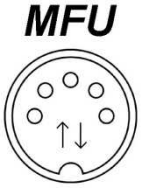
User Manual

Firmware Revision 2.2



MADE IN ITALY

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1) GENERAL WARNINGS

READ CAREFULLY BEFORE CONNECTING ELECTRICAL CABLES.

- Do not place the instrument in wet or dirty environments.
- Do not remove the protective coverings.
- Do not touch the AC plug with wet hands.

FACTORY DEFAULTS

- The CRUMAR Mojo accepts voltages from 100V to 240V AC 50-60Hz through the original power supply. Be sure that local electrical standards are compliant with the instrument.
- The serial number, international standards and other informations are printed on the plate positioned in the back panel near power inlet and in the power supply.

DO NOT REMOVE THE TOP PANEL FOR ANY REASON.

IN THE EVENT THAT SUPPORT OR TECHNICAL ASSISTANCE IS REQUIRED, PLEASE CONTACT YOUR CRUMAR DEALER OR AN AUTHORIZED CRUMAR TECHNICAL CENTER.

THE MAIN POWER CONNECTION IS LOCATED ON THE REAR OF THE INSTRUMENT ON THE LEFT SIDE. THE POWER BUTTON IS ON THE TOP OF THE INSTRUMENT ON THE LEFT SIDE.

BEFORE CONNECTING THE MAIN POWER CABLE, CONNECT ALL OTHER CABLES FIRST.

When you are using the instrument, please be aware of the following:

- Do not cover any of the instrument's ventilation holes.
- Air must circulate freely around the instrument.
- Do not set the instrument on a surface with excessive vibration.
- Do not expose the instrument to electro-magnetic interference.
- Do not expose the instrument to heat, cold, wet or dust.
- Do not leave the instrument in direct sunlight.
- Do not expose the instrument to electrostatic forces.
- Do not place items with flames, such as candles or lighters, on the instrument.
- Do not place the instrument on anything containing water or other fluids.

If any foreign objects enter the instrument, please contact your dealer or an authorized CRUMAR technical center.

AC Power Information

1. Do not forcibly unplug the power cord.
2. When not in use, unplug the AC cable from the instrument.
3. Unplug the AC cable during thunderstorms.

2) PACKAGE AND HANDLING

Carefully remove the instrument from its packaging. The CRUMAR Mojo weighs just over 37 lbs (17 kg).

Please set the CRUMAR Mojo on a stand rated at 44 lbs (20 kg).

Please keep the original packaging material for future use.

The packaging bag is not a toy. Keep out of reach of children.

CRUMAR is not responsible for any injuries incurred by incorrect use of the organ or the packaging materials.

3) INCLUDED ACCESSORIES

- **CRUMAR Mojo** organ
- User manual
- Power supply
- IEC and ROHS compliant AC plug (US plug or EU plug)

The organ can be equipped with additional, optional accessories like sustain pedal, rotary effect control pedal, half-moon rotary effect control, soft or hard case. For information about purchasing original CRUMAR accessories, please contact your dealer or CRUMAR directly.

4) CONNECTIONS AND CONTROLS

The CRUMAR Mojo is suitable for use in most countries worldwide. Its power supply accepts voltages from 100 to 240 Volts AC. For more details, please contact your dealer or an authorized CRUMAR service center. The CRUMAR Mojo should be used with a power source that is compliant with the standards listed on the label located in the rear of the original power supply of the instrument.

If the instrument will be used in countries with different electricity standards, please contact your dealer or an authorized CRUMAR service center.

It is recommended that only compatible devices or accessories in perfect working condition be connected to the instrument. Connecting broken or incompatible devices to the CRUMAR Mojo's sockets, inputs and outputs could damage the instrument. Do not insert foreign objects into ventilation holes or into sockets and plugs. If you are not sure about compatibility of your equipment, we strongly recommend that you contact your dealer or an authorized CRUMAR service center.

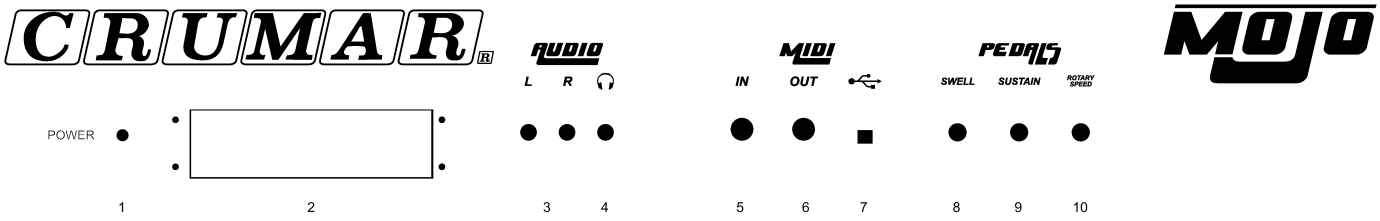
Important notes on Power supply.

Depending on your country, Mojo power supply can be of class 1 or class 2 type.
If your instrument doesn't work properly (power off after a while, no sound after a while ecc) or you notice noise on your instrument (power supply, ground loop noise), please check connections and avoid ground loops; if this doesn't solve your problem, if your power supply is Class 1 type, you can remove earth connection from the AC connector to the AC main (also using an adapter). Please remember that using Vintage Leslie speakers (also modified ones) connected to Crumar Mojo, can amplify ground loop problems and changing speed on the Vintage Leslies can cause power off of the instrument as protection.

CRUMAR is not responsible of any damage caused by these operations.

Back Panel Connections and Controls (Fig.1):

Fig.1



1. **Power:** This plug is used to connect the CRUMAR Mojo power supply (12 Volt CC). **Do not use any power supply other than the original unit that shipped with the instrument.**

2. **Motherboard Connections Access Slot:** Connections to the motherboard can be accessed in this panel. The motherboard connections should be used only for updates and advanced instrument configuration. A VGA-compatible monitor can be connected using a 15-pin connection to the blue port. A mouse or keyboard can be connected using the din PS/s purple or green ports or any available USB ports. USB ports can also be used for connecting other devices such as USB flash drives for data transfer. The LAN port and the blue, green and purple audio connection ports have been disabled.

3. **Main Audio Out - L & R (Left and Right channels):** These outputs are used to connect the instrument to the main amplification system. The CRUMAR Mojo should be connected to a stereo amplification system to provide the fullest sound.

   In normal operation, the rotary speaker simulation is output in stereo. The CRUMAR Mojo can additionally create a vertical rotary speaker simulation using CRUMAR's exclusive "V.S. Technology." When using the vertical simulation, the output from the R channel provides the bass/rotor simulation and the L channel provides the treble/horn simulation. An internal crossover filters the signal to the appropriate output. To fully benefit from the vertical simulation and to best simulate the sound image of a rotary speaker, place the speaker to which the L channel is connected above the speaker to which the R channel is connected. On latest software revision, if you select other combinations of sound (for example combination 2 tonewheel organ + tines e-piano) using out split mode, you will find the organ on left output and e-piano on right output.

   Additional settings for the L and R outputs can be chosen. (See **Section 7: Edit and Programming Mode**.)

4. **Headphones (stereo):** This output is used to connect headphones for individual use of the instrument. It is recommended that the rotary speaker simulation be used in stereo when using headphones. (See **Section 6: CRUMAR Mojo Overview** for more information about the stereo rotary simulation.)

5. **MIDI IN:** This five-pole DIN connection is used to connect the CRUMAR Mojo to a device capable of sending MIDI data, such as a master keyboard or a pedal board.

   This connection is also used when updating the instrument's firmware with MIDI Firmware Upload (MFU) technology.

6. **MIDI OUT:** This five-pole DIN connection is used to connect the CRUMAR Mojo to a device capable of receving MIDI data. The instrument's controls are configured as follows:

   - **Channel 1**: Drawbars, pots and all other upper manual controls
   - **Channel 2**: Lower manual
   - **Channel 3**: Lower manual if "Pedal to Lower" function is enabled
   - **Channel 4 & 5:** when activated the dedicated function (see page 9).

CAUTION: It is highly recommended not to connect or disconnect MIDI cables with the instrument on. The instrument can be damaged or work incorrectly.

7. **USB Output:** This connection is used to send MIDI data from the CRUMAR Mojo to a computer via USB without the need for a converter. For example, the CRUMAR Mojo could be used to play sounds from a software-based synthesizer on a laptop computer. Please check software driver compatibility on the computer before connecting the CRUMAR Mojo.

8. **Swell:** This 6.3 mm stereo output jack connection is used to connect an expression pedal to the CRUMAR Mojo.

Please use only genuine CRUMAR expression pedals. Other pedals and/or equipment can damage the instrument. For a compatibility list, please contact CRUMAR MUSICAL INSTRUMENTS.

CAUTION: Do not connect or disconnect the expression pedal with the instrument on. The instrument can be damaged or work incorrectly.

9. **Sustain:** This 6.3 mm stereo output jack connection is used to connect an optional momentary “on/off” type of sustain pedal to the CRUMAR Mojo. The instrument accepts both pedals configured as normally closed and pedals configured as normally open.

   The instrument automatically configures the pedal at start-up. Connect the pedal to the instrument before turning the instrument on. The internal organ sounds of VBC CE 2 organ software may not respond to MIDI sustain messages.

   Bass pedal Tap function

   With new firmware 2.2, sustain pedal can be used also for “bass pedal tap” function**:** this is something you might like if you are a jazz organist. Many jazz organists use their radial pedalboard for just “tapping” on a single note while playing the bass line with their left hand. This adds a sense of percussive feel to their comping mimiking the sound of an upright bass. You can now play a tap note by using a sustain pedal connected to the MOJO.

   a. Make sure that you have connected the sustain pedal *before turning the MOJO on*, this assures that the pedal has been configured with the correct polarity. In case you find that the response is reversed, press SHIFT and press PEDAL-TO-LOWER for more than 3 seconds, this will reboot the controller and rescan the sustain pedal port.
   b. Make sure you're using Combination n. 1.
   c. Make sure the PEDAL-TO-LOWER function is off.
   d. Make sure that the sustain pedal function is off for both manuals (press SHIFT, check both the preset LEDs n. 3).
   e. Now play a note on the lower manual within the first 25 notes;
   f. Press SHIFT to enter EDIT MODE;
   g. Push the sustain pedal to assign the last played note to the pedal tap function;
   h. Exit the EDIT mode.

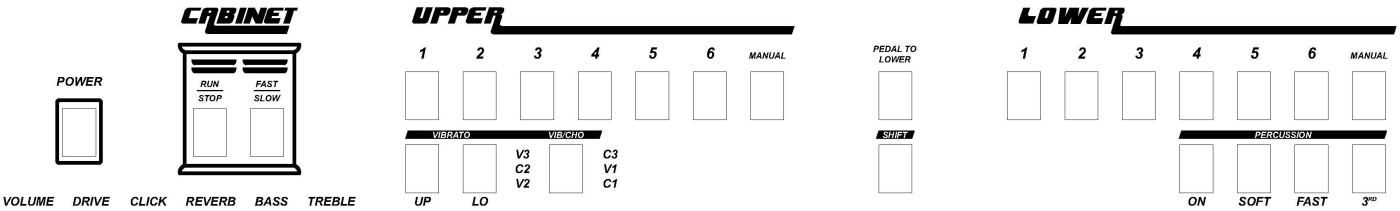
   Now, every time you push the sustain pedal, you'll hear that note playing the pedalboard tones. <u>Don't forget to use the pedalboard drawbars!</u>

10. **Rotary Speed:** This 6.3 mm stereo output jack connection is used to connect an optional foot pedal or front-mounted half-moon switch to control the speed of the internal rotary speaker simulation. **Use only original CRUMAR pedals or switches. Other pedals or switches could damage the instrument.**

    The instrument automatically configures the pedal or switch at start-up. Connect the pedal or switch before turning the instrument on. (See **Section 7: Edit and Programming Mode** for more information about the rotary speed settings.)

Front Panel Controls (Fig. 2):

Fig. 2



- **Power**: This button is used to turn the instrument on and off. Pressing this button initiates the start-up boot process. The LED light sequence across the top panel displays while the instrument is starting.

  To turn the instrument off, hold the Power button for four seconds.

- **Cabinet Section:** These buttons control the rotary speaker simulation.

  - "Run/Stop" – This button controls whether the horn and rotor of the simulated rotary speaker are turning. When set to "Stop," the horn and rotor do not move. This is often referred to as "Brake." When set to "Run," the horn and rotor spin according to the setting of the "Fast/Slow" button.

  - "Fast/Slow" – This button controls the speed of the horn and rotor when the "Run/Stop" button is set to "Run." The speed changes from "Fast," which provides a vibrato effect, to "Slow," which provides a chorus effect.

- **Upper Section:** This section consists of a button called "Manual" and six buttons called "Presets." These buttons control the sound settings related to the upper manual drawbars found directly under the upper manual preset buttons.

  - "Manual" – When the "Manual" button is selected, all nine drawbars can be used in real time to adjust the sound. This setting also allows for the addition of percussion to the sound. Any drawbar settings created when using the "Manual" setting can be saved to one of the six presets. To cancel the sound of all the drawbars, press and hold the "Manual" button for one second. The LED on the button blinks and sound is cancelled. When in "cancel" of upper manual, Mojo will start to transmit on midi channel 4 but with velocity: this will bypass all global velocity settings. This new feature is useful if you need to work with an external midi module receiving in midi channel 4.

  - "Presets 1-6" – These buttons operate like the preset keys on an original tonewheel organ. Drawbar settings created when the organ is set to "Manual" can be saved to one of these presets. When using a preset, the drawbars are not active. Additionally, percussion cannot be enabled or saved in a preset.

To create a preset, select the “Manual” setting and adjust the drawbars and the vibrato/chorus to the preferred setting. Press and hold any of the six preset buttons for five seconds. Any saved presets remain in the memory of the instrument when the instrument is powered off.

- **Lower Section:** This section consists of a button called “Manual” and six buttons called “Presets.” These buttons control the sound settings related to the lower manual drawbars found directly under the lower manual preset buttons. Preset storage operates the same as on the Upper manual. Percussion cannot be enabled on the lower manual.
  To cancel the sound of all the drawbars, press and hold the “Manual” button for one second. The LED on the button blinks and sound is cancelled. When in “cancel” of lower manual, Mojo will start to transmit on midi channel 5 but with velocity: this will bypass all global velocity settings. This new feature is useful if you need to work with an external midi module receiving in midi channel 5.

  BY DEFAULT ALL PRESETS ARE EMPTY

- **Vibrato Section:** This section controls the vibrato/chorus function of the instrument. The vibrato/chorus effect can be added to the upper and lower manuals independently with the “Up” and “Lo” buttons.

  Varying degrees of vibrato/chorus can be selected with the “Vib/Cho” button. Pressing the button repeatedly changes the setting. An LED lights up next to the current selection. The same setting affects both manuals simultaneously.

- **Percussion Section:** This section controls the percussion function of the instrument. Percussion can be added to the Upper manual when the instrument is using the “Manual” setting.

  - “On” – Turns the percussion on or off for the Upper manual.

  - “Soft” – Sets the percussion at a lower volume when enabled.

  - “Fast” – Sets the decay rate of the percussion effect. When enabled, the percussion decays quickly. When disabled, the percussion decays at a slower rate.

  - “3rd” – Sets the percussion harmonic. When enabled, the percussion harmonic is set to a 3rd. When disabled, the harmonic is set to a 2nd.

- **Pedal to Lower:** This button enables the deep pedal tones to be played in the first two octaves on the lower manual. The two center drawbars control the sound of the pedal tones. Other than this feature, the only way to trigger the pedal tones in the instrument is with a pedal board connected to the instrument via the MIDI IN connector.

- **Shift Button**: This button enables the instrument's "Edit" mode. Various software parameters, controller functions and selection of sound combinations can be adjusted in this mode. For more information, see **Section 7: Edit and Programming Mode and section 8.**

- **Drawbars Section:** The CRUMAR Mojo has 20 drawbars arranged into two sections of nine for the upper and lower manuals and a central section of two for the pedal tones. The drawbars correspond to the "Upper" or "Lower" sections with which they are arranged. The nine drawbars in each section initially represent the length of a pipe on a pipe organ and are arranged in the following colors:

  Brown: **16', 5-1/3'**
  White : **8', 4', 2', 1'**
  Black: **2-2/3', 1-1/3', 1-3/5'**

  The drawbars allow the mixing of harmonics and the ability to set the volume on each from minimum of 0 (closed) to a maximum of 8 (fully opened).

  From left to right, each set is composed of the following:

16'	One octave under the fundamental with repetition of first low octave
5-1/3'	A fifth above the fundamental
8'	Fundamental
4'	An octave above the fundamental
2-2/3'	An octave and a fifth above the fundamental
2'	Two octaves above the fundamental with repetition of the last upper octave
1-1/3'	Two octaves and a third above the fundamental
1-3/5'	Two octaves and a fifth above the fundamental
1''	Three octaves above the fundamental with repetition of the two last upper octaves

  In the middle of the two drawbars sets, there are two brown drawbars used to control the 32' and 16' lengths when a MIDI pedal board is connected to the instrument or when the "Pedal to Lower" function is active.

- **Control Knobs:** These six knobs are used for real-time control over various parameters of the sound of the instrument.

  Volume: Overall output volume of the instrument
  Drive: Adjusts the amount of saturation from the tube overdrive emulation
  Click: Adjusts the volume of the key-click simulation
  Reverb: Adjusts the depth of the spring reverb simulation
  Bass: Adjusts the equalization of the output of the bass frequency of the instrument. When the knob is set in the middle position (12:00), the equalization is at zero.
  Treble: Adjust the equalization of the ouput of the treble frequency of the instrument. When the knob is set in the middle position (12:00), the equalization is at zero.

  These knobs are used in conjunction with the “Shift” button to edit additional parameters of the sound of the instrument. For more information, see **Section 7: Edit and Programming Mode**.

5) START-UP AND SHUT-DOWN PROCEDURES

To start up the CRUMAR Mojo, the instrument needs to be powered on and the keyboards need to be synchronized with the software.

START-UP PROCEDURE:

1. Connect the audio cables, expression pedal, sustain pedal and rotary speaker control cables.

2. Connect the power supply to the instrument and to the main AC outlet.

3. Press the “Power” button to start the boot-up process. The LED on the “Power” button lights up.

   In some instances, upon first connection to the power supply, is it possible that a “false boot” will appear: power led turn on for few seconds and then turn off immediately. This is caused by the power supply’s need for a reference. Pressing the power button starts the boot-up process.

4. The CRUMAR Mojo displays the firmware version by illuminating the appropriate LEDs on the Upper and Lower preset buttons. For example, if the instrument is running firmware version 1.3, the LED for the number 1 preset in the Upper section and the LED for the number 3 preset in the Lower section light up at the same time.

5. The boot-up process continues as evidenced by the steadily lit LEDs across the Upper and Lower preset sections. During this process, the instrument starts the internal software and configures the settings of the various connected accessories. The boot-up procedure lasts about 20 seconds.

6. After 20 seconds, press any of the keys on either the upper or lower manual. Once the keys are active, the boot-sequence is completed and the manuals can be synchronized. Press the “Manual” button or any of the presets on both the Upper and Lower preset sections to synchronize the keyboards. The boot-sequence LED pattern stops and the LEDs for any and all related functions light up.

SHUT-DOWN PROCEDURE:

1. Hold down the “Power” button for four seconds. All of the LEDs turn off when the instrument powers down. Please note that the instrument is still under voltage until the power supply is disconnected. If the instrument will not be used for more than two hours, it is recommended that the power supply be unplugged from the main AC connection to extend the life of the power supply and please “think green", don’t waste energy!

6) CRUMAR MOJO OVERVIEW

The CRUMAR Mojo is a modern computer-based musical instrument. The source of the sound of the instrument is the VB3 CE 2 software. This software runs on an internal computer processor using the Windows XP Embedded (XPE) operating system. Windows XP Embedded is a special version of Windows XP created for running specific applications. In the case of the CRUMAR Mojo, its processing is dedicated to running the VB3 CE 2 software to make music which results in absolute processing stability and integration of components based on actual software demands, as well as an extremely fast start-up time.

The CRUMAR Mojo's internal system is equipped with traditional connections for a monitor and a mouse. Connecting a monitor enables users to access the Graphical User Interface (GUI) of the VB3 CE 2 software to make edits to every available aspect of the VB3 CE 2 software.

EWF

One of the most important features of XP Embedded is the Enhanced Write Filter (EWF). EWF provides the ability to protect the image of XPE from being accidentally or voluntarily over-written. This feature allows XPE to be booted from a CD-ROM. The CRUMAR Mojo does not have a hard drive. The XPE system is installed in flash memory, which acts as "read-only" media. No data is written to the flash memory. Any attempt to write additional data to the system, change system data, or install any additional software installed will be "misunderstood" by the system at the next start-up. The system will then boot to the default settings. This extends the life of the system and prevents any accidental changes that would adversely affect the performanace of the instrument. Please note that changing compact flash drives from read-only media to read-write media can shorten the lives of the drives. If the EWF is disabled for any reason, please re-anable it upon completion of the task.

CRUMAR MUSICAL INSTRUMENTS is not responsible for any damage you cause to the operating system. However, CRUMAR is able to restore the CRUMAR Mojo system settings to factory specifications. Please contact CRUMAR if you have any operating system issues.

VB3 CE 2

The VB3 CE 2 software program automatically starts when the CRUMAR Mojo is powered on. The VB3 CE 2 is the most advanced electromagnetic organ emulation software available and features many editable parameters that enable the instrument to emulate a wide variety of tonewheel organs. Many of these parameters can be edited from the control panel of the CRUMAR Mojo, which can be helpful to adjust the sound during live performances. Additional parameters can be edited via the Graphical User Interface (GUI), which can be accessed when a monitor and mouse are connected to the instrument.

From software version 2.1, Crumar Mojo is capable of emulating other sounds like tines e-pianos, synth bass, red tolex combo organ, italian transistor combo organ and reed e-piano. See section 8 for details.

The values of parameters that can be edited from the CRUMAR Mojo control panel are synchronized with the physical settings of the knobs or buttons on the controller. For example, the “Percussion Volume” parameter can be changed by pressing “Shift” on the CRUMAR Mojo control panel and turning the “Treble” knob. The percussion volume remains at the level set by the knob when the instrument is shut down. When the CRUMAR Mojo is restarted, the VB3 CE 2 software detects the values of the physical knobs and synchronizes the parameters accordingly. Even though these parameters can also be adjusted within the GUI, the values of the parameters reset to the values that match the physical settings of the controller whenever a preset is chosen, the “Manual” button is pressed, or the instrument is restarted. It is recommended that users of the CRUMAR Mojo study the GUI in order to familiarize themselves with the various editable parameters and to explore the software’s ability to emulate different organs.

Figure 3 shows the main screen of the software.

Fig. 3

Parameters with an asterisk (*) are synchronized with the CRUMAR Mojo control panel. The settings of all other parameters can be saved and made the default settings by pressing the red “**Store**” button.

Tonewheel Generator Set * – The VB3 CE 2 software is able to model 20 different tonewheel organs. The settings are based on measurements taken from specific organs of different models and dates of manufacture. Changing the Tonewheel Generator Set is like choosing to use a different organ. When the Tonewheel Generator Set is changed, none of the other parameters or EQ settings are changed. Any apparent differences in sound are solely a result of the different measurements from the organ on which the tonewheel set is based.

The Tonewheel Generator Set can be changed from the CRUMAR Mojo control panel by pressing “Shift” and using Upper Manual Preset buttons 1 and 2 to scroll through the different sets. When preset button 1 is lit up, the first tonewheel set in the list, “1. VB3CE2 Standard,” is selected.

Generator Leakage – This parameter controls the amount of ambient noise created by the magnetic interaction of the tonewheels of an organ.

Generator Xtalk * – This parameter controls the amount of overtones, often referred to as “Cross Talk,” created by the interaction of the different drawbar settings. The Generator Xtalk parameter can be adjusted from the CRUMAR Mojo control panel by pressing “Shift” and turning the “Drive” knob.

Percussion Volume * – This parameter controls the volume of the harmonic percussion effect when it is enabled on the panel of the CRUMAR Mojo. The Percussion Volume parameter can be adjusted from the CRUMAR Mojo control panel by pressing “Shift” and turning the “Treble” knob.

Percussion Length – This parameter controls the length of the decay of the harmonic percussion effect.

Percussion Dropout – This parameter controls the amount of volume reduction of the drawbars when the percussion volume is not set to “Soft.”

Pedals Sustain * – This parameter controls the amount of the sustain of the pedal drawbar sound. The Pedals Sustain parameter can be adjusted from the CRUMAR Mojo control panel by pressing shift and adjusting the 8' drawbar.

Pedals To Lower * – This parameter controls the addition of the tones from the pedal drawbars to the bottom two octaves of the lower manual. The pedal tones can also be added by pressing the “Pedal to Lower” button on the CRUMAR Mojo control panel.

Vibrato Depth – This parameter controls the depth of the vibrato effect. Unlike other parameters where a change to the setting is immediately audible, the effect of adjusting this parameter is not heard until the Vibrato/Chorus type is changed from the panel of the CRUMAR Mojo.

V/C Mix – This parameter controls the mix between the vibrato or chorus effects and the base tone of the organ. Unlike other parameters where a change to the setting is immediately audible, the effect of adjusting this parameter is not heard until the Vibrato/Chorus type is changed from the panel of the CRUMAR Mojo.

Reverb Length * – This parameter controls the duration of the spring reverb simulation. The Reverb Length parameter can be adjusted from the CRUMAR Mojo control panel by pressing “Shift” and turning the “Reverb” knob.

Digital Reverb –you can now choose between the usual spring reverb, placed between the dry organ sound and the Rotary simulation, and a new FDN stereo digital hall reverb, placed at the end of the effect chain. Make this selection on the graphic interface. This parameter is not accessible by the console. When one of the output splits is enabled, the stereo digital reverb always outputs from both channels.

Keyclick Length * – This parameter controls the duration of the keyclick effect. This effect simulates the attack transient when the nine key contacts on a tonewheel organ close. The Keyclick Length parameter can be adjusted from the CRUMAR Mojo control panel by pressing “Shift” and turning the “Keyclick” knob.

DRIVE1 / **DRIVE2** – This parameter controls which overdrive type is used.

Rotary Balance * – This parameter controls the balance between the top horn and bottom rotor of the simulated rotary speaker effect. When the parameter is set to half-way between the top and bottom, the balance is equal. The Rotary Balance parameter can be adjusted from the CRUMAR Mojo control panel by pressing “Shift” and turning the “Bass” knob.

Rotary Ambience – This parameter controls the amount of simulated “room” noise surrounding the rotary speaker.

Rotary Cabinet – This parameter controls the amount of the simulated cabinet resonance of the rotary speaker simulation.

Rotary Mic. Angle – This parameter controls the angle of the microphones on the simulated rotary speaker. When this parameter is set to zero, the microphones are placed on the same side of the rotary speaker cabinet. When set at half-way, the microphones are placed at 90 degrees on the cabinet. When set at full, the microphones are placed on opposite sides of the cabinet.

Rotary Distance – This parameter controls the distance of the microphones from the simulated rotary speaker cabinet. When the parameter is set to zero, the microphones are very close to the cabinet, which creates a more pulsating sound and less “Dopler” effect. When set at full, the microphones are very far away from the cabinet.

Rotary Horn EQ – This parameter controls the equalization of the top horn of the simulated rotary speaker. When set at full, the high frequencies are emphasized.

Rotary Out Split – This parameter controls which type of rotary speaker simulation is used. When this parameter is set to “Off,” the rotary speaker simulation is output in stereo. When the parameter is set to “On,” the instrument outputs the rotary simulation using CRUMAR’s “Vertical Simulation Technology,” which simulates the experience of listening to a rotary speaker while standing or sitting in front of it. The L output simulates the bass rotor and the R output simulates the horn. The sound is output with an 800 Hz internal crossover, which is the same crossover used in a classic rotary speaker. By placing two speakers on top of each other with the L output attached to the bottom speaker and the R output to the top, the physics of a rotary speaker can be accurately simulated.

Import function; the Custom Generator - VB3CE2 can now model anyone's specific tonewheel organ. Users can import a file that contains the information to add a custom generator to the tonewheel list.
The definition file is a plain text ASCII file that must contain 92 lines. The first line must be a literal string of max. 128 characters. This string must contain the name of the custom generator to be displayed onto the interface. The following 91 lines must contain the values expressed in milliVolt peak-to-peak as measured from the corresponding 91 terminals of the tonewheel generator of the original organ. These values must be a real number with the dot as the decimal separator. For example, if tonewheel n. 1 has an amplitude of 66,5 mVpp, the number to be added to the file must be **"66.5".** If the number is not in the expected format, the program won't load the file. If more than 92 lines are found in the file, or if unexpected characters are found where decimal numbers are expected, the program won't load the file.
Once you click the IMPORT button on the interface, you are requested to load the file from drive D (the USB memory stick). The file must have the .txt extension. If the file loads successfully, the new generator will be added to the list as the generator n.21. In order to have the changes retained after the reboot, you have to click the STORE button. Unless the STORE function is used, all the changes are temporary.

Obtaining Tonewheel Organ Measurements

NOTE: This is a complicated process. Users with no experience with electronics or electronic measurement equipment should not attempt this.

Required tools: Calibrated Digital Oscilloscope (Experienced users may use an analog oscilloscope)
1. Locate the terminal strip on the backside of the tonewheel organ generator.
2. Connect the ground lead of the oscilloscope to a ground point on the organ (any metal part of the generator is connected to ground).
3. Use the probe of the oscilloscope to measure the output of the individual tonewheels. Most oscilloscopes have a cursor function which enables users to make fine adjustments with less effort. Once the waveform (usually a sinusoidal waveform from tonewheels n.13 to n.91) is completely visible in the screen, set cursor 1 on the top peak of the waveform and cursor 2 on the bottom peak. The oscilloscope should automatically provide the correct reading in milliVolts. Please note that the first 12 tonewheels give an amplitude of about 60~70 mVpp, while the remaining tonewheels vary from 30 to 10 mVpp. Measuring each tonewheel could take up to an hour. Please note that the tonewheels are not arranged in the organ from 1 to 91. They are organized in rows. The cart at the end of this addendum shows what toneheels correspond to each connection in the four rows in the organ.
4. **Enter the values in the spreadsheet at the end of this manual.**

First connection row:
85 42 30 78 66 18 6 54 90 35 83 71 23 11 59 47 40 28 76 64 16 4 52 88
Second connection row:
33 81 69 21 9 57 45 38 26 74 62 14 2 50 86 43 31 79 67 19 7 55 91 36
Third connection row:
84 72 24 12 60 48 41 29 77 65 17 5 53 89 34 82 70 22 10 59 46 39 27 75
Fourth connection row:
63 15 3 51 89 32 80 68 20 8 56 44 37 25 73 61 13 1 49 ground

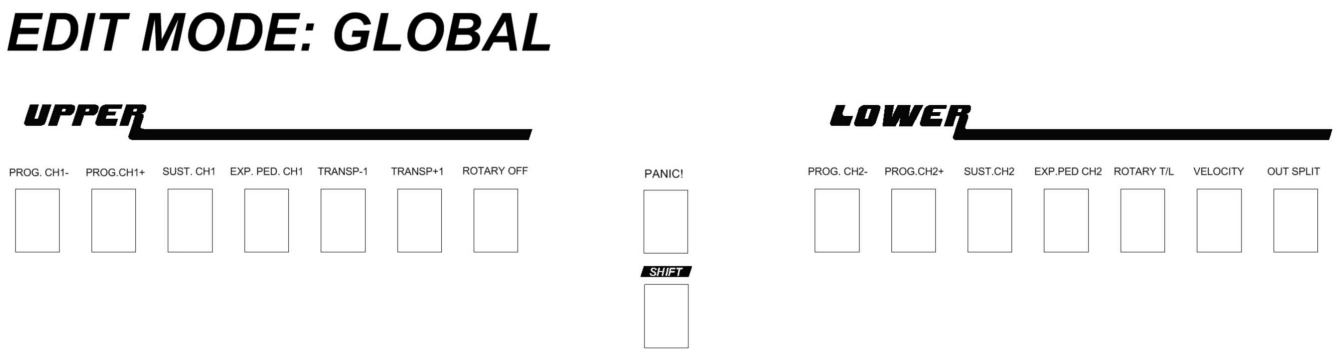
7) EDIT AND PROGRAMMING MODE

The CRUMAR Mojo's "Edit" mode can be accessed by pressing the "Shift" button which is found just above the pedal drawbars on the top panel of the instrument. When "Edit" mode is engaged, the LED on the "Shift" button blinks. In "Edit" mode, various parameters related to sound and global functions can be controlled with buttons and knobs on the control panel.

GLOBAL EDIT FUNCTIONS

The buttons shown in Figure 4 control various global instrument settings when the instrument is in "Edit" mode. Changes made while in "Edit" mode are set when the "Shift" button is pressed to exit "Edit" mode.

Fig. 4



Upper Manual Preset 1 – Tonewheel Generator Set and MIDI Program Change - Decrease Value, -1

Upper Manual Preset 2 – Tonewheel Generator Set and MIDI Program Change - Increase Value, +1

These two buttons are used to scroll through the different tonewheel generator settings and also to send program change messages to external instruments or modules connected to the CRUMAR Mojo on MIDI channel 1.

The preset 1 button decreases the value of the setting by 1, while the preset 2 button increases the value by 1. When the lower limit of tonewheel generator set number 1 or program change 0 is reached, the LED on the preset 1 button lights up. When the upper limit of program change 127 is reached, the LED on the preset 2 button lights up.

Upper Manual Preset 3 – Sustain Pedal, MIDI Channel 1

This button is used to enable or disable functionality of a sustain pedal on MIDI channel 1. This setting is only applicable for instruments or modules connected to the CRUMAR Mojo on MIDI channel 1. The VB3 CE 2 software does not recognize MIDI sustain pedal messages. This button lights up when the function is active.

Upper Manual Preset 4 – Expression Pedal, MIDI Channel 1

This button is used to enable or disable whether MIDI expression pedal information transmits on CC11 to instruments or modules connected to the CRUMAR Mojo on MIDI channel 1. This button lights up when the function is active.

Upper Manual Preset 5 – Global Transpose - Decrease Value, -1

Upper Manual Preset 6 – Global Transpose - Increase Value, -1

These two buttons are used to adjust the global transposition of the instrument +/- 12 semitones. This change affects both the upper and lower manuals of the instrument. Pressing one of these buttons changes the global tuning of the instrument by 1 semitone up or down. When the transposition of the instrument is not set at “0,” one of the LEDs on these buttons is illuminated, depending on whether the instrument is tuned higher or lower than “0.” When the LEDs of both lights are off, the instrument is tuned to “0.” Even when transposed, the global extension of the instrument is 61 notes. It is not possible to make the VBE CE 2 software generate notes above or below the traditional range of a tonewheel organ.

Manual Upper – Rotary Simulation, On/Off

This button is used to enable or disable the rotary speaker simulation. If the CRUMAR Mojo is connected to a real rotary speaker, the rotary speaker simulation should be turned off. This button lights up when the function is active.

Pedal to Lower – Panic

This button is used to send an “all notes off” MIDI “panic” message to all 16 MIDI channels. This function also resets the CRUMAR Mojo MIDI interface. If this button is held for three seconds, the CRUMAR Mojo sends an “all notes off” message to all 16 MIDI channels and then reboots the CRUMAR Mojo MIDI interface but not the entire system.

Lower manual preset 1 – MIDI Program Change - Decrease Value, -1

Lower manual preset 2 – MIDI Program Change - Decrease Value, -1

These two buttons are used to send program change messages to external instruments or modules connected to the CRUMAR Mojo on MIDI channel 2.

The preset 1 button decreases the value of the setting by 1, while the preset 2 button increases the value by 1. When the program change value of 0 is reached, the LED on the preset 1 button lights up. When the upper limit of program change 127 is reached, the LED on the preset 2 button lights up.

Lower Manual Preset 3 – Sustain Pedal, MIDI Channel 2

This button is used to enable or disable functionality of a sustain pedal on MIDI channel 2. This setting is only applicable for instruments or modules connected to the CRUMAR Mojo on MIDI channel 2. The VB3 CE 2 software does not recognize MIDI sustain pedal messages.

Lower Manual Preset 4 – Expression Pedal, MIDI Channel 2

This button is used to enable or disable whether MIDI expression pedal information transmits on CC11 to instruments or modules connected to the CRUMAR Mojo on MIDI channel 2.

Lower Manual Preset 5 – Rotary Connection

This button is used to set how the “Rotary Speed” connection on the rear of the instrument works. The CRUMAR Mojo senses the type of pedal (latched or temporary) that is connected at start-up. There’s no need to modificate this parameter during a performance, if you connect halfmoon and then you boot the organ, this parameter will be automatic set on “latched”, if you connect the rotary pedal switch and then you boot the organ, this parameter will be automatic set to temporary. If the instrument fail to auto sense the type of pedal you can operate with this button to properly set it.

Lower Manual Preset 6 – Velocity

This button is used to set the velocity mode of the two manuals of the CRUMAR Mojo. When using the CRUMAR Mojo to control external instruments or modules that are connected via MIDI, sounds that are velocity sensitive, such as pianos, will not respond as expected unless the velocity mode is set to “On.” The velocity sensitivity of the upper and lower manuals of the CRUMAR Mojo can be set independently to facilitate playing organ sounds with a fast, no-velocity trigger on one keyboard, and controlling external sounds with velocity sensitivity on the other. There are four settings for this button.

- LED Off = Velocity mode is off for both keyboards
- LED Blinking Fast = Velocity mode is on for the top manual only
- LED Blinking Slow = Velocity mode is on for the lower manual only
- LED On = Velocity mode is on for both manuals

Manual Lower – Output Split

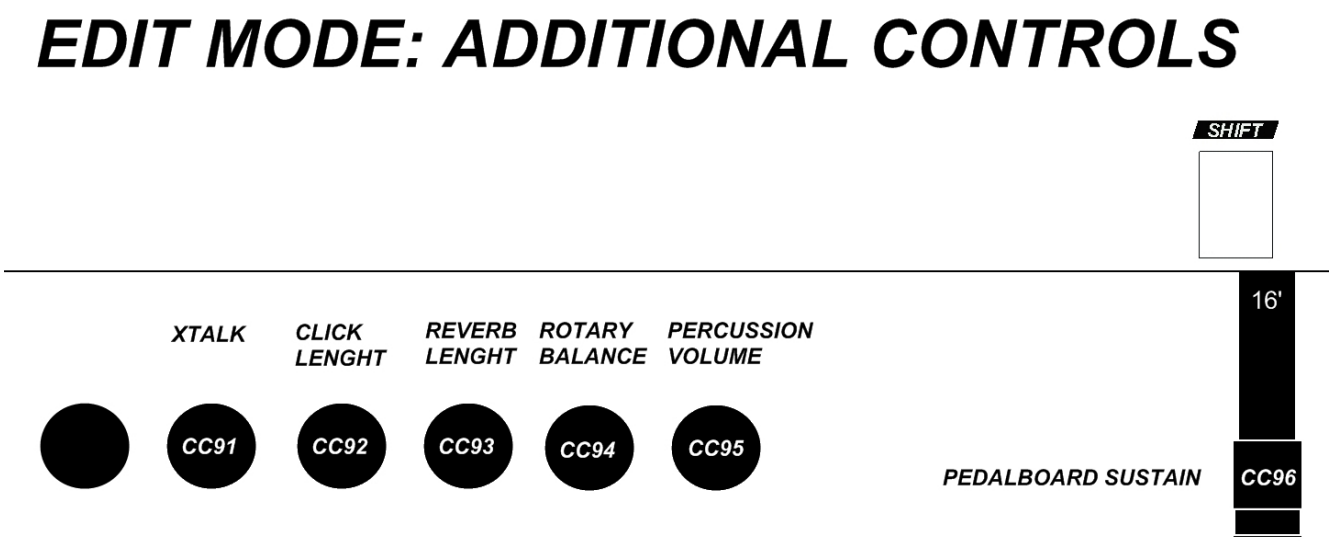
This button is used to activate the vertical simulation output option for the rotary speaker simulation and to choose the output behavior. The CRUMAR Mojo offers six different output options when this button is used in conjunction with the “Manual Upper – Rotary Speaker On/Off” button.

- Simulation On, Output Split Off = Stereo simulation
- Simulation On, Output Split 1 (LED blinking) = Stereo simulation
- Simulation On, Output Split 2 (LED on) = “Vertical Simulation” active
- Simulation Off, Output Split Off = Dry organ (no simulation), reverb on both outputs
- Simulation Off, Output Split 1 (LED blinking) = Dry organ (no simulation), reverb on left out, mono simulation on right
- Simulation Off, Output Split 2 (LED on) = Dry organ (no simulation), reverb on right output

VB3 CE 2 EDIT FUNCTIONS

The controls shown in Figure 5 control various parameters of the VB3 CE 2 software when the instrument is in “Edit” mode. Changes made while in “Edit” mode are set when the “Shift” button is pressed to exit “Edit” mode.

Fig. 5



The following parameters are the default parameters assigned to the physical controls and the MIDI control change numbers associated with the control.

Drive – Generator Xtalk. CC91.

Click – Keyclick length. CC92.

Reverb – Reverb Length. CC93.

Bass – Rotary Speaker Balance. CC94.

Treble – Percussion Volume. CC95.

Pedal Drawbar 16' – Pedal sustain. CC96.

The VB3 CE 2 parameters associated with the various knobs on the panel are set at the factory. It is possible to assign the knobs to different parameters of the software using the “MIDI Learn” feature of the VB3 CE 2 software. A monitor and mouse must be plugged in to the instrument. To change the parameter assigned to a control, right-click on the parameter to be assigned, select “MIDI Learn” from the menu, and move the control to which the parameter will be assigned. To save the assignment, click “Store” on the VB3 CE 2 interface.

FACTORY RESET

To reset the CRUMAR Mojo’s knobs and percussion and vibrato buttons to their original factory settings, press and hold the “Upper Manual” and “Lower Manual” buttons together for one second.

8) NEW FUNCTIONS/BONUS SOUNDS FROM VERSION 2.1.

The most important change from revision 2.1 of VB3CE2 is the introduction of four different bonus sound combinations:

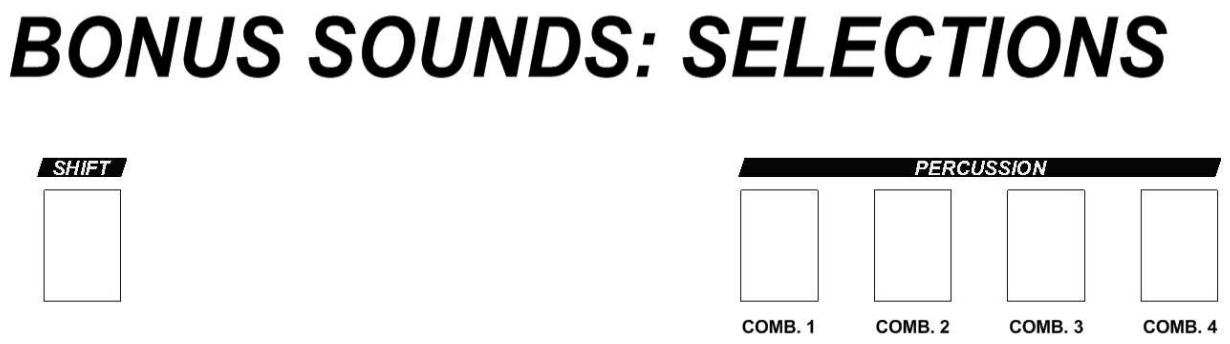
Combination 1: Tonewheel organ only.

Combination 2: Tonewheel organ on the upper manual + Tines E.Piano on the lower manual + Synth Bass on the pedalboard

Combination 3: Red Tolex Combo Organ on the upper manual + Tines E.Piano on the lower manual + Synth Bass on the pedalboard

Combination 4: Italian Transistor Combo Organ on the upper manual + Reed E.Piano on the lower manual + Synth Bass on the pedalboard

Fig. 6



HOW TO RECALL THE COMBINATIONS

Press the SHIFT button to enter the EDIT MODE, one of the four Percussion buttons LEDs is blinking. Use the Percussion buttons as Combination Select 1 to 4. Remember to EXIT EDIT MODE by pressing the SHIFT button again after having selected the combination you wish to use.

COMBINATION n. 1 – TONEWHEEL ORGAN

Combination n. 1 is just the tonewheel organ, what the MOJO was built for and the sole reason why you have choose to play a MOJO! From version 2.1 this sound has been furtherly improved under two important aspects:

- the keyclick now reintroduces the 9-contact simulation like on GSi's VB3 1.x
- new rotary speaker simulation, more spatial, more “woody”, more realistic.

By using the parameter KEYCLICK LENGTH (accessible through SHIFT + KEYCLICK KNOB) you can adjust the average time spread between the first and the last virtual contact being closed. This mainly affects the actual length of every keyclick and varies the feel of the attack. You will notice different behaviors according to the length you choose, each with a different feel of the finger-to-sound connection.

COMBINATION n. 2 – TONEWHEEL + TINES E.PIANO + SYNTH BASS

Combination n. 2 keeps the tonewheel organ on the upper manual. All related parameters remain accessible (Percussion buttons, V/C Selection, Upper V/C toggle switch, and Upper presets). On the lower manual you find a physical-model of a classic “dark” tines electric piano. Lower piano now responds to velocity and sustain pedal, overriding the global settings. The pedalboard (or a midi controller on midi ch 3) plays a monophonic bass synth sound.

COMBINATION n. 3 – RED TOLEX COMBO ORGAN + TINES E.PIANO + SYNTH BASS

Combination n. 3 offers a Red Tolex Combo Organ on the upper manual. This is the organ made famous by the band “The Doors”. Upper drawbars will now respond this way:

- drawbar n. 1: 16' pipe
- drawbar n. 2: 8' pipe
- drawbar n. 3: 4' pipe
- drawbar n. 4: IV mixture (a mixture of 4 pipes)
- drawbar n. 5: volume of the sinus waveform
- drawbar n. 6: volume of the main waveform

Drawbars 7, 8 and 9 are unused. NOTE: you won't hear any sound if you don't pull drawbars 5 or 6. The V/C selection is deactivated as you have only one vibrato type that you can turn on or off by using the UPPER V/C SWITCH.

COMBINATION n. 4 – ITALIAN TRANSISTOR COMBO ORGAN + REED E.PIANO + SYNTH BASS

Combination n. 4 offers an Italian Transistor Combo Organ on the upper manual and a Reed Electric Piano on the lower manual. The former is the organ used by Pink Floyd for their early records (think about the album “Echoes”), emulated here is the single manual version; the latter is a physical model of the electric piano as used by the band Supertramp (one example is the album “Breakfast in America”).
Upper drawbars will now act as on/off switch whereas OFF is every position below the middle position, and ON is the other half. They will now respond this way:

- drawbar n. 1: Bass 16'
- drawbar n. 2: Strings 16'
- drawbar n. 3: Flute 8'
- drawbar n. 4: Oboe 8'
- drawbar n. 5: Trumpet 8'
- drawbar n. 6: Strings 8'
- drawbar n. 7: Flute 4'
- drawbar n. 8: Strings 4'
- drawbar n. 9: Strings 2 – 2/3'

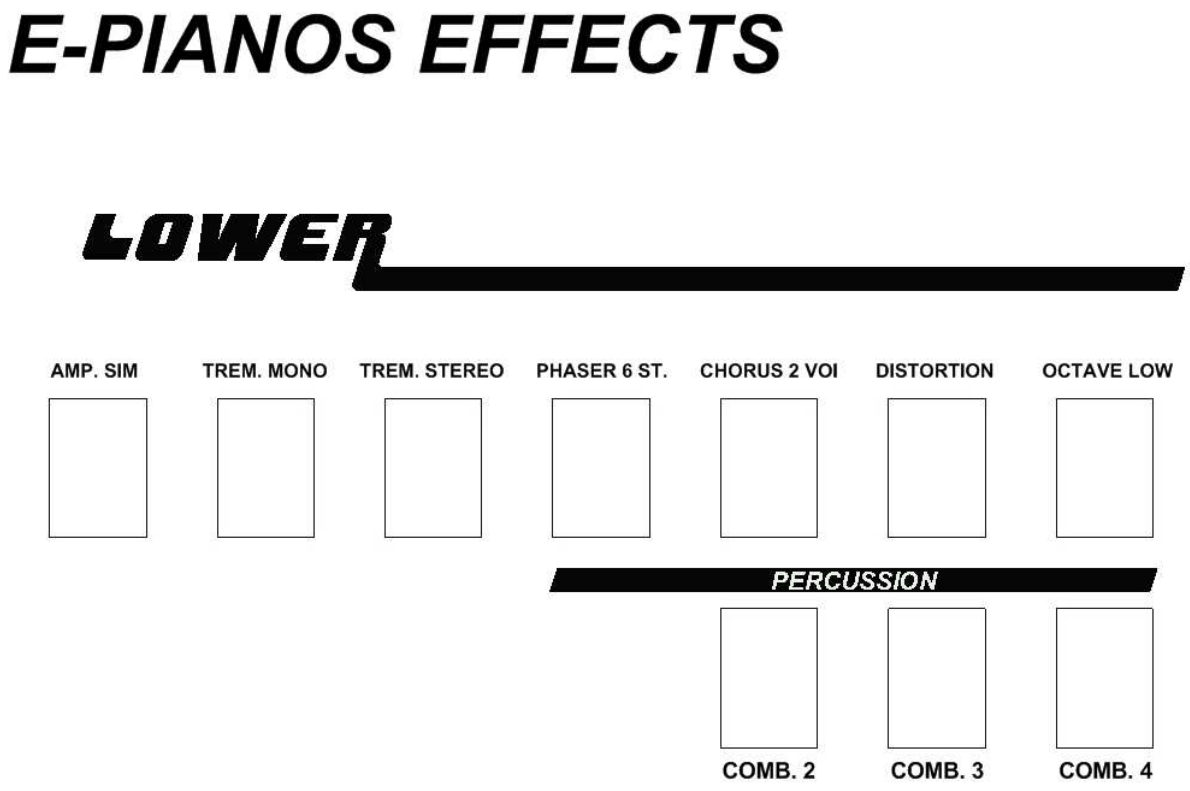
The V/C selection offers only four combinations of vibrato: slow mellow, fast mellow, slow deep, fast deep. You can turn the vibrato on and off by the UPPER V/C SWITCH.

COMMON ELEMENTS OF COMBINATIONS 2, 3 and 4

Organs: combo organs respond on MIDI channel 1; are 49 keys, from the second C to the last C, on the first octave you have a bass registration; Combo organs don't use the Rotary simulation; keyclick is not adjustable.

E.Pianos: respond on MIDI channel 2, you have a variety of 6 additional effects that can be activated by the Lower Preset buttons:

Fig. 7



- Button n.1: Amp simulation
- Button n.2: Mono tremolo
- Button n.3: Stereo tremolo
- Button n.4: Stereo 6-stage phaser
- Button n.5: Stereo 2-voice chorus
- Button n.6: Distorted amp simulation
- Button labeled “M”: E.Piano is transposed by one octave below.

Synth Bass: this responds on channel 3, is monophonic and offers two parameters accessible by the Pedal Drawbars (in the middle of the console):

- drawbar n.1: Filter envelope amount
- drawbar n.2: decay/sustain time

You can route the synth pedal to the first 2 octaves of the lower keyboard by turning the Pedal-to-lower function on. Unlike combination n. 1, this creates a split between the Synth Bass sound and the E.Piano sound. The split point is fixed at MIDI note n. 60 (the third C key of the keyboard).

Other: Treble and Bass EQ, Overdrive and the Spring Reverb only affect the Combo Organ sounds.

Output Split Mode: when a split mode is active, you find the organ (either tonewheel or combo) on the left output and the e.piano on the right output.

Settings: all settings made to combinations 2 to 4 are temporary and get lost every time you switch the instrument off.

ACCESSING THE ADDITIONAL BONUS SOUNDS VIA MIDI CONTROL

You can access the additional sounds by sending the following messages via an external MIDI unit:

1. Program Change 0 to 3 on channel 16 select the Combination 1 to 4

Control Change 100 with value 0 to 6 switch between the available effects on the piano section, whereas 0 = no effect

9) UPDATE

There are two types of updates that can be applied to the CRUMAR Mojo: firmware update and software update.

The CRUMAR **Mojo firmware** can be updated by uploading a .syx file to the instrument via the MIDI IN connection using MIDI Firmware Upload (MFU) technology. Firmware is the way of working of Mojo panel. Firmware updates can be used to add functionality to the instrument or to implement bug fixes.

Instructions for updating the firmware of the instrument are included in a “Read Me” file that is included with the .syx file in the firmware package. A computer equipped with a MIDI OUT connection and software with the ability to send .syx files are needed to complete a firmware update.

The firmware version currently installed in the instrument is displayed by the LEDs in the Upper and Lower manual section during the boot-up process. For example, if firmware version 1.3 is installed, the LED of the Upper preset 1 button lights up, while the LED of the Lower manual preset 3 button lights up.

Software updates can be used to update or replace the VB3 CE 2 sound software installed in the instrument. Updates could include new features, updated parameters or bug fixes. Updates of the VB3 CE 2 are free for CRUMAR Mojo owners up to version 2. Visit www.crumar.it to find the most recent software versions.

If any other non-proprietary software is installed in the CRUMAR Mojo, CRUMAR reserves the right not to provide assistance on the operation of the software and the operation of the CRUMAR Mojo. Any warranty service will only be honored if the instrument is loaded with the original CRUMAR software only.

10) MAINTENANCE AND WARRANTY

The CRUMAR Mojo does not require special maintenance procedures but the following guidelines should be observed:

- Do not clean the instrument with solvents, flammable liquids or cleaners. The wooden and metal parts of the instrument should be cleaned with a soft cloth. When cleaning the instrument, do not let water enter the panel through the spaces between the buttons and the panel.
- Flammable objects or containers holding liquid should not be placed on the instrument.
- In case of malfunctions due to foreign objects or liquids entering the instrument panel, shut down the instrument and contact an authorized CRUMAR service center or contact CRUMAR directly. Do not attempt any unassisted maintenance.

The CRUMAR Mojo is covered under warranty for two years. This warranty covers all defects of the instrument not attributable to misuse by the owner.

11) ADDENDUM

CRUMAR MOJO MIDI IMPLEMENTATION CHART

FUNCTION	TRASMITTED	RECOGNIZED	REMARKS
Basic Channel Default: Changed:	 :1-2 :1-2 4-5 : 3	Y	
Mode Messages Default: Altered:	Y	Y	
Note Number True Voice	24-108 _____	Y	
Velocity Note On Note Off	Y Y	Y Y	
Aftertouch Keys: Channel :	X X	X X	
Pitch Bend	X	X	
Control Change	Y	Y	
Program Change	Y	Y	
System Exclusive	X	Y, firmware upgrade	
Song Position Common song select	X	X	
System : Clock Exclusive : Command	X X	X X	
Aux : Local ON/OFF Messages: All Notes OFF :Active Sense :Reset	X Y X X X	X Y X Y X	
Notes			

CRUMAR MOJO EDIT FUNCTION TABLE

UPPER PRESET 1	▶	PROGRAM CHANGE MIDI CHANNEL 1-	LOWER PRESET 1	▶	PROGRAM CHANGE MIDI CHANNEL 2-
UPPER PRESET 2	▶	PROGRAM CHANGE MIDI CHANNEL 1+	LOWER PRESET 2	▶	PROGRAM CHANGE MIDI CHANNEL 2+
UPPER PRESET 3	▶	SUSTAIN PEDAL MIDI CHANNEL 1	LOWER PRESET 3	▶	SUSTAIN PEDAL MIDI CHANNEL 2
UPPER PRESET 4	▶	EXPRESSION PEDAL MIDI CHANNEL 1	LOWER PRESET 4	▶	EXPRESSION PEDAL MIDI CHANNEL 2
UPPER PRESET 5	▶	GLOBAL TRANSPOSE -1	LOWER PRESET 5	▶	ROTARY CONNECTION TEMP/LATCHED
UPPER PRESET 6	▶	GLOBAL TRANSPOSE +1	LOWER PRESET 6	▶	VELOCITY ON/OFF
UPPER MANUAL	▶	ROTARY SIMULATION ON/OFF CC53	LOWER MANUAL	▶	OUT SPLIT ON/OFF CC54

PEDAL TO LOWER	▶	PANIC! (3 SECONDS)
DRIVE	▶	CROSSTALK CC91
KEYCLICK	▶	KEYCLICK LENGHT CC92
REVERB	▶	REVERB LENGHT CC92
BASS	▶	ROTARY BALANCE CC94
TREBLE	▶	PERCUSSION VOLUME CC95
PEDAL DRAWBAR 16'	▶	PEDALBOARD SUSTAIN CC96

PERCUSSION ON	▶	COMB.1 - TONEWHEEL
PERCUSSION SOFT	▶	COMB.2 - TW + TINES E-P. + B.SYNTH
PERCUSSION FAST	▶	COMB.3 - RED TOLEX + TINES E-P. + B.SYNTH
PERCUSSION 3RD	▶	COMB.4 - I.COMBO + REED E-P. + B.SYNTH

MIDI FUNCTIONS TABLE

STANDARD FUNCTIONS		
Controls	**Midi messages**	**Type**
Upper Drawbar 16	Control Change Channel 1 n 12	Continuous
Upper Drawbar 5-1/3	Control Change Channel 1 n 13	Continuous
Upper Drawbar 8	Control Change Channel 1 n 14	Continuous
Upper Drawbar 4	Control Change Channel 1 n 15	Continuous
Upper Drawbar 2-2/3	Control Change Channel 1 n 16	Continuous
Upper Drawbar 2	Control Change Channel 1 n 17	Continuous
Upper Drawbar 1-1/3	Control Change Channel 1 n 18	Continuous
Upper Drawbar 1-3/5	Control Change Channel 1 n 19	Continuous
Upper Drawbar 1	Control Change Channel 1 n 20	Continuous
Lower Drawbar 16	Control Change Channel 1 n 21	Continuous
Lower Drawbar 5-1/3	Control Change Channel 1 n 22	Continuous
Lower Drawbar 8	Control Change Channel 1 n 23	Continuous
Lower Drawbar 4	Control Change Channel 1 n 24	Continuous
Lower Drawbar 2-2/3	Control Change Channel 1 n 25	Continuous
Lower Drawbar 2	Control Change Channel 1 n 26	Continuous
Lower Drawbar 1-1/3	Control Change Channel 1 n 27	Continuous
Lower Drawbar 1-3/5	Control Change Channel 1 n 28	Continuous
Lower Drawbar 1	Control Change Channel 1 n 29	Continuous
Pedalboard Drawbar 32	Control Change Channel 1 n 30	Continuous
Pedalboard Drawbar 16	Control Change Channel 1 n 31	Continuous
Volume	Control Change Channel 1 n 36	Continuous
Drive	Control Change Channel 1 n 35	Continuous
Click	Control Change Channel 1 n 38	Continuous
Reverb	Control Change Channel 1 n 39	Continuous
Bass	Control Change Channel 1 n 41	Continuous
Treble	Control Change Channel 1 n 40	Continuous
Swell Pedal	Control Change Channel 1 n 34 and Channels 1-2 n 11	Continuous
Rotary Run/Stop	Control Change Channel 1 n 48	On/Off
Rotary Slow/Fast	Control Change Channel 1 n 49	On/Off
Rotary Slow/Brake/Run	Control Change Channel 1 n 1	Continuous / Fixed Values
Vibrato Upper	Control Change Channel 1 n 46	On/Off
Vibrato Lower	Control Change Channel 1 n 47	On/Off
Vib/Cho	Control Change Channel 1 n 32	Continuous / Fixed Values
Percussion On	Control Change Channel 1 n 42	On/Off
Percussion Soft	Control Change Channel 1 n 43	On/Off
Percusiion Fast	Control Change Channel 1 n 44	On/Off
Percussion 3rd	Control Change Channel 1 n 45	On/Off
Sustain	Control Change Channel 1-2 n 64	On/Off
Rotary Selection	Control Change Channel 1 n 53	On/Off
L&R out Selection	Control Change Channel 1 n 54	Continuous / Fixed Values

Crosstalk	Control Change Channel 1 n 91	Continuous
Keyclick Length	Control Change Channel 1 n 92	Continuous
Reverb Length	Control Change Channel 1 n 93	Continuous
Rotary Balance	Control Change Channel 1 n 94	Continuous
Percussion Volume	Control Change Channel 1 n 95	Continuous
Pedalboard Sustain	Control Change Channel 1 n 96	Continuous

SPECIAL FUNCTIONS

Presets & Manual	Send panel values and selections snapshot	
Pedal to Lower	Add ch3 on ch2 note messages + All notes off	
Reset Function	MIDI Panic + reset the function panel	

Tonewheels measurement spreadsheet

1		25		49		73	
2		26		50		74	
3		27		51		75	
4		28		52		76	
5		29		53		77	
6		30		54		78	
7		31		55		79	
8		32		56		80	
9		33		57		81	
10		34		58		82	
11		35		59		83	
12		36		60		84	
13		37		61		85	
14		38		62		86	
15		39		63		87	
16		40		64		88	
17		41		65		89	
18		42		66		90	
19		43		67		91	
20		44		68			
21		45		69			
22		46		70			
23		47		71			
24		48		72			

Contacts

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English Translation: Mitch Towne

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