

Smart-**AVI**

SMART AUDIO VIDEO INNOVATION

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Many industry-leading companies have recognized the innovation and power of SmartAVI's technologies and have successfully implemented them within their systems. Users of SmartAVI technology include:



Smart-**AVI**

SMART AUDIO VIDEO INNOVATION

DVR16X16



16-port DVI-D Matrix Switch with Front Panel, RS-232, and TCP/IP Control

USER MANUAL

WHAT'S IN THE BOX?

PART NO.	QTY.	DESCRIPTION
DVR16x16S	1	DVI-D 16x16 Router. Includes: [DVR16x16 & CCPWR06USA]
User Manual	1	

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LIMITED WARRANTY STATEMENT

A. Extent of limited warranty

1. SmartAVI Technologies, Inc. warrants to the end-user customers that the SmartAVI product specified above will be free from defects in materials and workmanship for the duration of 1 year, which duration begins on the date of purchase by the customer. Customer is responsible for maintaining proof of date of purchase.
2. SmartAVI limited warranty covers only those defects which arise as a result of normal use of the product, and do not apply to any:
 - a. Improper or inadequate maintenance or modifications
 - b. Operations outside product specifications
 - c. Mechanical abuse and exposure to severe conditions
3. If SmartAVI receives, during applicable warranty period, a notice of defect, SmartAVI will at its discretion replace or repair defective product. If SmartAVI is unable to replace or repair defective product covered by the SmartAVI warranty within reasonable period of time, SmartAVI shall refund the cost of the product.
4. SmartAVI shall have no obligation to repair, replace or refund unit until customer returns defective product to SmartAVI.
5. Any replacement product could be new or like new, provided that it has functionality at least equal to that of the product being replaced.
6. SmartAVI limited warranty is valid in any country where the covered product is distributed by SmartAVI.

B. Limitations of warranty

TO THE EXTENT ALLOWED BY LOCAL LAW, NEITHER SMARTAVI NOR ITS THIRD PARTY SUPPLIERS MAKE ANY OTHER WARRANTY OR CONDITION OF ANY KIND WHETHER EXPRESSED OR IMPLIED, WITH RESPECT TO THE SMARTAVI PRODUCT, AND SPECIFICALLY DISCLAIM IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE

C. Limitations of liability

To the extent allowed by local law the remedies provided in this warranty statement are the customers sole and exclusive remedies

TO THE EXTENT ALLOWED BY LOCAL LAW, EXCEPT FOR THE OBLIGATIONS SPECIFICALLY SET FORTH IN THIS WARRANTY STATEMENT, IN NO EVENT WILL SMARTAVI OR ITS THIRD PARTY SUPPLIERS BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY AND WHETHER ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

D. Local law

To the extent that this warranty statement is inconsistent with local law, this warranty statement shall be considered modified to be consistent with such law.

INTRODUCTION

SmartAVI's non-blocking DVR16X16 digital video matrix switch provides an easy and dynamic approach to switching the DVI output from up to 16 computers, to up to 16 displays. The matrix configuration provides maximum flexibility, allowing switching between any digital video source and/or display. The DVR 16x16 provides digital video output up to 30 feet and at resolutions up to 1920 x 1200. The switching can be controlled directly via the front panel, or remotely using RS-232 commands, IR, or TCP/IP (optional). The DVR16X16 is controlled by Windows® -based software that is easy to understand and simple to use – a cornerstone of all SmartAVI products.

FEATURES

- Multiple EDID support
- Supports EDID learning from any display
- Increases productivity by providing access to up to 16 computers from 16 work stations
- 16 x 16 non-blocking, single-link DVI-D matrix switch
- Automatic output pre-emphasis and drive level
- Automatic receiver equalization
- Supports DVI operation at the maximum rate of 2 x 1.65 Gbps
- Supports resolutions up to 1920 x 1200
- Switching controlled via the front panel or RS-232
- Optional IR remote control
- Optional TCP/IP control (using SMTCP-2 or NET-IP-PRO)
- Easy-to-use Windows®-based software

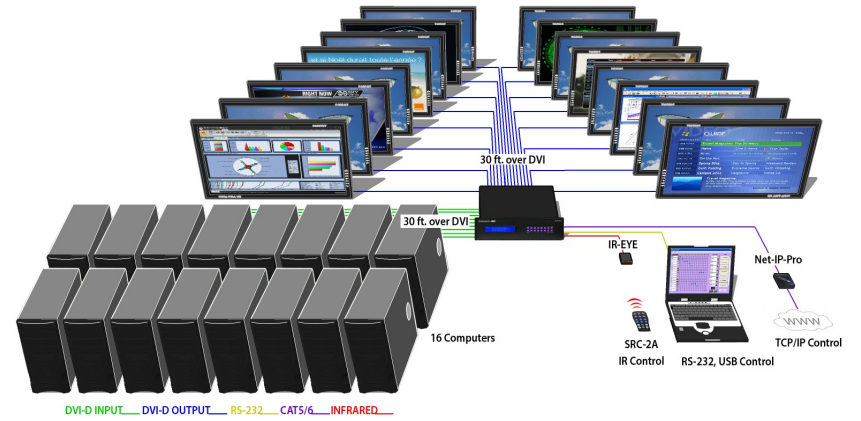
TECHNICAL SPECIFICATIONS

VIDEO	
Format	DVI-D Single Link
Maximum Pixel Clock	165 MHz
Input Interface	(16) DVI-I 29-pin female
Output Interface	(16) DVI-I 29-pin female
Resolution	Up to 1920 x 1200
DDC	5 volts p-p (TTL)
Input Equalization	Automatic
Input Cable Length	Up to 30 ft.
Output Cable Length	Up to 30 ft.

OTHER	
Warranty	Limited 1 Year Parts and Labor
Control	Panel, RS-232, IR, USB and TCP/IP
Power	Internal 100-240 VAC
Dimensions	19"W x 5.25"H (2U) x 7"D
Weight	10 lbs.
HDR 16X16 Approvals	FCC, CE, RoHS Compliant
Power Supply Approvals	UL, CE, CSA, CEC, RoHS

ENVIRONMENTAL	
Operating Temperature	0 to +40° C (+32° to 104° F)
Operating Humidity	10% to 85% (Non-condensing)
Storage Temperature	-20° to +60° (+20° to +140° F)
Storage Humidity	10% to 85% (Non-condensing)

APPLICATION DIAGRAM

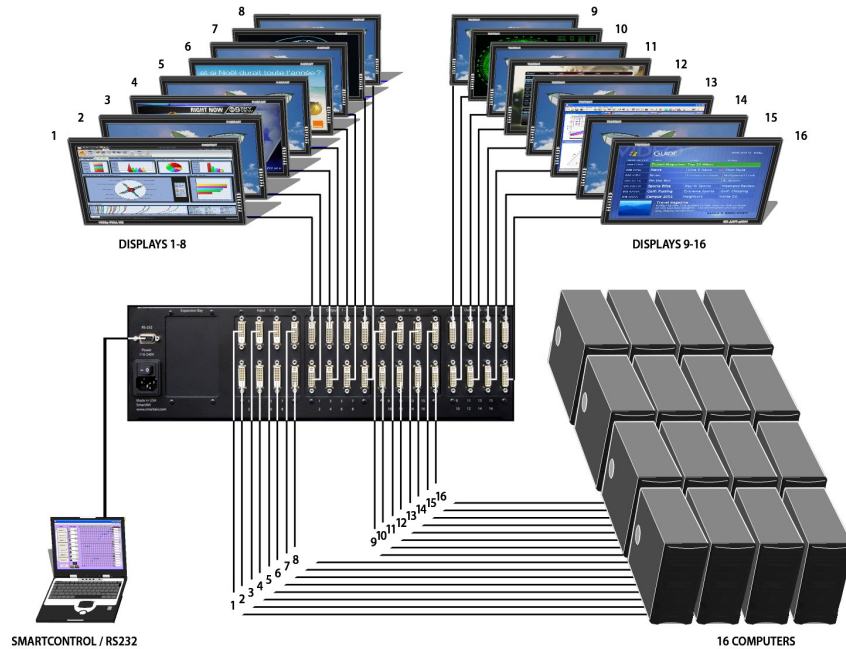


APPLICATIONS

- Corporate or Educational Presentations
- Airport Installations
- Wall Displays
- Digital Signage
- Dealer Rooms
- Control Rooms
- Shopping Centers
- Security
- Point-of-Sale
- Hotels/Resorts

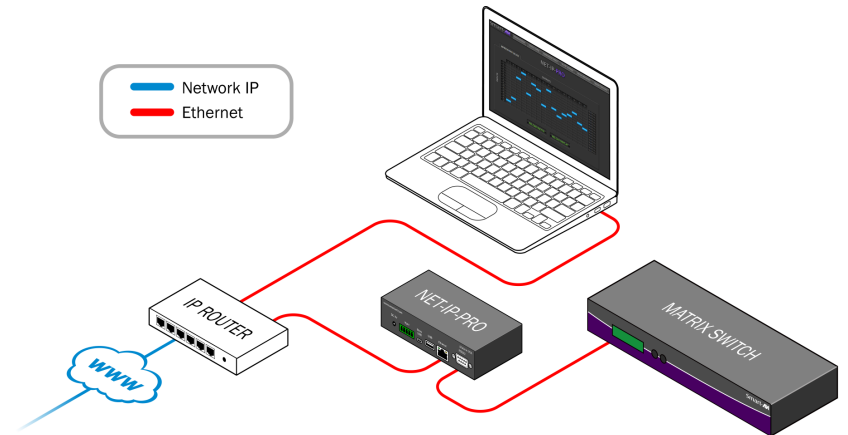
HARDWARE INSTALLATION

1. Turn off all the computers and displays.
2. Connect the male to male DVI cables from the computers to the DVI *input* ports on the rear of the DVR16x16.
3. Connect the DVI displays to the *output* ports on the rear of the DVR16x16.
4. Connect the power cord and power-on the DVR16x16.
5. Power on the computers and the displays.



USING NET-IP-PRO MODULE (TCP/IP CONTROL)

The NET-IP-PRO is an RS-232 control module that allows most SmartAVI switching matrixes to be controlled remotely via HTTP or TELNET. Manage the switching functions of your matrix with ease from anywhere in the world. With NET-IP-PRO you can save input/output configuration presets for easy access. TELNET access provides transparent command control of your matrix, perfect for use with automated third-party control software.



For more information about the NET-IP-PRO, visit www.smartavi.com.

CONTROLLING THE HDR8X8/HDR16X16

There are multiple ways to control the DVR: via the front panel, via the SmartControlPro software, via RS-232 commands (using third-party software such as AMX, Crestron), and with a TCP-IP module

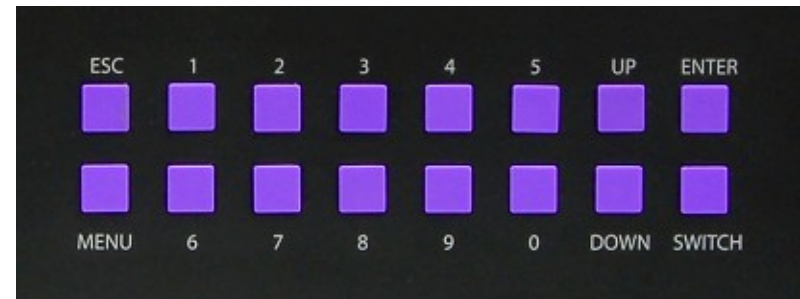
USING RS-232 CONTROL (continued)

NOTES:

- When successful, commands #1-5 will acknowledge by sending the checksum with nibbles swapped & <CR><LF>
e.g. checksum of 0x24 acknowledges with <0x42><CR><LF>
- All bytes in examples are ASCII characters unless they are contained in brackets <>
- Calculating the Checksum: <CHK> stands for CHECKSUM: the <CHK> value is calculated by performing an XOR of the full command string
*For example: //FOOM12I03 will XOR to the hexadecimal value 0x42, therefore the value of <CHK> is 0x42
- <CHK> is the logical exclusive OR (XOR) of all previous bytes.
- <CR> is carriage return (0x0D), all commands sent from PC end with <CR>.
- <LF> is line feed (0x0A)
- xx is the frame address of the router e.g. "00" or "01"
From the factory the address is always "00", however it can be changed with command #5 above.
- yy is the Output (monitor) number. e.g. "01"
- zz is the Input number. e.g. "06" or "16"
- nn is the Matrix's new frame address

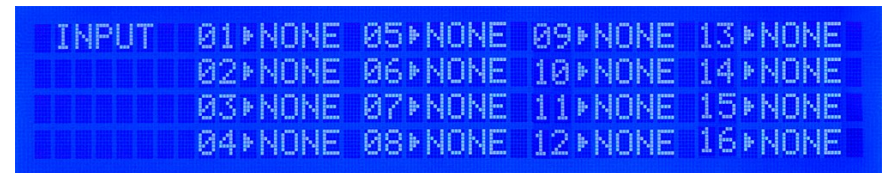
USING THE FRONT PANEL CONTROL

Front Panel Buttons



To lock the front panel buttons to avoid any accidental changes, press ESC + MENU + ENTER + SWITCH at the same time. The display will indicate that it is locked. Repeat the procedure to unlock the front panel.

During normal operation, you will see a list of ports on the front panel display.



Default Display

To assign an output to an input, press SWITCH. A blinking block cursor will appear. Use UP and DOWN to select the input that you would like to assign. Once the cursor is over the desired input port, press ENTER to enter editing mode. Press UP and DOWN to select the output port. Once you have selected an output, press ENTER to save the configuration. To escape from editing mode, press ESC.

Main Menu

To view the menu, press MENU. There are 6 menu options available:

```
MENU    ▶Manage EDID
         RS-232 Acknowledge ON
         Send Update OFF
         Memory Save ON
```

```
MENU    ▶Display Input Status
         Restore Factory Settings
         Manage EDID
         RS-232 Acknowledge ON
```

Manage EDID - Gives the option to learn the EDID of your display or choose

```
Press number to make selection.
 1) Learn EDID from monitor.
 2) Learn 1920x1080 EDID.
 3) Learn 1920x1200 EDID  ESC to exit
```

a programmed EDID that is compatible with your monitor.

RS-232 Acknowledge - Sets the DVR16x16 to send a confirmation that an RS-232 command has been received.

Send Update - Sets the DVR16X16 to send an RS-232 command back to the controller when the configuration is changed via the front panel or remote control (optional).

Memory Save - Sets the DVR16X16 to save the configuration when powered off.

Display Input Status - This displays the status of the inputs. If no input is present, the display will read NONE. This is the default view.

Restore Factory Settings - Sets the DVR16x16 to the default factory configuration.

USING RS-232 CONTROL (continued)

- To reboot the processor:
`//BOOT<CR>`
- To restore the matrix to factory defaults:
`//RESET<CR>`
You must cycle matrix's power after this command.
- To change data switching mode to RS-232 (user sets data xpoints)
`//RS<CR>`
- To change data switching mode to IR (data follows last switch to any input)
`//IR<CR>`
- To query version number:
`//XXXX<CR>`

B. Sending commands without CHECKSUM:

- To set a video crosspoint:
`\\FxxMyyIzz<CR>`
Ex. to set video input 3 to output 12 on a router with the default frame address "0" send the command: `\\F00M12I03<CR>`
- To broadcast an input to all outputs:
`\\FxxBzz<CR>`
Ex. to broadcast input 3 to all outputs, send the command:
`\\F00B04<CR>`
- To set RS-232 crosspoint:
`\\FxxRyyIzz<CR>`
- To disconnect RS-232 crosspoint:
`\\FxxDyyIzz<CR>`
**A new method is to disconnect all: //F00D<CR>*
- To set new frame address:
`\\FxxFnn<CR>`
- To query crosspoints from PC:
`\\FxxU<CR>`

USING RS-232 CONTROL (continued)

Command Mode: allows raw commands to be sent to the DVR 16x16 to control its various functions without the use of a menu or prompt. This mode is intended for advanced use only.

There are two types of commands that you can issue the DVR 16x16:

Commands with CHECKSUM <CHK> begin with //

Commands without CHECKSUM begin with \\

A. Sending commands with CHECKSUM:

- To set a video crosspoint:
`//FxxMyyIzz<CHK><CR>`
Ex. to set video input 3 to output 12 on a router with the default frame address "0" send the command: `//F00M12I03<0x42><CR>`
- To broadcast an input to all outputs:
`//FxxBzz<CHK><CR>`
Ex. to broadcast input 3 to all outputs, send the command:
`//F00B0402<CR>`
- To set RS-232 crosspoint:
`//FxxRyyIzz<CHK><CR>`
- To disconnect RS-232 crosspoint:
`//FxxDyyIzz<CHK><CR>`
**A new method is to disconnect all: //F00D<CR>*
- To set new frame address:
`//FxxFnn<CHK><CR>`
- To query crosspoints from PC:
`//FxxU<CHK><CR>`
 - If all outputs are connected to input 1 then a 4x4 Matrix will respond with `<0x80><0x80><0x80><0x80><CR>`
 - The router will send back one byte for each output and the string ends with a <CR>. The first byte sent is Out#1. In the example above, since there are 5 bytes total, we know that there are 4 outputs.
 - To calculate the input number, the router sends the input number with the 7th bit set.
 - 0x80 = "1000 0000" >> input 0
 - 0x81 = "1000 0001" >> input 1
 - ...0x8F "1000 1111" >> input 15

USING THE SMARTCONTROL SOFTWARE

Find the Installation CD that came with your DVR16x16 unit. This CD has the SmartControlPro software that you will need in order to control the unit using a computer.

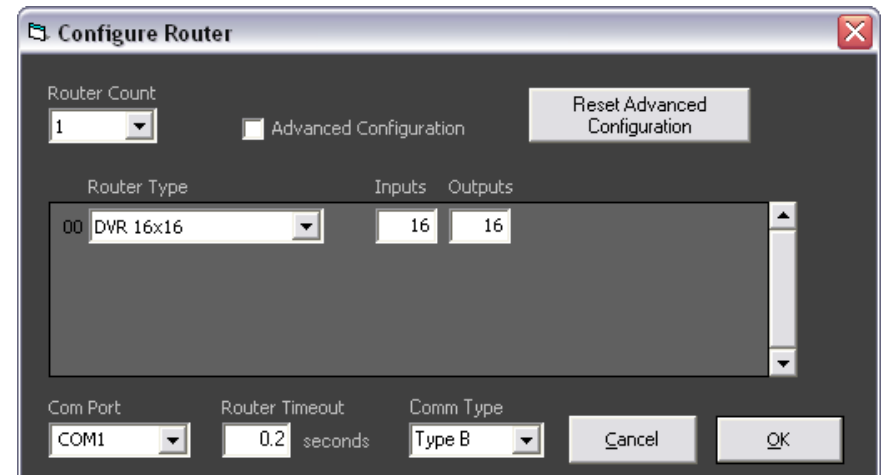
Insert the CD into your CD-ROM. On the CD you should see:

- SmartControl Pro Installer.exe
- SmartControl Pro Help File
- DVR16X16 Manual in PDF format

Double click SmartControlPro.exe in order to initiate software installation. Click Install. After installation has completed, click CLOSE.

In order to use the software, click on the *START* button > *Programs* > *SmartControlPro*. There you should see a help file, the SmartControlPro launcher as well as a shortcut to uninstall SmartControlPro. Click on SmartControlPro in order to launch the software.

When the software starts you will see a screen like this:



USING THE SMARTCONTROL SOFTWARE (continued)

Router Count: Set to the number of routers connected to the computer.

Advanced Configuration: This option is used when there is more than one router being used or when all the inputs are not looped from router to router. For most applications, this box is usually unchecked.

Reset Advanced Configuration: Returns the advanced setting to their default settings.

Router Type: Select the type of router that is connected to the computer.

Inputs: Enter the number of physical inputs on the back of the router.

Outputs: Enter the number of physical outputs on the back of the router.
Note: Inputs and outputs are automatically configured when the router type is chosen. These parameters are changed when router type is not available on the list.

COM Port: Choose the correct com port number that connects to the router.

Router Timeout: Set how many seconds the program will wait for the router to respond to commands. The default is 0.2 seconds.

Comm Type: This option is set automatically when the router type is selected.

When finish with the settings, click *OK*. This will take you to the *Main Routing Window*.

USING RS-232 CONTROL (continued)

To display the help menu for a list of commands, type “? <enter>”

```
DBG>?
=====
Command Line Interface Help:

d      Enable/Disable debug      d  [on][off]
sw     Switch Port               sw [output] 1-16 [input] 1-16
br     Broadcast Port           br  [input] 1-16
om     Set output mode          om  [output] [mode# (0-2) | ?]
o      Enable/Disable Output    o   [output] [0 = disable | 1 = enable]
q      Query Crosspoints

h      Toggle Hotplug           h   [input]
reset  Restore Factory Settings

boot  Reboot matrix

info  Display matrix info

edid  Manage EDID

help  Command list

?
```

To switch ports, type “sw [output] 1-16[input] 1-16 <enter>”:

```
DBG>sw 2 2
Switched Output 2 to Input 2
```

To set the broadcast port, type “br [input] 1-8<enter>”:

```
DBG>br 2
```

To manage the EDID modes, type “edid <enter>” and you will see the following prompt:

```
DBG>edid
EDID Mode:
EDID>
```

To learn the EDID, type “learn <enter>”:

```
EDID>learn
Successfully learned EDID!
```

To set the EDID to factory default 1920x1080, type “PC-1080 <enter>”:

```
EDID>PC-1080
Successfully learned EDID!
```

To set the EDID to factory defaults, type “PC-1200 <enter>”:

```
EDID>PC-1200
Successfully learned EDID!
```

USING RS-232 CONTROL (continued)

There are two primary modes of operation for the DVR16x16: *Command Mode* and *Debug Mode*. When connecting to the DVR16x16 via RS-232, it will start in Command Mode (see Command Mode on p. 19 for options). Debug Mode is a more user-friendly way of operating the DVR16x16 and includes instructional menus. The following section details the use of the Debug Mode.

When you connect to the DVR16X16 to a computer via an RS-232 connection, you will see the following screen (results from HDR16X16 shown):

```
SmartAVI DVR 16X16 ver 12.06.11#1
```

Debug Mode: To enter Debug Mode type “d on <enter>” and you will see the following prompt:

```
d on
Debug mode:
DBG>
```

To exit Debug Mode (and enter Command Mode) type “d off <enter>”:

```
DBG>d off
Command line debugging disabled.
Type “d on” to re-enable.
```

To display the DVR 16x16 information including cross-point data, type “info <enter>”:

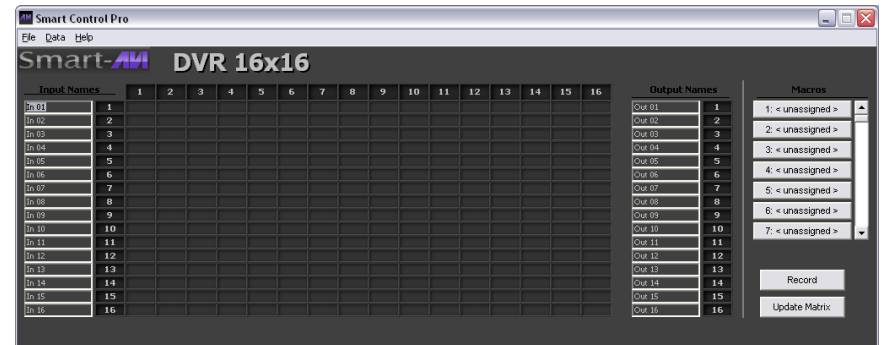
```
DBG>info
=====
SmartAVI

DVR 16X16
fw ver. 12.06.11#1
Frame Address: 0

OUT      IN      IN STATE      OUT_ENABLED
=====
1         1         DVI           YES
2         1         DVI           YES
3         1         DVI           YES
4         1         DVI           YES
5         1         DVI           YES
6         1         DVI           YES
7         1         DVI           YES
8         1         DVI           YES
...
16        1         DVI           YES
```

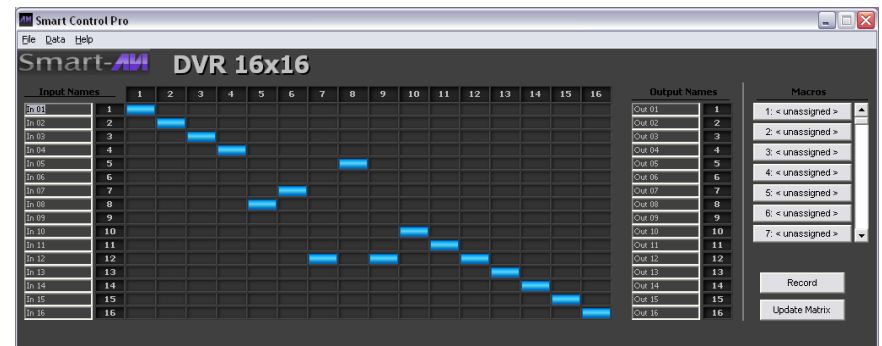
USING THE SMARTCONTROL SOFTWARE (continued)

Main Routing Window



The Main Routing Window enables you to control the router connections by means of the cross-point panel, the button panel, or with the pre-recorded routes called macros.

Cross-point Panel: Simply click on the cross point itself. The input on the left will then be routed to the output above.



Note: Inputs can be routed to several different outputs, but each output can only have a single input at any one time. So you can have several connections horizontally but not vertically.

The Button Panel: To broadcast all outputs to an input, hold the CTRL key down and click on an input.

Macros: This section of the window is used to save and play black macros. Macros store a set sequence of routes.

USING THE SMARTCONTROLPRO SOFTWARE (continued)

To record a macro:

- Click on the *Record* button. Select *Manual Save*. A blinking “Recording” message below this button will be displayed to indicate that all routes are being recorded.
- Select the desired cross-points. There is no limit on the number of routes you may record.
- If you click a macro button while in the record mode, the macro will be executed, and these routes will be added to the recording. This makes it possible to combine the routes of two or more macros into one bigger macro.
- When finished, click the *Save Macro* button. You will be instructed to then click on one of the macro buttons. Then, you will be prompted to write a name for this button. This will save the recorded routes to that button. To cancel saving the macro, click the *Cancel Save* button.
- To play back a macro, simply click on one of the 50 macro buttons. Use the scroll bar to bring any of these into view.
- The macros are automatically saved in the current configuration file. They are also saved when you select the File>Save Configuration menu.

To change the input and output names, simply click on the box next to the input/output number (located under the *Input Names* or *Output Names*) and change the text.



The *Update Matrix* button allows you to update the configuration on the main routing window based on the actual current settings on the router.

USING RS-232 CONTROL

How to properly create an RS-232 connection between a PC and most SmartAVI RS-232 compliant devices.

Establish a connection to DVR16x16:

- Connect a straight through male-to-female RS-232 cable (not included) to the RS-232 connector on the PC.
- Connect the other end of the cable to the RS-232 port of the DVR16x16.
- Power on the device.

CONNECTOR	PIN	NAME	DESCRIPTION
DB9 MALE - RECEIVE 	2	RxD	Receive Data on DB9 Male
	3	TxD	Transmit Data on DB9 Male
	5	SGND	Ground
DB9 FEMALE - TRANSMIT 	2	TxD	Transmit Data on DB9 Female
	3	RxD	Receive Data on DB9 Female
	5	SGND	Ground

Setting up the Terminal Application:

- Open Hyperterminal on the PC. (or use the terminal client of your choice)
- Use the default settings to create a connection to the device: **9600, 8, N, 1.**(see settings on right).
- Be sure that Flow Control is *None*.
- The output of the device will be the same as the PC.

