<th>DIO5</th>
<th>DIO4</th>
<th>DIO3</th>
<th>DIO2</th>
<th>DIO1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>∗</td>
<td>∗</td>
<td>Error</td>
<td>Busy</td>
<td>Trigger program execution completed</td>
<td>Sweep execution completed</td>
<td>Marker position matched</td>
<td>String execution completed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>∗</td>
<td>∗</td>
<td>No Error</td>
<td>Ready</td>
<td>Trigger program execution complete</td>
<td>Sweep execution incomplete</td>
<td>Marker position not matched</td>
<td>String execution incomplete</td>
</tr>
</tbody>
</table>

| Sending | 0 | 1/0 | 0 | 1/0 | 1/0 | 1/0 | 1/0 | 1/0 |

*: Items marked with ∗ are not used.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA</td>
<td>0~9</td>
</tr>
<tr>
<td>MINUS</td>
<td>—</td>
</tr>
<tr>
<td>DECIMAL POINT</td>
<td>•</td>
</tr>
<tr>
<td>UNIT</td>
<td>DB</td>
</tr>
<tr>
<td></td>
<td>DBM, DM</td>
</tr>
<tr>
<td></td>
<td>DBU, DU</td>
</tr>
<tr>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>MV</td>
</tr>
<tr>
<td></td>
<td>UV</td>
</tr>
<tr>
<td></td>
<td>GHZ, GZ</td>
</tr>
<tr>
<td></td>
<td>MHZ, MZ</td>
</tr>
<tr>
<td></td>
<td>KHZ, KZ</td>
</tr>
<tr>
<td></td>
<td>HZ</td>
</tr>
<tr>
<td></td>
<td>PC</td>
</tr>
<tr>
<td></td>
<td>RAD, RD</td>
</tr>
<tr>
<td></td>
<td>DEG, DG</td>
</tr>
<tr>
<td></td>
<td>PT</td>
</tr>
<tr>
<td></td>
<td>SEC, SC</td>
</tr>
<tr>
<td></td>
<td>MS</td>
</tr>
<tr>
<td>FREQUENCY</td>
<td>FR, FC or CF</td>
</tr>
<tr>
<td>FREQUENCY or CENTER FREQUENCY</td>
<td></td>
</tr>
<tr>
<td>FREQUENCY INCREMENTAL STEP</td>
<td></td>
</tr>
<tr>
<td>INCREMENTAL STEP UP FREQ</td>
<td></td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN FREQ</td>
<td></td>
</tr>
<tr>
<td>KNOB UP FREQ</td>
<td>FIS</td>
</tr>
<tr>
<td>KNOB DOWN FREQ</td>
<td>UFR</td>
</tr>
<tr>
<td>RESET TUNABLE FREQ</td>
<td>DFR</td>
</tr>
<tr>
<td>FREQ RESOLUTION RIGHT</td>
<td>TFR</td>
</tr>
<tr>
<td>FREQ RESOLUTION LEFT</td>
<td>EFR</td>
</tr>
<tr>
<td>FREQ RESOLUTION 0.01 Hz</td>
<td>ZFR</td>
</tr>
<tr>
<td>FREQ RESOLUTION 0.1 Hz</td>
<td>FSR</td>
</tr>
<tr>
<td>FREQ RESOLUTION 1 Hz</td>
<td>FSL</td>
</tr>
<tr>
<td>FREQ RESOLUTION 10 Hz</td>
<td>R0</td>
</tr>
<tr>
<td>FREQ RESOLUTION 100 Hz</td>
<td>R1</td>
</tr>
<tr>
<td>FREQ RESOLUTION 1 kHz</td>
<td>R2</td>
</tr>
<tr>
<td>FREQ RESOLUTION 10 kHz</td>
<td>R3</td>
</tr>
<tr>
<td>FREQ RESOLUTION 100 kHz</td>
<td>R4</td>
</tr>
<tr>
<td>FREQ RESOLUTION 1 MHz</td>
<td>R5</td>
</tr>
<tr>
<td>FREQ RESOLUTION 10 MHz</td>
<td>R6</td>
</tr>
<tr>
<td>FREQ RELATIVE ON</td>
<td>R7</td>
</tr>
<tr>
<td>FREQ RELATIVE OFF</td>
<td>R8</td>
</tr>
<tr>
<td>FREQ OFFSET</td>
<td>R9</td>
</tr>
<tr>
<td></td>
<td>FO</td>
</tr>
<tr>
<td></td>
<td>FF</td>
</tr>
<tr>
<td></td>
<td>FOS</td>
</tr>
<tr>
<td>Parameter</td>
<td>Program code</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>OUTPUT LEVEL</td>
<td>OL or AP, OIS, UOL, DOL, TOL, EOL, ZOL, OSR, OSL, L0, L1, L2, LC, LN, LO, LF, RO, RF, RS, OOS, OLM, OLDBM, OLDM, APDBM, APDM, OLDBU, OLDU, APDBU, APDU, OLV or APV</td>
</tr>
<tr>
<td>MODULATION (AM)</td>
<td>AM, UAM, DAM, TAM, EAM, ZAM, AD3, AD4, AD0, AD1, AD2, A1, A2, A3, A4, A5, A0</td>
</tr>
</tbody>
</table>

GP-IB Control Message (2/6)
### GP-IB Control Message (3/6)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM(FREQUENCY MODULATION)</td>
<td>FM</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP FM</td>
<td>UFM</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN FM</td>
<td>DFM</td>
</tr>
<tr>
<td>KNOB UP FM</td>
<td>TFM</td>
</tr>
<tr>
<td>KNOB DOWN FM</td>
<td>EFM</td>
</tr>
<tr>
<td>RESET TUNABLE FM</td>
<td>ZFM</td>
</tr>
<tr>
<td>FM RESOLUTION RIGHT</td>
<td>FD3</td>
</tr>
<tr>
<td>FM RESOLUTION LEFT</td>
<td>FD4</td>
</tr>
<tr>
<td>FM RESOLUTION 1st DIGIT</td>
<td>FD0</td>
</tr>
<tr>
<td>FM RESOLUTION 2nd DIGIT</td>
<td>FD1</td>
</tr>
<tr>
<td>FM RESOLUTION 3rd DIGIT</td>
<td>FD2</td>
</tr>
<tr>
<td>INT FM MODE ON</td>
<td>F1</td>
</tr>
<tr>
<td>EXT AC FM MODE ON</td>
<td>F2</td>
</tr>
<tr>
<td>EXT DC FM MODE ON</td>
<td>F3</td>
</tr>
<tr>
<td>INT/EXT AC FM MODE ON</td>
<td>F4</td>
</tr>
<tr>
<td>INT/EXT DC FM MODE ON</td>
<td>F5</td>
</tr>
<tr>
<td>FM OFF</td>
<td>F0</td>
</tr>
<tr>
<td>FREQ CAL</td>
<td>CAL</td>
</tr>
<tr>
<td>ØM(PHASE MODULATION)</td>
<td>PHM</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP ØM</td>
<td>UPH</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN ØM</td>
<td>DPH</td>
</tr>
<tr>
<td>KNOB UP ØM</td>
<td>TPH</td>
</tr>
<tr>
<td>KNOB DOWN ØM</td>
<td>EPH</td>
</tr>
<tr>
<td>RESET TUNABLE ØM</td>
<td>ZPH</td>
</tr>
<tr>
<td>ØM RESOLUTION RIGHT</td>
<td>PD3</td>
</tr>
<tr>
<td>ØM RESOLUTION LEFT</td>
<td>PD4</td>
</tr>
<tr>
<td>ØM RESOLUTION 1st DIGIT</td>
<td>PD0</td>
</tr>
<tr>
<td>ØM RESOLUTION 2nd DIGIT</td>
<td>PD1</td>
</tr>
<tr>
<td>ØM RESOLUTION 3rd DIGIT</td>
<td>PD2</td>
</tr>
<tr>
<td>INT ØM MODE ON</td>
<td>PH1</td>
</tr>
<tr>
<td>EXT AC ØM MODE ON</td>
<td>PH2</td>
</tr>
<tr>
<td>EXT DC ØM MODE ON</td>
<td>PH3</td>
</tr>
<tr>
<td>INT/EXT AC ØM MODE ON</td>
<td>PH4</td>
</tr>
<tr>
<td>INT/EXT DC ØM MODE ON</td>
<td>PH5</td>
</tr>
<tr>
<td>ØM OFF</td>
<td>PH0</td>
</tr>
<tr>
<td>ØM UNIT radian</td>
<td>PHMRAD, PHMRD</td>
</tr>
<tr>
<td>ØM UNIT degree</td>
<td>PHMDEG, PHMDG</td>
</tr>
<tr>
<td>MODULATION (FM/ØM)</td>
<td>MOD</td>
</tr>
<tr>
<td>INT DEVIATION FIX</td>
<td>IND</td>
</tr>
<tr>
<td>EXT DEVIATION FIX</td>
<td>EXD</td>
</tr>
<tr>
<td>Parameter</td>
<td>Program code</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>AF OSC</td>
<td>AF</td>
</tr>
<tr>
<td>INT MOD FREQ OUTPUT AF OSC</td>
<td>M0</td>
</tr>
<tr>
<td>INT MOD FREQ OUTPUT 1 kHz</td>
<td>M1</td>
</tr>
<tr>
<td>INT MOD FREQ OUTPUT 400 Hz</td>
<td>M2</td>
</tr>
<tr>
<td>AF INCREMENTAL STEP</td>
<td>AIS</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP AF</td>
<td>UAF</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN AF</td>
<td>DAF</td>
</tr>
<tr>
<td>KNOB UP AF</td>
<td>TAF</td>
</tr>
<tr>
<td>KNOB DOWN AF</td>
<td>EAF</td>
</tr>
<tr>
<td>RESET TUNABLE AF</td>
<td>ZAF</td>
</tr>
<tr>
<td>AF RESOLUTION RIGHT</td>
<td>ASR</td>
</tr>
<tr>
<td>AF RESOLUTION LEFT</td>
<td>ASL</td>
</tr>
<tr>
<td>AF RESOLUTION 0.1 Hz</td>
<td>AR0</td>
</tr>
<tr>
<td>AF RESOLUTION 1 Hz</td>
<td>AR1</td>
</tr>
<tr>
<td>AF RESOLUTION 10 Hz</td>
<td>AR2</td>
</tr>
<tr>
<td>AF RESOLUTION 100 Hz</td>
<td>AR3</td>
</tr>
<tr>
<td>AF RESOLUTION 1 kHz</td>
<td>AR4</td>
</tr>
<tr>
<td>AF RESOLUTION 10 kHz</td>
<td>AR5</td>
</tr>
<tr>
<td>SWEEP (FREQ)</td>
<td></td>
</tr>
<tr>
<td>FREQ SWEEP START</td>
<td>FSA</td>
</tr>
<tr>
<td>FREQ SWEEP STOP</td>
<td>FSB</td>
</tr>
<tr>
<td>FREQ SWEEP SPAN</td>
<td>FSP</td>
</tr>
<tr>
<td>FREQ SWEEP POINT</td>
<td>FSN</td>
</tr>
<tr>
<td>FREQ SWEEP STEP SIZE</td>
<td>FSZ</td>
</tr>
<tr>
<td>FREQ SWEEP STEP LOG SIZE</td>
<td>FLG</td>
</tr>
<tr>
<td>FREQ SWEEP OFF</td>
<td>SF0</td>
</tr>
<tr>
<td>FREQ SWEEP AUTO</td>
<td>SF1</td>
</tr>
<tr>
<td>FREQ SWEEP SINGLE</td>
<td>SF2</td>
</tr>
<tr>
<td>FREQ SWEEP MANUAL</td>
<td>SF3</td>
</tr>
<tr>
<td>FREQ SWEEP MARKER OFF</td>
<td>SF4</td>
</tr>
<tr>
<td>FREQ SWEEP MARKER ON</td>
<td>SF5</td>
</tr>
<tr>
<td>FREQ SWEEP BREAK</td>
<td>SF6</td>
</tr>
<tr>
<td>FREQ SWEEP CONTINUE</td>
<td>SF7</td>
</tr>
<tr>
<td>FREQ SWEEP STEP UP</td>
<td>SF8</td>
</tr>
<tr>
<td>FREQ SWEEP STEP DOWN</td>
<td>SF9</td>
</tr>
<tr>
<td>FREQ SWEEP START PRESET</td>
<td>SFA</td>
</tr>
<tr>
<td>FREQ SWEEP STOP PRESET</td>
<td>SFB</td>
</tr>
<tr>
<td>Parameter</td>
<td>Program code</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>SWEEP (OUTPUT LEVEL)</td>
<td>OSA</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP START</td>
<td>OSA</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP STOP</td>
<td>OSB</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP SPAN</td>
<td>OSP</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP OFF</td>
<td>SO0</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP AUTO</td>
<td>SO1</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP SINGLE</td>
<td>SO2</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP MANUAL</td>
<td>SO3</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP MARKER OFF</td>
<td>SO4</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP marker on</td>
<td>SO5</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP BREAK</td>
<td>SO6</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP CONTINUE</td>
<td>SO7</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP STEP UP</td>
<td>SO8</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP STEP DOWN</td>
<td>SO9</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP START PRESET</td>
<td>SOA</td>
</tr>
<tr>
<td>OUTPUT LEVEL SWEEP STOP PRESET</td>
<td>SOB</td>
</tr>
<tr>
<td>SWEEP (AF OSC)</td>
<td>ASA</td>
</tr>
<tr>
<td>AF SWEEP START</td>
<td>ASA</td>
</tr>
<tr>
<td>AF SWEEP STOP</td>
<td>ASB</td>
</tr>
<tr>
<td>AF SWEEP SPAN</td>
<td>ASP</td>
</tr>
<tr>
<td>AF SWEEP POINT</td>
<td>ASN</td>
</tr>
<tr>
<td>AF SWEEP STEP SIZE</td>
<td>ASZ</td>
</tr>
<tr>
<td>AF SWEEP STEP LOG SIZE</td>
<td>ALG</td>
</tr>
<tr>
<td>AF SWEEP OFF</td>
<td>SA0</td>
</tr>
<tr>
<td>AF SWEEP AUTO</td>
<td>SA1</td>
</tr>
<tr>
<td>AF SWEEP SINGLE</td>
<td>SA2</td>
</tr>
<tr>
<td>AF SWEEP MANUAL</td>
<td>SA3</td>
</tr>
<tr>
<td>AF SWEEP MARKER OFF</td>
<td>SA4</td>
</tr>
<tr>
<td>AF SWEEP MARKER ON</td>
<td>SA5</td>
</tr>
<tr>
<td>AF SWEEP BREAK</td>
<td>SA6</td>
</tr>
<tr>
<td>AF SWEEP CONTINUE</td>
<td>SA7</td>
</tr>
<tr>
<td>AF SWEEP STEP UP</td>
<td>SA8</td>
</tr>
<tr>
<td>AF SWEEP STEP DOWN</td>
<td>SA9</td>
</tr>
<tr>
<td>AF SWEEP START PRESET</td>
<td>SAA</td>
</tr>
<tr>
<td>AF SWEEP STOP PRESET</td>
<td>SAB</td>
</tr>
<tr>
<td>Parameter</td>
<td>Program code</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>SWEEP (FREQ MEMORY)</td>
<td></td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP ADDRESS</td>
<td>FRM</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP OFF</td>
<td>SR0</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP AUTO</td>
<td>SR1</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP SINGLE</td>
<td>SR2</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP MANUAL</td>
<td>SR3</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP MARKER OFF</td>
<td>SR4</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP MARKER ON</td>
<td>SR5</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP BREAK</td>
<td>SR6</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP CONTINUE</td>
<td>SR7</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP STEP UP</td>
<td>SR8</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP STEP DOWN</td>
<td>SR9</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP START PRESET</td>
<td>SRA</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP STOP PRESET</td>
<td>SRB</td>
</tr>
<tr>
<td>SWEEP (FUNCTION MEMORY)</td>
<td></td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP ADDRESS</td>
<td>FUM</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP OFF</td>
<td>SU0</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP AUTO</td>
<td>SU1</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP SINGLE</td>
<td>SU2</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP MANUAL</td>
<td>SU3</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP BREAK</td>
<td>SU6</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP CONTINUE</td>
<td>SU7</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP STEP UP</td>
<td>SU8</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP STEP DOWN</td>
<td>SU9</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP START PRESET</td>
<td>SUA</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP STOP PRESET</td>
<td>SUB</td>
</tr>
<tr>
<td>SWEEP TIME</td>
<td></td>
</tr>
<tr>
<td>SWEEP TIME</td>
<td>SWT</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP TIME</td>
<td>FT</td>
</tr>
<tr>
<td>MEMORY</td>
<td></td>
</tr>
<tr>
<td>STORE</td>
<td>ST</td>
</tr>
<tr>
<td>RECALL</td>
<td>RC</td>
</tr>
<tr>
<td>FREQ</td>
<td>FQ</td>
</tr>
<tr>
<td>FUNCTION</td>
<td>FN</td>
</tr>
<tr>
<td>SPECIAL</td>
<td></td>
</tr>
<tr>
<td>SPECIAL FUNCTION</td>
<td>SP</td>
</tr>
<tr>
<td>TRIGGER</td>
<td></td>
</tr>
<tr>
<td>TRIGGER PROGRAM SET</td>
<td>TRG</td>
</tr>
<tr>
<td>BINARY</td>
<td></td>
</tr>
<tr>
<td>BINARY FREQUENCY SET</td>
<td>B1</td>
</tr>
<tr>
<td>BINARY FREQ MEMORY SET</td>
<td>B2</td>
</tr>
<tr>
<td>BINARY PANEL SET</td>
<td>B3</td>
</tr>
<tr>
<td>BINARY FUNCTION MEMORY SET</td>
<td>B4</td>
</tr>
<tr>
<td>BINARY FREQ MEMORY DATA CHECK</td>
<td>CBF</td>
</tr>
<tr>
<td>BINARY FUNCTION MEMORY DATA CHECK</td>
<td>CBU</td>
</tr>
<tr>
<td>BINARY FREQ MEMORY ADDRESS SET</td>
<td>ABF</td>
</tr>
<tr>
<td>BINARY FUNCTION MEMORY ADDRESS SET</td>
<td>ABU</td>
</tr>
</tbody>
</table>

2 - 11
## Special Function Message  (1/2)

<table>
<thead>
<tr>
<th>Parameter (contents of special function)</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial</strong></td>
<td>SP00</td>
</tr>
<tr>
<td>Initialization</td>
<td></td>
</tr>
<tr>
<td><strong>Bell</strong></td>
<td>SP01</td>
</tr>
<tr>
<td>Bell OFF</td>
<td></td>
</tr>
<tr>
<td>Bell ON</td>
<td>SP02</td>
</tr>
<tr>
<td><strong>Level display</strong></td>
<td>SP03</td>
</tr>
<tr>
<td>Output level: open-circuit voltage display (EMF)*</td>
<td></td>
</tr>
<tr>
<td>Output level: terminated voltage display</td>
<td></td>
</tr>
<tr>
<td><strong>Limiter</strong></td>
<td>SP05</td>
</tr>
<tr>
<td>Output level: limiter OFF*</td>
<td></td>
</tr>
<tr>
<td>Output level: limiter ON</td>
<td>SP06</td>
</tr>
<tr>
<td><strong>Offset</strong></td>
<td>SP07</td>
</tr>
<tr>
<td>Output level: offset mode OFF*</td>
<td></td>
</tr>
<tr>
<td>Output level: offset mode ON</td>
<td>SP08</td>
</tr>
<tr>
<td>Frequency: offset mode OFF*</td>
<td>SP11</td>
</tr>
<tr>
<td>Frequency: offset mode ON</td>
<td>SP12</td>
</tr>
<tr>
<td><strong>Memory protect</strong></td>
<td>SP13</td>
</tr>
<tr>
<td>Frequency memory: protect OFF</td>
<td></td>
</tr>
<tr>
<td>Frequency memory: protect ON</td>
<td>SP14</td>
</tr>
<tr>
<td>Function memory: protect OFF</td>
<td>SP15</td>
</tr>
<tr>
<td>Function memory: protect ON</td>
<td>SP16</td>
</tr>
<tr>
<td><strong>MODULATION</strong></td>
<td>SP17</td>
</tr>
<tr>
<td>FM OSC: automatic switching</td>
<td></td>
</tr>
<tr>
<td>FM OSC: middle fixed</td>
<td>SP18</td>
</tr>
<tr>
<td>FM OSC: wide fixed</td>
<td>SP19</td>
</tr>
<tr>
<td>ØM OSC: automatic switching</td>
<td>SP20</td>
</tr>
<tr>
<td>ØM OSC: middle fixed</td>
<td>SP21</td>
</tr>
<tr>
<td>ØM OSC: wide fixed</td>
<td>SP22</td>
</tr>
<tr>
<td>FM/ØM: polarity normal</td>
<td>SP23</td>
</tr>
<tr>
<td>FM/ØM: polarity invert</td>
<td>SP24</td>
</tr>
<tr>
<td>FM/ØM: INT/EXT deviation release</td>
<td>SP25</td>
</tr>
<tr>
<td>FM/ØM: INT deviation fixed</td>
<td>SP26</td>
</tr>
<tr>
<td>FM/ØM: EXT deviation fixed</td>
<td>SP27</td>
</tr>
<tr>
<td><strong>AF OSC</strong></td>
<td>SP30</td>
</tr>
<tr>
<td>INT MOD: normal</td>
<td></td>
</tr>
<tr>
<td>INT MOD: + DC applied</td>
<td>SP31</td>
</tr>
<tr>
<td>INT MOD: − DC applied</td>
<td>SP32</td>
</tr>
<tr>
<td>INT MOD: ± DC external control</td>
<td>SP33</td>
</tr>
<tr>
<td>MOD OUTPUT: automatic switching</td>
<td>SP35</td>
</tr>
<tr>
<td>MOD OUTPUT: INT fixed</td>
<td>SP36</td>
</tr>
<tr>
<td>MOD OUTPUT: AM EXT fixed</td>
<td>SP37</td>
</tr>
<tr>
<td>MOD OUTPUT: FM/ØM EXT fixed</td>
<td>SP38</td>
</tr>
<tr>
<td><strong>Sweep</strong></td>
<td>SP43</td>
</tr>
<tr>
<td>SWEEP BLANKING output: positive logic</td>
<td></td>
</tr>
<tr>
<td>SWEEP BLANKING output: negative logic</td>
<td></td>
</tr>
<tr>
<td>Function memory sweep: sweep output pattern 1</td>
<td>SP45</td>
</tr>
<tr>
<td>Function memory sweep: sweep output pattern 2</td>
<td>SP46</td>
</tr>
</tbody>
</table>

*: Items marked with * indicate the status when SP00 is executed.
### Special Function Message (2/2)

<table>
<thead>
<tr>
<th>Parameter (contents of special function)</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger</td>
<td>SP56</td>
</tr>
<tr>
<td>Trigger program: setting</td>
<td>SP57</td>
</tr>
<tr>
<td>Trigger program: clear</td>
<td>SP58</td>
</tr>
<tr>
<td>Trigger program: start</td>
<td></td>
</tr>
<tr>
<td>GP-IB</td>
<td>SP60</td>
</tr>
<tr>
<td>GP-IB: talker data with header</td>
<td>SP61</td>
</tr>
<tr>
<td>GP-IB: talker data with no header</td>
<td>SP62</td>
</tr>
<tr>
<td>GP-IB: address display</td>
<td>SP63</td>
</tr>
<tr>
<td>SRQ</td>
<td>SP70</td>
</tr>
<tr>
<td>SRQ: ALL MASK*</td>
<td>SP71</td>
</tr>
<tr>
<td>SRQ: ERROR MASK OFF</td>
<td>SP72</td>
</tr>
<tr>
<td>SRQ: BUSY/READY MASK OFF</td>
<td>SP73</td>
</tr>
<tr>
<td>SRQ: MALFUNCTION MASK OFF</td>
<td>SP74</td>
</tr>
<tr>
<td>SRQ: SELF TEST MASK OFF</td>
<td>SP75</td>
</tr>
<tr>
<td>SRQ: SUSPENSION MASK OFF</td>
<td>SP76</td>
</tr>
<tr>
<td>SRQ: DATA ERROR MASK OFF</td>
<td>SP77</td>
</tr>
<tr>
<td>SRQ: TRIGGER PROGRAM END MASK OFF</td>
<td>SP78</td>
</tr>
<tr>
<td>SRQ: SWEEP END MASK OFF</td>
<td>SP79</td>
</tr>
<tr>
<td>SRQ: MARKER POSITION MASK OFF</td>
<td>SP80</td>
</tr>
<tr>
<td>SRQ: STRINGS END MASK OFF</td>
<td></td>
</tr>
<tr>
<td>Memory clear</td>
<td>SP81</td>
</tr>
<tr>
<td>Frequency memory: clear</td>
<td>SP82</td>
</tr>
<tr>
<td>Function memory: clear</td>
<td></td>
</tr>
<tr>
<td>Option</td>
<td>SP83</td>
</tr>
<tr>
<td>Option display</td>
<td></td>
</tr>
<tr>
<td>Output level correction</td>
<td>SP86</td>
</tr>
<tr>
<td>Output level correction: normal</td>
<td></td>
</tr>
<tr>
<td>Output level correction: CAL data 1 (option 07)</td>
<td>SP87</td>
</tr>
<tr>
<td>Output level correction: CAL data 2 (option 07)</td>
<td>SP88</td>
</tr>
</tbody>
</table>

*: Items marked with * indicate the status when SP00 is executed.
SECTION 3
PRECAUTIONS BEFORE USING GP-IB

3.1 Connecting and Disconnecting GP-IB Cable
Connect and disconnect the GP-IB cable with the POWER switch set to OFF and with the power cord pulled out.

The reason is described below. Occasionally, the common signal line of the cable may be disconnected faster than the other lines when connecting and disconnecting the cable. At this time, if the power is left on, parts such as ICs in the interface unit may be damaged as a result of AC leak voltage.

3.2 Setting and Confirming GP-IB Address
Set the GP-IB address after turning on the power with front panel keys by SP62.
Address No. 03 is set at the factory so it is not necessary to set the address when 03 is to be used.
Set the GP-IB address as follows:
• After the power is turned on, set the local state and input GP-IB address by SP62.
• When the remote state (REMS) is set, press [LOCAL] to set the local state.
• When the remote with lockout state (RWLS) is set, obtain the local state by executing program.

Confirming address by SP63
Press [SPECIAL], [6], [3] (hold [3]). The current address is displayed on the FREQUENCY display while [3] is pressed.

Setting address by SP62
• Press [SPECIAL], [6], [2], then set the address by using the numeric keys [0] to [9].
• Set the address by using two-digit numeric. Addresses 0 (00) to 9 (09) are set by pressing [0] [0] to [0] [9].
• Address setting range: 00 through 30
Example: Set remote status (REMS) to local status, check the current address 13, then change the address to 6.

<table>
<thead>
<tr>
<th>Step</th>
<th>Key Operation</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[LOCAL]</td>
<td>Check REMOTE lamp went out.</td>
</tr>
</tbody>
</table>

**Confirming address**

<table>
<thead>
<tr>
<th>Step</th>
<th>Key Operation</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>[SPECIAL] [6] [3]</td>
<td>GHz MHz kHz Hz</td>
</tr>
<tr>
<td></td>
<td>Press and hold.</td>
<td>MONITOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
</tbody>
</table>

**Changing address**

<table>
<thead>
<tr>
<th>Step</th>
<th>Key Operation</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>[SPECIAL] [6] [2]</td>
<td>GHz MHz kHz Hz</td>
</tr>
<tr>
<td>4</td>
<td>[0] [6]</td>
<td>GHz MHz kHz Hz</td>
</tr>
</tbody>
</table>

↑ Frequency is displayed immediately after "6" is keyed-in.
SECTION 4
DEVICE-MESSAGE GENERAL FORMAT

4.1 Comments on Device Message

When using the GP-IB system, actual control may be poor although the IEEE-488 standard has been met mechanically and electrically.

This is because device message conventions have not been observed although interface messages fully meet the IEEE-488 standard.

The GP-IB Interface messages are specifications applied universally to all devices, while device messages are device-dependent. So a device cannot be controlled unless a program is written in accordance with the unique device message specifications decided accordingly for each device.

Therefore, a fixed standard within the range which keeps their universality has been established for the code and format of device messages. The first standard (publication 625-2) was issued by IEC in 1980 and was followed by IEEE-Std. 728-1982 in 1982.

To minimize problems and to facilitate use and in consideration of these moves toward standardization, Anritsu has standardized the code and format of its device messages.
4.2 Device-Message General Format

As indicated with the figure below, the general structure of a device message is in three parts: header HR, data NR, and separator SR, in this order.

Also indicated is that any one of the header, numeric data, or separator fields can be omitted, and the data element may be repeated.

4.3 Explanting Each Device Message Element

This paragraph explains HR, NR and SR device message elements.

(1) HR field (Header)

This is used at the beginning of a device message. Generally, it shows the purpose and function of numerical data following the header. If numerical data is not attached, the header expressed some predetermined setting.

Usually, 1 to 4 upper-case alphabetic characters are used as shown in the table in paragraph 2.2. Since the meaning of headers are unique to each device, read the operation manual of the corresponding device.

The header format is usually divided into two: HR1 format, where the header is expressed only as alphabetic characters (A to Z); and HR2 format, where a combination of alphabetic characters and spaces is allowed.
(a) **HR1 format**
- Combination of upper-case alphabetic characters (A to Z)
- There is no length limit, but 1 to 3 characters are normally used.

(b) **HR2 format**
- The first character must be an upper-case alphabetic. All other characters can be any combination of upper-case alphabetic and spaces.

(HR1 format is part of HR2 format but in most cases HR1 format is used (MG3633A uses HR1 format).)
- SP indicates space
(2) **NR field (Numerical Representation)**

The NR field contains numeric decimal data for execution of functions indicated by headers.

The NR1 format is for integers, NR2 format is for real numbers, and NR3 format is for exponents. A suffix (unit) can be placed at the end of each format.

The above-mentioned general format is shown in the figure below.

![](image)

**NR-Field General Format**

(a) **NR1 format (integer)**

- **DIGIT**: Numbers 0 to 9
- Space can be inserted at head
- + sign can be replaced with a space or omitted
- Do not use - (minus) sign with the number 0.

![](image)

**NR1 Format Syntax Diagram**
Example: Set frequency to 903 MHz.

Format

```
F R ∆ ∆ 9 0 3 M H Z CR LF
```

WRITE @103 : “FR 903MHZ”

SR2 Separator: Output automatically

The above program can be created without space as WRITE @103 : “FR903MHZ”.

(b) NR2 format (real number)
- A decimal point must be included.
- The left side of the decimal point is the same as NR1 format,
- The right side of the decimal point uses no spaces.

NR2 Format Syntax Diagram

Example: Set frequency deviation to 3.5 kHz (For suffix, see paragraph (d) below)

<table>
<thead>
<tr>
<th>Format</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 FM ∆∆3.5KHZ CR LF V V V HR1 NR2 SR2</td>
<td>WRITE @103:”FM 3.5KHZ”</td>
</tr>
<tr>
<td>2 FM 3.5KHZ CR LF V V V HR1 NR2 SR2</td>
<td>WRITE @103:”FM3.5KHZ”</td>
</tr>
</tbody>
</table>
(C) NR3 format (Floating point number)
- The left side of E is the same as in NR2 format.
- The standard number of exponent digits is two.

(Listener must operate regardless of the presence of decimal point.)

NR3 Format Syntax Diagram

(d) Suffix
- The suffix is the last part of the NR field, but there may be a space at the beginning.
- Only a space can be placed right after NR.
- ALPHA NUMERIC DIGITS: In addition to alphanumerics, / and * can be included

Suffix Syntax Diagram
The suffixes used with the MG3633A are shown in the Table below.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHz</td>
<td>GHZ, GZ</td>
</tr>
<tr>
<td>MHz</td>
<td>MHZ, MZ</td>
</tr>
<tr>
<td>kHz</td>
<td>KHZ, KZ</td>
</tr>
<tr>
<td>Hz</td>
<td>HZ</td>
</tr>
<tr>
<td>dBm</td>
<td>DBM, DM</td>
</tr>
<tr>
<td>dBµ</td>
<td>DBU, DU</td>
</tr>
<tr>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td>mV</td>
<td>MV</td>
</tr>
<tr>
<td>µV</td>
<td>UV</td>
</tr>
<tr>
<td>dB</td>
<td>DB</td>
</tr>
<tr>
<td>%</td>
<td>PC</td>
</tr>
<tr>
<td>radian</td>
<td>RAD, RD</td>
</tr>
<tr>
<td>degree</td>
<td>DEG, DG</td>
</tr>
<tr>
<td>point</td>
<td>PT</td>
</tr>
<tr>
<td>second</td>
<td>SEC, SC</td>
</tr>
<tr>
<td>m second</td>
<td>MS</td>
</tr>
</tbody>
</table>
(3) SR field (Separator)

The figure below shows the general format of device messages that use the SR field type (SR1, SR2, and SR3) expressions.

![Hierarchical diagram of message elements and separators]

**Device-Message General Format**

<table>
<thead>
<tr>
<th>Level</th>
<th>Name</th>
<th>ASCII code</th>
<th>Uni-line message</th>
<th>Meaning and usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SR1 Separator</td>
<td>,</td>
<td></td>
<td>Identifies the end of the lowest level of message elements or data fields</td>
</tr>
<tr>
<td>2</td>
<td>SR2 Separator</td>
<td>CR, LF</td>
<td></td>
<td>End of record</td>
</tr>
<tr>
<td>3</td>
<td>SR3 Separator</td>
<td>EOI</td>
<td></td>
<td>Sent simultaneously with the last DAB</td>
</tr>
</tbody>
</table>

As shown above, when there are two or more message elements (data) within a message (record), the SR field (SR1) is used to identify them as different data. It (SR2, SR3) is also used to indicate the end of a message (record).
(a) SR1 format

SR1 Syntax Diagram

An SR1 separator is the lowest level separator. Two separators exist at this level: the comma (,) and semicolon (;). The lowest order separator of these two is the comma (,) and is, for most applications, the preferred separator. The MG3633A uses a comma.

SR1 flexibility

A comma is the preferred SR1 separator, but the following are also recognized for SR1. (Since they are not used in some devices, separation using a comma is recommended.)

- Semicolon (;)
- Only spaces used for part of suffix.
- Separation of message element (data) can be identified explicitly only with HR field

(b) SR2 format

SR2 Syntax Diagram

SR2 is used to indicate the end of a message (record) generally expressed in one line. It is recommended that the Line Feed (LF) code is used. However, at present, carriage return (CR) code is also allowed for the following reasons.


2. Generally, it is enough for the listener to recognize only the last LF as the separator and to ignore the CR code.

   However, if the CR code is actually used, as with a printer, the CR code is required.

The MG3633A can accept a CR and LF, or simply an LF.
SR3 is the highest level separator. In response to this, the END message (using the EOI line simultaneously with the last data byte, as shown above) is sent and received. The SR3 is used to indicate the end of binary data and the transfer completion of multiple messages. Generally, release (or modification) of the talker/listener specification is performed after SR3 is transferred.

The last data byte may be SR2.
SECTION 5
FORMAT OF MG3633A DEVICE MESSAGE

The following device-message formats used for the MG3633A are explained in this section.

- Format of control message
- Format of data request message
- Format of talker output message other than status message

*Note:* Status message is described in Section 8.

5.1 Format of Control Message

There are three types of control messages to control the MG3633A.

This explanation uses the PACKET V command. In the PACKET V WRITE statement, SR2 (CR LF) is output automatically at the end of the message.

(1) Control-message format 1

![Diagram of control-message format 1]

Example

Turn off output level

```plaintext
WRITE @1 03: "RF"
```

- HR of RF OFF
- MG3633A GP-IB address
- PACKET V interface select code
(2) Control-message format 2

Example
Set carrier frequency to 123 MHz.
WRITE @103: “FR123MHZ”

(3) Control-message format 3

Example
Store center frequency to frequency memory 24.
WRITE @103: “FQ24ST”

(4) Control-message format 4

This format transfers multiple control messages at a time:

Example 1
WRITE @103: “FR10MHZ, OL-10DBM, FM75KHZ”

Frequency 10 MHz, Output level - 10 dBm, FM 75 kHz

Example 2
WRITE @103: “F 1, M 1”

NR: Sets INT MOD FREQ to 1 kHz
INT MOD FREQ
NR: Sets FM MODE to INT
FM MODE
5.2 Format of Data Request Message

The data request message reads data such as MG3633A-set values (FREQ, OUTPUT LEVEL, etc.), frequency memory, and function memory.

To read data from the MG3633A, the data request message must be sent to the MG3633A from the controller immediately before reading data. When the MG3633A becomes the talker after receiving data request messages, it sends the data and the CR LF and END message (EOI) at the end of the data.

In the MG3633A, the data request message has the following format.

```
   HR
    \
    \
    \
    \
SR2
    \
  \
 SR3
  \
```

Data Request Message

The HR field consists of 4 or 5 characters and OA is attached to the last. For example, the header to read the AM modulation factor is AMOA.

Example

Setting and reading of a 3.5 kHz frequency deviation

```
10 WRITE @103:“5P61”
20 WRITE @103:“FM3.5KHZ”
30 WRITE @103:“FMOA”
40 READ @103:A
50 PRINT A/1000;“KHz”
60 END
```

- Line 10: Specifies talker output message format with non-header
- Line 20: Control message
- Line 30: Data request message
- Line 40: The data sent from the MG3633A (talker) by the data request message is stored into variable A at the controller (listener).
- Line 50: Displays 3.5 kHz
5.3 Format of Talker Output Message

When the MG3633A becomes the talker, it sends the panel setting data and measured results specified by the previously received data request message.

There are two message formats as shown below.

(1) Data-output format 1 (with header)

The message is output with a header and unit.

The units are determined for each measurement item as shown in the data request message table in paragraph 2.2.

The message is output with a header and units after SP00 (initialization) is executed.

This format can be specified using SP60.

Example

Setting and reading a center frequency of 123.456 MHz

10 DIM A$*100
20 WRITE @103:“SP60”
30 WRITE @103:“FR123.456MHz”
40 WRITE @103:“FROA”
50 READ @103:A$
60 PRINT A$
70 END

Output results: FR 123456000.00 HZ
(2) Data-output format 2 (without header)

The message is output without header and unit. This format can be specified using SP61.

Example

Setting and reading a center frequency of 123.456 MHz

10 WRITE @103:“SP61”
20 WRITE @103:“FR123.456MHZ”
30 WRITE @103:“FROA”
40 READ @103:A
50 PRINT A
60 END

Output results: 123456000.00
SECTION 6
DETAILS OF DEVICE MESSAGES

6.1 Setting Frequency

The program codes for frequency settings are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQUENCY</td>
<td>FR, FC or CF</td>
</tr>
<tr>
<td>FREQUENCY or CENTER FREQUENCY</td>
<td>FIS</td>
</tr>
<tr>
<td>FREQUENCY INCREMENTAL STEP</td>
<td>UFR</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP FREQ</td>
<td>DFR</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN FREQ</td>
<td>TFR</td>
</tr>
<tr>
<td>KNOB UP FREQ</td>
<td>EFR</td>
</tr>
<tr>
<td>KNOB DOWN FREQ</td>
<td>ZFR</td>
</tr>
<tr>
<td>RESET TUNABLE FREQ</td>
<td>FSR</td>
</tr>
<tr>
<td>FREQ RESOLUTION RIGHT</td>
<td>FSL</td>
</tr>
<tr>
<td>FREQ RESOLUTION LEFT</td>
<td>R0</td>
</tr>
<tr>
<td>FREQ RESOLUTION 0.01 Hz</td>
<td>R1</td>
</tr>
<tr>
<td>FREQ RESOLUTION 0.1 Hz</td>
<td>R2</td>
</tr>
<tr>
<td>FREQ RESOLUTION 1 Hz</td>
<td>R3</td>
</tr>
<tr>
<td>FREQ RESOLUTION 10 Hz</td>
<td>R4</td>
</tr>
<tr>
<td>FREQ RESOLUTION 100 Hz</td>
<td>R5</td>
</tr>
<tr>
<td>FREQ RESOLUTION 1 kHz</td>
<td>R6</td>
</tr>
<tr>
<td>FREQ RESOLUTION 10 kHz</td>
<td>R7</td>
</tr>
<tr>
<td>FREQ RESOLUTION 100 kHz</td>
<td>R8</td>
</tr>
<tr>
<td>FREQ RESOLUTION 1 MHz</td>
<td>R9</td>
</tr>
<tr>
<td>FREQ RESOLUTION 10 MHz</td>
<td>FO</td>
</tr>
<tr>
<td>FREQ RELATIVE ON</td>
<td>FF</td>
</tr>
<tr>
<td>FREQ RELATIVE OFF</td>
<td>FOS</td>
</tr>
<tr>
<td>FREQ OFFSET</td>
<td>FO</td>
</tr>
</tbody>
</table>
(1) Setting frequency

Example

The various control messages shown below are used to set 100 MHz.

```
WRITE @103: "FR100000000.00"
WRITE @103: "FR100000000.00HZ"
WRITE @103: "FR100000KHZ"
WRITE @103: "FR100MHZ"
WRITE @103: "FR0.1GHZ"
WRITE @103: "FC0.1GHZ"
WRITE @103: "CF0.1GHZ"
```

**Note:** Four frequency units Hz, kHz, MHz, and GHz can be used. The corresponding suffix codes used are as follows:

- Hz : “HZ”
- kHz : “KHZ”, “KZ”
- MHz : “MHZ”, “MZ”
- GHz : “GHZ”, “GZ”

When the suffix codes are omitted, they are regarded as “HZ”.

(2) Setting frequency and resolution using rotary knob

The frequency can be set with any resolution within an appropriate range of the current frequency setting.

Example

```
100 WRITE @103: "FR100MHZ"       ------- Set frequency to 100 MHz.
110 WRITE @103: "R8"          ----------- Set resolution to 1 MHz.
120 FOR I = 1 TO 10 STEP 1
130 WRITE @103: "TFR" (or "EFR")  } Increase (or decrease) the frequency by 1 MHz
140 NEXT I
150 END
```

**Note:** The value adjusted to by the rotary knob can be canceled by the “ZFR” program code to reset the previous frequency set using “FR”, “FC”, or “CF” program codes in the RELATIVE OFF mode.
(3) Setting frequency using [INCREMENT]

Frequency can be set in any chosen step within an appropriate range of the current frequency setting.

Example

```
100 WRITE @103: "FR100MHZ" .......... Set frequency to 100 MHz.
110 WRITE @103: "FIS1MHZ" .......... Set increment frequency to 1 MHz.
120 FOR I = 1 TO 10 STEP 1
130 WRITE @103: "UFR"(or "DFR")    \ Increase (or decrease) the frequency by 1 MHz
140 NEXT I
150 END
```

Note: The value adjusted to using [INCREMENT] can be canceled by the “ZFR” program code to reset the previous frequency set using the “FR”, “FC”, or “CF” program codes.

(4) Setting relative frequency mode

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>FO</td>
<td>Turn ON relative frequency mode</td>
</tr>
<tr>
<td>FF</td>
<td>Turn OFF relative frequency mode</td>
</tr>
</tbody>
</table>

Example

```
100 WRITE @103: "FR500MHZ" .......... Set frequency to 500 MHz.
110 WRITE @103: "FO" .................. Set relative frequency mode.
120 END
```

(5) Setting offset frequency

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP11</td>
<td>Turn OFF frequency offset mode</td>
</tr>
<tr>
<td>SP12</td>
<td>Turn ON frequency offset mode</td>
</tr>
</tbody>
</table>

Example

```
100 WRITE @103: "FR500MHZ" .......... Set frequency to 500 MHz.
110 WRITE @103: "FOS10MHZ" .......... Set offset frequency to 10 MHz.
120 WRITE @103: "SP12" ................. Turn on frequency offset mode.
130 END
```
6.2 Data Request Message for Frequency

To read the frequency data from the MG3633A, the required program code of the data request messages shown in the table below is sent from the controller (talker) to the MG3633A (listener).

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFOA, FCOA, FROA</td>
<td>Frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FISOA</td>
<td>Step (incremental) frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FOSOA</td>
<td>Offset frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>RLFOA</td>
<td>Relative frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>REFOA</td>
<td>Reference frequency</td>
<td>Hz</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads the data sent from the MG3633A (talker), with the frequency data format shown in the table below.

### Output Format of Messages Sent from Talker

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFOA, FCOA, FROA</td>
<td>FR&lt;sdddddddddd.ddHZ</td>
<td>sdddddddddd.dd</td>
<td>The header sent from the MG3633A talker is always “FR” when any one of the CFOA, FCOA, and FROA program codes is set as a data request message.</td>
</tr>
<tr>
<td>FISOA</td>
<td>FIS&lt;sdddddddddd.ddHZ</td>
<td>&lt;dddddddd.dd</td>
<td></td>
</tr>
<tr>
<td>FOSOA</td>
<td>FOsdddddddddd.ddHZ</td>
<td>sdddddddddd.dd</td>
<td>Sent with sign (+ or −)</td>
</tr>
<tr>
<td>RLFOA</td>
<td>RLFsdddddddddd.ddHZ</td>
<td>sdddddddddd.dd</td>
<td>Sent with sign (+ or −)</td>
</tr>
<tr>
<td>REFOA</td>
<td>REFsdddddddddd.ddHZ</td>
<td>sdddddddddd.dd</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** In the output format of the frequency message sent from a talker, the leading zero is replaced by a space. However zeros to the right of the decimal point are sent.
(1) Reading frequency

The absolute value of the frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“FR100MHZ” ---------- Set frequency to 100 MHz.
120 WRITE @103:“FROA” ------------ Request reading of set frequency.
130 READ @103:A$ ------------------ Read data.
140 PRINT A$ ---------------------- Output the read value at the specified device.
150 END
```

Output results: FR 10000000.00HZ

(2) Reading step frequency

The step (incremental) value of the frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“FIS1MHZ” ---------- Set step frequency to 1 MHz.
120 WRITE @103:“FISOA” ---------- Request reading of step frequency.
130 READ @103:A$ ------------------ Read data.
140 PRINT A$ ---------------------- Output the read value at the specified device.
150 END
```

Output results: FIS 1000000.00HZ

(3) Reading relative frequency

The relative value of the frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“FR500MHZ” ---------- Set frequency to 500 MHz.
120 WRITE @103:“FO” -------------- Set relative frequency mode.
130 WRITE @103:“FIS10MHZ” ---------- Set step frequency to 10 MHz.
140 WRITE @103:“UFR” -------------- Increase frequency by 10 MHz.
150 WRITE @103:“RLFOA” ---------- Request reading of relative frequency.
160 READ @103:A$ ------------------ Read data.
170 PRINT A$ ---------------------- Output the read value at the specified device.
180 END
```

Output results: RLF + 10000000.00HZ
(4) Reading frequency offset value

The offset value of the frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "FOS10MHZ"       Set frequency offset value to 10 MHz.
120 WRITE @103: "FOSOA"          Request reading of frequency offset value.
130 READ @103: A$                Read data.
140 PRINT A$                     Output the read value at the specified device.
150 END                           
```

Output results:  FOS + 10000000.00MHZ

(5) Reading reference frequency

The reference frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "FR100MHZ"       Set frequency to 100 MHz.
130 WRITE @103: "R8"             Set resolution to 1 MHz.
140 WRITE @103: "TFR"            Increase frequency by 1 MHz.
150 WRITE @103: "REFOA"          Request reading of reference frequency.
160 READ @103: A$                Read data.
170 PRINT A$                     Output the read value at the specified device.
180 END                           
```

Output results:  REF 100000000.00HZ
### 6.3 Setting Output Level

The program codes for setting the output level are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTPUT LEVEL</td>
<td></td>
</tr>
<tr>
<td>OUTPUT LEVEL or AMPLITUDE</td>
<td>OL or AP</td>
</tr>
<tr>
<td>OUTPUT LEVEL INCREMENTAL STEP</td>
<td>OIS</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP OUTPUT LEVEL</td>
<td>UOL</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN OUTPUT LEVEL</td>
<td>DOL</td>
</tr>
<tr>
<td>KNOB UP OUTPUT LEVEL</td>
<td>TOL</td>
</tr>
<tr>
<td>KNOB DOWN OUTPUT LEVEL</td>
<td>EOL</td>
</tr>
<tr>
<td>RESET TUNABLE OUTPUT LEVEL</td>
<td>ZOL</td>
</tr>
<tr>
<td>OUTPUT LEVEL RESOLUTION RIGHT</td>
<td>OSR</td>
</tr>
<tr>
<td>OUTPUT LEVEL RESOLUTION LEFT</td>
<td>OSL</td>
</tr>
<tr>
<td>OUTPUT LEVEL RESOLUTION 0.1 dB</td>
<td>L0</td>
</tr>
<tr>
<td>OUTPUT LEVEL RESOLUTION 1 dB</td>
<td>L1</td>
</tr>
<tr>
<td>OUTPUT LEVEL RESOLUTION 10 dB</td>
<td>L2</td>
</tr>
<tr>
<td>OUTPUT LEVEL CONTINUOUS MODE SET</td>
<td>LC</td>
</tr>
<tr>
<td>OUTPUT LEVEL NORMAL MODE SET</td>
<td>LN</td>
</tr>
<tr>
<td>OUTPUT LEVEL RELATIVE ON</td>
<td>LO</td>
</tr>
<tr>
<td>OUTPUT LEVEL RELATIVE OFF</td>
<td>LF</td>
</tr>
<tr>
<td>OUTPUT LEVEL ON</td>
<td>RO</td>
</tr>
<tr>
<td>OUTPUT LEVEL OFF</td>
<td>RF</td>
</tr>
<tr>
<td>RPP RESET</td>
<td>RS</td>
</tr>
<tr>
<td>OUTPUT LEVEL OFFSET</td>
<td>OOS</td>
</tr>
<tr>
<td>OUTPUT LEVEL LIMIT</td>
<td>OLM</td>
</tr>
<tr>
<td>OUTPUT LEVEL UNIT dBm or AMPLITUDE UNIT dBm</td>
<td>OLDBM, OLDM or APDBM, APDM</td>
</tr>
<tr>
<td>OUTPUT LEVEL UNIT dBu or AMPLITUDE UNIT dBu</td>
<td>OLDBU, OLDU or APDBU, APDU</td>
</tr>
<tr>
<td>OUTPUT LEVEL UNIT V or AMPLITUDE UNIT V</td>
<td>OLV or APV</td>
</tr>
</tbody>
</table>
(1) Setting output level using data keys

Example

The various control messages shown below are used.

WRITE @103: "OL + 17"
WRITE @103: "OL + 17DBM"
WRITE @103: "OL + 130DBU"
WRITE @103: "OL6.32V"
WRITE @103: "OL999MV"
WRITE @103: "OL999UV"
WRITE @103: "AP999UV"

Note: Five output level units dBm, dBμ, V, mV, and μV can be used.

dBm : "DBM" , "DM"
dBμ : "DBU" , "DU"
V : "V"
mV : "MV"
μV : "UV"

When the suffix codes are omitted, they are regarded as DBM.

(2) Setting output level and resolution using rotary knob

The output level can be set with any resolution within an appropriate range of the current output level setting.

Example

100 WRITE @103: "OL0DBM"  Set output level to 0 dBm.
110 WRITE @103: "L0"  Set resolution to 0.1 dB.
120 FOR I = 1 TO 10 STEP 1
130 WRITE @103: "TOL" (or "EOL")  Increase (or decrease) output level by 0.1 dBm from 0 dBm to 1 dBm (or −1 dBm).
140 NEXT I
150 END

Note: The value adjusted to using the rotary knob can be canceled by the “ZOL” program code to reset the previous output level set by the “OL” or “AP” program codes in the RELATIVE OFF mode.
(3) Setting output level using [INCREMENT]

The output level can be set with any step size within an appropriate range of the current output level setting.

Example

100 WRITE @103: “OL0DBM”  Set output level to 0 dBm.
110 WRITE @103: “OIS1DB”  Set step output level to 1 dB.
120 FOR I = 1 TO 10 STEP 1
130 WRITE @103: “UOL” (or “DOL”)  Increase (or decrease) output level by 1 dB from 0 dBm to +10 dBm (or –10 dBm).
140 NEXT I
150 END

Note: The value adjusted to using [INCREMENT] can be canceled by the “ZOL” program code to reset the previous output level set by the “OL” or “AP” program codes in the RELATIVE OFF mode.
Decibel (dB) units are used for the step output level and the corresponding suffix code is DB. When the suffix codes are omitted, they are regarded as DB.

(4) Setting relative output level mode

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO</td>
<td>Turn ON relative output level mode</td>
</tr>
<tr>
<td>LF</td>
<td>Turn OFF relative output level mode</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: “OL-30DBM”  Set output level to –30 dBm.
110 WRITE @103: “LO”  Set relative output level mode.
120 END

(5) ON/OFF control of output level

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>RO</td>
<td>Turn ON output level</td>
</tr>
<tr>
<td>RF</td>
<td>Turn OFF output level</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: “OL-30DBM”  Set the output level to –30 dBm.
110 WRITE @103: “RF”  Turn off the output level.
120 WAIT DELAY 1
130 WRITE @103: “RO”  Turn on the output level (–30 dBm.)
140 END
(6) Releasing reverse power protection (RPP) circuit

The "RS" program code is sent to release the RPP.

Example

100 WRITE @103: "RS" ..................... Release the RPP circuit operation.
110 END

(7) Setting offset output level

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP07</td>
<td>Turn OFF output level offset mode</td>
</tr>
<tr>
<td>SP08</td>
<td>Turn ON output level offset mode</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: "OL-30DBM" .......... Set the output level to –30 dBm.
110 WRITE @103: "OOS10DB" .......... Set the offset output level to 10 dB.
120 WRITE @103: "SP08" .......... Turn the output level offset mode ON.
130 END

*Note:* Decibel (dB) units are used for offset output level and the corresponding suffix code is DB. When the suffix codes is omitted, they are regarded as DB.

(8) Setting output level upper limit value

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP05</td>
<td>Turn OFF output level limit mode</td>
</tr>
<tr>
<td>SP06</td>
<td>Turn ON output level limit mode</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: "OL – 30DBM" ........ Set output level to –30 dBm.
110 WRITE @103: "OLM – 10DBM" ...... Set output level limit value to 10 dBm.
120 WRITE @103: "SP06" ................ Turn on output level limit mode.
130 END
(9) Changing output level units

The output level units are changed as described below.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLDBM</td>
<td>Changes output level units to dBm.</td>
</tr>
<tr>
<td>OLDM</td>
<td></td>
</tr>
<tr>
<td>APDBM</td>
<td></td>
</tr>
<tr>
<td>APDM</td>
<td></td>
</tr>
<tr>
<td>OLDBU</td>
<td>Changes output level units to dBμ.</td>
</tr>
<tr>
<td>OLDU</td>
<td></td>
</tr>
<tr>
<td>APDBU</td>
<td></td>
</tr>
<tr>
<td>APDU</td>
<td></td>
</tr>
<tr>
<td>OLV</td>
<td>Changes output level units to V.</td>
</tr>
<tr>
<td>APV</td>
<td></td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:“OL – 30DBM” ..........  Set output level to −30 dBm.
110 WRITE @103:”OLDBU” ............... Change output level units to dBμ
                                 (−30 dBm → +83 dBμ).
120 END

6 - 11
6.4 Data Request Messages for Output Level

To read the output level data from the MG3633A, the required program code of the data request messages shown in the table below is sent from the controller (talker) to the MG3633A (listener).

### Data Request Messages for Output Level

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLOA, APOA</td>
<td>Output level</td>
<td>dBm, dB, V</td>
</tr>
<tr>
<td>OISOA</td>
<td>Step (incremental) output level</td>
<td>dB</td>
</tr>
<tr>
<td>OOSOA</td>
<td>Offset output level</td>
<td>dB</td>
</tr>
<tr>
<td>OLMOA</td>
<td>Output level limit value</td>
<td>dBm, dB, V</td>
</tr>
<tr>
<td>RLOOA</td>
<td>Relative output level</td>
<td>dB</td>
</tr>
<tr>
<td>REOOA</td>
<td>Reference output level</td>
<td>dBm, dB, V</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads the data sent from the MG3633A (talker), with the output level data format shown in the table below.

### Output Format of Message Sent from Talker

\[\Delta : \text{Space} \quad s : \text{Sign} \quad d : \text{Data}\]

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLOA, APOA</td>
<td>OL∆sddd.dDBM</td>
<td>sddd.d</td>
<td>• The header sent from the MG3633A talker is always “OL” when either OLOA or APOA is set as a data request message.</td>
</tr>
<tr>
<td></td>
<td>OL∆sddd.dDBU</td>
<td>sddd.d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OL∆d.dddd.dddddV</td>
<td>d.dddd.dddd</td>
<td></td>
</tr>
<tr>
<td>OISOA</td>
<td>OIS∆ddd.dDB</td>
<td>∆ddd.d</td>
<td></td>
</tr>
<tr>
<td>OOSOA</td>
<td>OOSsddd.dDB</td>
<td>sddd.d</td>
<td>Sent with + or – sign.</td>
</tr>
<tr>
<td>OLMOA</td>
<td>OLMsddd.dDBM</td>
<td>sddd.d</td>
<td>The same units as those set on the panel are set.</td>
</tr>
<tr>
<td></td>
<td>OLMsddd.dDBU</td>
<td>sddd.d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OLMd.dddd.ddddV</td>
<td>d.dddd.dddd</td>
<td></td>
</tr>
<tr>
<td>RLOOA</td>
<td>RLOsddd.dDB</td>
<td>sddd.d</td>
<td>Sent with + or – sign.</td>
</tr>
<tr>
<td>REOOA</td>
<td>REOsddd.dDBM</td>
<td>sddd.d</td>
<td>The same units as those set on the panel are set.</td>
</tr>
<tr>
<td></td>
<td>REOsddd.dDBU</td>
<td>sddd.d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>REOd.dddd.ddddV</td>
<td>d.dddd.dddd</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** In the output format of the output level message sent from a talker, the leading zero is replaced by a space, but zeros to the right of the decimal point are sent.
(1) Reading output level

The absolute value of the output level is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "OL-10DBM"          Set output level to -10 dBm.
120 WRITE @103: "OLOA"              Request reading of output level.
130 READ @103: A$                  Read data.
140 PRINT A$                      Output the read value at the specified device.
150 END
```

Output results: OL = 10.0DBM

(2) Reading step output level

The increment value of the output level is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "OIS10DB"           Set step level to 10 dB.
120 WRITE @103: "OISOA"             Request reading of step level.
130 READ @103: A$                  Read data.
140 PRINT A$                     Output the read value at the specified device.
150 END
```

Output results: OIS = 10.0DBM

(3) Reading output level offset value

The offset value of the output level is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "OOS10DB"           Set output level offset to 10 dB.
120 WRITE @103: "OOSOA"             Request reading of output level offset.
130 READ @103: A$                  Read data.
140 PRINT A$                     Output the read value at the specified device.
150 END
```

Output results: OOS = 10.0DB
(4) Reading output level limit value

The limit value of the output level is read using the following method.

Example

100 DIM A$ "100
110 WRITE @103: "OLM-10DBM" Set output level limit to -10 dBm.
120 WRITE @103: "OLMOA" Request reading of output level limit.
130 READ @103:A$ Read data.
140 PRINT A$ Output the read value at the specified device.
150 END

Output results: OLM- 10.0DBM

(5) Reading relative output level

The relative value of the output level is read using the following method.

Example

100 DIM A$ "100
110 WRITE @103:"OL-10DBM" Set output level to -10 dBm.
120 WRITE @103: "LO" Set relative output level mode.
130 WRITE @103: "OIS10DB" Set step level to 10 dB.
140 WRITE @103: "DOLO" Decrease output level by 10 dB.
150 WRITE @103: "RLOOA" Request reading of relative output level.
160 READ @103:A$ Read data.
170 PRINT A$ Output the read value at the specified device.
180 END

Output results: RLO- 10.0DBM

(6) Reading reference output level

The reference output level is read using the following method.

Example

100 DIM A$ "100
110 WRITE @103: "OL-10DBM" Set output level to -10 dBm.
130 WRITE @103: "LO" Set resolution to 0.1 dB.
140 WRITE @103: "TOL" Increase output level by 10 dB.
150 WRITE @103: "RLOOA" Request reading of reference output level.
160 READ @103:A$ Read data.
170 PRINT A$ Output the read value at the specified device.
180 END

Output results: RLO- 10.0DBM
6.5 Setting AM modulation

The program codes for setting AM modulation are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODULATION (AM)</td>
<td>AM</td>
</tr>
<tr>
<td>AM (AMPLITUDE MODULATION)</td>
<td>AM</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP AM</td>
<td>UAM</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN AM</td>
<td>DAM</td>
</tr>
<tr>
<td>KNOB UP AM</td>
<td>TAM</td>
</tr>
<tr>
<td>KNOB DOWN AM</td>
<td>EAM</td>
</tr>
<tr>
<td>RESET TUNABLE AM</td>
<td>ZAM</td>
</tr>
<tr>
<td>AM RESOLUTION RIGHT</td>
<td>AD3</td>
</tr>
<tr>
<td>AM RESOLUTION LEFT</td>
<td>AD4</td>
</tr>
<tr>
<td>AM RESOLUTION 1st DIGIT</td>
<td>AD0</td>
</tr>
<tr>
<td>AM RESOLUTION 2nd DIGIT</td>
<td>AD1</td>
</tr>
<tr>
<td>AM RESOLUTION 3rd DIGIT</td>
<td>AD2</td>
</tr>
<tr>
<td>INT AM MODE ON</td>
<td>A1</td>
</tr>
<tr>
<td>EXT AC AM MODE ON</td>
<td>A2</td>
</tr>
<tr>
<td>EXT DC AM MODE ON</td>
<td>A3</td>
</tr>
<tr>
<td>INT/EXT AC AM MODE ON</td>
<td>A4</td>
</tr>
<tr>
<td>INT/EXT DC AM MODE ON</td>
<td>A5</td>
</tr>
<tr>
<td>AM OFF</td>
<td>A0</td>
</tr>
</tbody>
</table>

(1) Setting AM modulation factor using data keys

Example

The control messages shown below are used to set a value of 10%.

```
WRITE @103: "AM10PC"
WRITE @103: "AM10"
```

Note: The % unit is used for the AM modulation factor and the corresponding suffix code is PC. Omission of the suffix code is regarded as "PC".
(2) Setting AM modulation factor and resolution using rotary knob

The AM modulation factor can be set with any resolution within an appropriate range of the current AM modulation factor setting.

Example

```
100 WRITE @103: "AM30PC"          Set AM modulation factor to 30%.
110 WRITE @103: "AD0"             Specify resolution to the lowest digit.
120 FOR I = 1 TO 10 STEP 1
130 WRITE @103: "TAM"(or "EAM")   Increase (or decrease) the AM modulation factor by 0.1% from 30% to 31% (or 29%).
140 NEXT I
150 END
```

Note: The value adjusted to by turning the rotary knob can be canceled by the “ZAM” program code to reset the previous AM modulation factor set by the “AM” program code.

(3) Setting AM modulation factor using [INCREMENT]

The AM modulation factor can be set at an interval of 10% within an appropriate range of the current AM modulation factor setting.

Example

```
100 WRITE @103: "AM40PC"          Set AM modulation factor to 40%.
110 FOR I = 1 TO 3 STEP 1
120 WRITE @103: "UAM"(or "DAM")  Increase (or decrease) the AM modulation factor by 10% from 40% to 70% (or 10%).
130 NEXT I
140 END
```

Note: The value increased or decreased by pressing [INCREMENT] can be canceled by the “ZAM” program code to reset the previous AM factor set by the “AM” program code.
(4) ON/OFF control of AM modulation

Sending the program codes listed below produce the indicated AM modulation commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>Turn OFF AM modulation</td>
</tr>
<tr>
<td>A1</td>
<td>Turn ON INT modulation mode</td>
</tr>
<tr>
<td>A2</td>
<td>Turn ON EXT AC modulation mode</td>
</tr>
<tr>
<td>A3</td>
<td>Turn ON EXT DC modulation mode</td>
</tr>
<tr>
<td>A4</td>
<td>Turn ON INT/EXT AC modulation mode</td>
</tr>
<tr>
<td>A5</td>
<td>Turn ON INT/EXT DC modulation mode</td>
</tr>
</tbody>
</table>

Example

```
100 WRITE @103: "A1"           Select INT modulation mode.
110 WRITE @103: "AM30PC"       Set AM modulation factor to 30%.
120 END
```
### 6.6 Setting FM Modulation

The program codes for setting FM modulation are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODULATION (FM)</td>
<td></td>
</tr>
<tr>
<td>FM (FREQUENCY MODULATION)</td>
<td>FM</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP FM</td>
<td>UFM</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN FM</td>
<td>DFM</td>
</tr>
<tr>
<td>KNOB UP FM</td>
<td>TFM</td>
</tr>
<tr>
<td>KNOB DOWN FM</td>
<td>EFM</td>
</tr>
<tr>
<td>RESET TUNABLE FM</td>
<td>ZFM</td>
</tr>
<tr>
<td>FM RESOLUTION RIGHT</td>
<td>FD3</td>
</tr>
<tr>
<td>FM RESOLUTION LEFT</td>
<td>FD4</td>
</tr>
<tr>
<td>FM RESOLUTION 1st DIGIT</td>
<td>FD0</td>
</tr>
<tr>
<td>FM RESOLUTION 2nd DIGIT</td>
<td>FD1</td>
</tr>
<tr>
<td>FM RESOLUTION 3rd DIGIT</td>
<td>FD2</td>
</tr>
<tr>
<td>INT FM MODE ON</td>
<td>F1</td>
</tr>
<tr>
<td>EXT AC FM MODE ON</td>
<td>F2</td>
</tr>
<tr>
<td>EXT DC FM MODE ON</td>
<td>F3</td>
</tr>
<tr>
<td>INT/EXT AC FM MODE ON</td>
<td>F4</td>
</tr>
<tr>
<td>INT/EXT DC FM MODE ON</td>
<td>F5</td>
</tr>
<tr>
<td>FM OFF</td>
<td>F0</td>
</tr>
<tr>
<td>FREQ CAL</td>
<td>CAL</td>
</tr>
</tbody>
</table>
(1) Setting FM frequency deviation using data keys

Example

The various control messages shown below are used to set 3.5 kHz deviation.

WRITE @103: “FM3500”
WRITE @103: “FM3500HZ”
WRITE @103: “FM3.5KHZ”
WRITE @103: “FM0.0035MHZ”
WRITE @103: “FM0.0000035GHZ”

Note: Four FM frequency deviation units Hz, kHz, MHz, and GHz can be used. The corresponding suffix codes used are as follows:

- Hz : “HZ”
- kHz : “KHZ”, “KZ”
- MHz : “MHZ”, “MZ”
- GHz : “GHZ”, “GZ”

When the suffix codes are omitted, they are regarded as HZ.

(2) Setting FM frequency deviation and resolution using rotary knob

The FM frequency deviation can be set with any resolution within an appropriate range of the current FM frequency deviation setting.

Example

100 WRITE @103: “FM3.5KHZ”        Set FM frequency deviation to 3.5 kHz.
110 WRITE @103: “FD1”              Specify the resolution to 100 Hz digit.
120 FOR I = 1 TO 5 STEP 1         
130 WRITE @103: “TFM”(or “EFM”)   Increase (or decrease) FM frequency deviation
140 NEXT I                          by 100 Hz from 3.5 kHz to 4 kHz (or 3 kHz.)
150 END

Note: The value adjusted to using the rotary knob can be canceled by the “ZFM” program code to reset the previous FM frequency deviation set by the “FM” program code.
(3) **Setting FM frequency deviation using [INCREMENT]**

The FM frequency deviation can be increased by 10 times or decreased to by one-tenth the currently-set FM frequency deviation.

**Example**

```
100 WRITE @103:"FM3.5KHZ"  .......... Set the FM frequency deviation to 3.5 kHz.
110 WRITE @103:"UFM"(or"DFM")  ...... Increase the FM frequency deviation by 10 times
                          (or decrease it by one-tenth).
120 END
```

**Note:** The value adjusted to using [INCREMENT] can be canceled by the “ZFM” program code to reset the previous FM frequency deviation set by the “FM” program code.

(4) **ON/OFF control of FM modulation**

Sending the program codes listed below produce the indicated FM modulation commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td>Turn OFF FM modulation</td>
</tr>
<tr>
<td>F1</td>
<td>Turn ON INT modulation mode</td>
</tr>
<tr>
<td>F2</td>
<td>Turn ON EXT AC modulation mode</td>
</tr>
<tr>
<td>F3</td>
<td>Turn ON EXT DC modulation mode</td>
</tr>
<tr>
<td>F4</td>
<td>Turn ON INT/EXT AC modulation mode</td>
</tr>
<tr>
<td>F5</td>
<td>Turn ON INT/EXT DC modulation mode</td>
</tr>
</tbody>
</table>

**Example**

```
100 WRITE @103:"F1"           .................... Select INT modulation mode.
110 WRITE @103:"FM3.5KHZ"     .......... Set FM frequency deviation to 3.5 kHz.
120 END
```

(5) **Frequency calibration**

The frequency is calibrated at EXT DC FM mode.

The “CAL” program code is sent to calibrate the frequency.

**Example**

```
100 WRITE @103:"F3"(or"F5")       .......... Select EXT DC modulation (or INT/EXT DC modulation).
110 WRITE @103:"CAL"              ............... Calibrate frequency.
120 END
```
6.7 Setting ØM Modulation

The program codes for setting ØM modulation are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ØM(PHASE MODULATION)</td>
<td>PHM</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP ØM</td>
<td>UPH</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN ØM</td>
<td>DPH</td>
</tr>
<tr>
<td>KNOB UP ØM</td>
<td>TPH</td>
</tr>
<tr>
<td>KNOB DOWN ØM</td>
<td>EPH</td>
</tr>
<tr>
<td>RESET TUNABLE ØM</td>
<td>ZPH</td>
</tr>
<tr>
<td>ØM RESOLUTION RIGHT</td>
<td>PD3</td>
</tr>
<tr>
<td>ØM RESOLUTION LEFT</td>
<td>PD4</td>
</tr>
<tr>
<td>ØM RESOLUTION 1st DIGIT</td>
<td>PD0</td>
</tr>
<tr>
<td>ØM RESOLUTION 2nd DIGIT</td>
<td>PD1</td>
</tr>
<tr>
<td>ØM RESOLUTION 3rd DIGIT</td>
<td>PD2</td>
</tr>
<tr>
<td>INT ØM MODE ON</td>
<td>PH1</td>
</tr>
<tr>
<td>EXT AC ØM MODE ON</td>
<td>PH2</td>
</tr>
<tr>
<td>EXT DC ØM MODE ON</td>
<td>PH3</td>
</tr>
<tr>
<td>INT/EXT AC ØM MODE ON</td>
<td>PH4</td>
</tr>
<tr>
<td>INT/EXT DC ØM MODE ON</td>
<td>PH5</td>
</tr>
<tr>
<td>ØM OFF</td>
<td>PH0</td>
</tr>
<tr>
<td>ØM UNIT radian</td>
<td>PHMRAD, or PHMRD</td>
</tr>
<tr>
<td>ØM UNIT degree</td>
<td>PHMDEG, or PHMDG</td>
</tr>
</tbody>
</table>

(1) Setting ØM phase deviation using data keys

Example

The control messages shown below are used to set 30 rad (or deg.).

WRITE @103: “PHM30.0”
WRITE @103: “PHM30.0RAD”
WRITE @103: “PHM30.0DEG”

Note: The two ØM modulation units rad and deg can be used. The corresponding suffix codes used are as follows:

rad : “RAD”, “RD”
deg : “DEG”, “DG”

When the suffix codes are omitted, they are regarded as “RAD”.

6 - 21
(2) Setting ØM phase deviation and resolution using rotary knob

The ØM phase deviation can be set with any resolution within an appropriate range of the current ØM phase deviation setting.

Example

```
100 WRITE @103:"PHM30.0RAD"        Set ØM phase deviation to 30 rad.
110 WRITE @103:"P0"                Specify resolution to the lowest digit.
120 FOR I = 1 TO 10 STEP 1
130 WRITE @103:"TPH"(or"EPH")      Increase (or decrease) ØM phase deviation by
140 NEXT I                      0.1 rad from 30 rad to 31 rad (or 29 rad).
150 END
```

*Note:* The value adjusted to using the rotary knob can be canceled by the “ZPH” program code to reset the previous ØM phase deviation set by the “ØM” program code.

(3) Setting ØM phase deviation using [INCREMENT]

The ØM phase deviation can be increased by 10 times or decreased by one-tenth around the currently-set ØM phase deviation.

Example

```
100 WRITE @103:"PHM30RAD"        Set ØM phase deviation to 30 rad.
110 WRITE @103:"UPH"(or"DPH")    Increase ØM phase deviation by 10 times (or
decrease it by one-tenth).
120 END
```

*Note:* The value adjusted to using [INCREMENT] can be canceled by the “ZPH” program code to reset the previous ØM phase deviation set by the “ØM” program code.
(4) **ON/OFF control of ØM modulation**

Sending the program codes listed below produce the indicated ØM modulation commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH0</td>
<td>Turn OFF ØM modulation</td>
</tr>
<tr>
<td>PH1</td>
<td>Turn ON INT modulation mode</td>
</tr>
<tr>
<td>PH2</td>
<td>Turn ON EXT AC modulation mode</td>
</tr>
<tr>
<td>PH3</td>
<td>Turn ON EXT DC modulation mode</td>
</tr>
<tr>
<td>PH4</td>
<td>Turn ON INT/EXT AC modulation mode</td>
</tr>
<tr>
<td>PH5</td>
<td>Turn ON INT/EXT DC modulation mode</td>
</tr>
</tbody>
</table>

Example

```
100 WRITE @103: "PH1"  ?????????????????? Select INT modulation mode.
110 WRITE @103: "PHM30RAD"  ---------- Set ØM phase deviation to 30 rad.
120 END
```

(5) **Changing ØM phase deviation units**

The ØM phase deviation are changed as follows.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHMDEG</td>
<td>Changes ØM phase deviation units to deg.</td>
</tr>
<tr>
<td>PHMDG</td>
<td>Changes ØM phase deviation units to rad.</td>
</tr>
</tbody>
</table>

Example

```
100 WRITE @103: "PHMDEG"  ?????????????????? Change ØM phase deviation units to deg.
110 END
```
6.8 Setting Fixed Data for Frequency and Phase Deviations

The program codes for setting fixed frequency and phase deviations data are shown in the table below.

<table>
<thead>
<tr>
<th>MODULATION (FM/ΩM)</th>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INT DEVIATION FIX</td>
<td>IND</td>
</tr>
<tr>
<td></td>
<td>EXT DEVIATION FIX</td>
<td>EXD</td>
</tr>
</tbody>
</table>

(1) Setting fixed frequency deviation data

Example 1

WRITE @103: "IND3.5KHZ"  Set fixed INT frequency deviation data to 3.5 kHz.

Example 2

WRITE @103: "EXD3.5KHZ"  Set fixed EXT frequency deviation data to 3.5 kHz.

(2) Setting fixed phase deviation data

Example 1

WRITE @103: "IND30RAD"  Set fixed INT phase deviation data to 30 rad.

Example 2

WRITE @103: "EXD30RAD"  Set fixed EXT phase deviation data to 30 rad.
6.9 Data Request Messages for AM/FM/ΩM Modulation

To read the modulation data from the MG3633A, the required program code of the data request messages shown in the table below is sent from the controller (talker) to the MG3633A (listener).

### Data Request Messages for Modulation

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMOA</td>
<td>FM frequency deviation</td>
<td>Hz</td>
</tr>
<tr>
<td>RFMOA</td>
<td>Reference FM frequency deviation</td>
<td>Hz</td>
</tr>
<tr>
<td>AMOA</td>
<td>AM modulation factor</td>
<td>%</td>
</tr>
<tr>
<td>RAMOA</td>
<td>Reference AM modulation factor</td>
<td>%</td>
</tr>
<tr>
<td>PHMOA</td>
<td>ΩM phase deviation</td>
<td>rad or deg</td>
</tr>
<tr>
<td>RPHOA</td>
<td>Reference ΩM phase deviation</td>
<td>rad or deg</td>
</tr>
<tr>
<td>INDOA</td>
<td>Fixed FM/ΩM INT frequency and phase deviations data</td>
<td>Hz/rad, deg</td>
</tr>
<tr>
<td>EXDOA</td>
<td>Fixed FM/ΩM EXT frequency and phase deviations data</td>
<td>Hz/rad, deg</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads the data sent from the MG3633A (talker) with the modulation data output format shown in the table below.

### Output Format of Message Sent from Talker (1/2)

$$\Delta : \text{Space} \quad s : \text{Sign} \quad d : \text{Data}$$

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMOA</td>
<td>FM$$\Delta$$dddddd0HZ</td>
<td>ddddd0</td>
<td>During frequency deviation measurements, the talker always sends 0 as the 1 Hz digit.</td>
</tr>
<tr>
<td>RFMOA</td>
<td>RFM$$\Delta$$dddd0Hz</td>
<td>ddddd0</td>
<td></td>
</tr>
<tr>
<td>AMOA</td>
<td>AM$$\Delta$$ddd.dPC</td>
<td>ddd.d</td>
<td></td>
</tr>
<tr>
<td>RAMOA</td>
<td>RAM$$\Delta$$ddd.dPC</td>
<td>ddd.d</td>
<td></td>
</tr>
<tr>
<td>PHMOA</td>
<td>PHM$$\Delta$$ddd.ddRAD</td>
<td>$$\Delta$$ddd.dd</td>
<td>The same units as those set on the panel are sent.</td>
</tr>
<tr>
<td></td>
<td>PHM$$\Delta$$ddd.dDEG</td>
<td>$$\Delta$$ddd.d</td>
<td></td>
</tr>
</tbody>
</table>
## Output Format of Message Sent from Talker (2/2)

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPHOA</td>
<td>PPHΔddd.ddRAD &lt;br&gt; RPHΔddd.dDEG</td>
<td>Δddd.dd &lt;br&gt; Δddd.d</td>
<td>The same units as those set on the panel are sent.</td>
</tr>
</tbody>
</table>
| INDOA        | INDΔddd0HZ <br> INDΔddd.ddRAD <br> INDΔddd.dDEG | Δddd0 <br> Δddd.dd <br> Δddd.d | • Hertz (Hz) units are sent for FM, and rad or deg is sent for ØM.  
• In PM mode, the talker always sends 0 as the 1 Hz digit.  
• In ØM mode, the same units as those set on the panel are sent.  
• When the modulation is off, the FM data is sent. |
| EXDOA        | EXDΔddd0HZ <br> EXDΔddd.ddRAD <br> EXDΔddd.dDEG | Δddd0 <br> Δddd.dd <br> Δddd.d |                                             |

**Note:** In the output format of the modulation message sent from a talker, the leading zero is replaced by a space. However, zeros to the right of the decimal point are sent for data other than FM data.
(1) Reading AM modulation factor

The value of the AM modulation factor is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "AM30PC"          Set AM modulation factor to 30%.
120 WRITE @103: "AMOA"            Request reading of AM modulation factor.
130 READ @103: A$                   Read data.
140 PRINT A$                        Output the read value at the specified device.
150 END
```

Output results: AM 30.0PC

(2) Reading reference AM modulation factor

The reference AM modulation factor is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "AM30PC"          Set AM modulation factor to 30%.
120 WRITE @103: "AD0"             Specify resolution to the lowest digit.
130 WRITE @103: "TAM"             Increase AM modulation factor by 0.1%.
140 WRITE @103: "RAMOA"           Request reading of the reference AM modulation factor.
150 READ @103: A$                  Read the data.
160 PRINT A$                       Output the read value at the specified device.
170 END
```

Output results: RAM 30.0PC

(3) Reading FM frequency deviation

The FM frequency deviation value is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "FM3.5KHZ"         Set FM frequency deviation to 3.5 kHz.
120 WRITE @103: "FMOA"             Request reading of FM frequency deviation.
130 WRITE @103: A$                 Read data.
140 PRINT A$                       Output the read value at the specified device.
150 END
```

Output results: FM 3500HZ
(4) Reading reference FM frequency deviation
The reference FM frequency deviation is read using the following method.

Example

100 DIM A$*100
110 WRITE @103: "FM3.5KHZ"           Set FM frequency deviation to 3.5 kHz.
120 WRITE @103: "FD0"                 Specify resolution to the lowest digit.
130 WRITE @103: "TFM"                 Increase FM frequency deviation by 0.01 kHz.
140 WRITE @103: "RFMOA"               Request reading of reference FM frequency deviation.
150 READ @103: A$                    Read data.
160 PRINT A$                         Output the read value at the specified device.
170 END

Output results: RFM 3500HZ

(5) Reading $\Omega M$ phase deviation
The value of the $\Omega M$ phase deviation is read using the following method.

Example

100 DIM A$*100
110 WRITE @103: "PHM30.0RAD"           Set $\Omega M$ phase deviation to 30 rad.
120 WRITE @103: "PHMOA"                Request reading of $\Omega M$ phase deviation.
130 WRITE @103: A$                   Read data.
140 PRINT A$                         Output the read value at the specified device.
150 END

Output results: PHM 30.00RAD
(6) Reading reference ∅M phase deviation

The reference ∅M phase deviation is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "PHM30.0RAD"       Set ∅M phase deviation to 30 rad.
120 WRITE @103: "PD0"              Specify resolution to the lowest digit.
130 WRITE @103: "TPH"             Increase ∅M phase deviation by 0.1 rad.
140 WRITE @103: "RPHOΩA"         Request reading of reference ∅M phase deviation.
150 READ @103: A$                 Read data.
160 PRINT A$                      Output the read value at the specified device.
170 END
```

Output results: RPH 30.00RAD

(7) Reading fixed data for frequency and phase deviations

Example 1

The value of the fixed INT FM frequency deviation data is read using the following method.

```
100 DIM A$*100
110 WRITE @103: "IND3.5KHZ"       Set fixed INT frequency deviation data to 3.5 kHz.
120 WRITE @103: "INDOA"           Request reading of fixed INT frequency deviation data.
130 READ @103: A$                 Read data.
140 PRINT A$                      Output the read value at the specified device.
150 END
```

Output results: IND 3500HZ

Example 2

The value of the fixed EXT FM frequency deviation data is read using the following method.

```
100 DIM A$*100
110 WRITE @103: "EXD3.5KHZ"       Set fixed EXT frequency deviation data to 3.5 kHz.
120 WRITE @103: "EXDOA"           Request reading of fixed EXT frequency deviation data.
130 READ @103: A$                 Read data.
140 PRINT A$                      Output the read value at the specified device.
150 END
```

Output results: EXD 3500HZ
Example 3

The value of the fixed INT phase deviation data is read using the following method.

100 DIM A$*100
110 WRITE @103: "IND30.0RAD" ------- Set fixed INT phase deviation data to 30 rad.
120 WRITE @103: "INDOA" ----------- Request reading of fixed INT phase deviation data.
130 READ @103: A$ ------------------ Read data.
140 PRINT A$ ------------------------ Output the read value at the specified device.
150 END

Output results: IND 30.00RAD

Example 4

The value of the fixed EXT phase deviation data is read using the following method.

100 DIM A$*100
110 WRITE @103: "EXD30.0RAD" ------- Set fixed EXT phase deviation data to 30 rad.
120 WRITE @103: "EXDOA" ----------- Request reading of fixed EXT phase deviation data.
130 READ @103: A$ ------------------ Read data.
140 PRINT A$ ------------------------ Output the read value at the specified device.
150 END

Output results: EXD 30.00RAD
6.10 Setting AF Modulation Frequency

The program codes for setting AF modulation frequency are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF OSC</td>
<td>AF</td>
</tr>
<tr>
<td>INT MOD FREQ OUTPUT AF OSC</td>
<td>M0</td>
</tr>
<tr>
<td>INT MOD FREQ OUTPUT 1 kHz</td>
<td>M1</td>
</tr>
<tr>
<td>INT MOD FREQ OUTPUT 400 Hz</td>
<td>M2</td>
</tr>
<tr>
<td>AF INCREMENTAL STEP</td>
<td>AIS</td>
</tr>
<tr>
<td>INCREMENTAL STEP UP AF</td>
<td>UAF</td>
</tr>
<tr>
<td>INCREMENTAL STEP DOWN AF</td>
<td>DAF</td>
</tr>
<tr>
<td>KNOB UP AF</td>
<td>TAF</td>
</tr>
<tr>
<td>KNOB DOWN AF</td>
<td>EAF</td>
</tr>
<tr>
<td>RESET TUNABLE AF</td>
<td>ZAF</td>
</tr>
<tr>
<td>AF RESOLUTION RIGHT</td>
<td>ASR</td>
</tr>
<tr>
<td>AF RESOLUTION LEFT</td>
<td>ASL</td>
</tr>
<tr>
<td>AF RESOLUTION 0.1 Hz</td>
<td>AR0</td>
</tr>
<tr>
<td>AF RESOLUTION 1 Hz</td>
<td>AR1</td>
</tr>
<tr>
<td>AF RESOLUTION 10 Hz</td>
<td>AR2</td>
</tr>
<tr>
<td>AF RESOLUTION 100 Hz</td>
<td>AR3</td>
</tr>
<tr>
<td>AF RESOLUTION 1 kHz</td>
<td>AR4</td>
</tr>
<tr>
<td>AF RESOLUTION 10 kHz</td>
<td>AR5</td>
</tr>
</tbody>
</table>

1) Changing INT modulation frequency

Sending the program codes listed below produce the indicated internal modulation frequency commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0</td>
<td>Sets INT mod. freq. to AF frequency</td>
</tr>
<tr>
<td>M1</td>
<td>Sets INT mod. freq. to 1 kHz</td>
</tr>
<tr>
<td>M2</td>
<td>Sets INT mod. freq. to 400 Hz</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:”M1”          Fix INT modulation frequency to 1 kHz.
110 END
(2) Setting AF frequency using data keys

Example

The various control messages shown below are used to set AF 1 kHz.

```
WRITE @103:"AF1000.0"
WRITE @103:"AF1000.0HZ"
WRITE @103:"AF1.0000KHZ"
WRITE @103:"AF0.0010000MHZ"
WRITE @103:"AF0.0000010000GHZ"
```

*Note:* The four AF frequency units Hz, kHz, MHz, and GHz can be used. The corresponding suffix codes used are as follows:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hz</td>
<td>&quot;HZ&quot;</td>
</tr>
<tr>
<td>kHz</td>
<td>&quot;KHZ&quot;, &quot;KZ&quot;</td>
</tr>
<tr>
<td>MHz</td>
<td>&quot;MHZ&quot;, &quot;MZ&quot;</td>
</tr>
<tr>
<td>GHz</td>
<td>&quot;GHZ&quot;, &quot;GZ&quot;</td>
</tr>
</tbody>
</table>

When the suffix codes are omitted, they are regarded as "HZ".

(3) Setting AF frequency and resolution using rotary knob

The AF frequency can be set with any resolution within an appropriate range of the current AF frequency setting.

Example

```
100 WRITE @103:"AF2KHZ"          Set AF frequency to 2 kHz.
110 WRITE @103:"AR3"            Set resolution to 100 Hz.
120 FOR i = 1 TO 10 STEP
130 WRITE @103:"TAF"(or"EAF")} Increase (or decrease) AF frequency by 100 Hz
140 NEXT I
150 END
```

*Note:* The value adjusted to using the rotary knob can be canceled by the "ZAF" program code to reset the previous AF frequency set by the "AF" program code.
(4) Setting AF frequency using [INCREMENT]

The AF frequency can be set using any step size within an appropriate range of the current AF frequency setting.

Example

```
100 WRITE @103: "AF2KHZ"           Set AF frequency to 2 kHz.
110 WRITE @103: "AIS100HZ"         Set resolution to 100 Hz.
120 FOR I = 1 TO 10 STEP 1
130 WRITE @103: "UAF" (or "DAF")   Increase (or decrease) AF frequency by 100 Hz
                                  from 2 kHz to 3 kHz (or 1 kHz).
140 NEXT I
150 END
```

Note: The value adjusted to using [INCREMENT] can be canceled by the “ZAF” program code to reset the previous AF frequency set by the “AF” program code.
6.11 Data Request Messages for AF Modulation Frequency

To read the AF modulation frequency data from the MG3633A, the required program code of the data request messages shown in the table below is sent from the controller (talker) to the MG3633A (listener).

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFOA</td>
<td>AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>AISOA</td>
<td>Step (incremental) AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>RAFOA</td>
<td>Reference AF frequency</td>
<td>Hz</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads the data sent from the MG3633A (talker), with the AF frequency data output format shown in the table below.

Output Format of Message Sent from Talker

```
△: Space   s: Sign   d: Data
```

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFOA</td>
<td>AF△dddddd.dHZ</td>
<td>ddddd.d</td>
<td></td>
</tr>
<tr>
<td>AISOA</td>
<td>AIS△dddddd.dHZ</td>
<td>△dddd.d</td>
<td></td>
</tr>
<tr>
<td>RAFOA</td>
<td>RAFdddddd.dHZ</td>
<td>ddddd.d</td>
<td></td>
</tr>
</tbody>
</table>

Note: In the output format of the AF message sent from a talker, the leading zero is replaced by a space. However, zeros to the right of the decimal point are sent.

(1) Reading AF frequency

The value of the AF frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "AF1KHZ"          ← Set AF frequency to 1 kHz.
120 WRITE @103: "AFOA"            ← Request reading of AF frequency.
130 READ @103: A$                  ← Read data.
140 PRINT A$                       ← Output the read value at the specified device.
150 END
```

Output results: AF 1000.0HZ
(2) Reading step AF frequency
The value of the step AF frequency is read using the following method.

Example

100 DIM A$*100
110 WRITE @103: "AIS100HZ"  "           Set step AF frequency to 100 Hz.
120 WRITE @103: "AISOA"  "           Request reading of step AF frequency.
130 READ @103: A$  "           Read data.
140 PRINT A$  "           Output the read value at the specified device.
150 END

Output results: AIS 100.0HZ

(3) Reading reference AF frequency
The value of the reference AF frequency is read using the following method.

Example

100 DIM A$*100
110 WRITE @103: "AF2KHZ"  "           Set AF frequency to 2 kHz.
120 WRITE @103: "AR3"  "           Set resolution to 100 Hz.
130 WRITE @103: "TAF"  "           Increase AF frequency by 100 Hz.
140 WRITE @103: "RAFOA"  "           Request reading of reference AF frequency.
150 READ @103: A$  "           Read data.
160 PRINT A$  "           Output the read value at the specified device.
170 END

Output results: RAF 2000.0HZ
6.12 Executing Frequency Sweep

The program codes for the frequency sweep are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQ SWEEP START</td>
<td>FSA</td>
</tr>
<tr>
<td>FREQ SWEEP STOP</td>
<td>FSB</td>
</tr>
<tr>
<td>FREQ SWEEP SPAN</td>
<td>FSP</td>
</tr>
<tr>
<td>FREQ SWEEP STEP POINT</td>
<td>FSN</td>
</tr>
<tr>
<td>FREQ SWEEP STEP SIZE</td>
<td>FSZ</td>
</tr>
<tr>
<td>FREQ SWEEP LOG</td>
<td>FLG</td>
</tr>
<tr>
<td>FREQ SWEEP OFF</td>
<td>SF0</td>
</tr>
<tr>
<td>FREQ SWEEP AUTO</td>
<td>SF1</td>
</tr>
<tr>
<td>FREQ SWEEP SINGLE</td>
<td>SF2</td>
</tr>
<tr>
<td>FREQ SWEEP MANUAL</td>
<td>SF3</td>
</tr>
<tr>
<td>FREQ SWEEP MARKER OFF</td>
<td>SF4</td>
</tr>
<tr>
<td>FREQ SWEEP MARKER ON</td>
<td>SF5</td>
</tr>
<tr>
<td>FREQ SWEEP BREAK</td>
<td>SF6</td>
</tr>
<tr>
<td>FREQ SWEEP CONTINUE</td>
<td>SF7</td>
</tr>
<tr>
<td>FREQ SWEEP STEP UP</td>
<td>SF8</td>
</tr>
<tr>
<td>FREQ SWEEP STEP DOWN</td>
<td>SF9</td>
</tr>
<tr>
<td>FREQ SWEEP START PRESET</td>
<td>SFA</td>
</tr>
<tr>
<td>FREQ SWEEP STOP PRESET</td>
<td>SFB</td>
</tr>
</tbody>
</table>

**Note:** The four frequency units Hz, kHz, MHz, and GHz can be used. The corresponding suffix codes used are as follows:

- Hz : “HZ”
- kHz : “KHZ”, “KZ”
- MHz : “MHZ”, “MZ”
- GHz : “GHZ”, “GZ”

When the suffix codes are omitted, they are regarded as “HZ”.

6 - 36
(1) Setting start-stop sweep

The start (FSA) and stop (FSB) frequencies are set to execute sweep.

Example 1

The various control messages shown below are used to set a 10 MHz start frequency.

WRITE @103: "FSA10000000.00"
WRITE @103: "FSA10000000.00HZ"
WRITE @103: "FSA10000.00000KHZ"
WRITE @103: "FSA10.000000000MHZ"
WRITE @103: "FSA0.01000000000GHZ"

Example 2

The various control messages shown below are used to set a 100 MHz stop frequency.

WRITE @103: "FSB1000000000.00"
WRITE @103: "FSB1000000000.00HZ"
WRITE @103: "FSB10000.00000KHZ"
WRITE @103: "FSB100.000000000MHZ"
WRITE @103: "FSB0.10000000000GHZ"

(2) Setting center-span sweep

The span frequency (FSP) is set to sweep with the set frequency as the center.

Example

The various control messages shown below are used to set a 10 MHz span frequency.

WRITE @103: "FSP10000000.00"
WRITE @103: "FSP10000000.00HZ"
WRITE @103: "FSP10000.00000KHZ"
WRITE @103: "FSP10.000000000MHZ"
WRITE @103: "FSP0.01000000000GHZ"
(3) Switching the method of specifying frequency sweep step

There are three ways to specify the sweep step:

- setting the number of frequency sweep points (FSN);
- setting the frequency sweep step size (FSZ); or
- setting the frequency sweep to LOG (fixed at 1% steps) (FLG).

Example 1

The control messages shown below are sent to set 100 frequency sweep points.

WRITE @103: "FSN100"
WRITE @103: "FSN100PT"

Note: Omission of the suffix codes is regarded as “PT”.

Example 2

The various control messages shown below are sent to set a 10 MHz frequency sweep step size.

WRITE @103: "FSZ10000000.00"
WRITE @103: "FSZ10000000.00HZ"
WRITE @103: "FSZ10000.000000KHZ"
WRITE @103: "FSZ10.00000000MHZ"
WRITE @103: "FSZ0.0100000000GHZ"

Example 3

The program code shown below is sent to set the frequency sweep to LOG (fixed at 1% steps).

100 WRITE @103: "FLG"  ""           Set frequency LOG sweep mode.
110 END
(4) Controlling frequency sweep

Sending the program codes listed below produce the indicated frequency sweep commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF0</td>
<td>Terminates sweep</td>
</tr>
<tr>
<td>SF1</td>
<td>Starts auto-sweep</td>
</tr>
<tr>
<td>SF2</td>
<td>Starts single sweep</td>
</tr>
<tr>
<td>SF3</td>
<td>Starts manual sweep</td>
</tr>
<tr>
<td>SF6</td>
<td>Suspends sweep</td>
</tr>
<tr>
<td>SF7</td>
<td>Resumes sweep</td>
</tr>
<tr>
<td>SF8</td>
<td>Manual sweep moves one-step up</td>
</tr>
<tr>
<td>SF9</td>
<td>Manual sweep moves one-step down</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:“SF1”  \---------------------\  Freq. auto-sweep started
110 WRITE @103:“SF6”  \---------------------\  Freq. sweep suspended
120 WRITE @103:“SF7”  \---------------------\  Freq. sweep resumed
130 WRITE @103:“SF0”  \---------------------\  Freq. sweep terminated
140 END

(5) ON/OFF control of frequency sweep marker function

Sending the program codes listed below produce the indicated frequency sweep marker function commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF4</td>
<td>Turns OFF freq. sweep marker function</td>
</tr>
<tr>
<td>SF5</td>
<td>Turns ON freq. sweep marker function</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:“SF5”  \---------------------\  Turn ON freq. sweep marker function
110 END

6 - 39
(6) Presetting start/stop frequencies

Sending the program codes listed below produce the indicated commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFA</td>
<td>Sets current freq. to start freq.</td>
</tr>
<tr>
<td>SFB</td>
<td>Sets current freq. to stop freq.</td>
</tr>
</tbody>
</table>

Example

```
100 WRITE @103:“FSA10MHZ”   "-------- Start freq. set to 10 MHz
110 WRITE @103:“SFA”        "---------------- Current freq. set to start freq.
120 END
```
6.13 Data Request Messages for Frequency Sweep

To read the frequency sweep data from the MG3633A, the required program codes for data request messages below are sent from the controller (talker) to the MG3633A (listener).

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSAOA</td>
<td>Start frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FSBOA</td>
<td>Stop frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FSPOA</td>
<td>Span frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>FSNOA</td>
<td>Number of frequency sweep points</td>
<td>PT</td>
</tr>
<tr>
<td>FSZOA</td>
<td>Frequency step size</td>
<td>Hz</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads the frequency sweep data sent from the MG3633A (talker), with the output format shown below.

Output Format of Messages Sent from Talker

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSAOA</td>
<td>FSAdddddddddddddd.dHz</td>
<td>sdddddddddddd.dd</td>
<td></td>
</tr>
<tr>
<td>FSBOA</td>
<td>FSBdddddddddddd.ddHZ</td>
<td>sdddddddddddd.dd</td>
<td></td>
</tr>
<tr>
<td>FSPOA</td>
<td>FSPΔdddddddddddd.HZ</td>
<td>Δdddddddddddd.dd</td>
<td></td>
</tr>
<tr>
<td>FSNOA</td>
<td>FSNΔddddddddddddPT</td>
<td>Δdddddddddddd.dd</td>
<td></td>
</tr>
<tr>
<td>FSZOA</td>
<td>FSZΔdddddddddddd.HZ</td>
<td>Δdddddddddddd.dd</td>
<td></td>
</tr>
</tbody>
</table>

Δ: Space s: Sign d: Data

Note: In the output format of the frequency sweep message sent from a talker, the leading zero is replaced by a space. However, zeros to the right of the decimal point are sent for a program code other than FSNOA.
(1) **Reading start frequency**

The value of the start frequency is read using the following method (FSAOA).

Example

```
100 DIM A$*100
110 WRITE @103: "FSA10MHZ"          Set start frequency to 10 MHz.
120 WRITE @103: "FSAOA"             Request reading of start frequency.
130 READ @103: A$                   Read data.
140 PRINT A$                        Output the read value at the specified device.
150 END
```

Output results: FSA 10000000.00HZ

(2) **Reading stop frequency**

The value of the stop frequency is read using the following method (FSBOA).

Example

```
100 DIM A$*100
110 WRITE @103: "FSB100MHZ"         Set stop frequency to 100 MHz
120 WRITE @103: "FSBOA"             Request reading of stop frequency.
130 READ @103: A$                   Read data.
140 PRINT A$                        Output the read value at the specified device.
150 END
```

Output results: FSB 100000000.00HZ

(3) **Reading span frequency**

The value of the span frequency is read using the following method (FSPOA).

Example

```
100 DIM A$*100
110 WRITE @103: "FSP10MHZ"          Set span frequency to 10 MHz.
120 WRITE @103: "FSPOA"             Request reading of span frequency.
130 READ @103: A$                   Read data.
140 PRINT A$                        Output the read value at the specified device.
150 END
```

Output results: FSP 10000000.00HZ
(4) Reading the number of frequency sweep points

The value of the number of frequency sweep points is read using the following method (FSNOA).

Example

```
100 DIM A$*100
110 WRITE @103:“FSN100PT”          Set number of frequency sweep points to 100 points.
120 WRITE @103:“FSNOA”              Request reading of number of frequency sweep points.
130 READ @103:A$                    Read data.
140 PRINT A$                       Output the read value at the specified device.
150 END
```

Output results:  FSN  100PT

(5) Reading sweep step frequency

The value of sweep step frequency is read using the following method (FSZOA).

Example

```
100 DIM A$*100
110 WRITE @103:“FSZ100HZ”          Set sweep step frequency to 100 Hz.
120 WRITE @103:“FSZOA”             Request reading of sweep step frequency.
130 READ @103:A$                   Read data.
140 PRINT A$                       Output the read value at the specified device.
150 END
```

Output results:  FSZ  100.00HZ
6.14 Executing Output Level Sweep

The program codes for the output level sweep are shown in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWEEP (OUTPUT LEVEL)</td>
<td>OUTPUT LEVEL SWEEP START</td>
<td>OSA</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP STOP</td>
<td>OSB</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP SPAN</td>
<td>OSP</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP OFF</td>
<td>SO0</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP AUTO</td>
<td>SO1</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP SINGLE</td>
<td>SO2</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP MANUAL</td>
<td>SO3</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP MARKER OFF</td>
<td>SO4</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP MARKER ON</td>
<td>SO5</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP BREAK</td>
<td>SO6</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP CONTINUE</td>
<td>SO7</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP STEP UP</td>
<td>SO8</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP STEP DOWN</td>
<td>SO9</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP START PRESET</td>
<td>SOA</td>
</tr>
<tr>
<td></td>
<td>OUTPUT LEVEL SWEEP STOP PRESET</td>
<td>SOB</td>
</tr>
</tbody>
</table>

(1) Setting start-stop level sweep

The start (OSA) and stop (OSB) output levels are set to execute the level sweep.

Example 1

The various control messages shown below are used to set the start output level.

WRITE @103: "OSA-143.0"
WRITE @103: "OSA-143.0DBM"
WRITE @103: "OSA-30.0DBU"
WRITE @103: "OSA1.00V"
WRITE @103: "OSA1.00MV"
WRITE @103: "OSA0.032UV"

Example 2

The various control messages shown below are used to set the stop output level.

WRITE @103: "OSB23.0"
WRITE @103: "OSB23.0DBM"
WRITE @103: "OSB136.0DBU"
WRITE @103: "OSB6.32V"
WRITE @103: "OSB999MV"
WRITE @103: "OSB999UV"
**Note:** The five output level sweep units dBm, dBµ, V, mV, and µV can be used. The corresponding suffix codes are as follows:

- dBm : “DBM”, “DB”
- dBµ : “DBU”, “DU”
- V : “V”
- mV : “MV”
- µV : “UV”

When the suffix codes are omitted, they are regarded as “DBM”.

(2) **Setting center-span level sweep**

The span output level (OSP) is set to seep with the current output level as the center.

**Example**

The control messages shown below are used to set the 10 dB span output level.

```
WRITE @103:“OSP10.0”
WRITE @103:“OSP10.0DB”
```

**Note:** The dB unit is used and the suffix code corresponding to the unit is as “DB”.

When the suffix codes are omitted, they are regarded as “DB”.
(3) Controlling output level sweep

Sending the program codes listed below produce the indicated output level sweep marker function commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO0</td>
<td>Terminates sweep</td>
</tr>
<tr>
<td>SO1</td>
<td>Starts auto-sweep</td>
</tr>
<tr>
<td>SO2</td>
<td>Starts single sweep</td>
</tr>
<tr>
<td>SO3</td>
<td>Starts manual sweep</td>
</tr>
<tr>
<td>SO6</td>
<td>Suspends sweep</td>
</tr>
<tr>
<td>SO7</td>
<td>Resumes sweep</td>
</tr>
<tr>
<td>SO8</td>
<td>Manual sweep moves one-step up</td>
</tr>
<tr>
<td>SO9</td>
<td>Manual sweep moves one-step down</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:“SO1” ................................ Output level auto-sweep started
110 WRITE @103:“SO6” ................................ Output level sweep suspended
120 WRITE @103:“SO7” ................................ Output level sweep resumed
130 WRITE @103:“SO0” ................................ Output level sweep terminated
140 END

(4) ON/OFF control of output level sweep marker function

Sending the program codes listed below produce the indicated output level sweep marker function commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO4</td>
<td>Turns OFF output level sweep marker function</td>
</tr>
<tr>
<td>SO5</td>
<td>Turns ON output level sweep marker function</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:“SO5” ................................ Output level sweep marker function ON.
110 END
(5) Presetting start/stop output levels

Sending the program codes listed below produce the indicated output level commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOA</td>
<td>Sets current output level to start output level</td>
</tr>
<tr>
<td>SOB</td>
<td>Sets current output level to stop output level</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: "OSA-30DBM"  Start output level set to −30 dBm
110 WRITE @103: "SOA"  Current output level set to start output level
120 END
6.15  Data Request Messages for Output Level Sweep

To read the output level sweep data from the MG3633A, the required program codes for data request messages (below) are sent from the controller (talker) to the MG3633A (listener).

### Data Request Messages for Output Level Sweep

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSAOA</td>
<td>Start output level</td>
<td>dBm, dBµ, V</td>
</tr>
<tr>
<td>OSBOA</td>
<td>Stop output level</td>
<td>dBm, dBµ, V</td>
</tr>
<tr>
<td>OSPOA</td>
<td>Span output level</td>
<td>dB</td>
</tr>
<tr>
<td>OSNOA</td>
<td>Number of output level points</td>
<td>PT</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads the output level sweep data sent from the MG3633A (talker) with format shown below.

### Output Format of Message Sent from Talker

\[\Delta: \text{Space} \quad s: \text{Sign} \quad d: \text{Data}\]

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSAOA</td>
<td>OSA addd.dDBM</td>
<td>sddd.d</td>
<td>The same unit as that set on the panel is sent.</td>
</tr>
<tr>
<td></td>
<td>OSA sddd.dDBU</td>
<td>sddd.d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OSA d.dddd ddddV</td>
<td>sddd.d</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d.dddd dd</td>
<td></td>
</tr>
<tr>
<td>OSBOA</td>
<td>OSB sddd.dDBM</td>
<td>sddd.d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OSB sddd.dDBU</td>
<td>sddd.d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OSB d.dddd ddddV</td>
<td>d.dddd dddd</td>
<td></td>
</tr>
<tr>
<td>OSPOA</td>
<td>OSP\Delta dd.dDB</td>
<td>\Delta dd.d</td>
<td></td>
</tr>
<tr>
<td>OSPOA</td>
<td>OSN\Delta dd PT</td>
<td>\Delta dd</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** In the output format for output level sweep messages sent from a talker, the leading zero is replaced by a space. However, zeros to the right of the decimal point are sent for program codes other than OSNOA.
(1) **Reading start output level**

The value of the start output level is read using the following method.

Example

```
100 DIM A$ * 100
110 WRITE @103: "OSA-50DBM"       Set start output level to -50 dBm.
120 WRITE @103: "OSAOA"           Request reading of start output level.
130 READ @103: A$                 Read data.
140 PRINT A$          Output the read value at the specified device.
150 END
```

Output results: OSA- 50.0DBM

(2) **Reading the stop output level**

The value of the stop output level is read using the following method.

Example

```
100 DIM A$ * 100
110 WRITE @103: "OSB10DBM"       Set the stop output level to 10 dBm.
120 WRITE @103: "OSBOA"           Request reading of the stop output level.
130 READ @103: A$                 Read the data.
140 PRINT A$          Output the read value at the specified device.
150 END
```

Output results: OSB 10.0DBM

(3) **Reading span output level**

The span output level is read using the following method.

Example

```
100 DIM A$ * 100
110 WRITE @103: "OSP20DB"       Set span output level to 20 dB.
120 WRITE @103: "OSPOA"           Request reading of span output level.
130 READ @103: A$                 Read data.
140 PRINT A$          Output the read value at the specified device.
150 END
```

Output results: OSP 20.0DB
(4) **Reading the number of output level sweep points**

The number of output level sweep points is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“OSNOA”            Request reading of number of output level sweep
120 READ @103:A$                  points.
130 PRINT A$                     Read data.
140 END                           Output the read value at the specified device.
```

Output results: OSN 100PT
### 6.16 Executing AF Frequency Sweep

The program codes for the AF frequency sweep are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWEEP</td>
<td>ASA</td>
</tr>
<tr>
<td>AF SWEEP START</td>
<td>ASB</td>
</tr>
<tr>
<td>AF SWEEP STOP</td>
<td>ASP</td>
</tr>
<tr>
<td>AF SWEEP SPAN</td>
<td>ASN</td>
</tr>
<tr>
<td>AF SWEEP STEP POINT</td>
<td>ASZ</td>
</tr>
<tr>
<td>AF SWEEP STEP SIZE</td>
<td>ALG</td>
</tr>
<tr>
<td>AF SWEEP LOG</td>
<td>SA0</td>
</tr>
<tr>
<td>AF SWEEP OFF</td>
<td>SA1</td>
</tr>
<tr>
<td>AF SWEEP AUTO</td>
<td>SA2</td>
</tr>
<tr>
<td>AF SWEEP SINGLE</td>
<td>SA3</td>
</tr>
<tr>
<td>AF SWEEP MANUAL</td>
<td>SA4</td>
</tr>
<tr>
<td>AF SWEEP MARKER OFF</td>
<td>SA5</td>
</tr>
<tr>
<td>AF SWEEP MARKER ON</td>
<td>SA6</td>
</tr>
<tr>
<td>AF SWEEP BREAK</td>
<td>SA7</td>
</tr>
<tr>
<td>AF SWEEP CONTINUE</td>
<td>SA8</td>
</tr>
<tr>
<td>AF SWEEP STEP UP</td>
<td>SA9</td>
</tr>
<tr>
<td>AF SWEEP STEP DOWN</td>
<td>SAA</td>
</tr>
<tr>
<td>AF SWEEP START PRESET</td>
<td>SAB</td>
</tr>
<tr>
<td>AF SWEEP STOP PRESET</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The four start/stop AF frequency sweep units Hz, kHz, MHz, and GHz can be used. The corresponding suffix codes are as follows:

- Hz : “HZ”
- kHz : “KHZ”, “KZ”
- MHz : “MHZ”, “MZ”
- GHz : “GHZ”, “GZ”

When the suffix codes are omitted, they are regarded as “HZ”.

---

#### (1) Setting start-stop sweep

The start and stop AF frequencies are set to execute the sweep.

**Example 1**

The various control messages shown below are used to set a 1 kHz start AF frequency.

```plaintext
WRITE @103: “ASA1000.0”
WRITE @103: “ASA1000.0HZ”
WRITE @103: “ASA1.0000KHZ”
WRITE @103: “ASA0.0010000MHZ”
WRITE @103: “ASA0.000010000GHZ”
```
Example 2

The various control messages shown below are used to set a 100 kHz stop AF frequency.

WRITE @103: "ASB100000.0"
WRITE @103: "ASB100000.0HZ"
WRITE @103: "ASB100.0000KHZ"
WRITE @103: "ASB0.1000000MHZ"
WRITE @103: "ASB0.0001000000GHZ"

(2) Setting center-span sweep

The span AF frequency is set to sweep with the current AF frequency as the center.

Example

The various control messages shown below are used to set a 100 kHz span AF frequency.

WRITE @103: "ASP100000.0"
WRITE @103: "ASP100000.0HZ"
WRITE @103: "ASP100.0000KHZ"
WRITE @103: "ASP0.1000000MHZ"
WRITE @103: "ASP0.0001000000GHZ"

(3) Specifying number of AF frequency sweep steps

There are three methods for specifying a desired number of AF frequency sweep steps:

1. by setting the number of AF frequency sweep points (ASN);
2. by setting the AF frequency sweep step size (ASZ); and
3. by setting the AF frequency sweep to LOG, fixed at 1% steps (ALG).

Example 1

Sending control messages below sets 100 AF frequency sweep points.

WRITE @103: "ASN100"
WRITE @103: "ASN100PT"

Note: When the suffix codes are omitted, they are regarded as "PT".

Example 2

The control messages shown below are sent to set a 10 Hz AF frequency sweep step size.

WRITE @103: "ASZ10.0"
WRITE @103: "ASZ10.0HZ"
WRITE @103: "ASZ0.01KHZ"
WRITE @103: "ASZ0.000100MHZ"
WRITE @103: "ASZ0.000000100GHZ"
Example 3

The program codes shown below are sent to set the AF frequency sweep to LOG (fixed at 1% steps).

100 WRITE @103: "ALG"  Set AF frequency LOG sweep mode.
110 END

(4) Controlling AF frequency sweep

Sending the program codes listed below produce the indicated AF frequency sweep commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA0</td>
<td>Terminates sweep</td>
</tr>
<tr>
<td>SA1</td>
<td>Starts auto-sweep</td>
</tr>
<tr>
<td>SA2</td>
<td>Starts single sweep</td>
</tr>
<tr>
<td>SA3</td>
<td>Starts manual sweep</td>
</tr>
<tr>
<td>SA6</td>
<td>Suspends sweep</td>
</tr>
<tr>
<td>SA7</td>
<td>Resumes sweep</td>
</tr>
<tr>
<td>SA8</td>
<td>Manual sweep moves one-step up</td>
</tr>
<tr>
<td>SA9</td>
<td>Manual sweep moves one-step down</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: "SA1"  AF freq. auto-sweep started
110 WRITE @103: "SA6"  AF freq. sweep suspended
120 WRITE @103: "SA7"  AF freq. sweep resumed
130 WRITE @103: "SA0"  AF freq. sweep terminated
140 END
(5) ON/OFF control of AF frequency sweep marker function

Sending the program codes listed below produce the indicated AF frequency sweep marker function commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA4</td>
<td>Turns OFF AF frequency sweep marker function</td>
</tr>
<tr>
<td>SA5</td>
<td>Turns ON AF frequency sweep marker function</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:"SA5" .......................... AF freq. sweep marker function ON
110 END

(6) Presetting start/stop AF frequencies

Sending the program codes listed below produce the indicated AF frequency commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAA</td>
<td>Sets current AF freq. to start AF freq.</td>
</tr>
<tr>
<td>SAB</td>
<td>Sets current AF freq. to stop AF freq.</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:"AF10KHZ" .................... AF freq. set to 10 kHz.
110 WRITE @103:"SAA" .......................... Current AF freq. set to start AF freq.
120 END
6.17 Data Request Messages for AF Frequency Sweep

To read the AF frequency sweep data from the MG3633A, the required program codes for data request messages (below) are sent from the controller (talker) to the MG3633A (listener).

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAOA</td>
<td>Start AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>ASBOA</td>
<td>Stop AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>ASPOA</td>
<td>Span AF frequency</td>
<td>Hz</td>
</tr>
<tr>
<td>ASNOA</td>
<td>Number of AF frequency points</td>
<td>PT</td>
</tr>
<tr>
<td>ASZOA</td>
<td>AF frequency step size</td>
<td>Hz</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads AF frequency sweep data sent from the MG3633A (talker), with format shown in the table below.

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAOA</td>
<td>ASAdddddd.dHZ</td>
<td>ddddd.d</td>
<td></td>
</tr>
<tr>
<td>ASBOA</td>
<td>ASBddddddd.dHZ</td>
<td>ddddd.d</td>
<td></td>
</tr>
<tr>
<td>ASPOA</td>
<td>ASPΔdddddd.dHZ</td>
<td>Δdddd.d</td>
<td></td>
</tr>
<tr>
<td>ASNOA</td>
<td>ASNΔdddddddPT</td>
<td>Δdddddd</td>
<td></td>
</tr>
<tr>
<td>ASZOA</td>
<td>ASZddddddd.dHZ</td>
<td>ddddd.d</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* In the output format of the AF frequency sweep message sent from a talker, the leading zero is replaced by a space. However, zeros to the right of the decimal point are sent for program codes other than ASNOA.
(1) Reading start AF frequency

The value of the start AF frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“ASA10KHZ” .......... Set start AF frequency to 10 kHz.
120 WRITE @103:“ASAOA” .......... Request reading of start AF frequency.
130 READ @103:A$ .................. Read data.
140 PRINT A$  ...................... Output the read value at the specified device.
150 END
```

Output results: ASA 10000.0HZ

(2) Reading stop AF frequency

The stop AF frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“ASB100KHZ” .......... Set the stop AF frequency to 100 kHz.
120 WRITE @103:“ASBOA” .......... Request reading of the stop AF frequency.
130 READ @103:A$ .................. Read data.
140 PRINT A$  ...................... Output the read value at the specified device.
150 END
```

Output results: ASB100000.0HZ

(3) Reading span AF frequency

The value of the span AF frequency is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“ASP10KHZ” .......... Set span AF frequency to 10 kHz.
120 WRITE @103:“ASPOA” .......... Request reading of span AF frequency.
130 READ @103:A$ .................. Read data.
140 PRINT A$  ...................... Output the read value at the specified device.
150 END
```

Output results: ASP 10000.0HZ
(4) Reading number of AF frequency sweep points

The value of the number of AF frequency sweep points is read using the following method.

Example

100 DIM A$*100
110 WRITE @103: "ASN100PT" Set the number of AF frequency sweep points to
120 WRITE @103: "ASNOA" Request reading of number of AF frequency
130 READ @103: A$ Read data.
140 PRINT A$ Output the read value at the specified device.
150 END

Output results: ASA 100 PT

(5) Reading sweep step AF frequency

The value of the sweep step AF frequency is read using the following method.

Example

100 DIM A$*100
110 WRITE @103: "ASZ100HZ" Set the AF frequency sweep step to 100 Hz.
120 WRITE @103: "ASZOAS Request reading of AF frequency sweep step.
130 READ @103: A$ Read data.
140 PRINT A$ Output the read value at the specified device.
150 END

Output results: ASZ 100.00HZ
6.18 Executing Frequency Memory Sweep

The program codes for the frequency memory sweep are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQ MEMORY SWEEP ADDRESS</td>
<td>FRM</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP OFF</td>
<td>SR0</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP AUTO</td>
<td>SR1</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP SINGLE</td>
<td>SR2</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP MANUAL</td>
<td>SR3</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP MARKER OFF</td>
<td>SR4</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP MARKER ON</td>
<td>SR5</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP BREAK</td>
<td>SR6</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP CONTINUE</td>
<td>SR7</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP STEP UP</td>
<td>SR8</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP STEP DOWN</td>
<td>SR9</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP START PRESET</td>
<td>SRA</td>
</tr>
<tr>
<td>FREQ MEMORY SWEEP STOP PRESET</td>
<td>SRB</td>
</tr>
</tbody>
</table>

(1) Setting frequency-memory sweep addresses

Example

The control messages shown below are sent to set the frequency-memory sweep addresses.

```
WRITE @(03):"FRM5.10..20.6"  ............ Set frequency-memory sweep addresses to 5, 10, ...
..., 20, and 6.
WRITE @(03):"FRM5.10..20.6PT"
```

Note: When suffix codes are omitted, they are regarded as “PT”.
(2) Controlling frequency memory sweep

Sending the program codes listed below produce the indicated frequency memory sweep commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR0</td>
<td>Terminates sweep</td>
</tr>
<tr>
<td>SR1</td>
<td>Starts auto-sweep</td>
</tr>
<tr>
<td>SR2</td>
<td>Starts single sweep</td>
</tr>
<tr>
<td>SR3</td>
<td>Starts manual sweep</td>
</tr>
<tr>
<td>SR6</td>
<td>Suspends sweep</td>
</tr>
<tr>
<td>SR7</td>
<td>Resumes sweep</td>
</tr>
<tr>
<td>SR8</td>
<td>Manual sweep moves one-step up</td>
</tr>
<tr>
<td>SR9</td>
<td>Manual sweep moves one-step down</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: “SR1” .................. Freq. memory auto-sweep started
110 WRITE @103: “SR6” .................. Freq. memory sweep suspended
120 WRITE @103: “SR7” .................. Freq. memory sweep resumed
130 WRITE @103: “SR0” .................. Freq. memory sweep terminated
140 END

(3) ON/OFF control of frequency-memory sweep marker function

Sending the program codes listed below produce the indicated frequency-memory sweep marker function commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR4</td>
<td>Turns OFF freq. memory sweep marker function</td>
</tr>
<tr>
<td>SR5</td>
<td>Turns ON freq. memory sweep marker function</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: “SR5” .................. Freq. memory sweep marker function ON
110 END
(4) Presetting start/stop frequency memories

Sending the program codes listed below produce the indicated frequency memory commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRA</td>
<td>Sets current frequency to start freq. memory</td>
</tr>
<tr>
<td>SRB</td>
<td>Sets current frequency to stop freq. memory</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103: "FC10MHZ"       Set center frequency (CF) to 10 MHz.
110 WRITE @103: "FQ1ST"          Store CF in the first address of the frequency memory.
120 WRITE @103: "FC50MHZ"       Set frequency to 50 MHz.
130 WRITE @103: "FRM1...10PT"    Set frequency-memory sweep addresses to 1 to 10.
140 WRITE @103: "SRA"            Set frequency to start-frequency memory data (10 MHz).
150 END
6.19 Data Request Messages for Frequency Memory Sweep

To read the frequency-memory sweep data from the MG3633A, the required program codes for data request messages (below) are sent from the controller (talker) to the MG3633A (listener).

### Data Request Messages for Frequency Memory Sweep

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRNOA</td>
<td>Number of frequency-memory sweep</td>
<td>PT</td>
</tr>
<tr>
<td></td>
<td>points</td>
<td></td>
</tr>
<tr>
<td>FRMOA</td>
<td>Frequency-memory sweep address</td>
<td>PT</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads frequency-memory sweep data sent from the MG3633A (talker) with format shown in the table below.

### Output Format of Message Sent from Talker

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRNOA</td>
<td>FRNΔdddddPT</td>
<td>Δddddd</td>
<td>The talker sends a space to replace the leading zeros.</td>
</tr>
<tr>
<td>FRMOA</td>
<td>FRMΔddd.ddd....</td>
<td>Δddd.ddd.......</td>
<td>Leading zeros in data separated by periods are sent justified to the left.</td>
</tr>
<tr>
<td></td>
<td>....dddPT</td>
<td>....dddPT</td>
<td></td>
</tr>
</tbody>
</table>
(1) **Reading number of frequency-memory sweep points**

The number of frequency-memory sweep points is read using the following method.

**Example**

```plaintext
100 DIM A$*100
110 WRITE @103:“FRM1.5.8PT”         Set frequency-memory sweep addresses 1, 5, and 8.
120 WRITE @103:“FRNOA”              Request reading the number of frequency-memory sweep points.
130 READ @103:A$                   Read data.
140 PRINT A$                     Output the read value at the specified device.
150 END
```

Output results: FRN 3PT

(2) **Reading frequency-memory sweep addresses**

The frequency-memory sweep addresses are read using the following method.

**Example**

```plaintext
100 DIM A$*100
110 WRITE @103:“FRM1.5.8PT”         Set frequency-memory sweep addresses to 1, 5, and 8.
120 WRITE @103:“FRMOA”              Request reading of the frequency-memory sweep addresses.
130 READ @103:A$                   Read data.
140 PRINT A$                     Output the read value at the specified device.
150 END
```

Output results: FRM 1.5.8PT
6.20 Executing Function Memory Sweep

The program codes for the function memory sweep are shown in the table below.

**Program Codes for Executing Function Memory Sweep**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWEEP (FUNCTION MEMORY)</td>
<td></td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP ADDRESS</td>
<td>FUM</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP OFF</td>
<td>SU0</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP AUTO</td>
<td>SU1</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP SINGLE</td>
<td>SU2</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP MANUAL</td>
<td>SU3</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP BREAK</td>
<td>SU6</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP CONTINUE</td>
<td>SU7</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP STEP UP</td>
<td>SU8</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP STEP DOWN</td>
<td>SU9</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP START PRESET</td>
<td>SUA</td>
</tr>
<tr>
<td>FUNCTION MEMORY SWEEP STOP PRESET</td>
<td>SUB</td>
</tr>
</tbody>
</table>

(1) Setting function-memory sweep addresses

Example

The control messages shown below are sent to set the function-memory sweep addresses.

```
WRITE @103: "FUM5.10..20.6" .............. Set the function-memory sweep addresses to 5, 10, ..., 20, and 6.
WRITE @103: "FUM5.10..20.6PT"
```

*Note:* When suffix codes are omitted, they are regarded as “PT”.

6 - 63
(2) Controlling function memory sweep

Sending the program codes listed below produce the indicated function memory (F.M.) sweep commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SU0</td>
<td>Terminates sweep</td>
</tr>
<tr>
<td>SU1</td>
<td>Starts auto-sweep</td>
</tr>
<tr>
<td>SU2</td>
<td>Starts single sweep</td>
</tr>
<tr>
<td>SU3</td>
<td>Starts manual sweep</td>
</tr>
<tr>
<td>SU6</td>
<td>Suspends sweep</td>
</tr>
<tr>
<td>SU7</td>
<td>Resumes sweep</td>
</tr>
<tr>
<td>SU8</td>
<td>Manual sweep moves one-step up</td>
</tr>
<tr>
<td>SU9</td>
<td>Manual sweep moves one-step down</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:“SU1”                     F.M. auto-sweep started
110 WRITE @103:“SU6”                     F.M. sweep suspended
120 WRITE @103:“SU7”                     F.M. sweep resumed
130 WRITE @103:“SU0”                     F.M. sweep terminated
140 END
(3) Presetting start/stop function memories

Sending the program codes listed below produce the indicated function memory (F.M.) commands.

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUA</td>
<td>Sets current front-panel settings to start F.M.</td>
</tr>
<tr>
<td>SUB</td>
<td>Sets current front-panel settings to stop F.M.</td>
</tr>
</tbody>
</table>

Example

100 WRITE @103:“FN1ST” Store front panel settings in the first address of the function memory.
110 WRITE @103:“SP00” Set function-memory sweep addresses to 1 to 10.
120 WRITE @103:“FUM1..10PT” Set current panel settings to start-function memory data (first address function memory)
130 WRITE @103:“SUA”  
140 END
6.21 Data Request Messages for Function Memory Sweep

The read the function memory sweep data from the MG3633A, the required program code of the data request messages shown in the table below is sent from the controller (talker) to the MG3633A (listener).

### Data Request Messages for Function Memory Sweep

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNOA</td>
<td>Number of function-memory sweep</td>
<td>PT</td>
</tr>
<tr>
<td></td>
<td>points</td>
<td></td>
</tr>
<tr>
<td>FUMOA</td>
<td>Function-memory sweep address</td>
<td>PT</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads function memory sweep data sent from the MG3633A (talker), with format shown in the table below.

### Output Format of Message Sent from Talker

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNOA</td>
<td>FUN△dddPT</td>
<td>△△ddd</td>
<td>The talker sends a space to replace leading</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>zeros.</td>
</tr>
<tr>
<td>FUMOA</td>
<td>FUM△dd.dd.dd…</td>
<td>△dd.dd.dd…</td>
<td>Leading zeros in data separated by periods</td>
</tr>
<tr>
<td></td>
<td>….ddPT</td>
<td>…dd</td>
<td>are sent justified to the left.</td>
</tr>
</tbody>
</table>
(1) Reading the number of function memory sweep points

The number of function-memory sweep points is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“FUM1.5.8PT”         Set function-memory sweep addresses to 1, 5, and 8.
120 WRITE @103:“FUNOA”              Request reading of number of function-memory sweep points.
130 READ @103:A$                    Read data.
140 PRINT A$                       Output the read value the specified device.
150 END
```

Output results: FUN 3PT

(2) Reading function-memory sweep addresses

The function-memory sweep addresses are read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“FUM1.5.8PT”         Set function-memory sweep addresses to 1, 5, and 8.
120 WRITE @103:“FUMOA”              Request reading of function-memory sweep addresses.
130 READ @103:A$                    Read data.
140 PRINT A$                       Output the read value at the specified device.
150 END
```

Output results: FUM 1.5.8PT
6.22 Setting Sweep Time

The program codes for setting the sweep time are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWEEP TIME</td>
<td>SWT</td>
</tr>
<tr>
<td>FUNCTION MEMORY</td>
<td>FT</td>
</tr>
<tr>
<td>SWEEP TIME</td>
<td></td>
</tr>
<tr>
<td>FUNCTION MEMORY</td>
<td></td>
</tr>
<tr>
<td>SWEEP TIME</td>
<td></td>
</tr>
<tr>
<td>FUNCTION MEMORY</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* The sweep time units sec or ms can be used. The corresponding suffix codes are as follows:

- ms : "MS"
- sec : "SEC", "SC"

When suffix codes are omitted, they are regarded as "SEC".

(1) Setting sweep time

Example

The control messages shown below are sent to set a 100 ms sweep time.

```
WRITE @103: "SWT0.1"
WRITE @103: "SWT100MS"
WRITE @103: "SWT0.1SEC"
```

(2) Setting function-memory sweep time

Example

The following control messages shown below are sent to set a 100 ms function-memory sweep time.

```
WRITE @103: "FT0.1"
WRITE @103: "FT100MS"
WRITE @103: "FT0.1SEC"
```
6.23 Data Request Messages for Sweep Time

To read the sweep time data from the MG3633A, the required program codes for data request messages (below) are sent from the controller (talker) to the MG3633A (listener).

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWTOA</td>
<td>Sweep time</td>
<td>sec</td>
</tr>
<tr>
<td>FTOA</td>
<td>Function-memory sweep time</td>
<td>sec</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads sweep time data sent from the MG3633A (talker), with format shown in the table below.

Output Format of Messages Sent from Talker

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWTOA</td>
<td>SWTddd.ddddSEC</td>
<td>ddd.ddddd</td>
<td></td>
</tr>
<tr>
<td>FTOA</td>
<td>FTΔddd.ddddSEC</td>
<td>ddd.ddddd</td>
<td></td>
</tr>
</tbody>
</table>

Note: In the output format of the sweep time message sent from a talker, the leading zeros are replaced by a space. However, zeros to the right of the decimal point are sent.
(1) **Reading sweep time**

The sweep time is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "SWT100MS"       Set sweep time to 100 ms.
120 WRITE @103: "SWTOA"          Request reading of sweep time.
130 READ @103: A$               Read data.
140 PRINT A$                     Output the read value at the specified device.
150 END
```

Output results: SWT 0.10000SEC

(2) **Reading function-memory sweep time**

The function-memory sweep time is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "FT100MS"       Set function-memory sweep time to 100 ms.
120 WRITE @103: "FTOA"         Request reading of function-memory sweep
                                time.
130 READ @103: A$             Read data.
140 PRINT A$                    Output the read value at the specified device.
150 END
```

Output results: FT 0.10000SEC
6.24 Executing Memory Function

The program codes for the memory function are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>STORE</td>
<td>ST</td>
</tr>
<tr>
<td>RECALL</td>
<td>RC</td>
</tr>
<tr>
<td>FREQ</td>
<td>FQ</td>
</tr>
<tr>
<td>FUNCTION</td>
<td>FN</td>
</tr>
</tbody>
</table>

(1) Storing frequency memory
The center frequency is stored in the frequency memory.

Example
The control message shown below is sent to store the center frequency in the frequency memory.

**WRITE @103:“FQ24ST”**  --------------------------------------- Store the center frequency in address 24 of the frequency memory.

(2) Recalling frequency memory
The data stored in the frequency memory is recalled as the center frequency.

Example
The control message shown below is sent to recall the center frequency from the frequency memory.

**WRITE @103:“FQ24RC”**  --------------------------------------- Recall the data from address 24 of the frequency memory as the center frequency.

(3) Storing function memory
The front panel settings are stored in the function memory.

Example
The control message shown below is sent to store the panel settings in the function memory.

**WRITE @103:“FN4ST”**  --------------------------------------- Store the panel settings in address 4 of the function memory.
(4) **Recalling function memory**

The data from the function memory is recalled to the front panel.

Example

The control message shown below is sent to recall data from the function memory.

```
WRITE @103:“FN4RC”  --------------------- Recall the data from address 24 of the function memory to the front panel.
```

6.25 **Executing Special Functions**

The program codes for the Special Functions are shown in the table below.

<table>
<thead>
<tr>
<th>Program Codes for Executing Special Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>SPECIAL</td>
</tr>
</tbody>
</table>

(1) **Executing Special Functions**

Example

The control message shown below is sent to execute the Special Functions.

```
WRITE @103:“SP00”  ---------------------- Set the MG3633A to initial status.
```

**Note:** The special function program code SP must be followed by two numeral digits (00 to 99).
6.26 Data Request Messages for Special Function

To read the special function status data from the MG3633A, the required program codes for data request messages (below) are sent from the controller (talker) to the MG3633A (listener).

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAOA</td>
<td>Special Functions (01 to 20)</td>
<td>None</td>
</tr>
<tr>
<td>SPBOA</td>
<td>Special Functions (21 to 40)</td>
<td>None</td>
</tr>
<tr>
<td>SPCOA</td>
<td>Special Functions (41 to 60)</td>
<td>None</td>
</tr>
<tr>
<td>SPDOA</td>
<td>Special Functions (61 to 80)</td>
<td>None</td>
</tr>
<tr>
<td>SPEOA</td>
<td>Special Functions (81 to 99)</td>
<td>None</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads special function status data sent from the MG3633A (talker), with format shown in the table below.

**Output Format of Messages Sent from Talker**

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAOA</td>
<td>SPAΔdddddddddddddddddd</td>
<td>Δddddddddddddddddddddd</td>
<td></td>
</tr>
<tr>
<td>SPBOA</td>
<td>SPBΔdddddddddddddddddd</td>
<td>Δddddddddddddddddddddd</td>
<td></td>
</tr>
<tr>
<td>SPCOA</td>
<td>SPCΔdddddddddddddddddd</td>
<td>Δddddddddddddddddddddd</td>
<td></td>
</tr>
<tr>
<td>SPDOA</td>
<td>SPDΔdddddddddddddddddd</td>
<td>Δddddddddddddddddddddd</td>
<td></td>
</tr>
<tr>
<td>SPEOA</td>
<td>SPEΔdddddddddddddddddd</td>
<td>Δddddddddddddddddddddd</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** For the data output format of the special function message sent from a talker, “0” is “not set” and “1” is “set” status (paragraph 4.11.1 in a separate operation manual). For example, SPAΔ00001000010000100001 means SP5, 10, 15, and 20 are set.
(1) Reading special functions
(a) The 01 to 20 special functions are read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "SP00" 1111111111111111 Perform initialization
120 WRITE @103: "SPAOA" 1111111111111111 Request reading of 01 to 20 Special Functions.
130 READ @103: A$ 1111111111111111 Read the data.
140 PRINT A$ 1111111111111111 Output the read value at the specified device.
150 END
```

Output results: SPA 01101010001010101001

(b) The 21 to 40 special functions are read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "SP00" 1111111111111111 Perform initialization.
120 WRITE @103: "SPBOA" 1111111111111111 Request reading of 21 to 40 Special Functions.
130 READ @103: A$ 1111111111111111 Read data.
140 PRINT A$ 1111111111111111 Output the read value at the specified device.
150 END
```

Output results: SPB 00101000010000100000

(c) The 41 to 60 special functions are read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103: "SP00" 1111111111111111 Perform initialization.
120 WRITE @103: "SPCOA" 1111111111111111 Request reading of 41 to 60 Special Functions.
130 READ @103: A$ 1111111111111111 Read data.
140 PRINT A$ 1111111111111111 Output the read value at the specified device.
150 END
```

Output results: SPC 0010100000000000000001
(d) The 61 to 80 special functions are read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:”SP00”  -------------- Perform initialization.
120 WRITE @103:”SPDOA” ----------- Request reading of 61 to 80 Special Functions.
130 READ @103:A$            ------ Read data.
140 PRINT A$                ---------- Output the read value at the specified device.
150 END
```

Output results: SPD 00000000001000000000

(e) The 81 to 99 special functions are read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:”SP00”  -------------- Perform initialization.
120 WRITE @103:”SPEOA” ----------- Request reading of 81 to 99 Special Functions.
130 READ @103:A$            ------ Read data.
140 PRINT A$                ---------- Output the read value at the specified device.
150 END
```

Output results: SPE 00000100000000000000
6.27 Setting Trigger Program

The program codes for setting the trigger program are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRIGGER</td>
<td>TRG</td>
</tr>
<tr>
<td>TRIGGER PROGRAM SET</td>
<td></td>
</tr>
</tbody>
</table>

(1) Setting trigger program

Example

The control messages shown below are sent to set the trigger program.

```
WRITE @103:” TRG30. 01. 00. 10. 07. 13” .... Set center frequency to 10.7 MHz.
```

**Note:** See paragraph 4.11.18 in a separate operation manual for key codes.
6.28 Data Request Message for Trigger Program

To read the trigger program data from the MG3633A, the required program code for the data request message (below) is sent from the controller (talker) to the MG3633A (listener).

### Data Request Messages for Trigger Program

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRGOA</td>
<td>Trigger program</td>
<td>None</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads the trigger program data sent from the MG3633A (talker) with format shown in the table below.

### Output Format of Messages Sent from Talker

Δ: Space  s: Sign  d: Data

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRGOA</td>
<td>TRGΔ dd.dd.dd.⋯.dd</td>
<td>Δ dd.dd.dd.⋯.dd</td>
<td>The data separated by periods are sent as two fixed digits in which “0” is also used as a significant digit.</td>
</tr>
</tbody>
</table>

(1) Reading trigger program

The trigger program is read using the following method.

Example

```
100 DIM A$*100
110 WRITE @103:“TRG30.01.00.10.07.13”  … Set center frequency to 10.7 MHz.
120 WRITE @103:“TRGOA”                 … Request reading of trigger program.
130 READ @103:A$                      … Read data.
140 PRINT A$                         … Output the read value at the specified device.
150 END
```

Output results:  TRG  30.01.00.10.07.13
6.29 Data Request Messages for Error Status and Option Settings

To read error status and option settings from the MG3633A, the required program codes for data request messages (below) are sent from the controller (talker) to the MG3633A (listener).

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>STSOA</td>
<td>Error status</td>
<td>None</td>
</tr>
<tr>
<td>OPTOA</td>
<td>Option setting condition</td>
<td>None</td>
</tr>
</tbody>
</table>

After sending the above message, the MG3633A and controller are specified as the talker and listener, respectively.

The controller (listener) reads the data sent from the MG3633A (talker) with data format shown in the table below.

### Output Format of Message Sent from Talker

<table>
<thead>
<tr>
<th>Program code</th>
<th>With header (SP60)</th>
<th>Without header (SP61)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>STSOA</td>
<td>STSΔdd</td>
<td>Δdd</td>
<td>The data is sent as two fixed digits in which “0” is also used as a significant digit.</td>
</tr>
<tr>
<td>OPTOA</td>
<td>OPTΔdddddddddddddddddddd</td>
<td>Δdddddddddddddddddddd</td>
<td>“0” is “not set” and “1” is “set” status (paragraph 4.11.26 in a separate operation manual).</td>
</tr>
</tbody>
</table>
(1) Reading error status

Error status is read using the following method.

Example

100 DIM A$*100
110 WRITE @103: "STSOA"  ..........  Request reading of error status.
120 READ @103: A$     ..........................  Read data.
130 PRINT A$     ..................................  Output the read value at the specified device.
140 END

Output results:  STS  01

(2) Reading option setting conditions

The option setting conditions are read using the following method.

Example

100 DIM A$*100
110 WRITE @103: "OPTOA"  ..........  Request reading of option setting conditions.
120 READ @103: A$     ..........................  Read data.
130 PRINT A$     ..................................  Output the read value at the specified device.
140 END

Output results:  OPTA10000000000000000000000000  ......  Option 01 is set.
6.30 High-Speed Data Transfer

The program codes for high-speed data transfer are shown below. These data request messages shown below are sent to specify data to be sent from the MG3633A.

### Program Codes for High-Speed Data Transfer

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Program code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BINARY FREQUENCY SET</td>
<td>B1</td>
</tr>
<tr>
<td>BINARY FREQ MEMORY SET</td>
<td>B2</td>
</tr>
<tr>
<td>BINARY PANEL SET</td>
<td>B3</td>
</tr>
<tr>
<td>BINARY FUNCTION MEMORY SET</td>
<td>B4</td>
</tr>
<tr>
<td>BINARY FREQ MEMORY DATA CHECK</td>
<td>CBF</td>
</tr>
<tr>
<td>BINARY FUNCTION MEMORY DATA CHECK</td>
<td>CBU</td>
</tr>
<tr>
<td>BINARY FREQ MEMORY ADDRESS SET</td>
<td>ABF</td>
</tr>
<tr>
<td>BINARY FUNCTION MEMORY ADDRESS SET</td>
<td>ABU</td>
</tr>
</tbody>
</table>

These data request messages shown below are sent to specify data to be sent from the MG3633A. Then, specify the MG3633A as the talker and read the data.

### Data Request Messages for High-Speed Data Transfer

<table>
<thead>
<tr>
<th>Program code</th>
<th>Data contents</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>B5</td>
<td>Center frequency</td>
<td>None</td>
</tr>
<tr>
<td>B6</td>
<td>Frequency memory data</td>
<td>None</td>
</tr>
<tr>
<td>B7</td>
<td>Front panel settings</td>
<td>None</td>
</tr>
<tr>
<td>B8</td>
<td>Function memory data</td>
<td>None</td>
</tr>
</tbody>
</table>

**Notes:**
1. The MG3633A does not accept other program codes (from the time when the high-speed transfer data request messages are sent) until reading of the data is completed.
2. When transfer time exceeds 10 s, transfer is interrupted. So, when the number of data to be transferred is large, divide the number.
3. Set the number of bytes to be transferred to the value which is specified for the personal computer.
(1) High-speed frequency data transfer

The high-speed transfer of frequency data is performed using the following method.

Example 1

Set the frequencies 903 012 500.00 Hz and 2 456 789 012.34 Hz.

100 OPTION BASE 1 .............................................. Declare subscript lower limit of array variable to 1.
110 DIM INT B(6), I, J Define variable area.
120 DIM FS*12 ................................................ No terminator.
130 TERM IS "" ................................................ No terminator.
140 FOR J = 1 TO 2 .............................................. Convert the frequency data to the packed-BCD format and store it in array variable B ( ).
150 READ FS ...................................................... Send control message “B1”.
160 FOR I = 1 TO 3 .............................................. Send array variable B ( ) data of 2 bytes at the same time.
170 LET A = HVAL(FS(I*4 - 3: I*4)) Convert the frequency to 100 MHz.
180 LET B(I + (J - 1)*3) = A ..................................
190 NEXT I .....................................................
200 NEXT J .....................................................
210 WRITE @103: "B1" ......................................... Set frequency data 1.
220 EOI ON .....................................................
230 MAT WRITE @1 USING "WH": B ...................... Set frequency data 2.
240 EOI OFF ..................................................
250 STOP .......................................................% 260 DATA "090301250000" ...........................................
270 DATA "245678901234" ...........................................
280 END ...........................................................

Note: Data format is the packed-BCD (where 1 byte represents two-digit integer), where 6 bytes represent one frequency and the resolution (least digit) is 0.01 Hz. The MG3633A performs I/O settings each time data is received.

Example 2

Set 100 MHz frequency and read the frequency using high-speed transfer.

100 OPTION BASE 1 .............................................. Declare subscript lower limit of array variable to 1.
110 DIM INT B(3), I Define variable area.
120 DIM FS*12 ................................................ No terminator.
130 WRITE @103: "FR100MHZ" ............................... Set frequency to 100 MHz.
140 WRITE @103: "B5" ......................................... Request high-speed reading of frequency.
150 MAT READ @103 USING "WH": B ...................... Read data of 2 bytes at the same time.
160 LET FS = HSTR$(B(1), 4)&HSTR$(B(2), 4)&HSTR$(B(3), 4) Convert the packed-BCD format data to hexadecimal data.
170 PRINT FS ................................................ Output the read value at the specified device.
180 END ...........................................................
High-speed data transfer to frequency memory

The high-speed frequency-data transfer to the frequency memory is performed using the following method.

Example 1

Set the frequencies 903 012 500.00 Hz to the frequency \( \times \) address 0.

```
100 OPTION BASE 1
110 DIM INT B(3), I,
120 DIM F$*12
130 TERM IS ""
140 READ F$
150 FOR I = 1 TO 3
160 LET A = HVAL(F$(I*4 - 3:1*4))
170 LET B(I) = A
180 NEXT I
190 WRITE @103:"B2"
200 EOI ON
210 MAT WRITE @1 USING"WH":B
220 EOI OFF
230 STOP
240 DATA "090301250000"
250 END
```

- Declare subscript lower limit of array variable to 1.
- Define variable area.
- No terminator.
- Convert frequency data to the packed-BCD format and store it in array variable B ( ).
- Send control message "B2".
- Send array variable B ( ) data of 2 bytes at the same time.
- Set frequency data.

Note: Data format is the packed-BCD (where 1 byte represents two-digit integer), where 6 bytes represent one frequency and the resolution (least digit) is 0.01 Hz.
Example 2

Read the data from addresses 50 to 52 of the frequency memory using high-speed transfer.

100 OPTION BASE 1
110 DIM INT B(9), I, J
120 DIM FS$*12
130 WRITE @103:“FR100MHZ”
140 WRITE @103:“FQ50ST”
150 WRITE @103:“FR101MHZ”
160 WRITE @103:“FQ51ST”
170 WRITE @103:“FR102MHZ”
180 WRITE @103:“FQ52ST”
190 WRITE @103:“ABF50.52”
200 WRITE @103:“B6”
210 MAT READ @103 USING ”WH”:B
220 FOR J = 1 TO 3
230 LET FS$ = ””
240 FOR I = 1 TO 3
250 LET FS$ = FS$&H$(B(I + (J - 1)*3), 4)
260 NEXT I
270 PRINT FS$
280 NEXT J
290 END

Output results: 010000000000
010100000000
010200000000

Note: The address-specified range is valid unless it is specified to other address. The initial status can take the whole range (0 to 999).
(3) High-speed data transfer of front-panel settings

The high-speed data transfer of the front-panel settings is performed using the following method.

Example 1

Read the current front-panel settings, save them in a file named “PANEL”.

100 OPTION BASE 1  "" Declare subscript lower limit of array variable to 1.
110 DIM INT B(800)  "" Define the variable area.
120 WRITE @103:”FR200MHZ”  "" Set frequency to 200 MHz.
130 WRITE @103:”OL-10DBM”  "" Set output level to –10 dBm.
140 WRITE @103:”OIS5DB”  "" Set increment output level to 6 dB.
150 WRITE @103:”AM30PC”  "" Set AM modulation factor to 30%.
160 WRITE @103:”B7”  "" Request high-speed reading of front-panel settings.
170 MAT READ @103 USING ”B”:B  "" Read data.
180 MAT SAVE ”PANEL”,B  "" Save front-panel settings.
190 END

Example 2

Change the front-panel settings to the settings saved in a file named “PANEL”.

100 OPTION BASE 1  "" Declare subscript lower limit of array variable to 1.
110 DIM INT B(800)  "" Define the modulation.
120 TERM IS ””  "" No terminator.
130 MAT LOAD ”PANEL”, B  "" Load front-panel settings.
140 WRITE @103:”B3”  "" Send control message “B3”.
150 EOI ON
160 MAT WRITE @1 USING ”B”:B  "" Send array variable B( ) data.
170 ·EOI OFF
180 END

Note: Data format is the packed-BCD (where 1 byte represents two-digit integer), where 800 bytes represent one front-panel settings.
(4) **High-speed transfer of function memory data**

The high-speed transfer of function memory data is performed as described below.

**Example**

Read the data from function memories 10 to 14, save it in the file named “FUNCTION”, and store it in 60 to 64 function memories.

```
100 OPTION BASE 1 .................. Declare subscript lower limit of array variable to 1.
110 DIM INT B(4000) .................. Define variable area.
120 WRITE @103:”ABU10.14” ....... Specify function memory address.
130 WRITE @103:”B8“ ................. Request high-speed reading of front-panel settings.
140 MAT READ @103 USING ”B”:B .... Read data.
150 MAT SAVE ”FUNCTION”, B ....... Save function memory settings.
160 WRITE @103:”ABU60.64” ....... Specify function memory address.
170 TERM IS ”” ....................... No terminator.
180 WRITE @103:”B4“ ................. Send “B4” control message.
190 EOI ON
200 MAT WRITE @1 USING ”B”:B .... Send array variable B ( ) data.
210 EOI OFF
220 END
```

**Note:** The address-specified range is valid unless it is specified to other range. The initial status can take the whole range (0 to 99).

(5) **Checking memory data**

<table>
<thead>
<tr>
<th>Program code</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBF</td>
<td>Checks frequency-memory data</td>
</tr>
<tr>
<td>CBU</td>
<td>Checks function-memory data</td>
</tr>
</tbody>
</table>

**Example**

```
100 WRITE @103:”CBF” ................. Check the frequency memory data.
110 END
```

**Note:** If an error occurs with the frequency or function memory data check, 10 MHz or the initial status contents will be stored in all the addresses, respectively.
SECTION 7
TALK/LISTEN ONLY MODES

The MG3633A talk or listen-only model can be set using Special Functions. The “Only” mode can turned off by executing SP64.

7.1 Talk-Only Mode
In the talk-only mode, three functions can be selected as described below.

1. Talk-only mode for carrier frequency (SP65)
The talker sends carrier frequency data only when the carrier frequency data varies. The output format is the same as the talker output message format with the header and unit.
Output example

\[
\text{FRΔΔΔ}360300000.00\text{Hz} \quad \Delta : \text{Space}
\]

2. Talk-only mode for output level (SP66)
The talker sends the output level data only when the output level data varies.
The output format is the same as the talker output message format with the header and unit.
Output example

\[
\text{OL} \Delta \rightarrow \Delta 15.0\text{DBM}
\]

3. Talk-only mode for both carrier frequency and output level (SP67)
The talker sends both the carrier frequency and output level data simultaneously when either the carrier frequency or output level data varies.
The output format is as shown below.
Output example

\[
\text{FRΔΔΔ}360300000.00\text{Hz} , \text{OL} \Delta \rightarrow \Delta 15.0\text{DBM}
\]

7.2 Listen-Only Mode
The listen-only mode is set by executing SP68. All the MG3633A control messages are subject codes.

Notes: 1. The front-panel keys can be operated in either the talk-only or listen-only mode.
2. When the talk-only or listen-only mode is changed to other state, turn off and then turn on the pow
SECTION 8
PROGRAMMING

8.1 Programming Using Status Message

In a similar manner in which a talker or listener issues an SRQ signal on the GP-IB, an interruption can be sent to the controller. The controller checks which talker or listener issued the SRQ interruption signal; this is called polling. Of the two types of polling, serial and parallel, the MG3633A uses serial polling.

The following figure shows the serial polling operation.

1. Service request from device side (SRQ = 1, low level)
   The device side sets the SRQ line to low level.

2. Serial polling mode
   When the controller detects SRQ = 1, it sends a Serial Poll Enable (SPE) command, places all devices under serial polling mode, and assigns itself as the listener and the devices as the talker one-by-one.

3. Status message send
   The device assigned as the talker sends the status message (status byte: STB) to the controller.

4. STB bit 6 = 1?
   Yes
   SRQ = 0 (high level)
   When STB with bit 6 = 1 is received by the controller, the device which sends the STB sets the SRQ line to high level.

5. Serial polling mode release
   Since the data cannot be sent or received in the serial poll mode, the controller sends the Serial Poll Disable (SPD) command to release the serial poll mode.

Serial Polling Mode
Using the PACKET V Personal Technical Computer, the following statement is used as a command to process items \( \text{@} \) to \( \text{@} \) in the flowchart above.

```
STATUS @ device number: numeric variable
```

Serial polling to the MG3633A with address No. 03 is described as shown below.

- \( \text{STATUS @103 : 5} \)
  - The contents of the status data (weight) are input in variable S.
  - Specify the MG3633A (address No. 03) as talker.
  - GP-IB interface select code 1

Each bit of the status data byte (STB) has a meaning as shown below.

The status meaning of the lower 4 bits (bit 3 to bit 0) depends on the value (1 or 0) of error bit (bit 5).

- **When error bit is 1**

<table>
<thead>
<tr>
<th>bit</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Data</td>
<td>DIO8</td>
<td>DIO7</td>
<td>DIO6</td>
<td>DIO5</td>
<td>DIO4</td>
<td>DIO3</td>
<td>DIO2</td>
<td>DIO1</td>
</tr>
<tr>
<td>1</td>
<td>×*</td>
<td>Service request (SRQ)</td>
<td>ERROR</td>
<td>BUSY</td>
<td>Malfunction (error)</td>
<td>Self test error</td>
<td>Suspension error</td>
<td>Data error</td>
</tr>
<tr>
<td>0</td>
<td>×*</td>
<td>No service request</td>
<td>NO ERROR</td>
<td>READY</td>
<td>No malfunction (No error)</td>
<td>No self test error</td>
<td>No suspension error</td>
<td>No data error</td>
</tr>
<tr>
<td>Weight</td>
<td>128</td>
<td>64</td>
<td>32</td>
<td>16</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Sending</td>
<td>0</td>
<td>1/0</td>
<td>1</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>Special Function to mask off</td>
<td>×</td>
<td>×</td>
<td>SP71</td>
<td>SP72</td>
<td>SP73</td>
<td>SP74</td>
<td>SP75</td>
<td>SP76</td>
</tr>
</tbody>
</table>

*: × means unused.
### When error bit is 0

<table>
<thead>
<tr>
<th>bit</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DIO8</td>
<td>DIO7</td>
<td>DIO6</td>
<td>DIO5</td>
<td>DIO4</td>
<td>DIO3</td>
<td>DIO2</td>
<td>DIO1</td>
</tr>
<tr>
<td>Line</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>×*</td>
<td>Service request (SRQ)</td>
<td>ERROR</td>
<td>BUSY</td>
<td>Trigger program execution completed</td>
<td>Sweep execution completed</td>
<td>Marker position marked</td>
<td>String execution completed</td>
</tr>
<tr>
<td>0</td>
<td>×*</td>
<td>No service request</td>
<td>NO ERROR</td>
<td>READY</td>
<td>Trigger program execution incomplete</td>
<td>Sweep execution incomplete</td>
<td>Marker position not matched</td>
<td>String execution incomplete</td>
</tr>
<tr>
<td>Weight</td>
<td>128</td>
<td>64</td>
<td>32</td>
<td>16</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Sending</td>
<td>0</td>
<td>1/0</td>
<td>0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>Special Function to mask off</td>
<td>×</td>
<td>×</td>
<td>SP71</td>
<td>SP72</td>
<td>SP77</td>
<td>SP78</td>
<td>SP79</td>
<td>SP80</td>
</tr>
</tbody>
</table>

*: × means unused.

**Note:** The special function SP70 is used to mask the STB.

As described above, when the controller requests a status byte from a talker or listener, the serial poll method determines, by the status byte contents, which talker or listener generated the SRQ. The talker or listener that generated the SRQ sets bit 6 (SRQ message) of the status byte to 1. Other bits indicate the status when the SRQ is generated.
Special Functions 70 to 80 are used as commands to turn on/off SRQ generation (shown below) before performing a serial poll in the program.

<table>
<thead>
<tr>
<th>Function</th>
<th>Name of function</th>
<th>Example</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP70 :</td>
<td>Masks all SRQs</td>
<td>(ALL MASK)</td>
<td></td>
</tr>
<tr>
<td>SP71 :</td>
<td>Releases SRQ mask concerning ERROR</td>
<td>(ERROR MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP72 :</td>
<td>Releases SRQ mask concerning BUSY</td>
<td>(BUSY/READY MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP73 :</td>
<td>Releases SRQ mask concerning MAL-FUNCTION ERROR</td>
<td>(MAL-FUNCTION ERROR MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP74 :</td>
<td>Releases SRQ mask concerning SELF TEST ERROR</td>
<td>(SELF TEST ERROR MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP75 :</td>
<td>Releases SRQ mask concerning SUSPENSION ERROR</td>
<td>(SUSPENSION ERROR MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP76 :</td>
<td>Releases SRQ mask concerning DATA ERROR</td>
<td>(DATA ERROR MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP77 :</td>
<td>Releases SRQ mask concerning TRIGGER PROGRAM END</td>
<td>(TRIGGER PROGRAM END MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP78 :</td>
<td>Releases SRQ mask concerning SWEEP END</td>
<td>(SWEEP END MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP79 :</td>
<td>Releases SRQ mask concerning MARKER POSITION</td>
<td>(MARKER POSITION MASK OFF)</td>
<td></td>
</tr>
<tr>
<td>SP80 :</td>
<td>Releases SRQ mask concerning STRING END</td>
<td>(STRING END MASK OFF)</td>
<td></td>
</tr>
</tbody>
</table>

For example, when WRITE @103:“SP71” is sent, the MG3633A performs a service request to the controller with bit 6 = 1 only when bit 5 = 1 (when an error occurs).

Then, when STATUS @ 103:S is performed, the contents of S are 96, since bit 6 = 1 and bit 5 = 1 (S = 2^6 + 2^5 = 96).

The BIT(N, S) function is used to detect the bit position in the binary value of the numeric variable S (≥ 65535).

(N specifies bit position of numeric expression S)

<table>
<thead>
<tr>
<th>Function</th>
<th>Name of function</th>
<th>Example</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| BIT (N, S)| Bit check        | In HSTR$(16385,4) = 4001  
4001 = 0100 0000 0000 0001  
BIT (15,16385) = 0  
BIT (0,16385) = 1 | Checks that the bit at position N of the numeric expression S is 0 or 1. |

The service request is made from the device regardless of the current process being performed by the controller, so it is an interruption process from the device to the controller.
Example

This example creates a program, written in BASIC, to control the MG3633A using the PACKET computer (Anritsu) with the configurations shown below.

```
100 DIM INT I,$ .............................................. Define variables as integer type.
110 WRITE @103: "5P70,5P78"  ...................... Release sweep end SRQ mask.
  120 ! ....................................................... Set frequency to 100 MHz.
  130 WRITE @103: "FR100MHZ"  ...................... Set incremental (step) frequency to 250 kHz.
  140 WRITE @103: "FIS250KHZ"  ......................
  150 ! ....................................................... Store frequencies in 0 to 400 frequency-memory addresses.
  160 FOR I = 0 TO 400  .............................. Store in frequency memory.
  170 WRITE @103: "FQ",STR$(I),"ST"  .......... Step-up frequency by 250 kHz.
  180 WRITE @103: "UFR"  ............................... 200 !
  190 NEXT I .............................................
  210 WRITE @103: "FRM0..400PT" .................... Set frequency-memory sweep address range to 0 to 400 addresses.
  220 WRITE @103: "SWT1SEC"  .......................... Set sweep time to 1 second.
  230 WRITE @103: "5R2"  ............................... Start single sweep.
  240 ! ....................................................... Perform serial polling
  250 DO ................................................... Read STB.
  260 STATUS @103:5  ................................. Exit from loop when both STB RQS (bit 6) and
  270 EXIT IF BIT(6,5) = 1 AND BIT(2,5) = 1 ... sweep end (bit 2) are 1.

  280 LOOP
  290 ! ....................................................... Specify output device at display.
  300 PRINTER IS @0  ................................. Output "SWEEP END" on display.
  310 PRINT "SWEEP END"  .............................
  320 ! ....................................................... 330 END
```

Store 100 to 200 MHz frequencies in 0 to 400 frequency-memory addresses in 250 kHz steps, and sweep the frequency memory in a 1 second step.
# APPENDIXES

## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DEVICE MESSAGE IN ALPHABETIC ORDER</td>
<td>A-1</td>
</tr>
<tr>
<td>B</td>
<td>SPECIAL FUNCTION IN NUMERICAL ORDER</td>
<td>B-1</td>
</tr>
<tr>
<td>C</td>
<td>UNIVERSAL ASCII* CODE TABLE</td>
<td>C-1</td>
</tr>
<tr>
<td>D</td>
<td>BIT ASSIGNMENT FOR CAUSES OF GP-IB INTERFACE INTERRUPT</td>
<td>D-1</td>
</tr>
<tr>
<td>E</td>
<td>IEEE STANDARD ABBREVIATIONS INDEX</td>
<td>E-1</td>
</tr>
</tbody>
</table>
## APPENDIX A

### DEVICE MASSAGE IN ALPHABETIC ORDER

**Device Massage in Alphabetic Order (1/12)**

<table>
<thead>
<tr>
<th>Program code</th>
<th>Parameter</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>AM OFF</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>A1</td>
<td>INT AM MODE ON</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>A2</td>
<td>EXT AC AM MODE ON</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>A3</td>
<td>EXT DC AM MODE ON</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>A4</td>
<td>INT/EXT AC AM MODE ON</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>A5</td>
<td>INT/EXT DC AM MODE ON</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>ABF</td>
<td>BINARY FREQ MEMORY ADDRESS SET</td>
<td>BINARY</td>
</tr>
<tr>
<td>ABU</td>
<td>BINARY FUNCTION MEMORY ADDRESS SET</td>
<td>BINARY</td>
</tr>
<tr>
<td>AD0</td>
<td>AM RESOLUTION 1st DIGIT</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>AD1</td>
<td>AM RESOLUTION 2nd DIGIT</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>AD2</td>
<td>AM RESOLUTION 3rd DIGIT</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>AD3</td>
<td>AM RESOLUTION RIGHT</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>AD4</td>
<td>AM RESOLUTION LEFT</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>AF</td>
<td>AF (AUDIO FREQUENCY)</td>
<td>AF OSC</td>
</tr>
<tr>
<td>AFOA</td>
<td>AF FREQUENCY request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>AIS</td>
<td>AF INCREMENTAL STEP</td>
<td>AF OSC</td>
</tr>
<tr>
<td>AISOA</td>
<td>AF INCREMENTAL STEP request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>ALG</td>
<td>AF SWEEP STEP LOG SIZE</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>AM</td>
<td>AM (AMPLITUDE MODULATION)</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>AMOA</td>
<td>AM request</td>
<td>Data request message (%)</td>
</tr>
<tr>
<td>AP</td>
<td>OUTPUT LEVEL or AMPLITUDE</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>APOA</td>
<td>OUTPUT LEVEL request</td>
<td>Data request message (dBm, dBu, V)</td>
</tr>
<tr>
<td>APDBM</td>
<td>OUTPUT LEVEL UNIT dBm or AMPLITUDE UNIT dBm</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>APDM</td>
<td>OUTPUT LEVEL UNIT dBm or AMPLITUDE UNIT dBm</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>APDBU</td>
<td>OUTPUT LEVEL UNIT dBμ or AMPLITUDE UNIT dBμ</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>APDU</td>
<td>OUTPUT LEVEL UNIT dBμ or AMPLITUDE UNIT dBμ</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>APV</td>
<td>OUTPUT LEVEL UNIT V or AMPLITUDE UNIT V</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>AR0</td>
<td>AF RESOLUTION 0.1 Hz</td>
<td>AF OSC</td>
</tr>
<tr>
<td>AR1</td>
<td>AF RESOLUTION 1 Hz</td>
<td>AF OSC</td>
</tr>
<tr>
<td>AR2</td>
<td>AF RESOLUTION 10 Hz</td>
<td>AF OSC</td>
</tr>
<tr>
<td>AR3</td>
<td>AF RESOLUTION 100 Hz</td>
<td>AF OSC</td>
</tr>
<tr>
<td>AR4</td>
<td>AF RESOLUTION 1 kHz</td>
<td>AF OSC</td>
</tr>
<tr>
<td>AR5</td>
<td>AF RESOLUTION 10 kHz</td>
<td>AF OSC</td>
</tr>
<tr>
<td>ASA</td>
<td>AF SWEEP START</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>ASAOA</td>
<td>AF SWEEP START request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>ASB</td>
<td>AF SWEEP STOP</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>ASBOA</td>
<td>AF SWEEP STOP request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>ASL</td>
<td>AF RESOLUTION LEFT</td>
<td>AF OSC</td>
</tr>
<tr>
<td>ASN</td>
<td>AF SWEEP POINT</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>ASNOA</td>
<td>AF SWEEP POINT request</td>
<td>Data request message (PT)</td>
</tr>
<tr>
<td>ASP</td>
<td>AF SWEEP SPAN</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>ASPOA</td>
<td>AF SWEEP SPAN request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>ASR</td>
<td>AF RESOLUTION RIGHT</td>
<td>AF OSC</td>
</tr>
<tr>
<td>ASZ</td>
<td>AF SWEEP STEP SIZE</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>ASZOA</td>
<td>AF SWEEP STEP SIZE request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>B1</td>
<td>BINARY FREQUENCY SET</td>
<td>BINARY</td>
</tr>
<tr>
<td>B2</td>
<td>BINARY FREQ MEMORY SET</td>
<td>BINARY</td>
</tr>
<tr>
<td>B3</td>
<td>BINARY PANEL SET</td>
<td>BINARY</td>
</tr>
<tr>
<td>B4</td>
<td>BINARY FUNCTION MEMORY SET</td>
<td>BINARY</td>
</tr>
<tr>
<td>B5</td>
<td>CENTER FREQUENCY request</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>B6</td>
<td>FREQ MEMORY DATA request</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>B7</td>
<td>PANEL SET CONDITION request</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>B8</td>
<td>FUNCTION MEMORY DATA request</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>CAL</td>
<td>FREQ CAL</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>CBF</td>
<td>BINARY FREQ MEMORY DATA CHECK</td>
<td>BINARY</td>
</tr>
<tr>
<td>CBU</td>
<td>BINARY FUNCTION MEMORY DATA CHECK</td>
<td>BINARY</td>
</tr>
<tr>
<td>CF</td>
<td>FREQUENCY or CENTER FREQUENCY</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>CFOA</td>
<td>FREQUENCY request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>DAF</td>
<td>INCREMENTAL STEP DOWN AF</td>
<td>AF OSC</td>
</tr>
<tr>
<td>DAM</td>
<td>INCREMENTAL STEP DOWN AM</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>DB</td>
<td>dB</td>
<td>UNIT</td>
</tr>
<tr>
<td>DBM</td>
<td>dBm</td>
<td>UNIT</td>
</tr>
<tr>
<td>DM</td>
<td>dBm</td>
<td>UNIT</td>
</tr>
<tr>
<td>DBU</td>
<td>dBµ</td>
<td>UNIT</td>
</tr>
<tr>
<td>DEG</td>
<td>degree</td>
<td>UNIT</td>
</tr>
<tr>
<td>DG</td>
<td>degree</td>
<td>UNIT</td>
</tr>
<tr>
<td>DFM</td>
<td>INCREMENTAL STEPDOWN FM</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>DFR</td>
<td>INCREMENTAL STEP DOWN FREQ</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>DOL</td>
<td>INCREMENTAL STEP DOWN OUTPUT LEVEL</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>DPH</td>
<td>INCREMENTAL STEP DOWN ØM</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>DU</td>
<td>dBµ</td>
<td>UNIT</td>
</tr>
<tr>
<td>EAF</td>
<td>KNOB DOWN AF</td>
<td>AF OSC</td>
</tr>
<tr>
<td>EAM</td>
<td>KNOB DOWN AM</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>EFM</td>
<td>KNOB DOWN FM</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>EFR</td>
<td>KNOB DOWN FREQ</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>EOL</td>
<td>KNOB DOWN OUTPUT LEVEL</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>EPH</td>
<td>KNOB DOWN ØM</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>EXD</td>
<td>EXT DEVIATION FIX</td>
<td>MODULATION [FM/ØM]</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>EXDOA</td>
<td>FM/ΩM EXT DEVIATION FIX request</td>
<td>Data request message (Hz, rad, deg)</td>
</tr>
<tr>
<td>F0</td>
<td>FM OFF</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>F1</td>
<td>INT FM MODE ON</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>F2</td>
<td>EXT AC FM MODE ON</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>F3</td>
<td>EXT DC FM MODE ON</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>F4</td>
<td>INT/EXT AC FM MODE ON</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>F5</td>
<td>INT/EXT DC FM MODE ON</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>FC</td>
<td>FREQUENCY or CENTER FREQUENCY</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>FCOA</td>
<td>FREQUENCY request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>FD0</td>
<td>FM RESOLUTION 1st DIGIT</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>FD1</td>
<td>FM RESOLUTION 2nd DIGIT</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>FD2</td>
<td>FM RESOLUTION 3rd DIGIT</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>FD3</td>
<td>FM RESOLUTION RIGHT</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>FD4</td>
<td>FM RESOLUTION LEFT</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>FF</td>
<td>FREQ RELATIVE OFF</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>FIS</td>
<td>FREQUENCY INCREMENTAL STEP request</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>FISOA</td>
<td>FREQUENCY INCREMENTAL STEP</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>FLG</td>
<td>FREQ SWEEP STEP LOG SIZE</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>FM</td>
<td>FM (FREQUENCY MODULATION)</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>FMOA</td>
<td>FM request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>FN</td>
<td>FUNCTION</td>
<td>MEMORY</td>
</tr>
<tr>
<td>FO</td>
<td>FREQ RELATIVE ON</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>FOS</td>
<td>FREQ OFFSET</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>FOSOA</td>
<td>FREQ OFFSET request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>FQ</td>
<td>FREQ</td>
<td>MEMORY</td>
</tr>
<tr>
<td>FR</td>
<td>FREQUENCY or CENTER FREQUENCY</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>FRM</td>
<td>FREQ MEMORY SWEEP ADDRESS</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>FRMOA</td>
<td>FREQ MEMORY SWEEP ADDRESS request</td>
<td>Data request message (PT)</td>
</tr>
<tr>
<td>Program Code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>FRNOA</td>
<td>FREQ MEMORY SWEEP POINT request</td>
<td>Data request message (PT)</td>
</tr>
<tr>
<td>FROA</td>
<td>FREQUENCY request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>FSA</td>
<td>FREQ SWEEP START</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>FSAOA</td>
<td>FREQ SWEEP START request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>FSB</td>
<td>FREQ SWEEP STOP</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>FSBOA</td>
<td>FREQ SWEEP STOP request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>FSL</td>
<td>FREQ RESOLUTION LEFT</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>FSN</td>
<td>FREQ SWEEP POINT</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>FSNOA</td>
<td>FREQ SWEEP POINT request</td>
<td>Data request message (PT)</td>
</tr>
<tr>
<td>FSP</td>
<td>FREQ SWEEP SPAN</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>FSPOA</td>
<td>FREQ SWEEP SPAN request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>FSR</td>
<td>FREQ RESOLUTION RIGHT</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>FSZ</td>
<td>FREQ SWEEP STEP SIZE</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>FSZOA</td>
<td>FREQ SWEEP STEP SIZE request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>PT</td>
<td>FUNCTION MEMORY SWEEP TIME</td>
<td>SWEEP TIME</td>
</tr>
<tr>
<td>FTOA</td>
<td>FUNCTION MEMORY SWEEP TIME request</td>
<td>Data request message (sec)</td>
</tr>
<tr>
<td>FUM</td>
<td>FUNCTION MEMORY SWEEP ADDRESS</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>FUMOA</td>
<td>FUNCTION MEMORY SWEEP ADDRESS request</td>
<td>Data request message (PT)</td>
</tr>
<tr>
<td>FUNOA</td>
<td>FUNCTION MEMORY SWEEP POINT request</td>
<td>Data request message (PT)</td>
</tr>
<tr>
<td>GHZ</td>
<td>GHz</td>
<td>UNIT</td>
</tr>
<tr>
<td>GZ</td>
<td>GHz</td>
<td>UNIT</td>
</tr>
<tr>
<td>HZ</td>
<td>Hz</td>
<td>UNIT</td>
</tr>
<tr>
<td>IND</td>
<td>FM/ØM INT DEVIATION FIX</td>
<td>MODULATION [FM/ØM]</td>
</tr>
<tr>
<td>INDOA</td>
<td>FM/ØM INT DEVIATION FIX request</td>
<td>Data request message (Hz, rad, deg)</td>
</tr>
<tr>
<td>KHZ</td>
<td>kHz</td>
<td>UNIT</td>
</tr>
<tr>
<td>KZ</td>
<td>kHz</td>
<td>UNIT</td>
</tr>
<tr>
<td>L0</td>
<td>OUTPUT LEVEL RESOLUTION 0.1 dB</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>L1</td>
<td>OUTPUT LEVEL RESOLUTION 1 dB</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>L2</td>
<td>OUTPUT LEVEL RESOLUTION 10 dB</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>LC</td>
<td>OUTPUT LEVEL CONTINUOUS MODE SET</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>LF</td>
<td>OUTPUT LEVEL RELATIVE OFF</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>LN</td>
<td>OUTPUT LEVEL NORMAL MODE SET</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>LO</td>
<td>OUTPUT LEVEL RELATIVE ON</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>M0</td>
<td>INT MOD FREQ OUTPUT AF OSC</td>
<td>AF OSC</td>
</tr>
<tr>
<td>M1</td>
<td>INT MOD FREQ OUTPUT 1kHz</td>
<td>AF OSC</td>
</tr>
<tr>
<td>M2</td>
<td>INT MOD FREQ OUTPUT 400 Hz</td>
<td>AF OSC</td>
</tr>
<tr>
<td>MHZ</td>
<td>MHz</td>
<td>UNIT</td>
</tr>
<tr>
<td>MS</td>
<td>milli second</td>
<td>UNIT</td>
</tr>
<tr>
<td>MV</td>
<td>mV</td>
<td>UNIT</td>
</tr>
<tr>
<td>MZ</td>
<td>MHz</td>
<td>UNIT</td>
</tr>
<tr>
<td>OIS</td>
<td>OUTPUT LEVEL INCREMENTAL STEP request</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OISOA</td>
<td>OUTPUT LEVEL INCREMENTAL STEP request</td>
<td>Data request message (dB)</td>
</tr>
<tr>
<td>OL</td>
<td>OUTPUT LEVEL or AMPLITUDE</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OLOA</td>
<td>OUTPUT LEVEL request</td>
<td>Data request message (dBm, dBM, V)</td>
</tr>
<tr>
<td>OLDBM</td>
<td>OUTPUT LEVEL UNIT dBm or AMPLITUDE UNIT dBm</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OLDM</td>
<td>OUTPUT LEVEL UNIT dBm or AMPLITUDE UNIT dBm</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OLDBU</td>
<td>OUTPUT LEVEL UNIT dBM or AMPLITUDE UNIT dBM</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OLDU</td>
<td>OUTPUT LEVEL UNIT dBm or AMPLITUDE UNIT dBM</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OLM</td>
<td>OUTPUT LEVEL LIMIT</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OLMOA</td>
<td>OUTPUT LEVEL LIMIT request</td>
<td>Data request message (dBm, dBM, V)</td>
</tr>
<tr>
<td>OLV</td>
<td>OUTPUT LEVEL UNIT V or AMPLITUDE UNIT V</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OOS</td>
<td>OUTPUT LEVEL OFFSET</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>OOSOA</td>
<td>OUTPUT LEVEL OFFSET request</td>
<td>Data request message (dB)</td>
</tr>
<tr>
<td>OPTOA</td>
<td>OPTION request</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>OSA</td>
<td>OUTPUT LEVEL SWEEP START</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>OSAOA</td>
<td>OUTPUT LEVEL SWEEP START request</td>
<td>Data request message (dBm, dBμ, V)</td>
</tr>
<tr>
<td>OSB</td>
<td>OUTPUT LEVEL SWEEP STOP</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>OSBOA</td>
<td>OUTPUT LEVEL SWEEP STOP request</td>
<td>Data request message (dBm, dBμ, V)</td>
</tr>
<tr>
<td>OSL</td>
<td>OUTPUT LEVEL RESOLUTION LEFT</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>OSNOA</td>
<td>OUTPUT LEVEL POINT request</td>
<td>Data request message (PT)</td>
</tr>
<tr>
<td>OSP</td>
<td>OUTPUT LEVEL SWEEP SPAN</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>OSPOA</td>
<td>OUTPUT LEVEL SWEEP SPAN request</td>
<td>Data request message (dB)</td>
</tr>
<tr>
<td>OSR</td>
<td>OUTPUT LEVEL RESOLUTION RIGHT</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>PC</td>
<td>%</td>
<td>UNIT</td>
</tr>
<tr>
<td>PD0</td>
<td>ØM RESOLUTION 1st DIGIT</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PD1</td>
<td>ØM RESOLUTION 2nd DIGIT</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PD2</td>
<td>ØM RESOLUTION 3rd DIGIT</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PD3</td>
<td>ØM RESOLUTION RIGHT</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PD4</td>
<td>ØM RESOLUTION LEFT</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PH0</td>
<td>ØM OFF</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PH1</td>
<td>INT ØM MODE ON</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PH2</td>
<td>EXT AC ØM MODE ON</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PH3</td>
<td>EXT DC ØM MODE ON</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PH4</td>
<td>INT/EXT AC ØM MODE ON</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PH5</td>
<td>INT/EXT DC ØM MODE ON</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PHM</td>
<td>ØM (PHASE MODULATION)</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PHMOA</td>
<td>ØM request</td>
<td>Data request message (rad, deg)</td>
</tr>
<tr>
<td>PHMDEG</td>
<td>ØM UNIT degree</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PHMDG</td>
<td>ØM UNIT degree</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PHMRAD</td>
<td>ØM UNIT radian</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>PHMRD</td>
<td>ØM UNIT radian</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>PT</td>
<td>point</td>
<td>UNIT</td>
</tr>
<tr>
<td>R0</td>
<td>FREQ RESOLUTION 0.01 Hz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R1</td>
<td>FREQ RESOLUTION 0.1 Hz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R2</td>
<td>FREQ RESOLUTION 1 Hz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R3</td>
<td>FREQ RESOLUTION 10 Hz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R4</td>
<td>FREQ RESOLUTION 100 Hz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R5</td>
<td>FREQ RESOLUTION 1 kHz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R6</td>
<td>FREQ RESOLUTION 10 kHz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R7</td>
<td>FREQ RESOLUTION 100 kHz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R8</td>
<td>FREQ RESOLUTION 1 MHz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>R9</td>
<td>FREQ RESOLUTION 10 MHz</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>RAD</td>
<td>radian</td>
<td>UNIT</td>
</tr>
<tr>
<td>RD</td>
<td>radian</td>
<td>UNIT</td>
</tr>
<tr>
<td>RAFOA</td>
<td>REFERENCE AF FREQUENCY request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>RAMOA</td>
<td>REFERENCE AM MODULATION FACTOR request</td>
<td>Data request message (%)</td>
</tr>
<tr>
<td>RC</td>
<td>RECALL</td>
<td>MEMORY</td>
</tr>
<tr>
<td>REFOA</td>
<td>REFERENCE FREQUENCY request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>REEOOA</td>
<td>REFERENCE OUTPUT LEVEL request</td>
<td>Data request message (dBm, dBp)</td>
</tr>
<tr>
<td>RFMOA</td>
<td>REFERENCE FM request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>RPHOA</td>
<td>REFERENCE ØM request</td>
<td>Data request message (rad, deg)</td>
</tr>
<tr>
<td>RLFOA</td>
<td>RELATIVE FREQUENCY request</td>
<td>Data request message (Hz)</td>
</tr>
<tr>
<td>RLOOA</td>
<td>RELATIVE OUTPUT LEVEL request</td>
<td>Data request message (dB)</td>
</tr>
<tr>
<td>RF</td>
<td>OUTPUT LEVEL OFF</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>RO</td>
<td>OUTPUT LEVEL ON</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>RS</td>
<td>RPP RESET</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>SA0</td>
<td>AF SWEEP OFF</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SA1</td>
<td>AF SWEEP AUTO</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SA2</td>
<td>AF SWEEP SINGLE</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SA3</td>
<td>AF SWEEP MANUAL</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>SA4</td>
<td>AF SWEEP MARKER OFF</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SA5</td>
<td>AF SWEEP MARKER ON</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SA6</td>
<td>AF SWEEP BREAK</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SA7</td>
<td>AF SWEEP CONTINUE</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SA8</td>
<td>AF SWEEP STEPUP</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SA9</td>
<td>AF SWEEP STEP DOWN</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SAA</td>
<td>AF SWEEP START PRESET</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SAB</td>
<td>AF SWEEP STOP PRESET</td>
<td>SWEEP (AF OSC)</td>
</tr>
<tr>
<td>SC</td>
<td>second</td>
<td>UNIT</td>
</tr>
<tr>
<td>SEC</td>
<td>second</td>
<td>UNIT</td>
</tr>
<tr>
<td>SF0</td>
<td>FREQ SWEEP OFF</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF1</td>
<td>FREQ SWEEP AUTO</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF2</td>
<td>FREQ SWEEP SINGLE</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF3</td>
<td>FREQ SWEEP MANUAL</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF4</td>
<td>FREQ SWEEP MARKER OFF</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF5</td>
<td>FREQ SWEEP MARKER ON</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF6</td>
<td>FREQ SWEEP BREAK</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF7</td>
<td>FREQ SWEEP CONTINUE</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF8</td>
<td>FREQ SWEEP STEP UP</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SF9</td>
<td>FREQ SWEEP STEP DOWN</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SFA</td>
<td>FREQ SWEEP START PRESET</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SFB</td>
<td>FREQ SWEEP STOP PRESET</td>
<td>SWEEP (FREQ)</td>
</tr>
<tr>
<td>SO0</td>
<td>OUTPUT LEVEL SWEEP OFF</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SO1</td>
<td>OUTPUT LEVEL SWEEP AUTO</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SO2</td>
<td>OUTPUT LEVEL SWEEP SINGLE</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SO3</td>
<td>OUTPUT LEVEL SWEEP MANUAL</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SO4</td>
<td>OUTPUT LEVEL SWEEP MARKER OFF</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SO5</td>
<td>OUTPUT LEVEL SWEEP MARKER ON</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SO6</td>
<td>OUTPUT LEVEL SWEEP BREAK</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>SO7</td>
<td>OUTPUT LEVEL SWEEP CONTINUE</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SO8</td>
<td>OUTPUT LEVEL SWEEP STEP UP</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SO9</td>
<td>OUTPUT LEVEL SWEEP STEP DOWN</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SOA</td>
<td>OUTPUT LEVEL SWEEP START PRESET</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SOB</td>
<td>OUTPUT LEVEL SWEEP STOP PRESET</td>
<td>SWEEP (OUTPUT LEVEL)</td>
</tr>
<tr>
<td>SP</td>
<td>SPECIAL FUNCTION</td>
<td>SPECIAL</td>
</tr>
<tr>
<td>SPAOA</td>
<td>SPECIAL FUNCTION request (01~20)</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>SPBOA</td>
<td>SPECIAL FUNCTION request (21~40)</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>SPCOA</td>
<td>SPECIAL FUNCTION request (41~60)</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>SPDPA</td>
<td>SPECIAL FUNCTION request (61~80)</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>SPOEA</td>
<td>SPECIAL FUNCTION request (81~99)</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>SR0</td>
<td>FREQ MEMORY SWEEP OFF</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR1</td>
<td>FREQ MEMORY SWEEP AUTO</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR2</td>
<td>FREQ MEMORY SWEEP SINGLE</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR3</td>
<td>FREQ MEMORY SWEEP MANUAL</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR4</td>
<td>FREQ MEMORY SWEEP MARKER OFF</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR5</td>
<td>FREQ MEMORY SWEEP MARKER ON</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR6</td>
<td>FREQ MEMORY SWEEP BREAK</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR7</td>
<td>FREQ MEMORY SWEEP CONTINUE</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR8</td>
<td>FREQ MEMORY SWEEP STEP UP</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SR9</td>
<td>FREQ MEMORY SWEEP STEP DOWN</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SRA</td>
<td>FREQ MEMORY SWEEP START PRESET</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>SRB</td>
<td>FREQ MEMORY SWEEP STOP PRESET</td>
<td>SWEEP (FREQ MEMORY)</td>
</tr>
<tr>
<td>ST</td>
<td>STORE</td>
<td>MEMORY</td>
</tr>
<tr>
<td>STSOA</td>
<td>ERROR STATUS request</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>SU0</td>
<td>FUNCTION MEMORY SWEEP OFF</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SU1</td>
<td>FUNCTION MEMORY SWEEP AUTO</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SU2</td>
<td>FUNCTION MEMORY SWEEP SINGLE</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SU3</td>
<td>FUNCTION MEMORY SWEEP MANUAL</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>SU6</td>
<td>FUNCTION MEMORY SWEEP BREAK</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SU7</td>
<td>FUNCTION MEMORY SWEEP CONTINUE</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SU8</td>
<td>FUNCTION MEMORY SWEEP STEP UP</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SU9</td>
<td>FUNCTION MEMORY SWEEP STEP DOWN</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SUA</td>
<td>FUNCTION MEMORY SWEEP START PRESET</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SUB</td>
<td>FUNCTION MEMORY SWEEP STOP PRESET</td>
<td>SWEEP (FUNCTION MEMORY)</td>
</tr>
<tr>
<td>SWT</td>
<td>SWEEP TIME</td>
<td>SWEEP TIME</td>
</tr>
<tr>
<td>SWT0A</td>
<td>SWEEP TIME request</td>
<td>Data request message (sec)</td>
</tr>
<tr>
<td>TAF</td>
<td>KNOB UP AF</td>
<td>AF OSC</td>
</tr>
<tr>
<td>TAM</td>
<td>KNOB UP AM</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>TFM</td>
<td>KNOB UP FM</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>TFR</td>
<td>KNOB UP FREQ</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>TOL</td>
<td>KNOB UP OUTPUT LEVEL</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>TPH</td>
<td>KNOB UP øM</td>
<td>MODULATION [øM]</td>
</tr>
<tr>
<td>TRG</td>
<td>TRIGGER PROGRAM SET</td>
<td>TRIGGER</td>
</tr>
<tr>
<td>TRGOA</td>
<td>TRIGGER PROGRAM SET request</td>
<td>Data request message (No unit)</td>
</tr>
<tr>
<td>UAF</td>
<td>INCREMENTAL STEPUP AF</td>
<td>AF OSC</td>
</tr>
<tr>
<td>UAM</td>
<td>INCREMENTAL STEPUP AM</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>UFM</td>
<td>INCREMENTAL STEP UP FM</td>
<td>MODULATION [FM]</td>
</tr>
<tr>
<td>UFR</td>
<td>INCREMENTAL STEPUP FREQ</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>UOL</td>
<td>INCREMENTAL STEPUP OUTPUT LEVEL</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>UPH</td>
<td>INCREMENTAL STEP UP øM</td>
<td>MODULATION [øM]</td>
</tr>
<tr>
<td>Program code</td>
<td>Parameter</td>
<td>Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>UV</td>
<td>μV</td>
<td>UNIT</td>
</tr>
<tr>
<td>V</td>
<td>V</td>
<td>UNIT</td>
</tr>
<tr>
<td>ZAF</td>
<td>RESET TUNABLE AF</td>
<td>AF OSC</td>
</tr>
<tr>
<td>ZAM</td>
<td>RESET TUNABLE AM</td>
<td>MODULATION [AM]</td>
</tr>
<tr>
<td>ZFM</td>
<td>RESET TUNABLE FM</td>
<td>MODULATION[FM]</td>
</tr>
<tr>
<td>ZFR</td>
<td>RESET TUNABLE FREQ</td>
<td>FREQUENCY</td>
</tr>
<tr>
<td>ZOL</td>
<td>RESET TUNABLE OUTPUT LEVEL</td>
<td>OUTPUT LEVEL</td>
</tr>
<tr>
<td>ZPH</td>
<td>RESET TUNABLE ØM</td>
<td>MODULATION [ØM]</td>
</tr>
<tr>
<td>0~9</td>
<td>NUMERAL 0~9</td>
<td>DATA</td>
</tr>
<tr>
<td>•</td>
<td>DECIMAL POINT</td>
<td>DATA</td>
</tr>
<tr>
<td>–</td>
<td>MINUS</td>
<td>DATA</td>
</tr>
</tbody>
</table>
# APPENDIX B

**SPECIAL FUNCTION IN NUMERICAL ORDER**

<table>
<thead>
<tr>
<th>Program code</th>
<th>Parameter</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP00</td>
<td>Initial setting</td>
<td>INITIAL</td>
</tr>
<tr>
<td>SP01</td>
<td>Bell OFF</td>
<td>BELL</td>
</tr>
<tr>
<td>SP02</td>
<td>Bell ON *</td>
<td></td>
</tr>
<tr>
<td>SP03</td>
<td>Output level open voltage display (EMF) *</td>
<td>LEVEL DISPLAY</td>
</tr>
<tr>
<td>SP04</td>
<td>Output level terminating voltage display</td>
<td></td>
</tr>
<tr>
<td>SP05</td>
<td>Output level limiter OFF</td>
<td>LIMITER</td>
</tr>
<tr>
<td>SP06</td>
<td>Output level limiter ON</td>
<td></td>
</tr>
<tr>
<td>SP07</td>
<td>Output level offset mode OFF *</td>
<td>OFFSET</td>
</tr>
<tr>
<td>SP08</td>
<td>Output level offset mode ON</td>
<td></td>
</tr>
<tr>
<td>SP11</td>
<td>Frequency offset mode OFF *</td>
<td></td>
</tr>
<tr>
<td>SP12</td>
<td>Frequency offset mode ON</td>
<td></td>
</tr>
<tr>
<td>SP13</td>
<td>Frequency memory protect OFF*</td>
<td>MEMORY PROTECT</td>
</tr>
<tr>
<td>SP14</td>
<td>Frequency memory protect ON</td>
<td></td>
</tr>
<tr>
<td>SP15</td>
<td>Function memory protect OFF*</td>
<td></td>
</tr>
<tr>
<td>SP16</td>
<td>Function memory protect ON</td>
<td></td>
</tr>
<tr>
<td>SP17</td>
<td>FM OSC auto switching *</td>
<td>MODULATION</td>
</tr>
<tr>
<td>SP18</td>
<td>FM OSC MIDDLE fixed</td>
<td></td>
</tr>
<tr>
<td>SP19</td>
<td>FM OSC WIDE fixed</td>
<td></td>
</tr>
<tr>
<td>SP20</td>
<td>ΩM OSC auto switching *</td>
<td></td>
</tr>
<tr>
<td>SP21</td>
<td>ΩM OSC MIDDLE fixed</td>
<td></td>
</tr>
<tr>
<td>SP22</td>
<td>ΩM OSC WIDE fixed</td>
<td></td>
</tr>
<tr>
<td>SP23</td>
<td>FM/ΩM POLARITY NORMAL *</td>
<td></td>
</tr>
<tr>
<td>SP24</td>
<td>FM/ΩM POLARITY INVERT</td>
<td></td>
</tr>
<tr>
<td>SP25</td>
<td>FM/ΩM INT/EXT deviation release *</td>
<td></td>
</tr>
<tr>
<td>SP26</td>
<td>FM/ΩM INT deviation fixed</td>
<td></td>
</tr>
<tr>
<td>SP27</td>
<td>FM/ΩM EXT deviation fixed</td>
<td></td>
</tr>
</tbody>
</table>

*: Set at initialization by SP00.
<table>
<thead>
<tr>
<th>Program code</th>
<th>Parameter</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP30</td>
<td>INT MOD NORMAL *</td>
<td>INT MOD FREQ</td>
</tr>
<tr>
<td>SP31</td>
<td>INT MOD + DC applied</td>
<td></td>
</tr>
<tr>
<td>SP32</td>
<td>INT MOD – DC applied</td>
<td></td>
</tr>
<tr>
<td>SP33</td>
<td>INT MOD ± DC external control</td>
<td></td>
</tr>
<tr>
<td>SP35</td>
<td>MOD OUTPUT auto switching *</td>
<td></td>
</tr>
<tr>
<td>SP36</td>
<td>MOD OUTPUT INT fixed</td>
<td></td>
</tr>
<tr>
<td>SP37</td>
<td>MOD OUTPUT AM EXT fixed</td>
<td></td>
</tr>
<tr>
<td>SP38</td>
<td>MOD OUTPUT FM/ØM EXT fixed</td>
<td></td>
</tr>
<tr>
<td>SP43</td>
<td>SWEEP BLANKING output positive logic *</td>
<td>SWEEP</td>
</tr>
<tr>
<td>SP44</td>
<td>SWEEP BLANKING output negative logic</td>
<td></td>
</tr>
<tr>
<td>SP45</td>
<td>Function memory sweep</td>
<td></td>
</tr>
<tr>
<td>SP46</td>
<td>SWEEP OUTPUT pattern 1*</td>
<td></td>
</tr>
<tr>
<td>SP56</td>
<td>Trigger program setting</td>
<td>TRIGGER</td>
</tr>
<tr>
<td>SP57</td>
<td>Trigger program clear</td>
<td></td>
</tr>
<tr>
<td>SP58</td>
<td>Trigger program start</td>
<td></td>
</tr>
<tr>
<td>SP60</td>
<td>GP-IB TALKER DATA with header *</td>
<td>GP-IB</td>
</tr>
<tr>
<td>SP61</td>
<td>GP-IB TALKER DATA with no header</td>
<td></td>
</tr>
<tr>
<td>SP63</td>
<td>GP-IB address display</td>
<td></td>
</tr>
<tr>
<td>SP70</td>
<td>SRQ ALL MASK *</td>
<td>SRQ</td>
</tr>
<tr>
<td>SP71</td>
<td>SRQ ERROR MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP72</td>
<td>SRQ BUSY/READY MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP73</td>
<td>SRQ MALFUNCTION MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP74</td>
<td>SRQ SELF TEST MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP75</td>
<td>SRQ SUSPENSION MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP76</td>
<td>SRQ DATA ERROR MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP77</td>
<td>SRQ TRIGGER PROGRAM MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP78</td>
<td>SRQ SWEEP END MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP79</td>
<td>SRQ MARKER POSITION MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP80</td>
<td>SRQ STRINGS END MASK OFF</td>
<td></td>
</tr>
<tr>
<td>SP81</td>
<td>Frequency memory clear</td>
<td>MEMORY CLEAR</td>
</tr>
<tr>
<td>SP82</td>
<td>Function memory clear</td>
<td></td>
</tr>
<tr>
<td>SP83</td>
<td>Option display</td>
<td>OPTION</td>
</tr>
</tbody>
</table>

*: Set at initialization by SP00.
### Special Function Numerical Order (3/3)

<table>
<thead>
<tr>
<th>Program code</th>
<th>Parameter</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP86</td>
<td>Output level correction NORMAL *</td>
<td></td>
</tr>
<tr>
<td>SP87</td>
<td>Output level correction (CAL DATA 1) (Option)</td>
<td></td>
</tr>
<tr>
<td>SP88</td>
<td>Output level correction (CAL DATA 2) (Option)</td>
<td></td>
</tr>
</tbody>
</table>

*: Set at initialization by SP00.
## APPENDIX C
### UNIVERSAL ASCII* CODE TABLE

<table>
<thead>
<tr>
<th>B7 B6 B5</th>
<th>B4 B3 B2 B1</th>
<th>0 0 0 0</th>
<th>0 0 0 1</th>
<th>0 0 1 0</th>
<th>0 0 1 1</th>
<th>0 1 0 0</th>
<th>0 1 0 1</th>
<th>0 1 1 0</th>
<th>0 1 1 1</th>
<th>1 0 0 0</th>
<th>1 0 0 1</th>
<th>1 0 1 0</th>
<th>1 0 1 1</th>
<th>1 1 0 0</th>
<th>1 1 0 1</th>
<th>1 1 1 0</th>
<th>1 1 1 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CONTROL</td>
<td>NUMBERS SYMBOLS</td>
<td>UPPER CASE</td>
<td>LOWER CASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 0 0 0</td>
<td>0 0 0 1</td>
<td>0 0 1 0</td>
<td>0 0 1 1</td>
<td>0 1 0 0</td>
<td>0 1 0 1</td>
<td>0 1 1 0</td>
<td>0 1 1 1</td>
<td>1 0 0 0</td>
<td>1 0 0 1</td>
<td>1 0 1 0</td>
<td>1 0 1 1</td>
<td>1 1 0 0</td>
<td>1 1 0 1</td>
<td>1 1 1 0</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td></td>
</tr>
<tr>
<td>0 1 0 1</td>
<td>0 1 0 1</td>
<td>0 1 1 0</td>
<td>0 1 1 1</td>
<td>1 0 0 0</td>
<td>1 0 0 1</td>
<td>1 0 1 0</td>
<td>1 0 1 1</td>
<td>1 1 0 0</td>
<td>1 1 0 1</td>
<td>1 1 1 0</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td>1 1 1 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address command</th>
<th>Universal command</th>
<th>Listen address</th>
<th>Talk address</th>
<th>Secondary address or command</th>
</tr>
</thead>
</table>

**KEY**
- **octal**: 25, 26, 27, ...
- **hex**: 15, 16, 17, ...
- **PPU**: GP-IB code
- **NAK**: ASCII character
- **decimal**: *U.S.A. Standard Code for Information Interchange*

---

**C - 1**
# APPENDIX D

## BIT ASSIGNMENT FOR CAUSES OF GP-IB INTERFACE INTERRUPT

<table>
<thead>
<tr>
<th>Bit No.</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Set to controller</td>
</tr>
<tr>
<td>1</td>
<td>EIO detected Interrupt generated when PACKET is controller, not when it is talker or listener</td>
</tr>
<tr>
<td>2</td>
<td>SRQ received</td>
</tr>
<tr>
<td>3</td>
<td>Remote/local state changed</td>
</tr>
<tr>
<td>4</td>
<td>MTA received</td>
</tr>
<tr>
<td>5</td>
<td>MLA received</td>
</tr>
<tr>
<td>6</td>
<td>GET received</td>
</tr>
<tr>
<td>7</td>
<td>Device clear received</td>
</tr>
<tr>
<td>8</td>
<td>IFC received</td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Parity error occurred during data reading</td>
</tr>
<tr>
<td>12</td>
<td>MLA/MTA released</td>
</tr>
<tr>
<td>13</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
### APPENDIX E

**IEEE STANDARD ABBREVIATIONS INDEX**

<table>
<thead>
<tr>
<th>A</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DIO</td>
<td>Data input/output</td>
</tr>
<tr>
<td>AC</td>
<td>DT</td>
<td>Device Trigger</td>
</tr>
<tr>
<td>ACDS</td>
<td>DTAS</td>
<td>Device Trigger Active State</td>
</tr>
<tr>
<td>ACG</td>
<td>DTIS</td>
<td>Device Trigger Idle State</td>
</tr>
<tr>
<td>ACRS</td>
<td>END</td>
<td>End</td>
</tr>
<tr>
<td>AD</td>
<td>EOI</td>
<td>End Or Identify</td>
</tr>
<tr>
<td>AH</td>
<td>EOS</td>
<td>End of String</td>
</tr>
<tr>
<td>AIDS</td>
<td>GET</td>
<td>Group execute Trigger</td>
</tr>
<tr>
<td>ANRS</td>
<td>GTS</td>
<td>go to standby</td>
</tr>
<tr>
<td>APRS</td>
<td>IST</td>
<td>Individual Status</td>
</tr>
<tr>
<td>ATN</td>
<td>IFC</td>
<td>Interface Clear</td>
</tr>
<tr>
<td>AWNS</td>
<td>IDY</td>
<td>Identify</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>L</td>
</tr>
<tr>
<td>C</td>
<td>LAC</td>
<td>Listener Active State</td>
</tr>
<tr>
<td>CACs</td>
<td>LAD</td>
<td>Listener Address</td>
</tr>
<tr>
<td>CADS</td>
<td>LADS</td>
<td>Listener Addressed State</td>
</tr>
<tr>
<td>CAWS</td>
<td>LAG</td>
<td>Listen Address Group</td>
</tr>
<tr>
<td>CIDS</td>
<td>LE</td>
<td>Extended Listener</td>
</tr>
<tr>
<td>CPWS</td>
<td>LIDS</td>
<td>Listener Idle State</td>
</tr>
<tr>
<td>CSBS</td>
<td>LLO</td>
<td>Local Lock Out</td>
</tr>
<tr>
<td>CSNS</td>
<td>LOCS</td>
<td>Local State</td>
</tr>
<tr>
<td></td>
<td>LON</td>
<td>Listen only</td>
</tr>
<tr>
<td>CPTPS</td>
<td>LPAS</td>
<td>Listener Primary Addressed State</td>
</tr>
<tr>
<td>CSRS</td>
<td>LPE</td>
<td>Local Poll enabled</td>
</tr>
<tr>
<td>CSWS</td>
<td>LPI</td>
<td>Listener Primary Idle State</td>
</tr>
<tr>
<td>CTRS</td>
<td>LTN</td>
<td>Listen</td>
</tr>
<tr>
<td></td>
<td>LWLS</td>
<td>Local with Lockout State</td>
</tr>
<tr>
<td></td>
<td>LUN</td>
<td>Local unlisten</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCAS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCIS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **A**: Address Command
- **AC**
- **ACDS**
- **ACG**
- **ACRS**
- **AD**
- **AH**
- **AIDS**
- **ANRS**
- **APRS**
- **ATN**
- **AWNS**
- **B**
- **C**
- **CAC**
- **CDS**
- **CAWS**
- **CIDS**
- **CPWS**
- **CSBS**
- **CSNS**
- **CPPS**
- **CSRS**
- **CSWS**
- **CTRS**
- **D**
- **DAB**
- **DAC**
- **DAV**
- **DC**
- **DCAS**
- **DCIS**
- **DCL**
- **DD**
### M
- MLA — My Listen Address
- MSA — My Secondary Address
- MTA — My Talk Address
- rPP — Request Parallel Poll
- RQS — Request Service
- rsc — Request system Control
- rsv — Request service
- rtl — Return to local
- RWLS — Remote With Lockout state

### N
- nba — new byte available
- NDAC — Not Data Accepted
- NPRS — Negative Poll Response State
- NRFD — Not Ready For Data
- NR — Numeric Representation
- NUL — Null Byte

### O
- OSA — Other Secondary Address
- OTA — Other Talk Address

### P
- PACS — Parallel Poll Addressed to Configure State
- PCG — Primary Command Group
- pof — Power-off
- pon — Power-on
- PP — Parallel Poll
- PPAS — Parallel Poll Active State
- PPC — Parallel Poll Configure
- PPD — Parallel Poll Disable
- PPE — Parallel Poll Enable
- PPIS — Parallel Poll Idle State
- PPR1−8 — Parallel Poll Response 1 ~ 8
- PPSS — Parallel Poll Standby State
- PPU — Parallel Poll Unconfigure
- PUCS — Parallel Poll Unaddressed to Configure State

### S
- SACS — System Control Active State
- SCG — Secondary Command Group
- SDC — Selected Device Clear
- SDYS — Source Delay State
- SE — Secondary Message
- SGNS — Source Generate State
- SH — Source Handshake
- SIAS — System Control Interface Clear Active State
- sic — Send interface clear
- SIDS — Source Idle State
- SIIS — System Control Interface Clear Idle State
- SINS — System Control Interface Clear Not Active State
- SIWS — Source Idle Wait State
- SNAS — System Control Not Active State
- SPAS — Serial Poll Active State
- SPD — Serial Poll Disable
- SPE — Serial Poll Enable
- SPIS — Serial Poll Idle State
- SPMS — Serial Poll Mode State
- SR — Service Request
- SRAS — System Control Remote Enable Active State
- sre — Send remote enable
- SRIS — System Control Remote Enable idle State
- SRNS — System Control Remote Enable not active State
- SRQ — Service Request
- SRQS — Service Request State
- ST — Status
- STB — Status Byte
- STRS — Source Transfer State DAV to Low
- SWNS — Source Wait for New cycle State
- SACS — System Control Active State
T       -----  Talker
TACS     -----  Talker Active State
TAD      -----  Talk Address
TADS     -----  Talker Addressed State
TAG      -----  Talker Addressed Group
tca      -----  Take Control asynchronously
tcs      -----  Take Control synchronously
TCT      -----  Take Control
TE       -----  Extended Talker
TIDS     -----  Talker Idle State
ton      -----  Talk only
TPAS     -----  Talker Primary Addressed State
TPIS     -----  Talker Primary Idle State

U

U       -----  Uniline Message
UC       -----  Universal Command
UCG      -----  Universal Command Group
UNL      -----  Unlisten
UNT      -----  Untalk
(Blank)