INLINE

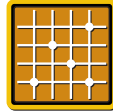## A WORLD OF A/V SOLUTIONS

MATRICES

MSX1616 / MSX1616HR MATRIX SWITCHER
16-INPUT, 16-OUTPUT

MSX1616/MSX1616HR

OPERATION MANUAL

High Resolution Video Products • A/V System Integration Tools • Interactive Training Systems

⚠ Installation and Safety Instructions

For Models without a Power Switch:
The socket outlet shall be installed near the equipment and shall be accessible.

For all Models:
No serviceable parts inside the unit. Refer service to a qualified technician.

For Models with Internal or External Fuses:
For continued protection against fire hazard, replace only with same type and rating of fuse.

⚠ Instructions d'installation et de sécurité

Pour les modèles sans interrupteur de courant:
La prise de courant d'alimentation sera installé près de l'équipement et sera accessible.

Pour tout les modèles:
Pas de composants à entretenir à l'intérieur. Confiez toute réparation à un technicien qualifié.

Pour les modèles équipés de fusibles internes ou externes:
Afin d'éviter tout danger d'incendie, ne remplacer qu'avec le même type et la même valeur de fusible.

⚠ Installations- und Sicherheitshinweise

Für Geräte ohne Netzschalter:
Die Netzsteckdose soll in der Nähe des Gerätes installiert und frei zugänglich sein.

Für alle Geräte:
Keine Wartung innerhalb des Gerätes notwendig. Reparaturen nur durch einen Fachmann!

Für Geräte mit interner oder externer Sicherung:
Für dauernden Schutz gegen Feuergefahr darf die Sicherung nur gegen eine andere gleichen Typs und gleicher Nennleistung ausgewechselt werden.

⚠ Instalacion E Instrucciones de Seguridad

Modelos Sin Interruptor:
La conexión debe ser instalada cerca del equipo y debe ser accesible.

Para Todos Los Modelos:
Dentro de la unidad , no hay partes para reparar. Llame un tecnico calificado.

Modelos con Fusibles Internos o Externos:
Para prevenir un incendio, reemplace solo con el mismo tipo de fusible.

CE COMPLIANCE

All products exported to Europe by Inline, Inc. after January 1, 1997 have been tested and found to comply with EU Council Directive 89/336/EEC. These devices conform to the following standards:

EN50081-1 (1991), EN55022 (1987)
EN50082-1 (1992 and 1994), EN60950-92

Shielded interconnect cables must be employed with this equipment to ensure compliance with the pertinent Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) standards governing this device.

CE

FCC COMPLIANCE

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide against harmful interference when equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

Table of Contents

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MSX1616 Matrix Switcher - Quick Start

Installation

Step 1
Install the switcher into a standard 19"
equipment rack, or set it on a flat surface.

Step 2
Connect input video sources to the BNC
connector inputs. Connect sync inputs to the
H/C and V connectors and video inputs to
the RGB connectors.

Step 3
Connect output devices (monitors, data
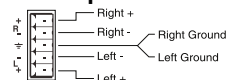projectors, etc.) to the BNC outputs.

Step 4
Connect audio sources to the audio inputs
(5-pin captive screw terminals). The wiring
diagram below illustrates connections for
unbalanced and balanced audio signals.

For unbalanced Stereo Audio Input:

Right +
Right Ground
Left Ground
Left +

For balanced Stereo Audio Input:
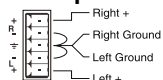
Right +
Right - ⎤ Right Ground
Left - ⎦ Left Ground
Left +

Step 5
Connect the audio outputs to the audio
system's line level input.

For unbalanced Stereo Audio Output:

Right +
Right Ground
Left Ground
Left +

For balanced Stereo Audio Output:
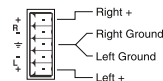
Right +
Right - ⎤ Right Ground
Left - ⎦ Left Ground
Left +
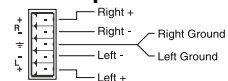
Step 6
Select the serial communication protocol
format for serial port 1 as required by the
control system. Set DIP switches in Switch
Bank 1 according to the following chart:

Port 1 Serial Format:	Switch 1 DIP Switch Settings:
RS-232	Set switches 123 to OFF
RS-422/485	Set switches 123 to ON

Step 7
If you will be controlling the switcher with
serial commands, cable the control system
or computer serial port to serial port 1 based
on the type of connection described below.

RS-232 Connection Diagram:
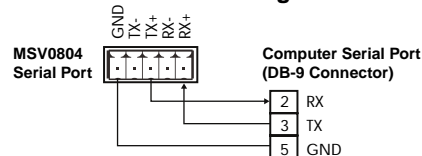
MSV0804 Serial Port — GND TX- TX+ RX- RX+

Computer Serial Port (DB-9 Connector)

2	RX
3	TX
5	GND

Full Duplex RS-422/485 Connection Diagram:

MSV0804 Serial Port — GND TX- TX+ RX- RX+

Computer Serial Port (DB-9 Connector)

3	RX+
7	RX-
2	TX+
6	TX-
5	GND
1	GND

Half Duplex RS-485 Connection Diagram:

MSV0804 Serial Port — GND TX- TX+ RX- RX+

Computer Serial Port (DB-9 Connector)

3	RX+
7	RX-
2	TX+
6	TX-
5	GND
1	GND
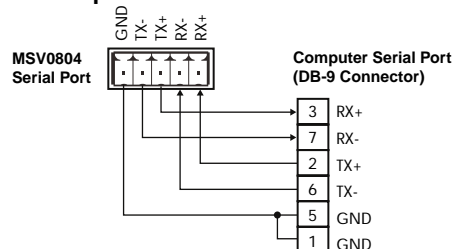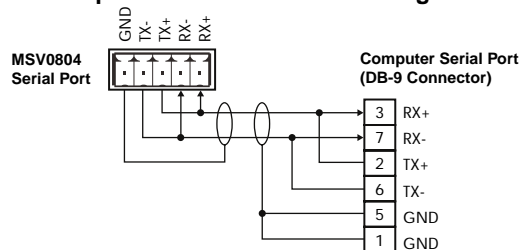
Step 8
Connect power and turn on the switcher,
display devices, control, and audio
equipment as applicable.

Front Panel Controls

Buttons to the **left of the LCD** let you navigate through the LCD menu options.

Arrowed buttons let you increase or decrease a selection, scroll up or down, move forward and backward, and change inputs and outputs.

MENU displays the status menu on the initial press. Subsequent presses display the next menu level up.

ENTER saves newly selected menu settings.

VOLUME adjusts the volume of the selected audio output or input.

MUTE silences the selected audio output.

INPUT and **OUTPUT** buttons configure any number of new patches.

TAKE performs the input-to-output switches as configured.

PRESET recalls a preset configuration, which includes all input/output patches and volume levels.

BLANK acts as an input when creating patches. Use it to blank any or all outputs.

CANCEL deletes unsaved configurations.

Functionality

Creating new patches
1. Press the button of the desired input device.
2. Press the button(s) of the output(s) where you want the input signal sent.
3. Repeat steps 1 and 2 until all connections are defined.
4. Press **TAKE** to perform the patches.

Alternately, use the LCD menu.

Adjusting audio levels
1. Use the **VOLUME** buttons on the front panel to increase or decrease volume level for the currently selected output.
2. Press **MUTE** to silence the audio output.

Creating a preset
1. Set all desired input/output patches, audio levels, and mute states.
2. Press **MENU**.
3. Select `Preset Store` on the LCD.
4. Press any one of the input or output buttons to select a storage location for this preset.
   Result: The switcher stores the current configuration into memory.

Viewing switches
1. On the LCD Menu, select `Preview`.
2. Select and press an input or output button to see all current switches.
   Result: The LED indicators above each button glow to indicate all stored patches for those inputs/outputs.

Product Overview

Description

The **MSX1616** matrix switcher routes audio and video signals from multiple sources to multiple monitors, screens, and speakers without requiring cable changes.

Model	Description
MSX1616	16 x 16 Matrix for RGBHV & Stereo Audio – 160 MHz
MSX1616HR	16 x 16 Matrix for RGBHV & Stereo Audio – 475 MHz
MSX3216	32 x 16 Matrix for RGBHV & Stereo Audio – 150 MHz
MSX3216HR	32 x 16 Matrix for RGBHV & Stereo Audio – 450 MHz

Product Features

- **475 MHz** 16 x 16 HR video bandwidth

- **450 MHz** 32 x 16 HR video bandwidth

- **Three RS-232/RS-422/RS-485 Serial Control** ports enable third-party control systems to control the switcher using RS-232, RS-422, or RS-485 serial commands. Offers fast communication speed, individual unit addresses, and command buffering.

- **New Serial Control Protocol** for programming serial commands.

- **Ergonomic Front Panel Design** features large rubber buttons with ample room for labels.

- **Master Volume Control** and **Mute** for each output.

- **Audio Gain Trim Level Storage** is available for each input.

- **Integrated Labeling System** provides attachment posts to hold optional nameplates to engrave or label inputs, outputs, and presets.

- **Large LCD Status Screen** displays system menu and settings

- **Two Auxiliary Serial Control Ports** store and transmit serial commands to control projectors of other serial-controlled equipment.

- **Genlock Input and Output -** Vertical Interval Switching for glitch-free transitions when used with synchronous video sources

- **Dual Switching Modes**

  o **Matrix** mode – Lets you configure new or change existing input-output patches with the press of one button.

  o **Express** mode – Lets you recall previously stored input/output patches.

- **RGB Delay** mode for enhanced switching translations.

- **256 Configuration Memories** let you to store and recall input/output configurations, audio levels, and auxiliary serial commands.

- **Blank Front Panel Versions** are available at a lower cost.

MSX1616 model Numbers

16 x 16 Matrix Switcher 160 MHz	With Faceplate	Without Faceplate
RGB/Component Video	MSX1616-1	MSX1616-5
RGB/Component Video + Balanced Stereo Audio	MSX1616-2	MSX1616-6
RGBHV	MSX1616-3	MSX1616-7
RGBHV + Balanced Stereo Audio	MSX1616-4	MSX1616-8

16 x 16 Matrix Switcher 475 MHz	With Faceplate	Without Faceplate
RGB/Component Video	MSX1616HR-1	MSX1616HR-5
RGB/Component Video + Balanced Stereo Audio	MSX1616HR-2	MSX1616HR-6
RGBHV	MSX1616HR-3	MSX1616HR-7
RGBHV + Balanced Stereo Audio	MSX1616HR-4	MSX1616HR-8

Installation

Mounting the MSX1616

Mount the **MSX1616** switcher on a standard 19-inch metal equipment rack. The unit is 6U tall. Allow 1U above and below the switcher for heat dissipation.

To rack-mount the switcher:

1. Slide the switcher into the equipment rack.

2. Align the mounting holes of the unit with those of the rack.

3. Fasten the switcher to the rack using the machine screws included with the rack.

Device Connections

All connections (including switches, serial ports, and power, audio, and video BNC connectors) are on the rear panel of the switcher.
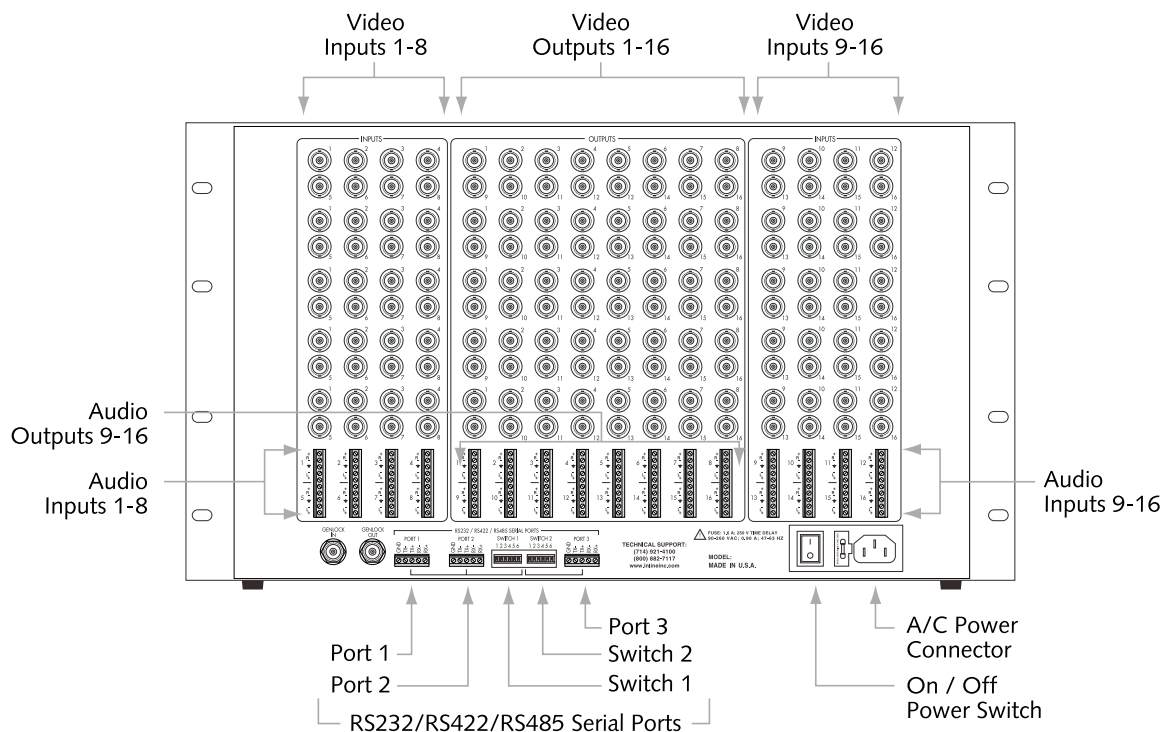
Power Connection

Attach the power cord to the connector on the rear of the switcher. A standard IEC power cord comes with the unit. Plug it into a 100 – 240 VAC, 50 Hz, or 60 Hz power source.

Video Input and Output Connections

Video connections are made with BNC connectors, one for each of five inputs: Red (R), Green (G), Blue (B), Horizontal/Comp Sync (H/C), and Vertical Sync (V).

1. Connect video input devices to the appropriate video input connectors.

2. Connect video output devices to the appropriate video output connectors.

The types of video signals the switcher can receive on the RGB input connectors are:

- Composite

- S- Video

- Component

- RGB Video

The types of signals that the switcher can receive on the H/C and V input connectors are:

TTL level sync info

Note: Video signals do not pass on sync channels.

Audio Input and Output Connections

Make audio connections with 5-pin captive screw connectors in a balanced or unbalanced arrangement. Screw connectors come with the **MSX1616** switchers. The following diagrams depict proper wiring for balanced and unbalanced inputs and outputs.
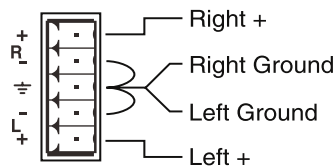
For Unbalanced Stereo Audio Input: **For Balanced Stereo Audio Input:**
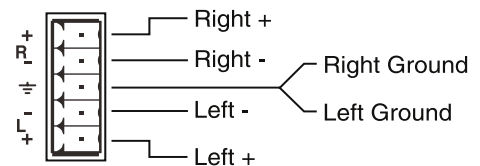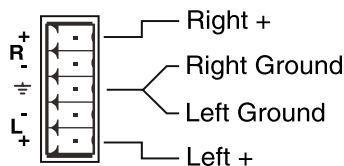
For Unbalanced Stereo Audio Output: **For Balanced Stereo Audio Output:**
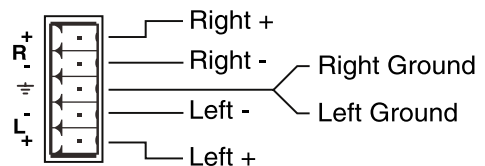
Note: Be sure to connect each cable completely.

Serial Ports

The switcher features three serial ports that can accommodate RS-232, RS-422, and RS-485 connections.

Use serial port 1 to control the switcher using either a PC or a third-party control system.

Use serial ports 2 and 3 to control auxiliary devices with serial commands you store into the switcher.

RS-232/422/485 Connections

RS-232 Connection Diagram:
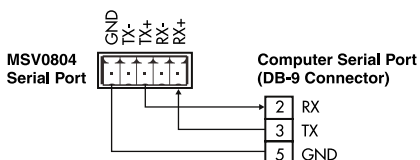
Full Duplex RS-422/485 Connection Diagram:
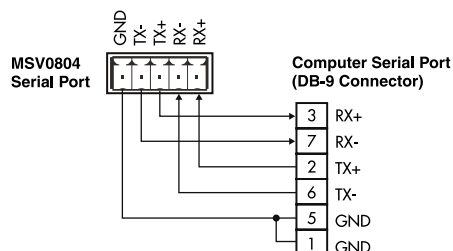
Half Duplex RS-485 Connection Diagram:
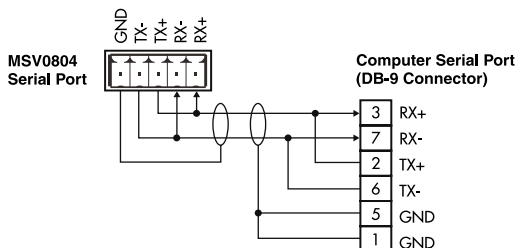
DIP Switch Settings: Standard

DIP switch settings change according to the standard used. Higher standards require a different signal type. DIP switches make subtle adjustments to that signal type. Configure the DIP switch settings according to the following table.

Serial port #	RS-232	RS-422/RS-485
1	SW 1: 123 OFF	SW 1: 123 ON
2	SW 1: 456 OFF	SW 1: 456 ON
3	SW 2: 123 OFF	SW 2: 123 ON

The settings of the...	Control serial port #:
First three switches of DIP switch 1	1
Last three switches of DIP switch 1	2
First three switches of DIP switch 2	3

DIP Switch Settings: Termination

	PORT 1			PORT 2			PORT 3			**Technical Notes**
	Switch 1 Position 1	Switch 1 Position 2	Switch 1 Position 3	Switch 1 Position 4	Switch 1 Position 5	Switch 1 Position 6	Switch 2 Position 1	Switch 2 Position 2	Switch 2 Position 3	**Technical Notes**
RS232	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Do not terminate
422/485 Full duplex termination	ON	ON	ON	ON	ON	ON	ON	ON	ON	Terminate if first or last position
422/485 Full duplex non-termination	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	Do not terminate if center of multi-drop connection
485 half-duplex termination	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF	Only one termination required at ends
Non-termination	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	Do not terminate if center of multi-drop
Function:	RS232/ 485 select	Receive termination	Transmit termination	RS232/ 485 select	Receive termination	Transmit termination	RS232/ 485 select	Receive termination	Transmit termination	

Switch 2/Position 4, Switch 2/Position 5, and Switch 2/Position 6 are reserved for future definition.

MSX1616 DIP switch ON position:

SWITCH 1

SWITCH 2

ON N 1 2 3 4 5 6

ON N 1 2 3 4 5 6

ON Position

OFF Position

MSX3216 DIP switch ON position:

N O 1 2 3 4 5 6

SWITCH 1
ON Position

N O 1 2 3 4 5 6
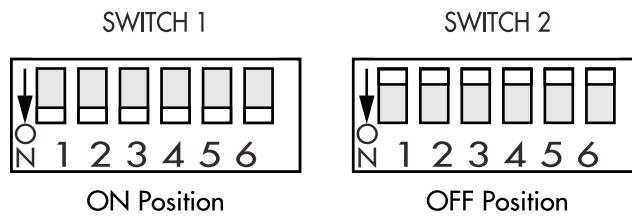
SWITCH 2
OFF Position
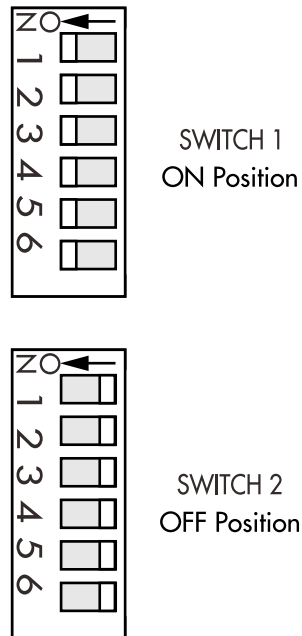
Compatibility

Input

The **MSX1616** 16 input connections are terminated with BNC connectors that can accept composite, S-Video component (YUV, YPrPb, YR-Y, B-Y), RGBHV, RGBS, RGsB, or computer pass through singles. You can configure a single input to feed up to 16 different output sources simultaneously, giving you 32 possible input/output configurations.

The **MSX1616** has analog audio-follow-video and breakaway capability. All analog audio inputs are compatible with balanced and unbalanced line level signals from a computer audio card or any other audio device that delivers a stereo line level signal.

Output

The **MSX1616** can output to 16 separate sources through its BNC connectors.

The analog stereo audio output provides a balanced or unbalanced line level signal. This output can drive any line level compatible audio unit or a local device such as powered speakers.

MSX1616 **MATRIX SWITCHER**

APPLICATION DIAGRAM
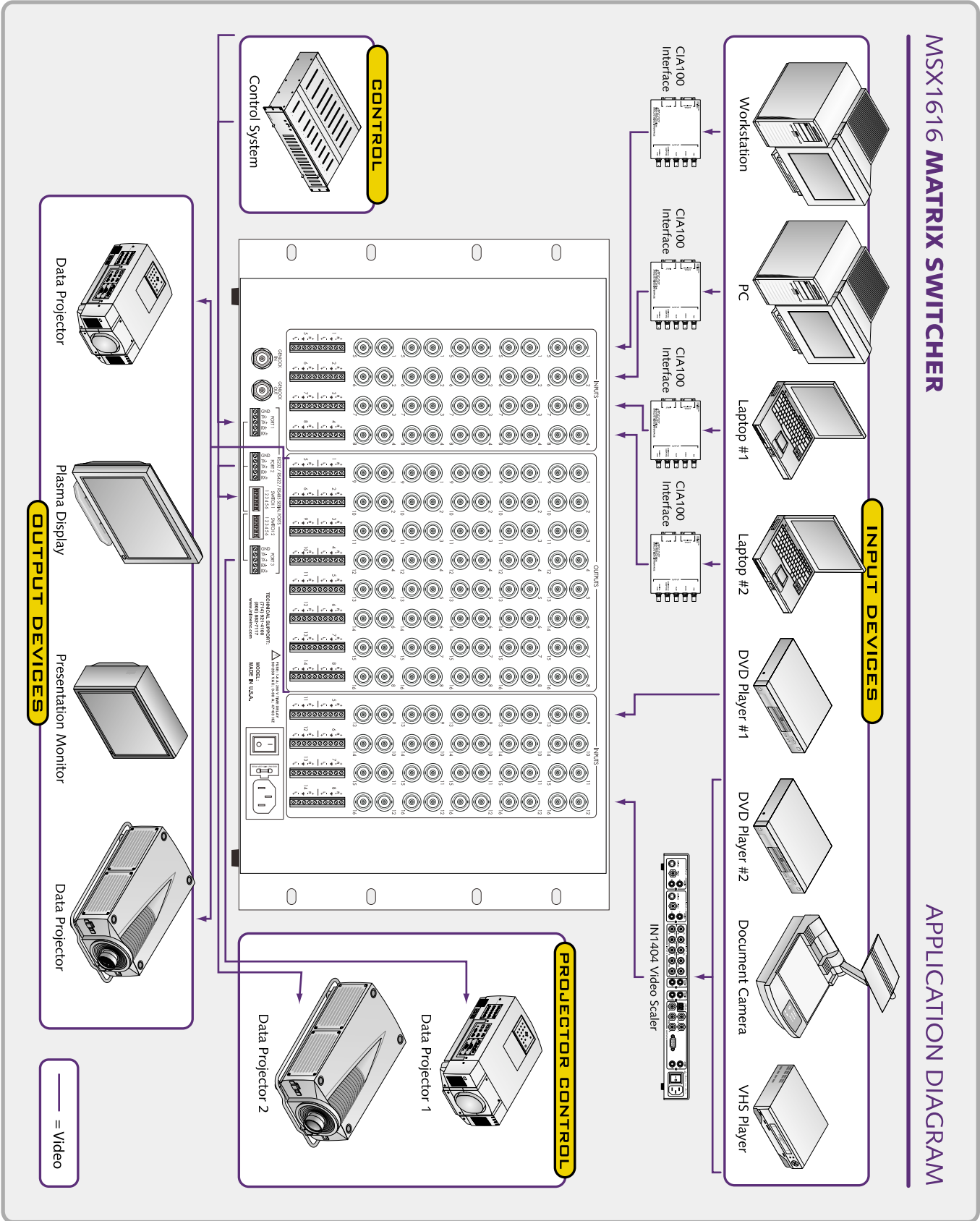
MSX1616 **MATRIX SWITCHER** · CONNECTORS & CONTROLS

Soft Keys

LCD Display

Menu Navigation Buttons

Volume Buttons

```
Current Level RGBHVA
Preview
In:
Out:
```

Mute Button

Input Buttons

Output Buttons

PRESET   BLANK   CANCEL   TAKE

INLINE
MSX1616 Matrix Switcher

Preset Button
Blank Button

Take Button
Cancel Button

Front View   Rear View

Video Inputs 1-8

Video Outputs 1-16

Video Inputs 9-16

Audio Outputs 9-16

Audio Inputs 1-8

Audio Inputs 9-16

Port 1
Port 2

Port 3
Switch 2
Switch 1

RS232/RS422/RS485 Serial Ports

A/C Power Connector

On / Off Power Switch

Operation

Front Panel Controls

The **MSX1616** features the following ergonomic front panel controls.
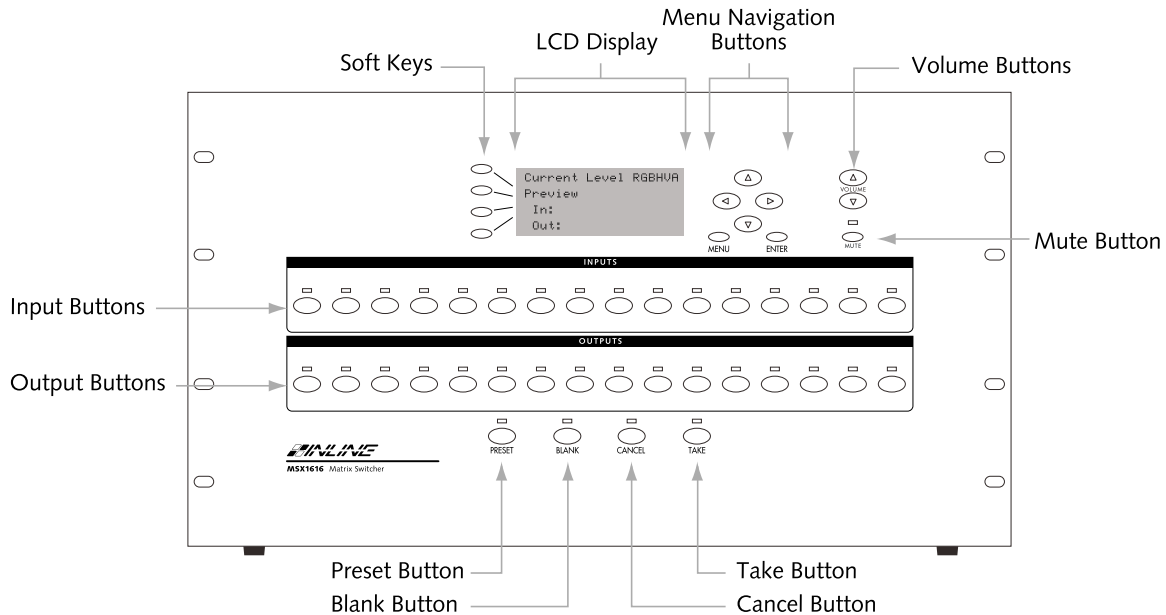
Button	Function
Soft Keys	Navigate through any menu on LCD.
Menu Navigation Buttons	Scrolls up and down LCD menu selections and changes inputs/outputs.
MENU	Displays the previous LCD screen.
ENTER	Saves changes made to existing patches and saves any new settings.
VOLUME	Adjusts volume of selected audio output or input.
TAKE	Completes a patch and saves the switch configuration into non-volatile memory.
CANCEL	Deletes any unsaved configuration, terminates a patch configuration prior to pressing **TAKE**, and takes you to the main LCD screen.
BLANK	Turns off (blanks) any output.
PRESET	Recalls an existing preset.
INPUT	Has an LED indicator above it and corresponds to a video input.
OUTPUT	Has an LED indicator above it and corresponds to an output source on the rear panel. The LED blinks when you create a new patch and glows steady when you press **TAKE**.

Front Panel Operation

The **MSX1616** series has three operational modes: Matrix, Preview, and Express.

- In **Matrix** mode, you can select an input, assign it to any output or series of outputs, and press **TAKE** to accept the new switch. Matrix mode allows maximum switching flexibility.

- In **Preview** mode, you can view input/output patches you have created.

- In **Express** mode, you can recall previously saved presets with the press of one button. Non-technical users will find Express mode simple and convenient to use.

Creating a Patch in Matrix Mode

1. Press the number of the desired input device.
   Result: The LED indicator above the button glows.

2. Press the number(s) of the output(s) where you want the input signal sent.
   Result: The LED indicator blinks. The connection does not yet exist.

3. Press **TAKE**.
   Result: The switcher makes the patches, stores the information in memory, and all selected LEDs go out.

To confirm the patch:

Press the input button again.
Result: The LED above each output connected to that input glows.

Creating Presets in Matrix Mode

Once you create a patch, you can assign the patch a preset number you can recall later without having to reconfigure the patch.

1. Create the desired switch or configuration of input/output connections.

2. Press **TAKE**.

3. Press **MENU** until `Main Menu` displays in the LCD.

4. Select `Preset Store` on the LCD.
   Result: `Store Preset` displays in the LCD.

5. Press any one of the input or output buttons to pick a storage location for this preset.
   Result: The switcher accepts the preset and stores it into memory.

To recall a saved preset:

1. To recall a preset, press **PRESET**.
   Result: The LEDs above the buttons designating saved presets glow.

2. Select the desired preset by pressing the corresponding button.

   Note: The **MSX1616** includes special labeling strips so you can label what
   functionality you assigned to which preset.

Previewing Patches in Preview Mode

Once you create a patch, you can preview it and other existing patches.

1. Press the soft key pointing to `Preview`.
   Result: `Select INPUT/OUTPUT to View Current Connections` displays
   on the LCD.

2. Press any input or output button.
   Result: The LED above each button corresponding to a patched input/output glows.

Press **CANCEL** to exit Preview mode.

If you need to change any patches, exit this feature and follow the **Matrix Mode** instructions
above or press the LCD buttons pointing to `In` or `Out`.

Recalling Presets in Express Mode

Express Mode lets you recall presets with the touch of one button.

1. Press **PRESET** twice in succession.
   Result: The LCD prompts you to press **ENTER** to accept or **MENU** to go back to
   Matrix Mode.

2. Press **ENTER**.
   Result: The LCD indicates that you are in Express Mode.

3. The LED(s) above the buttons corresponding to the first 32 (16 x 16) or 48 (32 x 16)
   previously saved preset(s) glows. Press one of these buttons to recall the preset
   associated with it.

4. You will stay in Express mode until you explicitly exit it using a serial command or as
   explained below.

To exit Express mode:

   Press **CANCEL** and **MENU** simultaneously.
   Result: The LED returns to Matrix Mode and displays the main screen.

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Hierarchy of LCD Screens

```
                              Current Level RGBHVA
                              Preview
                               In:
                               Out:
```

```
Select Level              Preview                Current Level RGBHVA
Level 1     RGBHVA                                Preview
Level 2     RGBHV      Select Input/Output         In: Input 01
Level 3      Audio       to View Current           Out: Output 14
Level 4     No Boards     Connections.
Level 5     No Boards
Level 6     No Boards
```

```
                    Main Menu            Current Level RGBHVA
                  Preset Store           Preview
                  Audio Setup             In: Input 01
                  Advanced                Out: Output 14
```

```
Store Preset            Audio Setup            Advanced Menu
                        Input Attenuation       Serial Setup
Press INPUT or OUTPUT   Output Attenuation     Reset Unit
Button.                 Reset Volume Levels     RGB Delay
```

```
Audio Reset          Serial Port Setup     RGB Delay Time        Reset Unit
Input Volume Level   Port 1                                      Partial Reset
Output Volume Level  Port 2               Seconds: 0.0           Full Reset
**Sets All Channels  Port 3
```

```
   Volume Level       Port 1: 9600,8,N, 1
Input 01     0.0dB      Baud Rate: 9600
                                              Partial Reset
                                           Reset RS232 and I/O
   Input 01                                Press ENTER to Reset.
                                           Press MENU to Exit.
```

```
   Volume Level       Port 2: 9600,8,N,1
Output 01     0.0dB     Baud Rate: 9600
                        Parity Bit: None    Erases Entire Config.
                        Stop Bits: 1        Takes two minutes.
   Output 01                                Press ENTER to Reset.
                                            Press MENU to Exit.
```

```
                      Port 3: 9600,8,N,1
                        Baud Rate: 9600
                        Parity Bit: None    Please wait while
                        Stop Bits: 1        MSX1616 Resets.
```

Menu Programming

Level Selection

The **MSX1616** has six user-definable switching levels:

Level Number:	Default Level:
1	RGBHVA
2	RGBHV
3	Audio
4	No boards
5	No boards
6	No boards

Each level can be one of nine board configurations:

- RGBHVA
- RGBHV
- RGB
- SYNC
- Audio
- Red
- Green
- Blue
- No boards

In or Out

Use this function to create a patch using the LCD menu functions:

1. Press **MENU** button until `Current Level` displays in the LCD.

2. Press the soft key pointing to `In` or `Out` on the LCD.
   Result: The LCD shows `Input 1` and `Output 1`, or the last output or input number designated.

3. Press the left and right arrow buttons to move forward or backward to the desired input.

4. Use the up and down arrow buttons to move between the `In` and `Out` fields.

5. Press the left and right arrow buttons to move forward or backward to the desired output number.

6. Press **ENTER** to accept the patch.

   Note: When using the LCD menu, patches are limited to one input and one output.

Audio Setup

This menu selection allows for input and output volume adjustments.

1. Press **MENU** until `Main Menu` displays in the LCD.

2. Press the soft key pointing to `Audio Setup` on the LCD.
   Result: `Audio Setup` displays in the LCD.

3. Select one:

   - Select `Input Attenuation` to adjust the volume level for any input. Use the menu navigation buttons to select an input. Then use the **VOLUME** buttons to adjust the level.

   - Select `Output Attenuation` to perform the same function as the **VOLUME** buttons on the front panel. Use the left and right arrow keys to select the output number. Use the **VOLUME** buttons to adjust the level for each selected output number.

   - Select `Reset Volume Levels` to reset all volume settings to 0.0dB.
     Result: The switcher resets all volume levels to zero dB, and the LCD changes to a new screen with `Audio Reset` displayed at the top. You may now reset either input or output volume levels.

Advanced Menu

This function lets you set up serial ports, reset the switcher, and activate RGB delay.

Setting up Serial Ports

1. Press **MENU** until `Main Menu` displays in the LCD.

2. Press the soft key pointing to `Advanced`.
   Result: `Advanced Menu` displays in the LCD.

3. Select the soft key pointing to `Serial Setup`.
   Result: `Serial Port Setup` displays in the LCD.

4. Select the soft key pointing to the serial port you want to set up.
   Result: The LCD screen for that port displays.

5. Make any necessary changes to the `Baud Rate`, `ADDR`, `Duplex`, `Parity Bit`, and `Stop Bits` settings.

   - Use the up-and-down menu navigation buttons to scroll between the `Baud Rate`, `ADDR`, and `Duplex`.

   - Use the left-and-right menu navigation buttons to change the actual `Baud Rate`, `ADDR`, and `Duplex`.

6. Press **ENTER** to accept the changes.

7. Press **MENU** to exit.

Resetting the Switcher

1. Press **MENU** until `Main Menu` displays in the LCD.

2. Press the soft key pointing to `Advanced`.
   Result: `Advanced Menu` displays in the LCD.

3. Select the soft key pointing to `Reset Unit`.
   Result: `Reset Menu` displays in the LCD.

4. You can do either a partial reset or a full reset.

   a. To do a partial reset, press the soft key pointing to `Partial Reset`.
      Result: The switcher resets the RS232 serial port, opens all input/output patches, resets all volume levels, sets all outputs to un-mute state, and removes any address given to the unit.

      i. Press **ENTER** to reset.

      ii. Press **MENU** to exit.

   b. To do a full reset, press the button pointing to `Full Reset`.
      Result: The switcher resets the RS232 serial port, opens all input/output patches, resets all volume levels, removes any address given to the unit, and clears all saved presets and labels. This process may take up to 2 minutes, if all presets are used.

      i. Press **ENTER** to reset.

      ii. Press **MENU** to exit.

Activating RGB Delay

This feature allows older model projectors (or a series of projectors) time to synchronize their signals so the image pops cleanly and clearly onto the screens. Set RGB delay for up to 6 seconds.

1. Press **MENU** until `Main Menu` displays in the LCD.

2. Press the soft key pointing to `Advanced`.
   Result: Advanced Menu displays in the LCD.

3. Select the soft key pointing to `RGB Delay`.
   Result: `RGB Delay Time` displays in the LCD.

4. Use either the up-and-down or the left-and-right menu navigation buttons to set the RGB delay time.

5. Press **ENTER** to accept the changes.

6. Press **MENU** to exit.

Remote Operation

Communication Protocol

The **MSX1616** contains three serial ports for communication. You can configure all three ports to communicate serially via RS-232, RS-422 or RS-485 standards by setting the DIP switches located at the rear of the unit to the appropriate setting.

Use this port...	To...
1	Directly communicate with the switcher.
2 and 3	Control projectors, Inline products, or other serially controlled A/V equipment.

Control Port 1

The baud rate is selectable from 1200 to 38,400. You can change the baud rate using the Advanced menu option on the LCD on the front panel or via serial control using the [CPxbpsfd] serial command. Other adjustable parameters for port 1 include flow control (none or Xon/Xoff) and duplex (full or half). Parity, data bits, and stop bits are predefined and have no affect on port 1. The factory default communication parameters for the control port are:

Communication Parameters	
Baud rate	9600
Parity	None
Data bits	8
Stop bits	1
Flow control	None
Duplex	Full

Protocol Structure

All commands sent to the unit must contain a leading delimiter, the actual command, and an ending delimiter.

This part of the command string...	Represents:
[	The leading character
BLANK01	The actual command.
]	The ending character

Command	Meaning
[ADDR@]	Remove address from unit
[BLANK01]	Blank output #1
[RES1]	Enable serial responses
[MS1O02I01]	Connect input 1 to output 2 at level 1

The **MSX1616** and **MSX3216** offer command buffering. This allows you to send multiple commands to the unit with out a delay between each command. When you send a command, the unit responds **R0**. This indicates a valid command executed, followed by the original command and any other requested information.

Command	Meaning	Response from unit
[MS1O02I01]	Connect input 1 to output 2 at level 1	[R0 MS1O02I01]

> **Note:**   You may disable serial responses using RESx command.

Auxiliary Ports 2 and 3

The two auxiliary ports can store and transmit ASCII or Hex commands to control projectors, INLINE products, or other serially controlled A/V equipment. The baud rate of the auxiliary ports is selectable from **1200** to **38,400**. The baud rate, parity, and stop bits can be changed individually for each port. You can make these changes using the `Advanced` menu option on the LCD on the front panel or via serial control using the **[CPxbpsfd]** command. Flow control and duplex parameters are predefined and have no affect on ports 2 or 3. The factory default communication parameters for the projector control ports are:

Communication Parameters	
Baud rate	9600
Parity	None
Data bits	8
Stop bits	1
Flow control	None
Duplex	Full

The switcher can store ASCII or Hex command strings to an input, an output, or a preset. It can transmit these command strings out of the projector control port in two ways:

1. When an input to output switch occurs.

2. Using a serial command to force the string out, regardless of whether the switcher executed a switch.

Input and Output Codes

Each input and output can store one 60-character code for each auxiliary port. The switcher sends the output and input codes whenever you make a switch. The input code transmits first, followed by the output code.
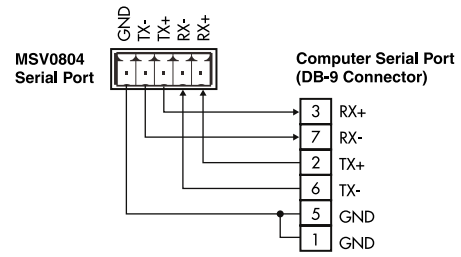
Preset Codes

Each preset can store one 60-character code for each auxiliary port. When you recall a preset, the switcher sends the codes stored with that preset.
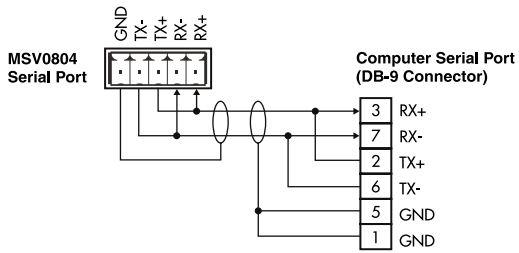
Serial Port Pin-outs

RS-232 Connection Diagram:
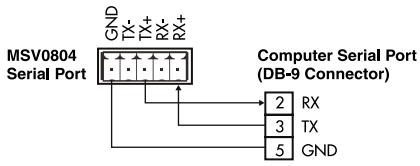
Full Duplex RS-422/485 Connection Diagram:

Half Duplex RS-485 Connection Diagram:

Serial Commands

All serial commands apply to the **MSX1616** and **MSX3216**. Both switchers follow the same command structure with the exception of command strings that designate *ii* for input assignment. For the **MSX1616**, *ii* would be **01 – 16** while the **MSX3216** *ii* would be **01 - 32**.

Addressing Commands

If you use the switcher in RS-232 mode (no other devices connected in parallel), there is no need to assign an address for this unit. If you are using multiple INLINE products connected in parallel to a single serial port using RS-422 or RS-485 communications, you must assign addresses for each unit.

The factory default for the unit is NO ADDRESS. The address for the unit must be between **01** and **98**. Address **00** is a broadcast address, and all units on the buss will perform the action commanded; however, the unit will not issue any responses.

To open communications to an addressed device you must send a [CCxx] command. All other devices on the buss will ignore commands until they are addressed

COMMAND	DESCRIPTION
[ADDR*xx*]	Assigns an address to the unit, 01 to 98. Address 99 is reserved for future products. • Where o *xx* = 01 - 98
[ADDR@]	Removes an address from the unit. This is the factory default, and is the typical way to use the switcher when in the RS-232 mode
[ADDR?]	Query unit for a pre-assigned address.
[CC*xx*]	Connects controller to the addressed unit. 00 is a broadcast address thus all connected devices will perform commands. Use this command in conjunction with the [ADDRxx] command string. • Where o *xx* = 01 - 98 **Note:** This command string is case sensitive.

Set-Up Commands

These commands are for configuring the switcher and only need to be sent once. If using a third party control system, most commands in this section should be placed in the start-up section of the program.

COMMAND	DESCRIPTION
[ARC]	Request for model and version information.
[CPx@]	Re-sets a specific port to default of 9600, 8, N and 1. • Where ○ *x* = 1 - 3 for specific port
[CPx?]	Query a specific port for current settings. • Where ○ *x* = 1 - 3 for specific port

[CP*xbpsfd*]	Configures a specific port for baud rate, parity, stop bits, flow control and duplex.
	• Where
	    ○ *x* = 1 - 3 for specific port
	    ○ *b* = 0 for 1200, 1 for 2400, 2 for 4800, 3 for 9600, 4 for 19200, 5 for 38400
	    ○ *p* = 0 for no parity, 1 for odd parity, 2 for even parity
	    ○ *s* = 0 for 1 stop bit, 1 for 2 stop bits
	    ○ *f* = 0 to disable flow control, 1 to enable flow control
	    ○ *d* = 0 for full duplex and 1 for half duplex

[DFLT*x*]	Performs factory reset. The partial reset will default I/O configurations, volume levels and serial set-up, but does not reset projector codes and/or presets. A full reset will reset all parameters including projector codes and presets, and will take up to 2 minutes. • Where ○ *x* = 0 for partial reset, 1 for full reset

[FP*x*]	Enable/disable front panel control and request current status.
	• Where
	    ○ *x* = 0 to disable, 1 to enable
	    ○ *x* = ? to request current state
	    ○ *x* = (left blank) to toggle current state

[LBLI*iiabcde…*]	Allows for custom labeling to be displayed on LCD for all inputs, up to 20 characters
	• Where
	    ○ *ii* = 01 – 16 for input
	    ○ *abcde* = custom label up to 20 characters, ? to query

[LBLO*ooabcde…*]	Allows for custom labeling to be displayed on LCD for all outputs, up to 20 characters.
	• Where
	    ○ *oo* = 01 - 16 for output
	    ○ *abcde* = custom label up to 20 characters, ? to query

[RES*x*]	Enable/disable serial responses from switcher. • Where ○ *x* = 0 to disable, 1 to enable, ? to query

COMMAND	DESCRIPTION
[**RGB**xx]	RGB delay provides an adjustable delay time between switching sync and RGB boards. • Where ○ *x.x* = 0.0 – 6.0 in .1 seconds intervals, ? to query
[**VIS**x]	Enable/Disable Vertical Interval Switching. Requires sources to be Genlocked. Contact Inline Inc. For specific application support. • Where *x* = 0 to disable, 1 to enable, ? to query

Level Commands

Level commands are a command subset that involves the assigning of boards into switching levels. Levels can consist of combinations of R, G, B, HV and audio boards. You can access six assignable levels via the front panel or serial control. For commands that use level designators, see **Switching Commands** and **Volume Commands.**

Default Levels include:

- Level 1 - RGBHVA

- Level 2 - RGBHV

- Level 3 - Audio

- Level 4-6 - No Boards

COMMAND	DEFINITION
[**LVL**x]	Sets current working level of switcher. • Where ○ *x* = 1 - 6, x = ? query
[**LVL??**]	Queries all levels.

[**LVL**xyyy]	Assigns individual boards to a specific level.
	• Where
	    ○ *x* = 1 - 6
	    ○ *yyy* = RGBHVA for all boards
	    ○ *yyy* = RGBHV for RGB and sync
	    ○ *yyy* = RGB for RGB only
	    ○ *yyy* = SYNC for sync only
	    ○ *yyy* = AUD for audio only
	    ○ *yyy* = RONLY for red only
	    ○ *yyy* = GONLY for green only
	    ○ *yyy* = BONLY for blue only
	    ○ *yyy* = NO for no boards

Switching Commands

These commands can either initiate a one-input-to-one-output switch or load an entire I/O configuration. You must fallow all "load" commands (identified by [L….]) by a [TAKE] command to initiate switch.

COMMAND	DESCRIPTION

[MSxO*oo*I*ii*]	Executes a matrix switch of an input to an output for a specific level.
	 • Where
	    ○ *x* = 1 - 6 for specific level
	    ○ *oo* = 01 – 16 for output
	    ○ *ii* = 00 – 16 for input (00 = blank)
	 Example:
	 • Desired Action:
	    ○ On Level 1, Patch Output 13 to Input 8
	 • Required Code:
	    ○ [MS1O13I08]

[MSxO*oo*?] [MSx?]	Returns the current connections for Level x

[LMS,x,aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn,oo,pp]	Preloads an I/O configuration for a specific level. Each output has a two-character placeholder for an input assignment to that output. Inserting 00 will blank the output.A [TAKE] command must be sent to execute switches.
	 • Where
	    ○ *x* = 1 - 6 for specific level
	    ○ *aa* = 00 – 16 designating an input to assign to output 1
	    ○ *bb* = 00 – 16 designating an input to assign to output 2
	    ○ *cc* = 00 – 16 designating an input to assign to output 3
	    ○ *dd* = 00 – 16 designating an input to assign to output 4
	    ○ *ee* = 00 – 16 designating an input to assign to output 5
	    ○ *ff* = 00 – 16 designating an input to assign to output 6
	    ○ *gg* = 00 – 16 designating an input to assign to output 7
	    ○ *hh* = 00 – 16 designating an input to assign to output 8
	    ○ etc.

[LMS,l?]	Query pre-loaded configuration • l = 1 – 6 for specific level
[LMS,?]	Queries all levels.
[TAKE]	Causes previously loaded parameters to take effect.

COMMAND	DESCRIPTION
ss[BLANK*oo*]	Blanks a specific output. • Where ○ *oo* = 01 – 16 for output

Volume Commands

These commands control volume levels for both inputs and outputs. You can adjust input volume levels to minimize drastic changes in volume when performing switches. As with switching commands, all "load" commands, identified by [L…], require a [TAKE] command to execute changes.

COMMAND	DESCRIPTION

[MUTE*oox*]	Used to mute/un-mute a specific output and request current status.
	• Where
	    ○ *oo* = 01 – 16 for output
	    ○ *x* = 0 to disable mute, 1 to enable mute
	    ○ *x* = ? to request current state
	    ○ *x* = (left blank) to toggle current state

[MUTE]	Toggle mute/un-mute all outputs
[MUTE?]	Queries all mutes.
[VOL+]	Increase volume for all outputs
[VOL-]	Decrease volume for all outputs
[VOL@]	Restores factory default to all outputs
[VOL?]	Queries all volume levels.

[VOL*oox*]	Increments/decrements volume level for a specific output.
	• Where
	    ○ *oo* = 01 – 16 for output
	    ○ *x* = + (plus sign) to increment output volume
	    ○ *x* = - (minus sign) to decrement output volume
	    ○ *x* = @ to return output volume to factory default
	    ○ *x* = ? to request current volume level

[VOL*ooxxx*]	Sets volume level for a specific output in dB. The range is -55.0 dB - +9.0 dB.
	• Where
	    ○ *oo* = 01 – 16 for output
	    ○ *xxx* = -550 to 90
	Note: Level is set in .5 dB steps. For example, -23.5 dB is entered as -235.

COMMAND	DESCRIPTION

[VOLL*oox*]	Increments/decrements left channel volume level for a specific output.
	• Where
	    o *oo* = 01 – 16 for output
	    o *x* = + (plus sign) to increment output volume
	    o *x* = - (minus sign) to decrement output volume
	    o *x* = @ to return output volume to factory default (0 dB)
	    o *x* = ? to request current volume level

[VOLL?]	Queries all left volumes.

[VOLL*ooxxx*]	Sets left channel volume level for a specific output.
	• Where
	    o *oo* = 01 – 16 for output
	    o *xxx* = -550 to 90
	Note: Level is set in .5 dB steps . For example, –23.5 dB is entered as -235

[VOLR*oox*]	Increments/decrements right channel volume level for a specific output.
	• Where
	    o *oo* = 01 – 16 for output
	    o *x* = + (plus sign) to increment output volume
	    o *x* = - (minus sign) to decrement output volume
	    o *x* = @ to return output volume to factory default (0 dB)
	    o *x* =? to request current volume level

[VOLR?]	Queries all right volumes.

[VOLR*ooxxx*]	Sets right channel volume level for a specific output.
	• Where
	    o *oo* = 01 – 16 for output
	    o *xxx* = -550 to 90
	Note: Level is set in .5 dB steps, for example, –23.5 dB is entered as -235

[VOLRMP*oox*]	Starts volume ramp of a specific output. Volume gradually increases/decreases
	• Where
	    o *oo* = 01 – 16 for output
	    o *x* = + (plus sign) for volume ramp up
	    o *x* = - (minus sign) for volume ramp down

[VOLSTOP]	Stop volume ramp function.
[VIN@]	Restores Factory Default for all Input volume levels (0 dB)
[VIN+/-]	Increments/decrements all input volume levels.
[VIN?]	Queries all input volume levels.

COMMAND	DESCRIPTION

[VIN*iix*]	Increments/decrements input volume level for a specific input.
	• Where
	    ○ *ii* = 01 – 16 for input
	    ○ *x* = + (plus sign) to increment input volume
	    ○ *x* = - (minus sign) to decrement input volume
	    ○ *x* = @ to return input volume to factory default (0 dB)
	    ○ *x* = ? to request current volume level

[VIN*iixxx*]	Increments/decrements input volume level for a specific input.
	• Where
	    ○ *oo* = 01 – 16 for input
	    ○ *xxx* = -640 - 0
	Note: 0 equals max (+0.0 db), -640 equals minimum (-55.0 dB)

[LMUTE,*a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,*]	Preload mute state for all outputs.
	Must send a [TAKE] command to execute changes.
	• Where
	    ○ *a* = 0 to disable, 1 to enable for output 1
	    ○ *b* = 0 to disable, 1 to enable for output 2
	    ○ *c* = 0 to disable, 1 to enable for output 3
	    ○ *d* = 0 to disable, 1 to enable for output 4
	    ○ *e* = 0 to disable, 1 to enable for output 5
	    ○ *f* = 0 to disable, 1 to enable for output 6
	    ○ *g* = 0 to disable, 1 to enable for output 7
	    ○ *h* = 0 to disable, 1 to enable for output 8
	    ○ etc.

[LMUTE,?]	Queries all LMUTE commands.

[LVOL,*aaa,bbb,ccc,ddd,ee,efff,ggg,hhh,iii,jjj,kk,lll,mmm,nnn,ooo,ppp*]	Preload output volume level for all outputs.
	Must send a [TAKE] command to execute changes.
	• Where
	    ○ *aaa* = -550 to 90 for output 1
	    ○ *bbb* = -550 to 90 for output 2
	    ○ *ccc* = -550 to 90 for output 3
	    ○ *ddd* = -550 to 90 for output 4
	    ○ *eee* = -550 to 90 for output 5
	    ○ *fff* = -550 to 90 for output 6
	    ○ *ggg* = -550 to 90 for output 7
	    ○ *hhh* = -550 to 90 for output 8
	    ○ etc.
	Note: Level is set in .5 dB steps. For example, –23.5dB is entered as -235

[LVOL,?]	Queries any previously loaded LVOL commands.

COMMAND	DESCRIPTION

[LVOLL,*aaa,bbb,ccc,ddd,eee,fff, ggg,hhh,iii,jjj,kkk,lll,mmm,nnn,o oo,ppp*]	Preload left channel output volume level for all outputs. Must send a [TAKE] command to execute changes.
	• Where
	    ○ *aaa* = -550 to 90 for output 1
	    ○ *bbb* = -550 to 90 for output 2
	    ○ *ccc* = -550 to 90 for output 3
	    ○ *ddd* = -550 to 90 for output 4
	    ○ *eee* = -550 to 90 for output 5
	    ○ *fff* = -550 to 90 for output 6
	    ○ *ggg* = -550 to 90 for output 7
	    ○ *hhh* = -550 to 90 for output 8
	    ○ etc.
	Note: Level is set in .5 dB steps . For example, – 23.5dB is entered as -235

[LVOLL,?]	Queries any previously loaded LVOLL commands.

[LVOLR,*aaa,bbb,ccc,ddd,eee,fff, ggg,hhh,iii,jjj,kkk,lll,mmm,nnn,o oo,ppp*]	Preload right channel output volume level for all outputs. Must send a [TAKE] command to execute changes.
	• Where
	    ○ *aaa* = -550 to 90 for output 1
	    ○ *bbb* = -550 to 90 for output 2
	    ○ *ccc* = -550 to 90 for output 3
	    ○ *ddd* = -550 to 90 for output 4
	    ○ *eee* = -550 to 90 for output 5
	    ○ *fff* = -550 to 90 for output 6
	    ○ *ggg* = -550 to 90 for output 7
	    ○ *hhh* = -550 to 90 for output 8
	    ○ etc.
	Note: 90 equals max (+9.0 db), 000 equals factory default (0 db), -550 equals minimum (-55db)

[LVOLR,?]	Queries any previously loaded LVOLR commands.

Auxiliary Commands

The **MSX1616** contains two auxiliary communications ports, port 2 and port 3 (see **Setup Commands** to properly configure ports). You can use both ports to control other devices or equipment that accept RS232/RS-422/RS-485 command strings. The switcher can store command strings to an input, an output and/or presets (see **Preset Commands**). It can force these commands out or send them when it executes an input, output, or preset.

COMMAND	DESCRIPTION

[PCP*px*]	Enable/disable projector port.
	• Where
	    ○ *p* = 2 for port 2, 3 for port 3
	    ○ *x* = 0 to disable, 1 to enable, ? to query

COMMAND	DESCRIPTION
[PCH*p*I*ii*abcde] **[PCH*p*I*ii*?]**	Loads hex command string to an input up to 60 characters. • Where o *p* = 2 for port 2, 3 for port 3 o *ii* = 01 – 16 for input o *abcdef*… = hex string to be stored o *abcdef* = ?, queries current label
[PCH*p*O*oo*abcde] **[PCH*p*O*oo*?]**	Loads hex command string to an output up to 60 characters. • Where o *p* = 2 for port 2, 3 for port 3 o *oo* = 01 – 16 for output o *abcdef*… = hex string to be stored o *abcdef* - ?, queries current label
[PCH*p*P*mmm*abcde] **[PCH*p*P*mmm*?]**	Loads hex command string to a preset up to 60 characters. • Where o *p* = 2 for port 2, 3 for port 3 o *mmm* = 001 - 256 for preset o *abcdef*… = hex string to be stored o *abcdef* - ?, queries current label
[PCL*p*I*ii*abcde] **[PCL*p*I*ii*?]**	Loads ASCII command string to an input up to 60 characters. • Where o *p* = 2 for port 2, 3 for port 3 o *ii* = 01 – 16 for input o *abcdef*… = hex string to be stored o *abcdef* - ?, queries current label **Note:** When controlling Inline products that also use brackets as delimiters, replace open bracket [with ' and closed bracket] with " in the abcde… portion of the command. When this command is sent out the command port the 'will automatically be replaced with []. "
[PCL*p*O*oo*abcde] **[PCL*p*O*oo*?]**	Loads ASCII command string to an output up to 60 characters. • Where o *p* = 2 for port 2, 3 for port 3 o *oo* = 01 – 16 for output o *abcdef*… = hex string to be stored o *abcdef* - ?, queries current label **Note:** When controlling Inline products that also use brackets as delimiters, replace open bracket [with ' and closed bracket] with " in the abcde… portion of the command. When this command is sent out the command port the ' " will automatically be replaced with [ ].

COMMAND	DESCRIPTION

[PCL*pP*mmm*abcde*]
[PCL*pP*mmm?]
	Loads ASCII command string to a preset up to 60 characters.
	   • Where
	       o *p* = 2 for port 2, 3 for port 3
	       o *mmm* = 001 - 256 for preset
	       o *abcdef…* = hex string to be stored
	       o *abcdef* - ?, queries current label
	Note: When controlling Inline products that also use brackets as delimiters, replace open bracket [with ' and closed bracket] with " in the abcde… portion of the command. When this command is sent out the command port the ' " will automatically be replaced with [ ].

[PCC*p*I*ii*]	Forces command string loaded to a specific input to be sent.
	   • Where
	       o *p* = 2 for port 2, 3 for port 3
	       o *ii* = 01 – 16 for input

[PCC*p*O*oo*]	Forces command string loaded to a specific output to be sent.
	   • Where
	       o *p* = 2 for port 2, 3 for port 3
	       o *oo* = 01 – 16 for output

[PCC*p*P*mmm*]	Forces command string loaded to a specific preset to be sent.
	   • Where
	       o *p* = 2 for port 2, 3 for port 3
	       o *mmm* = 001 – 256 for preset

[PCPD*pxx*]	Sets projector code delay to a defined period.
	   • Where
	       o *p* = 2 for port 2, 3 for port 3
	       o *x* = 0 for a 0 second delay
	       o *x* = 1 for a 1 msec. delay
	       o *x* = 2 for a 5 msec. delay
	       o *x* = 3 for a 10 msec. delay
	       o *x* = 4 for a 20 msec. delay
	       o *x* = 5 for a 50 msec. delay
	       o *x* = 6 for a 100 msec. delay, x = ? to query

[PRST]	Resets all projector command codes to null.

Preset Commands

The **MSX1616** has the ability to store and recall common configurations. Both units offer **256** presets available via serial control. The **MSX3216** has **48** presets available via the front panel, while the **MSX1616** has **32** presets available via the front panel.

COMMAND	DESCRIPTION

[PSV*xxx*]	Save current configuration to preset memory.
	   • Where
	       o *xxx* = 001 – 256

[PRC*xxx*]	Recall stores configuration from preset memory.
	   • Where
	       o *xxx* = 001 – 256

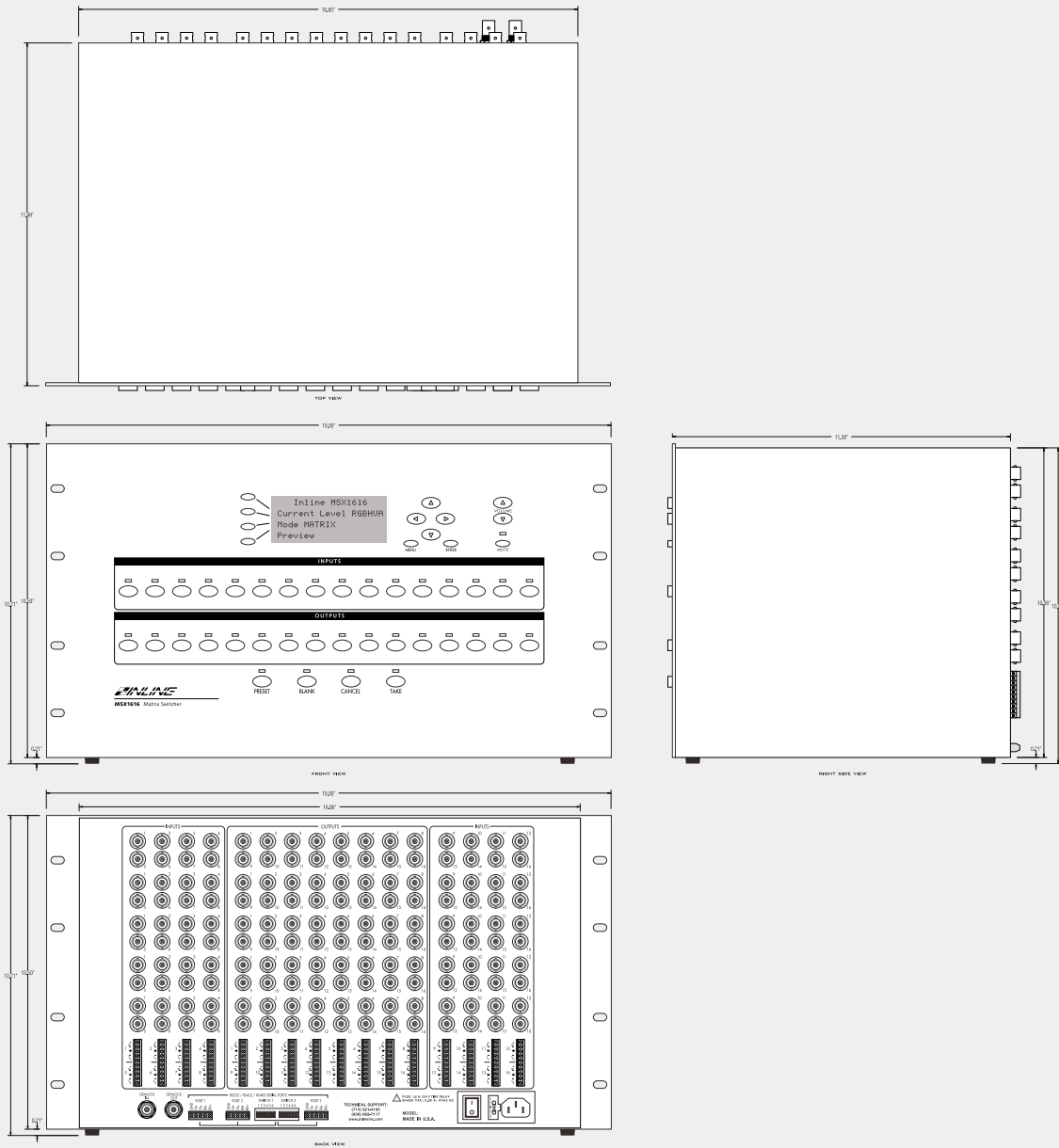| COMMAND	DESCRIPTION
[PSV*xxx*@]	This command will delete all I/O configurations previously stored to this preset. This command does not delete any projector codes stored to the preset and thus allows the preset to strictly send out command strings and to have no effect on current I/O configuration. • Where ○ *xxx* = 001 – 256

Preset Label Commands

The **MSX1616** has the ability to store preset label commands up to 20 characters in length.

COMMAND	DESCRIPTION
[PLBLIxxxabcd...] **[PLBL2xxxabcd...]**	Up to 20 characters
[PLBL1xxx?] **[PLBL2xxx?]**	Queries preset labels.
[PSV?]	Lists first 32 (16 x 16) or 48 (32 x 16) presets. Returns a "1" if a preset has been saved and a "0" if it has not been saved.

TOP VIEW

    Inline MSX1616
    Current Level RGBHVA
    Mode MATRIX
    Preview

INPUTS

OUTPUTS

PRESET   BLANK   CANCEL   TAKE

MSX1616 Matrix Switcher

FRONT VIEW

RIGHT SIDE VIEW

INPUTS   OUTPUTS   INPUTS

BACK VIEW

Warranty

- INLINE warrants the equipment it manufactures to be free from defects in materials and workmanship.

- If equipment fails because of such defects and INLINE is notified within three (3) years from the date of shipment, INLINE will, at its option, repair or replace the equipment at its plant, provided that the equipment has not been subjected to mechanical, electrical, or other abuse or modifications.

- Equipment that fails under conditions other than those covered will be repaired at the current price of parts and labor in effect at the time of repair. Such repairs are warranted for ninety (90) days from the day of re-shipment to the Buyer.

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