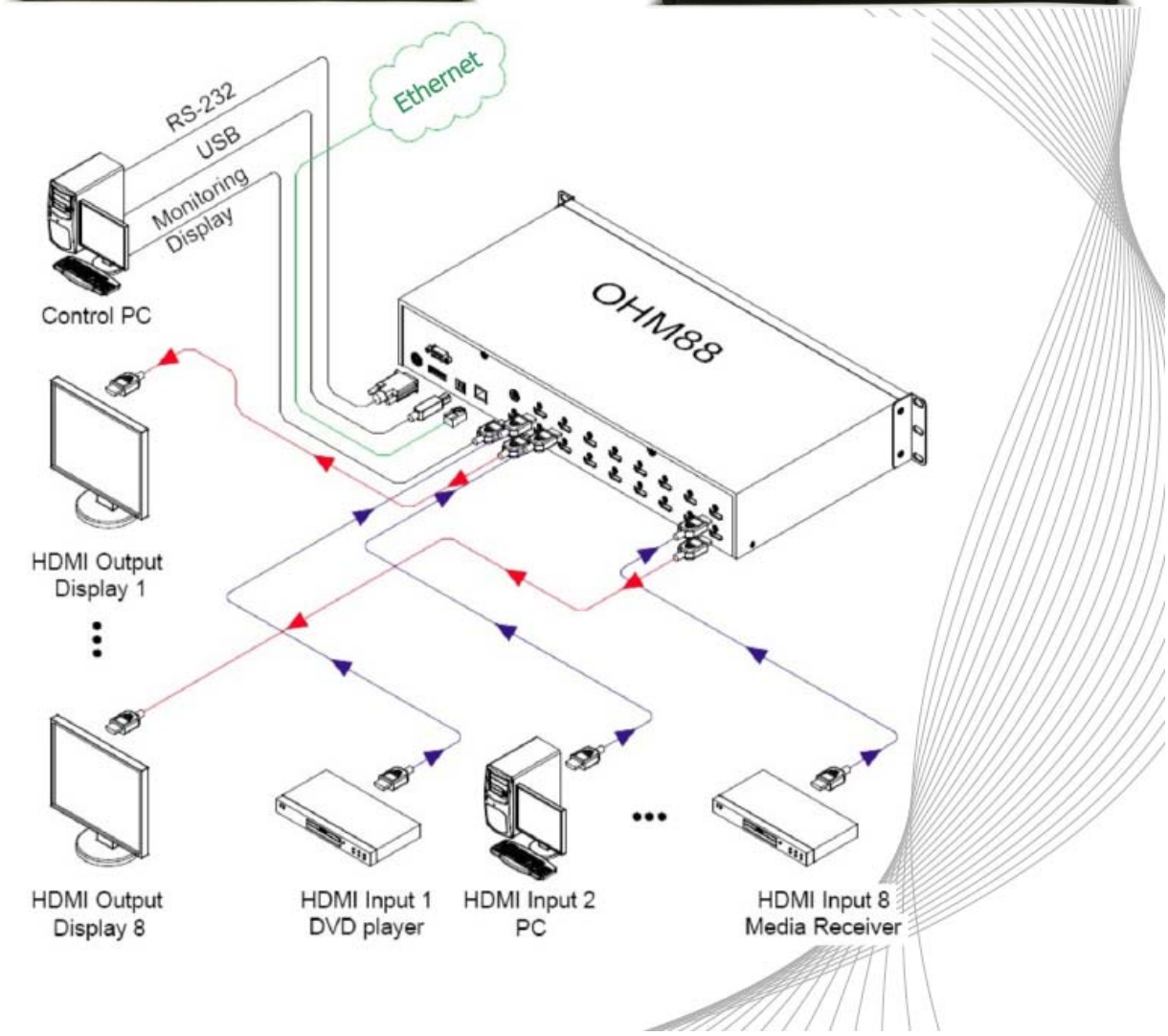
USER MANUAL

HDMI Matrix Router - OHM88 (OHM66)



USER MANUAL

HDMI MATRIX ROUTER - OHM88 (OHM66)

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1 Introduction and Installation

OHM88 is a high speed cross-switch with 8 HDMI inputs and 8 HDMI outputs housed in a ruggedized metal enclosure to protect against harsh environments.

1.1 Key features:

- Eight (8) HDMI single-link inputs and outputs
- Pixel resolution up to WUXGA (1920x1200) @ 60Hz refresh ratio – with 1.65Gbps transmission bandwidth
- Dynamic EDID management – adapts to overall power management of the system
  - Restores the default EDID to Input port
  - Reads EDID from display and stores EDID to Input port via EEPROM
- Long distance extension of HDMI Input and Output by Optical HDMI cables or modules
- Re-Clocking of R, G, B of HDMI inputs and outputs
- Various Control Interfaces:
  - Front panel key input
  - Input commands through RS232, LAN, and USB
  - Graphical user interface using Ethernet and Proprietary PC software in the shipped system
- Hierarchical connection of multiple OHM88 - up to 3 levels to increase the number of display connections or source connections
- DIP switch for up to 255 different ID settings for multiple use of OHM88 over RS232 connection
- IP setting for Ethernet – point-to-point and local network control

1.2 OHM88 Shipping Content:

- OHM88 Mainframe: 1 EA
- Hard carrying case: 1 EA
- Keys for hard carrying case: 2 EA
- AC/DC power adaptor (12V/5A, AC110V-240V): 1 EA
- AC power cord: 1 EA
- User Manual: 1 EA
- PC control software CD: 1 EA
- A plug – B plug USB cable: 1 EA
- Firmware download cable: 1 EA
- RS-232 cable (crossed type): 1 EA
- RJ-45 UTP cable (crossed type): 1 EA
- Rack ear: 2 EA

1.3 Safety Instructions

- Use of the equipment in a manner not specified by the manufacturer may result in irre-coverable damage.
- Use the assigned power cord or power adaptor shipped with the system.
- Connect the power cord to the normal and safe outlet.
- Keep the unit away from liquid, magnetic and combustible substances.
- Do not place heavy weight on the unit.
- Move away from noisy environment such as vibration or impact.
- Do not install the unit vertically.
- Do not disassemble the unit.
- When malfunction or breakdown occurs, contact factory immediately.

1.4 Physical Description

1.4.1 Front Panel

- OHM88 chassis is mountable on a 19” standard rack with rack ears. Control keys, Input-Output buttons and the status LCD display, are placed on the front panel as shown in Figure 1-1.
- Control keys: ①
  - **CREATE** – Update or Configure Input-Output setup
  - **PREVIEW** – Displays current status of Input-Output configuration
  - **CANCEL** - Resets all Outputs configured with an Input or Reject any key in-puts
  - **ENTER** - Accepts keyed inputs and completes configuration of Input-Output setup
  - **FUNCTION** - Configures IP for Ethernet, baud rate for RS232 and EDID
- Input-Output Buttons:
  - Eight (8) LED inputs: ②
  - Eight (8) LED outputs: ③
- Status display: LCD displays the control status in 20x4 text mode: ④
- POWER ON/OFF button: ⑤
- **RESET** button – Restart System ⑥

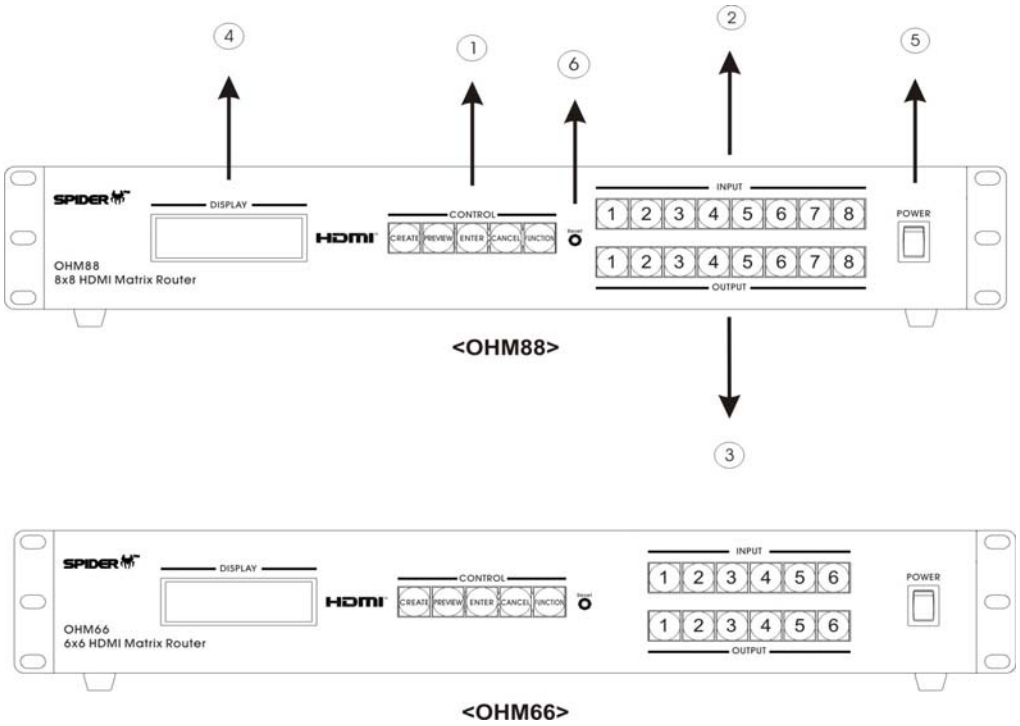


Figure 1-1 Front Panel

1.4.2 Rear Panel

- All Input ports, Output ports, interface ports and power connections are placed on the rear panel as follows;
  - Eight (8) single link HDMI inputs: ①
  - Eight (8) single link HDMI outputs: ②
  - DIP switch - 8 bits to set ID (identifier) in case of multiple connection of OHM88: ③
  - USB B type receptacle port: ④
  - RS-232 Serial port: ⑤
  - 10/100 Base Ethernet port: ⑥
  - Firmware download port: ⑦
  - DC power receptacle: ⑧
  - MONITORING HDMI port – monitors a designated source for test purpose: ⑨

[Note] For OHM88, Output #1 will be disconnected automatically when monitoring port is connected and working.

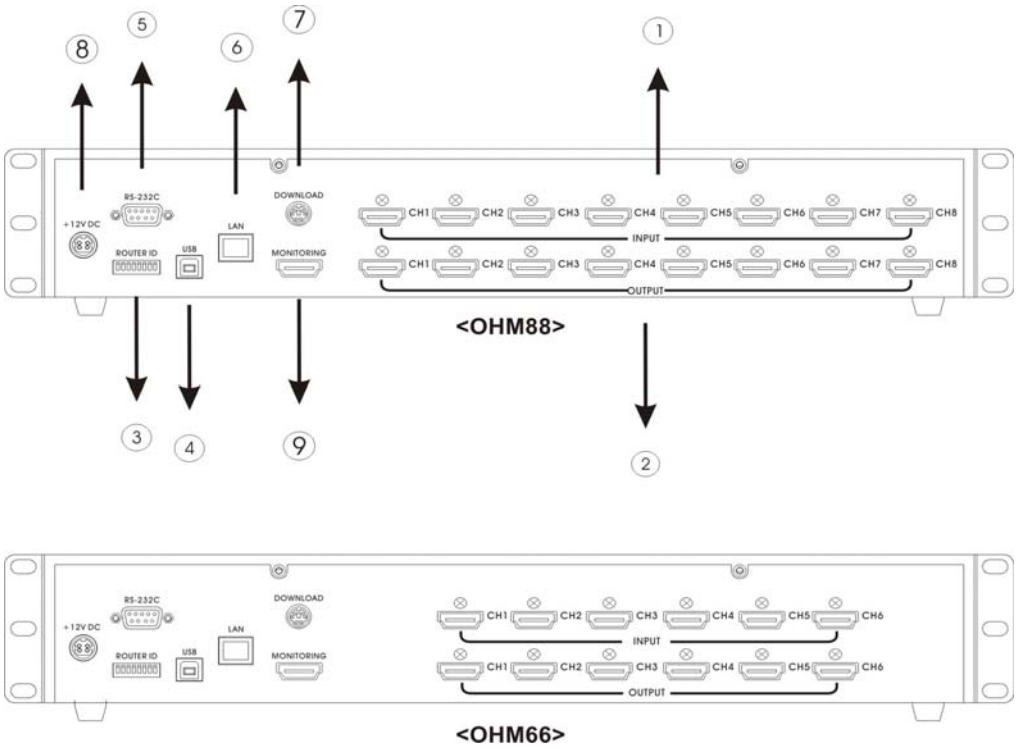


Figure 1-2 Rear Panel

1.5 EDID Control and Configuration

- EDID (Extended Display Identification Data) is an information set that is provided by a display to describe its capabilities to a graphic source. It enables a graphic source to identify the connected display.
- The information set includes: manufacturer, product type, phosphor or filter type, timings supported by the display, display size, luminance data and (for digital displays only) pixel mapping data.
- Once the graphic source reads the information set (usually during the booting process), the EDID determines the optimal format for a connected display.
- OHM88 supports storing of EDID information to an EEPROM for each Input by dedicated PC software.
- OHM88 has two-way EDID settings, default EDID from factory and direct readout of stored EDID of any target display. The default EDID setting from the factory is 720p (1280x720) @ 60Hz for all inputs.

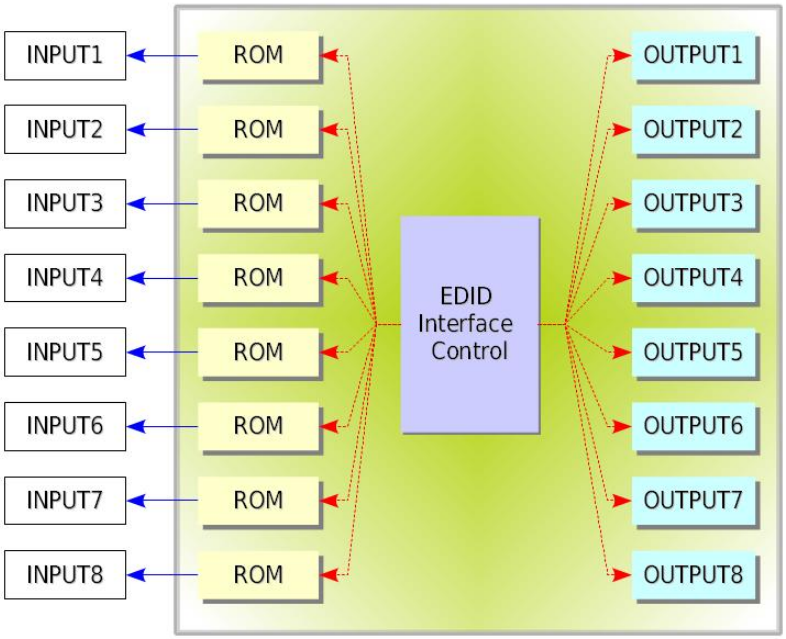


Figure 1-3 Concept drawing for setting EDID in OHM88

- As depicted in Figure 1-3, once EDID is configured, each EDID is stored in EEPROM at the front of the HDMI Input. As a result, the video sources are able to read EDID from the EEPROM during boot-up; even though the OHM88 and connected displays are not powered on yet.

1.6 Connecting Optical HDMI cables and modules for extended distance

- OHM88 supports connection of Optical HDMI cables or modules to all inputs and outputs. The use of copper HDMI cables over 3m (10ft.) is not recommended.

1.7 Initializing OHM88 and Installation Guide

1.7.1 Initialization

1) Plug the provided AC power cord to the AC/DC power adaptor then plug the DC cord to the +12VDC connector on the rear panel; make sure that the arrow mark on the connector of the DC cord is aligned.
2) Push POWER button on the front panel then observe:
   - Red LED (on the button) – will light up
   - Display – will display “Initializing … 8x8 HDMI Matrix”
   - Green and Red lights on the Input and Output – will sweep on.
   - Display – will show **“USER MODE”**
   - The system is now ready to accept commands.

1.7.2 Rack Mounting

- Before installing cables, attach two rack ears on left and right side of OHM88 using the supplied screws.

1.7.3 Control Connection

- Commands and functions of OHM88 are transferred through the RS-232 and Ethernet connection. USB connection is only valid with proprietary Windows PC Software; contained in the CD ROM provided with the system.

1.7.4 RS-232 Control

- Connect the OHM88 to a video controller or PC with the supplied RS-232 cable.

1.7.5 Ethernet Control

- Connect the OHM88 to a video controller or PC with the RJ-45 connector/cable.

1.7.6 Direct connection of PC or video controller to the OHM88: Use a crossover Ethernet cable.

- Typically, a PC is connected to the network and configured for dynamic IP address by a network DHCP server. If the PC is connected directly to the OHM88, the network server will not be able to address the PC.
- In this case, the PC should be manually set in a static IP address. Refer to Setting the PC IP address in Chp. 2.8.1.

1.7.7 LAN connection of OHM88: Direct Ethernet connection.

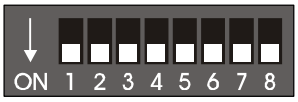
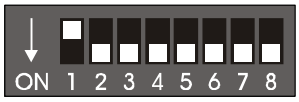
- OHM88 is configured at the factory with the default IP address of 192.168.0.88. Before connecting to your network, verify the IP address on your network.
- The IP address can be reconfigured by front key buttons or command lines over RS 232, Ethernet and USB.

2 Communications Setup

2.1 Setting the Router ID of OHM88

- If multiple units of OHM88 with a video controller or PC controller are used, each OHM88 should be identified with the DIP switch located on the rear panel marked as Router ID. Each DIP switch has 8 digits, one (1) at the up position and zero (0) at the down position; possible ranges are 000 to 255 and the default factory setting is 255.

Example Setting

In case of 000	In case of 001	In case of 255
		

- All command codes are required to have the Router ID in its header. For more details, refer to the command code instruction in Chapter. 3.2.

2.2 Front Panel Interface

- All communication with OHM88 is possible using the front input keys - without video controller or control PC.
  - Before pressing control keys, make sure that the LCD display shows **USER MODE**.
  - **CREATE, PREVIEW** and **CANCEL** keys are activated and deactivated by pressing each key repeatedly - the activated key is executed by pressing **ENTER** key.
  - **The FUNCTION** has the ability to select multiple features on the OHM88.
    - Repeatedly pressing the **FUNCTION** key will display each feature on the LCD display.
    - To save the selected feature, press **ENTER -** to escape current setting, press another control key; i.e. **CREATE** or **PREVIEW**.

2.3 CREATE Mode

- Configures Input-Output connections for cross switching.
  1) Press CREATE button once to activate (orange color LED is on) - LCD will display the current Input and Output configuration.
  2) Select and Press an input key (the respective Green LED is on) – LCD will display current configured Output (Red LED is on).
  3) Press single or multiple Output buttons to select desired outputs (Red LED is on for each selected Output button).
  4) Outputs can be deselected by pressing the respective Output button (Red LED is off)
  5) Press ENTER to save the selected configuration.
  6) To configure the next Input to Output or outputs, repeat steps 1 to 5.

2.4 PREVIEW Mode

- PREVIEW mode shows current Input-Output configuration.
  1) Press PREVIEW to see current Input-Output connection status on the LCD display.
  2) Press any Input button (Green LED is on) to see the current connected Output (indicated by Red LED is on)
  3) To preview status of another Output, press another Input button.

  To see the status of all Input-Output connections, press **PREVIEW** then **ENTER**.

2.5 CANCEL Mode

- To Cancel each Input-Output configuration:

  1) Press **CANCEL** then press the desired Input button to be cancelled. The configured Output buttons LED will be on.

  Press ENTER to complete cancellation.

2.6 FUNCTION Mode

Press FUNCTION to view features – pressing FUNCTION repeatedly will cycle the following features:

- Monitor Output Selection
- RS-232 Baud Rate
- Gateway
- Subnet Mask
- IP Address
- Mac Address
- Port Number
- EDID Save
- Factory mode

2.6.1 MONITOR OUTPUT SELCTION – To verify the video source press FUNCTION key once.

1) Connect a display to the MONITORING port and any video sources to the HDMI Input ports on the rear panel.
2) Press the FUNCTION key once – the LCD displays:

   ========== Function ==========

   Monitor Output sel.
   Old Input Channel: 1
   New Input Channel:
3) Press Input button of the Input to be monitored.
4) Press **ENTER** to finish the process.
5) If you want to keep the previous, press **CANCEL**.

[Note] For OHM88, Output #1 will be disconnected automatically when monitoring port is connected and working.

2.6.2 RS-232 BAUD RATE: press FUNCTION two times

- Press Input 1 button for 19200
- Press Input 2 button for 38400
- Press Input 3 button for 57600

- Press Input 4 button for 115200
- Press **ENTER** to complete the process and return to the User mode.

=========Function Mode========

RS-232 Baud Rate
Old Baud Rate: 19200
New Baud Rate: 19200

[Note] Baud Rate of 19200 bps is highly recommended.

2.6.3 GATEWAY: press FUNCTION three times

- The Under Bar mark represents selected and activated.
- Pressing Input 1 button repeatedly changes the selected number from 0, 1, 2...9.
- The Input 2 button decreases the number.
- Input 3 and 4 buttons moves the Under Bar from left to right.

=========Function Mode========

Gate Way
192. 168. 000. 001
192. 168. 000. 001

- Factory setting is 192.168.000.
- Press **ENTER** button to complete the process and return to the **User mode**.

2.6.4 SUBNET MASK: press FUNCTION four times

- The Under Bar mark represents selected and activated.
- Pressing Input 1 button repeatedly changes the selected number from 0, 1, 2...9.
- The Input 2 button decreases the number.
- Input 3 and 4 buttons moves the Under Bar from left to right.

=========Function Mode========

Subnet Mask
255. 255. 255. 000
255. 255. 255. 000

- Factory setting is 255. 255. 255.000.
- Press **ENTER** button to complete the process and return to the **User mode**.

2.6.5 IP ADDRESS: press FUNCTION five times

- The Under Bar mark represents selected and activated.
- Pressing Input 1 button repeatedly changes the selected number from 0, 1, 2...9.
- The Input 2 button decreases the number.
- Input 3 and 4 buttons moves the Under Bar from left to right.

=========Function Mode========

IP Address
192. 168. 000. 088
192. 168. 000. 088

- Factory setting is 192. 168. 000. 088.
- Press **ENTER** button to complete the process and return to the **User mode**.

2.6.6 MAC ADDRESS: press FUNCTION six times

- In computer networking, a Media Access Control address (MAC address) is a unique identifier assigned to most network adapters or network interface cards by the manufacturer for identification, and used in the Media Access Control protocol sub layer. If assigned by the manufacturer, a MAC address usually encodes the manufacturer's registered identification number. It may also be known as an Ethernet Hardware Address (EHA), hardware address, adapter address, or physical address.
  - There are three numbering spaces, managed by the Institute of Electrical and Electronics Engineers (IEEE), which are in common use for formulating a MAC address:
  - OHM88 is shipped with a default MAC ADDRESS. The MAC ADDRESS of OHM88 can be edited, however, it is strongly not recommended.
  - Editing MAC ADDRESS
    - The Under Bar mark represents selected and activated.
    - Pressing Input 1 button repeatedly changes the selected number from 0, 1, 2...9.
    - The Input 2 button decreases the number.
    - Input 3 and 4 buttons moves the Under Bar from left to right.

2.6.7 PORT NUMBER: press FUNCTION seven times

- The Under Bar mark represents selected and activated.
- Pressing Input 1 button repeatedly changes the selected number from 0, 1, 2...9.
- The Input 2 button decreases the number.
- Input 3 and 4 buttons moves the Under Bar from left to right.

=========Function Mode========

Port Number
Old Data: 03000
New Data: 03000

- Factory setting is 03000.
- Press **ENTER** button to complete the process and return to the **User mode**.

[Note] Port number setting in this section is for UDP with supplied PC software not TCP/IP with web browser or Telnet. For TCP/IP, port number 23 is fixed value.

2.6.8 EDID SAVE: press FUNCTION eight times

- Reads EDID from connected displays and stores information to Input ports EEPROM.

  =========Function Mode========

  EDID Save
  Old: 1. 2. 2. 2. 3. 6. 7. 8
  New: 1. 3. 3. 3. 5. 6. 7. 8

- Row “Old” represent current EDID while “New” represents EDID to be saved.
- Each Column 1 through 8 represents each Input port: i.e. the fifth column ‘3’ represents the EDID information from connected display at Output port 3 was saved in Input port 5 EEPROM.
  - The Under Bar mark represents selected and activated.
  - Pressing Input 1 button repeatedly changes the selected number from 1, 2..., and 8. KK
  - The Input 2 button decreases the number.
  - Input 3 and 4 buttons moves the Under Bar from left to right.

[Note] “P” (**P**revious) is the factory default EDID setting: typically, VESA standard (1280x720) @ 60Hz example, to save the input 1~4 EDID with Output 3 and input 5~8 EDID with Output 5; edit “New” row as follow:

=========Function Mode========

EDID Save
Old: P. P. P. P. P. P. P. P
New: 3. 3. 3. 3. 5. 5. 5. 5

- Press **ENTER** button to complete the configuration, store the information and execute the process.

2.6.9 FACTORY MODE: press FUNCTION nine times

- Press **ENTER** to reset and restore factory default settings.

2.7 Serial Communication

2.7.1 HyperTerminal

- OHM88 provides command line interface through serial port, RS-232.
- Hyper Terminal is an effective serial emulation software to communicate with OHM88 when Microsoft Windows operating system is used to control OHM88.
- Hyper Terminal connection procedures:
  1) Connect the OHM88 to a PC as described in section RS-232 Control.
  2) Select Start > Programs > Accessories > Communications > HyperTerminal

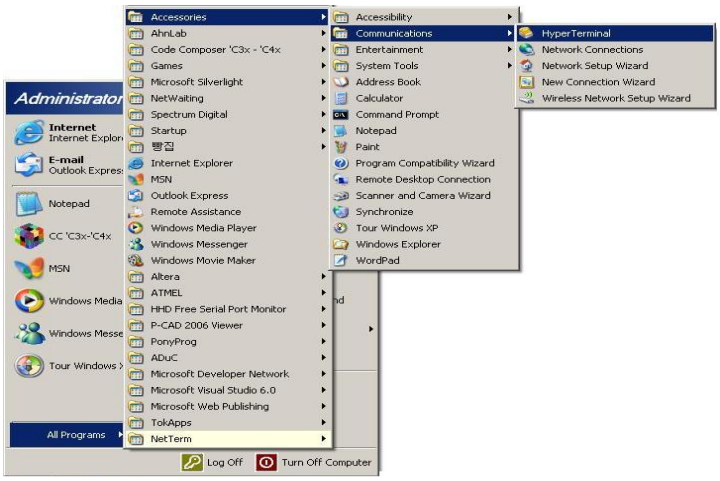


Figure 2-1 HyperTerminal Access

3) **Connection Description Dialog:** Enter a name and choose an icon.

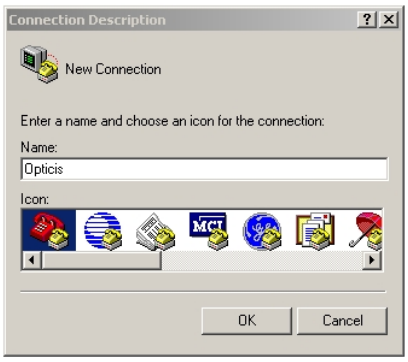


Figure 2-2 Connection Description Dialog

4) Selecting **OK** displays the **Connect To** dialog. In the **Connect To** dialog box, ignore the **Country, Area Code** and **Phone Number** fields and select the available COM port to which OHM88 is connected.

Figure 2-3 Connect To Dialog

5) Select **OK** to go to the **COM Properties** dialog box.

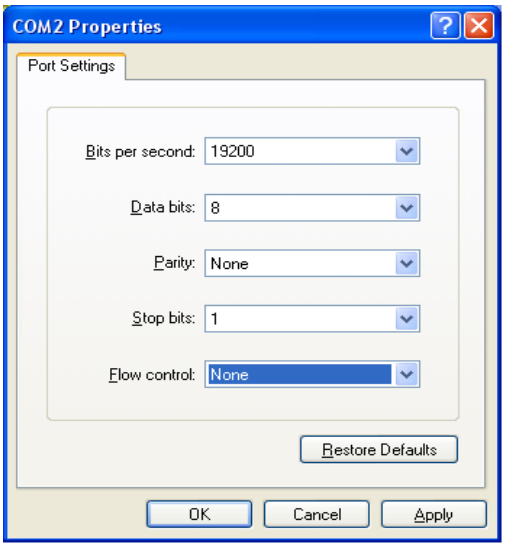


Figure 2-4 COM Properties Dialog

6) Configure the port settings as follows;
   - Bits per second (baud rate): 19200 (recommended)
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None
7) Select **OK** to display the HyperTerminal window
8) Press ENTER on OHM88 to begin communication with OHM88
9) Type serial command set. (Refer to Chap. 3.2)

2.7.2 Telnet

- Telnet is a terminal emulation program for TCP/IP networks such as the Internet.
- The Telnet program runs on your computer and connects your PC to a server on the network. You can then enter commands through the Telnet program and they will be executed as if you were entering them directly on the server console. This enables you to control the server and communicate with other servers on the network

2.7.3 LAUNCHING TELNET SESSION

1) Select **Start** menu and select **Run**.
2) Type **command** as shown below.

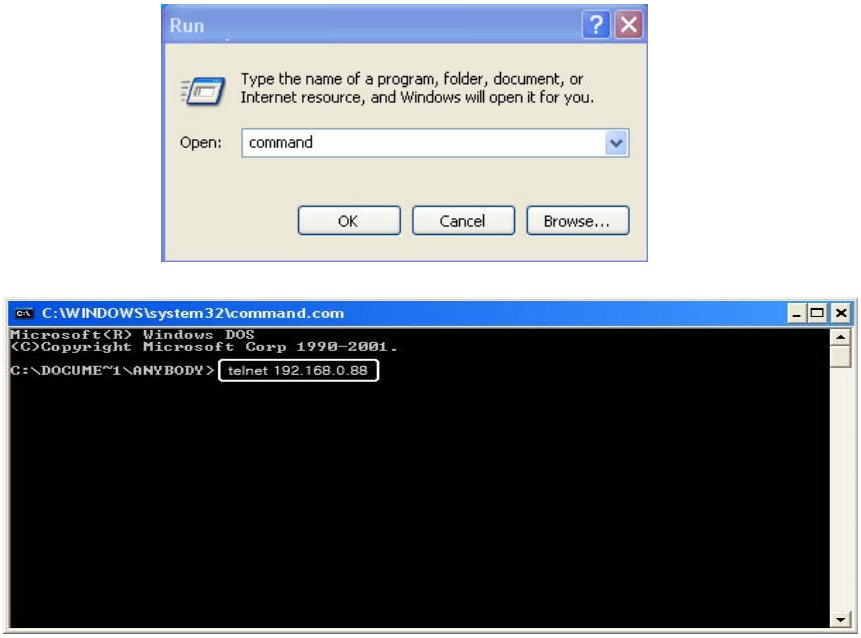


Figure 2-5 Run Windows

3) Select **OK** to open the command window.

4) Type the command: **telnet 192.168.0.88**

[Note] 192.168.0.88 is the default IP address of OHM88. Change IP address as needed. (Refer to Chap. 2.6.6 and 2.8)

5) Press **ENTER**: "HDMI Matrix Router Connected" will be displayed.

6) Type serial command set. (Refer to Chap. 3.2)

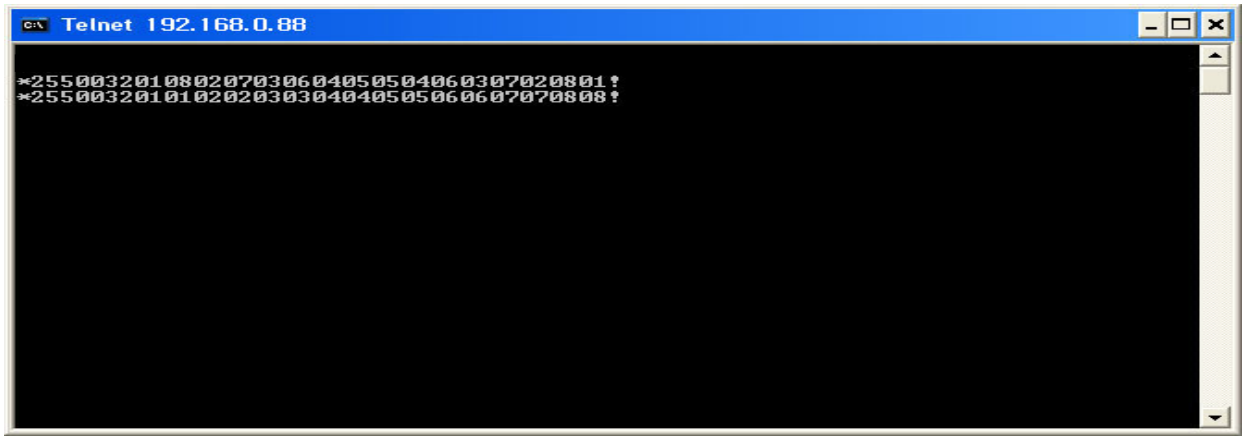


Figure 2-6 Telnet connected

2.8 Ethernet Control

- The OHM88 can be controlled through the 10/100 base Ethernet port using either graphic user interfaces or a command line interface.
- The graphic user interfaces uses both standard web browser such as Microsoft Internet Explorer and proprietary PC software.
- The physical connection of OHM88 can be made on the standard LAN or point to point connection.
- The command line interface uses a Telnet session to a private port.
- To connect OHM88 to Ethernet, specify static IP address for OHM88 (Refer to Chap. 2.6.5). The default IP address is 192.168.000.088.

2.8.1 SETTING THE IP ADDRESS of the PC

- If the PC is connected to the OHM88 through the 10/100 Base Ethernet port, a static address should be configured on the PC:

1) Use Ethernet crossover cable (provided with OHM88 system) for point-to-point direct connection between PC or controller and OHM88 or use Ethernet strait cable to connect OHM88 on LAN.
2) From the PC: select **Start** menu, select **Control Panel**.
3) In the **Control Panel**, select **Network Connections**.

In **Network Connections**, right click on **Local Area Connection** and select **Properties** tab.

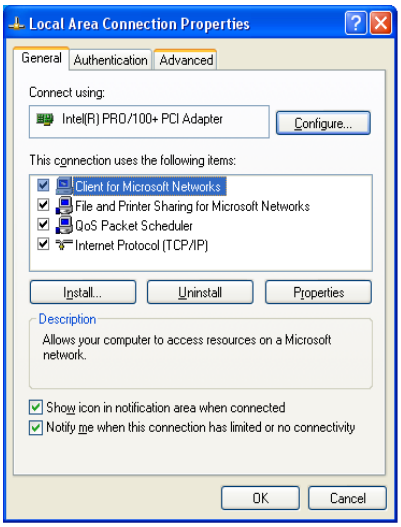


Figure 2-7 Local Area Network Properties

Select **Internet Protocol (TCP/IP)** and click on **Properties**.

In the Internet Protocol (TCP/IP) Properties, click **Use the following IP address** radio button.

Enter IP address compatible with the current IP address of the OHM88.

- For point to point direct connection, if the IP address of OHM88 is 192.168.000.088, the PC IP address should be chosen as 192.168.000.nnn; where nnn ranges 000 to 255 except 088. (Refer to Chap. 2.6.5)
- For LAN connection, maintain existing PC IP address then consult you network manager to obtain available IP address for OHM88.

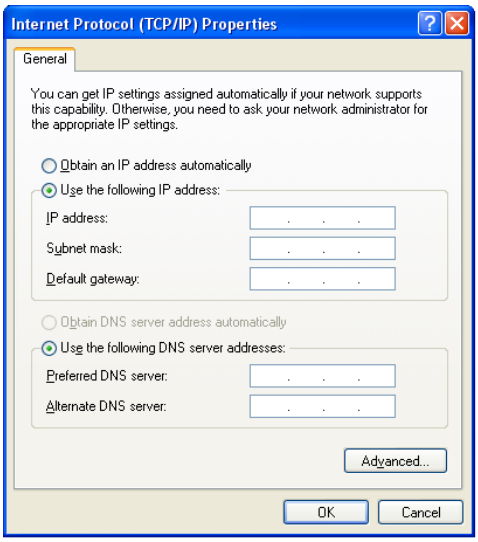


Figure 2-8 PC IP address setting

4) Select OK to terminate IP setup session.

2.9 USB CONTROL

- USB connection to OHM88 is only valid with proprietary PC software – command line interface cannot be used.
- For its device installation and instruction, refer to the Proprietary PC Software Operation in Chap. 3.4.

3 Operation

- OHM88 has various operational interfaces: Front Panel Key Input, Serial Command Lines, Graphic Interface on web control panel (WCP) and Proprietary PC Software through RS-232, Ethernet or USB.
- Graphic Interface or Proprietary PC Software is the most efficient since all other methods use command line interface.

3.1 Front Panel Operation

- Please Refer to Chap. 2.2 for detail explanation of front keys functions.
- Front Panel Operation examples:
- 8 Displays with 3 different typed of EDID:

Port No.	Input	Output
1	Source 1	Display 1 (EDID type A)
2	Source 2	Display 2 (EDID type B)
3	Source 3	Display 3 (EDID type B)
4	Source 4	Display 4 (EDID type A)
5	Source 5	Display 5 (EDID type B)
6	Source 6	Display 6 (EDID type C)
7	Source 7	Display 7 (EDID type C)
8	Source 8	Display 8 (EDID type A)

- The arrows represent :
  - Input 1 to Output 1 and 4
  - Input 2 to Output 2
  - Input 3 to Output 3
  - Input 4 to Output 5
  - Input 5 no connection
  - Input 6 to Outputs 6 and 7
  - Input 7 to Output 8
  - Input 8 no connection
- Operation is executed in two steps:
  - Set EDID for each Input port for proper graphic signal transmittal.
  - Configure Input-Output for cross-switching as configured above.

1) Press **FUNCTION** key eight (8) times – LCD will display EDID save:

=========Function Mode========

EDID Save
Old: P. P. P. P. P. P. P. P
New: P. P. P. P. P. P. P. P

2) Configure as shown below:

=========Function Mode========

EDID Save
Old: P. P. P. P. P. P. P. P
New: **1. 2. 3. 5. P. 6. 8. P**

[Note 1] If Input has no Output connection (as in Input 5, 8 above), enter P <Previous>.

[Note 2] If a source is connected to two or more different displays, assigning the lower resolution EDID to Input port EEPROM is highly recommended. Assigning higher resolution will show 'OUT OF RANGE'.

3) Press **ENTER** to save.

[Note] EDID setting is valid until a new EDID setting is processed - even though the OHM88 is powered on and off repeatedly.

4) To configure Input-Output, press **CREATE**; current Input-Output configuration will be displayed.

```
========= Create Mode ========
O:  1  2  3  4  5  6  7  8  M
    |  |  |  |  |  |  |  |  |
I:  1  2  3  4  5  6  7  8  N
```

Where **N** is **N**ot defined for the monitoring, **M**.

5) Press Input button **1** (Green LED is on) – LCD displays:

```
========= Create Mode ========
        Input Channel NUM.: 1
        Out:   1
        New:
```

Press Output 1 and 4 (number **1 and 4)** as the selected outputs for the given Input. Press **ENTER** key and then turn back to the **user mode**.

[Note] Specific Input can be connected to multiple Output channels. However, one Output channel cannot share multiple Input channels.

Repeat above process 4 to 6 for other Input channels.

Press **PREVIEW** key to review newly saved Input-Output configuration;

```
========= Preview Mode ========
O:  1  2  3  4  5  6  7  8  M
|   |  |  |  |  |  |  |  |
I:  1  2  3  1  4  6  6  7  N
```

[Note] Pressing ENTER key completes the Input-Output configuration.

3.2 Command Line Operation

- Command line interface is performed through RS-232 or Ethernet. Refer to Chap. 2.7 and 2.8 for setting procedures.
- The commands are coded in ASCII and HEXA. All descriptions are shown in Table 3.1. A command line consists of string of ASCII or HEXA codes in series as shown below;

  Start (1 Byte) + **Router ID** (3 Bytes) + **Command** (1 Byte)

  + **Data Length** (3 Bytes)

  + **Output Number** (2 Bytes) + **Input Number** (2 Bytes)

  + **Output Number** (2 Bytes) + **Input Number** (2 Bytes) + …..

  + **End** (1 Byte)
- A command line allows execution of only one command. Multiple commands require execution of multiple strings; one command per string.
- All strings begin with **Start** byte.
- **Router ID** can be selected within the range of 000 to 255; written in 3 bytes. (Default factory setting is 255. Refer to Chap. 2.1.)

- **Data Length** represents total number of all bytes. Data Length is determined by the number of channels in the command line.
    - For example: Configuring 4 Input-Output connections (8 channels), data length is 016 in ASCII - 16 bytes in base of 2 bytes per channel regardless of Input and Output.
- **Input channel Number** follows **Output channel Number** - designated as a pair.
- A command line closes with **End** byte.

Table 3.1 Descriptions of Command Codes

Command Format	ASCII	HEX	Description	Byte
Start	*	0x2A	Header Code	1
Router ID	Variable	Variable	Router ID Value	3
Create	0	0x30	Connect or Disconnect the Selected Input and Output channels	1
Preview	1	0x31	Preview all connected channels	
Cancel	2	0X32	Cancel selected channel connection	
Upload Data Request	3	0x33	Upload connection information to the controller	
Rolling	4	0x34	Rotates Input and Output connection	
Upload Router ID	5	0x35	Upload Router ID to controller	
Rolling Stop	6	0x36	Stop rolling command	
Check Connection	7	0x37	Upload connection integrity	
Upload One Channel Data Request	8	0x38	Upload connection status of selected channel	
Baud Rate Setting	@	0x40	Change Baud rate of RS-232	
Read Output Device EDID	A	0x41	Read EDID from attached display	
Default EDID Setting	B	0x42	Restore factory default EDID on EEPROM	
Read Input EEPROM	C	0x43	Read EDID from EEPROM	
EDID Write	D	0x44	Read EDID from display and write to EEPROM	
Edit EDID Write	E	0x45	Edit EDID Write mode	
EDID Data	F	0x46	Send divided data by two	
Monitoring	G	0x47	Set the monitoring channel	
Data Length		Variable		3
Output channel		Variable	Selected Output channel	2
Input channel		Variable	Selected Input channel	2
End	!	0x21	Tail Code	1

- In response to the command line Input to OMD88, the following ACK signals are returned to the controller shown in Table 3.2.

Table 3.2 Descriptions of Acknowledge (ACK) Signals

Acronym	Bytes	ASCII Codes	Description
Error	1	0x05	Router received incorrect data packet
RX Complete	1	0x06	Router received correct data packet
Job Complete	1	0x07	Completed operation per command
Connection OK	1	0xA0	Successful connection

- ACK will be returned after command codes are sent.
- If the command codes are successfully done, 0x06, 0x07 will be returned. But if it is failed, 0x05 will follow it by return. Some command codes have special ACK and it is described under the each example command code below.

The followings illustrate example codes for various applications to be utilized on HyperTerminal for RS-232 and on Telnet for TCP/IP.

3.2.1 Create:

- Configure cross-switching of inputs and outputs.
- Command line format:
  - *Start (*)* + Router ID (3 byte) + *Command (0)* + Data Length (Variable) + Output channel (2 byte) + Input channel (2 byte) + … + *End (!)*

Example 1: One (1) channel connection of Output Channel 1 and Input Channel 1

	Start	Router ID			Command	Data Length			Output Channel		Input Channel		End
ASCII	*	2	5	5	0	0	0	4	0	1	0	1	!
HEX	2Ah	32h	35h	35h	30h	30h	30h	34h	30h	31h	30h	31h	21h

Example 2: One (1) channel disconnection of Output Channel 1 by setting “0” on the Input channel bytes.

	Start	Router ID			Command	Data Length			Output Channel		Input Channel		End
ASCII	*	2	5	5	0	0	0	4	0	1	0	0	!
HEX	2Ah	32h	35h	35h	30h	30h	30h	34h	30h	31h	30h	30h	21h

Example 3: Two (2) channel connection: Output Channel 1 → Input Channel 8 & Output Channel 8 → Input Channel 1

	Start	Router ID			Command	Data Length			Output Channel		Input Channel	
ASCII	*	2	5	5	0	0	0	8	0	1	0	8
HEX	2Ah	32h	35h	35h	30h	30h	30h	38h	30h	31h	30h	38h

Output Channel		Input Channel		End
0	8	0	1	!
30h	38h	30h	31h	21h

Example 4: Eight (8) channel direct - through connection (for OHM88)

	Start	Router ID			Command	Data Length			Output Channel		Input Channel	
ASCII	*	2	5	5	0	0	3	2	0	1	0	1
HEX	2Ah	32h	35h	35h	30h	30h	33h	32h	30h	31h	30h	31h

Output Channel		Input Channel		…	Output Channel		Input Channel		Output Channel		Input Channel		END
0	2	0	2	...	0	7	0	7	0	8	0	8	!
30h	32h	30h	32h	…	30h	37h	30h	37h	30h	38h	30h	38h	21h

Example 5: Six (6) channels direct - through connection (for OHM66)

	Start	Router ID			Command	Data Length			Output Channel		Input channel	
ASCII	*	2	5	5	0	0	2	4	0	1	0	1
HEX	2Ah	32h	35h	35h	30h	30h	32h	34h	30h	31h	30h	31h

Output Channel		Input Channel		…	Output Channel		Input Channel		Output Channel		Input Channel		END
0	2	0	2	...	0	5	0	5	0	6	0	6	!
30h	32h	30h	32h	…	30h	35h	30h	35h	30h	36h	30h	36h	21h

3.2.2 Preview: Shows all Input-Output configurations

- Command line format:
  - Start (*) + Router ID (3 byte) + Command (1) + Data Length (000) + End (!)

Byte	Start	Router ID			Command	Data Length			End
ASCII	*	2	5	5	1	0	0	0	!
Hex	2Ah	32h	35h	35h	31h	30h	30h	30h	21h

3.2.3 Cancel: Cancels configuration of outputs for each Input.

- Command line format:
  - *Start (*)* + Router ID (3 byte) + *Command (2)* + Data Length (variable) + Input Channel (2 byte) + *End (!)*

Example: Disconnect Input Channel 1

Byte	Start	Router ID			Command	Data Length			Input Channel		End
ASCII	*	2	5	5	2	0	0	2	0	1	!
Hex	2Ah	32h	35h	35h	32h	30h	30h	32h	30h	31h	21h

3.2.4 Upload Data Request: Uploads connection data to the controller.

- Command line format:
  - Start (*) + Router ID (3 byte) + Command (3) + Data Length (000) + End (!)

Byte	Start	Router ID			Command	Data Length			End
ASCII	*	2	5	5	3	0	0	0	!
Hex	2Ah	32h	35h	35h	33h	30h	30h	30h	21h

3.2.5 Upload Data Request:

- Allows OHM88 to respond with ACK signal to controller in the following format: 0x06(06h) + Connection DATA + 0x07(07h)
- The Connection Data represents the connection information of router

1) Connection Data for OHM88: 1-1, 2-2, 3-3, 4-4, 5-5, 6-6, 7-7, 8-8

Byte	Start	Router ID			Command	Data Length			Output Channel		Input Channel	
ASCII	*	2	5	5	3	0	3	2	0	1	0	1
Hex	2Ah	32h	35h	35h	33h	30h	33h	32h	30h	31h	30h	31h

Output Channel		Input Channel		…	Output Channel		Input Channel		Output Channel		Input Channel		END
0	2	0	2	.....	0	7	0	7	0	8	0	8	!
30h	32h	30h	32h	……	30h	37h	30h	37h	30h	38h	30h	38h	21h

2) Connection Data for OHM66: 1-2, 2-3, 3-4, 4-5, 5-6, 6-1

Byte	Start	Router ID			Command	Data Length			Output Channel		Input Channel	
ASCII	*	2	5	5	3	0	2	4	0	2	0	1
Hex	2Ah	32h	35h	35h	33h	30h	32h	34h	30h	32h	30h	31h

Output Channel		Input Channel		…	Output Channel		Input Channel		Output Channel		Input Channel		END
0	3	0	2	.....	0	6	0	5	0	1	0	6	!
30h	32h	30h	32h	……	30h	36h	30h	35h	30h	31h	30h	36h	21h

3.2.6 Rolling command

- Rotates Input at fixed Output.
- Checks connection status of all inputs and outputs by changing them in sequence.
- Format of Command Line:
  - *Start (*)* + Router ID (3 byte) + *Command (4)* + Data Length (Variable) + Output Channel (2 byte) + Input Channel (2 byte) + … + *End (!)*
  - Example: To rotate three (3) inputs 1, 2, and 3 on three (3) outputs 1, 2, and 3.

1) Output Channel 1 → Input Channel 1, Output Channel 2 → Input Channel 2, Output Channel 3 → Input Channel 3

Byte	Start	Router ID			Command	Data Length			Output Channel		Input Channel	
ASCII	*	2	5	5	4	0	1	2	0	1	0	1
Hex	2Ah	32h	35h	35h	34h	30h	31h	32h	30h	31h	30h	31h

Output Channel		Input Channel		Output Channel		Input Channel		End
0	2	0	2	0	3	0	3	!
30h	32h	30h	32h	30h	33h	30h	33h	21h

2) Output Channel 1 → Input Channel 2, Output Channel 2 → Input Channel 3, Output Channel 3 → Input Channel 1

Byte	Start	Router ID			Command	Data Length			Output Channel		Input Channel	
ASCII	*	2	5	5	4	0	1	2	0	1	0	2
Hex	2Ah	32h	35h	35h	34h	30h	31h	32h	30h	31h	30h	32h

Output Channel		Input Channel		Output Channel		Input Channel		End
0	2	0	3	0	3	0	1	!
30h	32h	30h	33h	30h	33h	30h	31h	21h

3) Output Channel 1 → Input Channel 3, Output Channel 2 → Input Channel 1, Output Channel 3 → Input Channel 2

Byte	Start	Router ID			Command	Data Length			Output Channel		Input Channel	
ASCII	*	2	5	5	4	0	1	2	0	1	0	3
Hex	2Ah	32h	35h	35h	34h	30h	31h	32h	30h	31h	30h	33h

Output channel		Input channel		Output channel		Input channel		End
0	2	0	1	0	3	0	2	!
30h	32h	30h	31h	30h	33h	30h	32h	21h

3.2.7 Upload Router ID

- Uploads Router ID to the controller or PC.
- Command line format:
  - Start (*) + Router ID (3 byte) + Command (5) + Data Length (000) + End (!)

Byte	Start	Router ID			Command	Data Length			End
ASCII	*	2	5	5	5	0	0	0	!
Hex	2Ah	32h	35h	35h	35h	30h	30h	30h	21h

- If the Router ID is 015, ACK signal is as follows:

Byte	Start	Router ID			Command	End
ASCII	*	0	1	5	5	!
Hex	2Ah	30h	31h	35h	35h	21h

3.2.8 Rolling Stop

- Rolling stop command.
- Command line format:
  - Start (*) + Router ID (3 byte) + Command (6) + Data Length (000) + End (!)

Byte	Start	Router ID			Command	Data Length			End
ASCII	*	2	5	5	6	0	0	0	!
Hex	2Ah	32h	35h	35h	36h	30h	30h	30h	21h

3.2.9 Check Connection

- Check status of all connections
- Command line format:
  - Start (*) + Router ID (3 byte) + Command (7) + Data Length (000) + End (!)

Byte	Start	Router ID			Command	Data Length			End
ASCII	*	2	5	5	7	0	0	0	!
Hex	2Ah	32h	35h	35h	37h	30h	30h	30h	21h

- By sending **Check Connection** command to the router, OHM88 responds with the following **ACK** signal to controller :
  - Good connection: **0xA0 (A0h)**
  - Bad connection: **0x05 (05h)**

3.2.10 Upload One Channel Data Request

- Upload connection status of a selected Output channel.
- Command line format:
  - *Start (*)* + Router ID (3 byte) + *Command (8)* + *Data Length (002)* + Output channel (2 byte) + *End (!)*

Input 6 → Output 1 connection

Byte	Start	Router ID			Command	Data Length			Output channel		End
ASCII	*	2	5	5	8	0	0	2	0	1	!
Hex	2Ah	32h	35h	35h	38h	30h	30h	32h	30h	31h	21h

ACK signal

Byte	Start	Router ID			Command	Data Length			Input channel		End
ASCII	*	2	5	5	8	0	0	2	0	6	!
Hex	2Ah	32h	35h	35h	38h	30h	30h	32h	30h	36h	21h

3.2.11 Read Output Device EDID

- Read EDID from connected display.
- Command line format:
  - *Start (*)* + Router ID (3 byte) + *Command (A)* + *Data Length (002)* + Output channel (2 byte) + *End (!)*

Example: Read EDID from a Display connected to Output 1

Byte	Start	Router ID			Command	Data Length			Output Channel		End
ASCII	*	2	5	5	A	0	0	2	0	1	!
Hex	2Ah	32h	35h	35h	41h	30h	30h	32h	30h	31h	21h

ACK signal

Byte	Start	ID			Command	Data Length			Output Channel		EDID (256Byte)	End
ASCII	*	2	5	5	A	2	5	8	0	1	…	!
Hex	2Ah	32h	35h	35h	41h	32h	35h	38h	30h	31h	00h…xxh	21h

EDID (256 Bytes) contains EDID information of Output display 1.

3.2.12 Read Input EEPROM EDID

- Read EDID stored on EEPROM of an Input.
- Format of Command Line:
  - *Start (*)* + Router ID (3 byte) + *Command (C)* + *Data Length (002)* + Input EEPROM (2 byte) + *End (!)*

Example: Read EDID stored on EEPROM of Input 2

Byte	Start	Router ID			Command	Data Length			Input EEPROM		End
ASCII	*	2	5	5	C	0	0	2	0	2	!
Hex	2Ah	32h	35h	35h	43h	30h	30h	32h	30h	32h	21h

ACK signal

Byte	Start	Router ID			Command	Data Length			Input EEPROM		EDID (256Byte)	End
ASCII	*	2	5	5	C	2	5	8	0	2	…	!
Hex	2Ah	32h	35h	35h	43h	32h	35h	38h	30h	32h	00h…xxh	21h

EDID (256 Bytes) contains EDID information stored on EEPROM 2.

3.2.13 EDID Write

- Read EDID information from connected displays and writes EDID to each EEPROM.
- Format of Command Line:
  - *Start (*)* + Router ID (3 byte) + *Command (D)* + Data Length (Variable) + EEPROM 1 (2 byte) + EEPROM 2 (2 byte) + … + *End (!)*
    - Variable in Data Length is determined by multiplying 2 bytes to the maximum number of Input channels. With OHM88, it is 16 bytes, multiplying 2 bytes by 8 inputs.
    - The 2 bytes in EEPROM # represents the Output port number of target display. For example, 03 in EEPROM 2 represents: load the EDID of Output 3 display into EEPROM 2. The value, 00 in EEPROM # represent: no updating to EEPROM.

Example: Sets, Output 1 display→ Input 1 EEPROM; Output 3 display → Input 2 EEPROM)

(OHM88 only)

Byte	Start	Router ID			Command	Data Length			EEPROM 1		EEPROM 2	
ASCII	*	2	5	5	D	0	1	6	0	1	0	3
Hex	2Ah	32h	35h	35h	44h	30h	31h	36h	30h	31h	30h	33h

EEPROM 3		……..		EEPROM 8		END
0	0	…	…	0	0	!
30h	30h	…	…	30h	30h	21h

Example: Sets, Output 1 display → Input 1 EEPROM and Output 3 display →Input 6 EEPROM)

(OHM66 only)

Byte	Start	Router ID			Command	Data Length			EEPROM 1		EEPROM 2	
ASCII	*	2	5	5	D	0	1	2	0	1	0	0
Hex	2Ah	32h	35h	35h	44h	30h	31h	32h	30h	31h	30h	30h

EEPROM 3		……..		EEPROM 6		END
0	0	…	…	0	3	!
30h	30h	…	…	30h	33h	21h

3.2.14 Default EDID Setting

- Restores factory default EDID on EEPROM.
- Command line format:
  - Start (*) + Router ID (3 byte) + Command (B) + Data Length (000) + End (!)

Byte	Start	Router ID			Command	Data Length			End
ASCII	*	2	5	5	B	0	0	0	!
Hex	2Ah	32h	35h	35h	42h	30h	30h	30h	21h

3.2.15 Baud rate Setting

- Change baud rate through RS-232.
- Command line format:
  - *Start (*)* + Router ID (3 byte) + *Command (@)* + *Data Length (002)* + Baud Rate (variable) + *End (!)*
  - The default baud rate is 19,200
  - Baud rate options:
    - 01 for 19,200bps
    - 02 for 38,400bps
    - 03 for 57,600bps
    - 04 for 115,200bps

Example: Set the baud rate to 38,400bps.

Byte	Start	ID			Command	Data Length			Baud Rate		End
ASCII	*	2	5	5	@	0	0	2	0	2	!
Hex	2Ah	32h	35h	35h	40h	30h	30h	32h	30h	32h	21h

ACK is identical to command code for BAUD RATE SETTING

Byte	Start	ID			Command	Data Length			Baud Rate		End
ASCII	*	2	5	5	@	0	0	2	0	2	!
Hex	2Ah	32h	35h	35h	40h	30h	30h	32h	30h	32h	21h

3.2.16 Monitoring

- Sets monitoring channel.
- Format of Command Line:
  - *Start (*)* + Router ID (3 byte) + *Command (G)* + *Data Length (002)* + Monitoring Data (2 byte) + *End (!)*

Ex.> Set Input Channel 2 as the Monitoring channel

Byte	Start	ID			Command	Data Length			Monitoring Data		End
ASCII	*	2	5	5	G	0	0	2	0	2	!
Hex	2Ah	32h	35h	35h	47h	30h	30h	32h	30h	32h	21h

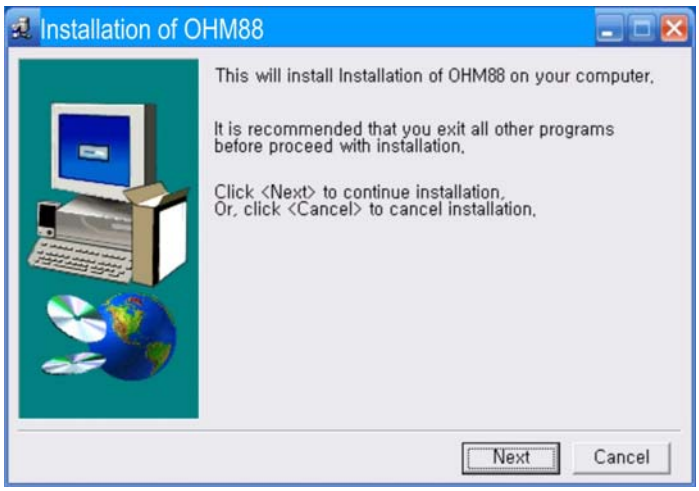
3.3 Web Control Panel Operation

- The web control panel (WCP) provides a graphic alternative to command line interface.
- The OHM88 supports standard web browser. Microsoft Explorer is highly recommended.
- Before running the web browser, confirm that Ethernet connection is setup properly (Refer to Chap. 2.8)
- Run the web browser then enter IP address into the URL address line.
- For example, if the IP address of OHM88 is 192.168.000.088, type the following entry into the URL address line: **http://192.168.000.088**

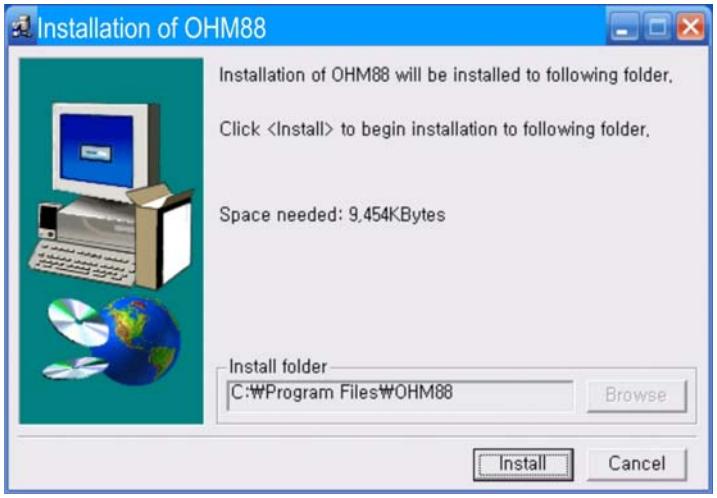
3.4 Proprietary PC Software Operation

3.4.1 Installation of PC Application

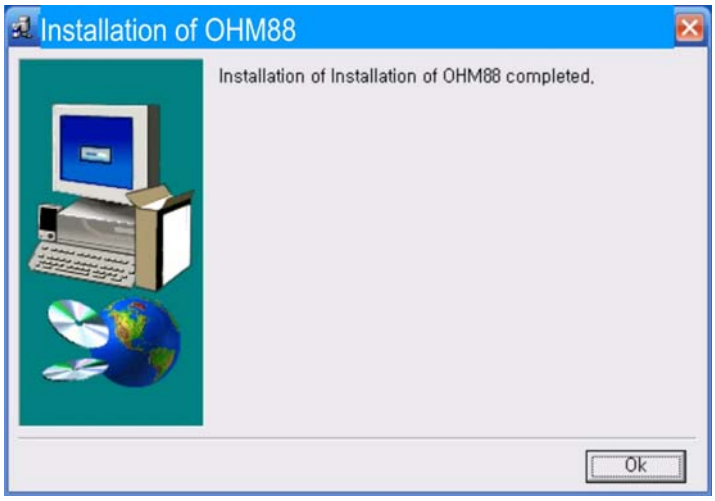
1) Insert OHM88 software CD ROM into PC. If the CD ROM does not automatically run, Select Start >Run. Enter X:\ 'OHM88-install.exe, (where X is the letter of your CD ROM drive)
2) Installation of OHM88 screen will be opened – select **NEXT**.



3) Select the destination directory path then select **Install**.

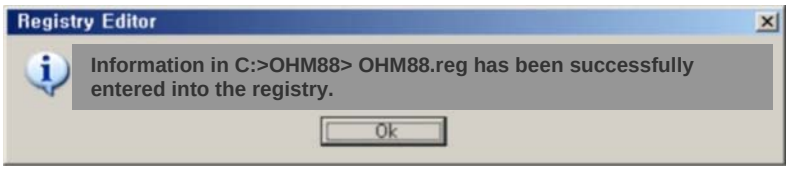


4) To complete the installation, select the **OK**.



5) Select **Yes** to update the registry.

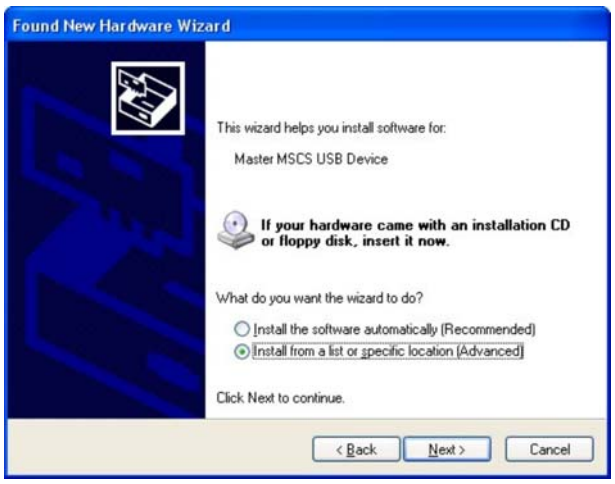
6) Select the **OK** button.



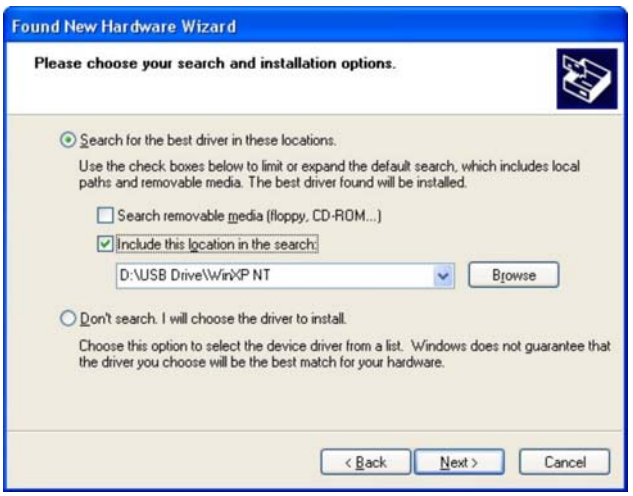
3.4.2 Installation of USB Driver

- Windows XP

1) Connect OHM88 to PC using USB cable then turn on OHM88.
2) Select "**Install from a list or specific location (Advanced)" then select 'NEXT'**.



3) Insert CD ROM then select **Search for the best driver in these locations** and **Include this location in the search** (CD ROM Drive\USB Drive\WinXP NT) then select **NEXT**



4) Select the **Continue Anyway** to proceed.

5) Select **FINISH** to complete installation.

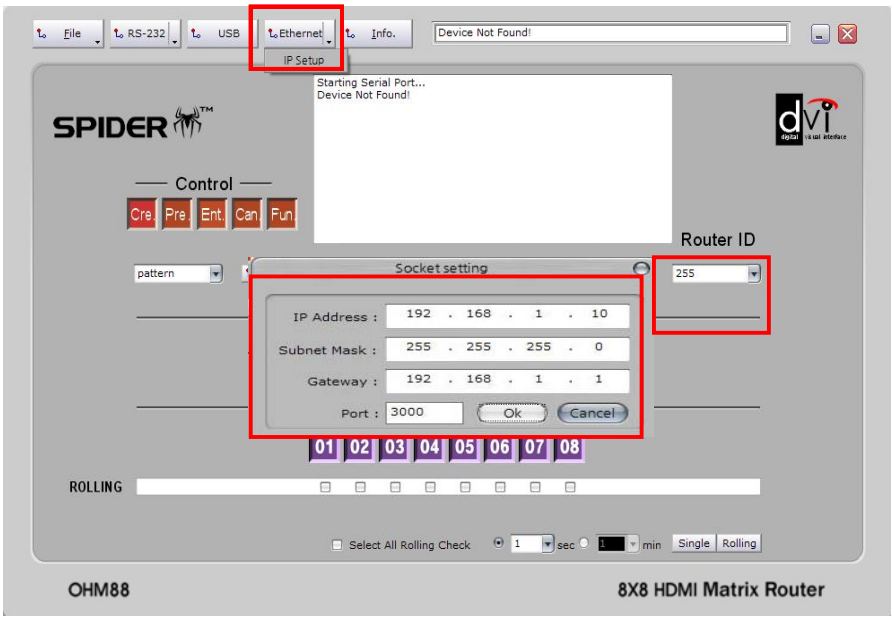
3.4.3 PC Operation using RS-232

1) Run PC Application.
2) Check the communication cable (RS-232, LAN or USB) and turn on the router.
3) Double click the PC Application.
4) Set identical Router ID number on the PC Application and OHM88 using the Dipswitch settings on the rear panel of router. (Default factory setting is 255)
5) Router will initialize and verify the connection status of communication cable.
6) Message 'connection is completed successfully' appears on status display area, and begins loading of switching-patterns from router.
7) If incorrect cable, COM port or Router ID is detected, message 'Device Not Found' will appear on the status display.
8) Verify that cable is securely connected then check COM port.
   - To check COM port, click right side of 'RS-232' button and make sure the COM port number and baud rate are set properly. Make necessary changes then click left side of RS-232 to initiate RS-232 connection again.

[Note] The default interface for PC Application is RS-232. See below instructions to use LAN.

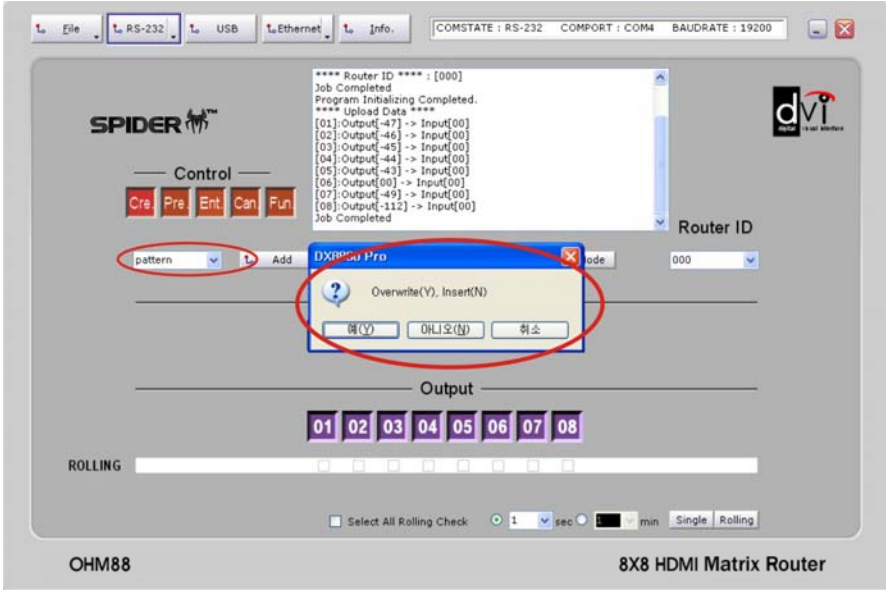
3.4.4 PC Operation using Ethernet

- Network configuration by PC program.
  1) Select right side of **Ethernet** button to configure the network setup as below:



  2) Enter identical IP address as the Router. (Refer to Chap. 2.6.5)

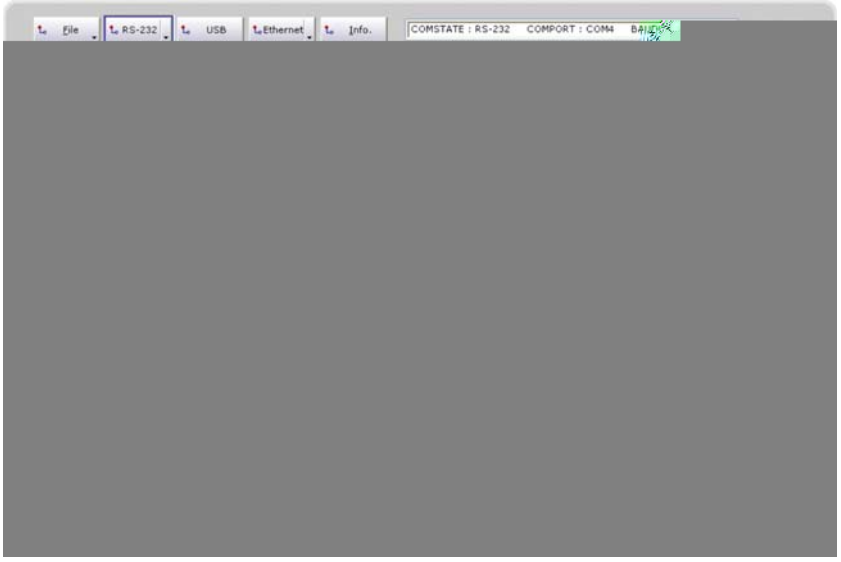
3) Users can now create or update the switching-patterns.
4) Message box will display Overwrite (Y) or Insert (N).
   - Select **Y**: Overwrite the old switching-data
   - Select N: Create new switching-pattern



5) Enter new pattern name then select **Accept.**

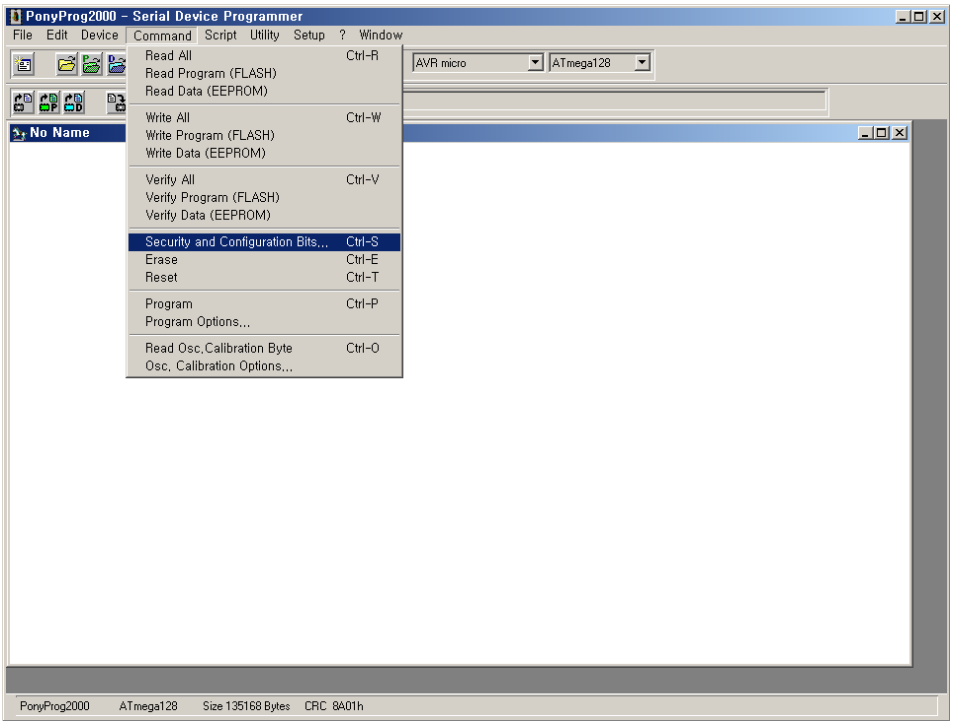
6) Once the system has updated and created the switching-patterns, **Job Completed** message will be displayed.

3.5 Control Buttons

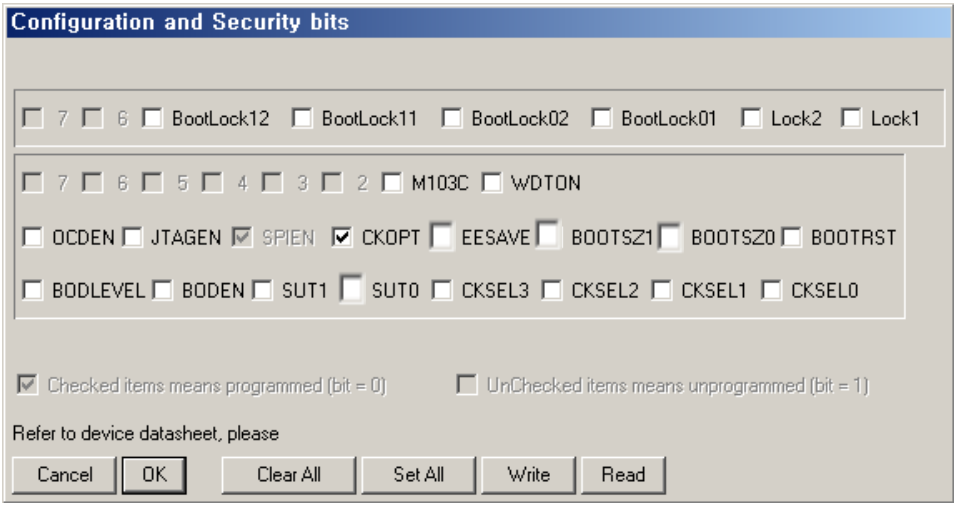


- **Cre** (Create)
  - Configures Input-Output channel connections; same function as the Create-Button on front panel of OHM88.
  - Process flow: **Cre** Button → **Input** Button → **Output** Button → **Ent** Button
- **Pre** (Preview)
  - Verifies current Input-Output connection status; same function as the Preview-Button on front panel of OHM88.
  - Process:
    - **Pre** Button → **Input** Button (Single Mode),
    - **Pre** Button → **Ent** Button (Auto Mode)
- **Can** (Cancel)
  - Disconnects Input and Output; same function as the Cancel-Button on front panel of OHM88.
  - Process: **Can** Button → **Input** Button → **Ent** Button

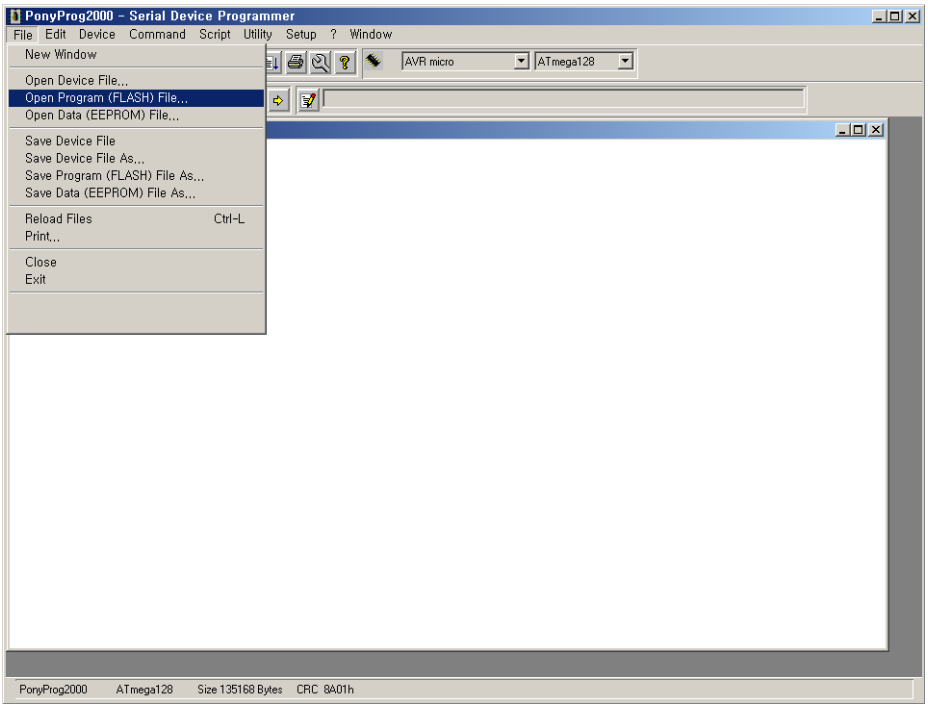
Select ‘Security and Configuration Bits’ in Command menu.



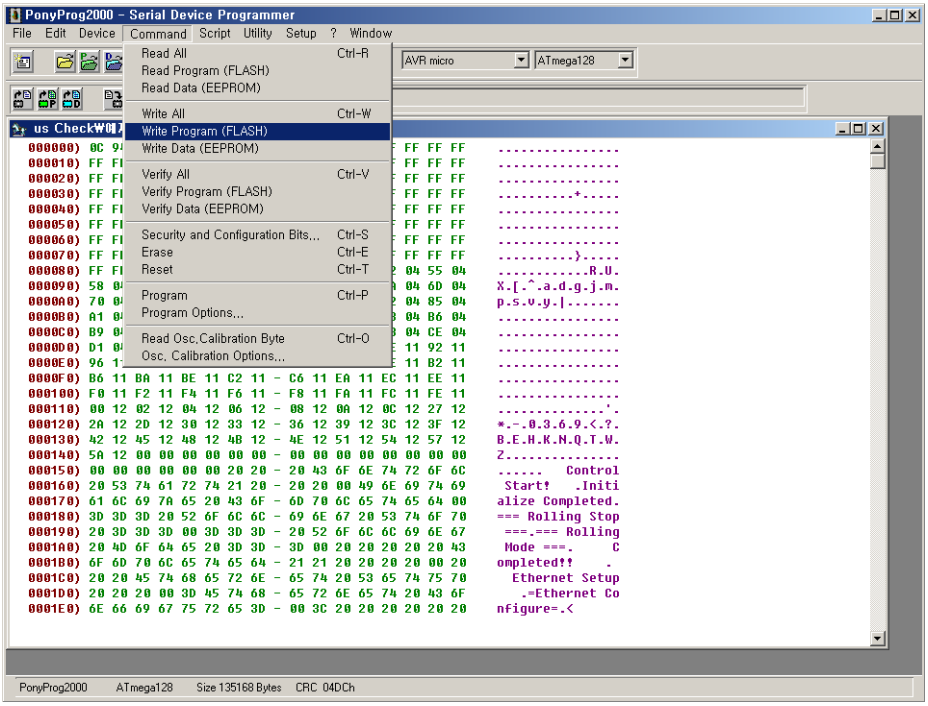
Select the ‘Read’ button and make sure the option is set as below.
If the option is not same as below, click the ‘Clear All’ and mark it as below.
Then click ‘Write’ button and click ‘Read’ button.
If the option is same as below, click ‘OK’.



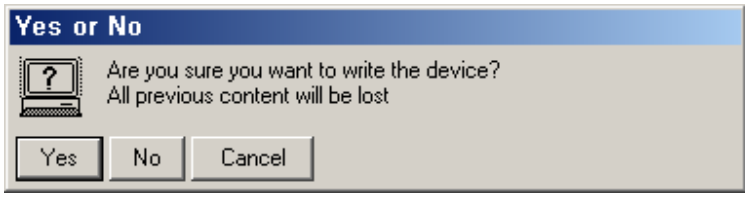
Select ‘Open Program (FLASH) File’ in File menu and select new firmware to download.

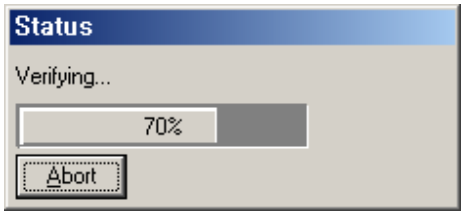


Select ‘Write Program(FLASH)’ in Command menu.

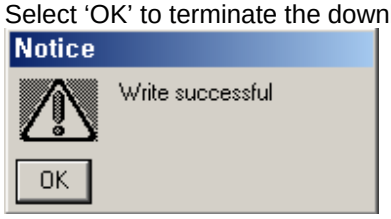


Select ‘OK’ button to starts downloading and verifying process in order.
.





Select ‘OK’ to terminate the downloading.



Now the Router is operated under the new firmware.

USER MANUAL

HDMI MATRIX ROUTER - OHM88 (OHM66)

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