

GTO Gated Scaler  
Rev. 1.0

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# Table of contents

<b>1</b>	<b>General</b>	<b>1</b>
1.1	Function . . . . .	1
1.2	Connector . . . . .	1
1.2.1	Clock output . . . . .	1
1.2.2	Output register . . . . .	1
1.2.3	Gate input . . . . .	1
1.2.4	Veto input . . . . .	2
1.2.5	Read latch input . . . . .	2
1.2.6	Clear input . . . . .	2
1.2.7	Scaler input . . . . .	2
<b>2</b>	<b>Interface</b>	<b>5</b>
2.1	Command Map . . . . .	5
2.2	Setting . . . . .	5
2.2.1	Gate Enable . . . . .	5
2.2.2	Soft Veto . . . . .	6
2.2.3	Test LED . . . . .	6
2.2.4	Level output . . . . .	6
2.2.5	Pulse output . . . . .	6
2.2.6	Clear Data . . . . .	6
2.2.7	Initialize . . . . .	6
2.2.8	Set ID1/ID2 . . . . .	6
2.2.9	Purge command . . . . .	6
2.3	Readout . . . . .	7
2.3.1	Data . . . . .	7
2.3.2	Version & Setting . . . . .	7
2.4	Software . . . . .	7
<b>3</b>	<b>Appendix</b>	<b>11</b>
3.1	Version Information . . . . .	11



# 1 General

## 1.1 Function

GTO gated scaler has 20ch scaler inputs and gate and veto control inputs. In addition to usual scalers, there is internal 1kHz counter and gate number counter. As clock output signals, there are 10kHz, 1kHz and 1Hz pulse outputs. Also there are pulse and level output registers. LED indicates the status of the scaler.

## 1.2 Connector

GTO has 8 NIM output connectors and 24 NIM input connectors. In Gated Scaler GTO, output connectors 1–2 are for clock signals, 7–8 are output registers. For the input, 1–4 is control inputs, and 5–24 are scaler inputs. Figure 1.1 shows the connector and LED indicators.

### 1.2.1 Clock output

There are 10kHz (NOUT1), 1kHz (NOUT2), 1Hz (NOUT3) clock outputs. The pulse width is 60ns.

### 1.2.2 Output register

NOUT7 is 60ns width pulse output according to the command. NOUT8 is the level signal output.

### 1.2.3 Gate input

NIN1 is the gate input connector. When the gate input is enabled, scalers count up during this gate is logic high. If gate input is disabled, scalers count up regardless of this gate input.

### 1.2.4 Veto input

NIN2 is the veto input. When the veto input is logic high, scalers cannot count up.

### 1.2.5 Read latch input

NIM3 is for latching readout values. During this read latch is logic high, the readout values are latched. However, this latch is only for the readout, scalers are counting up even read latch is logic high.

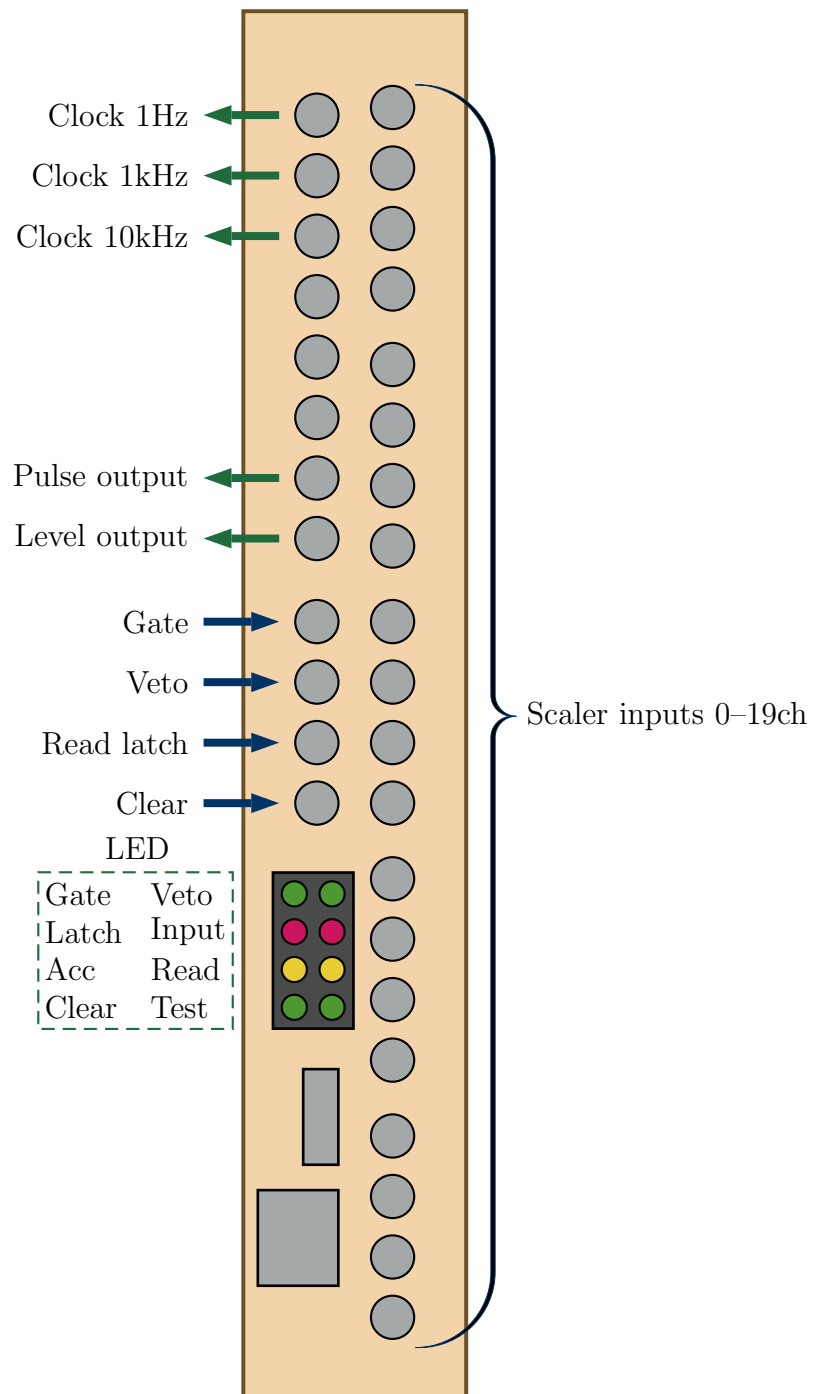
### 1.2.6 Clear input

NIM4 is for clear scaler values.

### 1.2.7 Scaler input

NIM5–24 are the scaler inputs 0–19th channel. The bandwidth of this scaler is more than 200MHz.

Figure 1.1: Connector assignment of Gated Scaler 1.0







## 2 Interface

### 2.1 Command Map

Command list. GTO uses the port number 10001.

Table 2.1: Command map, '\*' means any characters.

<b>Function</b>	On	Off	Default
Gate Enable	0G	0g	On
Soft Veto	0V	0v	Off
Test LED	0T	0t	Off
Level output	0L	0l	Off
Pulse output	0P		
Clear Data	0C		
Initialize	0I		
Set ID1	1*		
Set ID2	2*		
Purge command	!!		
<b>Readout</b>			Length
Data	R*		96Bytes
Version & Setting	@@		8Bytes

### 2.2 Setting

#### 2.2.1 Gate Enable

If enable the gate function (0G), scaler can count up during gate signal (NIM Input 0th) is high. When disable the gate function (0g), scaler always count up. The default setting is gate enabled (0G).

### 2.2.2 Soft Veto

Veto signal can be latched from the command 0V. During veto, scaler don't count up. 0v is off the soft veto.

### 2.2.3 Test LED

For the test purpose, LED (4th row, right) can be controlled by the command. On is 0T, and Off is 0t.

### 2.2.4 Level output

0L command generates the level signal from 6th output. 0l clear the level output.

### 2.2.5 Pulse output

According to 0P command, the NIM pulse is generated (width is 40 ns).

### 2.2.6 Clear Data

This command clears all scaler values.

### 2.2.7 Initialize

This command initialize all settings and scaler values.

### 2.2.8 Set ID1/ID2

User defined ID (2 characters) can be set by 1\* and 2\*. The character placed at '\*' will be written. These are shown in the version code (readout setting).

### 2.2.9 Purge command

!! is the special command to purge command buffer. Usually, this command is not used.

## 2.3 Readout

### 2.3.1 Data

Data format is 96 bytes (32bit  $\times$  24) fix length binary with little endian. The first word contains 28bit Gate Number and the status of Software Veto (S) and Gate Enable (G). The 23th word contains 30bit Gated 1kHz counter and the status of Level output (L) and Veto input (V). This Gated 1kHz counter is incremented during Gate=ON only. The last word has the 30bit 1kHz counter that is unconnected with Gate status.

31					0
1	0	S	G	28bit Gate Number	
32bit Scaler Ch0					
32bit Scaler Ch1					
⋮					
32bit Scaler Ch18					
32bit Scaler Ch19					
Reserve					
L	V	30bit Gated 1kHz Counter			
0	1	30bit 1kHz Counter			

### 2.3.2 Version & Setting

Returns the version code of this module and the current setting. The version code is first 6 bytes and settings are 4 bytes. Totally, it returns 12 bytes with LF and EOT. LF is the line feed. EOT is the end of transmission. 4 and 5th characters are user defined ID1 and ID2. The default values are space (blank). 6–9th characters correspond to Gate Enable, Soft Veto, Test LED, and Level output, respectively. Following is GTO Gate Scaler Rev 1.0:

0	1	2	3	4	5	6	7	8	9	10	11
G	S	1	0	ID1	ID2	G/g	V/v	T/t	L/l	LF	EOT

## 2.4 Software

There is an example program `cmdgscrgto`. The synopsis is:

```
cmdgscrgto [OPTIONS] hostname
-h          : this help
-n          : get version information
```

```

-f XX      : set identifier
-s         : continuous readout
-S         : continuous readout and store data
-R FILE    : readout from gscr file
-d DIR     : directory for storing data
-b         : block other connection during continuous readout
-r RATE    : refresh rate for continuous readout
-g ON/OFF  : Gate Enable On or Off
-v ON/OFF  : Soft Veto On or Off
-t ON/OFF  : Test LED On or Off
-l ON/OFF  : Level output On or Off
-p         : Pulse output
-c         : Clear data
-i         : Initialize

```

EXAMPLE :

```

cmdgscrgto -s -r 0.5    : continuous readout 0.5s each
cmdgscrgto -s -b       : continuous readout 1s each, block other connections

```

To end the continuous readout mode, press Ctrl-C. ‘-b’ block other connections with continuous readout mode. For the continuous readout mode, rate will be shown as follows. ‘Total rate’ is the average rate from when cmdgscrgto is launched. The denominator of the time is gated 1kHz counter. ‘Current rate’ is the difference between previous readout and current readout values.

```

Refresh = 2.0s
Gate Enable / Soft Veto Off
Veto Status Off / Level Output On
1kHz =      1775753 / gated 1kHz =      1770821
Gate Number = 1

```

	Low value /	Current rate /	Total rate
Scr[ 0]	1771 /	0.983 (Hz) /	1.000 (Hz)
Scr[ 1]	1770821 /	1.000 (kHz) /	1.000 (kHz)
Scr[ 2]	17708203 /	9.999 (kHz) /	10.000 (kHz)
Scr[ 3]	0 /	0.000 (Hz) /	0.000 (Hz)
Scr[ 4]	0 /	0.000 (Hz) /	0.000 (Hz)
Scr[ 5]	0 /	0.000 (Hz) /	0.000 (Hz)
Scr[ 6]	0 /	0.000 (Hz) /	0.000 (Hz)
Scr[ 7]	0 /	0.000 (Hz) /	0.000 (Hz)
Scr[ 8]	0 /	0.000 (Hz) /	0.000 (Hz)
Scr[ 9]	0 /	0.000 (Hz) /	0.000 (Hz)

Scr[10]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[11]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[12]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[13]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[14]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[15]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[16]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[17]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[18]	0 /	0.000 (Hz)	/	0.000 (Hz)
Scr[19]	0 /	0.000 (Hz)	/	0.000 (Hz)



## 3 Appendix

### 3.1 Version Information

1.0 First version