

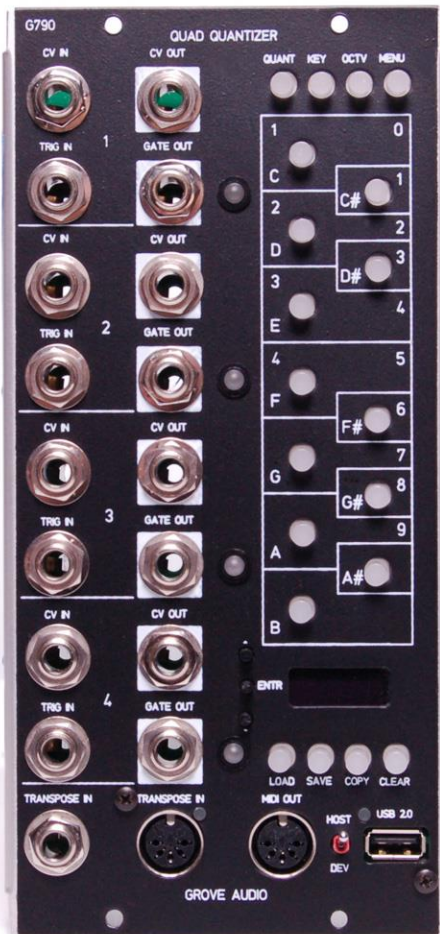
# **GMS-790 Quad Quantizer**

## **PRELIMINARY OPERATION MANUAL**

**Ver. 1.0 – July 5 2022**

**Grove Audio LLC**

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## INTRODUCTION

The GMS-790 Quad Quantizer module offers the ability to quantize continuous analog voltage values into discrete note voltage values either chromatically into 12 discrete voltages or based on a scale such as C# minor emitting discrete voltages and gates for the notes in that scale. Up to four quantizers are available that can all be set to one scale or used independently. Preprogrammed scales are available as well as 8 user definable scales. The module can also be used as a CV to MIDI converter with note commands output as 5 pin DIN MIDI or USB MIDI. Analog and MIDI transpose inputs are provided to offset the converted note values by the input value. Through the panel USB 2.0 connector, the module can support USB Device connections to a remote computer or the module can provide USB Host support for other USB Devices such as keyboard controllers or sequencers.

## BASIC FUNCTIONS

Each quantizer channel can be set to an available quantization scale or a previously stored user scale can be loaded. The default scales include:

- Major
- Minor

- Minor Pentatonic
- Dorian
- Major Third
- Minor Third
- Whole Tone
- Chromatic

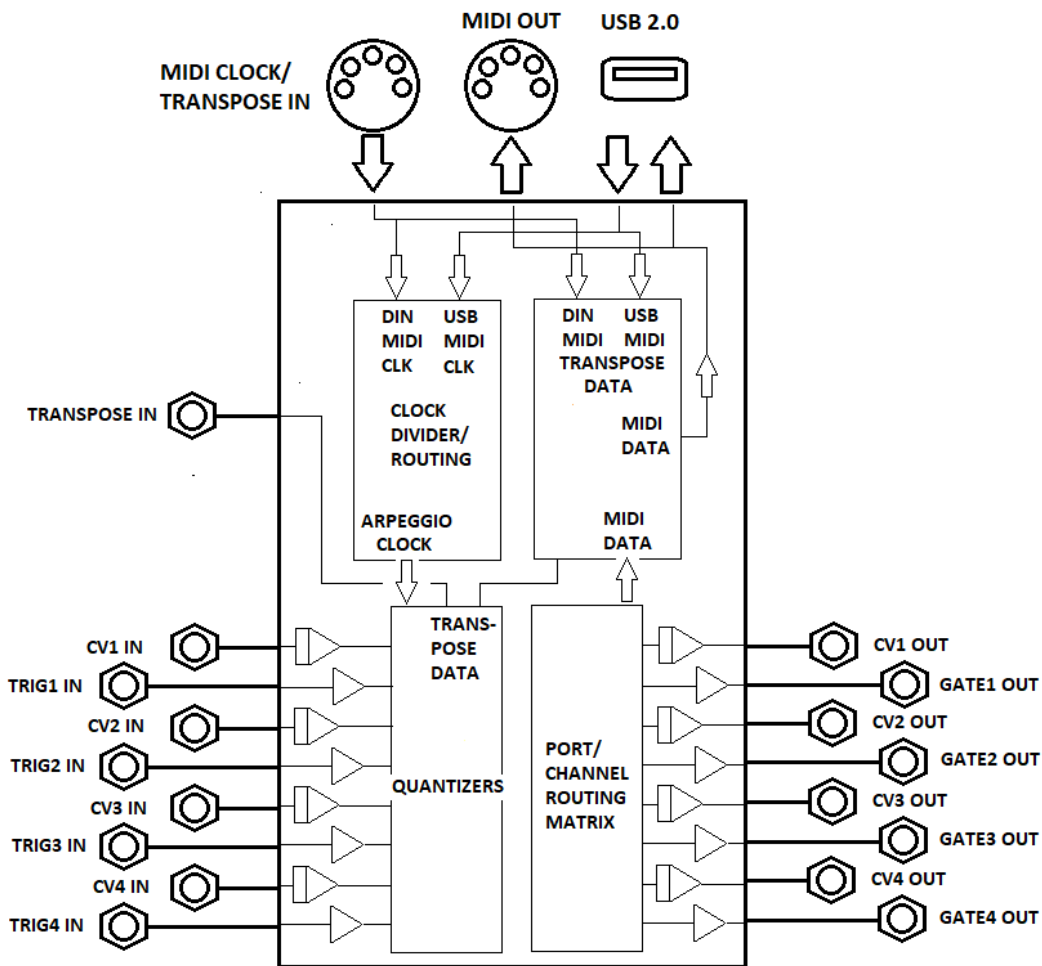
Nonvolatile storage for eight user defined scales is also included.

The key in which quantization occurs can be preselected for each channel. This limits the quantized notes to only the notes in the scale of the selected key.

Multiple quantizers can be configured simultaneously by selecting “Quant” from the four function keys above the scale keys area, enabling the desired quantizers by selecting their numbers from the scale keys (indicated by a flashing gate lamp), and selecting the desired settings from the OLED display. The settings can be saved as a user default that will be loaded the next time the quantizer is powered on or as a set of user settings saved in nonvolatile memory.

A note input can be quantized and used to select up to four notes of a chord value if a key is set. The voltage value for each note of the chord will be output on a separate output channel along with a gate signal on each channel for the duration of the note. The generated note values can also be routed to either the DIN MIDI or USB MIDI output.

## **DIVERSE INPUT AND OUTPUT CAPABILITY**



GMS-790 BLOCK DIAGRAM

## CV TO MIDI CONVERSION

The quantizer module can output results of quantized input values as MIDI note commands. These quantized values can be sent to specific MIDI channels depending on routing configurations. A single quantized input voltage can be converted to a MIDI note command and sent to a preselected MIDI channel or multiple quantized voltages from several input channels can be combined and sent on one MIDI output channel to be used to play a chord on a polyphonic synthesizer.

The module will output the MIDI note information on either the 5 pin DIN MIDI output connector or output as USB MIDI on the USB connector.

The USB connector supports USB 2.0 and can be configured as a USB Device or a USB Host. In the Host mode, the module can be connected directly to external modules, synthesizers, or sound generators without the need for an intervening computer to host the external device. In USB Host mode, USB hub support is provided and connected devices will be enumerated automatically and presented in the USB routing menu. Device targets can be routed with USB streams coming from specific sources so multiple output devices do not have to receive the

same input stream.

## OTHER FUNCTIONS

Each quantizer channel can be configured as a triggerable sample and hold. When a trigger input pulse occurs, the current value of the analog input on the channel will be transferred to the analog output and held at that value until a new trigger input is received.

Analog and DIN MIDI transpose inputs are provided to allow the current analog output values to be transposed to a new basis depending on the value of the analog input voltage or MIDI note received. If the analog voltage input is used, it can be quantized to a scale value before it is added to the output voltage values.

## OPERATING MODE TABLE

Operating mode is selected by a menu entry in the MENU tab. First an active channel is selected. Then in SELECT CHAN MODE set the operating mode from the following table:

CHAN	MODE	FUNCTION
1	1	Quantize / Sample & Hold
	2	Arpeggio
	3	Root + Fifth
	4	4 Note Chord
2	1	Quantize / Sample & Hold
	2	Arpeggio
3	1	Quantize / Sample & Hold
	2	Arpeggio
	3	Root + Fifth
4	1	Quantize / Sample & Hold
	2	Arpeggio

## MIDI CLOCK OUTPUT

If the input MIDI stream on the MIDI TRANSPOSE connector contains the MIDI clock (24ppqn clock), the module can be used to output the clock to external devices, divided by a preset factor. The clock is output through the front panel MIDI OUT jack. It can also be sent as part of outgoing USBMIDI packets.

The division ratio is controlled by the MIDI CLOCK menu in the MENU group. Select the division ratio from the following table. Factory default is one beat per quarter note.

RATIO	DIVISOR
0	32nd
1	16th
2	Dotted 16th
3	8th
4	Dotted 8th
5	quarter
6	Dotted quarter
7	half
8	Dotted half
9	whole

## MIDI INPUT CONNECTIONS

MIDI note commands and other control commands can enter the module using either a standard MIDI 5 pin DIN connector or through the USB connector as USB MIDI.

## USB DEVICE/USB HOST OPERATION

The USB connector mode is selected using a panel toggle. In DEV mode, the USB port acts like a USB device when connected to an external USB host such as a computer in which case, it acts like an external USB MIDI device such as a USB connected synthesizer that accepts and interprets MIDI note commands.

In the HOST mode, the module can host other USB devices such as keyboard controls, alleviating the need for external computer host support. Devices detected by the module during enumeration of the USB bus are displayed in an on-screen router and can be virtually connected either to or from an external device to resources with the module or used to pass USB commands through the module to a different external USB device.

When using the HOST mode, the internal enumerator will also support devices requiring up to 500 mA of bus power. The enumerator also supports connected USB hubs. If more than 500 mA of external power is needed by devices, a powered hub should be used.

## TECHNICAL SPECIFICATIONS GMS-742

Each Channel

Voltage Scale	1 Volt/Octave - .0833 Volts/Semitone Note number 0 - 127 produces -4.0 V to +6.0 V
MIDI Note Range	0 V = MIDI Note #48 = C4 (starting note for zero volts is presettable)

D/A Converter Output	16 Bits; full-scale range +-10 V
Gate/Trigger Output	0 - +5 V Gate width: duration of note Trigger width: 25 msec.
Module Power	+15 Volts 25 mA., -15 Volts 25 mA., +5 Volts 100 mA
Module Size	Panel height - 8.75 inches (222 mm); Panel width - 2.125 inches (54 mm); Depth (behind panel) 3.75 inches (96 mm)

## MODULE PROGRAMMING OPTIONS

Certain module functions can be programmed by using the mode selector switch and a front panel toggle switch. To enter the programming mode, press and hold the toggle switch to the right (PGM) position for approximately two seconds until the Gate 1 LED starts to flash. This indicates that the module is in the programming mode. By briefly pressing the toggle switch to the right and releasing it, the program group can be selected. The Gate 2, Trig 1, and Trig 2 LEDs will successively flash, indicating that the corresponding program group is selected. There are four program groups with 16 options per group. The table below describes the functions controlled by this arrangement.

Once the option is programmed, its current state is stored in a non-volatile memory and will be restored the next time the module is powered. One of the program options can be selected to return all settings to the factory defaults.

Within a group, to select the option to be programmed, turn the mode selector switch to the appropriate number and then press the toggle switch to the right (PGM) position for approximately two seconds or until the LED stops flashing and remains lit. Then release the toggle switch. The LED will go off after approximately one second indicating successful programming of the option. Rotate the Mode selector switch back to the operation mode that was being used.

## RUN/STOP REALTIME MESSAGES AND MIDI NOTE CONTROL

An external control line on the ring of the MIDI CLK connector supplies a 0-5 V pulse or level waveform that can be used to gate an external clock or sequencer. The line can be set by programmable switch to be high from the time the RUN realtime message or MIDI note command is received until the STOP realtime message or MIDI note command is received. The output can be set to be either a level or pulse depending on the needs of the controlled device. By using this line and the MIDI clock signal on the tip of the same connector, the external device can be synchronized with software sequencers.

When using the MIDI note command to control the external control line, the internal logic will only respond to MIDI

note messages sent on the MIDI channel which is one channel above the highest MIDI channel used by the current mode. For example, if Mode 1 is selected, the module responds to MIDI channels one and two to produce the CV and velocity signals and to MIDI channel 2 channels higher than the value set on the front panel MIDI channel selector switch for the RUN/STOP note commands. If mode 5 is selected, the RUN/STOP note commands should be sent on a MIDI channel 4 channels higher than the value set on the front panel MIDI channel selector switch.

## CONTROL REFERENCE

### RUN MODE



RUN mode display

The module is in RUN mode when nothing is selected in the control group at the top of the right column. When in the RUN mode, the OLED display will indicate the last quantized value of the input of the currently selected channel. To change the displayed channel, press either the up arrow or down arrow keys to the left of the display. To the right of the channel number, the current scale selected for the channel will be shown.

### CONTROL MODE

Selecting one of the four buttons in the control group will change what is displayed in the KEYS buttons and will also affect the display in the OLED display. Deselecting the selected button in the control group will return to RUN mode and again display the data for the selected quantizer channel.

### QUANT GROUP





When the QUANT group is selected, four keys in the KEYS group will illuminate with one key indicating the currently selected quantizer channel. To change to a different quantizer channel, press one of the other illuminated keys. The current selected channel will be shown in the OLED display along with the scale the quantizer is currently set to. To change the scale, press the up or down arrow buttons to the left of the OLED display. To confirm the selection, press the ENTR button. To return to the RUN mode, deselect the QUANT group button.

### KEY GROUP



When the KEY group is selected all twelve of the KEYS buttons will light with the currently selected key indicated. To select a different key, press the appropriate key button in the KEYS button section. To select the major or minor scale, press the up arrow or down arrow buttons to the left of the OLED display. To confirm the selection, press the ENTR button. Currently, only one key signature selection is permitted.

### OCTAVE GROUP

The Reference Output menu enables a reference pulse at a rate of one pulse per quarter note on the Channel 8 gate output. 0 – output off, 1 – output on.

### MENU GROUP

#### 1 - SELECT ACTIVE CHANNEL



Selects the active quantizer channel to be used for other menu options. To change the active channel press the

up arrow or down arrow buttons to the left of the OLED display. To confirm the selection, press the ENTR button.

## 2 – SELECT INPUT VOLTAGE RANGE



Select the voltage range of the quantizer CV input. The options are +5VDC or 0-10VDC.

## 3 – SELECT OUTPUT VOLTAGE RANGE



Select the voltage range of the quantizer CV output. The options are +5VDC or 0-10VDC.

## 4 – ASSIGN MIDI OUTPUT CHANNEL



Assigns a MIDI output channel to a quantizer. If two quantizers are assigned to the same MIDI channel, the MIDI messages from both channels are combined and sent to one MIDI port allowing polyphonic devices to receive the quantized note values.

## 5 – ASSIGN THE CHANNEL OPERATING MODE



Sets the channel operating mode. The current modes are Quantize, Arpeggio, Root+ 5th, and Chord.

### **INSTALLING PROGRAM UPDATES**

The process for installing program update files in the GMS-790 Quad Quantizer module using the Microsoft UF2 bootloader is described below. The UF2 process places the file to be uploaded to the device in a removable drive partition that is created on the host machine by the device to be updated. The target device is connected to the host by USB and placed into the bootloader mode with a reset switch on the device.

1. The device to be updated needs to be powered from its normal power source.
2. Connect the device to be updated to the host machine using a USB cable. If the device is capable of HOST or DEV mode, be sure to set it to DEV (Device) mode.
3. Connect a reset switch or use the on-board reset switch depending on what is implemented.
4. To place the connected device into bootloader mode, rapidly double click the reset switch. A message on the host machine should appear indicating that a new USB removable drive has been detected and installed.
5. In the file explorer of the host machine, navigate to the new drive that was installed. In the folder, there should be three files, CURRENT.UF2, INDEX.HTM, and INFO\_UF2.TXT. In order to backup the current installation, copy these files to a backup folder on the host machine. This will allow restoring the original device programming if the update fails. It is not necessary to backup or update the "System Volume Information" folder that may be present in the drive folder.
6. To initiate the update, select, copy and paste the three files included in the update into the folder of the removable drive. As soon as the update files have finished copying, the device bootloader program should install the update and immediately start the new program version running.