# panoptigon

- Owner's Manual -
- Quick Start -

IMPORTANT SAFETY INSTRUCTIONS

1 – Read and keep these instructions.

2 – Heed all warnings and follow all instructions.

3 – WARNING: To prevent fire or electric shock, do not expose this equipment to rain or moisture. Do not use this apparatus near water.

4 – Clean only with a dry cloth.

5 – WARNING: To prevent excessive temperature rise, operate product only in free air with unrestricted ventilation. Do not install in confined spaces or near heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.

6 – Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding plug has two blades and a grounding prong. The wide blade or third prong is provided for your safety. If the provided plug does not fit your outlet, consult an electrician for the replacement of the obsolete outlet.

7– Protect the power cord from being walked on or pinched, particularly plugs, convenience receptacles, and the point where they exit from the apparatus.

8 – Unplug the apparatus during lightning storms or when unused for long periods of time.

9 – The appliance coupler (or attachment plug) is the mains disconnect device and should remain readily accessible when the unit is in use.

10 – Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

11 – This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

12 – Changes or modifications made by the user that are not expressly approved by the manufacturer may void your authority to operate the unit.
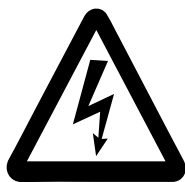
The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous" voltage within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to humans.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in this manual.

CAUTION: DO NOT REMOVE THE COVER. NO USER–SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL.

WARNING: Do not expose this equipment to rain or moisture.

Content Guide

Panoptigon Package Contents

Please verify that your package includes the following. If there are any issues, visit Quilter Labs support at https://www.quilterlabs.com.

- Dust cover
- Disc starter set
- PS-24 universal voltage power supply (100VAC – 240VAC, 50/60Hz)
- IEC AC cord (type varies per region)
- Owner's manual
- Keyboard labels
- 12" long pipe cleaner (for cleaning optical slit)

Note: Please retain the shipping carton and packing materials in the unlikely event your Panoptigon needs servicing.

Welcome!

Welcome to the Panoptigon, and the world of analog, optical-based sampling.

Based on the retro concepts of the Optigan and Orchestron instruments from the 70s, the Panoptigon brings analog, optical-based sampling into the present-day world of MIDI, digital effects, and live performance control. Compared to its ancestors, the Panoptigon features far more reliable construction, and a greatly expanded feature set that fosters creativity. It's also easy to understand, use, and play—so let's get started.

Part 1: Hookup

1. Referring to above illustration, insert the Quilter PS-24 power supply's small barrel plug into the 24 VDC power inlet jack (**A**). Please do not use any adapter other than the one supplied with the Panoptigon.

2. Plug the IEC AC cord female jack into the PS-24 power supply's AC male receptacle. Make sure the jack is seated firmly. Then, insert the PS-24's male AC plug into an AC outlet (100V to 240V, 50/60Hz). If the JUICE power switch (**B**) glows, turn it off by pressing the switch button center once. This puts the Panoptigon into standby mode while you set it up.

3. Connect a 5-pin DIN MIDI cable (not supplied) from the MIDI controller's output jack to the Panoptigon's MIDI IN jack (**C**). Typical controllers include keyboards, sequencer outputs, and MIDI control surfaces. *Tip*: If you're controlling the Panoptigon from a computer that can send and receive MIDI only via USB, or an iOS device, the iConnectMIDI1 interface from iconnectivity.com adapts USB and Apple Lightning connectors to standard 5-pin DIN jacks.

4. Connect the Panoptigon audio output to an audio mixer, amplifier, or headphones, using one of three output options.

Headphones: Plug a standard, low-impedance stereo headphone with a 3.5 mm (1/8") plug into the rear-panel Headphones jack (**D**).

Connecting the output to a monitoring system other than headphones requires a cables or cables with one of the following plug types. The left plug is a mono ¼" plug; the one on the right is a stereo ¼" TRS plug.

Mono audio: Connect an audio cable with a ¼" mono phone plug (e.g., an instrument or guitar cable) between the Panoptigon's CHORDS LEFT (MONO SUM) jack (**E**) and the input of a mixer, amplifier, audio interface, etc. *Tip:* Turn down the audio amplifier's volume before plugging in, then turn it up to a comfortable level later, as indicated.

Stereo audio: The Panoptigon accommodates single or dual-cable stereo operation.

• For *dual-cable stereo,* connect an audio cable with a ¼" mono phone plug (e.g., an instrument or guitar cable) between the Panoptigon's CHORDS LEFT jack (**E**), and the left channel of a device like a mixer, amplifier, audio interface, etc. Similarly, connect another ¼" phone cable between the Panoptigon's KEYS RIGHT output (**F**) and the device's right channel.
• For *single-cable stereo,* connect a stereo cable wired for TRS connections (T = Right, R = Left, Sleeve = Ground;) between the Panoptigon's KEYS RIGHT (TRS STEREO) jack (**F**) and a stereo input jack on the audio monitoring gear. Or, use the Panoptigon's Headphones jack (**D**) if the stereo cable terminates in a stereo 1/8" connector.

Part 2: Initial Settings

1. Set your MIDI controller to MIDI Channel 1 (the usual default for controllers). To cover the full range of Panoptigon functionality, you may need to adjust the controller's octave range. With a 61-note MIDI controller, set the octave range or transpose function (refer to your controller's manual) so that middle C (MIDI note 60) is the third C key from the left of the keyboard. (A 49-note controller is usable, but some notes and special effects buttons will not be available without transposing the keyboard, which will then put other notes out of range.) **Tip:** Note names can be ambiguous, but note numbers are not. Middle C is named C3 with some controllers, and C5 with others; MIDI-OX (a MIDI monitoring program) uses C1, and scientific pitch notation uses C4. **60** is the standard note number for middle C.

2. Set the lower left Panoptigon knobs to their initial settings, as shown below.

KEY MAPPING: Choose the KEY MAPPING number based on the disc type you're playing: 3 for Optigan discs, 4 for Orchestron discs, 6 for Panoptigon discs
MIDI CHANNEL: ALL
PITCH BEND: 2
TRANSPOSE: 0
FORWARD•REVERSE: Off. If on (lit), press to turn off.

3. Set the lower right controls to their initial settings (see below).

PITCH ADJ., VOLUME, and **BALANCE:** Center (indicator dot points towards front of unit)
START•STOP: Off. If on (lit), press to turn off.
MANUAL: On (glows blue), press to turn on.

4. Set the three **FX CONTROL** knobs and the **FX LEVEL** control fully counter-clockwise, and **FX SELECT** to 1.

Part 3: Start Playing!

1. Remove the Program Disc from its jacket and sleeve. **Tip:** To prevent damaging a disc, make sure your fingers are free of contaminants like grease, food, oils, and the like.

2. To avoid putting fingerprints on the disc's soundtracks, hold the disc with two hands on the thin edge margin, at opposite sides of the disc (toward the Panoptigon's right and left sides). The label should be facing up. Slide the disc under the red optical cover until the disc's center hole aligns with disc spindle. Then, let the center hole fall into place around the spindle, so that the disc settles on the foam-covered center hub. When handling the disc, use care not to crease, fold, or scratch it.

3. Remove the pale yellow tape used to secure the Disc Weight during transport. Then lift the Disc Weight up, past the holder's detent, to remove the Disc Weight from the holder. With the Disc Weight's foam side down, center its hole over the spindle, then place the Disc Weight gently on the program disc. **Note:** The disc will not spin, and therefore the Panoptigon will not be playable, unless the Disc Weight is in place.

4. Turn on power by pressing the power switch (labeled **JUICE**), and then wait 5 seconds for the fans to get up to speed. The air from the fans elevates the disc so it can rotate freely when the motor runs.

5. Press the **START•STOP** button (the associated green LED lights). Confirm that the disc is spinning.

6. Send MIDI note-on and note-off commands to the Panoptigon by playing your controller keyboard, or generating notes over MIDI channel 1 from any MIDI controller.Move the **PITCH ADJ.** control to set the desired speed and tempo.

7. Adjust your monitoring system's level.

8. Add DSP effects with the **FX SELECT** switch, **FX CONTROLS 1-3**, and **FX LEVEL** (see above). For more on the DSP effects, please see the main manual.

9. As with inserting a disc, when removing a disc, be very careful not to crease, fold, or scratch it. Remove the Disc Weight and stow it on its holder, then pick the disc up from opposite sides, and raise it slowly until it's free of the spindle. Then, bring the disc toward you gently, while keeping the bottom of the disc from contacting the controls. You may leave the fans running to raise the disc slightly, or you can slide a piece of paper under the disc to raise up its edge, to make it easier to grab the edges.

   Congratulations! You're on your way. But the Panoptigon has many more talents, so please take the time to read the full manual, and familiarize yourself with the Panoptigon's operation.

QUICK START

Owners Manual

Back in the 1970s, long before the debut of digital sampling keyboards, the Optigan and Orchestron instruments introduced optical-based analog sampling to the world. Although tape-based replay instruments had existed previously, the Optigan and Orchestron borrowed film industry technology to put sounds on lighter, more compact, and more reliable optical media.

The Panoptigon resurrects analog sampling in a modern format. Although fully compatible with Optigan and Orchestron discs from the 1970s, the Panoptigon also introduces a new, more advanced disc format. Standout Panoptigon features include:

- Compatible with MIDI keyboards for triggering sounds, and providing basic motor control
- Intuitive interface (no scrolling through menus!) for real-time performance control and disc manipulation
- On-board, stereo DSP effects provide a wide range of audio effects to enhance the sampled sounds
- Accurate pitch control from the computer-controlled motor drive
- Plays multiple formats: Optigan, Orchestron, and Panoptigon program discs
- Standard MIDI In and MIDI Thru 5-pin DIN connectors
- Responds to MIDI commands for aftertouch, sustain, and vibrato (mod wheel), as well as motor start/stop and reverse playback
- Strobe lines and Start Mark on newer discs support concert pitch tuning, pitch bend, modulation, and accurate transposition
- Air flotation gently supports the disc with minimal contact
- Compact, turntable-like format is far sturdier and more reliable than the bulky, fragile consoles used in the original Optigan and Orchestron instruments
- Controllable from the iOptigan iOS app
- Stereo audio outputs and independent headphone output
- Synchronization port to control a second player

Whether for new (and distinctively unique) sounds in the studio, or live performance on stage, the Panoptigon brings something new to the world of analog sample playback—while respecting a tradition that dates back almost half a century.

Controls

This section provides an overview of the Panoptigon's controls, starting from the upper left corner of the front panel, then proceeding counterclockwise. There's additional information on each control in their related sections.

Juice

"Juice" is slang for power, and the Orchestron's power switch was labeled JUICE—so the Panoptigon honors the legacy of that vintage instrument by adopting its nomenclature. Press once to turn on power, press again to turn off.

Key Mapping Switch

When playing the Panoptigon from a MIDI keyboard controller, in addition to triggering notes, some keys are dedicated to triggering specific functions, such as chords or special effects. Mapping is the term that describes the controller's key assignments to notes and functions. The Panoptigon offers 7 different mappings for the various disc types, as well as options for stereo or monaural operation. In addition, position 1 selects a test mode to confirm proper Panoptigon and disc operation. A label that summarizes the mapping options is near the Disc Weight holder; see the Panoptigon Key Mappings section for details about mapping.

MIDI Channel

The MIDI (Musical Instrument Digital Interface) protocol can send note-triggering data from a keyboard or other controller to a sound generator, over 1 of 16 possible data channels. It's important to match the controller's transmission channel (which usually defaults to MIDI channel 1) with the Panoptigon's reception channel. The MIDI CHANNEL rotary switch chooses among MIDI channels 1 through 7, or ALL channels. ALL channels is called MIDI Omni mode, because it receives incoming data over any channel (except for some commands that could be problematic when applied to all channels, like All Notes Off and Reset All Controllers commands). The ALL setting is the most universal Panoptigon MIDI option. Note that the Panoptigon is compatible with both MIDI 1.0 and MIDI 2.0 controllers.

Pitch Bend (Compu-Drive mode only)

The PITCH BEND switch works in Compu-Drive mode only, with discs that have strobe lines or Orchestron and Optigan discs that have 2-second long loops. MIDI can transmit pitch bend information from a controller's associated pitch bend wheel or lever. The PITCH BEND control determines a note's bend range, in semitones. For example, when set to 2, moving a controller's pitch bend wheel all the way forward transposes the audio playback up by +2 semitones. Moving a controller's pitch bend wheel all the back transposes the audio playback down by -2 semitones.

Transpose (Compu-Drive mode only)

As with PITCH BEND, TRANSPOSE works in Compu-Drive mode only, with discs that have strobe lines or Orchestron and Optigan discs that have 2-second long loops. The transposition range for sounds played by the Panoptigon is variable in semitone steps, from -3 semitones down, to +4 semitones up.

Forward•Reverse Switch

While the disc is rotating, pushing the FORWARD•REVERSE switch toggles the rotation between clockwise (normal rotation direction) and counterclockwise (reverse rotation and sound, as confirmed by a lit, red indicator next to the switch). This switch works in all drive modes and mappings, except the Test function (position 1 on the KEY MAPPING switch). You won't harm the motor by pushing this switch while the disc is rotating; pushing it rapidly gives scratching-type or "tape stop" effects.

Manual, Servo, & Compu-Drive Switches

These pushbutton switches choose the Drive Mode, which determines Panoptigon functionality for the various disc types. Only one mode button can be active at a time; selecting any one of them de-selects any other mode that might be active. See the Drive Modes section for more information.

Start•Stop Switch

This pushbutton switch toggles between starting and stopping the disc. When the disc is rotating, the green LED next to the switch lights. This switch works in all drive modes and mappings, except the Test function (position 1 on the KEY MAPPING switch).

Pitch Adj(ust)

Use this control in Manual mode to tune the Panoptigon's pitch as it plays back. It's like the variable speed control on turntables and tape recorders.

Volume

This adjusts the Panoptigon's output level that appears over the various audio output jacks (KEYS RIGHT, CHORDS LEFT, and HEADPHONES). It consists of the dry, unprocessed sound.

Balance

Some discs generate chords as well as individual notes. With stereo mappings, BALANCE determines which one is louder, or whether they both play back at equal volume. For mono mappings, this control pans the dry, unprocessed signal between the CHORDS LEFT and KEYS RIGHT audio outputs.

FX Level

The Panoptigon includes 8 Digital Signal Processing-based effects processors (DSP FX): two types of reverb, two types of delay, flanger, phaser, pitch shift (parallel harmony generation), and chorus. FX LEVEL is the master control for mixing the desired amount of processed sound into the overall output.

FX Select

Choose any one of the 8 DSP FX options with this control, to process sounds from the disc that's currently playing. The selected effect processes the audio signal in one of two ways, with the amount of applied processing based on the FX LEVEL control.

- Stereo Key Mapping: The DSP FX processes only the audio from the note keys (chords and special effects remain unprocessed).
- Mono Key Mapping: The DSP FX processes all audio.

FX Controls 1-3

Each DSP FX chosen by the FX SELECT control has three editable parameters. The knobs control the parameter values. A reference label above the FX controls shows the parameters, and duplicates the chart shown next.

FX Parameters

The various parameters affect the sound of the DSP FX as follows.

Switch Position	Effect	Control 1	Control 2	Control 3
1	Room Reverb	Decay Time	Pre-Delay	Damping
2	Hall Reverb	Decay Time	Pre-Delay	Damping
3	Delay/Echo	Decay Time	Feedback	Damping
4	Ping Pong Delay	Ping Delay	Pong Delay	Feedback
5	Flanger	Delay	Sweep Width	Sweep Rate
6	Phaser	Phase Rate	Sweep Width	Number of Stages (4,6,8,10)
7	Pitch Shifter	Pitch L	Pitch R	N/A
8	Chorus	Depth	Width	Rate

Room Reverb and Hall Reverb

These effects emulate the sound of reflections bouncing off the walls in a small acoustic space, like a room, or a larger space, like a concert hall.

- FX1: Decay Time determines how long it takes for the reverb "tail" to decay into inaudibility.
- FX2: Pre-delay adds a slight delay before the reverb tail begins, which emulates the time it takes for a   sound source's audio to reach the walls, ceilings, and floors of an acoustic space.
- FX3: Rooms with absorbent surfaces like drapes, furniture, people, etc., absorb higher frequencies more readily than rooms with hard surfaces. Turn down the damping control to give your virtual room harder surfaces and a brighter sound, or increase damping to emulate softer surfaces that dampen the high frequencies progressively more as the sound decays.

Delay/Echo

Unlike reverb, which produces a complex "wash" of sound, delay produces a series of discrete echoes.

- FX1: Delay Time sets the time interval between the notes you play and their delayed versions.
- FX2: Feedback sends some of the output back to the input to create a series of echoes, instead of a single repeat.
- FX3: Turn up damping to reduce high frequencies as the echoes repeat.

Ping Pong Delay

This is similar to Delay/Echo, but alternates each echo between the left and right channels. Note that if the Delay times are identical, the effect will appear to be mono because the echoes are occurring in the two channels simultaneously.

- FX1: Ping Delay sets the time interval in one channel between the notes you play and their delayed versions.
- FX2: Pong Delay sets the time interval in the other channel between the notes you play and their delayed versions.
- FX3: Feedback sends some of the output back to the input to create a series of echoes, instead of a single repeat.

Flanger

Flanging produces a whooshing, jet airplane-like effect that was popular during the 1960s. It works by mixing a signal with a varying delay time in equal proportion with a dry signal. As the delay time varies, it produces notches in the frequency response due to being mixed with the dry signal. The movement of these notches over the frequency range you specify produces the flanging effect.

- FX1: Delay sets the initial delay time around which flanging occurs. With FX2 and FX3 turned fully counterclockwise, this becomes a manual flanging control.
- FX2: Sweep Width determines the frequency range over which flanging occurs.
- FX3: Sweep Rate adjusts the flanging effect's speed, i.e., from a slow, leisurely sweep to a faster, more "bubbling" sweep.

Phaser

This effect is similar to flanging, but not as resonant because it produces far fewer notches (1 notch for every 2 phase-shifting stages). The effect is similar to sweeping an allpass filter.

- FX1: Phase Rate adjusts the phasing effect's speed, from slow to fast.
- FX2: Sweep Width sets the frequency range over which the phasing effect occurs.
- FX3: Number of Stages determines how many notches the phasing effect produces. More stages produce a more dramatic phasing effect. Note: This is not a stepped control; each option occupies about 20% of the control's rotation. You may hear a slight click during the transition from one number of stages to the next, which is normal.

Pitch Shifter

The Pitch Shifter creates two parallel harmony lines—one in the left channel, and one in the right. This is the only effect for which there is no third parameter. The controls do not affect pitch when the knob's dot is centered (i.e., facing the front of the Panoptigon). Turning either FX CONTROL clockwise shifts pitch continuously up to a maximum of +4 semitones (major 3rd), while turning counterclockwise shifts pitch continuously down to a maximum of -5 semitones (perfect 4th).

- FX1: Pitch L sets the harmony interval for the left channel.
- FX2: Pitch R sets the harmony interval for the right channel.

Chorus

Chorusing produces the effect of instruments playing "en ensemble," like doubling. Technically, it's similar to flanging, but covers a narrower range and typically sounds more animated.

- FX1: Depth adjusts how pronounced the chorus effect sounds.
- FX2: Width determines the time delay range where the effect produces chorusing. Increasing width, and/or depth, leads to more dramatic effects.
- FX3: Rate controls the chorus speed, from a slow sound that's lush and dreamy, to a faster rate that's more like vibrato.

Acknowledgement

Optical Alignment Control

This is the large, dial control in the Panoptigon's upper center. It adjusts the alignment of the disc track waveforms with respect to the photodiode-based detector. Correct alignment is important to avoid crosstalk (sound from one track "bleeding" into another track), and distortion. Misalignment can occur if the Panoptigon has been moved around a lot (e.g., it's used in live performance), but significant temperature variations, light leakage from adjoining tracks, or a worn or eccentric disc center hole can all cause crosstalk.

Vintage Optigans and Orchestrons had no easy or simple way to correct misalignment, and this was quite a problem. Fortunately, the Panoptigon's Optical Alignment Control allows optimizing alignment quickly and easily. It moves the detector assembly backwards and forwards, in thousandths of an inch (as shown by the calibrated scale), to null out the crosstalk and distortion. There is no need to adjust the head height.

1. To start, set the Optical Alignment Offset control's pointer near the middle of the range (typically "0" on the scale).
2. Turn the knob a few degrees clockwise or counterclockwise while playing a note (some play is normal in this control), and listen carefully.
3. Leave the knob in the position where crosstalk and distortion are minimized, or eliminated completely. You may need to audition several notes along the keyboard to find a setting that provides the highest sound quality for the greatest number of notes.

Discs and Drive Modes

For maximum flexibility, the Panoptigon is compatible with Modern and Vintage program discs.

- Modern discs, made since 2008, have an array of strobe lines around the center (label) disc region (see below). These allow for timing, synchronization, and MIDI modulation. All Panoptigon discs are Modern discs, as are some Optigan and Orchestron discs.
- Vintage discs made for the Orchestron and Optigan in the 1970s do not have strobe lines. (A very rare Vintage disc format, sold with Talentmaker organs, is currently incompatible with the Panoptigon due to a non-standard spindle hole size.)

STROBE LINES   **START MARK**
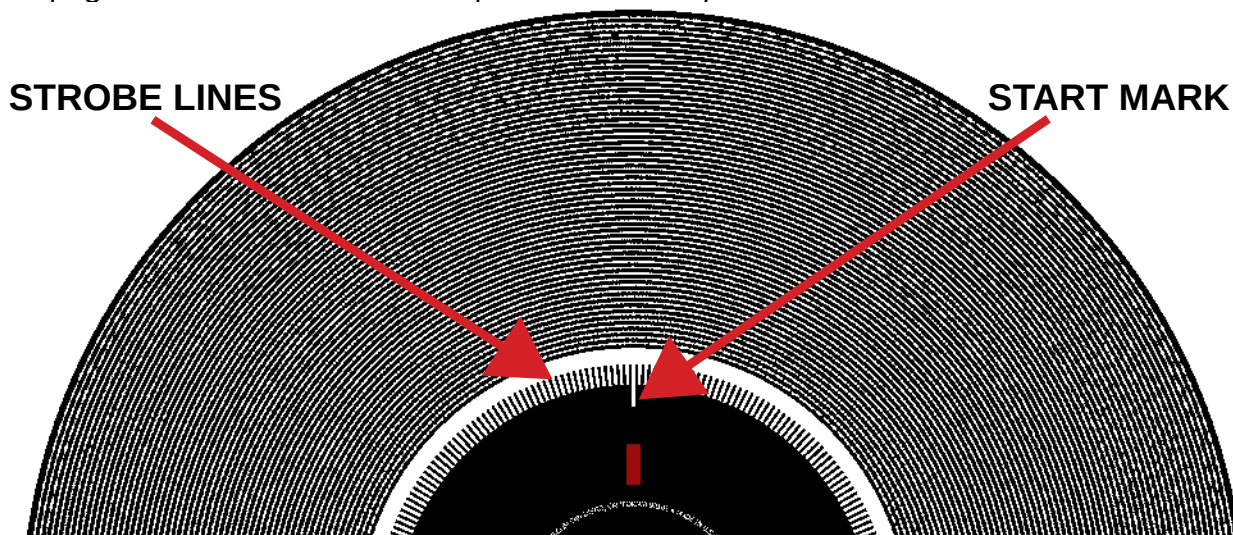
To achieve sustained tones, these discs loop their recorded sounds. In other words, the sound plays through to the end, then continues to repeat the sound for as long as there's a sustained MIDI note. The sound ends when the note ends. Note that Modern discs have seamless loops—there's no discontinuity between the end of playback, and the start of the repeat—but this is not always the case with Vintage discs.

- Optigan and Panoptigon discs have variable loop lengths, from about 1.7 to 3 seconds long.
- Orchestron discs have fixed, 2-second loop lengths.

Panoptigon Disc Modes: Manual, Servo, Compu-Drive

Choose one of the three disc drive modes, based on the disc type you're using, and how you want to play the Panoptigon. To enable a mode, press its associated button. It will light. If a different mode is already selected, selecting a new mode de-selects the existing mode.

The following table summarizes basic mode functionality for different disc types. Please read the section immediately following the table for detailed information on how different disc types operate in these modes.

		Manual	Servo	Compu-Drive			
				Transpose	Pitch Bend	Mod Wheel	Aftertouch
Vintage Discs	Optigan	√		*	*		
	Orchestron	√		√	√		
Modern Discs	Optigan	√	√	√	√	√	√
	Orchestron	√	√	√	√	√	√
	Panoptigon	√	√	√	√	√	√
* Vintage Optigan discs with 2-second loop lengths play at concert pitch in Compu-Drive mode							

Manual Mode: Most Basic

- Works with all disc types.
- PITCH ADJ control changes the disc playback speed to provide real-time pitch changes. For DJs, this is similar to a turntable's pitch control. It's also similar to the Tempo control in vintage Optigans, and the Orchestron's Pitch control.
- Wide playback speed range, from super-fast to dragging the sound through molasses.

Servo Mode: More Functionality

- Requires Modern discs with strobe lines.
- Constantly monitors and corrects the disc speed to lock the loops to concert pitch. The correction process adds very subtle speed variations (much like tape recording), which imparts a natural, "organic" quality.
- As with a vinyl record turntable, you can disrupt the disc's rotation by touching the Disc Weight, or the disc edge, to create pitch-bend effects. The motor overshoots the locked speed while attempting to regain lock, which produces a cool "boing" effect.
- Using the FORWARD•REVERSE and START•STOP switches provides similar disruptive effects.
- In Servo mode, Vintage discs spin at the fastest speed. This won't hurt anything, and may provide useful results.

Compu-Drive Mode: Advanced Functionality

- Requires Modern Optigan and Orchestron discs with strobe lines (Panoptigon discs are inherently Modern discs) for full functionality.
- Responds to modulation wheel and aftertouch only if strobe lines are present.
- Scans the strobe lines prior to playing, then calculates the best way to control and alter the motor speed.
- Constant speed (no subtle variations).
- Synchronizes pitch transposing, pitch bend, and modulation to the disc rotation rate.
- Spins Orchestron discs at 0.5 revolutions per second.
- Plays Vintage Optigan discs at the correct speed only if they have 2-second long loops.
- Upon entering Compu-Drive mode, or changing the KEY MAPPING rotary switch while in Compu-Drive mode, disc scanning occurs for 2 to 6 seconds. Scanning silences all notes, and disables the FORWARD•REVERSE and START•STOP switches.

For Modern Optigan Discs with Start Marks:

- If the disc is stopped upon entering Compu-Drive mode, the Panoptigon will rotate the disc, scan it until it sees the Start Mark twice, then park the disc at the Start Mark.
- If the disc is rotating upon entering Compu-Drive, the Panoptigon scans the disc until it sees the Start Mark twice, corrects the speed if needed, and continues rotating.
- You can start the disc with the START•STOP button, by playing a note on the MIDI controller, or pressing or tapping on a sustain pedal connected to a MIDI controller.

For Orchestron Discs (Modern and Vintage):

- With the KEY MAPPING rotary switch set to Orchestron (position 4), the Panoptigon doesn't scan, and spins the disc at 0.5 revolutions per second to accommodate the Orchestron's 2-second loops.
- The disc will not park, even if there's a Start Mark.

For All Other Discs and Key Mapping Settings:

- Switching to Compu-Drive mode always initiates a disc scan. If there are no strobe lines, the scan stops, and the disc turns at 0.5 revolutions per second. For some Vintage Optigan discs, this causes the disc to play out of tune.
- If a disc has strobe lines but no Start Mark, the disc will spin at 0.5 revolutions per second, and will not find a Start Mark where it can park.
- If you change discs while in Compu-Drive mode, force a rescan by going into Manual mode and then returning to Compu-Drive. Or, switch to another KEY MAPPING position, then switch back to the desired KEY MAPPING.

Panoptigon Key Mappings

Mapping refers to how MIDI notes are assigned to trigger various Panoptigon tracks (the sounds associated with notes) and functions. The mappings for Optigan, Orchestron, and Panoptigon discs are somewhat different, because these discs produce different playback experiences. The 8-Position KEY MAPPING rotary switch (see below) selects the desired mapping.

Please note: If you change the KEY MAPPING switch while in Compu-Drive mode, the Panoptigon needs to re-scan the disc. This takes a few seconds while the Panoptigon identifies the disc type, mutes the disc tracks, and disables the FORWARD•REVERSE and START•STOP switches. When the re-scan completes, the Panoptigon is ready to play.

The following diagram shows which keyboard controller notes map to which functions for the three types of Panoptigon-compatible discs (as well as the specialized Sequential Mapping, described later).

■ **KEYBOARD** ■ **START/STOP** ■ **CHORDS**

■ **KEYBOARD** ■ **FORWARD/REVERSE**
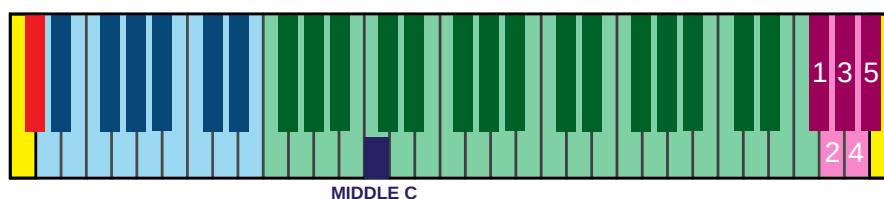
OPTIGAN MAPPING

MIDDLE C

ORCHESTRON MAPPING

MIDDLE C

PANOPTIGON & SEQUENTIAL MAPPINGS

MIDDLE C

-15-

Optigan•Key Mapping Switch Positions 2 & 3

The Optigan is a chord organ with 21 Chord Buttons, 5 Special Effects Switches (assigned to rocker switches that can trigger effects momentarily, or be locked to play continuously), and 37 Note Keys that cover a 3-octave range. These are mapped to a keyboard using the following MIDI notes (your Panoptigon includes a peel-off label you can apply to your keyboard controller for use with Optigan discs).

- **Keyboard Notes:** MIDI note #53 to MIDI note #89
- **Special Effects Switches:** MIDI note #90 to MIDI Note #94
- **Chord Buttons:** MIDI note #38 to MIDI note #52 (see chart below)

	Bb Min		C Min	G Min	D Min		E Min	D Dim
Bb Maj	F Min	F Maj	C Maj	G Maj	D Maj	A Min	Bb Dim	A Dim
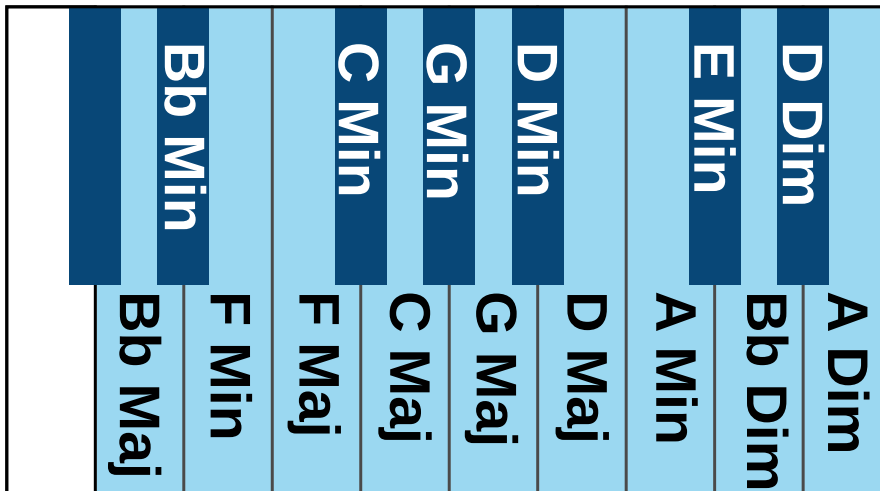
With a 61-note keyboard, the two highest and lowest keyboard notes are mapped to the Forward/Reverse and Start/Stop functions. However, when triggering with a keyboard it's assumed you want to use these functions for live performance, so they operate slightly differently from the unit's top-panel FORWARD•REVERSE and START•STOP pushbutton switches.

- **Forward/Reverse:** Pressing the key for MIDI note #36 or #95 reverses the current disc rotation direction. Releasing the key reverts to the original disc rotation direction.
- **Start/Stop:** Pressing the key for MIDI notes #37 or #96 toggles between the disc rotating, or the disc being stopped.

The KEY MAPPING Rotary Switch selects between two Optigan modes.

- **Stereo** (position 2) mimics the original Optigan format. Chords and special effects tracks go to the left audio channel, while the keyboard tracks go to the right channel. The Panoptigon's onboard DSP Effects (FX) process only the keyboard tracks, but because the FX output is stereo, the processed audio appears over the left and right outputs.
- **Monaural** (position 3) mixes the chords, special effects, and keyboard notes, so both the left and right outputs contain this mixed signal. The Panoptigon's onboard DSP FX process the summed signal, but again, because the DSP FX themselves are stereo, the processed audio appears over the left and right outputs. **Tip:** This mode is ideal with Modern Optigan discs like Symphonic Strings or Chamber Strings, where the tracks triggered by Chord Buttons benefit from adding effects like reverb.

Orchestron•Key Mapping Switch Position 4

Orchestron mapping for notes is the same as the Optigan. There are no Chord or Special Effects Tracks assigned to keys. The top two and bottom two notes of a 61-note keyboard provide the same Forward/Reverse and Stop/Start functions as for the Panoptigon.

Audio goes to both the left and right channels, and the DSP FX produce a stereo output.

iOptigan•Key Mapping Switch Position 5

With the iOptigan iPad or iPhone app, this switch position is similar to position 2 for Optigan stereo.
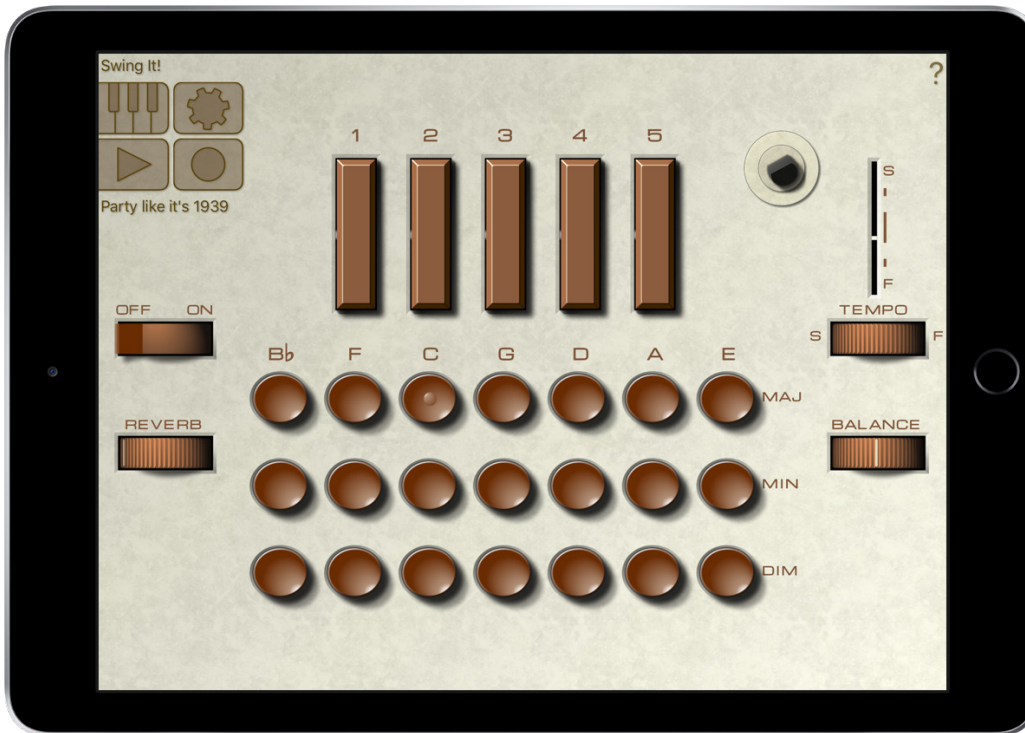
The iPad or iPhone becomes the controller; the app's virtual Keyboard, Chord Buttons, and Special Effects Switches trigger the Optigan's various functions.

Panoptigon•Key Mapping Switch Position 6

This accommodates the new Panoptigon disc format, which uses mapping similar to the Orchestron, but can play 60 notes—from the lowest C (MIDI note #36) to the highest B (MIDI note #95) on a 61-note keyboard. This assumes the keyboard's physical middle C key is MIDI note #60.

A 61-note keyboard's highest C note (MIDI note #96) provides the Start/Stop function. For keyboards with more than 61 notes, or if you transpose a 61-note keyboard up, MIDI note #97 (C#) triggers Forward/Reverse.

Specialty Mappings

The Panoptigon also has some special mappings…just because we can. And they can be kinda cool.

Custom Controller•Key Mapping Switch Position 7

This makes the Panoptigon compatible with a custom MIDI keyboard controller that's derived from an actual Optigan. Optigan.com will be publishing the plans to make this controller.

Sequential Test Mapping•Key Mapping Switch Position 8

Orchestron and Panoptigon discs do not have sounds laid out sequentially on the disc itself (although of course, a keyboard knows where to find the notes that correspond to its keys). This was done originally as a way to address crosstalk issues. By assigning adjacent tracks with musical intervals of either a fourth or fifth apart, any slight bleeding of an adjacent track would at least sound pleasant.
The mapping is similar to the Panoptigon mapping, but orders the tracks in sequence. While mostly for diagnostics, this mapping also provides an alternative Optigan mapping, with the keyboard range moved down to Bb and transposed (e.g., playing the lowest Bb sounds the lowest F). This mapping uses the top C note (MIDI note #96) for Start/Start.

Panoptigon Test Mapping•Key Mapping Switch Position 1

KEY MAPPING Rotary Switch position 1 tests the Panoptigon without a MIDI controller connected. Selecting this position starts the motor, and begins playing a Panoptigon disc's 60 tracks sequentially, for approximately 2 seconds each. (Because Optigan and Orchestron discs have fewer than 60 tracks, and the Panoptigon tests for 60 tracks, some notes may not sound, or you may hear artifacts like clicks or thumps when the unit tries to play the missing tracks.)

To stop the tracks from playing, move the KEY MAPPING switch to another position. The note that's playing stops after its full 2-second duration. The motor will remain spinning; to stop it, push the START•STOP pushbutton.

Panoptigon "Cheat Sheet"

This handy flow chart summarizes how to set the Panoptigon for different disc types and mappings.

```
                         ┌─────────────┐
                        ( SELECT DISC  )
                        (  TO PLAY     )
                         └──────┬──────┘
                                │
                                ▼
                          ╱ DOES DISC ╲        NO
                         ╱ HAVE STROBE  ╲──────────────────────┐
                         ╲   LINES?     ╱                      │
                          ╲            ╱                        │
                                │                               │
                               YES                              │
                                ▼                               │
         ORCHESTRON      ╱   SELECT   ╲   PANOPTIGON            │
    ┌───────────────────╱  DISC TYPE   ╲──────────────┐        │
    │                   ╲              ╱               │        │
    │                    ╲            ╱                │        │
    ▼                        │OPTIGAN                  ▼        │
┌──────────────┐             │              ┌──────────────┐   │
│ SET KEY      │             │              │ SET KEY      │   │
│ MAPPING      │             │              │ MAPPING      │   │
│ SWITCH TO    │             ▼              │ SWITCH TO    │   │
│ ORCHESTRON   │     ┌────────────────┐     │ PANOPTIGON   │   │
└──────┬───────┘     │ SET KEY MAPPING│     └──────┬───────┘   │
       │             │ SWITCH TO ONE  │            │           │
       │             │ OF THE OPTIGAN │            │           │
       │             │ OPTIONS:       │            │           ▼
       │             │ • OPTIGAN      │            │     ╱ ORCHESTRON ╲
       │             │   STEREO       │            │    ╱   DISC?      ╲
       │             │ • OPTIGAN MONO │            │    ╲             ╱
       │             │ • iOPTIGAN     │            │ YES ╲           ╱ NO
       │             │ • SPECIAL      │            │                │
       │             └───────┬────────┘            │                │
       │                     │                     │                │
       │                     ◄─────────────────────┘                │
       │                     │                                      │
       │                     │          ┌──────────────┐            │
       │                     │          │ SET KEY      │            │
       │                     │          │ MAPPING      │            │
       │                     │          │ SWITCH TO    │            │
       │                     │          │ ORCHESTRON   │            │
       │                     │          └──────┬───────┘            │
       │                     │                 │                    ▼
       │                     │                 │          ┌──────────────────┐
       └─────────────────────┤                 │          │ SET KEY MAPPING  │
                             │                 │          │ SWITCH TO ONE OF │
                             │                 │          │ THE OPTIGAN      │
                             │                 │          │ OPTIONS:         │
                             │                 │          │ • OPTIGAN STEREO │
                             │                 │          │ • OPTIGAN MONO   │
                             │                 │          │ • iOPTIGAN       │
                             │                 │          │ • SPECIAL        │
                             ▼                 │          └────────┬─────────┘
      SERVO          ╱  CHOOSE DRIVE ╲ MANUAL  │                   │
   ┌────────────────╱     MODE        ╲────────┤                   │
   │                ╲                 ╱        │                   │
   ▼                 ╲               ╱         │                   │
┌──────────┐  COMPU-DRIVE│   COMPU-DRIVE       │                   │
│ PLAY DISC│             │    ╱ CHOOSE  ╲ MANUAL│                  │
│ IN SERVO │             │   ╱  DRIVE    ╲──────┤                  │
│ MODE     │             │   ╲  MODE    ╱       │                  │
└──────────┘             │    ╲        ╱        ▼                  ▼
                         ▼                ┌──────────────┐  ┌──────────────┐
                  ┌──────────────┐        │ PLAY DISC IN │  │ PLAY DISC IN │
                  │ PLAY DISC IN │        │ MANUAL MODE  │  │ MANUAL MODE  │
                  │ COMPU-DRIVE  │        └──────────────┘  └──────────────┘
                  │ MODE         │
                  └──────────────┘
```

Other Features

Just when you think you've seen it all...

Metronome

Like the Optigan, the Panoptigon features an optical metronome, located on the red-colored optical cover near the disc spindle. When an Optigan disc is rotating, the Optical Metronome blinks on each beat, in time to the disc's rhythm. However, note that some Optigan discs use sustained chords, and don't blink (e.g., Big Organ and Drums).

The "Downbeat Beacon" will blink red on the first beat of each measure (the downbeat). This makes it easy to start your music, or play special effects, on the downbeat. Note that Orchestron discs don't include this feature.

Disc Weight and Holder

Unlike the vintage instruments that used a pinch roller scheme to drive the disc from its edge, the Panoptigon drives the disc from its center using a small spinning hub. In the vintage machine, the disc sat on a flocked surface, which rubbed the bottom of the disc while it spun. The Panoptigon levitates the disc on a cushion of air that's produced by three small fans. This reduces contact of the soundtrack areas to almost zero. Because the Panoptigon drives the disc from the hub, the Disc Weight holds the disc down against the hub to keep the disc from slipping. However, it's safe to stop the disc manually, by touching the edge for scratching-type effects.

To use the Disc Weight, grab the weight and lift it up off the holder pin. The pin has a spring-loaded retaining ball that retracts when you push or pull the weight over it. After a disc is in place on the center hub, position the Disc Weight with the foam side down on the disc, aligning the hole with the spindle.

When not in use, return the Disc Weight to the holder pin. The spring-loaded ball keeps the Disc Weight from sliding off the pin during transport.
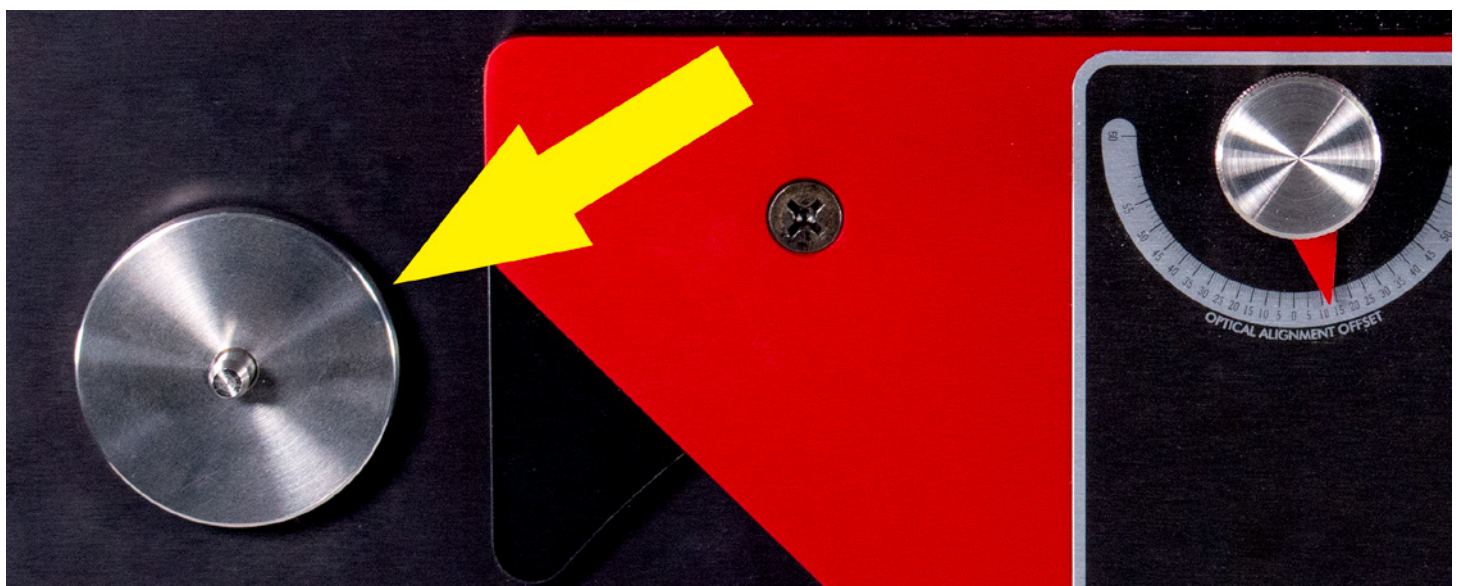
Sync In/Out

The Panoptigon can control a second Panoptigon's motor via the SYNC jacks, so that the second machine follows the first machine's behavior.

Remove the protective plastic plugs in the SYNC jacks, and set them aside. These plugs prevent headphones or audio cables from being plugged into the jacks accidentally, which could cause damage to equipment or worse, your hearing. Be sure to return the plugs to the SYNC jacks when not using the SYNC feature.

1. Connect to the second machine using a 3.5mm male-to-male cable (either mono or stereo) from the master machine's SYNC OUT to the second machine's SYNC IN.
2. Connect a five-pin MIDI cable from the master unit's MIDI THRU jack to the second machine's MIDI IN jack.
3. Select two discs that have the same rotations-per-second specification (e.g., two Orchestron discs).
4. Place a disc on each machine.
5. Select the master's drive mode with the appropriate switch (COMPU-DRIVE, SERVO, or MANUAL). The second machine's mode doesn't matter, because the SYNC IN signal bypasses the internal speed control.
6. Set both machines' KEY MAPPING switch to settings compatible with the selected discs.
7. Make sure the MIDI channels are matched via the MIDI CHANNEL selector switch. ALL is a good setting to test dual-machine operation.

- With any mode selected, the second machine will not respond to the master's on-board START•STOP and FORWARD•REVERSE switches (the SYNC signal only carries motor speed control). However, using MIDI notes to trigger these functions will control both machines.
- With the master in Compu-Drive mode, when you choose settings on the master for transpose, pitch bend, aftertouch, or mod wheel, the second machine will respond like the master regardless of its own switch settings.
- With the master in Servo mode, the second machine will respond to speed disruptions that the master encounters.
- With the master in Manual mode, the PITCH ADJ. control also controls the second machine's speed.

Note that the Panoptigon doesn't sync to MIDI sync, because it wasn't really designed for mechanical devices, but instead for electronic devices like drum machines, effects, and the like. For example, there's no way for a MIDI device that transmits Song Position Pointer and clock data to go backward in time if you reverse the Panoptigon motor's rotation, or touch the disc weight to slow down the disc speed momentarily.

How SYNC Works

The Panoptigon drives the stepper motor with signals that control speed and direction. One of these signals is a square wave, whose frequency sets the motor's speed. When in Manual or Servo modes, the waveform comes from a voltage-controlled oscillator. In Compu-Drive mode, the source is the internal computer (microcontroller). This waveform is available at the SYNC output jack. The SYNC input jack can receive an input signal to control the Panoptigon's motor speed. This is why you can connect two Panoptigons together, and control the speed of the second machine from the first machine.

The waveform is TTL compatible (+5 VDC). The motor speed varies with the frequency as follows: 0.5 rotations per second = 2 seconds per loop = 6,400 Hz.

Audio Output Details

The Panoptigon has two internal audio "buses" that feed the two stereo channels. One bus carries the Optigan chords/special effects tracks, and the other carries the keyboard tracks. This bus structure was used in vintage Optigan machines to create a dual-mono or pseudo-stereo effect.

Optigan Audio Outputs

The KEY MAPPING switch can choose one of two Optigan modes. **Stereo** (position 2) routes the buses to separate outputs; **Mono (**position 3) sums the buses and routes the same audio to both outputs. The **Stereo** mode is effective only for Optigan discs, because other disc types do not support chords or special effects tracks.

The signal sent to the DSP FX changes with the KEY MAPPING switch selection. For **Stereo,** only the "keys" bus goes to the DSP FX. For **Mono,** the keys, chords, and special effects go to the DSP FX. The DSP FX outputs go to both audio outputs (most effects are stereo). This is not affected by the **Stereo** or **Mono** setting.

Orchestron Audio Outputs

Orchestrons were monaural instruments and had only a single keyboard bus. With the KEY MAPPING switch set to position 4 (Orchestron), the keyboard signal goes to both outputs.

Panoptigon Audio Outputs

Orchestrons were monaural instruments and had only a single keyboard bus. With the KEY MAPPING switch set to position 4 (Orchestron), the keyboard signal goes to both outputs.

- **Mono:** The CHORDS LEFT channel jack provides a +4 dB nominal monaural output when used alone with a mono Tip/Sleeve 1/4" phone cable (like a guitar cable). When using only the CHORDS LEFT channel output, the Panoptigon's right channel, left channel, and DSP FX are summed together into a single, monaural output.
- **Stereo,** Option 1: Connect one audio cable with a 1/4" phone plug (an instrument or a guitar cable) to the jack labeled CHORDS LEFT and another 1/4" phone cable to the jack labeled KEYS RIGHT. Then plug the other ends of the cables to the monitoring or recording system, and set the channel volumes to reasonable levels (refer to the audio equipment owner's manual for information on its proper setup).
- **Stereo,** Option 2: Connect a TRS plug wired for stereo (Tip = Right, Ring = Left, Sleeve = Ground) into the KEYS RIGHT (TRS stereo) jack, and plug the other end of the cable into your audio monitoring or recording equipment.
- **Stereo Headphones:** The Panoptigon's 3.5 mm HEADPHONES jack drives low-impedance stereo headphones. However, this jack can also serve as an alternate stereo line out (Tip = Left, Ring = Right, Sleeve = Ground).

MIDI Features

MIDI brings a variety of features to the Panoptigon that were impossible to implement with the Optigan or Orchestron.

Sustain Pedal

The Panoptigon is compatible with sustain pedals. Note that some pedals close a switch when pushed down, while some close a switch when released. Some keyboard controllers accommodate either kind, depending on whether you hold down certain controller switches or keys on power-up. Make sure the footswitch you use is compatible with your keyboard controller.

Pitch Bend Wheel

In Compu-Drive mode, the Panoptigon responds to a controller keyboard's pitch bend wheel or lever. The PITCH BEND selector switch sets the pitch bend range. The switch positions indicate the maximum up and down pitch bend in semitones, ranging from ±1 to ±12 (an octave).

Modulation Wheel

In Compu-Drive mode (and when using discs with strobe lines), the Panoptigon uses modulation wheel MIDI messages to add vibrato to the sound. This data modulates the control signal sent to the motor, which modulates the disc speed as it turns.

The modulation syncs with the disc speed. There are 12 sinusoidal modulation cycles per disc rotation. Thus, varying the disc speed affects the modulation rate. If you interfere manually with a disc's rotation in Compu-Drive, it also affects the modulation rate.

Aftertouch

Aftertouch generates MIDI messages that reflect how hard you press a keyboard key once it's down. The Panoptigon responds to MIDI channel aftertouch messages by adding variable amounts of vibrato, depending on the aftertouch data's value. The vibrato is implemented like the Mod Wheel; the aftertouch message modulates the control signal sent to the motor, thus modulating the disc speed.

Exciter Lamp Auto Shutoff

To increase the longevity of the exciter lamp LEDs, the LED array shuts off automatically approximately five minutes after the disc has stopped turning.

Keyboard Overload Limiting

Vintage Optigans had an unpublished behavior that affected keyboard volume—the more notes you held down, the more the output level dropped. Fortunately, this effect wasn't very noticeable until you held down more than five notes. The reason this happened is because the Optigan circuit used resistors attached to a common ground to convert the currents from the photodiodes to voltages. The more notes that were held down, the more the resistors would load down the photodiodes. Because the Optigan was fully polyphonic, this effect prevented the keyboard output from overloading and clipping the internal amplifier.

The Panoptigon is fully polyphonic, and also incorporates a simple scheme that prevents overloading of the audio circuit. However the output drop is much less severe, and you need to play many more notes before any limiting starts.

Frequently Asked Questions (FAQ)

Why is it called Panoptigon?

"Pan" means all in Greek, "optig" from Optigan, and "on" from Orchestron. In other words, it's an instrument that plays all Optigan and Orchestron discs.

Why can't I change the envelope (ADSR) of the sounds?

The Panoptigon is an instrument based on the Optigan and Orchestron. The Optigan was a home organ, and like most organs, did not have an envelope generator. The Orchestron is a derivative of the Optigan and also lacked an envelope generator. As to the Panoptigon, it's fully polyphonic and the audio signals that come from the disc tracks are analog. To implement ADSR envelopes would require 60 analog envelope generators using audio-quality, voltage-controlled amplifiers. This would make the Panoptigon much more complex, and far more expensive.

Can I play the discs backwards if I insert them upside down?

Yes, but there's no need to do this. Unlike the Optigan and Orchestron, you can reverse the direction of the disc using MIDI or the on-board FORWARD•REVERSE pushbutton switch.

Can I stack more than one disc?

You can stack two discs, but probably not three or more. This is experimental territory, so have fun trying!

Can I draw on a clear sheet of plastic and have it play sounds?

People have tried this over the years with Optigans. The results are not very satisfying, unless you're into bad glitch music—you usually end up with random clicks and thumps. For sustained sounds, you have to draw very small repetitive patterns in a circular arc, which is extremely difficult to do.

Can I make my own discs?

Maybe, but it will be a challenge. You'll have to figure out a way to generate waveforms and print them in tightly controlled arcs at a very high resolution, onto a transparent matrix. You'll also have to punch a hole of the exact right diameter in the exact center of the disc, or face alignment issues like crosstalk.

Is there a way to know the loop lengths of Vintage Optigan discs?

Yes, see the Appendix for a table of Vintage Optigan discs and their loop lengths, time signatures, and tempo in BPM.

Is there a way to change an Optigan disc's tuning without changing the tempo of the rhythm tracks?

No and Yes. No, because by changing the tuning, you also change the disc's rotational speed, which affects the tempo and vice-versa. Yes, because you can experiment with the Pitch Shift DSP FX to change the tuning of tracks, without changing the disc speed. Turn down the VOLUME control to keep the dry sound out of the output, adjust the Pitch Shift DSP FX, and use the FX LEVEL control to set the audio level.

Are the track loop lengths all the same on a disc?

Yes, all the track loops on a given disc will be exactly the same length.

Why do some tracks have more high end (treble) than other tracks?

This is a result of the geometry of the optical scanning slit, and the disc's track layout. The outside tracks move past the scanning slit at a higher linear velocity than the inside tracks, giving them a wider frequency bandwidth.

For an Optigan disc playing in a Panoptigon at 0.5 revolutions per second, the outside track (track 1) bandwidth is approximately 5,300 Hz, while the inside track (track 57) bandwidth is approximately 2,500 Hz. These upper frequencies are shifted down slightly when played in vintage instruments, because they use a slightly wider scanning slit.

Optigan disc tracks are arranged so that the special effects tracks are on the outside, and the inside tracks are reserved for the lowest keyboard notes. This works well because the special effects usually have sounds that require wider bandwidth (more treble), while the lower keyboard notes usually require less bandwidth.

I'd like to set the Panoptigon on a tilting stand over my keyboard. How far can I tilt the Panoptigon?

You can tilt the Panoptigon surprisingly far—at least 20 degrees, if not more. The real limitation will depend on the state of the disc you're playing. The shock-mounted motor will tend to droop down, which may cause the drive belt to come loose while playing...so don't get carried away.

I have a Vintage Optigan disc with 58 tracks instead of the usual 57 tracks, what's up with that?

The disc you have is probably Big Organ and Drums [revision K]. We found out about this from a Japanese website showing a DIY optical disc player project. The additional track is outside of track 1 (i.e., track 0), and has signals consisting of a descending tone sweep along with four other frequencies. We speculate that this was either for a frequency response analysis, or maybe an experimental way to control the disc speed, much like the strobe lines on Modern discs. We know of no other Optigan discs with this hidden track. If you have this disc and are curious about the track, you can play it by selecting Sequential mapping, playing the highest B key on a properly set up 61-note keyboard controller, and moving the Optical Alignment Offset knob to the left to 60. Several other discs, for example the Folk and Other Moods Guitar (4/4) [revision N] disc, have a thin, clear, unmodulated track 0 between tracks 1 and 2. This may have been an attempt to prevent crosstalk, but the definitive answer is lost in the mists of time.

I want to adjust the volume level and the FX level simultaneously by adjusting one control. Can I group these together somehow?

You can do this with an external mixer by turning the controls up on the Panoptigon, sending them to individual channels, and then either grouping the mixer channels or sending them to a bus (which provides a master level control). Or, use a #19 rubber band as a belt around the VOLUME and FX LEVEL controls, and set the relative levels as desired—turn one of the knobs, and the other will follow (pick the knob that gives you the best results).

Can the Panoptigon Sync to DAWs Via MIDI?

Not at the present time. MIDI sync wasn't really designed for mechanical devices, but for electronic ones like drum machines, effects, and the like. For example, there's no way for a MIDI device that transmits Song Position Pointer and clock data to go backward in time if you reverse the Panoptigon motor's rotation, or touch the disc weight to slow down the disc speed momentarily.

Troubleshooting

The Panoptigon is far more reliable than its ancestors. Although there's always the possibility of a mechanical issue, the vast majority of problems are due to other elements used in conjunction with the Panoptigon (e.g., a bad cable), or a mis-set control.

Increased Crosstalk and Distortion

Crosstalk and distortion can start to occur for several reasons: if the Panoptigon has been moved around a lot (e.g., it's used in live performance), there are significant temperature changes, the disc hole is even slightly off-center, and so on. Crosstalk and distortion issues occur due to misalignment of the disc track waveforms with the photodiode-based detector head. For more information, see the section on the Optical Alignment Offset control in the Controls section.

Unlike the difficult alignment processes associated with the Optigan and Orchestron, the Panoptigon's Optical Alignment Control provides a simple, convenient adjustment for restoring minimum crosstalk and distortion by aligning the detector head to the disc tracks. The Optical Alignment Control moves the detector assembly backwards and forwards to null out the crosstalk and distortion. There is no need to adjust the head height. To adjust the alignment:

1. Set the pointer on the Optical Alignment Offset control near the middle of the range (indicated by "0" on the scale).
2. Turn the knob a few degrees clockwise or counterclockwise while playing a note (some play is normal in this control), and listen carefully.
3. Leave the knob in the position that minimizes crosstalk and distortion. You may need to audition several notes along the keyboard, and find a setting that provides the best sound for the greatest number of notes.

No Power

- Check that the AC cord's IEC plug is inserted fully and firmly into the power adapter.
- Verify that the power adapter cord is plugged into a working AC outlet.
- The PS-24 power supply has a green LED power indicator. If the power supply is receiving power but the green LED is not glowing, then the power supply is defective and should be replaced.
- Check that the green power switch (labeled JUICE) in the Panoptigon's left top rear corner is engaged. It should be illuminated if the power adapter is working.
- If the JUICE switch is illuminated, but other lighted switches or controls don't respond, the unit is defective and should be returned for factory servicing.

No Sound

- Verify that the Panoptigon is powered up, and that the disc is spinning
- Confirm that the controller's MIDI channel matches the channel selected by the MIDI CHANNEL rotary switch. If selecting ALL on the Panoptigon doesn't solve the problem, check the MIDI cable connecting your controller to the Panoptigon.
- Turn up the VOLUME and FX LEVEL controls.
- If the BALANCE control is set to one extreme, try turning the knob to the middle position.
- If you can hear sound from the headphone jack, verify that the ¼" Panoptigon outputs are connected to a working audio monitoring system, and that the cables are good.

- As a diagnostic test, set the KEY MAPPING switch to position 1 (Test position) and start playing a disc. It will play through all the tracks without the need for a MIDI controller. If there's still no sound from the headphone jack or outputs, the unit may be defective and require factory service.
- Scanning a disc in Compu-Drive mode silences all tracks until the scan is complete. This takes 4 to 6 seconds, and is normal.
- If some notes seem quieter than others, dust may have collected on the optical slit's surface, which is located under the red Optical Cover. See the section on Care and Maintenance for information on how to clean the optical slit's surface.

Stuck Notes

Stuck notes (where a note starts but doesn't stop) can happen for several reasons. To turn off stuck notes, change the KEY MAPPING switch to a new mapping, then return to the desired mapping. (In Compu-Drive mode, you'll have to wait until the Panoptigon finishes scanning the disc before you can resume playing.) If this occurs often, you'll need to track down the cause. The main ones are:

- Poor transfer of MIDI data from the MIDI source: This can be due to bad MIDI cables with broken or intermittent connections, bad or corroded MIDI jacks and plugs, or electrical interference with cables that have poor ground shielding.
- Interrupting the MIDI signal: This can occur if the MIDI cable was pulled out after a note-on occurred, but before its companion note-off occurred. Changing MIDI channel assignments while a note is sounding can also cause this problem.
- Computer software: Some software programs do not always send note-off messages if you interrupt the playback by stopping abruptly, or scrolling while playing a track. Other reasons include too many computer processes going on at once, improper MIDI settings in the software's preferences (e.g., MIDI buffer size), or extremely old computers that aren't fast enough to keep up with data-intensive projects.
- Some software apps send an All Notes Off channel message via MIDI to silence stuck notes, either via a "panic button" or whenever the software stops playing. Per the MIDI specification, this message will not be received if the Panoptigon is in OMNI mode (the ALL setting for the MIDI CHANNEL control). If you are having trouble with stuck notes, try changing the MIDI CHANNEL switch from ALL to one of the numbered positions (make sure the controller is sending data over the same channel).
- Some vintage Roland keyboards (e.g. Roland D-50) send the All Notes Off channel message when all keyboard notes are released, even if the sustain pedal is pressed. This can confuse modern MIDI players and software apps. If the Panoptigon receives the All Notes Off message after it receives a Sustain Pedal On message, it will process the All Notes Off message after the sustain pedal is released. As a result, owners of these vintage keyboards will not have to filter out the All Notes Off message to the Panoptigon.

Disc Plays Out of Tune (Spins at Wrong Speed)
- In Manual mode, adjust the tuning with the PITCH ADJ. control.
- In Servo mode, the disc must have strobe lines or it will not play in tune.
- In Compu-Drive mode, changing discs requires a re-scan from the Panoptigon. To force a re-scan, choose Manual mode, then go back to Compu-Drive. Wait a few seconds for the scan to complete (all notes will be silenced during the scan).

- Make sure that the KEY MAPPING switch is set correctly for the type of disc you're playing. Note that the Orchestron position always plays the disc at 0.5 rev/sec. The other positions will play Orchestron discs at the correct speed if no Start Mark is detected (the computer gives up and just defaults to 0.5 rev/sec), but of course, the note mapping will be wrong. Also note that some Orchestron discs can fool the Start Mark detector.
- If the disc lacks strobe lines, it will play at 0.5 revolutions per second, which is the standard Orchestron disc speed. If the disc speed is different, then it will play out of tune. Use Manual mode and tune the disc by using the PITCH ADJ. control.
- Check that the TRANSPOSE select switch is set to 0 (zero).
- Make sure the Panoptigon is not receiving MIDI pitch bend messages. To confirm this, change the PITCH BEND settings while playing the disc. If there is a "stuck" pitch bend message, the tuning will change as you move the switch. To reset the controllers, move the KEY MAPPING switch to another position and then back. You'll have to wait while the Panoptigon re-scans the disc before you can play notes.
- Some older discs were recorded with inexact tunings across the keyboard. This is part of the "vintage" nature of optical disc players.

Mapping Problems (Jumbled or Mixed-Up Notes)

- Check that the KEY MAPPING select switch is set correctly for the type of disc you are playing.
- Note that some Modern discs may contain material that is just sound loops instead of actual notes (e.g., the Glitchedelica and Sitar discs). The loops will not relate to the keyboard note pitches to which they're assigned.

MIDI Controller Problems

- If the controller's pitch bend wheel has no apparent effect, make sure your MIDI controller is set up to send pitch bend messages, and that the Panoptigon is in Compu-Drive mode. Other modes don't process MIDI pitch bend messages.
- If the controller's modulation wheel or aftertouch has no apparent effect, check that your MIDI controller is set up to send mod wheel messages as Controller #1, and that the controller can provide aftertouch data (not all do). Both types of modulation work only in Compu-Drive mode, with discs that have strobe lines.

Uneven or Warbling Sound

- Check that the disc you're using is in good condition (flat without creases, warpage, or foreign material sticking to it).
- A worn or poorly punched center hole can cause an uneven sound.
- In Compu-Drive mode, if your MIDI controller generates aftertouch, you may be activating it unintentionally by pushing hard on the keys.
- Make sure the MIDI controller's modulation wheel isn't turned up, which could add modulation to the disc.
- In Manual mode, if you play the disc at a very slow speed, you'll start to hear some "growl" because the audio will be modulated by the stepper motor.

Crosstalk

- You can fix most crosstalk problems by adjusting the Optical Alignment Offset control, as described previously.
- Some discs have a cyclic crosstalk. This usually means the disc is damaged, warped, or the spindle hole is worn or punched off-center.
- Pea Hicks at www.optigan.com has found that some revisions of Vintage Optigan discs are punched off-center; he has also discovered that some Vintage discs had crosstalk recorded into the disc tracks during their creation. This crosstalk cannot be fixed or adjusted out.

Unexpected DSP FX Results

- If there's no apparent processing from the effects, be sure the FX LEVEL control is turned up.
- The effects are applied to the audio signal in different ways, depending on the KEY MAPPING selector switch's setting. For Optigan Stereo, the DSP FX processes only the signal from the keyboard notes. For Optigan Mono, the DSP FX processes the keyboard notes, chords, and special effects.
- The sound from the DSP FX always goes to the left and right outputs, and is not affected by the Stereo or Mono setting.
- The Ping Pong echo will appear to be in mono instead of stereo if the delay time is the same for both the Ping and Pong echoes.

Clicks and Pops

- If the clicks and pops are synchronized with the disc's rotation, the problem is most likely due to foreign matter on the disc, or a damaged disc.
- Many Vintage discs have poor loop joints, which produces a click when the loop end returns to the loop beginning. There is no simple fix for this, because the problem is recorded in the disc itself. (There's a white paper on the subject written by Optigan's Musical Director, Mike LeDoux, at http://optigan.com/2006/04/circular-photo-electric-sound-track-joint-closure.)
- Some clicks and pops may be normal for a used disc (much like a used phonograph record). Wide scratches will cause loud clicks.
- Check to make sure the disc is clean of dust and fingerprints. Refer to the Disc Care and Handling section below.
- Other sources of clicks and pops may be due to electromagnetic interference from the environment (light dimmers, motorized equipment, lightning, etc.)

Disc Won't Spin or Stop After Pushing the START•STOP Button, or Playing MIDI Notes Assigned to this Function

- The disc speed may be set too high, and because the motor can't spin the platter instantly, it stalls. This could happen in Compu-Drive mode when the PITCH BEND selector switch is set to 12 and the pitch bend wheel is at maximum. In this case, when the motor stalls, it will not turn until the speed is reduced. This prevents damage to the drive system and to the disc.
- In KEY MAPPING switch Position 1 (Test) the motor is always on. It cannot be stopped without leaving the test mode.
- The controller keyboard may be set up to play in a different octave than the Panoptigon, so the keys for start and stop are not in the expected locations.

- If the motor still doesn't spin after checking the above, the drive belt may be broken, or have come off of the motor pulley or the center hub pulley. Test this by setting the unit in Manual mode, with the motor running (START•STOP switch LED is lit green). Then, using a flashlight, check to see if the motor pulley is moving by shining the light though the front fan hole, and turning the PITCH ADJ. knob. If you can see the pulley turning, but the disc support hub is stationary, then contact the factory for servicing.

Disc Won't Spin After Pushing the FORWARD•REVERSE Button, or Playing MIDI Notes Assigned to this Function

- The disc speed may be set too high, and because the motor can't reverse direction instantly, it stalls. This usually happens in Compu-Drive mode when the PITCH BEND selector switch is set to 12 and the pitch bend wheel is at maximum. When the motor stalls under these conditions, it will not turn until the speed is reduced. This prevents damage to the drive system and disc.
- In KEY MAPPING switch Position 1 (Test) the motor is always on. It cannot be stopped, or put into reverse or forward, without leaving the test mode.
- The controller keyboard may be set up to play in a different octave than the Panoptigon, so the keys for forward and reverse are not in the expected locations.

Problems that Aren't Problems

At best, the sounds produced by the Panoptigon playing clean new discs are "mid-fi," and more like "lo-fi" for used, Vintage discs. This was part of the charm and unique personality of this kind of optical instrument. You may also encounter lower bandwidth on some notes (this is normal; the frequency bandwidth gradually decreases from the outside tracks to the inside tracks), clicks and pops due to level changes between a loop start and loop end, and "wow" (audio pitch variations) during startup. Although the motor in the Panoptigon is very responsive, you will still hear wow upon starting or reversing a disc, because the disc cannot change speed or direction instantaneously. Then again, this can also give cool effects that resemble "tape stop"…think of the creative possibilities!

Care and Maintenance

Your Panoptigon is built in the USA by and for electronic music fanatics, and every effort has been made to insure a trouble-free life for your new instrument. However, proper care and maintenance is important so that the Panoptigon can fulfill its potential for years to come.

Disc Care and Handling

- Handle your discs with care to ensure maximum life. Like a fine phonograph record, take precautions to prevent the disc from being scratched.
- Always return the program disc to its sleeve and jacket when it's not being played, and store it flat.
- Although you can hold a disc with your fingers, they should be clean and free of contaminants.
- If a disc does become contaminated, NEVER USE WATER TO CLEAN IT. Clean it with a microfiber cloth, supplemented by a high-quality commercial film cleaner containing a lubricant. Read all usage instructions carefully! Some film cleaners dry rapidly, some slowly, and some have potentially dangerous chemicals that require ventilation when being used.
- If a disc does become wet with liquids containing water, absorb the moisture by blotting with a soft lint-free cloth. Allow the disc to dry thoroughly before use.
- Wipe discs with a microfiber cloth to remove dust.
- Although you can mount warped, creased, or otherwise damaged discs into the Panoptigon, they may not play properly. This might be acceptable for creative or experimental purposes, but for the best performance from your machine, always use quality, undamaged discs.

Using the Dust Cover

- Install the dust cover so that the front face just overhangs the Panoptigon's front edge, and the inside of the back face is against the red Optical Alignment Cover. The dust cover should be centered between the Panoptigon's wood sides.
- The dust cover is an important part of protecting your Panoptigon. Always place it on the Panoptigon when not in use.
- You can place the dust cover on the Panoptigon without removing the cables plugged into the top rear jacks. This allows keeping your setup intact (even during a break when performing), but still protects the unit and an installed disc from dust when not in use. Remove the cover when it's time to operate the unit.

Cleaning the Panoptigon

- Use a microfiber cloth to clean your Panoptigon's surfaces. Avoid using liquids, because some of the surfaces and internal circuitry can be damaged by water.
- Clean the acrylic dust cover by wiping it with a microfiber cloth, using an acrylic cleaner like Novus® 1 Plastic Clean and Shine. Never use ammonia-based glass cleaners—this will fog the acrylic permanently over time.

Outdoor Use

The Panoptigon's expected application is playing indoors. However, Panoptigons can be played in outdoor venues if you keep the Panoptigon and the discs out of direct sunlight, and prevent any moisture from getting on the Panoptigon and discs. (Moisture destroys the discs. Have we said that enough?)

Light Contamination

The Panoptigon is not sensitive to low or moderate ambient room lighting, but keep it out of direct sunlight, and avoid exposure to bright, direct stage lighting. During sound check, make sure that the lighting levels and direction don't affect the Panoptigon's performance. Finally, avoid aiming bright, flashing lights at the top of the Panoptigon.

Cleaning the Optical Slit

The optical slit is a rectangular piece of exposed film, with a thin transparent line running lengthwise down the center, that scans the disc's soundtracks and is located under the red cover. The photodiodes read the light shining through the slit, and converts the changes in light patterns to electrical signals. Once amplified, these are the sounds you hear when playing the Panoptigon.

Dust may accumulate on the optical slit over time, and will need to be cleaned off. Not doing so will result in quiet or silent notes, and potentially other functional problems. To remove dust from the optical slit:

1. Turn off the Panoptigon, and remove any discs from the machine.
2. Locate the soft, 12" long by 6 mm diameter pipe cleaner included with your Panoptigon. You'll use this to remove any accumulated dust on the optical slit.
3. Gently bend the pipe cleaner into an arc, as shown in the picture above. Do not kink or twist the pipe clean; a gradual, gentle bend is best.
4. Gently push and slide the pipe cleaner under the cover until it hits the rear of the optical cover support.
5. Pull and slide the pipe cleaner out from other the cover. Repeat if necessary.
6. Play a few discs to make sure the Panoptigon is in good working order.
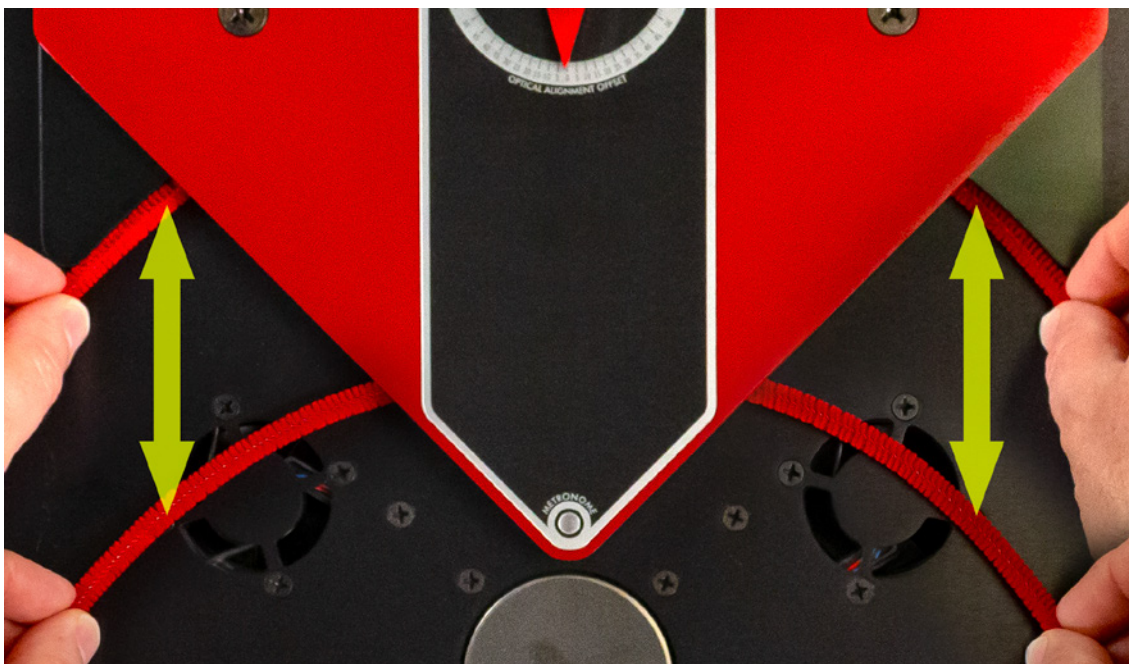
Specifications

Maximum Polyphony	60 Voices (Tracks)
Current Draw	650 mA , 24V
Dimensions (W x D x H)	17.6" (447 mm) x 16.75" (425 mm) x 5.25 (133 mm) without cover
	17.6" (447 mm) x 16.75" (425 mm) x 5.50 (140 mm) with cover
Weight	13.4 lbs. (6.08 kg) without cover
	15.1 lbs. (6.85 kg) with cover
Accessories	Dust cover, PS24 Power Supply, AC Cord, Disc Starter Pack, Owner's Manual
Connectors	MIDI (IN, THRU)
	Headphones (3.5mm)
	Audio Output x 2 (1/4" phone): LEFT-MONO SUM, RIGHT-TRS STEREO
	Output Impedance: 1 kOhm
	24 VDC Power (5.5mm barrel, 2.5mm pin, tip positive)
	SYNC IN (3.5mm), SYNC OUT (3.5mm)
Power Supply	PS-24 (24 VDC, 3A)

MIDI Implementation Chart

Panoptigon Gen 1, May 1, 2019, Version 1.00

Function		Transmitted	Recognized	Remarks
Basic	Default	X	1-7	Set via rotary switch
Channel	Changed	X	1-7	
Mode	Default	X	1,3	Set via rotary switch
	Messages	X	X	
	Altered	X	X	
Note		X	0-127	Set by KEY MAPPING switch
Number	True Voice	X	21-101	
Velocity	Note On	X	X	
	Note Off	X	X	
After Touch	Keys	X	X	
	Channels	X	0	
Pitch Bend		X	0	14 Bit
	1	X	0	Mod Wheel
Control Change	64	X	0	Hold/Sustain Pedal
Program		X	X	
Change	True #	X	X	
System Exclusive		X	X	
System	Song Pos	X	X	
	Song Sel	X	X	
Common	Tune	X	X	
System	Clock	X	X	
Real Time	Messages	X	X	
	All Sound Off	X	0	
	Reset All Controllers	X	0	
	Local On/Off	X	X	
	All Notes Off	X	0	
Aux	Omni Mode Off	X	X	
Messages	Omni Mode On	X	X	
	Mono Mode On	X	X	
	Poly Mode On	X	X	
	Active Sensing	X	X	
	System Reset	X	0	

Mode 1: OMNI ON, POLY   Mode 2: OMNI ON, MONO   0: Yes

Mode 3: OMNI OFF, POLY   Mode 4: OMNI OFF, MONO   X: No

Appendix

The Panoptigon's Origin Story

The Optigan, Orchestron, Talentmaker, and Panoptigon are based the same technology: a transparent, optical program disc stores patterns that represent analog audio, somewhat similarly to how a vinyl disc stores grooves that represent analog audio. This optical technology was originally used with film, so that the soundtrack could be stored on the same reel as the film.

To convert the patterns into sounds, the disc rotates between an exciter lamp that generates light, and photodiodes that generate voltages in response to light. The exciter lamp used in the vintage instruments was a 40 Watt, incandescent appliance light bulb. The Panoptigon uses a surface mount array of long-life, vastly more reliable light-emitting diodes (LEDs). The waveforms on the disc modulate the light beams generated by the LED exciter lamp; the photodiode array converts the changing light patterns into varying, analog voltages that represent sound.

The History of Optical-Based Instruments

The Panoptigon is an entirely new instrument, built from the ground up to apply a variety of today's advanced technologies to playing back optical program discs. However, it also honors the instruments of the past, which have their own interesting histories.

The Optigan

In the early 1970s, the toy company Mattel tried to go upmarket with an innovative concept for an easy-to-play home organ. Rather than generating tones with expensive electronics, a 12-inch optical film disc played 57 audio tracks, with actual recordings of a rhythm section in various styles. There was also a 37-note keyboard. With one hand, the home organist could trigger a full rhythm section by playing just one key, while using the other hand to pick out melodies. The sound quality was charmingly retro, but the machines were built rather cheaply. When the novelty wore off, thrift stores slowly accumulated intriguing—but unplayable—consoles. Later, a fan base developed to revive and play these old machines; some of the original sounds are still being used in modern recordings and television advertising.
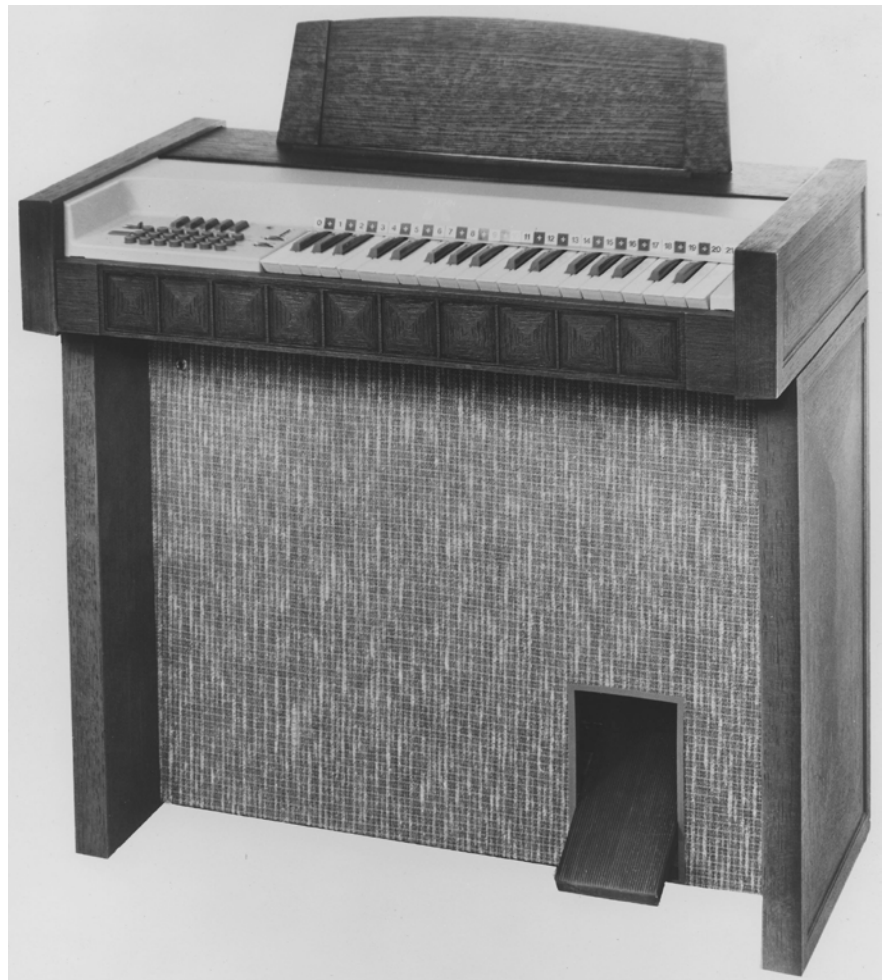
The Orchestron

The Optigan's "chord organ" layout was aimed at amateur musicians, but Vako Synthesizers' Orchestron was developed to play well-recorded instrument tracks as a professional alternative to somewhat similar, tape-based units of that era. Furthermore, the Orchestron offered better sound quality than the Optigan, was built to a higher construction standard, used a conventional keyboard, and the disc track assignments were changed to improve chronic problems that plagued Optigan discs. The result was a new, optical-based Orchestron program disc format, with its own body of material. However, despite being used by the seminal German electronic group Kraftwerk (as well as others) on several albums, technical problems prevented the Orchestron from becoming a serious and reliable instrument for stage or studio.

The Panoptigon

But…that was then, and this is now. In addition to its more sophisticated and robust playback mechanism, the Panoptigon brings other innovations to optical disc playback technology.

A precision stepper motor is the main drive system. A crystal-controlled, precision oscillator generates timing signals and commands that control the motor's speed and direction. The motor drives a flexible belt connected to a central rotating hub that holds and drives the program disc. The belt helps to smooth out the motor's action, similarly to how belt-driven record turntables work.

MIDI, the Musical Instrument Digital Interface, is a protocol that allows controllers and sound generators like the Panoptigon to "talk" to each other. A single MIDI keyboard controller can trigger sounds from hardware instruments, virtual instruments that exist inside a computer, control mixers, and the like—MIDI can even trigger lighting, pyrotechnics, and more. The Panoptigon is compatible with standard MIDI controllers, as well as the next generation of MIDI 2.0 controllers. A 61-note (or more) MIDI keyboard controller is ideal for playing the Panoptigon. However, with a suitable MIDI interface, it can also be driven by computer sequencers and even some iOS devices.

When the Panoptigon receives MIDI note-on commands to play notes within the range of its settings, electrical signals from the photodiodes are amplified, and routed through digitally controlled analog switches. The action of this multitude of switches turning on and off is what ultimately creates sound. These signals are then amplified, combined, and routed through circuitry to a volume control, then to the headphone and output jacks. A digital signal processor (DSP) adds effects (FX) that can be mixed in with a separate level control, and go far beyond the "special effects" included in the vintage instruments.

The Panoptigon is compatible with previous optical formats (except the extremely rare Talentmaker instrument format). However, a new, Panoptigon-specific disc format has also been created to take full advantage of the Panoptigon's advanced features. It's possible that more discs could be created in the future for this format.

Vintage Optigan Disc Stats

Title	Time Signature	Tempo (BPM)	Loop Length in Seconds	Comments
Banjo Sing-Along	4/4	100.19	2.40	
Big Band Beat	4/4	89.66	2.68	
Big Organ & Drums	4/4	120.00	2.00	Two time signatures on the same disc
Big Organ & Drums	3/4	90.00	2.00	
Big Top Marching Band	4/4	108.83	2.21	
Bluegrass Banjo	4/4	120.00	2.00	
Bossa Nova Style	4/4	120.00	2.00	
Cathedral Organ	4/4	120.89	1.99	Two time signatures on the same disc
Cathedral Organ	3/4	90.67	1.99	
Cha Cha Cha!	4/4	113.27	2.12	
Champagne Music	4/4	88.24	2.72	
Classic Guitar in 4/4	4/4	119.58	2.01	
Country Sunshine	4/4	88.84	2.70	
Country Waltz	3/4	83.05	2.17	
Dixieland Strut	4/4	96.39	2.49	
Down Home	12/8	92.19	2.60	
Easy Does It With Vibes	4/4	79.84	3.01	
Folk & Other Moods Guitar	4/4	121.08	1.98	
Gay 90's Waltz	6/8	92.95	1.94	
Gospel Rock	4/4	89.10	2.69	
Guitar Boogie	4/4	89.76	2.67	
Guitar in 3/4	3/4	95.35	1.89	
Hear & Now	4/4	114.62	2.09	
Latin Fever	4/4	120.00	2.00	
Majestic Pipe Organ	N/A	N/A	2.00	
Mazurka!	6/8	86.85	2.07	
Movin'!	4/4	120.00	2.00	
Nashville Country	4/4	120.28	2.00	
New Orleans Blues	4/4	89.96	2.67	
Organ Sing-Along	4/4	121.28	1.98	
Polka!	4/4	119.53	2.01	
Polynesian Village	4/4	110.06	2.18	
Pop Piano + Guitar	4/4	142.71	1.68	
Rock & Rhythm	4/4	127.14	1.89	
Rollin' Easy	4/4	120.00	2.00	
Romantic Strings	3/4	88.74	2.03	
Singing Rhythm	4/4	120.00	2.00	
Sleigh Ride	4/4	119.41	2.01	
Swing It!	4/4	97.96	2.45	
The Blues Sweet & Low	4/4	89.63	2.68	
Vox Humana	N/A	N/A	2.00	
Waltz Time	3/4	92.17	1.95	

MIDI Note Number	Note	Octave	Optigan Track Number	Optigan Range	Orchestron Track Number	Orchestron Range	Panoptigon Track Number	Panoptigon Range	iOptigan Track Number	iOptigan Range	Special Track Number	Special Range	Sequential Track Number	Sequential Range
21	A	0									1	SPECIAL FX		
22	A#	0									2	SPECIAL FX		
23	B	0									3	SPECIAL FX		
24	C	1									4	SPECIAL FX		
25	C#	1									5	SPECIAL FX		
26	D	1												
27	D#	1												
28	E	1												
29	F	1									1	SPECIAL FX		
30	F#	1									2	SPECIAL FX		
31	G	1									3	SPECIAL FX		
32	G#	1							18	CHORDS	4	SPECIAL FX		
33	A	1							19	CHORDS	5	SPECIAL FX		
34	A#	1							20	CHORDS				
35	B	1							18	CHORDS				
36	C	2	REV/FWRD		REV/FWRD		54	KEYS	19	CHORDS			60	KEYS
37	C#	2	STOP/START		STOP/START		59	KEYS	20	CHORDS	6		59	KEYS
38	D	2	6	CHORDS			52	KEYS	18	CHORDS	9		58	CHORDS
39	D#	2	7	CHORDS			57	KEYS	7	CHORDS	11		57	CHORDS
40	E	2	8	CHORDS			50	KEYS	8	CHORDS	13		56	CHORDS
41	F	2	9	CHORDS			55	KEYS	10	CHORDS	15		55	CHORDS
42	F#	2	10	CHORDS			60	KEYS	12	CHORDS	18		54	CHORDS
43	G	2	11	CHORDS			53	KEYS	14	CHORDS	19		53	CHORDS
44	G#	2	12	CHORDS			58	KEYS	16	CHORDS			52	CHORDS
45	A	2	13	CHORDS			51	KEYS	17	CHORDS	7	CHORDS	51	CHORDS
46	A#	2	14	CHORDS			56	KEYS	6	CHORDS	8	CHORDS	50	CHORDS
47	B	2	15	CHORDS			49	KEYS	9	CHORDS	10	CHORDS	49	CHORDS
48	C	3	16	CHORDS			42	KEYS	11	CHORDS	12	CHORDS	48	CHORDS
49	C#	3	17	CHORDS			47	KEYS	13	CHORDS	14	CHORDS	47	CHORDS
50	D	3	18	CHORDS			40	KEYS	15	CHORDS	16	CHORDS	46	CHORDS
51	D#	3	19	CHORDS			45	KEYS	18	CHORDS	17	CHORDS	45	CHORDS
52	E	3	20	CHORDS			38	KEYS	19	CHORDS			44	CHORDS
53	F	3	57	KEYS	37	KEYS	43	KEYS	57	KEYS	18	CHORDS	43	KEYS
54	F#	3	56	KEYS	30	KEYS	48	KEYS	56	KEYS	19	CHORDS	42	KEYS
55	G	3	55	KEYS	35	KEYS	41	KEYS	55	KEYS	20	CHORDS	41	KEYS
56	G#	3	54	KEYS	28	KEYS	46	KEYS	54	KEYS	18	CHORDS	40	KEYS
57	A	3	53	KEYS	33	KEYS	39	KEYS	53	KEYS	19	CHORDS	39	KEYS
58	A#	3	52	KEYS	26	KEYS	44	KEYS	52	KEYS	20	CHORDS	38	KEYS
59	B	3	51	KEYS	31	KEYS	37	KEYS	51	KEYS	18	CHORDS	37	KEYS
60	C	4	50	KEYS	36	KEYS	30	KEYS	50	KEYS			36	KEYS
61	C#	4	49	KEYS	29	KEYS	35	KEYS	49	KEYS			35	KEYS
62	D	4	48	KEYS	34	KEYS	28	KEYS	48	KEYS			34	KEYS
63	D#	4	47	KEYS	27	KEYS	33	KEYS	47	KEYS			33	KEYS
64	E	4	46	KEYS	32	KEYS	26	KEYS	46	KEYS			32	KEYS
65	F	4	45	KEYS	25	KEYS	31	KEYS	45	KEYS	57	KEYS	31	KEYS
66	F#	4	44	KEYS	18	KEYS	36	KEYS	44	KEYS	56	KEYS	30	KEYS
67	G	4	43	KEYS	23	KEYS	29	KEYS	43	KEYS	55	KEYS	29	KEYS
68	G#	4	42	KEYS	16	KEYS	34	KEYS	42	KEYS	54	KEYS	28	KEYS
69	A	4	41	KEYS	21	KEYS	27	KEYS	41	KEYS	53	KEYS	27	KEYS
70	A#	4	40	KEYS	14	KEYS	32	KEYS	40	KEYS	52	KEYS	26	KEYS
71	B	4	39	KEYS	19	KEYS	25	KEYS	39	KEYS	51	KEYS	25	KEYS
72	C	5	38	KEYS	24	KEYS	18	KEYS	38	KEYS	50	KEYS	24	KEYS
73	C#	5	37	KEYS	17	KEYS	23	KEYS	37	KEYS	49	KEYS	23	KEYS
74	D	5	36	KEYS	22	KEYS	16	KEYS	36	KEYS	48	KEYS	22	KEYS
75	D#	5	35	KEYS	15	KEYS	21	KEYS	35	KEYS	47	KEYS	21	KEYS
76	E	5	34	KEYS	20	KEYS	14	KEYS	34	KEYS	46	KEYS	20	KEYS
77	F	5	33	KEYS	13	KEYS	19	KEYS	33	KEYS	45	KEYS	19	KEYS
78	F#	5	32	KEYS	6	KEYS	24	KEYS	32	KEYS	44	KEYS	18	KEYS
79	G	5	31	KEYS	11	KEYS	17	KEYS	31	KEYS	43	KEYS	17	KEYS
80	G#	5	30	KEYS	4	KEYS	22	KEYS	30	KEYS	42	KEYS	16	KEYS
81	A	5	29	KEYS	9	KEYS	15	KEYS	29	KEYS	41	KEYS	15	KEYS
82	A#	5	28	KEYS	2	KEYS	20	KEYS	28	KEYS	40	KEYS	14	KEYS
83	B	5	27	KEYS	7	KEYS	13	KEYS	27	KEYS	39	KEYS	13	KEYS
84	C	6	26	KEYS	12	KEYS	6	KEYS	26	KEYS	38	KEYS	12	KEYS
85	C#	6	25	KEYS	5	KEYS	11	KEYS	25	KEYS	37	KEYS	11	KEYS
86	D	6	24	KEYS	10	KEYS	4	KEYS	24	KEYS	36	KEYS	10	KEYS
87	D#	6	23	KEYS	3	KEYS	9	KEYS	23	KEYS	35	KEYS	9	KEYS
88	E	6	22	KEYS	8	KEYS	2	KEYS	22	KEYS	34	KEYS	8	KEYS
89	F	6	21	KEYS	1	KEYS	7	KEYS	21	KEYS	33	KEYS	7	KEYS
90	F#	6	1	SPECIAL FX			12	KEYS			32	KEYS	6	KEYS
91	G	6	2	SPECIAL FX			5	KEYS	1	SPECIAL FX	31	KEYS	5	KEYS
92	G#	6	3	SPECIAL FX			10	KEYS	2	SPECIAL FX	30	KEYS	4	KEYS
93	A	6	4	SPECIAL FX			3	KEYS	3	SPECIAL FX	29	KEYS	3	KEYS
94	A#	6	5	SPECIAL FX			8	KEYS	4	SPECIAL FX	28	KEYS	2	KEYS
95	B	6	REV/FWRD		REV/FWRD		1	KEYS	5	SPECIAL FX	27	KEYS	1	KEYS
96	C	7	STOP/START		STOP/START		STOP/START				26	KEYS	STOP/START	
97	C#	7					REV/FWRD				25	KEYS		
98	D	7									24	KEYS		
99	D#	7									23	KEYS		
100	F#	7									22	KEYS		
101	G	7									21	KEYS		

RANGE OF 61 NOTE KEYBOARD

Important Information for Owners

Factory Service

Please retain the shipping carton and packing materials in the unlikely event your Panoptigon needs servicing.

To return a product to Quilter Labs for service under the warranty policy, please contact Quilter Labs by phone of email. Mail can be sent to Quilter Labs at 1700 Sunflower, Suite A, Costa Mesa, CA 92626. Please include the serial number of the product and a copy of your sales receipt. Instructions on how to send your product will be provided.

Do not attempt to open the product and service it yourself. Any attempt to service the product by a non-authorized service technician may void your warranty.

FCC Notice

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver
- Connect the product into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warranty

For warranty or service information visit us online at www.quilterlabs.com.

Author Credits

Manual written and edited by Craig Anderton and Robert Becker.

Please note that specifications and the documentation are subject to change without notice.

Owners Manual / Quick Start
Quilter P/N 001127 Rev. A