

Document History

| Date | Change List |
|----------|---|
| 20121104 | Initial |
| 20140528 | Support new model of HDD: <ol style="list-style-type: none"> 1. Seagate 4T Surveillance (SV35) 2. Seagate Video 3.5 series of HDD(3T/4T) 3. WD Purple series of HDD (1T/2T/3T/4T) |
| 20140825 | Support new model of HDD: <ol style="list-style-type: none"> 1. Seagate Constellation CS (4T/3T/2T/1T) 2. WD RE(3T) Add the test list of graphic card. |
| 20141114 | Add Seagate SV35, Surveillance + SRS support |
| 20141224 | Add compatible hard drives: <ol style="list-style-type: none"> 1. Seagate: ST6000NM0024 (6TB) 2. Toshiba: MD03ACA400V (4TB) 3. Seagate: ST4000VM000 (4TB) Add supported keyboard/joystick: <ol style="list-style-type: none"> 1. Videotec: DCZ keyboard 2. CH Products: VM Desktop |
| 20150121 | Add appendix A and appendix B to introduce how to configure and use supported joystick and keyboards |
| 20150420 | Add compatible hard drives: Seagate: ST6000VN001; ST6000VX001; S4000NC001 |
| 20151022 | Add compatible hard drives: Toshiba: MC04ACA400E; WD: WD60PURX |
| 20160216 | Add compatible hard deives: Seagate: ST8000VX0002; ST8000NM0055 |
| 20160503 | Add notice of graphic card: Matrox 9188 and Matrox are not recommended |
| 20161003 | Seagate rebranding update for Surveillance and SkyHawk |
| 20161226 | Add Seagate: ST6000VX0003 |
| 20170710 | Add Seagate: ST10000VX0004 |
| 20171026 | Add Seagate: ST6000NM0115 |
| 20171101 | Add APC Smart-UPS 750VA |
| 20180112 | Add Tripp Lite Smart1500LCD |
| | Renaming update for WD Purple Model Name from WDXXPUR X to WDXXPUR X Z |
| 20180807 | Update appendix A for how to configure and use supported Axis joystick T8312 |

Hard Drives

There are several product segments in hard drive industry such as Enterprise grade, Surveillance grade, Green series and the other consumer desktop hard drives. NUUO recommends system designers choose Enterprise grade or Surveillance grade drives to ensure high storage stability and performance. 24 x 7 operational capabilities are also important because your surveillance system is running around the clock.

Enterprise grade drives are recommended when the configuration of RAID (Redundant Array of Independent Disks) is required. Furthermore, to avoid vibration issue, please consider the maximum HDD number per storage system for system vibration tolerance, for example, if there are more than 5 HDDs in this storage system, please choose Enterprise grade drives or any HDD that has built-in RV Sensor. Enterprise grade drives are also highly recommended for rack-mount storage system or any industrial environments where are always full of vibrations.

Green series hard drives should never be used with NUUO recorders to avoid data lost due to long wake up time from a sleeping drive. Consumer desktop series hard drives should be avoided with NUUO recorders because it's suitable for 8x5 environments only. It's different from your surveillance needs.

Enterprise

| Vendor | Family | Model | Capacity | Interface | Firmware |
|------------|----------------------|--------------|------------|------------|----------|
| Seagate | Constellation ES.3 | ST6000NM0024 | 6TB | SATA 6Gb/s | SN02 |
| | | ST4000NM0033 | 4TB | SATA 6Gb/s | 0001 |
| | | ST3000NM0033 | 3TB | SATA 6Gb/s | 0001 |
| | | ST2000NM0033 | 2TB | SATA 6Gb/s | 0001 |
| | | ST1000NM0033 | 1TB | SATA 6Gb/s | 0001 |
| | Constellation ES | ST3500514NS | 500GB | SATA 3Gb/s | SN12 |
| | | ST31000524NS | 1TB | SATA 3Gb/s | SN12 |
| | Constellation CS | ST4000NC000 | 4TB | SATA 6Gb/s | CE02 |
| | | ST3000NC000 | 3TB | SATA 6Gb/s | CE02 |
| | | ST2000NC000 | 2TB | SATA 6Gb/s | CE02 |
| | | ST1000NC000 | 1TB | SATA 6Gb/s | CE02 |
| | | ST4000NC001 | 4TB | SATA 6Gb/s | CN03 |
| | Enterprise NAS + SRS | ST6000VN0011 | 6TB | SATA 6Gb/s | AN02 |
| | Enterprise NAS | ST6000VN0001 | 6TB | SATA 6Gb/s | AN02 |
| Enterprise | ST6000NM0115 | 6TN | SATA 6Gb/s | SN04 | |
| | ST8000NM0055 | 8TB | SATA 6Gb/s | PN01 | |
| WD | RE | WD4000FYYZ | 4TB | SATA 6Gb/s | 01.0 |
| | | WD3000FYYZ | 3TB | SATA 6Gb/s | 01.0 |
| | | WD2003FYYS | 2TB | SATA 3Gb/s | 01.0 |
| | | WD1003FBYX | 1TB | SATA 3Gb/s | 01.0 |
| | | WD5003ABYX | 500GB | SATA 3Gb/s | 01.0 |
| | SE | WD4000F9YZ | 4TB | SATA 6Gb/s | 01.0 |
| | | WD3000F9YZ | 3TB | SATA 6Gb/s | 01.0 |
| | | WD2000F9YZ | 2TB | SATA 6Gb/s | 01.0 |
| Toshiba | MD03ACAxxx | MD03ACA400V | 4TB | SATA 6Gb/s | FL1V |
| | MG04ACAxxx | MG04ACA500E | 5TB | SATA 6Gb/s | FP3B |
| | MG03ACAxxx | MG03ACA300 | 3TB | SATA 6Gb/s | FL1A |
| | | MG03ACA200 | 2TB | SATA 6Gb/s | FL1A |
| | | MG03ACA100 | 1TB | SATA 6Gb/s | FLOA |
| | MC04ACAxxx | MC04ACA400E | 4TB | SATA 6Gb/s | FP2A |

Video Surveillance

| Vendor | Family | Model | Capacity | Interface | Firmware |
|---------|--------------------|-------------------|----------|------------|-----------|
| Seagate | SV35 + SRS | ST3000VX004 | 3TB | SATA 6Gb/s | CV26 |
| | | ST2000VX004 | 2TB | SATA 6Gb/s | CV26 |
| | | ST1000VX002 | 1TB | SATA 6Gb/s | CV26 |
| | Video | ST4000VM000 | 4TB | SATA 6Gb/s | SC25 |
| | SkyHawk | ST4000VX007 | 4TB | SATA 6Gb/s | CV11 |
| | | ST6000VX0023 | 6GB | SATA 6Gb/s | SC60 |
| | | ST8000VX022 | 8TB | SATA 6Gb/s | AV01 |
| | | ST10000VX0004 (*) | 10TB | SATA 6Gb/s | AV01 |
| | Surveillance + SRS | ST4000VX002 | 4TB | SATA 6Gb/s | CV13 |
| | | ST4000VX0011 | 6TB | SATA 6Gb/s | VN02 |
| | SV35 | ST3000VX000 | 3TB | SATA 6Gb/s | CV12/CV26 |
| | | ST2000VX000 | 2TB | SATA 6Gb/s | CV12/CV26 |
| | | ST2000VX000 | 1TB | SATA 6Gb/s | CV12/CV26 |
| | | ST31000526SV | 1TB | SATA 6Gb/s | CV12 |
| | | ST3500411SV | 500 GB | SATA 6Gb/s | CV12 |
| WD | Purple | WD60PURZ (!) | 6TB | SATA 6Gb/s | 80.00A80 |
| | | WD40PURZ | 4TB | SATA 6Gb/s | 80.00A80 |
| | | WD30PURZ | 3TB | SATA 6Gb/s | 80.00A80 |
| | | WD20PURZ | 2TB | SATA 6Gb/s | 80.00A80 |
| | | WD10PURZ | 1TB | SATA 6Gb/s | 01.01A01 |

(*) Newly tested compatible hard drive models

(!) Only compatible to NT-4040, NT-4040R, CT-4000, CT-4000R, TR-0404NT, TR-0400CT, R1-0404NT and R1-0400CT

(!!) Only compatible to NT-8040R, CT-8040RP, CT-8000R, CT-8000RP, CT-8000IP, CT-8000IP-RP, CT-8000EX and CT-8000EX-RP

**The maximum volume size of each volume is 16TB for non-all-in-one firmware.

***Some listed devices may go EOL, so we cannot promise the market availability.

1. iSCSI Support

| Brand | Model | Infrastructure | HDD | Capacity* |
|---------|----------------------------------|----------------|--------------|-----------|
| EMC | IOMEGA px12-350r | SAN | SATA | 36 TB |
| EMC | IOMEGA px12-450r | SAN | SATA | 48 TB |
| EMC | VNX 5300 | SAN | Nearline SAS | 375 TB |
| HP | P2000 G3 MSA | SAN | SAS | 36 TB |
| HP | P2000 G3 MSA | SAN | SATA | 36 TB |
| Qsan | P600Q-DS316 | SAN | SATA | 48 TB |
| Proware | EN-3166JS6H-NQX | SAN | SATA | 48 TB |

*Capacity is the volume size of each iSCSI model, not the supported volume size of NUUO Crystal™ and Titan NVR.

**NUUO Crystal™ and Titan NVR support up to 6 iSCSI target. Each iSCSI target has size limitation of 16TB. The total size for iSCSI is 96TB (16TB x 6 targets)

2. DAS Support

| Brand | Model | Host Interface | HDD | Capacity |
|-------|------------------------|----------------|------|----------|
| Axus | FIT500 | eSATA | SATA | 15 TB |

3. Graphic Card* tested

| Brand | Series/Model |
|----------|-----------------|
| ATI | Radeon HD 4350 |
| AMD | Radeon HD 5450 |
| | Radeon HD 6670 |
| | Radeon HD 6750M |
| NVIDIA | GeForce GT 610 |
| | GeForce GT 210 |
| Intel HD | Graphics 3000 |
| | Graphics 4000 |

*Matrox 9188 and Matrox are not recommended

4. Keyboard/Joystick Support

| Vendor | Model |
|-------------|---------------|
| Videotec | DCZ Keyboard |
| CH Products | VM Desktop |
| Axis | 295 |
| Axis | T8311/ T8312* |
| Logitech | Attack 3 |

*Newly tested supported keyboard/joystick

**NUUO supports all the models of joysticks that are compatible with Windows.

***See appendix for introductions of configuring and using keyboard and joystick.

Supported function:

| Type | Function |
|-------------------------|---|
| View and grid switching | Go to monitor # Next view Previous view Next grid Previous grid Go to grid # |
| Screen layout switching | Toggle single camera view Toggle full-screen |
| PTZ control | Digital / Optical switch Zoom in Zoom out Go to preset # |

5. UPnP Router (auto port-forwarding)

| Vendor | Model |
|--------|---------|
| D-Link | DIR-300 |

Note: This is the model we tested for auto port-forwarding function. Basically, all router possess UPnP function should be compatible.

6. Web Browser support

| Browser | IE 8 | IE 9 | IE 10 | IE 11 | Firefox |
|---------|--------|--------|--------|--------|----------|
| OS | 32-bit | 32-bit | 32-bit | 32-bit | 23 to 42 |

| | | | | | |
|-----------------------|------|------|------|------|------|
| Windows XP-SP3 32-bit | PASS | N/A | N/A | PASS | PASS |
| Windows 7 32/64-bit | PASS | PASS | N/A | PASS | PASS |
| Windows 8 32/64-bit | N/A | N/A | PASS | PASS | PASS |
| Windows 8.1 32/64-bit | N/A | N/A | N/A | PASS | PASS |
| Windows 10 64bit | N/A | N/A | N/A | PASS | PASS |
| MAC OS X 10.9 | N/A | N/A | N/A | N/A | N/A |
| MAC OS X 10.10 | N/A | N/A | N/A | N/A | N/A |

*Not support web browser on MAC

7. OS supported for NuClient AP

| Application OS | Backup Player | Install Wizard | NuClient | Offline Tool | Verification Tool | Uninstall Toolkit |
|-----------------------|---------------|----------------|----------|--------------|-------------------|-------------------|
| Windows XP | PASS | PASS | PASS | PASS | PASS | PASS |
| Windows 7 32/64-bit | PASS | PASS | PASS | PASS | PASS | PASS |
| Windows 8 32/64-bit | PASS | PASS | PASS | PASS* | PASS | PASS |
| Windows 8.1 32/64-bit | PASS | PASS | PASS | PASS* | PASS | PASS |
| Windows 10 64bit | PASS | PASS | PASS | PASS | PASS | PASS |
| MAC OS X 10.9 | PASS | PASS | PASS | N/A | PASS | N/A |
| MAC OS X 10.10 | PASS | PASS | PASS | N/A | PASS | N/A |

* Please close UAC when operating Offline tool for license activation and transfer.

8. UPS Support

| Vendor | Model |
|------------|-------------------------------------|
| APC | APC Smart-UPS XL 3000VA (SUA3000XL) |
| APC | APC Smart-UPS 1500VA |
| APC | APC Smart-UPS 750VA |
| Tripp Lite | Tripp Lite Smart1500LCD |

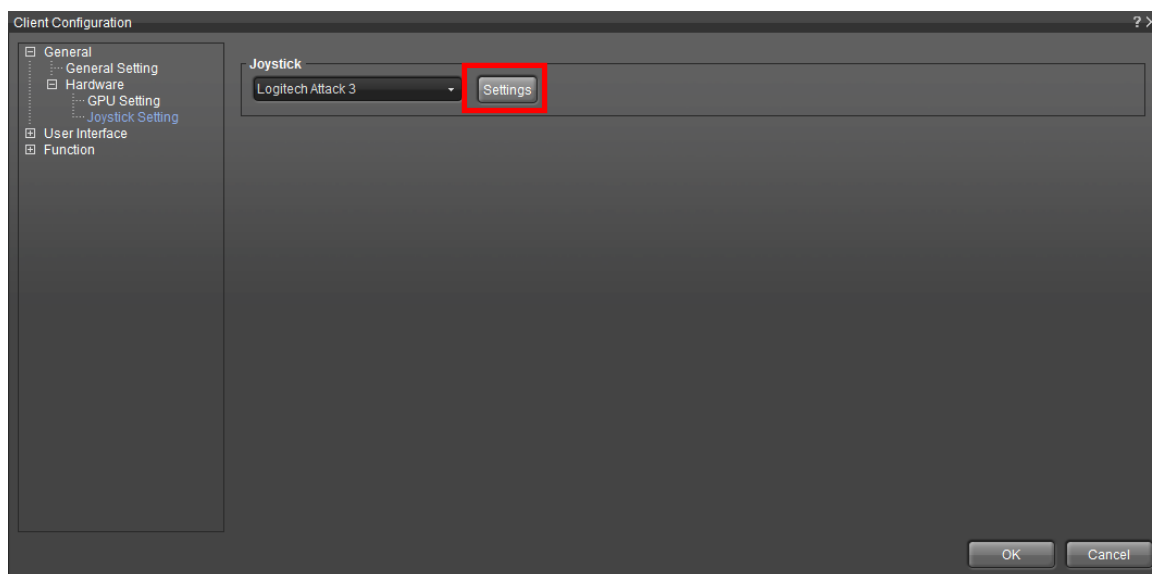
* The above list is based on what have been really tested. Crystal has applied the latest NUT driver from v3.9.0 to support multiple UPS brands and models. Please refer to <http://networkupstools.org/stable-hcl.html> for the supported list.

Appendix A: Introductions of configuring generic USB keyboard and joystick

Supported generic USB keyboard/joystick:

| Vendor | Model |
|-------------|--|
| CH Products | VM Desktop |
| Axis | 295 |
| Axis | T8311/ T8312 (Download Driver) |
| Logitech | Attack 3 |

Click “**Client Configuration**” from the global menu, and then select “**General->Hardware->Joystick Settings**”, and then click “**Setting**” button:

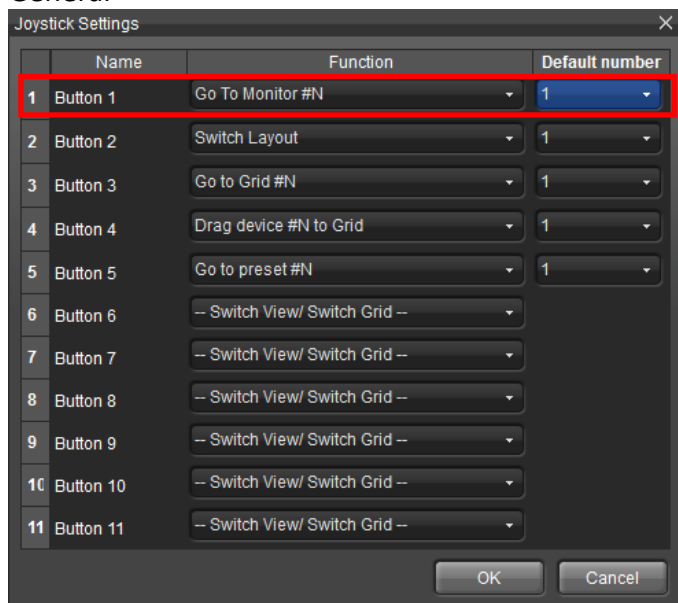


There are two types of keystroke:

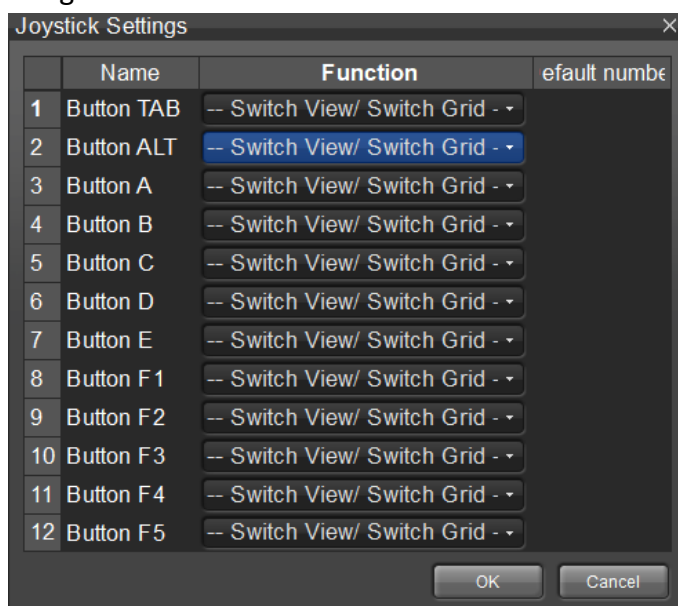
1. A **combo-keystroke** triggers a specific action with argument embedded. The variable argument is represented as “**#N**”. A default argument should be assigned for each **combo-keystroke**.
 2. A **single-keystroke** triggers a specific action without any argument. No default argument is needed.
- Currently there are 5 **combo-keystrokes** and 8 **single-keystrokes** supported.

Combo-keystroke:

General



Integrated T8312



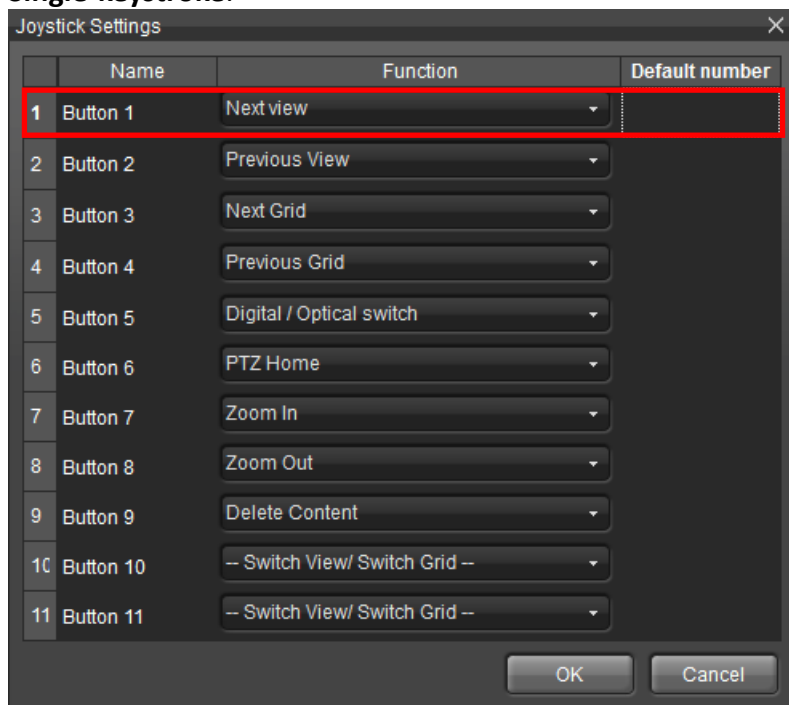
| Function | Description | Default Number (Argument) |
|------------------|--|---|
| Go To Monitor #N | Move focus to the first grid of monitor #N For example: Go to 1 st monitor: #N = 1 Go to 3 rd monitor: #N = 3 | 1 – (number of monitors utilized by client application) |
| Switch Layout | Switch layout For example: Switch to 1x1 layout: #N = 1 Switch to 2x2 layout: #N = 2 | 1 – 5 |

| | | |
|-------------------------------|--|--|
| | Switch to 1+5 layout: #N = 3 Switch to 3x3 layout: #N = 4 Switch to 2+8 layout: #N = 5 | |
| Go to Grid #N | Go to specified grid by focusing it | 1 – 100 (default number represents the grid number of the last focused monitor) |
| | For example: Focus grid 101: #N = 101 Focus grid 204: #N = 204 | |
| Drag device #N to Grid | Drag device #N to the focused grid | 1 – (number of total devices of all recording servers) |
| | For example: Recording Server A has 10 devices Recording Server B has 20 devices Drag 5 th device of Server A to the focused grid: #N = 5 Drag 10 th device of Server B to the focused grid: #N = 20 | |
| Go to preset #N | Go to preset number #N | 1 – 64 (maximum count of preset points) |
| | For example: Go to preset point 6: #N = 6 | |

For example, **Button 1** is mapped with **Function** “Go To Monitor #N”, and its **Default number** is “1”

| Key Strokes | Action |
|--|--|
| ➤ Press Button 1 and release it | Focus the first grid of monitor 3 |
| ➤ Press 3 | |
| ➤ Press Button 1 and release it | |
| ➤ Press Button 1 and hold it | Focus the first grid of monitor 3 |
| ➤ Press 3 | |
| ➤ Release Button 1 | |
| ➤ Press Button 1 and release it | Focus the first grid of monitor 1 by default |
| ➤ Press Button 1 and release it | |

Single-keystroke:



Function

Description

| | |
|---------------------------------|--|
| Next view | Select next view |
| Previous view | Select previous view |
| Next Grid | Focus next grid |
| Previous Grid | Focus previous grid |
| Digital / Optical switch | Toggle digital PTZ / optical PTZ |
| PTZ Home | Move PTZ camera to home position |
| Zoom In | Zoom In a PTZ camera |
| Zoom Out | Zoom Out a PTZ camera |
| Delete Content | Delete displayed content of the focused grid. (displayed content may be video, I/O, or E-Map) |

For example, pressing **Button 1** will trigger an action to select the next view.

Appendix B: Introductions of using Videotec DCZ keyboard

DCZ keyboard has its own proprietary keystrokes to trigger following actions:

| Function | Key Strokes Example | Action |
|------------------------|-----------------------|--|
| Go To Monitor #N | Monitor + 1 + Monitor | Focus the first grid of monitor 1 |
| Go to Grid #N | Cam + 1 + 0 + 2 + Cam | Focus Grid 102 |
| Drag device #N to Grid | Live + 1 + 0 + Live | Drag 10 th device to the focused grid |
| Go to preset #N | Preset + 5 + Preset | Go to preset point 5 |
| Next view | +NEXT | Select next view |
| Previous view | -PREV | Select previous view |

DCZ keyboard has a joystick upon it, and we can use the joystick to control camera's optical and digital PTZ motion with proportional speed.

