



OB3² Manual (v.2.0)

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Overview

The Oberheim OB3² Drawbar Organ Expander is designed to add the classic drawbar organ sound to any MIDI keyboard or MIDI setup. The compact design allows hands-on control of the OB3², an important part of an authentic organ performance. A host of foot controls can be connected to the OB3², offering great versatility in performance. Six programmable control the sound of the Upper, or Solo keyboard, while the Lower section offers five presets plus the Bass Pedal sound.

The OB3² authentically recreates the standard set of nine real-time drawbars, 2nd and 3rd Harmonic Percussion (featuring Norm/Soft and Slow/Fast options) and the Vibrato and Chorus can be assigned to either, neither or both Upper and Lower sections of the keyboard. Oberheim has also preserved the distinctive sound of the rotary speaker cabinet, featuring fast and slow speeds as well as a realistic "Hot Tube" Overdrive. Other onboard features include independent Bass and Treble controls as well as a Digital Reverb offering such effects as Plate, Spring and Stage reverbs and even a realistic Tape Echo effect.

[Front Panel](#)

Drawbars: The drawbars on an electronic organ are designed to represent various pipe lengths on a traditional organ. For this reason, the drawbars are labeled in footages: 16', 5 1/3', 8', 4', 2 2/3', 2', 1 3/5' and 1'. The 8' drawbar is called the Principal or Fundamental; the note played is the note sounded. The drawbar arrangement is laid along the overtone series of harmonics. The two Brown drawbars represent the undertones. The White drawbars are the octave overtones. The Black drawbars sound the non-octave overtones: fifths, thirds, etc.

The larger the pipe length, the lower the sound is pitched. By combining different drawbars

in various amounts, different organ "registrations" are created. Pulling each drawbar out and exposing more of the 1-8 numbers on top increases the volume of that drawbar's sound. As electronic organs became more popular in the worlds of rock and blues, many performers took to moving the drawbars in and out as they played. It is this type of real-time, hands-on control that Oberheim provides in the OB3².

1 - TONE section: Trimmers allowing adjustment of the instrument's general equalization.

2 - MASTER section: Two controls allowing the user to set the unit's general volume (VOLUME) and the quantity of distortion (OVERDRIVE) as preferred. N.B.: OVERDRIVE adjustment is ONLY enabled with the Rotary effect active. Volume can also be controlled from a volume pedal connected to the Volume jack on the rear panel.

3 - REVERB section: The EFFECT trimmer (with a choice of fixed settings) can be used to select one of the 5 reverb effects available (OFF = effect disabled). The VOLUME control of this section adjusts the general amount of effect.

4 - VIBRATO AND CHORUS section: The OB3² offers 3 types of VIBRATO and 3 types of CHORUS effects. Vibrato is a slight "warble in pitch while chorusing provides a doubling effect. Increasing from Vibrato 1 through Vibrato 2 and up to Vibrato 3 will increase the speed and the depth of the Vibrato effect. The same is true regarding the Chorus effect. The UPPER and LOWER buttons enable the effect selected on the respective sections.

5 - PERCUSSION section. Allows activation of 2 types of percussion (2nd and 3rd buttons). The user can also adjust the level of the percussion effect (NORM/SOFT button) and its fade time (SLOW/FAST).

6 - UPPER MEMORY section: This section provides 6 memory sites where the user can save 6 timbres created for the UPPER section (keys I to IV) for subsequent recall. The DRAWSTOPS key enables operation of the drawbar sliders (section 10).

7 - LOWER PRESET section: Using the keys in the Lower Preset section, the user can select a timbre (which cannot be subsequently modified) to be assigned to the LOWER section, with a choice from ORG. 1 to ORG. 6. The BASS key includes or excludes the pedal section timbre.

8 - ROTARY section: One element of the classic drawbar organ sound came from the associated speaker cabinet, which featured a two-speed motor that rotated the horn of the high-end speaker (tweeter) and the drum of the low-end speaker (woofer). This was a mechanical process that required a few moments of speeding up or slowing down. The Rotary Speaker effect on the OB3² recreates this distinctive sound. The OB3² also recreates the distinctive gritty sound of the classic speaker units that resulted from their tube amplifiers, and this is controlled by the Overdrive knob (see MASTER section).

The SLOW and FAST keys allow the user to choose one of two rotation speeds for the Rotary Speaker effect (which can also be recalled from the foot-switch). The SLOW key also switches the effect on and off.

9 - MIDI: This key is pressed (together with other dual function keys) to enable management of the instrument's MIDI functions.

Rear Panel

- 1 - POWER:** Machine on/off switch.
 - 2 - ADAPTER:** Connect the terminal of tO.5 VAC adapter supplied with the instrument to this socket
 - 3 - SLOW/FAST (ROTARY):** If an optional foot-switch is connected to this connector, whenever it is pressed the Rotary effect will switch from slow to fast rotation and vice-versa.
 - 4 - MEMORY/DRAWSTOPS:** If an optional foot-switch is connected, whenever it is pressed the system will switch from the DRAWSTOPS state (drawbars enabled) to recall of the programmable memories.
 - 5 - VOLUME:** Socket for connection of a pedal for adjustment of the general volume of the instrument (optional).
 - 6 - PITCH:** This trimmer can be used to adjust the fine tuning of the instrument.
 - 7 - MIDI IN:** 5 pin DIN connector which acts as input for the MIDI data from remote devices (master keyboards, keyboards, sequencer, etc.)
 - 8 - MIDI OUT** 5 pin DIN connector which acts as output for the MIDI data generated by the machine.
 - 9 - MIDI THRU:** This connector allows the MIDI data reaching the MIDI IN connector to be picked up (as such) for transmission to any other equipment connected.
 - 10 - OUTPUT:** General instrument stereo outputs (L and R channels). This pair of sockets can be use machine to an amplification system. If a mono amplification system is available, use the L (MONO) socket only.
 - 11 - Headphones:** Ouput for headphones.
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1. Before Starting

1.1 A few simple precautions

The following is a list of a number of simple precautions to be adopted when using and maintaining the instrument in order to avoid damage to its mechanical and electronic structures:

- Never apply excessive force to the instrument's mechanical pans and knobs.
- Do not stress the instrument in transit or during use.
- Do not place the instrument close to heat sources, in excessively damp or dusty places or close to strong magnetic fields.
- When possible, do not place the instrument close to units which generate strong

interference, such as radio and TV sets, monitors, etc.

- Never insert foreign bodies or liquids of any kind inside the instrument, for any reason.
- Never use solvents on the instrument's finishes. To clean, use only a soft cloth dipped in water.
- Never attempt to repair or modify the instrument in any way; always call in skilled personnel for any repairs.
- Use only foot-switches with normally open contact. The prolonged use of unsuitable foot switches causes serious damage to the instrument's electronic components.
- Disconnect the power supply lead from the mains socket if the instrument is to be out of use for long periods.
- Use only original adapters or models which comply in full with the specifications stated by the manufacturer; check that the mains voltage is as indicated on the body of the adapter.

1.2 Preliminary Operations (Setup)

Connect the equipment to the mains power supply by means of the adapter (10.5 VAC) supplied as standard with the instrument.

Using two jack connectors, connect the L and R outputs also on the rear (output) to the input of the amplifier or the mixer; if you have a mono amplifier available, connect to the LMONO output only.

If you have the model in Expander format available, connect the MIDI OUT socket of the pilot instrument (keyboard, master keyboard, etc.) to the OB3 MIDI IN socket. The OB3² always powers up in the OMNI MIDI Mode, so it is not necessary to select a MIDI channel at this time.

Now switch on the pilot instrument (if you have an OB3² Expander), the OB3 and then the amplification system, in that order. Begin with the Volume and Overdrive turned all the way down. Select Preset #6 (the maximum sound) and while playing the OB3², slowly increase the volume to a comfortable level. The MIDI button LED will flash to indicate MIDI information is being received.

2. Controls and Adjustments

2.1 Structure of the OB3²

Whether the instrument is equipped with a single keyboard (OB3² keyboard) or is in the module version (OB3²), all the instructions for use still apply unless otherwise stated.

The OB3² has been specially developed to provide the player with an instrument which reproduces both the sound and the playing mode of the mythical electromagnetic organ of the '60s and '70s.

Like the electromagnetic organ, the OB3² is subdivided into 3 sections:

- Upper Memory section: Main section of the instrument corresponding to the upper

manual: it is equipped with six programmable memories plus the DRAWSTOPS key which enables manual operation of the drawbars. When the instrument leaves the factory, the memories in this section are already programmed with standard drawbar presets. Try playing your favorite pieces and listen to how each of them sounds, then press the DRAWBARS key and try to create different sounds for yourself. Bear in mind that if necessary you can save your new combinations inside the memories, for recall whenever you wish.

- Lower Preset section: The Lower Preset section (which emulates the lower manual of the electromagnetic organ) consists of 5 non modifiable, mutual exclusive presets (keys from ORG.1 to ORG.6).
- Bass section: This section (which emulates the pedal section of the electromagnetic organ) consists of a single key incorporated in the Lower I Preset section. This key (BASS) is pressed to activate (LED on) or deactivate (LED off) the pedal section sound. The range of the BASS section cannot exceed that of the LOWER section (see point 2.2).

IMPORTANT NOTE: In the expander version, depending on the operating mode chosen the three sections may be present simultaneously and split over the keyboard (single midi reception channel), or each section may respond to its own Midi channel. See points 3.1 and 3.2 for more information.

2.2 Percussion section

Unlike a piano, an organ is not touch sensitive. In order to vary the soundboard technique, the organist relies on Key Percussion, which adds a quick, percussive strike to the attack of a note. On the OB3², it is possible to apply an effect typical of the electromagnetic organ, percussion on two different stops (4' and 2 2/3'). These percussions (known as the 2nd and 3rd) are mutually exclusive and can be set in normal or soft version (percussion volume normal or reduced) and slow/fast (long and short fade time) using special keys close to those controlling the percussions themselves.

Although they affect the sounds of the upper section, the status of the percussion functions cannot be saved in the memory.

This Percussion is only heard when a note or chord is played individually. That is, if a note is played while other notes are already being held, the Percussion effect is not heard.

2.3 General Controls

The following is a list of the instrument's general controls, common to all sections.

- At the top is the TONE section which adjusts the general equalization of the instrument; the BASS trimmer adjusts the intensity of the bass tones while the TREBLE trimmer adjusts the high tones.
- The MASTER section consists of the general VOLUME control plus a control known as the OVERDRIVE, which allows adjustment of the "saturation" effect: turn the trimmer to the right to increase this effect.

N.B.: OVERDRIVE adjustment is only enabled if the ROTARY effect is active (see point 2.4).

- The REVERB section offers 4 types of reverb effects and 1 delay effects, as follows.
- OFF: No effect selected

- Delay: This effect is more commonly known as the echo.
- Spring: Simulates the reverberation produced by a spring system.
- Plate: Simulates the reverberation produced by a metal plate, of the type which remained in vogue in recording studios for a long time.
- Room: Simulates the typical reverberation of a medium-sized room
- Hall: Simulates the reverberation of a large hall.

The required effect is selected using the EFFECT knob, while the Intensity of the selected effect is adjusted using the VOLUME trimmer of this section.

- The VIBRATO AND CHORUS section also allows the user to select a number of effects typical of the electromagnetic organ, such as the vibrato effect (available in 3 types. V1-V2-V3) and the chorus effect, also available in 3 types (C1-C2-C3).

The Vibrato and Chorus knob (which has six preset positions) can thus be turned to select one of the effects described above. Beside this knob there are two buttons, Lower and Upper, used to send the selected Chorus or Vibrato effect to either of these sections.

N.B.: If the LEDS of both the Upper and Lower sections are off, the Chorus/Vibrato effect will not be audible.

2.4 Rotary Effect

The success of the electromagnetic organ also brought popularity for a special amplification system, the speakers of which turned on their own axes inside the speaker casing. This amplifier (known as the Leslie (r) amplifier), consisted of two sections, one for the treble and one for the bass, which were able to turn at different speeds. The OB3 algorithm reproduces the effect of this amplification system in detail.

The Rotary effect is controlled using the SLOW and FAST keys as follows:

- When the SLOW key is pressed, the LED in the key illuminates and the effect is activated with LOW rotation speed.
- When the FAST key is pressed the effect gradually changes to HIGH speed rotation. Press this key again (the LED goes out) to return gradually to the previous condition.
- Press the SLOW key again to deactivate the effect (the LED will go out).

2.5 Saving a combination of drawstops in memory

Presets: Six programmable Presets (I-VI) provide instant access to your most frequently used drawbar combinations or registrations. The [diagrams](#) illustrate commonly used drawbar settings. The Drawbars do not affect the sound of the Presets. The Presets can be selected manually, by touching the associated button, or the Presets may be selected via MIDI.

To store the settings of the Drawbars into one of the six preset memories, press the DRAWSTOPS key (the key LED illuminates) and use the cursor sliders to build up the sound you require.

Then keep the DRAWSTOPS key pressed and also select the memory location in which the programming is to be saved (UPPER MEMORY section keys from I to VI).

Now release the two keys. Your new setup has been saved. ready for recall at any moment.

Additionally, a momentary footswitch may be connected to the Drawbar/Preset jack on the rear panel. This footswitch acts as a toggle between the current Drawbar setting (including any Percussion, Vibrato, Chorus and Rotary effects) and the current Preset (including any Percussion, Vibrato, Chorus and Rotary effects).

N.B.: When a new setup is saved a previous setup will be deleted with no possibility of retrieval. However, the BULK DUMP procedures can be used to record the presets saved in the form of MIDI SYS-EX codes.

3. MIDI Functions and modes of Operation

3.1 Modes of Operation

The OB-3 Squared series offers 3 different MIDI channel reception operating modes

- Mode 1: The three sections will respond on a single midi channel, and so if selected they will play simultaneously.

N.B.: The bass tone will not cover the entire range of the keyboard, but the range between the lowest note on the keyboard and the programmed split point (see point 2.2). Only program changes relating to the UPPER part will be received and transmitted.

- Mode 2: The BASS and LOWER sections receive on the same channel, which is different from that of the UPPER section. Only program changes relating to the UPPER and LOWER sections will be received and transmitted.
- Mode 3: Each of the three sections will be enabled to receive on its own midi channel. Only program changes relating to all three parts will be received and transmitted.

To select the required operating mode, press the MID key (the LED in the key illuminates). The identifiers M1 (Mode 1), M2 (Mode 2) and M3 (Mode 3) are screen-printed in pink above the UPPER MEMORY section keys IV, V and VI. Press the key relating to the chosen mode and press the MID key again (its LED will go out).

3.2 Setting split points The instrument allows the user to set up to two split points, one between the UPPER and LOWER sections and the other, within the limits set for the lower section, for the BASS section.

To do this, the instrument's MIDI control function has to be enabled, so press the MIDI key (the LED in the key illuminates) and then press the RX/TX (Rotary SLOW) key and keep it pressed until the flashing LED indicating the operating mode goes out altogether.

Keeping the RX/TX key pressed, press key M3 (Drawstops) and keeping it pressed, press any key on the keyboard below C4. The chosen note will be the split point for the LOWER section.

In the procedure described above, press M2 (VI) instead of M3 to set the BASS section split point.

N.B.: When a split is applied to the LOWER section, the bass voice will also automatically

follow this value. To maintain the two different values, set the split on the LOWER section first, and then repeat the procedure for the bass.

3.3 How to set up the Volume level for the Bass & Lower preset sections

To set up the Volume level for the Bass and Lower section, proceed as follow:

- Bass Section: Keeping pressed the "Bass" (preset) button, adjust the volume level through the "Master Volume" knob
- Lower Section: Keeping pressed one of the "Lower presets" push buttons, adjust the volume level through the "Master Volume" Knob.

Once you have set up the volumes, you should set up the Master Volume to the original position as it controls the general volume of the instrument.

3.4 Selecting the MIDI channel for reception and transmission

To select the MIDI channel for reception/transmission, press the MIDI key (the LED in the key illuminates) and then the RX/TX key.

Referring to the pink identifiers screen-printed on the instrument keys, select the required channel from 1 to 16 (the LED of the key pressed flashes). Press the MIDI key again to exit and make the selection operational.

The channel selected will refer to the UPPER section only. In case of operation modes 2 and 3, bear in mind that the MIDI channels for the LOWER and BASS sections are derived from that set for the UPPER section in accordance with the following rule.

LOWER midi channel = UPPER midi channel + 1

BASS midi channel = UPPER midi channel + 2

for example:

With UPPER CH. = 1-----> LOWER = CH.2 and BASS = CH.3

With UPPER CH. = 7-----> LOWER = CH.8 and BASS = CH.9

3.5 Parameters and function controls through Standard Midi Control Change

Some functions contained in the instrument can be controlled through the Standard Control Change codes (CC) contained in the documentation about the Midi communications. Through an instrument able to transmit this type of message (i.e Sequencers, Master Keyboards, computers etc.) it will be possible to control the following functions:

- Rotary Effect: Slow and Fast speed

Through Control change #14 (Undefined) is possible to change the two speeds for the rotary effect by means of an external instrument able to run these Midi messages (sequencers, master keyboards, computers etc).

When using this control please note that Control Change 14 less than 64 (decimals) will select the slow Rotary Effect, whilst values greater than 64 will select the fast Rotary effect.

- ROTARY effect: transit time from slow to fast speed

The use of the control change #12 (Effect control 1) permits the adjustment of the time

taken by the rotary effect when moving from the slow to the fast speed.

The value of this control change (selectable between 0-127) will give a high or low transit time.

- ROTARY effect: transit time from fast to low speed

Same as control change 12, also the control change #13 (effect control 2) will adjust the transit time when moving from fast to slow speed.

The use of this Midi control will adjust the time taken by the rotary effect when moving from the fast to the slow speed.

The value of this control change (selectable between 0-127) will give a low or high transit time.

- Delay effect (echo): Depth

The Delay effect depth can be adjusted through the Control Change #91 (effect depth).

Giving to this control a value between 0 and 127 it will change the depth on the repeating functions.

Low values will have a lower depth effect

- Delay effect: Feedback (Repeat number of the echo effect)

The control change #102 (Undefined) adjusts the Feedback parameter of the delay effect, ie. it adjusts the repeating number. With a low value of control change there will be a low repeating number.

- DAMPER

The Damper effect (known also as Sustain) can be removed using the control change #64. As it is an On/Off control giving to it values higher than 64, the damper will be on, with values lower than 64, it will be off.

N.B.: According to the selected mode (see paragraph 3.1) and to the Midi Channel where the relevant control change is located (see paragraph 3.3) it will be possible to activate the damper on all sections or on each section of the instrument (upper, lower and bass)

- PITCH BENDER

The instrument can receive the Pitch Bender control either on all sections or on individual sections (according to the operation mode or to the channel where the control is). The range is set with a limit +11 semitone.

- ALL SOUNDS OFF

Sending control change #120 with a 0 value on the relevant Midi Channel, the OB3square will effect the All Sound Off procedure; this means that it will automatically release all playing notes. If the damper was on previously, it will return to on.

- ALL NOTES OFF

Also, the All notes Off procedure (activated through the control change #123 with value 0) will release all playing notes. The difference between the All sound Off is in that this does not return the damper to the original position.

3.6 Parameters and functions controlled through MIDI Sys-Ex

Besides what already described , the ob 3 square is able to run on system exclusive messages (Sys-Ex) which may be sent to the instruments with the following syntax:

F0 31 01 01 cc vv vv F7

where:

1st byte = F0 indicates the beginning of the transmission of a string containing exclusive codes

2nd byte = 3 Is the number identifying the builder

3rd byte = 01 First identification of the OB3² model

4th byte = 01 Second identification of the OB3² model

5th byte = cc It identifies the type of command sent

6th byte = vv It indicates the value to associate with the sent command

7th byte = vv Extension of the 6th byte when the range of the values is not definable with a single byte

8th byte = F7 It indicates the end of the exclusive message (Eox)

The table below summarizes all the parameters controllable via exclusive system.

Values xx and yy when present indicate the variable (composed by two bytes) adjustment. The values will have to follow the hexadecimal numeration from 00 00 to 01 7F

The number within the bracket excludes itself.

Parameter	Sys-Ex String
Livello drawstop 16'	F0 31 01 01 36 xx yy F7
Livello drawstop 5 1/3'	F0 31 01 01 37 xx yy F7
Livello drawstop 8'	F0 31 01 01 38 xx yy F7
Livello drawstop 4'	F0 31 01 01 39 xx yy F7
Livello drawstop 2 2/3'	F0 31 01 01 3A xx yy F7
Livello drawstop 2'	F0 31 01 01 3B xx yy F7
Livello drawstop 1 3/5'	F0 31 01 01 3C xx yy F7
Livello drawstop 1 1/3'	F0 31 01 01 3D xx yy F7
Livello drawstop 1'	F0 31 01 01 3E xx yy F7
Overdrive level	F0 31 01 01 01 xx yy F7
Reverb level	F0 31 01 01 02 xx yy F7
Bass preset on (0)	F0 31 01 01 17 F7

Bass preset off (0)	F0 31 01 01 35 F7
Org. 1 lower preset on (1)	F0 31 01 01 1F F7
Org. 2 lower preset on (1)	F0 31 01 01 20 F7
Org. 3 lower preset on (1)	F0 31 01 01 21 F7
Org. 4 lower preset on (1)	F0 31 01 01 22 F7
Org. 5 lower preset on (1)	F0 31 01 01 23 F7
Rotary on (2)	F0 31 01 01 0E 01 F7
Rotary off (2)	F0 31 01 01 0E 00 F7
Rotary fast (3)	F0 31 01 01 0F 01 F7
Rotary slow (3)	F0 31 01 01 0F 00 F7
Upper memory 1 on (4)	F0 31 01 01 29 F7
Upper memory 2 on (4)	F0 31 01 01 2A F7
Upper memory 3 on (4)	F0 31 01 01 2B F7
Upper memory 4 on (4)	F0 31 01 01 2C F7
Upper memory 5 on (4)	F0 31 01 01 2D F7
Upper memory 6 on (4)	F0 31 01 01 2E F7
Drawstops on (4)	F0 31 01 01 33 F7
Percussion soft (5)	F0 31 01 01 12 01 F7
Percussion norm. (5)	F0 31 01 01 12 00 F7
Percussion fast (6)	F0 31 01 01 13 01 F7
Percussion slow (6)	F0 31 01 01 13 00 F7
Percussion 2nd (7)	F0 31 01 01 14 F7
Percussion 3rd (7)	F0 31 01 01 15 F7
Percussions off (7)	F0 31 01 01 16 F7
Vibrato/chorus to upper on (8)	F0 31 01 01 06 01 F7
Vibrato/chorus to upper off (8)	F0 31 01 01 06 00 F7
Vibrato/chorus to lower on (8)	F0 31 01 01 07 01 F7
Vibrato/chorus to upper off (8)	F0 31 01 01 07 00 F7
Delay effect on (9)	F0 31 01 01 04 01 F7
Spring effect on (9)	F0 31 01 01 04 02 F7

Plate effect on (9)	F0 31 01 01 04 03 F7
Room effect on (9)	F0 31 01 01 04 04 F7
Hall effect on (9)	F0 31 01 01 04 05 F7
Effect off position (9)	F0 31 01 01 04 00 F7
Vibrato V1 position (10)	F0 31 01 01 05 01 F7
Vibrato V2 position (10)	F0 31 01 01 05 02 F7
Vibrato V3 position (10)	F0 31 01 01 05 03 F7
Chorus C1 position (10)	F0 31 01 01 05 04 F7
Chorus C2 position (10)	F0 31 01 01 05 05 F7
Chorus C3 position (10)	F0 31 01 01 05 06 F7

3.7 Exclusive Bulk Dump System

This utility allows the user to send all the data resident in the OB3 programmable memory to the MIDI-OUT port in the form of exclusive system (MID Sys. Ex.) codes. This data can be recorded in a computer, sequencer or data filer, thus allowing the user to create one or more set-up archives for himself and reload them into the OB3 as required.

Connect the instrument MIDI OUT port to the MIDI IN port of the computer or sequencer. After pressing the MIDI key on the OB3, start recording on the connected instrument and then press the SYS.EX DUMP (Rotary Fast) key.

After a few moments, the saving procedure will have finished. Press the MIDI key to exit and return to the normal operating mode.

To reload the data saved previously into the OB3, connect the MIDI OUT port of the sequencer or computer to the instrument MIDI IN port, then start playback and the data will be reloaded.

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