Industrial Music Electronics

PISTON HONDA DUAL WAVETABLE OSCILLATOR
THREE-AXIS MORPHING WITH NONLINEAR WAVESHAPERS

FREQUENCY

SYNC 0-5V
MODE
SELECT
CV +/-8V
PRESET/EDIT

1V/OCT 0-8V
CV +/-8V
FM/EXT IN AC10Vpp
OSC A

PRESET 1
C:0 Osc A
Y:2 184 Hz
X:1

LINK
FREQUENCY
MODE
SELECT
SYNC 0-5V
OSC B

1V/OCT 0-8V
CV +/-8V
FM/EXT IN AC10Vpp

MICRO SD

A MIX B
OUTPUTS

CV +/-8V
X Y Z
WAVEFORM SELECTION

INDUSTRIAL MUSIC ELECTRONICS MODEL 1991 MARK III
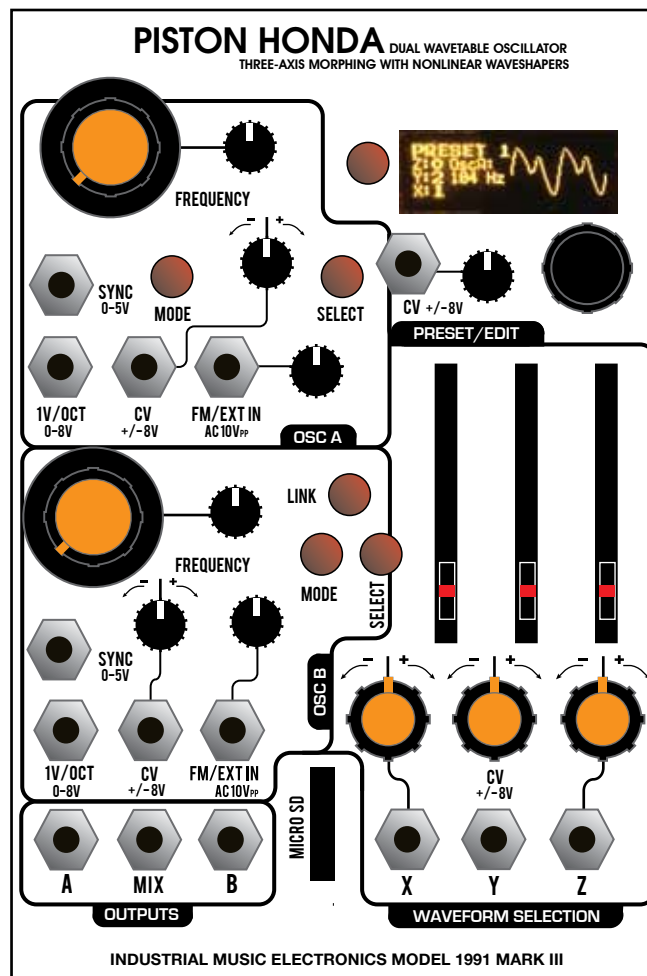
PISTON HONDA MARK III
OPERATIONS MANUAL · FIRMWARE V1.1

FUNDAMENTALS

The Piston Honda operates much like any voltage-controlled oscillator module, meant to be the main tone generator in a modular synthesizer patch. The difference in principle is the "wavetable", the means by which the waveforms are generated A wavetable oscillator is special because instead of generating a "classic" waveform like a sawtooth or square, it generates an arbitrary waveform by reading digital data from memory. The sounds generated by this method are quite different from typical analog waveforms. They are more harmonically complex, and less dependent on filtering action to achieve interesting sounds. They respond very well to chorus and unison effects. Piston Honda puts all of this wavetable synthesis control into a convenient package, with a large library of waveforms that may be "morphed' into one another. This module contains two complete oscillators and a preset controller, suitable for small and large systems. Suggested uses for the module's various features are given in this manual, but we encourage you to develop your own individual style. Our suggested applications are just that... suggestions! Heavy experimentation is encouraged.

GETTING STARTED

When the coarse tune is set to its minimum position and the fine tune is set to the middle position, the generated frequency will be 16.35hz (note C0) with no external voltages applied. Patching a 1 volt per octave tuned sequencer, quantizer, or keyboard voltage into this jack (such as the STILLSON HAMMER or ARGOS BLEAK) will change the oscillator's frequency to the desired note. If the control voltage is set so that C0 is equivalent to a value of 0 volts, then the note names shown on the Piston Honda's display (and the generated frequency) will match the input voltage.

SCREEN SAVER

The Piston Honda's display is an OLED. It is set to a brightness to provide the best balance between visibility and long life. To preserve the life of the OLED, it will turn off if a button or encoder is not used for 10 minutes. To turn it back on, press a button or turn the encoder.

OSCILLATOR OPERATION

The two frequency controls set the coarse and fine tuning frequencies of the oscillator. Their specific functions may be reversed in the MAIN "GLOBAL" OPTIONS menu by pressing the Encoder and Link button, scroll down to the "Freq Knob Mode" item. "Normal" assigns the large orange knob to Coarse Tune and the small knob to Fine Tune. "Reverse" assigns the large knob to Fine Tune and the small knob to Coarse Tune.

The frequency of the oscillator is set as a combination of the coarse and fine manual tuning controls, the voltage present at the "1V/Oct" and "CV" jacks, the OCTAVE SHIFT parameter, and the loaded preset data (if ALL PARAMS is enabled.) The "CV" jack accepts a bipolar control voltage, such as a vibrato LFO. It is attenuated by the nearby "attenuverter" knob.

The "FM" input provides audio-rate, thru-zero frequency modulation of the oscillator signal. It only accepts audio-rate signals. When the OSC MODE button is pressed the Piston Honda enters External In mode, this input provides the signal to be dynamically waveshaped through the selected wavetable (instead of using the internal oscillator) When active, "Ext" will be visible over the waveform display.
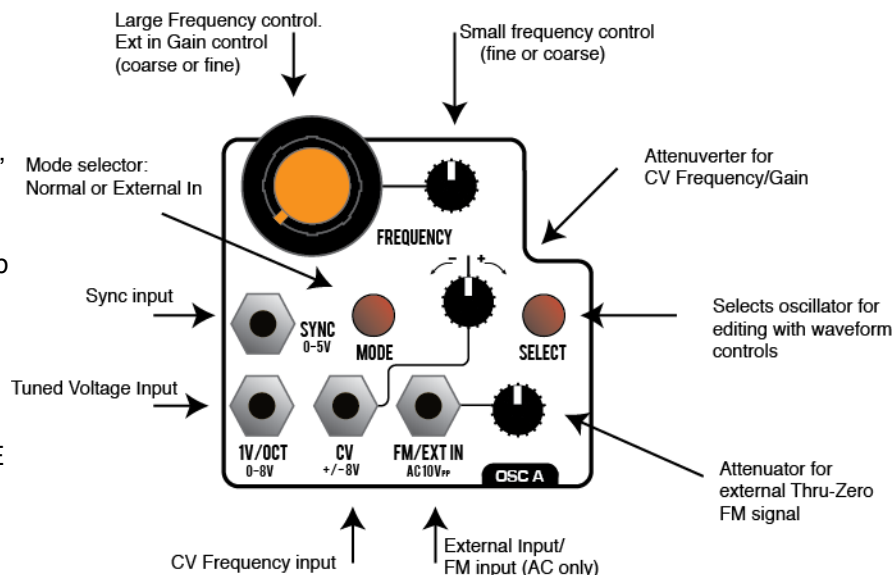
IMPORTANT: THE FM INPUT IS NORMALLED TO THE OUTPUT OF THE OTHER OSCILLATOR. YOU CAN USE THIS CONTROL WITHOUT USING ADDITIONAL PATCH CORDS. KEEP THIS KNOB IN THE ZERO POSITION IF YOU DO NOT WANT TO USE THE FM FEATURE.

CV INPUTS

Most CV inputs on the Piston Honda accept full-scale, bipolar control voltages with a range of +/-10v. The response of the various inputs are scaled to provide a musically useful range of motion within the typical range of +/-5V, with additional reactivity far outside of this range. The attenuverters use a nonlinear curve to allow a typical control voltage to subtly modulate a small range of the parameter, or full-swing travel without the use of external amplification.

Turn COUNTER-CLOCKWISE to SUBTRACT

Turn CLOCKWISE to ADD CV to parameter

CV Input

"Attenuverter"
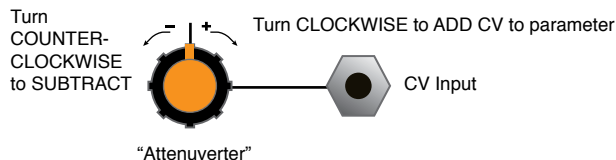
OSCILLATOR LINK

Oscillator B has a "Link" button. It allows one-touch linking of Oscillator A's frequency to Oscillator B, for easy "following" behavior without the use of patch cables. In this mode, the coarse tune parameter on oscillator B will be disabled. Oscillator B will copy the frequency from oscillator A, with the added influence of Oscillator B's Fine Tune and CV controls. If oscillator A has FM applied, it will not influence the follow frequency that is given to Osc B. Set oscillator B's fine tune control to the center position for easy unison effects while listening to the "Mix" output. Adding unison from each oscillator will result in massive 4-oscillator sounds, with two different morphing wavetables if you prefer.

SHORTCUTS

It is not necessary to use the menu system for accessing all features. Many sound parameters not related to the preset manager can be changed with shortcuts.

To increment an oscillator's UNISON parameter without using the menu, hold down the encoder button and press the oscillator's SELECT button.

To change an oscillator's OCTAVE setting without using the menu, hold down the oscillator's SELECT button and turn the rotary encoder.

WAVEFORM SELECTION

The waveform selection is shared by both oscillators though each can be tuned to their own waveform. The two SELECT buttons near the waveform sliders determine which oscillators will be updated by motions of the slider and attenuator controls. If the button is illuminated, its associated oscillator will receive the control motion in choosing a respective waveform. The display will update to show the vital parameters of the selected oscillator, or both. It is not possible to deselect both oscillators. When only one oscillator is selected, more detailed information will be shown such as the frequency of the oscillator, and a graphic tuning bar showing the deviation from the standard pitch.

In the display, if the colon (:) is missing from the waveform X, Y, or Z axis label, it means that morphing is disabled on that oscillator's axis.

Manual control (Slider)

CV Attenuverter

CV Input

CV +/-8V

X Y Z

WAVEFORM SELECTION

WAVEFORM AXIS

The Piston Honda contains 512 waveforms, organized into a "cube" of 8x8x8 with the axis labeled X, Y, and Z. Each axis has a manual control slider and a dedicated CV input with attenuverter, which adds or subtracts from the initial value set by the slider.
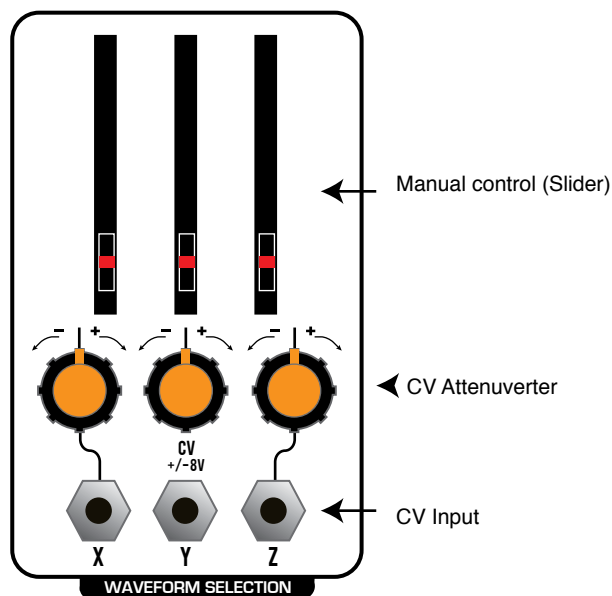
The shared waveform controls exhibit "locking" behavior to prevent accidental editing of the wrong oscillator. The sliders and attenuverters are locked when the SELECT buttons are pressed, or when a new preset is loaded. To unlock a slider, simply move it from its current position. It will edit the parameter only for the currently selected oscillator, while the unselected oscillator's parameters remain locked. The waveform axis CV attenuverters also have this shared locking behavior.

EXTERNAL INPUT MODE

Each oscillator's wavetable generator can accept an external audio signal, instead of the internal oscillator. To change to this mode, press the "MODE" button on the desired oscillator. "EXT" will appear in the display. Patch an external audio signal to the oscillator's FM input (or leave it unpatched to process the output of the other oscillator.) Turn up the large tune knob. In this mode, the large knob functions as the manual GAIN control. The oscillator's CV input and attenuverter will provide voltage control of the gain. For the "classic" nonlinear dynamic waveshaping sound, set the input signal to a sine wave, select the wavetable as desired, and put an envelope into the oscillator's CV input.

NOTE: Setting both oscillators to External Input whilst using the normaled input signals (no signals patched into either FM jack) will result in an unpleasant feedback signal of limited musical utility.

MENU SYSTEM

The Piston Honda's menu system can be accessed by holding down the black encoder button and pressing one of the buttons on the module.

HOLD ENCODER AND PRESS OSC A MODE - OSCILLATOR A OPTIONS MENU.

HOLD ENCODER AND PRESS OSC B MODE - OSCILLATOR B OPTIONS MENU.

HOLD ENCODER AND PRESS OSC LINK - MAIN "GLOBAL" OPTIONS MENU.

HOLD ENCODER AND PRESS PRESET - PRESET OPTIONS MENU.

You may scroll through the menu by turning the rotary encoder. To access the selected menu option, press the encoder button. To change the selected option, turn the encoder to change the highlighted data. When finished, press the encoder button again to program your edited value. To exit the menu, press any other button on the module.

OSCILLATOR OPTIONS MENU

UNISON:

Enables a second oscillator to run alongside the main oscillator, with all parameters identical other than a slight difference in the frequency. The number indicates the frequency deviation. The +OCT and -OCT options set the unison to increase or decrease one octave, respectively. This parameter can be changed without accessing the menu by holding down the rotary encoder button and pressing the desired OSC MODE button.

OCTAVE SHIFT:

Changes the main oscillator pitch across a +/- 2 octave range. The oscillator will become silent if you exceed the Piston Honda's minimum range of about 14 hz.

MORPH ENABLE:

The wave morphing behavior of the X, Y, and Z axis of the oscillator's waveform selection may be individually disabled. An axis with disabled morphing makes hard transitions between the eight waveforms instead of a smooth interpolation, for a more "glitchy" effect rather than a smooth morph. It also allows you to hear a selection with no content from the neighbor waveforms mixed in. For example, the 8 items on the Z axis represent 8 files that are loaded into the module. With Z axis morphing turned on, you would hear a mix of two Z axis waveforms as you moved the slider. To hear waveforms that are only contained within a single file, disable morphing on the Z axis.

WAVEFORM CV

Because the waveform selection CV inputs are shared between the two oscillators, you may wish to disable the response for one of the oscillators (such as when you are using the Piston Honda as two independent oscillators). Setting Waveform CV to "Off" will cause that particular oscillator to ignore incoming Waveform CV on the X, Y, and Z controls.

TONE

The tone menu offers several different types of subtle distortion to be applied. It is most audible with sinusoidal or additive waveforms at low frequencies, where you may hear quiet foldover of high frequency aliases of the distortion products. The "Orthodox" setting is not distorted and presents the full resolution of the 16 bit waveform set. The other settings introduce different flavors of quantization noise, enjoyable by enthusiasts of previous generations of the Piston Honda. To best hear the effects of the different tone selections, select a sine wave (X Y and Z set to 1 with the default factory waveforms) , set the oscillator to a low frequency, and listen to the different Tone options while moving the tune controls.

MAKING YOUR OWN WAVES

You can make your own wavetables for use on Piston Honda. The free, open-source "WaveEdit" program by the Synthesis Technology company allows convenient creation, editing, and sharing of files that may be loaded directly into Piston Honda. We recommend this program as a first solution to creating custom waveform data, but any means of generating samples in WAV format properly aligned to the 256-sample boundary will work (see FILE FORMAT DESCRIPTION)

FILE FORMAT DESCRIPTION

1-channel .WAV file, 16 bits, 32Kbytes (256 2-byte samples per waveform. 64 waveforms per file total). One file occupies one of the eight slots available on the Z axis slider. Eight files must be present on the SD card for a successful load operation.

LOADING CUSTOM WAV FILES

All eight waveform slots on Piston Honda must be written at once. You must collect 8 properly formatted WAV files onto a SD card (formatted with the FAT file system). The filenames MUST be "1.wav", "2.wav", "3.wav", and so on up to "8.wav". Copy these files to the root directory of the SD card, then properly eject the card from your computer and insert it into the Piston Honda. Go to the Global options menu and scroll down to the second page. Select the "Load Waves from SD" option and the loading process will begin.

The module will display the progress of checking the format of each file and the subsequent loading of the data. If the file is not correctly named or if the card is corrupt, the loading will fail. If the loading is successful, the new wave data will be written to memory and the module will restart. You may now remove the SD card until the next time you'd like to update the waves. It is safe to remove and re-insert the SD card while the module is turned on, but not while the file load operation is running.

If you have created only a small number of WAV files and need more data to fill the SD card's 8 files, you can download the original factory wave set from http://www.industrialmusicelectronics.com/

SOFT REBOOT

If you'd like to restart your Piston Honda without turning off your entire system, go to the Global Options menu (hold down encoder button and press LINK), and scroll down to the "Reboot" option. Selecting this with the encoder button will cause the module to restart.

PRESET MANAGER

The Preset Manager provides an easy way to manage the entire state of the control panel and menu system from a single set of controls. Eight presets are available and they may be stored to nonvolatile memory in the Piston Honda (not on the SD card). To enable the Preset Manager, push the PRESET button to the immediate left of the display. It will light up red and the display will change to say "PRESET" followed by the currently selected preset number. Managed controls will be locked and set to the values stored in that preset slot. To change the preset, rotate the encoder. The settings will change according to the stored data in memory. The "Preset scope" setting in the GLOBAL OPTIONS menu will determine if all panel settings are affected by the preset change, or just the waveform selection controls. The CV input and attenuator knob just below the display also changes the active preset. The behavior of the CV and knob is defined in the GLOBAL OPTIONS menu with the CTL option.
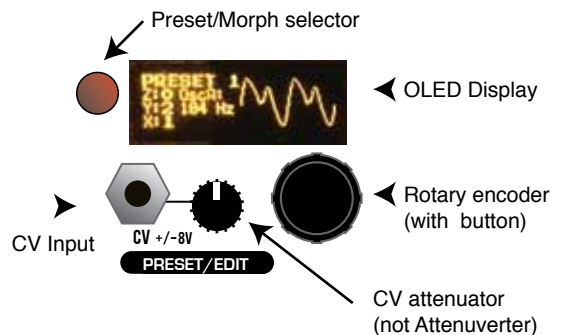
EDITING PRESETS

To write your own data into the preset slot, press the rotary encoder button while the preset manager is active. The EDITING indicator will appear on the screen. Any controls that you move while the editing indicator is active will be written into that preset slot. Any changes you make to the oscillator menu will be written to the preset whether the EDITING indicator is present or not. To exit EDITING mode, press the rotary encoder again. IMPORTANT: You must choose "Save Presets" from the PRESET menu to write your changes to memory. They will not be stored permanently unless you do this. The "Save to Preset" command will also commit the edited data to memory.

PRESET MORPH

When in PRESET mode, press the preset button again to enter MORPH mode. All controls under the scope of the preset manager are locked and unable to move (the CV inputs will still respond). Set the "base" preset for the morph by turning the rotary encoder to select. The base preset will determine the state of unison, octave and other button/menu settings that cannot be smoothly morphed. When the base preset is changed,these menu-based settings may change depending on the preset data. . Next, apply a CV to the preset CV input. The presets will smoothly morph from one to another.

PRESET CONFIGURATION (in GLOBAL OPTIONS MENU):

PRESET SCOPE:

This parameter controls which elements (or functions) are managed by the preset manager. "Waves Only" will only change the waveform sliders, CV/FM/XYZ attenuverters, and the unison/octave settings when the preset is changed. "All Params" will additionally change the coarse and fine controls so that the basic oscillator frequency is also under the control of the preset manager. This is useful if you wish to use the preset slots to create a sequence of notes, or a strictly defined basic pitch for each segment of a live performance. It is less useful in Preset Morph mode if you are using this feature to constrain the oscillator settings to musically identifiable pitches, as the morph will destroy that illusion by smoothly gliding through all of the intermediate frequencies between presets.

CTL:
This parameter determines the behavior of the Preset CV input and attenuator.

CV+OFFSET
Allows the CV input to directly cycle through the bank of 8 presets. The attenuator knob will act as a manual offset. This is useful if you need a manual control to smoothly morph the preset data in Morph mode.

CV+ATTEN
Works like CV+Offset, but the knob becomes an attenuator for the incoming CV. This mode is useful for changing presets within a strictly controlled range, or subtly morphing within a narrow range of preset data.

TRIG + OFFSET

Treats the CV input as a trigger input instead. When a trigger or gate event is received, it will advance the preset number by one. The attenuator knob will manually scan through the presets.

TRIG RANDOM

Randomizes all parameters subject to Preset Scope when a trigger event is received at the CV input. Note that random patch results must be written to memory using the PRESET menu's "Save Presets" command for permanent storage of these changes.

STARTUP:

This menu item allows you to enable the preset manager when the modular system is powered on. You may choose to leave PRESET OFF or select either PRESET or MORPH mode ON. This parameter is used when you have several Mark III modules in a live performance setup, to avoid setting the preset state on each one at startup.

PRESET MENU:

RANDOMIZE CURRENT

When selected, the random preset generator will create a new sound setting. The parameters to be changed are subject to the "Preset Scope" setting. This function works even if Preset Mode is not active. NOTE: Randomized presets are NOT automatically saved to memory. You must use the "Save Presets" or "Save to Preset" menu command to write the data to memory.

SAVE TO PRESET

If you are designing a sound and modulation setup and want to save it to the preset memory, choose this menu option. You must select the preset slot number to activate the save. This feature also works if the preset manager isn't active. The preset will automatically be stored in nonvolatile memory.

SAVE PRESETS

This option writes the current state of all preset slots to nonvolatile memory. Presets are stored on an EEPROM inside the module, not the SD card.

NOTE: THIS WILL OVERWRITE ALL OF THE PRESET MEMORY WITH THE NEW DATA, SO SUBSEQUENT USES OF THE "RELOAD PRESETS" COMMAND WILL RECALL THAT DATA INSTEAD OF WHAT WAS THERE BEFORE.

RELOAD PRESETS

This option reloads the saved memory contents of the Preset Manager to active memory. Use this if you have mistakenly initialized or randomized saved data that you would like to keep. Note: You cannot reload presets after initiating "Save Presets."

INIT ALL PRESETS

Initializes all preset slots and replaces the data with a simple sound. This function does not automatically clear the saved data in memory. You must use the "Save Presets" command to make your changes permanent.

Init Current: Initializes the currently playing sound and replaces it with a simple sound This function works even if the Preset Manager is not active.

NOTE: AFTER INITIALIZING THE CURRENT PRESET, THE FREQUENCIES OF THE OSCILLATORS WILL BE SET TO THE MINIMUM (14 HZ). ADJUST THE FREQUENCY CONTROLS TO HEAR AN AUDIBLE SIGNAL ONCE AGAIN.

UPGRADING FIRMWARE:

You will need an inexpensive "Pickit3" programmer device and a computer with a USB connection to install any available upgrades for this module. You may download new firmware and detailed upgrade instructions from http://www.industrialmusicelectronics.com on the relevant product page. Note that upgrading the firmware will reset the internal waveforms to the factory configuration. Your presets and user settings will not be disturbed.

TEST AND CALIBRATION:

Your oscillator comes from the factory with a fresh calibration job. It may need periodic adjustment, especiaally when placed into a permanent configuration with other oscillators and CV sources - calibrate your module so it is in tune with the rest of your setup.

1. Prepare two control voltages measuring exactly 1V and 7V. Select a single oscillator so you can see the frequency and tuning controls on the display.
2. Turn the coarse tune on that oscillator to the minimum position, and turn the fine tune control to center position.

3. Insert the 1V voltage into the Tuned CV input (1v/oct), and adjust the oscillator's fine tune until the tuning display is entered on note C1.
4. Replace the 1V input voltage with 7V. Adjust the trimmer on the rear of the module for that oscillator (labeled OSC1SCALE or OSC2SCALE) until the display is centered on note C7.

Repeat steps 3 and 4 until no further adjustment is needed.

FACTORY RESET:

   To perform a factory reset, make sure that NO patch cables are plugged into the module. Turn the module on while holding the Preset Mode button. The menu settings, CV input calibrations, and preset data will be reset.

MORE INFORMATION:

Find the latest firmware, waveforms, and other information:
http://www.industrialmusicelectronics.com/products/21

Need more help?
support@industrialmusicelectronics.com