OMX-9021

Vertical Interval Switcher

A Word on Video/Audio Switchers:

A video/audio Switcher usually switches between several sources and one or more acceptors. A Switcher that allows several inputs to be connected to several outputs simultaneously is called a Matrix Switcher. Switchers may be of the electronic or mechanical type. Most matrices are of the active electronic type, with many crosspoints.

Vertical Interval Switching, frequently used in video, ensures that the transition from one video source to another (such as switching between two genlocked cameras) is smooth and without interference. The switching and changeover is done during the blanked vertical interval period, when the transition is hidden.

Genlocked means synchronized so that the color and phase information from each source is identical. Thus switching is done with no interference on the screen, no rolling, no color loss and no jumping on the screen. Since the Syncs come with the same timing, all the information is identical and the transition between one switch and the other is smooth.

Vertical Interval Switching is needed when recording or transmitting a video program involving several video sources, as in live broadcast, to ensure clean, undisturbed picture transitions.

Matrices and Switchers may sometimes be RS-232 or RS-485/422 controlled. Each of these options is a way of remotely controlling a video/audio device (Switcher, SEG etc.) using a PC with a serial port, or another device that uses a similar communication protocol. Adding inputs or outputs will extend a Switcher's capability. Factors Affecting Quality of Results:

There are many factors affecting the quality of results when signals are transmitted from a source to an acceptor:

- ❑ <u>Source and acceptor signal handling capability</u> - different brands provide different performance levels and the final result is largely determined by the component providing the worst performance. Using a source with poor performance will always result in low quality duplicates.

- ❑ <u>Connection cables</u> - low quality cables are susceptible to interference, degrade signal quality due to poor matching and cause elevated noise levels. They should therefore be of the best possible quality.

- ❑ <u>Sockets and connectors of the sources and acceptors</u> - so often ignored, should be of highest quality, since "Zero Ohm" connection resistance must be the target. Sockets and connectors must match the required impedance (75 ohms in video). Cheap, low quality connectors tend to rust, thus causing breaks in the signal path.

- ❑ <u>Amplifying circuitry</u> - must have quality performance when the demanded end result is high linearity, low distortion and low noise operation.

- ❑ <u>Distance between sources and acceptors</u> - this plays a major role in the final result. For long distances (over 15 meters) between sources and acceptors, special measures should be taken in order to avoid cable losses. These include using higher quality cables and, perhaps, adding line amplifiers.

- ❑ <u>Interference from neighboring electrical appliances</u> - these could have an adverse effect on signal quality. Balanced audio lines are less prone to interference, but unbalanced audio and

video lines should be installed far from any mains power cables, electric motors, transmitters etc, even when the cables are shielded.

Equipment, Cables and Solutions

Video recording and playback frequently involve the use of several devices, such as: Video Cassette Recorders, Video Disc Players, Cameras, Video monitors, Video processors, Special Effects Generators, Live or Satellite Feeds or any combination of the above.
When hooking up a complex setup of several devices, you may find yourself in a maze of wires that is difficult to manage, cumbersome and possibly dangerous.

The OCEAN MATRIX **OMX-9021** Vertical Interval Switcher offers an innovative solution to many of the problems arising from switching, editing and signal distribution.

The OCEAN MATRIX **OMX-9021** is a full bandwidth, state-of-the art 5x4 Video/Audio Stereo Matrix Switcher designed for studio and other demanding applications. The **OMX-9021** may also be used as a 1:4 or two 2:2 Y/C-Video-Audio DAs or any other combination as well.

The **OMX-9021** switches during the Vertical Interval for smooth transitions between genlocked sources. The machine is microprocessor controlled, and is operated by touching a keypad on the front panel and via RS-232. The audio level of each output may be individually controlled. Large illuminated LEDs show the connection status of the machine at any given moment.

Some features of the OMX-9021:

➤ DC coupled, clamped outputs for highest quality signals.
➤ Extended video bandwidth for all professional applications.

➤ Easy change to "All" or "Off" state via front panel control switches.
➤ Output audio level easily controlled from the front panel.

A Quick Reference Table

The following illustrations provide information about the controls and display on the front panel of the **OMX-9021** and the connections on the back panel.

❑ **Front Panel:**

⊠ Power

This is the main **OMX-9021** Power ON/OFF switch.

⊠ Output/input Selectors

There are nine switches on the front panel of the **OMX-9021** for input and output selection. These switches electronically control the connection of any of the five input sources to any of the four output acceptors. When depressed, as will be explained later, the status read-out will show the connection. Two more switches marked as "ALL" and "OFF" appear on the front panel, their function will be explained later.

The "video sync signals" of input position "1" are used by the **OMX-9021** for sync extraction to allow for clean Vertical Interval switching.

❑ **Back Panel:**

⊠ Video Inputs

A variety of Composite video input sources may be used such as VCRs and cameras.

⊠ Audio Inputs

Up to five Stereo-audio input sources may be connected to the **OMX-9021**. Audio sources may be the audio section of the video equipment used, or another audio source such as a tape recorder.

☒ Video Outputs

Up to four Composite video output acceptors may be hooked up to these connectors. A variety of acceptors may be utilized such as VCRs or Video Monitors.

☒ Audio Outputs

Up to four Stereo-audio acceptors may be hooked up to these connectors. Audio acceptors may be the audio section of VideoCassette Recorders, Tape Recorders or Audio Amplifiers.

The **OMX-9021** may also be utilized for the duplication, switching and editing of stereo-audio sources only.

In this situation, you would utilize the audio outputs only.

☒ AC Power Socket

Connect the appropriate cable to the AC Power Socket and plug it into a proper AC receptacle. (117 Volts AC, U.S.A.: 230 Volts AC, Europe.)

☒ RS-232 Connector Socket

This socket connects via an appropriate adapter to the PC Serial port for RS-232 controlled switching.

Operation:

❑ To operate the **OMX-9021**, first push the POWER switch to the ON position.

❑ Turn on all units that have been connected to the **OMX-9021**.

❑ Use the input and output selector switches on the front panel to connect the relevant input sources to the chosen outputs.

❑ Keystrokes

☒ Press the appropriate output key followed by the appropriate input key in order to switch an input to an output.

☒ Press "ALL" followed by the appropriate input key to connect an input to all the outputs.

☒ Pressing "OFF" instead of an input key will disconnect an output.

☒ Any of the above instructions may be executed by pressing the two keys simultaneously rather than pressing them consecutively. When using two keys, the display will flash the appropriate output(s) while waiting for the second keystroke (if the second key is not pressed within a period of one minute, the pending operation is canceled).

☒ Pressing input keys 1, 2 and 3 simultaneously will reset the machine.

❑ Audio Level Control

To select the audio gain for one of the outputs, simultaneously press this output key together with the "ALL" key. Then, while both these keys are being held down, press the input key according to the required gain defined as:

1- 0 dB gain
2- 2 dB gain
3- 4 dB gain
4- 6 dB gain

❑ Dip-switch Settings

The Dip switches are situated on the main board within the machine. These switches are used for control of several machines via one RS-232 controller or for operating machines in parallel. The factory default setting is for a "Master" machine, i.e., either the first in the chain or in stand-alone operation.

☒ If only one machine is used in the system, it must be set up as the master.

☒ If more than one machine is used, setup up one as the master, and the others as slaves, each slave having its own unique "slave number" - except for the case where machines are hooked up in parallel (see below).

⊠   The **OMX-9021** only reads the dip-switch setting on initialization, so if the switch settings are changed while the machine is on, the machine must be turned off and then on again, in order that the new switch settings are realized.

⊠   If several machines are to be used "in parallel" to switch together, e.g.. when using 4 machines together to make a 5X4 RGBS switcher, then all the parallel machines should be set up to have the same slave number and switch 4 should be ON for the machine which switches the syncs (in an RGBS configuration).

The dip-switch settings are as follows:

	1	2*	3	4	5	6	7	8
UNIT 1 (Master)	OFF	OFF	OFF	ON	ON	ON	ON	ON
UNIT 2	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
UNIT 3	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
UNIT 4	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
UNIT 5	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
UNIT 6	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
UNIT 7	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
UNIT 8	ON	ON	ON	OFF	OFF	OFF	OFF	OFF

❑   **RS-232 Control**

⊠   To control the **OMX-9021** using RS-232 connect the "9 pin to 9 pin adapter" (provided with the machine) to the 9 pin serial port of the PC. Use a flat cable to connect from the 9 pin of the **OMX-9021** to the 9 pin of the adapter. (The adapter is a null-modem plug and 9-pin to 9-pin converter.

⊠   A PC control program is available for download at the Internet. Please consult your distributor how to do it. The protocol used for controlling the **OMX-9021** may be found in the appendix.

⊠   If several machines are used (in a master / slave setup, or if they are connected in parallel to switch together), then the machines should be daisy-chained via their 9 pin interface sockets using a flat-cable.

Protocol Used For OMX-9021 Communication (RS-232)

Communication with the **OMX-9021** is defined using 2 bytes of information. Data transfer is at 9600 baud, with no parity, 8 data bits and one stop bit.

MSB	1st byte				LSB			MSB	2nd byte					LSB	
N7	N6	N5	N4	N3	N2	N1	N0	N15	N14	N13	N12	N11	N10	N9	N8

Where:

$N7 = 0$ (continue bit).

$N6N5N4N3 = 1000$ (transmitted by the machine (to the PC), but not necessary when transmitting to the machine).

$N2N1N0$ is the binary value of the machine being addressed (or of the machine sending its data) minus one, e.g.. $N2N1N0=000$ to address machine #1 (the master);

$N2N1N0=101$ to address machine #6.

$N15 = 1$ (continue bit).

$N14 = 0$ for all communication from the PC.

$N13N12 N11N10N9N8 = 10 0001$ instructs a machine to send its present status. The machine returns 16 bytes. 4 pairs of bytes are sent for the status of the 4 outputs as defined by the table below, and 4 pairs for the gain settings of the 4 audio outputs as defined below.

$N13N12 N11N10N9N8 = 10 0010$ success code (the machine acknowledges the requested change in status).

$N13N12 N11N10N9N8 = 10 0011$ non-success code (the machine cannot perform the requested instruction).

NB:- Success/non-success codes, (according to the validity of the request), are returned from the machine which was instructed to change its status.

N13N12 N11N10N9N8 = 10 01GG set audio gain of output 1
N13N12 N11N10N9N8 = 10 10GG set audio gain of output 2
N13N12 N11N10N9N8 = 10 11GG set audio gain of output 3
N13N12 N11N10N9N8 = 11 00GG set audio
gain of output 4 where GG is defined as follows:

      00 = 0dB gain
      01 = 2dB gain
      10 = 4dB gain
      11 = 6dB gain

The above gain setting codes are bi-directional, i.e., if the change was made on the machine, then the code is sent to the PC; and if the PC sends the code, then the change is made on the machine.

When N13 is low then N12N11N10N9N8 corresponds to the status (or the required change in status) of the machine, as described in the table below. These are bi-directional codes.

	OUTPUT1	OUTPUT2	OUTPUT3	OUTPUT4	ALL
FROM INPUT 1	1	2	3	4	21
FROM INPUT 2	5	6	7	8	22
FROM INPUT 3	9	10	11	12	23
FROM INPUT 4	13	14	15	16	24
FROM INPUT 5	17	18	19	20	25
OFF	26	27	28	29	30

For example, to connect input 4 to output 2, N12N11N10N9N8 should be set up as 01110 (=14). To connect input 3 to all the outputs, set N12N11N10N9N8 = 11011 (=27). To disconnect output 1, set N12N11N10N9N8 = 11010 (=26). Similarly, if the front panel switches were pressed to connect input 2 to output 3, then N12N11N10N9N8 would be transmitted as 00111 (=7).

Technical Specifications:

INPUTS:	5 video, 1Vpp/75Ω Composite on BNCs.
	5 stereo audio 1Vpp/ 50kΩ on RCAs.
	DB-9 connector for RS-232 control.
OUTPUTS:	4 video, 1Vpp/75Ω Composite on BNCs.
	4 stereo audio 1Vpp/100Ω on RCAs.
VIDEO BANDWIDTH:	Exceeding 30 MHz.
AUDIO BANDWIDTH:	20-20000 Hz, -1dB.
DIFF. GAIN:	0.13%.
DIFF. PHASE:	0.8 Deg.
K-FACTOR:	<0.05%.
VIDEO S/N RATIO:	74 dB.
AUDIO S/N RATIO:	89 dB.
AUDIO THD:	0.02%.
VIDEO CROSSTALK:	-47dB Luma.
AUDIO CROSSTALK:	-53 dB.
DIMENSIONS:	19 inch (W), 7 inch (D), 1U (H) rack mountable.
POWER SOURCE:	230 VAC, 50/60Hz (115VAC U.S.A.) 6 VA.
WEIGHT:	2.7 Kg. (6 Lbs.) Approx.
ACCESSORIES:	Power cord, Windows 95/98 control software, Null modem adapter.

Please note that if the output signal is disturbed or interrupted by very strong external electromagnetic interference, it should return and stabilize when such interference ends. If not, turn the power switch off and on again to reset the machine.

The socket-outlet shall be installed near the equipment and shall be easily accessible. To fully disconnect equipment, remove power cord from its socket.

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