MG3641A/MG3642A
Synthesized Signal Generator
Option 22: FSK ENCODER
Operation Manual

Fifth Edition

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided within the MG3641A/MG3642A Synthesized Signal Generator Operation Manual. Please also refer to this document before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

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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

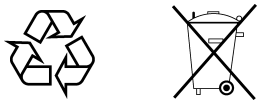
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

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.

MG3641A/MG3642A
Synthesized Signal Generator Option 22: FSK ENCODER
Operation Manual

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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.

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

Option: MG3641A/MG3642A-22 FSK ENCODER

2. Applied Directive and Standards

When the MG3641A/MG3642A-22 FSK ENCODER is installed in the MG3641A/MG3642A, the applied directive and standards of this unit conform to those of the MG3641A/MG3642A main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MG3641A/MG3642A-22 can be used with.

C-tick Conformity Marking

Anritsu affixes the C-tick marking 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

1. Product Model

Option: MG3641A/MG3642A-22 FSK ENCODER

2. Applied Directive and Standards

When the MG3641A/MG3642A-22 FSK ENCODER is installed in the MG3641A/MG3642A, the applied directive and standards of this unit conform to those of the MG3641A/MG3642A main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MG3641A/MG3642A-22 can be used with.

Table of Contents

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1. Overview

1.1 Outline of the Product

The FSK encoder is an option for the MG3641A and MG3642A synthesized signal generators. The FSK encoder is built into the internal signal source (Int2 or Int3) of the MG3641A or MG3642A. The FSK encoder is combined with the FM function of the MG3641A or MG3642A to generate the 2 level or 4 level FSK modulation signal by the external TTL signal.

1.2 Unit Configuration

The table below lists the unit configuration of the FSK encoder.

Table 1.1 Standard configuration

Item	Model and symbol	Product name	Quantity
Main unit	MG3641 A/MG3642A-22	FSK ENCODER	1
Accessory	Z0315A	Label	1
	Z0315B		1
	W1219AE	Operation manual	1

1.3 Specifications

The specifications of the FSK encoder are shown below.

Table 1.2 FSK encoder specifications

Frequency shift amount	Data 2^1,2^0	0,0	– Frequency modulation deviation set value
		0,1	– (Frequency modulation deviation set value)/3
		1,0	+ Frequency modulation deviation set value
		1,1	+ (Frequency modulation deviation set value)/3
Frequency set	Free		Shifts frequency at data input.
	Rise Trig		Shifts frequency at rising edge of external clock.
	Fall Trig		Shifts frequency at falling edge of external clock.
Baseband filter	Filter type		10th Bessel filter
	Cut-off frequency		100 Hz to 30 kHz (– 3 dB)
	Set resolution		Upper 2 digits (100, 110, 120, ..., 1.0 k, 1.1 k, 1.2 k, ..., 28 k, 29 k, 30 kHz)
	Signal route		Bypass or the baseband filter can be selected.
Frequency deviation accuracy			In accordance with the FM deviation accuracy of the MG3641A and MG3642A Only when the filter is bypassed.
External modulation signal input	Data	2^0	Rear BNC connector, TTL level, pull-down (Int Mod Cont 2 connector used)
		2^1	Rear BNC connector, TTL level, pull-down (Int Mod Cont 1 connector used)
	Ext Clock		Rear BNC connector, TTL level, pull-up (Int Mod Cont 3 connector used)

2. Preparation Before Use

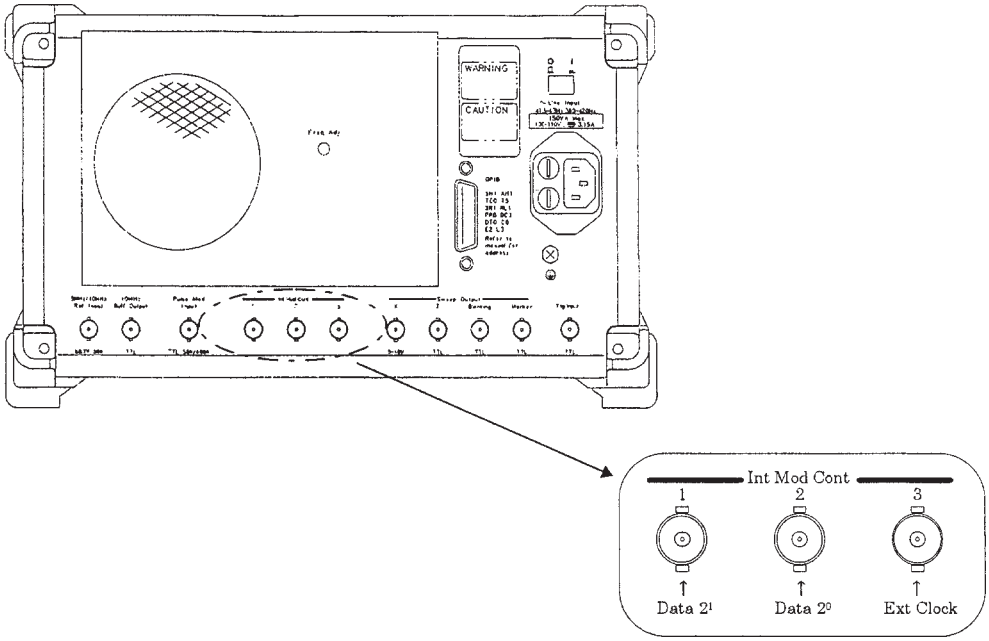
For details on the environmental conditions of the installation location, safety measures, and preparation before power-on, refer to Section 2 in the operation manual of the MG3641A/MG3642A.

This section describes the preparations before using the FSK encoder.

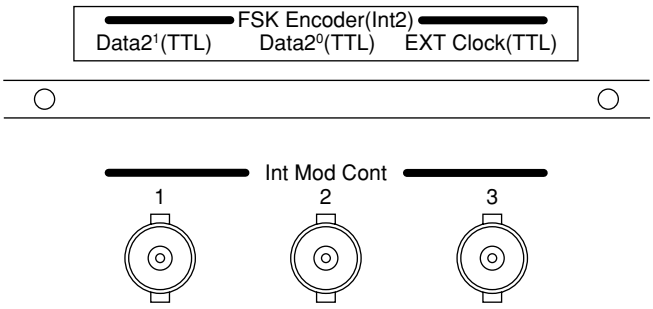
2.1 Attaching the Data and Clock Connector Labels

Data and clock signals are entered externally into the FSK encoder.

Int Mod Cont 1, 2, and 3 on the rear panel are assigned as input connectors as shown in the figure below.

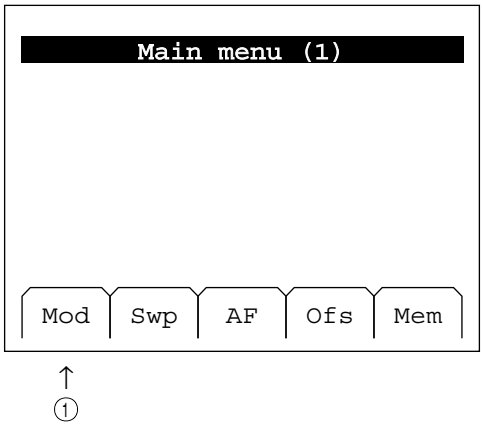


Attach the connector label to avoid errors in connecting the cables to the connectors. Attach the label above the Int Mod Cont connectors so that it can be seen easily as shown in the figure below.



3. Outline of Operation

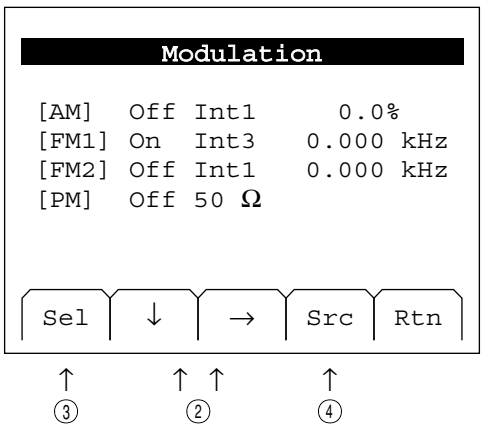
① Press the [Modulation] key to open the "Modulation" menu.



② Use the "↓" [F2] or "→" [F3] keys to select a set item (On/Off or modulation signal source) to be changed on the [FM1] or [FM2] line (characters are displayed in reverse video).

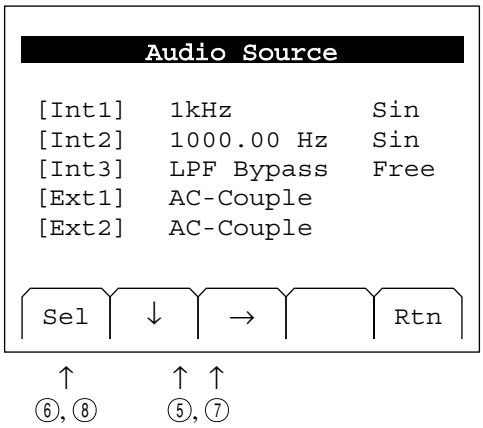
③ Press the "Sel" [F1] keys to set [FM1] or [FM2] to On.
Select Int2 or Int3 (modulation signal source to which the FSK encoder is inserted) as a modulation signal source.
Use the ten-key pad, step keys in the Edit zone, or rotary knob to set the FM deviation.

④ Press the "Src" [F4] key to open the "Audio Source" menu.



⑤ Use the "↓" [F2] or "→" [F3] keys to select the "LPF Bypass" part on the line of [Int2] or [Int3] (modulation signal source to which the FSK encoder is inserted) (characters are displayed in reverse video).

⑥ When using the built-in baseband filter, press the "Sel" key to display "LPF****Hz", then use the ten-key pad, step keys in the Edit zone, or rotary knob to set the cut-off frequency (–3 dB) of the filter.
When the "Sel" key is pressed repeatedly, the toggle display begins with "LPF Bypass" followed by "LPF****Hz", then returns to "LPF Bypass."



LPF Bypass: The built-in baseband filter is not used (the filter is bypassed).
LPF****Hz: The built-in baseband filter is used.
Note: The asterisks (****) indicate a cut-off frequency (one of the set values of four characters on the right).

• Set cut-off frequency value of baseband filter

100	110	120	130	••••	980	990
1.0 k	1.1 k	1.2 k	1.3 k	••••	9.8 k	9.9 k
10 k	11 k	12 k	13 k	••••	29 k	30 k

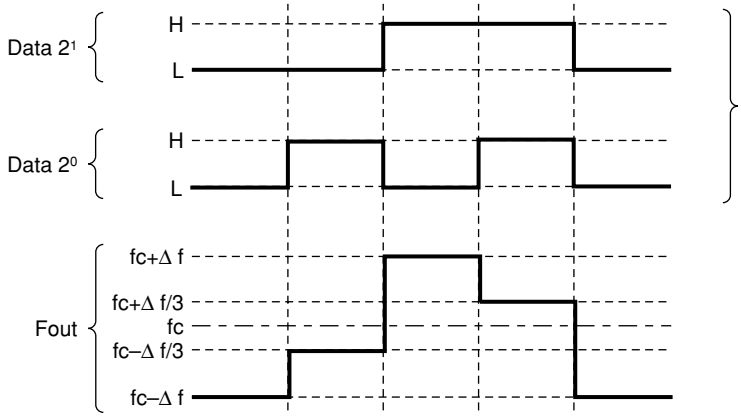
⑦ Use the "↓" [F2] or "→" [F3] keys to select the Free part on the line of [Int2] or [Int3] (modulation signal source to which the FSK encoder is inserted) (characters are displayed in reverse video).
By pressing the "Sel" key to display Trig ↑ or Trig ↓, the external modulation data (Data2^0 and Data2^1) can be fetched at the edge of the clock signal entered from the "Ext Clock" connector.
When the "Sel" key is pressed repeatedly, the display begins with "Free" followed by "Trig ↑" and "Trig ↓", then returns to "Free."

Free: Data entered to the external modulation data input connectors (Data2^0 and Data2^1) is used immeadiately data is entered.

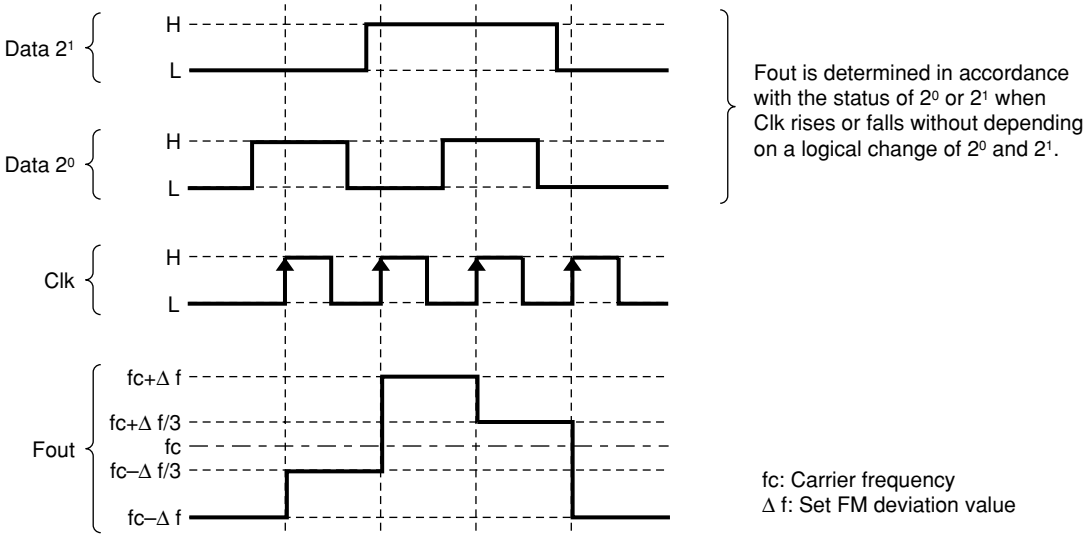
Trig ↑: Data entered to the external modulation data input connectors (Data2^0 and Data2^1) is triggered at the leading edge of the clock entered from the "Ext Clock" connector and fetched.

Trig ↓: Data entered to the external modulation data connectors (Data2^0 and Data2^1) is triggered at the trailing edge of the clock entered from the "Ext Clock" connector and fetched.

Sync: Free



Sync: Triggered (Trig ↑)



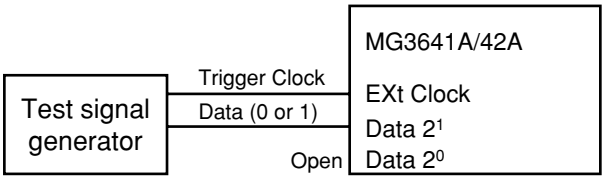
4. DETAILED DESCRIPTION

This section explains how to use the MG3641A/MG3642A with the MG3641A/MG3642A-22 (FSK ENCODER) to generate the FSK modulation signal (2 level or 4 level).

4.1 2 level FSK

For 2 level FSK, enter the modulation signal data (0 or 1 in TTL level) from the test signal generator to the Data2^1 connector on the rear panel. When synchronizing the modulation signal data to the external clock signal, enter the clock signal to the Ext Clock connector to set the FSK trigger (see Section 2). Table 4.1 lists the relationships between the modulation signal data and output frequencies.

The frequency and FM deviation accuracies at this time become the specified values of the MG3641A and MG3642A (Only when the filter is bypassed).



(Because both Data2^0 and Data2^1 connectors are pulled-down internally, set the Data2^0 input to Open for 2 level FSK.)

Table 4.1

Modulation signal data	Output frequency
0	fc – Δ f
1	fc + Δ f

• fc: Carrier frequency of MG3641A or MG3642A
• Δ f: Set FM deviation value

4.2 4 level FSK

For 4 level FSK, enter the modulation signal data (00, 01, 11, or 10 in TTL level) from the Data2^0 and Data2^1 connectors on the rear panel.

When synchronizing the modulation signal data to the external clock signal, enter the clock signal to the Ext Clock connector to set the FSK trigger (see Section 2).

Table 4.2 lists the relationships between the modulation signal data and output frequencies.

The frequency and FM deviation accuracies at this time become the specified values of the MG3641A and MG3642A (Only when the filter is bypassed).

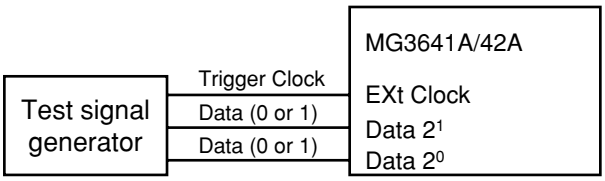


Table 4.2

Modulation signal data		Output frequency
2^1	2^0	
0	0	fc – Δ f
0	1	fc – Δ f/3
1	1	fc + Δ f/3
1	0	fc + Δ f

• fc: Carrier frequency of MG3641A or MG3642A
• Δ f: Set FM deviation value

5. REMOTE CONTROL USING GPIB

5.1 Overview

The MG3641A/MG3642A-22 (FSK ENCODER) unit is an optional unit for the MG3641A and MG3642A synthesized signal generators. As other functions of the MG3641A or MG3642A, the MG3641A/MG3642A-22 can be combined with an external controller and other measuring instruments to automate measurement.

The MG3641A/MG3642A-22 conforms to the Institute of Electrical and Electric Engineers (IEEE) standard 488.1, 1987.

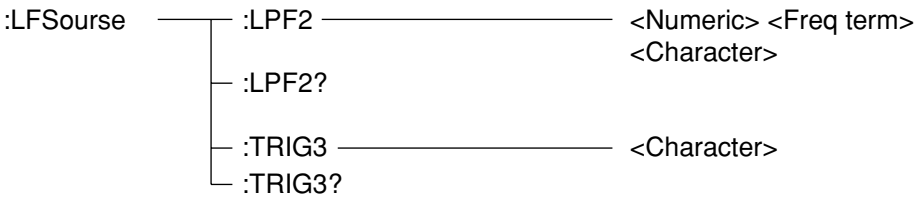
The software specifications conform to IEEE488.2 and Standard Commands for Programmable Instruments (SCPI).

This section describes the GPIB command tree and details of commands of the MG3641A/MG3642A-22.

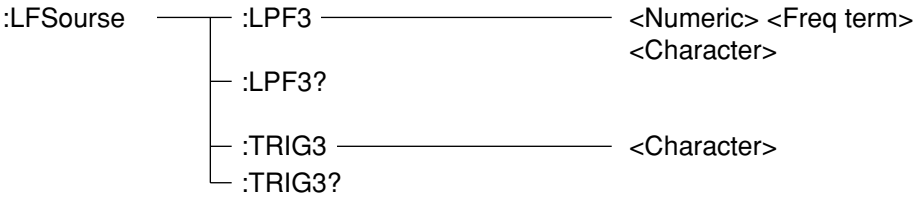
For other descriptions, refer to Section 6, "Remote Control Using GPIB" in the separate volume, "MG3641A/42A Synthesized Signal Generator Operation Manual."

5.2 Command Tree

① When the FSK encoder is set to Int2:



② When the FSK encoder is set to Int3:



5.3 Details of Commands

:LFSource:LPF2 <Numeric> or <Character>

Function: Sets the baseband filter of internal modulation signal source 2 (for the FSK encoder).

Parameters: <Character>BYPASS (The internal filter is bypassed.)
<Numeric>: 100 Hz to 30 kHz

Unit: <Freq term>
No unit for BTPASS

Restriction: None

:LFSource:LPF2?

Function: Reads out the set contents of the baseband filter of internal modulation signal source 2 (for the FSK encoder).

Response: Cut-off frequency or BYPASS of the set baseband filter.

Restriction: None

:LFSource:TRIG2<Character>

Function: Sets the trigger function of internal modulation signal source 2 (for the FSK encoder).

Parameter: <Character> = Free (The trigger function is not used.)
RISE (Synchronized when the external clock rises.)
FALL (Synchronized when the external clock falls.)

Unit: None

Restriction: None

:LFSource:TRIG2?

Function: Reads out the set contents of the trigger function of internal modulation signal source 2 (for the FSK encoder).

Response: Set trigger function.

Restriction: None

If the FSK encoder is set to Int3, replace "2" in each command by "3."

APPENDIX SETTINGS AT SHIPMENT

Setting item	
Baseband filter	Bypass
Baseband filter cut-off frequency	10 kHz
Trigger	Free

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