Q181W Wheel Controller

This document covers our Wheel Controllers in various configurations:

Q181WM Modulation wheel in a single-channel Q181 panel

Q181WP Pitch Bend wheel in a single-channel Q181 panel

Q182W Modulation and Pitch Bend wheels in a dual-channel Q182 panel

Q181 Single-Channel Controller Interface

Wheel Controller Sub-Module

The Wheel Controller provides voltages for pitch bending or to control any synthesizer parameter. The module can be mounted anywhere within a synthesizer system - next to a keyboard controller or in a system cabinet.

The Wheel Controller offers a variety of unique features not available on other wheel controllers including the ability to spring-return to center, forward, or reverse, and a user-enabled center-detent like the MiniMoog.

The acrylic wheel is illuminated with a 3-color LED which can be configured to change colors as the wheel's position changes, as the Auto Gate is tripped, or stay a fixed color. Colors include red, green, blue, and combinations such as purple, orange and aqua.

Switches at the end of the wheel's travel, both forward and reverse, activate the Switch Gate signal to trigger envelopes, sequencers, to shift pitch or alter filter settings.

Q181WM, Q181WP Wheel Controller Specifications
Panel Size: 2.125"w x 8.75"h. (single-space)
Wheel: Acrylic. .375"w x 2.5" diameter. .625" height above the panel
Wheel Range: ~90 degrees
Spring Return: Off, Center, Forward, or Reverse - user-configurable
Detent: Center - user-configurable
Voltage Output: Selectable range - 5V, 2V, 4/12V
Auto Gate Output: 5V, adjustable position activation
Switch Gate Output: 5V, activated at full-forward and full-reverse
LED Colors: 3 primary colors (Red, Green, Blue)
LED Control: Forward, Reverse, Power, or Auto Gate - user-configurable
Power: +15V@50ma, -15V@50ma, +5V@50ma

Q182W Wheel Controller Specifications
Panel Size: 4.250"w x 8.75"h. (double-space)
Wheel: Acrylic. .375"w x 2.5" diameter. .625" height above the panel
Wheel Range: ~90 degrees
Spring Return: Off, Center, Forward, or Reverse - user-configurable
Detent: Center - user-configurable
Voltage Output: Selectable range - 5V, 2V, 4/12V
Auto Gate Output: 5V, adjustable position activation
Switch Gate Output: 5V, activated at full-forward and full-reverse
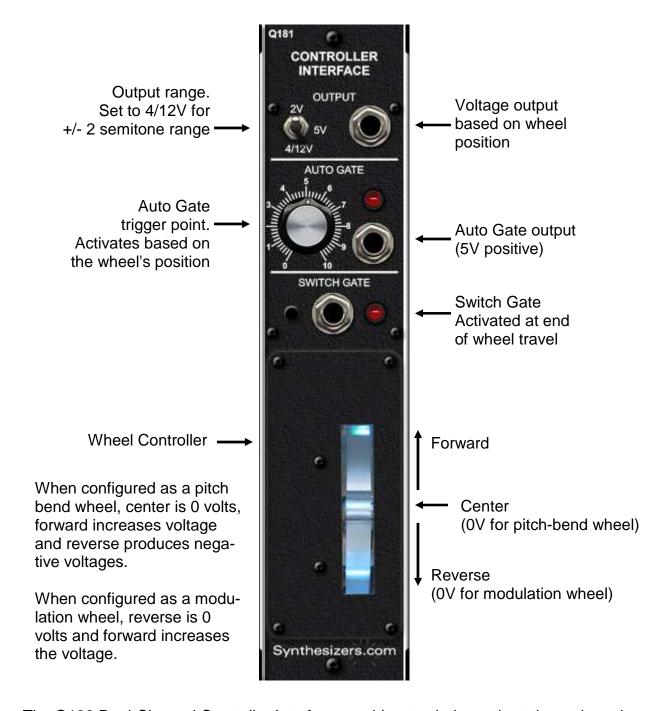**LED Colors:** 3 primary colors (Red, Green, Blue)
LED Control: Forward, Reverse, Power, or Auto Gate - user-configurable
Power: +15V@100ma, -15V@100ma, +5V@100ma

Synthesizers.com

Q181W Wheel Controller

Output range.
Set to 4/12V for
+/- 2 semitone range →

Voltage output
based on wheel
position

Auto Gate
trigger point.
Activates based on
the wheel's position →

Auto Gate output
(5V positive)

Switch Gate
Activated at end
of wheel travel

Wheel Controller →

Forward

When configured as a pitch
bend wheel, center is 0 volts,
forward increases voltage
and reverse produces nega-
tive voltages.

Center
(0V for pitch-bend wheel)

When configured as a modu-
lation wheel, reverse is 0
volts and forward increases
the voltage.

Reverse
(0V for modulation wheel)

The Q182 Dual-Channel Controller Interface provides two independent channels and a
dual-space controller panel capable of operating two single-channel controllers or one
dual-channel controller.

Synthesizers.com

Features and Operation

The Wheel Controller operates through the Q181 or Q182 Controller Interface module to produce voltages and gate signals. These signals can be used to control parameters in a synthesizer system.

The Wheel Controller can be configured for bipolar operation (center is zero) when used as a pitch bend wheel, or for unipolar operation (full reverse is zero) when used as a modulation wheel.

Voltage Output
The top section of the Q181/Q182 panel provides a voltage output corresponding to the wheel's position. The Output range switch offers three convenient voltage ranges - 4/12V, 2V, 5V.

Pitch-Bend Configuration
When configured as a pitch bend wheel, the center position produces 0 volts. For common pitch bending, set the Output range switch to 4/12V to produce a +/-2 semitone range. Set the switch to 2V for a +/-1 volt range, and 5V for +/-2.5 volt range.

Modulation Wheel Configuration
When configured as a modulation wheel, full reverse produces 0 volts and full forward produces the full voltage set by the Output range switch. For most modulation purposes, set the Output range switch to 5V, then attenuate the signal at the destination.

Auto Gate
A gate signal is produced automatically when the controller changes position. The position that triggers this gate signal is set by the variable control. An LED shows status of the signal. This Auto Gate can be used to trigger envelopes, start sequencers or change other module parameters depending on the controller's position. Auto Gate may also be used to transpose oscillators or alter filter parameters at certain wheel positions. The wheel controller can be used for this Auto Gate feature alone, ignoring the voltage output if desired. Use a Q125 Signal Processor module to Invert, offset or attenuate this gate signal as needed.

Switch Gate
The Wheel Controller has a switch at each end of its travel. These switches trigger the Switch Gate signal which can be used control envelope generators, sequencers, etc. The Switch Gate can also be activated manually using the panel button. The controller can be used solely for this Switch Gate feature if desired.

Q181W Wheel Controller

Always turn off power and remove the AC power cord before installing, removing or changing synthesizer components.

Mounting

The Wheel Controller sub-module mounts into a Q181 or Q182 panel using 4 screws, in any orientation. There are 4 screws (4-40x3/8), 4 nuts, and 4 star-washers. Use a star-washer under each nut.

Q181 Single-Channel Controllers

Q182 Dual-Channel Controller - Vertically

Q182 Dual-Channel Controller - Horizontally

Spring Options

The Wheel Controller offers 4 spring options selected by moving a bracket:

       Spring off, free movement (typical for modulation wheel usage)
       Spring return to center (typical for pitch bend usage)
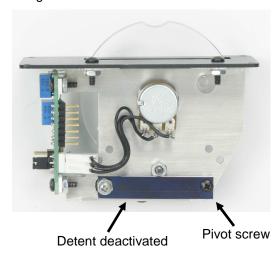   Spring return to top end of travel
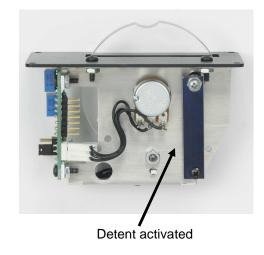   Spring return to bottom end of travel

To change the spring setting, remove the screw/nut that holds the spring bracket and move it to the desired location, or remove it completely for free movement. In this image, the spring is set to center return.

Forward   Reverse

Bracket holes for forward-return

Bracket holes for center-return

Bracket holes for reverse-return

Detent

The Wheel Controller offers a center-detent option like a MiniMoog and other synthesizers. Detent is activated by moving the detent arm from its horizontal storage position to the vertical position. The arm has a plunger that falls into a hole on the wheel to provide the detent. Remove the black pivot screw, turn the detent arm to the desired position, then tighten the pivot screw. Make sure the plastic detent button can move freely in the opening and make contact with the wheel. Normally the return spring is deactivated when using the detent.

Detent deactivated   Pivot screw   Detent activated

LED Colors

The acrylic wheel is illuminated with a 3-color LED. The LED can stay on constantly with any of the 3 colors, change colors based on the wheel's position, or change color based on the Auto Gate signal.
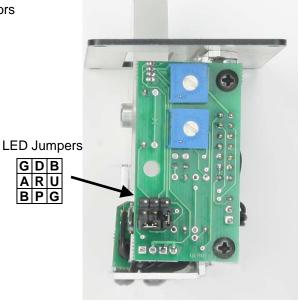
A 9-pin jumper array is provided to program the LED's operation. Move the jumpers according to the chart to get the effect you want. Letters in the chart represent LED colors and signals that can control them.

COLORS

R = Red
G = Green
B = Blue

SIGNALS

U = Up
D = Down
P = Power
A = Auto Gate

LED Jumpers

G	D	B
A	R	U
B	P	G

Examples,
To make the wheel change from blue to red, jumper B to D (blue to down), and jumper R to U (red to up).

To have the wheel blue all the time but switch to purple when the Auto Gate activates, jumper B to P (blue to power), and jumper R to A (red to Auto Gate). Blue and red together makes purple.

If you do not want LED illumination, simply hang the jumpers off to one side of the pins.
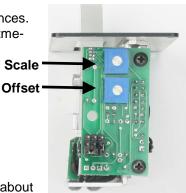
Calibration

Calibration is done at the factory and not required under normal circumstances. Only attempt these procedures if you have the skills and a good digital voltmeter. We can perform this procedure for you.

The Wheel Controller can be configured as bipolar where center is zero, or as unipolar where zero is full-reverse.

Two trimmers on the wheel's circuit board provide Scale and Offset adjustments so the wheel's motion produces the correct voltage output.

The potentiometer for the wheel controller is 50K linear but only part of the travel is used. The wheel must be attached to the pot so the resistance is about 5k when fully forward.

Scale

Offset

Unipolar (Zero-to-Full) Calibration

Attach a voltmeter to the Output jack of the Q181 Controller Interface.
Set the Output range switch to 5V.
Set the Mode jumper on the Q181 PCB to unipolar (pins 2-3).
Move the to wheel full reverse.
Adjust the Offset trimmer to get 0 volts.
Move the wheel between full-forward and full-reverse,
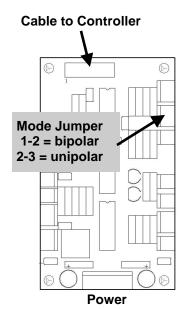and adjust the Scale trimmer for 5.00 volts of change.
This may take many cycles.
Move the wheel to full reverse.
Adjust the Offset trimmer to 0 volts.
Now the wheel should produce 0 to 5 volts.

Cable to Controller

**Mode Jumper
1-2 = bipolar
2-3 = unipolar**

Power

Bipolar (Center-Zero) Calibration

Same procedure as unipolar, but when complete,
set the Mode jumper on the Q181 PCB to pins 1-2.
Test for center 0 volts and adjust the Offset trimmer if necessary.
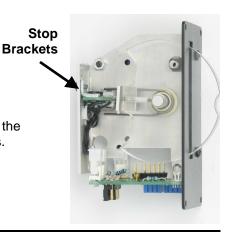Now the wheel should produce +/- 2.5 volts.
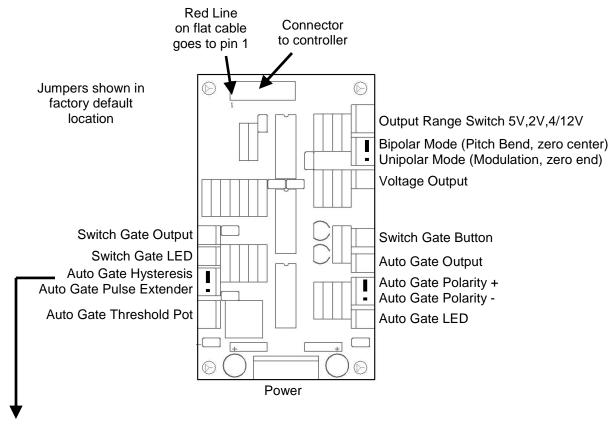
Stop and Switch Brackets

Two brackets limit the wheel's travel, and provide mounting for
the switches that produce the Switch Gate signal.
For the center-zero configuration, to achieve an equal forward
and reverse travel from the center position, it may be necessary to adjust the switch brackets at the bottom of the wheel.
There is an interaction between these switch brackets which provide the
stop position in each direction, and the Scale and Offset adjustments.

**Stop
Brackets**

Q181 Controller Interface PCB

Red Line
on flat cable
goes to pin 1

Connector
to controller

Jumpers shown in
factory default
location

Output Range Switch 5V,2V,4/12V

Bipolar Mode (Pitch Bend, zero center)
Unipolar Mode (Modulation, zero end)

Voltage Output

Switch Gate Output

Switch Gate Button

Switch Gate LED
Auto Gate Hysteresis
Auto Gate Pulse Extender

Auto Gate Output

Auto Gate Polarity +
Auto Gate Polarity -

Auto Gate Threshold Pot

Auto Gate LED

Power

Hysteresis limits Auto Gate oscillation
at the threshold. Pulse Extender is
used for piezo sensors such as drums
to lengthen the Auto Gate pulse.

14-Pin Controller Connector

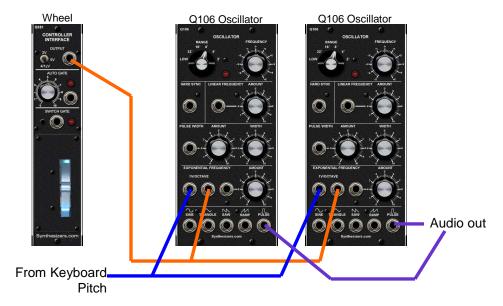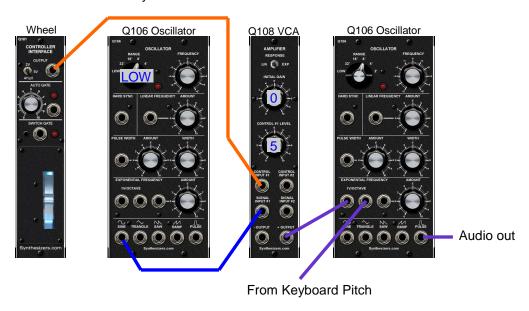|	
1 Ground	8 Range pot
2 +15V	9 Auto Gate
3 Key	10 +5V
4 -15V	11 Up LED
5 Offset pot wiper	12 Down LED
6 Sensor	13 Switch Gate
7 Range pot wiper	14 LED ground

Patch Ideas

This is a common patch where the wheel controller is used to pitch bend two oscillators. Voltage from the pitch bend wheel is added to the keyboard's pitch voltage at each oscillator. Pitch bend can also be accomplished by using the Q174 MIDI Interface's ADD IN input.
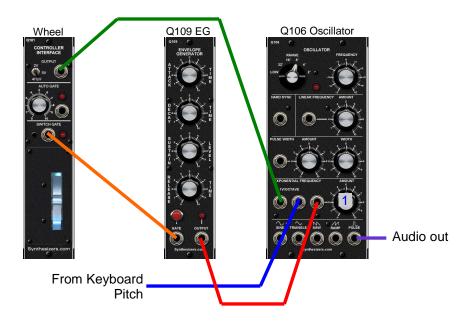

This patch shows a modulation wheel using a Q108 Amplifier (VCA) to control the modulation depth of an oscillator. The first oscillator is used as an LFO to create vibrato on the second oscillator. The second oscillator produces the waveform for the synthesizer voice.

Synthesizers.com

In this patch, the wheel is used as a pitch bender and the Switch Gate triggers an envelope generator for a special effect. When the wheel is pushed fully forward or fully reverse, the envelope will trigger.
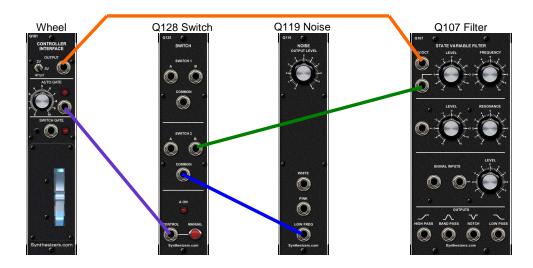

Wheel   Q109 EG   Q106 Oscillator

Audio out

From Keyboard
Pitch

This patch shows the wheel controller starting a Q960 or Q119 sequencer using the Auto Gate signal.

Wheel   Q119 Sequencer   Q960 Sequencer

This patch shows the wheel controlling a filter and the Auto Gate turning on noise modulation. As the wheel is pushed forward, the Auto Gate turns on according to the knob's position. That Gate is then used to switch on a noise signal using a Q128 Switch. A Q108 Amplifier could be used as the switch.

Wheel

Q128 Switch

Q119 Noise

Q107 Filter

Auto Gate and Switch Gate can be used for more than on/off functions. In this patch, the Auto Gate is used to transpose an oscillator by one octave. The gate provides 5 volts to the variable input on the oscillator and adjusted to produce a 1-volt (1-octave) change.

Wheel

Q106 Oscillator

Adjust for
1 octave change

Audio out

From Keyboard Pitch

Synthesizers.com