thinklogical®

A BELDEN BRAND

# TLX1280

## 10G KVM MATRIX SWITCH PRODUCT MANUAL

**Revision C, July 2019**

**Thinklogical,** A BELDEN BRAND • **100 Washington Street • Milford, Connecticut 06460 U.S.A.**

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**Subject:** TLX1280 10G KVM Matrix Switch Product Manual
**Revision**: C, July 2019

thinklogical®

CERTIFIED ISO 9001:2015 COMPANY

MADE IN USA

| | |
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# Table of Contents

**PREFACE** ..... **1**
About Thinklogical, A **BELDEN** BRAND ..... 1
About This Product Manual ..... 2
Note and Warning Symbols ..... 2
Referenced Documents ..... 2
Connection to the Product ..... 2
Product Serial Number ..... 2

**SECTION 1: REGULATORY AND SAFETY REQUIREMENTS** ..... **3**
Class 1 Laser Information ..... 3
Symbols Found on Our Products ..... 3
Regulatory Compliance ..... 3
North America ..... 3
Australia & New Zealand ..... 4
European Union ..... 4
Declaration of Conformity ..... 4
Standards with Which Our Products Comply ..... 4
Supplementary Information ..... 4

**SECTION 2: TLX1280 FEATURES** ..... **5**
The Logical Solution ..... 5
TLX Matrix Switch Security Features ..... 6
Physical Separation ..... 6
Partitioned and Restricted Switching ..... 6
Resiliancy ..... 6
System Functionality ..... 6
TLX1280 Ordering Information ..... 6
TLX1280 Matrix Switch Design ..... 7
Design Features ..... 7
Product Compatability ..... 7
Chassis Dimensions ..... 7
Diagram: Front View of the TLX1280 Matrix Switch ..... 8
Diagram: Rear View of the TLX1280 Matrix Switch ..... 9
Power Supply Modules ..... 10
The Fan Tray Module ..... 10
Alarms ..... 10
The Controller Cards ..... 11
The Processor ..... 12
The Network Interfaces ..... 12
SNMP Support ..... 13
NTP Support ..... 14
System Log File Support ..... 14
The Input/Output Cards ..... 14
Port Numbering ..... 15
The Switch Cards ..... 16
The Interconnect Card ..... 16
TLX1280 Technical Specifications ..... 16
*Diagram: Chassis Dimensions and Cable Guides* ..... 17

**SECTION 3: SET-UP AND INSTALLATION** ..... **18**
Order of Installation Events ..... 18
AC Source Requirements ..... 18
Contents ..... 18

Unpacking The TLX1280 Chassis ..... 19
Lifting Fixtures ..... 20
Connecting to the TLX1280 ..... 21
Ethernet Control ..... 21
TLX1280 DIP Switch Settings ..... 22
Redundancy and Network Requirements ..... 22
External Control CPU Minimum Requirements ..... 22
Pluggable SFP+ Modules ..... 22
Fiber-Optic Cable ..... 23
Requirements ..... 23
Handling ..... 23
Installing ..... 23
Routing Thinklogical Extenders through the TLX1280 ..... 24
Connecting to a Receiver ..... 24
Connecting to a Tranmitter ..... 24
Connecting to a Control CPU ..... 25
Linux Command Console (Console Port) ..... 25
ASCII API Settings (RS-232 Port) ..... 25
On Screen Display (OSD) - Firmware Option ..... 25
Firmware Updates ..... 25

**SECTION 4: MAINTENANCE ..... 26**
How to Safely Remove an Active *Controller Card* or Shut Down the System ..... 26
The HALT Button ..... 26
The PWROFF Command ..... 26
How to Remove and Replace a Controller Card ..... 26
The Interconnect Card ..... 27
How To Remove and Replace Modules that DO NOT Require a Halt ..... 27
How To Remove and Replace a *Power Supply* ..... 27
How To Remove and Replace an *Input/Output Card* ..... 27
How To Remove and Replace a *Fan Tray* ..... 28
How To Remove and Replace a *Switch Card* ..... 28

**SECTION 5: THINKLOGICAL® SUPPORT ..... 29**
Customer Support ..... 29
Website ..... 29
Email ..... 29
Telephone ..... 29
Fax ..... 29
Product Support ..... 29
Warranty ..... 29
Return Authorization ..... 29
Our Addresses ..... 29

**APPENDIX A: TLX1280 QUICK START GUIDE ..... 30**

**APPENDIX B: FPGA PROGRAM CODE UPDATE PROCEDURE ..... 31**

**APPENDIX C: SD CARD REPLACEMENT PROCEDURE FOR TLX1280 CONTROLLER CARDS ..... 32**

**APPENDIX D: SECURE APPLICATIONS ..... 34**

# PREFACE

## About Thinklogical A BELDEN BRAND

**Thinklogical, A BELDEN BRAND**
**100 Washington St.**
**Milford, CT 06460**

Thinklogical, A BELDEN BRAND, is the leading manufacturer and provider of fiber-optic and CATx video, KVM, audio, and peripheral extension and switching solutions used in video-rich, big-data computing environments.

**Thinklogical offers the only fiber-optic KVM matrix switches in the world that are accredited to the Common Criteria EAL4, TEMPEST SDIP 24 Level B, and NATO NIAPC Evaluation Scheme: GREEN and the U.S. DoD DISA JITC UCR 2013 APL information assurance standards. And Thinklogical Velocity products are the first system with both KVM and video matrix switching capabilities to be placed on the Unified Capabilities Approved Product List (UC APL) under the Video Distribution System (VDS) category.**

**Thinklogical products are designed and manufactured in the USA and are certified to the ISO 9001:2015 standard.**

Thinklogical is headquartered in Milford, Connecticut and is owned by Belden, Inc., St. Louis, MO (http://www.belden.com). For more information about Thinklogical products and services, please visit https://www.thinklogical.com.

# About this Product Manual

This product manual is divided into five sections to help you find the various topics and procedures. This manual also contains Appendices.

**Section 1 – Regulatory and Safety Requirements**: **Pg. 3**. Thinklogical® strongly recommends that you read this section prior to starting the hardware assembly.

**Section 2 – TLX1280 Features**: **Pg. 5**. Details the features and functions of your products.

**Section 3 – Set-Up and Installation**: **Pg. 18**. Contains all the requirements and procedures necessary to connect and install your equipment, including FPGA updates.

**Section 4 – Maintenance**: **Pg. 26**. Details on how to properly remove and replace individual modules or shut-down the system.

**Section 5 – Thinklogical Support**: **Pg. 29**. Thinklogical provides the best customer support available. If you have questions or need to contact us for any reason, please refer to this section of the manual.

**Appendices –** Beginning on **Pg. 30**.

## Note and Warning Symbols

Throughout this manual you will notice certain symbols that bring your attention to important information. These are **Notes** and **Warnings**. Examples are shown below.

**Note: Important Notes appear in blue text preceded by a yellow exclamation point symbol, as shown here.**

A **note** is meant to call the reader's attention to **helpful or important** information at a point in the text that is relevant to the subject being discussed. *Please read this information thoroughly.*

**Warning! All Warnings appear in red text, followed by blue text, and preceded by a red stop sign, as shown here.**

A **warning** is meant to call the reader's attention to **critical** information at a point in the text that is relevant to the subject being discussed. *Please read this information thoroughly.*

## Referenced Documents

All documents referenced in this manual (**In_This_Text_Format**) are available to view or download on the Thinklogical website at https://www.thinklogical.com. Most online documents are stored as Adobe Acrobat PDF files. If you do not have the Adobe Acrobat reader needed to view PDF files, visit www.adobe.com for a download.

## Connection to the Product

**Connections and installation hardware for our products use industry-standard devices and methods.** All wiring connections to the customer equipment are designed to minimize proprietary or customized connectors and cabling. Power connections are made with regionally appropriate power cords and approved methods.

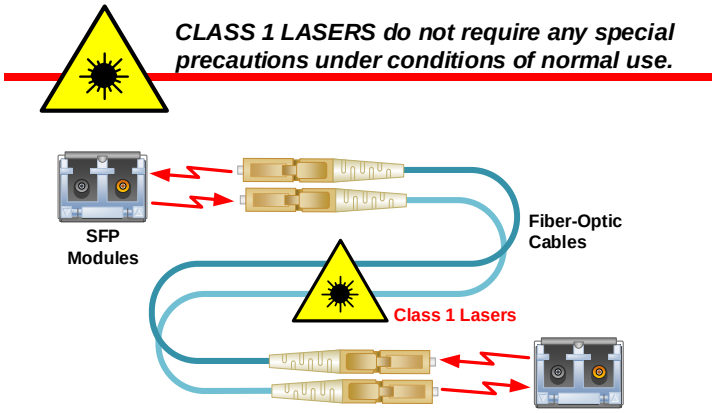
## Product Serial Number

Thinklogical products have a unique serial number, which includes a date-code, printed on an adhesive label that is affixed to the unit. The format for the date-code is *2 digits for the month*, dash, *2 digits for the year*, plus *at least four digits for a unique unit number*. **For example:**
**07-190023** indicates the unit was built in the **7**th month of 20**19** and is unit number **23**.

# Section 1: Regulatory and Safety Requirements

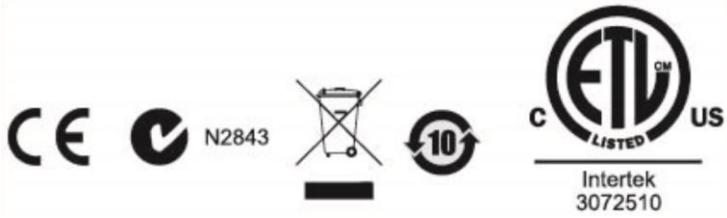
## Class 1 Laser Information

The TLX1280, like all Thinklogical® fiber-optic products, is designed and identified as a **Class 1 LASER product.** This means the maximum permissible exposure (MPE) cannot be exceeded when viewing the laser with the naked eye or with the aid of typical magnifying optics (e.g. telescope or microscope).




## Symbols Found on Our Products

Markings and labels on our products follow industry-standard conventions. Regulatory markings found on our products comply with all required domestic and many international requirements.




## Regulatory Compliance

Thinklogical's® products are designed and made in the U.S.A. These products have been tested by a certified testing laboratory and found compliant with the following standards for both domestic USA and many international locations:

### North America

**Safety**
UL 62368-1:2014Ed.2
CSA C22.2#62368-1:2014Ed.2

**LASER Safety**
CDRH 21 CFR 1040.10
Class 1 LASER Product
Canadian Radiation Emitting Devices Act, REDR C1370
IEC 60825:2001 Parts 1 and 2
Class 1 LASER Product

**Electromagnetic Interference**
FCC 47CFR Part 15 Subpart B: 2013 Class A
Industry Canada ICES-003: 2016 Ed. 6

### Australia & New Zealand

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take corrective action.

### European Union

#### Declaration of Conformity

Manufacturer's Name & Address: **Thinklogical,** A **BELDEN** BRAND
**100 Washington Street**
**Milford, Connecticut 06460 USA**

Thinklogical's products comply with the requirements of the Low Voltage Directive 2006/95/EC, the EMC Directive 2004/108/EC, the RoHS Directive 2011/65/EU, the WEEE Directive 2012/19/EU and carry the CE marking accordingly.

### Standards with Which Our Products Comply

**Safety**

IEC 62368-1:2014Ed.2+C1
CB Scheme Certificate

**Electromagnetic Emissions**

CENELEC EN 55022:2010 +AC:2011

**Electromagnetic Immunity**

EN 55024:2011+A1
CENELEC EN 55032:2015
EN 61000-3-2:2000 Harmonics
EN 61000-3-3:2008 Flicker
EN 61000-4-2:2009 Electro-Static Discharge Test
EN 61000-4-3:2006 A1:2008, A2:2010 Radiated Immunity Field Test
EN 61000-4-4:2004 Electrical Fast Transient Test
EN 61000-4-5:2006 Power Supply Surge Test
EN 61000-4-6:2009 Conducted Immunity Test
EN 61000-4-11:2004 Voltage Dips & Interrupts Test

## Supplementary Information

The following statements may be appropriate for certain geographical regions and might not apply to your location:

- This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations. *Cet appareil numérique de la classe A respecte toutes les exigencies du Règlement sur le matérial brouilleur du Canada*.
- This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take corrective action.
- This equipment has been tested and found compliant with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the 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 in which case the user may be required to make adequate corrective measures at their own expense.
- This Class A digital apparatus complies with Canadian ICES-003 and has been verified as compliant within the Class A limits of the FCC Radio Frequency Device Rules (FCC Title 47, Part 15, Subpart B CLASS A), measured to CISPR 22:1993 limits and methods of measurement of Radio Disturbance Characteristics of Information Technology Equipment.
- The user may notice degraded audio performance in the presence of electro-magnetic fields.

# Section 2: TLX1280 Features

## THE LOGICAL SOLUTION

**The TLX1280 is a 10G high-performance, modular, non-blocking KVM (keyboard-video-mouse) matrix switch that supports full, uncompressed 4K video with full color depth at a 60Hz frame rate for complete, end-to-end routing of video and peripheral signals over multi-mode or single-mode fiber-optic cable.**

This highly secure, reliable and resilient matrix switch is expandable from 32x32 ports to 1280x1280 ports, ideal for flexible and/or secure deployment configurations. In addition, the TLX1280 provides mission critical dependability and unrivalled signal integrity. Being protocol agnostic, the switch supports DVI, SDI, HD-SDI, Dual-link DVI, Dual-link SDI, USB HID, USB 2.0, RS-232 Serial and audio.

### Thinklogical's TLX1280 Matrix Switch® includes:

- **6** Power Supply Modules
- **1** Fan Tray Module (6 fans)
- **1** Controller Card
- **8** Switch Cards (7 plus 1 redundant)
- **1** Interconnect Card

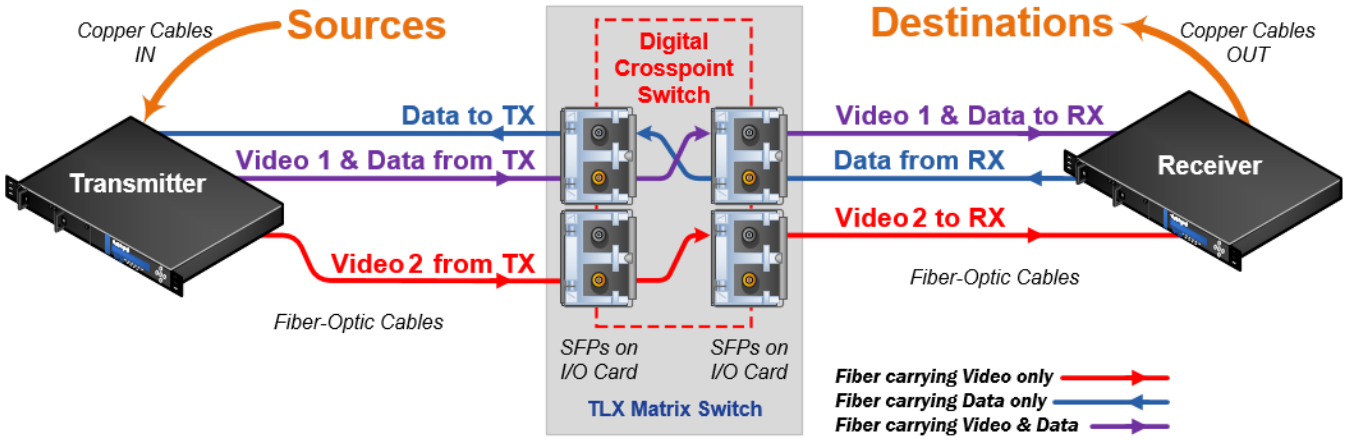
### Optional Modules (Spares):

- **1** Back-Up Controller Card
- **1-40** 32-port Input / Output Cards (with SFP+ modules)
- **1 Set** Fiber Cable Management Racks

*The TLX1280 Matrix Switch is only available with LC-type fiber connectors.*

### The Digital Crosspoint Switch

The key to any Thinklogical Matrix Switch is the *Digital Crosspoint Switch*, a non-blocking, 12Gpbs asynchronous switch that can connect any input to any output of Thinklogical's TLX, VX and MX Matrix Switches. Video and Data signals are routed in both directions and the data stream is de-multiplexed at the receiver to deliver uncompressed, high resolution video, audio and peripheral data to the end-user.



# TLX MATRIX SWITCH SECURITY FEATURES

## Physical Separation

Because creating physical separation between potential threats (users) and the target (secure data) is essential to a secure system design, Thinklogical's system permits users to **access sources up to 80 kilometers away, with no performance degradation**. System administrators can safeguard sources in a centralized location, allowing users to maintain remote access to the sources, but with no means to breach the system, either accidentally or intentionally (such as downloading sensitive information onto a USB drive).

## Partitioned and Restricted Switching

**To protect data between multiple networks**, partitioning allows the switch resources to be divided to support more than one network without allowing switching between networks. Restricted switching allows the administrator to manage access on a port-by-port basis. Partitioned and restricted switching is enabled through the switch's firmware, which means a threat would have to physically access the switch to tamper with the settings. (See *Appendix D: Secure Applications*, on pg. 34.)

## Resiliency

TLX Matrix Switches are designed to maximize system uptime. Their modular approach allows users to **hot-swap all critical system components** without turning off the Switch or interrupting active signals. **Redundant and current-sharing power supplies** ensure continuous, uninterrupted power to the switch. The TLX1280 is configurable to include a **Redundant Back-up Control Card with automatic fail-over (recommended)**. Enhanced diagnostics and alarms provide extensive real-time monitoring of critical switch functions.

## System Functionality

The TLX Extension System is **compatible with the full line of scalable, non-blocking TLX Matrix Switches**, ranging from 12 to 1280 ports.

## TLX1280 Ordering Information

***Part numbers for the various components of the TLX1280 Matrix Switch are as follows:***

| PART NUMBERS | FEATURES |
|---|---|
| **TLX1280 Matrix Switch** | |
| **TLX-MSC-001280** | TLX1280 Matrix Switch Chassis, with 1 Controller Card, 6 Power Supplies, 1 Fan Tray, 8 Switch Cards, 1 Interconnect Card |
| **TLX1280 Data Input/Output Modules** | |
| **TLX-MSD-M00032** | TLX Matrix Switch Data Input/Output Card, **32** Multi-Mode Fiber Ports |
| **TLX-MSD-S00032** | TLX Matrix Switch Data Input/Output Card, **32** Single-Mode Fiber Ports |
| **TLX-MSD-000032** | TLX Matrix Switch Data Input/Output Card, **unpopulated** for up to **32** Multi- or Single-Mode SFP+ Modules |
| **TLX1280 Spare Modules** | |
| **TLX-MSM-C01280** | TLX1280 Matrix Switch Module Controller Card |
| **TLX-MSM-F01280** | TLX1280 Matrix Switch Module Fan Tray |
| **TLX-MSM-P01280** | TLX1280 Matrix Switch Module Power Supply |
| **TLX-MSM-S01280** | TLX1280 Matrix Switch Module Switch Card |
| **TLX1280 Fiber Management** | |
| **HWR-000507** | Fiber Management Rack, Top |
| **HWR-000508** | Fiber Management Rack, Bottom |

Customized **Fiber-Optic Cable Bundles** (for Upper and Lower Card Cages) are available through Thinklogical. Please speak with a sales representative about your specific needs at 1-203-647-8700.

# THE TLX1280 MATRIX SWITCH DESIGN

The modular approach of the TLX1280 KVM Matrix Switch (sometimes referred to as a Switch or Router) allows all critical system components to be hot-swappable, including Input/Output Cards, Power Supplies and pluggable optics (SFP+), thus minimizing down-time during reconfigurations, updates or failures.

## Design Features

Each TLX1280 includes the following features:

- Up to 1280 fiber ports - In and Out for non-blocking matrix switching
- Each connection supports 10Gbps/6.25 Gbps with re-clocking input
- 32 ports scalability with hot-swappable Input/Output Cards
- 6 Redundant, hot-swappable, current sharing power supply modules
- Single-mode and multi-mode fiber capability
- Comprehensive system setup and control provided via Thinklogical's Configurator software (included)
- Multicasting and macros supported
- SNMP control protocol
- Controllable via LAN or serial connection
- Single, hot-swappable Fan Tray with annunciator port (for alarms)
- Redundant Controller Card
- Optional Fiber-Optic Cable Management Racks
- Custom Fiber-Optic Cable Bundles (available)

## Product Compatibility

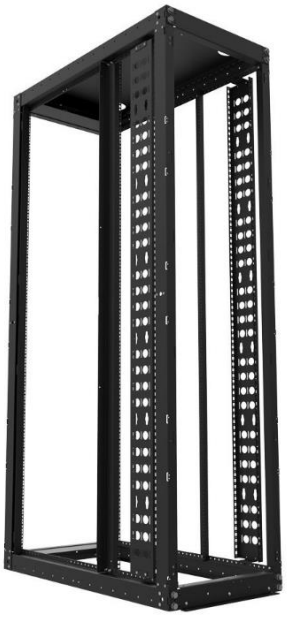
**TLX Matrix Switches are compatible with the following Thinklogical products:**

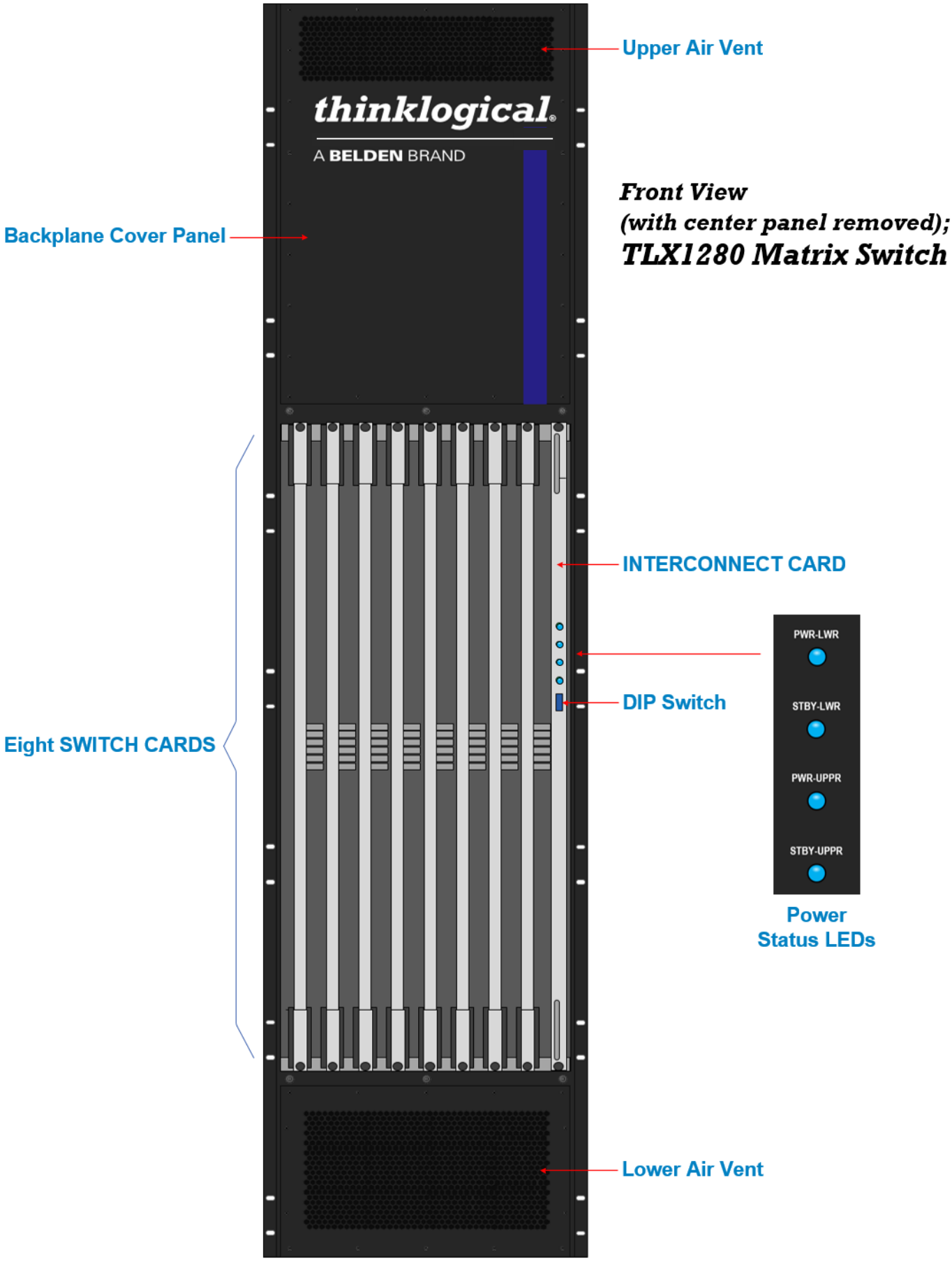
- Single & Multi-Mode **TLX 10G KVM and Video Extenders** (10G to 10G only)
- Single & Multi-Mode **Velocity 6G KVM and Video Extenders** (6G to 6G only)
- **SDI Xtreme 3G+ Extenders**
- **Configurator / Hot-Key Manager**
- **System Management Portfolio 2.0**
- Standard **VX Matrix Switch ASCII Interface** (via RS-232 port or via Network port)
- Standard **VX Matrix Switch IP Address Configuration Procedure**
- **VX1280 Matrix Switch 6G I/O cards** (6G to 6G only)

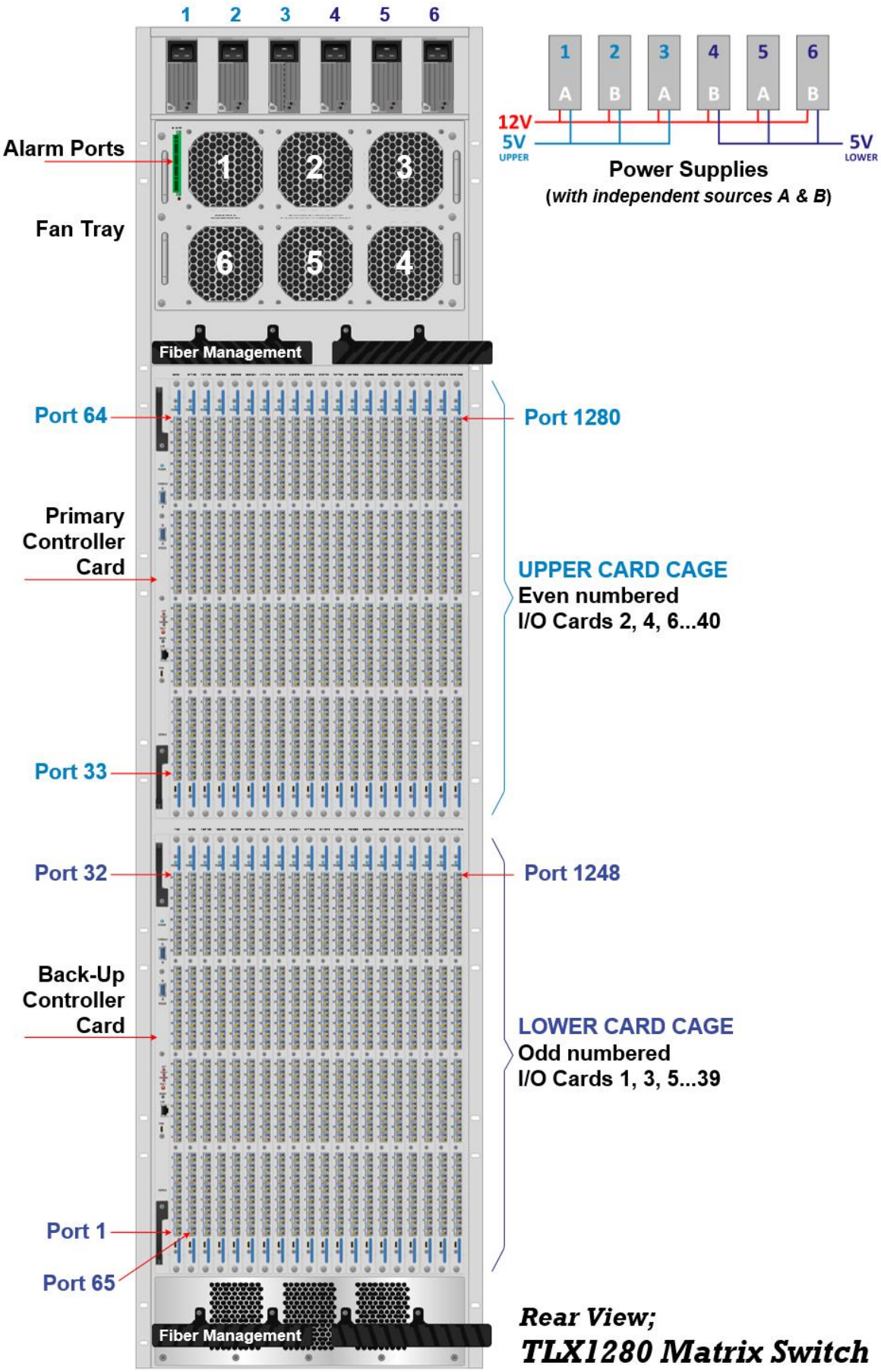
## Chassis Dimensions

- **Rack Size:** EIA 19" (482.6 mm)
- **Height:** 42 RU - 73.5" (1866.9 mm)
- **Depth:** 29.00" (736.6 mm)
- **Depth w/ handles/fiber management:** 35.125" (892.18 mm)
- **Width:** 17.25" (438.2 mm)

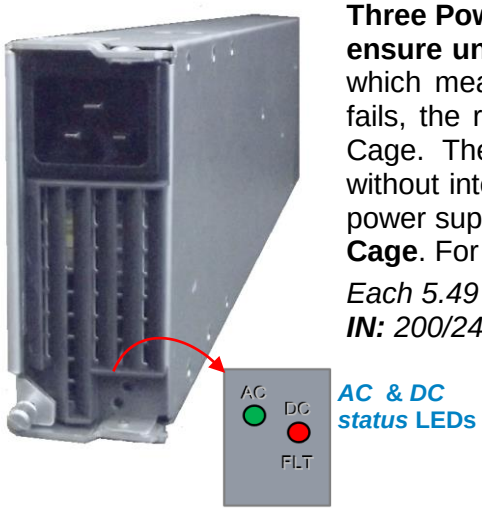
**The TLX1280 occupies one full EIA 42 RU, 19" Rack**




Upper Air Vent
thinklogical
A BELDEN BRAND
Backplane Cover Panel
Front View
(with center panel removed);
TLX1280 Matrix Switch
INTERCONNECT CARD
PWR-LWR
STBY-LWR
PWR-UPPR
STBY-UPPR
DIP Switch
Eight SWITCH CARDS
Power
Status LEDs
Lower Air Vent

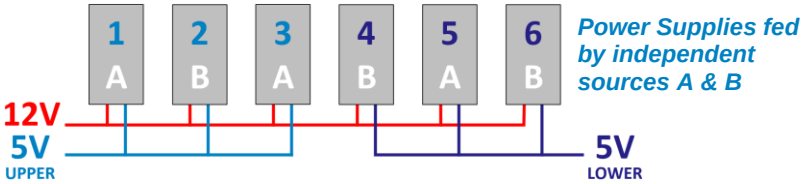

1 2 3 4 5 6
1 A
2 B
3 A
4 B
5 A
6 B
12V
5V
UPPER
5V
LOWER
Power Supplies
(with independent sources A & B)
Alarm Ports
Fan Tray
1
2
3
6
5
4
Fiber Management
Port 64
Port 1280
Primary Controller Card
UPPER CARD CAGE
Even numbered
I/O Cards 2, 4, 6...40
Port 33
Port 32
Port 1248
Back-Up Controller Card
LOWER CARD CAGE
Odd numbered
I/O Cards 1, 3, 5...39
Port 1
Port 65
Fiber Management
Rear View;
TLX1280 Matrix Switch

## Power Supply Modules




**Three Power Supplies per Card Cage and two independent AC Sources ensure uninterrupted power.** The two sets of supplies are *current-sharing*, which means they share the load of their Card Cage equally. If a supply fails, the remaining supplies can support the full current load of that Card Cage. The hot-swappable feature allows easy replacement of a supply without interrupting the system. Although the TLX1280 will function with one power supply per Card Cage, **redundancy requires a minimum of two per Cage**. For normal operation, all three supplies per Cage are recommended.

*Each 5.49 lb. power supply module contains an internal cooling fan.*
***IN:*** *200/240VAC, 16A, 50/60Hz* ***OUT:*** *12VDC, 3KW (5VDC @ 4A stand-by)*

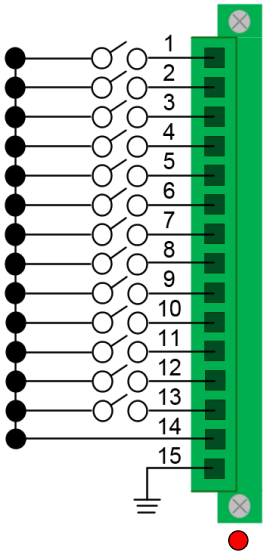



## The Fan Tray Module

**The TLX1280 uses 6 DC fans located in one modular, hot-swappable tray designed for easy replacement without interrupting system functionality.** The Fan Tray introduces air into the chassis through air baffles within the chassis. This cools the vertically mounted I/O Cards, the Controller Cards and the backplane. *The TLX1280 should not run more than ten minutes without a Fan Tray*.

The Fan Tray is also equipped with an **annunciator port** for system alarms that can be configured to trigger an external control system. The Critical Hardware Alarm contacts are *Normally Closed (* NC*).*

**The TLX1280 Matrix Switch Critical Hardware Alarms:** (Located at the top, left of the Fan Tray.)




**POWER SUPPLY 1** *(left)*
**POWER SUPPLY 2:**
**POWER SUPPLY 3:**
**POWER SUPPLY 4:**
**POWER SUPPLY 5:**
**POWER SUPPLY 6:**
*Fan failure, temperature spikes, DC voltage/current range, AC power input interrupt, module removed*

**FAN:** *Individual fan monitoring*
**TEMPERATURE WARNING:** *Chassis over temperature, multiple sensors*
**TEMPERATURE SHUTDOWN:** *Chassis over temperature causing shutdown*
**CPU:** *Card failure (Only with a redundant card)*
**INPUT/OUTPUT CARDS:** *SFP+ failure, laser output fault*
**SWITCH CARD:** *Initialization, power supply, communications or temperature failure*
**ORD:** *Active when any other alarm goes active. Useful when only one alarm contact is desired.*
**COMMON**
**GROUND**

**FAULT LED**

All **fan speeds** are monitored and any fan that does not meet specifications will trigger an alarm. **The temperature in the chassis is monitored by internal temperature sensors in several locations.** Sensors located in the Power Supplies, on the Fan Tray, on the Controller Card(s) and on the I/O Card(s) continuously monitor for anomalous conditions. A red LED indicates a fault.

# The Controller Cards

## Primary and Back-up:

**The hot-swappable Controller Card connects the Matrix Switch to an External CPU.** The RS-232 Serial Port (pg. 12) may also be used for 3rd party controller integration (such as Crestron, AMX or home-spun interfaces.). Additionally, the System Management Software may be used to control the Switch via the LAN port.

**The Primary Controller Card should always be in the upper controller slot.** *A Back-up Controller Card ensures uninterrupted functionality if the Primary Controller Card should fail or need to be replaced. The Back-up is sometimes referred to as a* Secondary.

The Back-up Controller must have a LAN connection that allows it to communicate with both the Primary Controller and the Configurator server (required for the Back-up Controller to take control of the switch). Both Controller Cards must have the same CPU Module/Processor.

## LED Definitions:

**POWER**: Blue = normal operation. Red = fault.

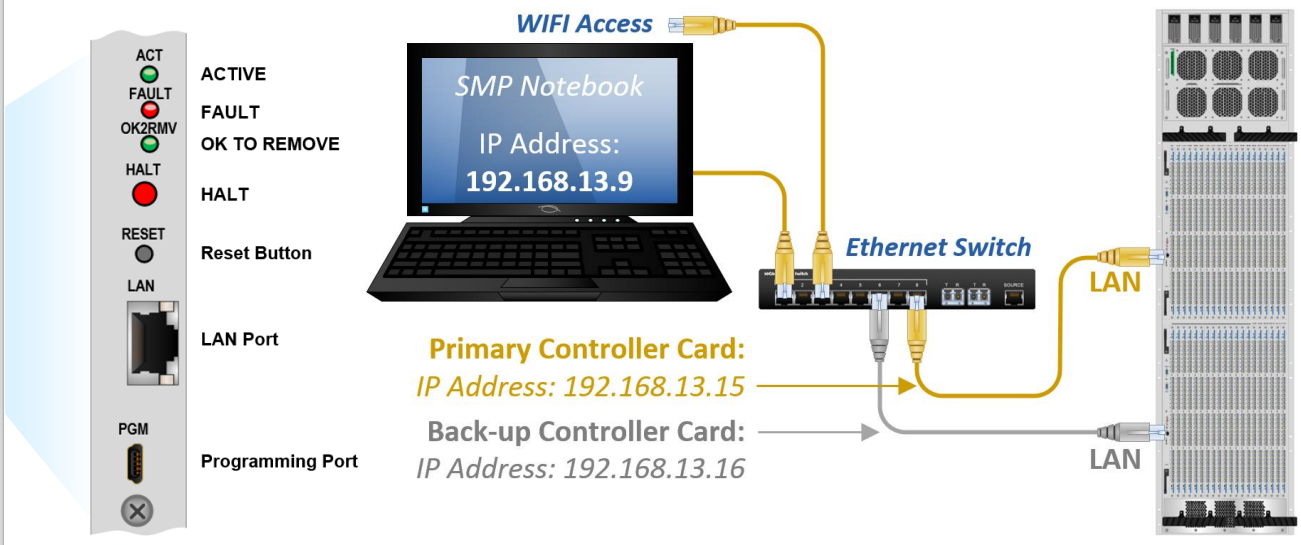
**ACT**: Informs which Controller Card (Primary / Back-up) is active.

**FAULT**: Informs of a Controller Card fault.

**OK2RMV**: Informs the operator if the CPU (IMX6) is halted. (**OK to ReMoVe**)

## The HALT Button:

**HALT (Primary Controller)**: In a TLX1280 with an operational Back-up Controller, holding this button for >5 seconds will halt the CPU (iMX6) and switch active control to the Back-up Controller. If the TLX1280 does not have a Back-up Controller, holding this button for >5 seconds will halt the CPU and power down the IO. Note that the OK2RMV (**Ok**ay **to re**m**ov**e) LED will be illuminated and the ACT LED will not.




**HALT (Back-up Controller)**: Holding this button for >5 seconds will halt the CPU (IMX6). If the Back-up Controller was the active controller, the TLX1280 will also power down the IO. If the Back-up Controller was not the active controller, the CPU will be halted and is ready to be removed. Note that the OK2RMV (**Ok**ay **to re**m**ov**e) LED will be illuminated and the ACT LED will not.

**RESET:** (Recessed button, for test purposes only): Resets the CPU (iMX6).

## Ports:

**LAN:** The CATx LAN Port is for Ethernet access (above, right).

**PGM:** The Programming Port is for programming updates. (See Appendix B, pg. 31.)

**CONSOLE/RS232:** The Controller Card has two RS-232 serial ports. One port is for the **Linux Command Line Interface** (labeled CONSOLE), and the other is for the switch's **ASCII Command Interface** (labeled RS-232*). If a Back-Up Controller card is installed, then its Linux Console Port is active, but only the RS-232 Port on the active Controller Card will function.*

**Linux Command Console** (Console Port)

- Baud Rate: 115200
- Data Bits: 8
- Parity: none
- Stop Bits: 1
- Flow Control: none
- DB9 DCE
  - A straight cable is needed to connect to a PC (*not* a null-modem).

**ASCII API** (RS-232 Port)

- Baud Rate: 9600
- Data Bits: 8
- Parity: none
- Stop Bits: 1
- Flow Control: XON/XOFF (Software)
- DB9 DCE
  - A straight cable is needed to connect to a PC (*not* a null-modem).

## The Processor

**The TLX1280 uses an i.MX 6 Quad (Freescale ) Processor. The key features are:**

- ARM Cortex-A9 MPCore 4 x CPU
- Memory Interfaces
  - 64-Bit DDR3-1066
  - SD (Memory Card Specification, v3.0 including high-capacity SDHC cards up to 32 GB.
  - Serial NAND Flash (SPI)
  - SATA II, 3.0 Gbps HDD
  - EIM Bus (FPGA Parallel Bus I/F)
- HDMI 1.4 port
- USB 2.0 Host (2 ports)
- UART (4 ports)
- Gigabit Ethernet Controller (RGMII)
- GPIO (32 bits)
- I2C Masters (3 ports)
- Internal 100 Megabit Ethernet Interface for Controller to Controller communications

## The Network Interfaces

**The TLX1280 uses up to three IP addresses.** The primary Controller Card uses address X and address X+100. The Back-Up Controller Card uses address X+1 and will take over address X in the event of a failure in the primary Controller Card. These addresses are set by an external DIP switch (see: *TLX1280 DIP Switch Settings*, pg. 22). The primary's IP address can be set from 15 to 45. **The default subnet used by the TLX1280 is 192.168.13.xxx.** The user may use their own subnet by reconfiguring the switch's network startup.

*This is detailed in the document* **Manual_How_To_Change_A_TLX_Matrix_Switch's_IP_Address**

The switch uses several network ports for control and status. Port 17567 accepts commands to control the switch.

*The command API is described in the document* **Manual_TLX_Matrix_Switch_ASCII_API_V5**

There are other ports that can be read to access system configuration and operating data. The actual data format varies by model and is described in the following sections. There are five blocks of data available for reading.

*These ports are documented in* **Manual_TLX_Matrix_Switch_Interfaces**

**1. Switch connection status** (broadcast over port 17564 every few seconds)
- The primary CPU IP address
- Upper or Lower chassis flag
- First port number in this block
- Last port number in this block
- 'N' port number values

**2. Port settings** (UDP port 17565, matrix switch localhost only)
- Port output level value
- Port input enable status
- Input port number (big-endian format)

**3. Hardware sensor status** (TCP port 17566)
- Reserved for future use.

**4. Alarm, Inventory and Power Supply Status** (TCP port 17600)
- State of the alarm contacts
- Card Inventory
- Power Supply Status (internal Thinklogical use only)
- Switch card temperature readings

**5. I/O card data** (TCP ports 17601 through 17640, 1 port per I/O card)
- SFP installed bits
- SFP TX Disable bits
- SFP TX Fault bits
- SFP LOS bits
- I/O Card type
- I/O Card temperature
- SFP Serial ID data
- SFP Diagnostic data

**6. Service Request (LOS) Signaling** (UDP port 17560)
The TLX1280 can broadcast a message over the network when a remote receiver requests attention. When enabled, the receiver will toggle its TX pin, causing a LOS (loss of signal) event to occur at the Matrix Switch. When detected, the Matrix Switch broadcasts an 'Attention Request' message over the network. This message contains the IP address of the Matrix Switch and the port number that detected the request. It is left up to an external system to detect, decode and act upon this request.
- 32-bits, matrix switch 's primary IP address
- 16-bits, 0 for the Upper (or only) Matrix Switch chassis, 1 for the Lower Matrix Switch chassis
- 16-bits, port number (list starts from 1, not 0)
- 16-bits, key code in bits 0 – 7, 0x00 and 0xff are ignored

## SNMP Support

**The TLX1280 can be monitored via SNMP** ***S****imple* ***N****etwork* ***M****anagement* ***P****rotocol* (supports version V2c and V3 USM). Please call our technical support staff at 1-203-647-8700 for downloadable **MIB** (***M****anagement* ***I****nformation* ***B****ase)* **definition files**.

**There are several entries in the SNMP configuration file (`/etc/snmp/snmpd.conf`) that users may want to modify:**

- `syslocation` Text to aid in locating the unit
- `syscontact` Name/Phone/email address of a contact
- `trap2sink` IP address/name of a system to receive SNMP traps

The default name used by trap2sink is '`snmp.trap`' and is defined in the file `/etc/hosts` as pointing to 127.0.0.1. The recommended method for changing the trap address is to modify the `/etc/hosts` entry and not to change the trap2sink setting in the configuration file, as you may have multiple trap2sink entries in the configuration file to specify multiple trap destinations. *For details about SNMP Traps, see the document* **Manual_TLX_Matrix_Switch_SNMP_Traps**

## NTP SUPPORT

**NTP, or *Network Time Protocol*, is used to keep the internal clock on the TLX1280 set to the correct time.** By enabling this service, users keep the Switch's clock synchronized to an external time reference. To use the service, users must have a time server running on their network or allow the Switch to access a public time server. NTP configuration is contained in the file `/etc/ntp.conf`

*Details about NTP configuration may be found at:*
`http://tldp.org/LDP/sag/html/basic-ntp-config.html`

## System Log Files Support

The Matrix Switch records system events to files located in the directory `/var/log/`. If you wish to preserve log files, you may redirect the logs to another system(s). This is a standard feature of Linux's rsyslogd program. Redirection is enabled by entries in **rsyslog** configuration files located in `/etc/rsyslog.d/`

*Details about syslog configuration file entries may be found at:*
`http://www.rsyslog.com/doc/`

***One of up to 40 I/O Cards***

# The Input/Output Cards

**The TLX1280 contains up to 40 vertically mounted I/O Cards.** I/O Cards provide the first (ingress) & third (egress) stages of a three stage Clos switch fabric.

The hot-swappable Input/Output (I/O) cards provide in-service expansion capabilities in sets of 32 ports per I/O card, thus allowing reconfiguration without interrupting signal processing.

Each I/O card consists of one Transmit (T) and one Receive (R) optic per port. **I/O Cards are available with LC-type fiber connectors that can be assembled with Single-mode or Multi-mode optics (SFP+).** Each I/O Card lists the ports as 1 through 32. A blue LED on each I/O card indicates when power is applied to that card.

The TLX1280 can have a minimum of one I/O Card (32 x 32) and a maximum of 40 I/O Cards (1280 x 1280). Each TLX1280 I/O Card contains 32 ports, so that when fully configured, the TLX1280 will provide 1280 Optical Input/Output connections (SFP+ T/R) described as Ports 1-1280. The TLX1280 switching matrix connects any port's optical output (SFP+ T) to any port's optical input (SFP+ R).

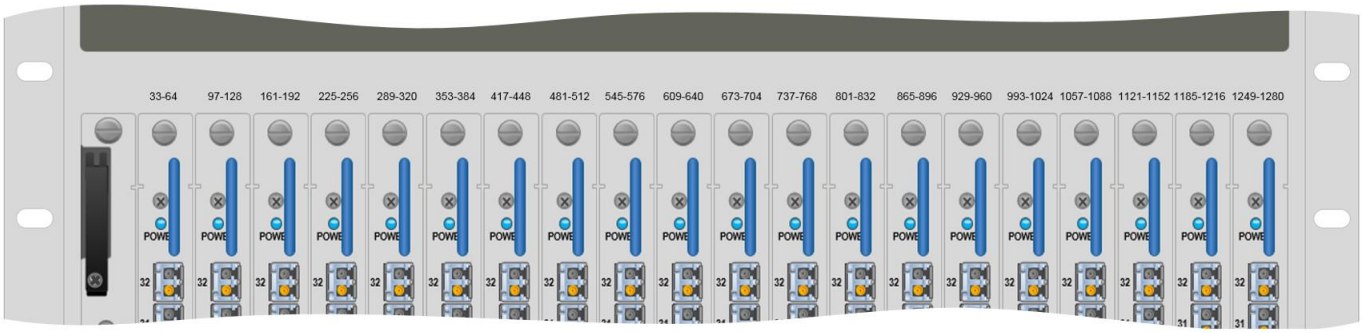
**I/O Cards are shipped in quantities specified by the customer** (1-40 per Chassis)**.**

**Note: Because all card slots must be filled for proper air-flow in the chassis, *Faceplate Filler Cards* are required where Controller and I/O Cards are not installed.**

## Port Numbering

Port numbering begins at the bottom of the TLX1280's chassis and starts with Card 1, the leftmost I/O card of the Lower Card Cage. Card 2 is directly above Card 1 in the Upper Card Cage. When installing fewer than 40 I/O Cards, cards slots may be chosen at the user's discretion. Each card slot has a **port number designation printed above the card** for easy reference.

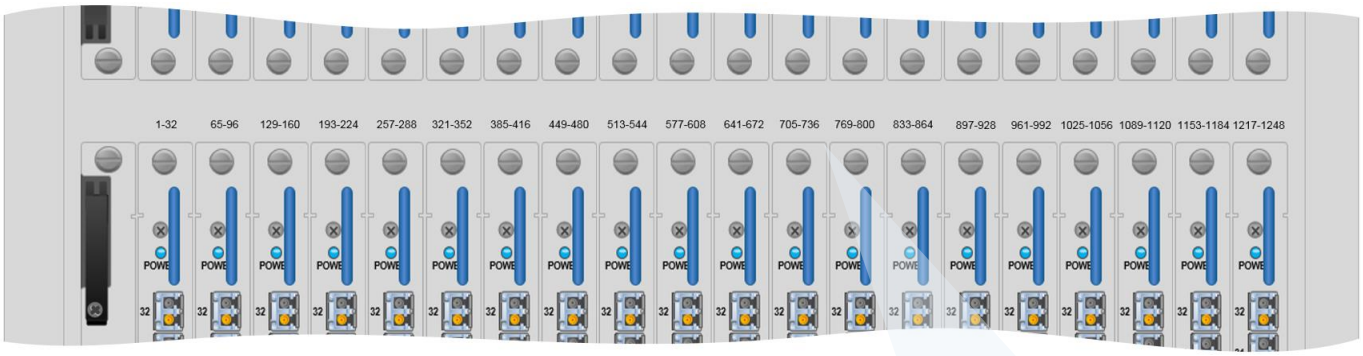
*Port numbers begin at the bottom and start with the left I/O Card*




**Port 64**
⇧
**Port 33**

**Upper Card Cage**

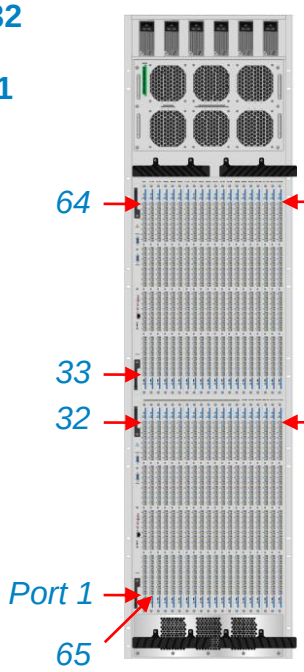
**Port 1280**
⇧
**Port 1249**




**Port 32**
⇧
**Port 1**

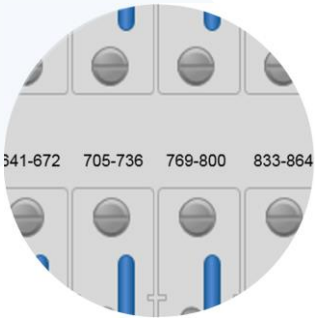
**Lower Card Cage**

**Port 1248**
⇧
**Port 1217**




**Upper Card Cage**
***Even numbered I/O cards 2,4,6…40***
20 Cards x 32 ports

**Lower Card Cage**
***Odd numbered I/O cards 1,3,5…39***
20 Cards x 32 ports



## The Switch Cards

**The TLX1280 contains 8 Switch Cards**, each populated with two 160x160 crosspoint switches that provide the mid-stage of a three stage CLOS switch fabric. The first stage (ingress) and the third stage (egress) are located on the 40 Input/Output Cards (32 I/O ports per card). The Switch Cards are labeled from right (Card 1) to left (Card 8) and allow 8 possible paths to each I/O card for making connections. If one Switch Card fails, the remaining seven Switch Cards will support all non-blocking connectivity. A blue LED indicates normal operation. A red LED indicates a fault. **Switch Cards are hot-swappable for easy replacement without a system shut-down.**

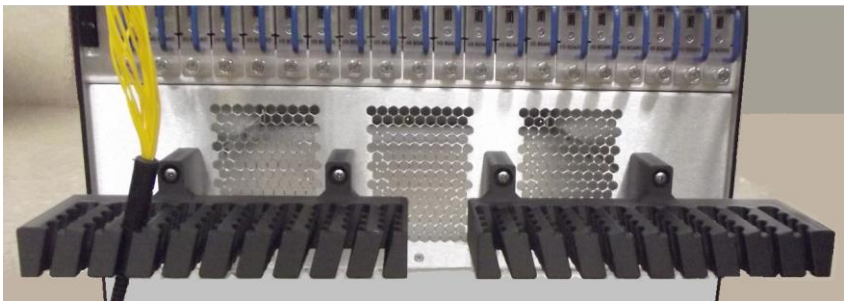
## The Interconnect Card

**The Interconnect Card connects the Upper Card Cage to the Lower Card Cage.** It is located within the chassis of the TLX1280 beside the Switch Cards and contains no active components. The Interconnect Card is not hot-swappable and requires a system shut-down to replace. *It is not user serviceable.* Call Thinklogical at 203-647-8700 if you suspect problems with the Interconnect Card.

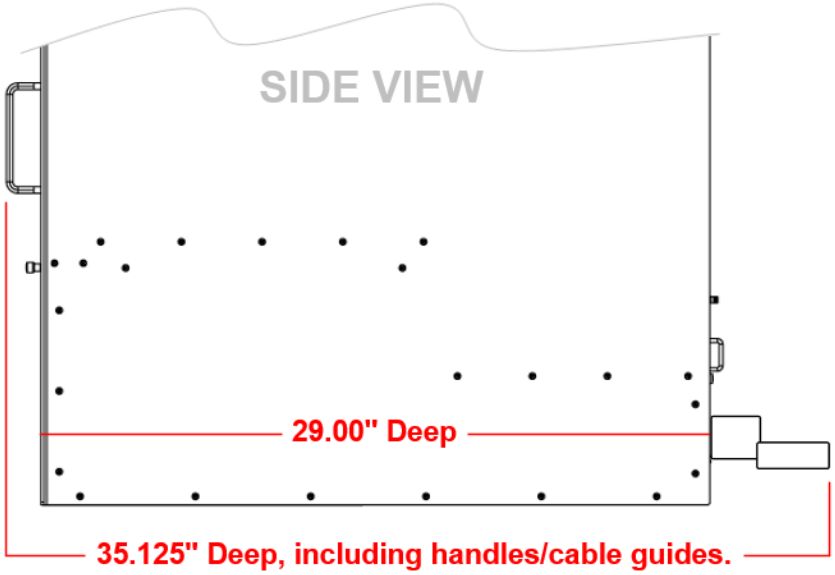
## TLX1280 TECHNICAL SPECIFICATIONS

| | |
|---|---|
| **PHYSICAL** | |
| **TLX1280 Chassis** | **Dimensions:**<br>Rack Size: **EIA 19.00"** (482.6 mm)<br>Height: **42 RU-73.50"** (1866.9 mm)<br>Depth: **29.00"** (736.6 mm)<br>Width: **17.25"** (438.2 mm)<br><br>**Weight:**<br>Fully loaded chassis: **348.0 lbs.** (157.9 kg)<br>Input/Output Cards: x1 = **4.91 lbs.** (2.23 kg), x40 = **196.4 lbs.** (89.1 kg)<br>Total Shipping Weight, Full Chassis (3 pallets): **950.0 lbs.** (430.9 kg) |
| **Fiber-Optic Ports** | **32 x 32 min., 1280 x 1280 max.** |
| **ENVIRONMENTAL** | |
| **Temperature** | Operating: **0° to 50°C** (32°F to 122°F) **Ambient**<br>Storage: **-20°C to 70°C** (-4°F to 158°F) |
| **Humidity** | Operating: **5% to 95%, non-condensing**<br>Storage: **Unlimited** |
| **Altitude** | Operating: **Thinklogical components are rated to 1000m max. elevation. Max. operating temp. de-rates by 3% for every 330m > 1000m**<br>Storage: **Unlimited** |
| **ELECTRICAL** | |
| **Alarm Relay Contacts** | Maximum DC: **1A at 30VDC**<br>Maximum AC: **0.3A at 125VAC**<br>Contact resistance max.: **.1Ω** |
| **Input Rating** | **200-240VAC, 1.5A, 50-60Hz** (current to nearest 0.1A) |
| **Max. DC Power Consumption** | ***Equal to max. output of a single Power Supply.*** |
| **THERMAL** | **Heat load (BTU/HR): *Equal to DC Power consumption x 3.1412*** |
| **REGULATORY** | **US / Canada EN 90650, FCC 47 CFR Part 15, ICES, CE** |
| **WARRANTY** | **One Year from date of shipment. Extended warranties available.** |

**Upper Fiber Management Guides**
**HWR-507**



**Lower Fiber Management Guides**
**HWR-508**
***(Fiber Cable Management Guides are optional)***



# Section 3: Set-Up and Installation

## Order of Installation Events

1. **Prepare a suitable area to permanently house the TLX1280 in a full-size rack and complete any pre-installation requirements, including redundant AC sources.**
2. **Check the contents of each container in your shipment** (*see below*)**.**
3. **Ensure all TLX1280 components are fully seated** (pg. 19, Steps 1 & 2)**.**
4. **Unpack the Chassis** (pg. 19, Steps 3 & 4)**.**
5. **Install the Chassis into its permanent mounting rack** (pg. 19, Step 5)**.**
6. **Unpack and install the modules, spares and options** (pg. 19, Steps 6 & 7)**.**
7. **Connect the TLX1280 to the Ethernet and set the static IP address via the DIP switch located on the Interconnect Card** (pg. 21)**.**
8. **Connect peripherals to Receivers, then Receivers to the TLX1280** (pg. 24)**.**
9. **Connect sources and peripherals to Transmitters, then Transmitters to the TLX1280** (pg. 24)**.**
10. **Connect the TLX1280 to an External Control CPU** (pg. 25)**.**

**READ THE INSTRUCTIONS THOROUGHLY BEFORE STARTING ANY PROCEDURE!**

### AC Source Requirements

**Thinklogical® strongly recommends that each AC inlet be supplied from a separate single-phase 200-240VAC, 50-60 Hz circuit capable of delivering 20A.**

### Contents

**When you receive your Thinklogical® TLX1280 Matrix Switch, you should find the following items in the quantities specified in your order:**

- **TLX1280 Chassis** (*with **Fan Tray** and **Interconnect Card** installed*)
  - Top-mount lifting fixtures (2) and front-mount lifting fixtures (4)
- **Shipped Separate:**
  ***1 or 2 Controller Card**(s), **8 Switch Cards**, up to **40 Input/Output Cards, Filler Cards** as needed, **6 Power Modules** and **Power Cords** – PWR-59-R* (International connections may differ)
  - Product Manual CD
  - Product Quick Start Guide
- **Options and Spares**:
  - Back-Up Controller Card
  - Spare Fan Tray
  - Spare Power Supply Modules
  - 32-Port Data Input/Output Cards (1-40)
  - Faceplate Filler Cards ENC-1825
  - Fiber Management Racks
  - Custom Fiber-Optic Cable Bundles (available)

*The TLX1280 Matrix Switch ships configured to customer specifications. Controller and I/O Cards ship separately from the Chassis in customer-specified quantities. Faceplate Filler Cards (ENC-1825) are provided as needed to fill all empty card slots.*

## Unpacking the TLX1280 Chassis

**THE TLX1280 CHASSIS REQUIRES A MINIMUM 500 LB. LIFTING CRANE to remove it from its shipping container and mount it into a standard EIA 19" rack.** *Lifting fixtures are provided (see next page).*

All physical connections to the product use industry-standard connectors. Non-supplied cables that may be needed are commercially available. All connections are found on the rear of the unit.

1. When the TLX1280 has been inspected and found to be in suitable condition, the process of removing the chassis from the shipping container can begin.
2. Carefully remove the TLX1280 Matrix Switch from its shipping container (see *Lifting Fixtures*, next page). Inspect the unit to make certain that no damage occurred during shipment. When the TLX1280 has been inspected and found to be in suitable condition, remove the lifting fixtures. The process of installing the chassis into its rack can now begin.
3. **When mounting the chassis in a rack, ensure that air flow to the fans is not restricted** (minimum 2" of free space on all sides). If any of the sensors detect an over temperature condition, power will be removed from all sensitive components and the system will shut down. (During normal operation, all failure conditions send out notifications prior to shut down. For a detailed list of the alarm functions, see pg. 10: *Alarm Descriptions for the TLX1280*.)
4. Fully seat the six **Power Supplies** (shipped separately) into the chassis and secure the retaining screws.
5. Fully seat the **Fan Tray** (shipped separately) into the chassis and secure the thumb screws.
6. Install the eight **Switch Cards** (shipped separately). **Do not install the Switch Cards until the chassis is fully mounted in the rack.**

   **To install the Switch Cards, the front panel must be removed.** Hold each card, one at a time, by the handles and place it into the card slot vertically with the HEAT SINK on the right. The card should slide freely until it reaches the backplane connector. Use just enough force on the handles to firmly engage the card with the connector. *If the module does not slide in easily, do not force it! Damage may occur. Remove the module, reinsert it, and start over.*

   **Secure the upper and lower handles on each card and reinstall the front panel.**
7. The **Controller and Input/Output Cards** are shipped separately from the chassis in quantities that meet your specific configuration. **Do not install these cards until the chassis is fully mounted in the rack.** Before installing I/O Cards into the chassis, ensure that all the SFP modules are sealed with a removable dust plug. If installing fewer than forty I/O Cards, cards may be installed in any configuration, in either the Upper or Lower Card cages. Install the provided **Faceplate Filler Cards** in any unused Card slots. (These are necessary for proper cooling-air flow within the chassis.)

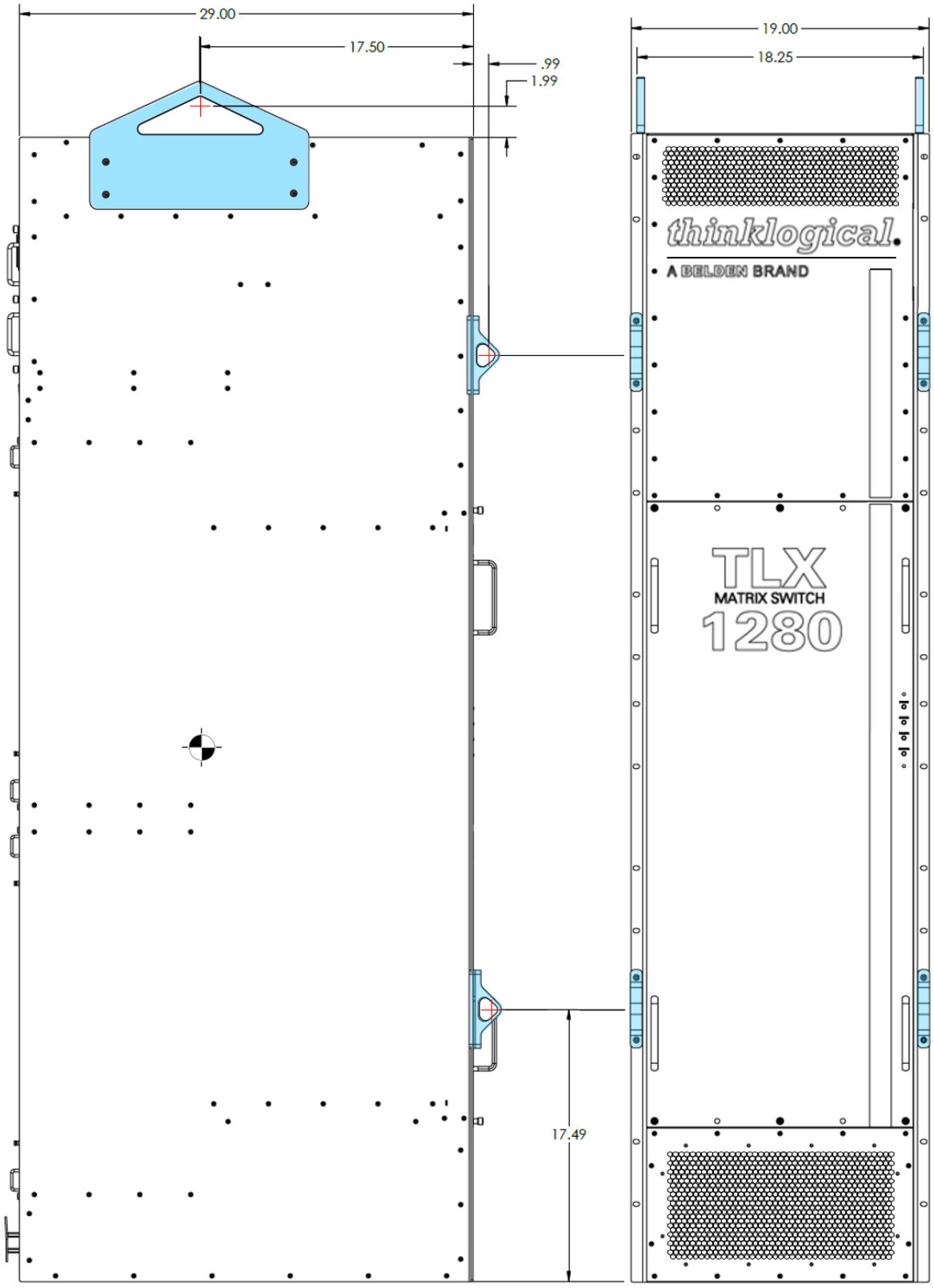
   **To install the Input/Output Cards,** hold each card, one at a time, by the handles and place it into the Card Cage slot vertically with the POWER LED on top. The card should slide freely until it reaches the backplane connector. Use just enough force to firmly engage the card with the connector. *If the module does not slide in easily, do not force it! Damage may occur. Remove the module, reinsert it, and start over.*

   **Hand-tighten the thumbscrews.** *Do not tighten the thumbscrews with a screwdriver.* Ensure that all thumb screws are finger tight so that the modules are properly secured in the chassis. **Controller Cards** are seated using the built-in levers to engage with the Backplane connectors.
8. Install the optional **Fiber Management Racks** above the Upper Card Cage and below the Lower Card Cage as shown on pg. 17.
9. Install the **Power Cords** into each of the six Power Supply Modules. **Each source should be a separate single-phase 200-240VAC, 50-60 Hz circuit capable of delivering 20A.**

To install **fiber-optic cables**, please refer to the **Quick Start Guides** included with your products for detailed instructions. The **TLX1280 Quick Start Guide** is also available in **Appendix A**, pg. 30. All our product Quick Start Guides are available on the Thinklogical website: www.thinklogical.com.

## Lifting Fixtures

The TLX1280 is shipped with six lifting fixtures attached to the chassis. They provide connection points for lifting the chassis from its shipping container with a suitable lift crane (at least 500 pounds). ***The lifting fixtures should be removed before installing the unit into the rack.***



## Connecting to the TLX1280

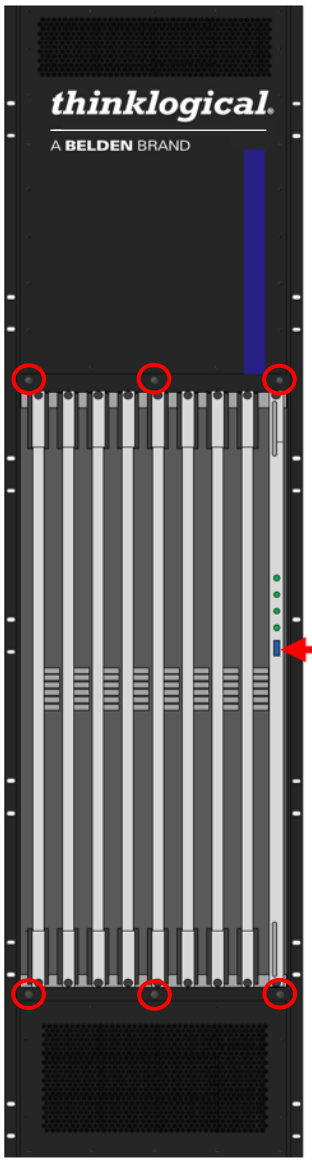
Thinklogical's proprietary multiplexing technology combines video, audio and peripheral data on a single data stream for up to 80km over a single fiber.

**TLX Matrix Switches are compatible with the following Thinklogical® products:**

- Single & Multi-Mode **TLX 10G KVM and Video Extenders** (10G to 10G only)
- Single & Multi-Mode **Velocity 6G KVM and Video Extenders** (6G to 6G only)
- **SDI Xtreme 3G+ Extenders**
- **Configurator / Hot-Key Manager**
- **System Management Portfolio 2.0**
- Standard **VX Matrix Switch ASCII Interface** (via RS-232 port or via Network port)
- Standard **VX Matrix Switch IP Address Configuration Procedure**
- Standard **VX Matrix Switch SNMP Traps**

### Ethernet Control

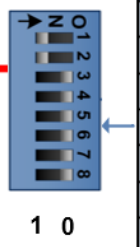
If the TLX1280 Matrix Switch is to be controlled via Ethernet, it will require a **static IP address**. This value can be set via the DIP switch located on the Interconnect Card. The front panel must be removed to access the DIP Switch*. The factory default setting is: **192.168.13.15** (00000000).




***Remove the front panel** by loosening the six thumb screws located at the top and bottom of the panel (red circles, left). Be sure to support the panel by the handles before all the screws have been loosened. Four guide pins will hold the panel in place until it is removed (2 upper, 2 lower). Replace the panel when done.*

**8-Position DIP Switch located on the TLX1280 Interconnect Card**
*(shown with front chassis cover removed, to the right of the 8 Switch Cards).*

**Switch 1 is at the top.**
**The ON ⇨ position = 0**
Example: **192.168.13.21**




| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Primary Controller IP Addresses | Back-up Controller IP Address |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 192.168.13.15 & 192.168.13.115 | 192.168.13.16 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 192.168.13.17 & 192.168.13.117 | 192.168.13.18 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 192.168.13.19 & 192.168.13.119 | 192.168.13.20 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 192.168.13.21 & 192.168.13.121 | 192.168.13.22 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 192.168.13.23 & 192.168.13.123 | 192.168.13.24 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 192.168.13.25 & 192.168.13.125 | 192.168.13.26 |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 192.168.13.27 & 192.168.13.127 | 192.168.13.28 |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 192.168.13.29 & 192.168.13.129 | 192.168.13.30 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 192.168.13.31 & 192.168.13.131 | 192.168.13.32 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 192.168.13.33 & 192.168.13.133 | 192.168.13.34 |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 192.168.13.35 & 192.168.13.135 | 192.168.13.36 |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 192.168.13.37 & 192.168.13.137 | 192.168.13.38 |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 192.168.13.39 & 192.168.13.139 | 192.168.13.40 |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 192.168.13.41 & 192.168.13.141 | 192.168.13.42 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 192.168.13.43 & 192.168.13.143 | 192.168.13.44 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 192.168.13.45 & 192.168.13.145 | 192.168.13.46 |

## TLX1280 DIP Switch Settings

The simplest network connection is an isolated network with only the TLX1280, the control server, and any control clients using static IP addresses. The TLX1280 can be set to any of the above settings. The **Control Server** must be at **192.168.13.9** and the **Control Clients** can then be set to any other addresses in the **192.168.13.X** subnet.

If static IP addresses for the control server and its clients are not possible, then the control server will require two (2) network interfaces, with one interface set to the static address **192.168.13.9** and dedicated to the TLX1280 Matrix Switch(s), while the other network interface can be configured as required by the facility's network administrator.

## Redundancy and Network Requirements

**A Back-Up Controller Card (sometimes called a Secondary or Fail-Over Control or Controller Card) is optional but recommended** and ensures uninterrupted functionality if the Primary Controller Card fails or needs to be replaced.

*Two network requirements must be in place for a switchover to occur:*

1. The Back-Up Controller Card must have a **LAN connection to the server** with the IP address as specified in "*TLX1280 DIP Switch Settings*" (above). Without this connection, the Back-Up Controller Card will NOT take control of the Switch under any circumstances.
2. The Back-Up Controller Card must also be able to **communicate with the Primary Controller Card** through the LAN connection*. It is important that this Network connection be verified***.** The user should log into the Back-Up Controller Card via SSH or Console port and ping the server as well as the Primary Controller Card to verify the connections.

## External Control CPU Minimum Requirements

**Refer to the document Manual_TLX_Matrix_Switch_ASCII_API_V5**

## Pluggable SFP+ Modules

Each Input/Output Card contains rows of SFP+ modules that serve as couplers for the fiber-optic cables running between Thinklogical transmitter and receiver extenders. The SFP+ modules are easy to access without removing the I/O Card.

The SFP+ Optical Module is a 10Gbs Short-Wavelength Transceiver designed for use in bi-directional fiber-optic channel links. The modules are hot-pluggable and operate on 3.3VDC.

**Always use dust caps to protect against dust and damage when a fiber-optic connector is not attached to its coupling device** (fiber-optic equipment, bulkheads, etc.). All Thinklogical SFPs are fully populated with dust plugs upon shipment.

**Note: It is good practice to immediately install dust plugs in unused SFP modules and on the ferrules of unconnected fiber-optic cables.**

**Each TLX1280 I/O card has 32 SFP+ Modules**, each mounted within a grounded, metal enclosure. Each SFP is locked into its enclosure with a built-in latch handle that can be opened for removal or locked for installation (right) when fully inserted.

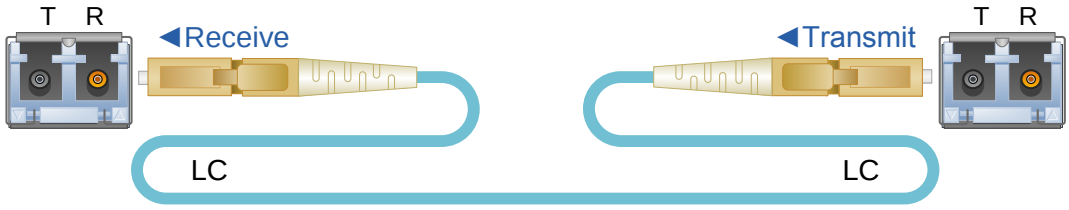
The latch handle spans the two LC ports. Arrows printed on the handle indicate which port is an OUTPUT ( ) and which is an INPUT ( ).

**SFP+ Latch Closed**

**SFP+ Latch Open**

## LC-Type Fiber-Optic Cable

**Requirements:** Thinklogical recommends LC-type, SX+ Laser Enhanced (50µm) fiber for your TLX1280 Matrix Switch and TLX Extension System. OM4 Multi-mode fiber can extend up to 400m and Single-mode fiber can extend up to 80km.

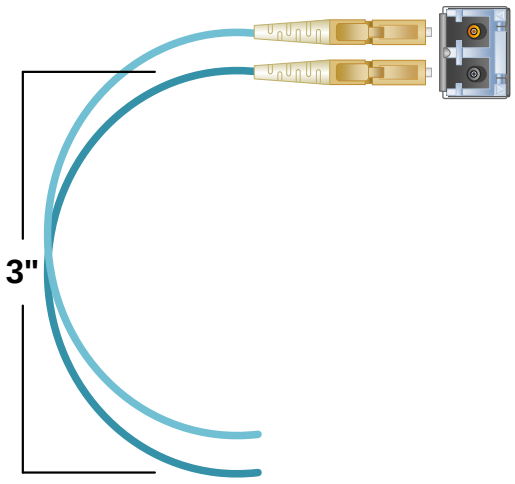



**Handling:** *Unlike copper cabling, glass-core fiber-optic cables require special handling. Be sure to install and protect your fiber using the methods and procedures recommended for your application.*

***When handling any fiber-optic cable, always follow these basic rules:***

- The ends of the connectors (the ferrule) should never contact any foreign object, including fingertips. Always install a dust cap immediately on the ferrule of any unused fiber to protect the tip. Likewise, keep dust plugs installed in all unused SFPs on Extenders and Matrix Switches.

- DO NOT WRAP, BUNCH OR TIE LIKE COPPER CABLES! The minimum bend diameter must be no less than 3". Be careful not to kink or pinch the fiber when using ties.




*Thinklogical recommends SX+ Laser Enhanced Fiber-optic Cable, 50 or 62.5 microns, terminated with LC type connectors.*

| | |
|---|---|
| **Multi-Mode:** | **Up to 33 meters with Type OM1** |
| | **Up to 82 meters with Type OM2** |
| | **Up to 300 meters with Type OM3** |
| | **Up to 400 meters with Type OM4** |
| **Single Mode:** | **Up to 80km with Type OS2 9/125** |

**Installing:** The Matrix Switch connects any SFP's optical output port (Transmit) to any other SFP's optical input port (Receive).

## Routing Thinklogical Extenders through the TLX1280

Comprised of a fiber-in / fiber-out Matrix Switch and fiber-in / fiber-out KVM Transmitter and Receiver Extenders, this complete system provides transparent and secure routing, switching and extension of video and high-speed data peripherals to remote destinations with ease. (Also see *Appendix A*, pg. 30.)

### Connecting to the Receiver

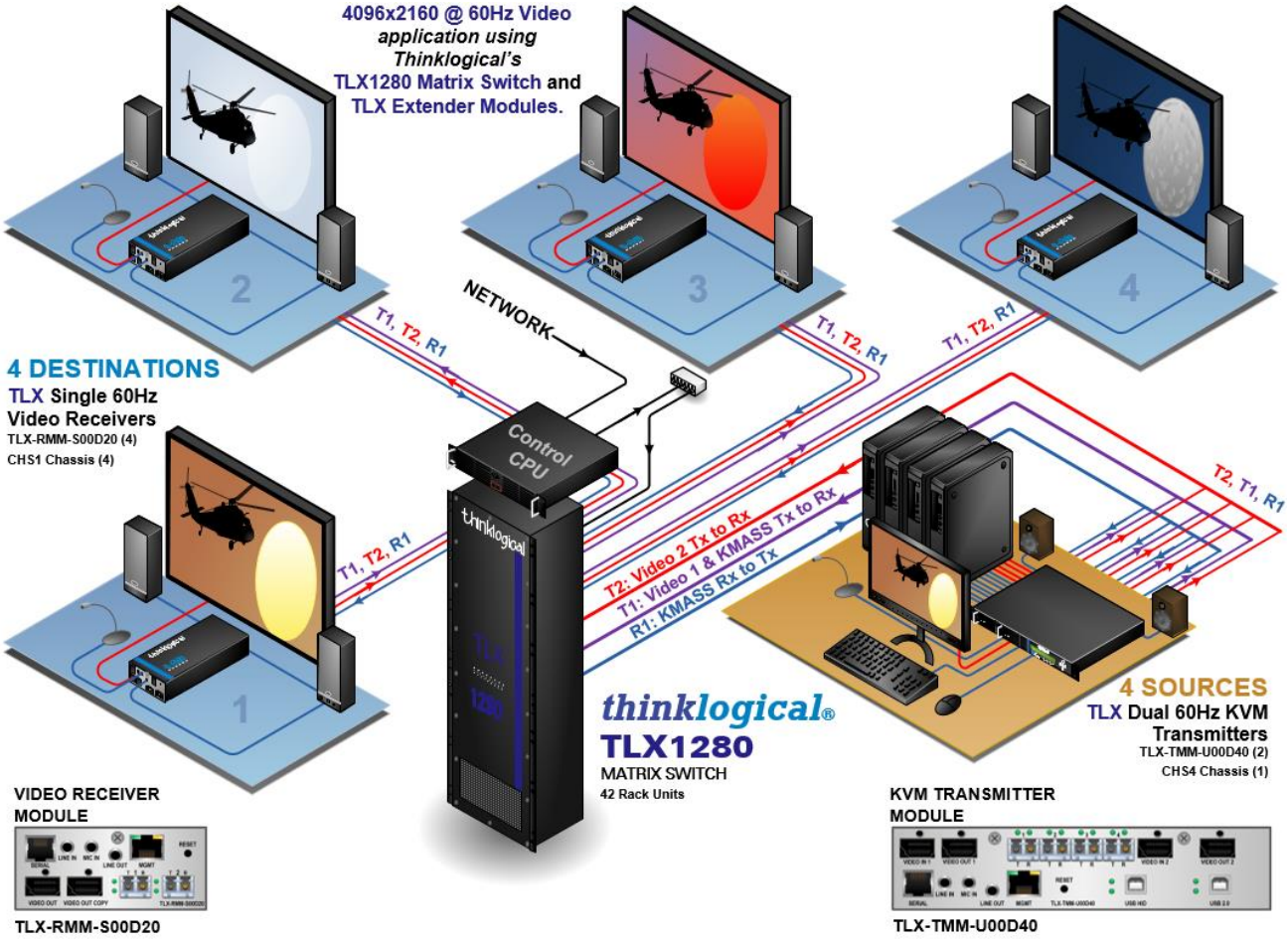
**The Receiver serves as the Destination** (desktop, theater, conference room, editing suite, etc.).

- First, connect the Receiver(s) to the TLX1280 using **fiber-optic cables** (Multi-mode fiber for distances up to 400m, Single-mode fiber for distances up to 80km).
- Turn ON the **power switches** on the KMASS devices.
- Apply **power** to the **Receiver**(s).
- Connect the **KMASS devices** (audio, monitor, keyboard, mouse, etc.) to the Receiver(s) using standard copper cables.

### Connecting to the Transmitter

**The Transmitter serves as the Source** (computer or other video devices).

- Connect the Transmitter(s) to the TLX1280 using **fiber-optic cables** (Multi-mode fiber for distances up to 400m, Single-mode fiber for distances up to 80km).
- Turn ON the **power switches** on all devices.
- Apply **power** to the **Transmitter**(s).
- If the source includes a workstation, your local **KMASS devices** (audio, monitor, keyboard, mouse, etc.) should be connected first.
- Connect your **video sources** (e.g. computers, tape decks, etc.) to the Transmitter using standard copper cables.



## Connecting to a Control CPU

**The TLX1280 is controlled via a dedicated external Control CPU** (supplied separately). This permits customization and ease of control and administration. Access is provided via a CATx network connection or serial RS-232.

- The network and serial RS-232 connection both use the same low-level ASCII API syntax. This command syntax is defined in the document **Manual_TLX_Matrix_Switch_ASCII_API_V5,** available on the Thinklogical website. www.thinklogical.com
- Each line contains only one command and must end with a carriage return (CR) and line feed (LF), or just a line feed (LF). The characters are not echoed.
- **The serial port is configured for 9600 baud, 1 stop bit, no parity, and no flow control.** The network interface listens on **TCP** (**T**ransmission **C**ontrol **P**rotocol) **port 17567**. It accepts the same commands as the serial interface. Telnet may be used to manually open a connection and control the TLX Matrix Switch using port 17567.
- Third-party controllers will control the Matrix Switch by connecting to either the serial or network port. **Using the network is the only means to take advantage of our automatic fail-over facility.**
- Thinklogical offers a web-based control program called 'Configurator'. This program is described in greater detail in the document **Manual_System_Management_Portfolio**, available on the Thinklogical website. www.thinklogical.com

## Linux Command Console (Console)

- Baud Rate: 115200
- Data Bits: 8
- Parity: none
- Stop Bits: 1
- Flow Control: none
- DB9 DCE
  - A straight (NOT a null-modem) cable is needed to connect to a PC.

## ASCII API Settings (RS-232)

- Baud Rate: 9600
- Data Bits: 8
- Parity: none
- Stop Bits: 1
- Flow Control: XON/XOFF (Software)
- DB9 DCE
  - A straight (NOT a null-modem) cable is needed to connect to a PC

## On Screen Display (OSD) - Firmware Option

**The Configurator can be accessed and controlled via an OSD** (**O**n-**S**creen **D**isplay) **technology.** The Configurator software can be installed on a designated out-of-band (OOB) PC which users can access from a workstation.

- A preconfigured hot-key sequence will deliver the Configurator GUI directly to the user's desktop monitor. **The user can then select which defined sources and destinations to connect**.
- While a user is making the connections, they have exclusive use of the OOB PC. Once they have completed their connections, the OOB PC becomes available for the next user.
- The OOB PC that has the Configurator loaded on it has a built-in **timeout function**, therefore the PC should not be taken out of service for an extended period. The timeouts can be set in increments of one second. Typical timeouts are in the order of 10 seconds.

# Firmware Updates

See **APPENDIX B: FPGA Program Code Update Procedure**, pg. 31. Firmware updates are available through Thinklogical. For technical assistance, please call us at **1-203-647-8700**.

# Section 4: Maintenance

**Module replacements that require a Halt Button**

- **Controller Card**

**Module replacements that DO NOT require a Halt** (pg. 27)

- **Power Supply**
- **Input/Output Cards**
- **Fan Tray**
- **Switch Cards**

**Firmware Updates** (*Appendix B*, pg. 31)

## How to Safely Remove an Active Controller Card or Shut Down the System

During normal, non-maintenance operation, the **Primary Controller Card should always be the active controller for the system.** However, other conditions may temporarily exist, such as during maintenance, updates, repairs, etc. when the Back-Up Controller Card will be active.

*Although the system will run normally on the Back-Up Controller Card, not having a second card eliminates the fail-over protection afforded by a redundant, two-card system.*

To safely remove a Controller Card and switch activity from one Controller Card to the other without interruption of connections, use the following commands:

### The HALT Button

**1.** Pressing the **HALT** button (> 5 seconds) will perform an orderly shut-down of the active Controller Card.

**2.** Once the Controller Card is inactive, it will stop signaling the other Controller Card. It's **ACT** (active) LED will be off and the **OK2RMV** (OK to Remove) LED will be on (see pg. 11). This prompts the other card to become active (ACT LED on). This may take up to a minute. The system is now running on the Back-Up Controller Card.

**3.** Remove any cables (LAN, RS-232, Console, etc.) from the inactive card. It can now be safely removed from the chassis.

**4.** Re-inserting the Primary Controller Card restores the system back to running on the Primary Controller Card. *Ensure that the LAN connection to the card is restored promptly.*

### The PWROFF Command

**1.** Typing **`pwroff`** at the command line prompt, from either the Primary or the Back-Up Controller Card, will halt BOTH Controller Cards and turn off power to all I/O Card slots in the system, *except the Controllers.*

**2.** Remove the AC power cords from the Matrix Switch or AC sources for a complete system shut-down.

**3.** Remove any cables (LAN, RS-232, Console, etc.) from the Controller Cards.

**4.** The Controller Cards can now be removed, swapped or replaced as needed.

Upon turn-on, the Controller Card in the top slot will become the Primary and the Card in the bottom slot will be the Back-Up.

### How to Remove and Replace a Controller Card

**1.** Remove cables, loosen the thumbscrews and pull the Controller Card straight out using both handles.

**2.** Hold the replacement module by the handles and place it into the slot vertically with the Power LED on top. The card should slide freely until it reaches the backplane connector. Use just enough force to firmly engage the card with the connector. *If the module does not slide in easily, do not force it! Damage may occur. Remove the module, reinsert it, and start over.*

**3.** Hand-tighten the thumbscrews. *Do not tighten the thumbscrews with a screwdriver.*

### The Interconnect Card

The Interconnect Card contains no active components and is **not user serviceable**. If there is a suspected problem with the Interconnect Card, please call Thinklogical immediately at 203-647-8700.

## How to Remove and Replace Modules that DO NOT Require a Halt

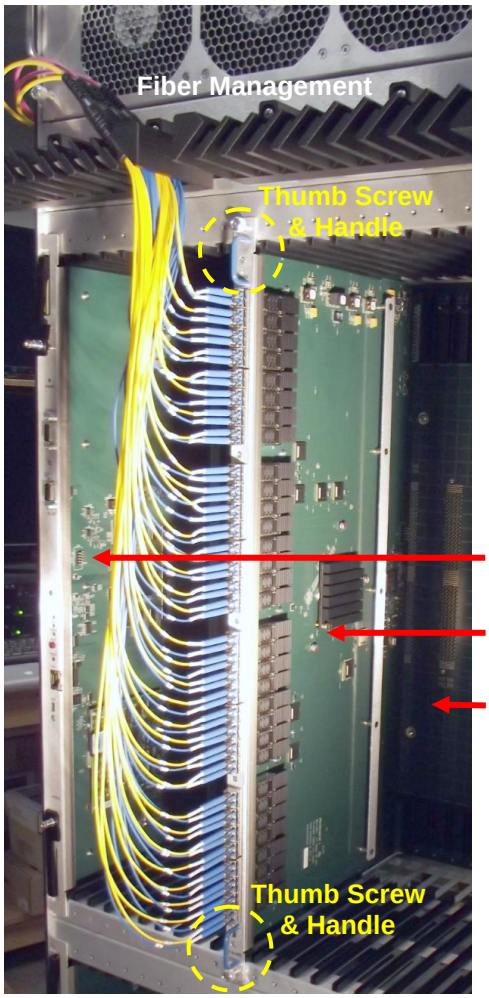
### How to Remove and Replace a Power Supply

**Warning! Disconnect the power cord from the power supply before proceeding!**

The Power Supplies are universal input 200-240VAC 50-60Hz. Use the proper power cords for your region (PWR-59-R, supplied with the unit).

1. ***Remove the Power Cord*** *from the Power Supply*.
2. **Loosen the thumb screw**, lower left and swing the handle open.
3. **Pull the Power Module straight out** of the chassis by the handle.
4. **Insert the new Power Module** into the chassis and slide it in until it reaches the backplane connector. Use just enough force to firmly engage the module with the connector. *If the module does not slide easily into the connector, do not force it! Damage may occur. Remove the module, reinsert it, and start over.* Once seated, secure the handle in the closed position with the thumb screw.

### How to Remove and Replace an Input / Output Card




1. **Remove any fiber-optic cables** that are installed on that Card and note their locations for later reinstallation**.**
2. **Loosen the thumbscrews** and pull the I/O Card straight out using both handles.
3. **Hold the replacement module by the handles** and place it into the slot vertically with the POWER LED on top. The card should slide freely until it reaches the backplane connector. Use just enough force to firmly engage the card with the connectors. *If the module does not slide in easily, do not force it! Damage may occur. Remove the module, reinsert it, and start over.*
4. **Hand-tighten the thumbscrews.** *Do not tighten the thumb-screws with a screwdriver.*
5. **Reinstall the fibers** in their original locations.

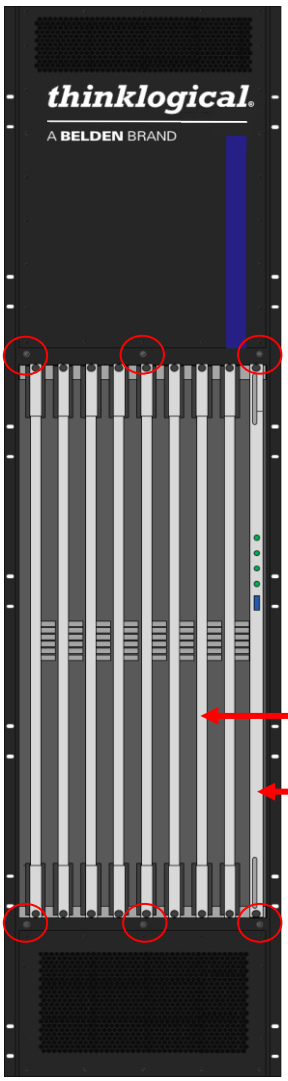
## How to Remove and Replace a Fan Tray

The TLX1280 uses six DC fans to move air vertically through the enclosure. Be sure not to block the air vents on the front of the unit and below the card cage on the rear panel.

**Warning! Do not operate the TLX1280 without a Fan Tray for more than 10 minutes. Overheating and serious damage may occur!**

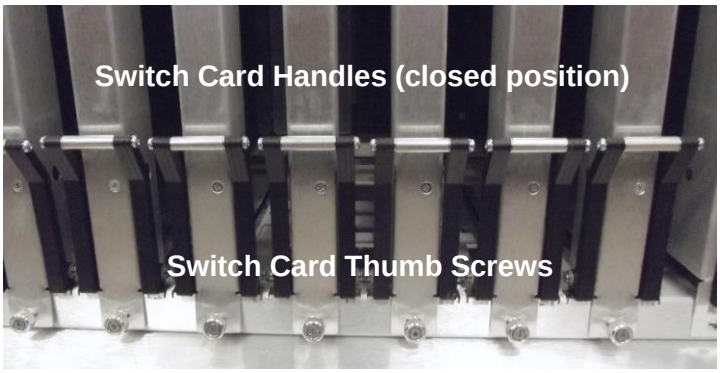
1. **Turn the six thumbscrews counter-clockwise** until they disengage from the chassis.
2. **Pull the Fan Tray straight out** using one of the two handles on each side.
3. **Install the new tray** with the alarm on the left. Hold the Fan Tray by two handles and slide the aluminum housing into the card guides until it reaches the backplane connector. Use just enough force to firmly engage the tray with the connector. *If the tray does not slide in easily, do not force it! Damage may occur. Remove the tray, reinsert it, and start over.*
4. **Hand-tighten the thumbscrews.** *Do not tighten the thumbscrews with a screwdriver.*

## How to Remove and Replace a Switch Card




The eight Switch Cards are hot-swappable and do not require a system shut-down to service. The front panel must be removed to replace Switch Cards. *Do not remove the Interconnect Card*.

1. **Remove the TLX1280's front panel** by loosening the six thumb screws located at the top and bottom (red circles, left). Be sure to support the panel by the handles before all the screws have been loosened.
2. Each of the eight Switch Cards is held in place with two thumb screws. **Loosen the thumb screws** and slide the card straight out of the chassis along the guide rails using the **upper and lower folding handles**.
3. **Hold the replacement card by the handles** and place it into the slot vertically with the Heat Sink on the right. The card should slide freely until it reaches the backplane connector. Use just enough force to firmly engage the card with the connector. *If the module does not slide in easily, do not force it! Damage may occur. Remove the module, reinsert it, and start over.*
4. **Secure the replacement Card** by folding the handles into the closed position and tightening the thumb screws.
5. **Reinstall the panel** by securing the six thumb screws.



# Section 5: Thinklogical Support

## Customer Support

**Website:** https://www.thinklogical.com

Check out our website for current products, support documents and useful information about all the products and services we offer, including:

- **Technical Specification Sheets**
- **Quick-Start Guides**
- **Product Manuals** (for viewing online or for download)
- **Chat live with a Technical Service Representative**

**Email:** mailto:support@thinklogical.com

For product support, technical issues or questions, product repairs and request for Return Merchandise Authorization.

**Telephone: 1-203-647-8700**

Please contact our expert sales staff in Milford, CT **Monday - Friday from 8:30am to 5:00pm**, Eastern Time Zone. If leaving a voice message, please provide a preferred time to call back.

**Fax: 1-203-783-9949**

Please indicate the nature of the fax on your cover sheet and provide contact information.

## Product Support

### Warranty

Thinklogical warrants this product against defects in materials and workmanship for a period of one year from the date of delivery, with longer terms available at time of purchase on most products. Thinklogical and its suppliers disclaim all other warranties. Please refer to your product invoice for the Warranty Terms & Conditions.

Defect remedy shall be the repair or replacement of the product, provided that the defective product is returned to the authorized dealer within a year from the date of delivery.

If you wish to return your device, contact the Thinklogical authorized dealer where you purchased the device, or if you purchased directly, call Thinklogical at **1-800-647-8700**.

### Return Authorization

If you must return a product to Thinklogical directly, please contact us at **1-203-647-8700**. Customer Support will ask you to describe the problem and will issue you a **R**eturn **M**erchandise **A**uthorization **number** (RMA#). Pack the device in its original box, if possible, and return it with the RMA# printed on the outside of the box. **DO NOT return a product to Thinklogical without a *Return Merchandise Authorization*.**

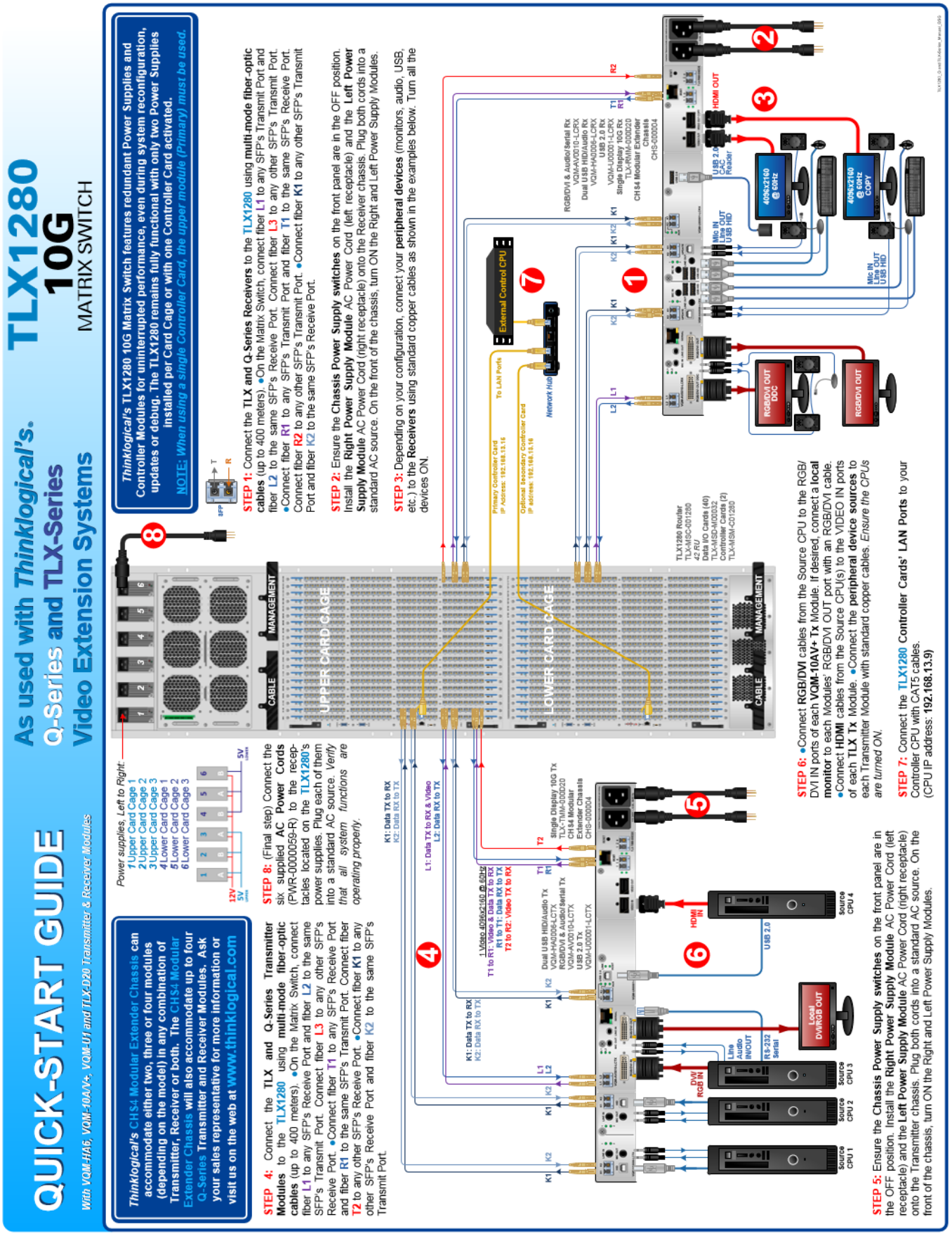
### Our Address

If you have any product issues or questions or need technical assistance with your Thinklogical system, please call us at **1-203-647-8700** and let us help. If you need to write us or return a product, please use the following address:

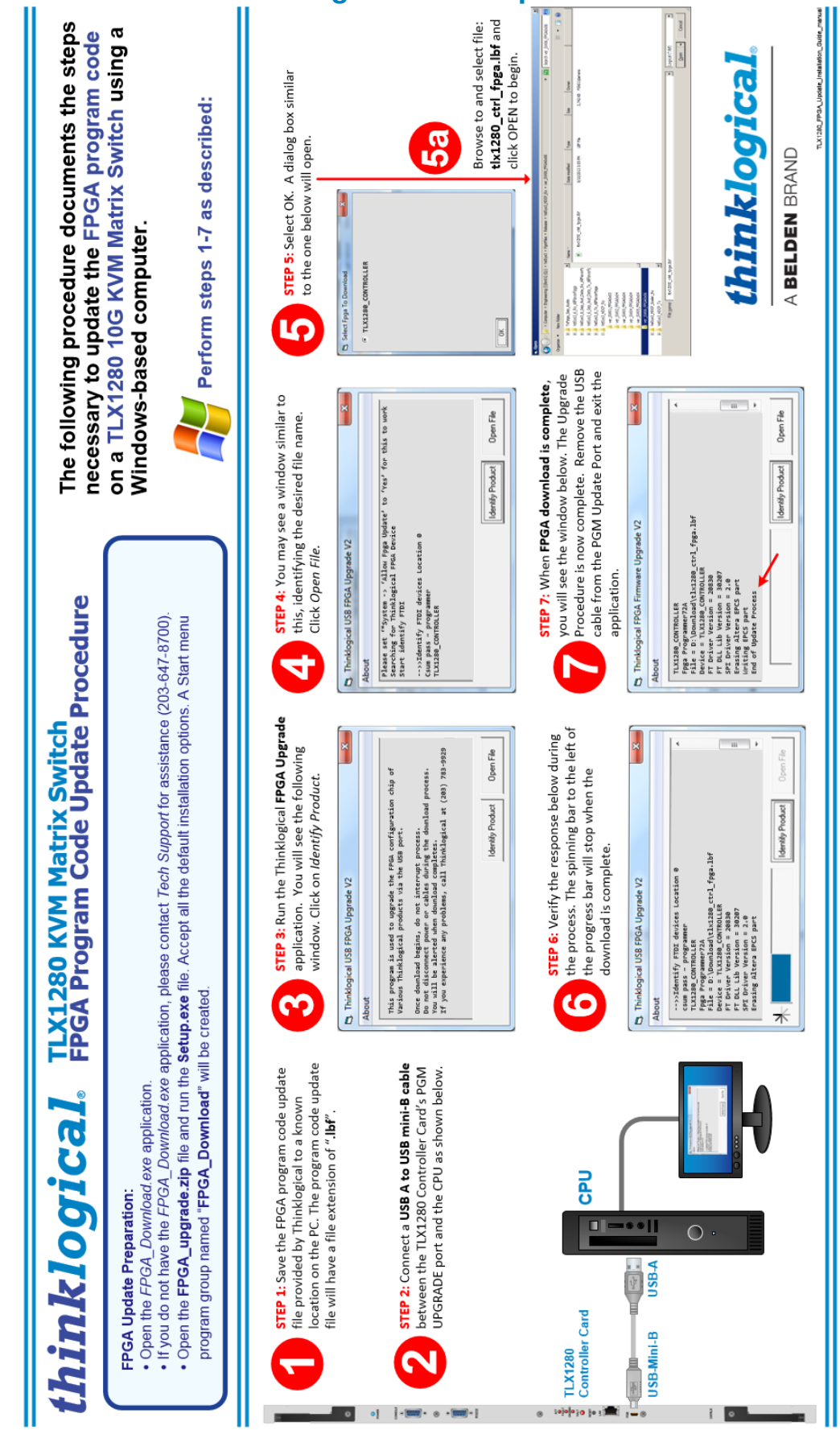
*Please include the Return Merchandise Authorization number:*

**Thinklogical,** A **BELDEN** BRAND
**100 Washington Street**
**Milford, CT 06460 USA**
**Attn:** *RMA#*

# APPENDIX A: TLX1280 QUICK START GUIDE



# Appendix B: TLX1280 FPGA Program Code Update Procedure



## APPENDIX C: SD Card Replacement Procedure for TLX1280 Controller Cards

*This procedure assumes a normally operating TLX system that is using both a Primary and a Back-up Controller Card.*

**Note: If Partitioning, Restricted Switching or P2P is being used, copy the `upstream.csv` file from the appropriate `/var/local/router` subdirectory. This file will be copied onto the new SD card.**

1. Connect a Linux Command Line Interface serial cable to the Controller Card via the serial CONSOLE port. Datacomm parameters are: 115200, 8, N, 1, None.
2. Connect a Linux Command Line Interface serial cable to the Back-up Controller Card via the serial CONSOLE port and issue a `poweroff` command. Wait until the OK2RMV (*OK to remove*) message appears.
3. Remove the Back-up Controller and replace the SD card.
4. Install the Back-up Controller Card into the chassis with a CONSOLE serial connection. Do not connect the network cable.
5. When the Controller Card boots up, wait for the `crng init done` message, then verify the IP settings with the `ipconfig` utility.
6. Check the 'date/time/time zone' with a `date` command.*
7. Perform other site-specific operations as necessary (*password, hostname, gateway, NTP, etc.*)
8. On the Back-up Controller, issue a `poweroff` command and wait for the `system halted` message to appear.
9. Disconnect the Back-up Controller from the chassis backplane, wait 5 seconds, then reconnect it.
10. Wait for the `crng init done` message, then connect the network cable to the Back-up Controller Card and wait 10 seconds.
11. Unplug the network cable from the Primary Controller Card.
12. After 20 seconds the system will fail-over to the Back-up Controller and the ACTIVE LED on the Back-up will come on. On the Primary, the ACTIVE LED will be off and the FAULT LED on.
13. Test the Back-up Controller's function by performing a switching operation.
14. On the Primary Controller, issue a `poweroff` command and wait for the OK2RMV (*OK to remove*) message to appear.
15. Remove the Primary Controller Card and replace the SD card.
16. Install the Primary Controller with a CONSOLE serial cable. Do not connect the network cable.
17. When the Controller Card boots up, wait for the `crng init done` message, then verify the IP settings with the `ipconfig` utility.
18. Check the 'date/time/time zone' with a `date` command.*
19. Perform other site-specific operations as necessary (*password, hostname, gateway, NTP, etc.*)
20. On the Primary Controller, issue a `poweroff` command and wait for the OK2RMV (*OK to remove*) message to appear.
21. Disconnect the Primary Controller from the chassis backplane, wait 5 seconds, then reconnect it.
22. Wait for the `crng init done` message, then connect the network cable to the Primary Controller.
23. Fail-over from the Back-up Card occurs automatically; The ACTIVE LED will come on.
24. Test the Primary Controller's function by performing a switching operation.

**To check and change the 'date, time & time zone,' see **Tech Support Bulletin 19-009B**, next page.*

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# Technical Support Bulletin

May 21, 2019
Page 1 of 1

**SUBJECT:** **TSB #: TSB-19-009, Rev. B**

## Setting the Date, Time & Time Zone – Linux Devices

**PRODUCT(S) AFFECTED:**

## Matrix Switches, SMP2 Module, SMP2 Appliance and SMP Client

**PROBLEM:**

Having an incorrect date/time setting may cause system problems. These range from; incorrect log file data to Linux not booting properly.

Note: This is not a bug in Debian Linux; it's an intentional security feature.

**For example:** In the case of a TLX matrix switch, it may boot into a "maintenance" mode which precludes the use of the ipconfig utility. This mode is indicated by: "login incorrect, type root password for maintenance, or type control-D to continue." If this should occur, login as root and set the date & time as below.

**SOLUTION:**

1. Log into the device as root.
2. Check the date, time and time zone by issuing a "date" command.
3. To change the time zone, issue a "dpkg-reconfigure tzdata" command. A menu will appear allowing you to easily update the time zone.
4. To set the date and time, issue the command in the format "date mmddhhmmyy" for month, day, hour, minute, year. For example: "date 0128162019" will set the module for January 28, 2019, 4:20PM. This sets the Linux clock. However, this will be lost after repowering the unit.
5. Check the date, time and time zone again to make sure it is correct.
6. Set the permanent hardware clock with the following command: "hwclock –systohc". Note there is a space and double hyphen between the parameters. Now when Linux boots it will read the H/W clock correctly.

**Warning:**

Make sure you double check your date & time setting after configuring it. Accidentally changing the date too far in the past will prevent Linux from booting at all. If this should ever happen, remove and replace the RTC battery to reset the date/time to a known state and then correct it.

**Additional benefit:**

Having the clocks set on system devices ensures that the log entries will have accurate timestamps if the system needs troubleshooting and the logs need to be examined.

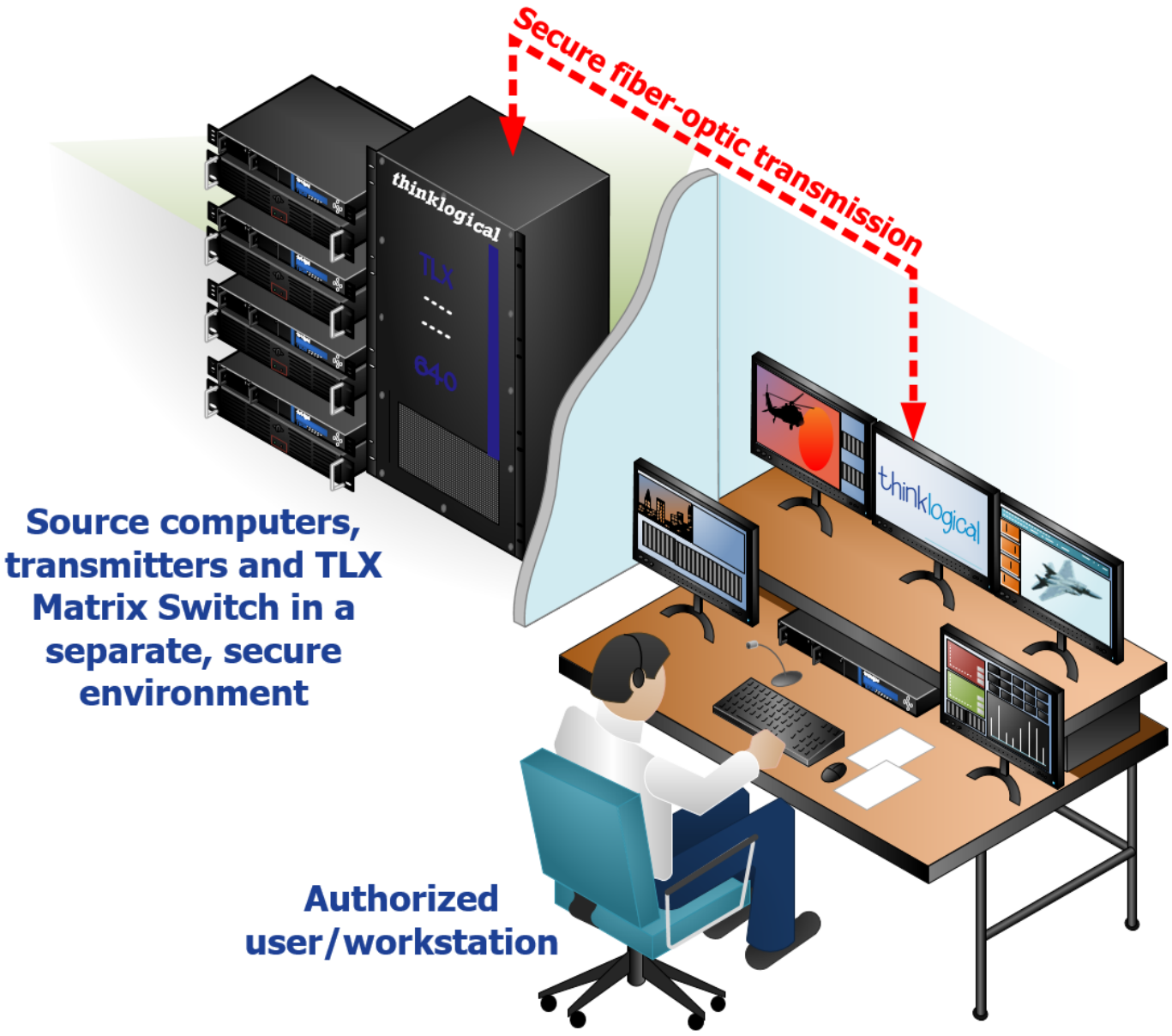
| INITIATOR(S): | DATE: |
|---|---|
| Egon Loffel | 5/21/2019 |

| APPROVALS: | | DATE: |
|---|---|---|
| Project Engineer: | Mitch Hillsberg | 5/21/2019 |

# APPENDIX D: Secure Applications

## TLX Matrix Switch Control

When used in a secure application, the Matrix Switch and External Computer (server) used to manage the system must be in a physically secure environment to which only trusted administrators have access. Similarly, the server used to manage the Matrix Switch must be physically protected and have suitable identification/authentication mechanisms to ensure that only trusted administrators have access.




Thinklogical's TLX, VX and MX Matrix Switches use two methods for secure routing. One is known as **Restricted Switching** and the other is known as **Partitioning**. These methods can be deployed singularly or jointly, depending on security requirements.

*CATx Matrix Switching applications, not available on all Thinklogical Matrix Switch models, do not offer an EAL4 rated level of security.*

## Restricted Switching

**Restricted Switching provides multiple levels of security classification domains on the same Matrix Switch.** Each destination must ensure that no unauthorized content is displayed or accessed. Therefore, every input and output must be prioritized. Priorities can range from 1 to the total number of ports in the Matrix Switch. An output can connect to an input with a priority greater than, or equal to, its own. Thus, a priority level of 1 on an output can connect to any input (priority 1, 2, 3…).

The user must provide a table defining the priorities for each input and output of the switch matrix. This table is in the form of a comma separated value (csv) file. This file contains the values in three columns: **Port Direction** (i=input, o=output), **Port Number** and **Port Priority**. For example:

| I/O | Number | Priority |
|---|---|---|
| "i", | 1, | 1 |
| "i", | 2, | 2 |
| "i", | 3, | 3 |
| "i", | 4, | 1 |
| "i", | 5, | 3 |
| "o", | 1, | 1 |
| "o", | 2, | 3 |
| "o", | 3, | 2 |
| "o" | 4, | 4 |
| "o", | 5, | 1 |

Output 1 can connect to ports 1-5.
Output 2 can connect to ports 3 and 5.
Output 3 can connect to ports 2, 3, and 5.
Output 4 cannot connect to any ports.
Output 5 can connect to ports 1-5.

Note that Port Direction (i or o) is in quotes and that the table must use only the following ASCII printable characters:

| | | |
|---|---|---|
| Double quotes (or speech marks) | character code = 34 | (") |
| Lower case i | character code = 105 | (i) |
| Lower case o | character code = 111 | (o) |
| Comma | character code = 44 | (,) |
| Carriage Return | character code = 13 | (CR) |
| Line Feed | character code = 10 | (LF) |

The Restricted Switching Table files are stored on the controller card at:
**/var/local/router/restrict/upstream.csv**

At system power up, after initial boot-up, the **Primary Controller Card** will only evaluate its Restricted Switching Table (upstream.csv file) once upon becoming active. The **Back-Up Controller Card** will NOT evaluate its Restricted Switching Table (upstream.csv file) at initial boot-up but rather when a switchover occurs from Primary Active to Back-Up Active. If an **upstream.csv** file is found, a log entry to the **deamon.log** file is made indicating “Restricted Switching ENABLED.” If no file is found, then a log entry of “Restricted Switching DISABLED” is made.

The inactive Back-Up Controller Card will not verify its Restricted Switching Table (csv file), so it will not log error messages with current time stamp entries until it becomes active. Also, any errors that occur during the Restricted Switching Table evaluation process will be logged as “error” with a *field and line invalid* identifier. The **daemon.log file** will be at the following location on the controller card: **/var/log/daemon.log**.

For access to the *daemon.log* file via SSH, refer to THE NETWORK INTERFACES section of this document (pg. 12) for correct IP addresses of Controller Cards when in Primary Active or Back-Up Active mode.

To verify the system's **Restricted Switching policy**, Thinklogical recommends the following:

1. Review the **daemon.log** file on the active Controller Card and correct any errors in the Restricted Switching Table before implementing multiple levels of security classification domains on the same Matrix Switch.
2. Fully test the **Restricted Switching** on the active Primary Controller Card before implementing multiple levels of security classification domains on the same Matrix Switch.
3. In a redundant system, make the Back-Up Controller Card active by disconnecting the LAN cable from the Primary Controller Card's LAN port. The Back-Up Controller Card, upon becoming active, will evaluate its Restricted Switching Table. Check the **daemon.log** file on the Back-Up Controller Card for any errors in the Restricted Switching Table and correct them before implementing multiple levels of security classification domains on the same Matrix Switch using the Back-Up Controller Card.
4. Fully test the Back-Up Controller Card's **Restricted Switching** before implementing multiple levels of security classification domains on the same Matrix Switch.

**There are cases where updates to the Restricted Switching Table must be made in an active system.** When an update is made to the table, the Controller will not evaluate the updated table until the following procedures are followed:

When updates are made to the Restricted Switching Table in a **non-redundant system**, Thinklogical recommends the following (This procedure will be disruptive to system connections):

1. Update the Restricted Switching Table of the Primary Controller Card.
2. Take the Primary Controller Card out of service by following guidelines in the "Safely Remove an Active Controller Card" section of this document (pg. 26).

When updates are made to the Restricted Switching Table in a **redundant system**, Thinklogical recommends the following (This procedure will NOT be disruptive to system connections):

1. Update the Restricted Switching Table of the inactive Back-Up Controller Card.
2. Take the Primary Controller Card out of service by following guidelines in the "Safely Remove an Active Controller Card" section of this document (pg. 26). This will cause the Back-Up Controller Card to become active and evaluate its Restricted Switching Table.
3. Update the Restricted Switching Table of the inactive Primary Controller Card with the same table used for the Back-Up Controller Card.
4. Extract and re-insert the Primary Controller Card back into the chassis to cause the system to make the Primary Controller Card the active controller and begin using the updated Restrict Switching Table. Ensure that the LAN connection to the Primary Controller Card is restored promptly.

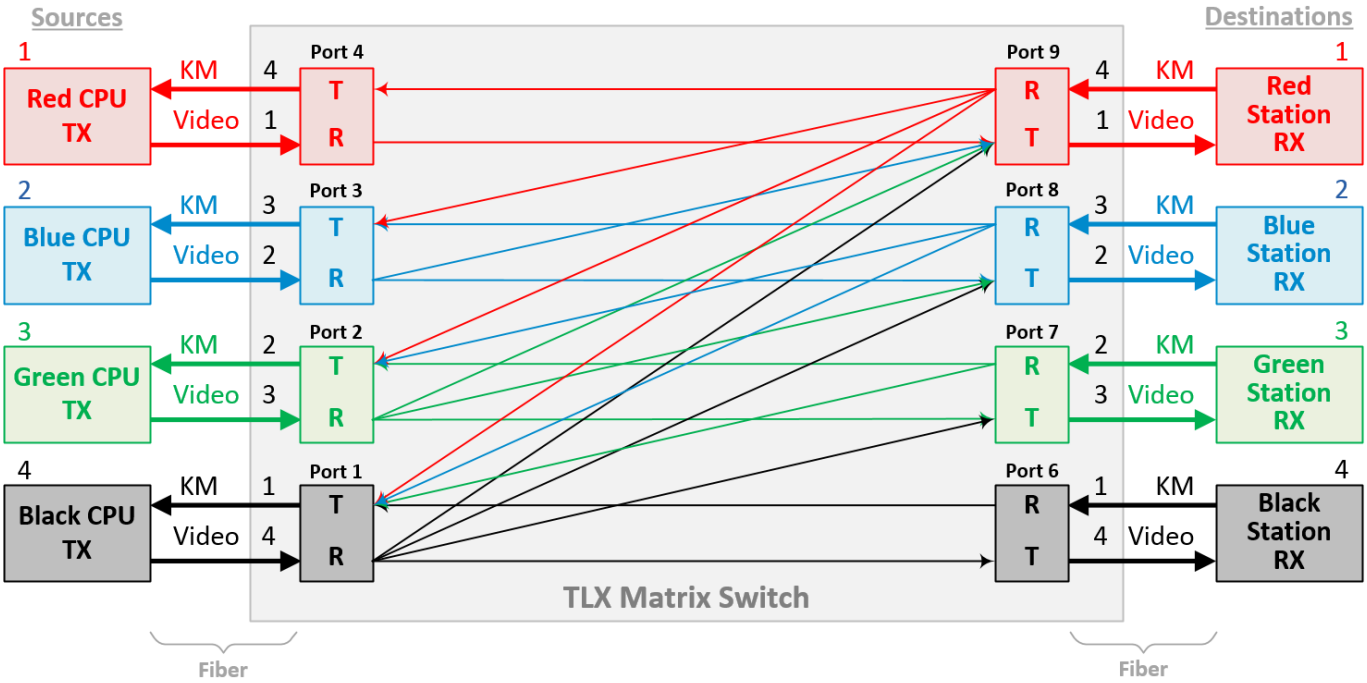
**Note: When using a Back-Up Controller configuration, both controllers must have the same Restricted Switching Table file(s) to maintain the security of the system.**

**Restricted Switching is disabled when Restricted Switching Table files are removed.** By default, when there are no Restricted Switching Table files, all input and output ports will have a priority of 1. All Switches are shipped without Restricted Switching Table files stored on the Controller Card and therefore do not restrict any connection.

# Restricted Switching with TLX, VX and MX Matrix Switches

## Restricted Switching Priority Scheme

**The following example shows a priority scheme for four levels of security managed by one TLX Matrix Switch:**




**VIDEO:**

| Destination Workstation Network | Source Computer Network Transmissions That Can Be Seen |
|---|---|
| RED | BLACK, GREEN, BLUE, RED |
| BLUE | BLACK, GREEN, BLUE |
| GREEN | BLACK, GREEN |
| BLACK | BLACK |

**KEYBOARD/MOUSE:**

| Destination Workstation Network | Source Computer Networks That Can Be Controlled |
|---|---|
| RED | BLACK, GREEN, BLUE, RED |
| BLUE | BLACK, GREEN, BLUE |
| GREEN | BLACK, GREEN |
| BLACK | BLACK |

Restricted switching is configured via firmware loaded into the Matrix Switch. The configuration file for this scenario will appear like the table at right. →

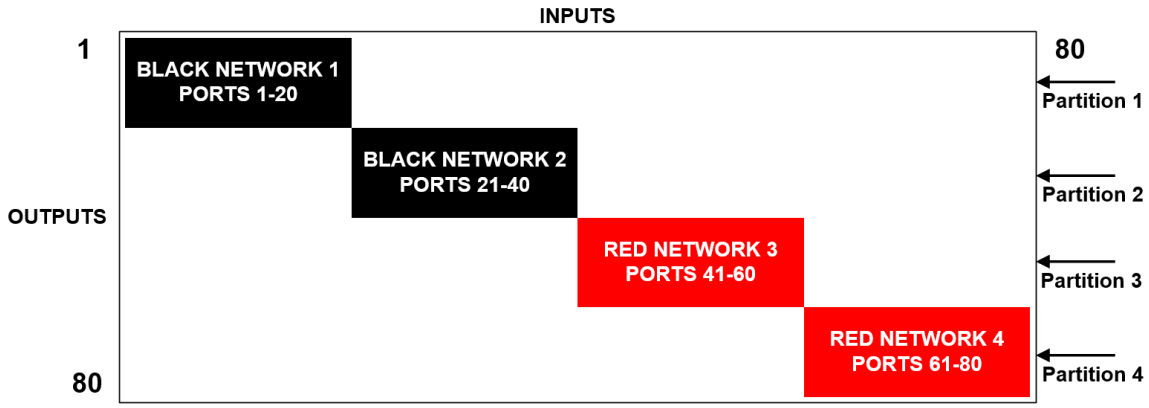
| I/O | Number | Priority |
|---|---|---|
| "i" | 1 | 4 |
| "i" | 2 | 3 |
| "i" | 3 | 2 |
| "i" | 4 | 1 |
| "i" | 6 | 1 |
| "i" | 7 | 2 |
| "i" | 8 | 3 |
| "i" | 9 | 4 |
| "o" | 1 | 1 |
| "o" | 2 | 2 |
| "o" | 3 | 3 |
| "o" | 4 | 4 |
| "o" | 6 | 4 |
| "o" | 7 | 3 |
| "o" | 8 | 2 |
| "o" | 9 | 1 |

## Partitioning

**Partitions allow TLX, VX and MX Matrix Switch sources and destinations to be segregated.** Therefore, destination workstations will only receive signals that are transmitted from source computers in the same partition. In addition, it is impossible for a source computer to be inadvertently routed outside of its designated partition as the signals will not be transmitted.

The user must provide a table defining the partitions. This table is in the form of a **C**omma **S**eparated **V**alue (CSV) file located in **/var/local/router/partition** on the Switch. This file contains the port number and the partitions to which it belongs.

***Example:*** **VX80 Matrix Switch with four distinct partitions:**

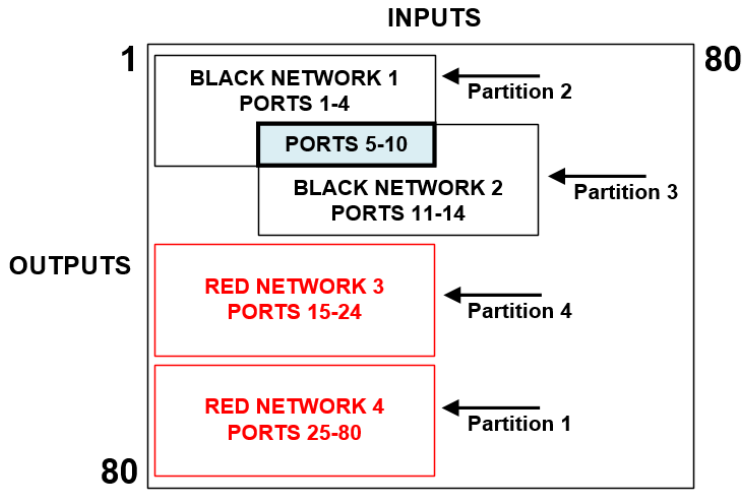



***Four partitions set up for secure routing and extension applications. Signals are only capable of transmitting and receiving within a single partition and not across partitions***

The maximum number of partitions is the number of ports that make up the Switch (12-1280) A TLX80, for example, can be configured with up to 80 partitions, a TLX160 with up to 160, and so forth. There are also overlapping partition configurations.

### A TLX80 with four partitions: Ports 5-10 are accessible to both partitions 2 and 3.

The following example shows a TLX80 Switch with an overlapping partition:




| PORT | PARTITION |
|---|---|
| 1 | 2 |
| 2 | 2 |
| 3 | 2 |
| 4 | 2 |
| 5 | 2,3 |
| 6 | 2,3 |
| 7 | 2,3 |
| 8 | 2,3 |
| 9 | 2,2 |
| 10 | 2,3 |
| 11 | 3 |
| 12 | 3 |

| PORT | PARTITION |
|---|---|
| 13 | 3 |
| 14 | 3 |
| 15 | 4 |
| 16 | 4 |
| 17 | 4 |
| 18 | 4 |
| 19 | 4 |
| 20 | 4 |
| 21 | 4 |
| 22 | 4 |
| 23 | 4 |
| 24 | 4 |

The Partition Table files are stored on the Controller Card at:
**/var/local/router/partition/upstream.csv**

At system power up, after initial boot-up, the **Primary Controller Card** will only evaluate its Partition Table (upstream.csv file) once upon becoming active. The **Back-Up Controller Card** will NOT evaluate its Partition Table (upstream.csv file) at initial boot-up, but rather when a switchover occurs from Primary Active to Back-Up Active. If an **upstream.csv** file is found, a log entry to the **deamon.log** file is made indicating "Partition ENABLED." If no file is found, then a log entry of "Partition DISABLED" is made.

The inactive Back-Up Controller Card will not verify its Partition Table (csv file), so it will not log error messages with current time stamp entries until it becomes active. Also, any errors that occur during the Partition Table evaluation process will be logged as "error" with a *field and line invalid* identifier. The **daemon.log file** will be at the following location on the controller card: **/var/log/daemon.log**.

For access to the *daemon.log* file via SSH, refer to THE NETWORK INTERFACES section of this manual (pg. 12) for correct IP addresses of controller cards when in Primary Active or Back-Up Active mode.

To verify the system's **Partitioning policy**, Thinklogical recommends the following:

1. Review the **daemon.log** file on the active controller card and correct any errors in the Partition Table before implementing multiple levels of security classification domains on the same Matrix Switch.
2. Fully test the **Partitioning** on the active Primary Controller Card before implementing multiple levels of security classification domains on the same Matrix Switch.
3. In a redundant system, make the Back-Up Controller Card active by disconnecting the LAN cable from the Primary Controller Card's LAN port. Check the **daemon.log** file on the Back-Up Controller Card for any errors in the Partition Table and correct them before implementing multiple levels of security classification domains on the same Matrix Switch using the Back-Up Controller Card.
4. Fully test the Back-Up Controller Card's **Partitioning Domains** before implementing multiple levels of security classification domains on the same Matrix Switch.

**There are cases where updates to the Partition Table need to be made in an active system.** When an update is made to the table, the Controller will not evaluate the updated table until the procedures outlined below are followed.

When updates are made to the Partition Table in a **non-redundant system**, Thinklogical recommends the following (This procedure will be disruptive to system connections):

1. Update the Partition Table of the Primary Controller Card.
2. Take the Primary Controller Card out of service by following guidelines in the "Safely Remove an Active Controller Card" section of this document (pg. 26).

When updates are made to the Partition Table in a **redundant system**, Thinklogical recommends the following (This procedure will NOT be disruptive to system connections):

1. Update the Partition Table of the inactive Back-Up Controller Card.
2. Take the Primary Controller Card out of service by following guidelines in the "Safely Remove an Active Controller Card" section of this document (pg. 26). This will cause the Back-Up Controller Card to become active and evaluate its Partition Table.
3. Update the Partition Table of the inactive Primary Controller Card with the same table used for the Back-Up Controller Card.
4. Extract and re-inserted the Primary Controller Card back into the chassis to cause the system to make the Primary Controller Card the active controller and begin using the updated Partition Table. Ensure that the LAN connection to the Primary Controller Card is restored promptly.

**Note: When using a Back-Up Controller configuration, both controllers must have the same Partition Table file(s) to maintain the security of the system.**

Partition Switching is disabled when Partition Table files are removed. By default, when there are no Partition Table files, all ports not listed will default to partition 1. All Switches are shipped without Partition Table files stored on the Controller Card and therefore do not restrict any connection.

### Administration Access

*There are two methods by which the administrator can access the Switch Controller Configurations:*

1. **The Serial Console directly connected to the Switch.** (It should be noted that, while no administrator password is required to use the Serial Console, physical access to the Switch is required. Therefore, the Switch should be stored in a physically secure location to avoid unauthorized access.)
2. **SSH access.** The Switch allows SSH connections to the Switch for management purposes. SSH sessions are authenticated using an encrypted password file.

**Password Security**
For security purposes, the Switch defaults to using the Message-Digest Algorithm (MD5) and shadow passwords**. It is highly recommended that you DO NOT alter these settings.** If you select the older Data Encryption Standard (DES) format, passwords will be limited to eight alphanumeric characters (disallowing punctuation and other special characters) with a modest 56-bit level of encryption. **The single most important thing you can do to protect the Switch is create a strong password.**

**Creating Strong Passwords**:
The password can contain up to 127 characters and cannot contain a space.

MAKE THE PASSWORD AT LEAST EIGHT CHARACTERS LONG. The longer the password, the more effective it will be. If you are using an MD5 password, it should be approximately 15 characters long. With DES passwords, use the maximum eight-character length.

Mix UPper AnD LowER CASE LETTERS. Passwords are case sensitive, so mixing will multiply the number of possible combinations.

Mix LETTER5 AND NUM8ER5 within the password to enhance its strength.

Include NON-ALPHANUMER!C CH@RACTER$. Special characters (& $ % >) and punctuation marks (? “ - !) increase the strength of a password.

## Secure Application Examples

The diagram on pg. 42 shows the TLX1280 Matrix Switch in a secure application. **The highly secure components are described as the Red Network and the other, lower security components are described as the Black Network.** The Red Network, containing the computers (sources), is shown in a physically secure environment along with the TLX Matrix Switch, the computer server used to manage the Switch, and the Network Hub. The Network Hub is a dedicated network used only to connect the TLX Switch to the computer server. This dedicated network does not connect to any other components and does not extend beyond the physically secure environment. The dedicated network connection may be replaced by a direct serial connection (RS-232) between the TLX Switch and the computer server.

**The TLX Matrix Switch can be configured to prevent accidental connection from the Red Network to the Black Network using the Restricted Switching feature.** For example, the TLX Matrix Switch Network Diagram should be configured with the following csv file:

| Direction | Number | Priority |
|---|---|---|
| I | 1 | 2 |
| I | 2 | 2 |
| O | 2 | 2 |
| I | 42 | 2 |
| O | 41 | 2 |
| O | 42 | 2 |
| I | 5 | 1 |
| O | 5 | 1 |
| I | 45 | 1 |
| O | 45 | 1 |

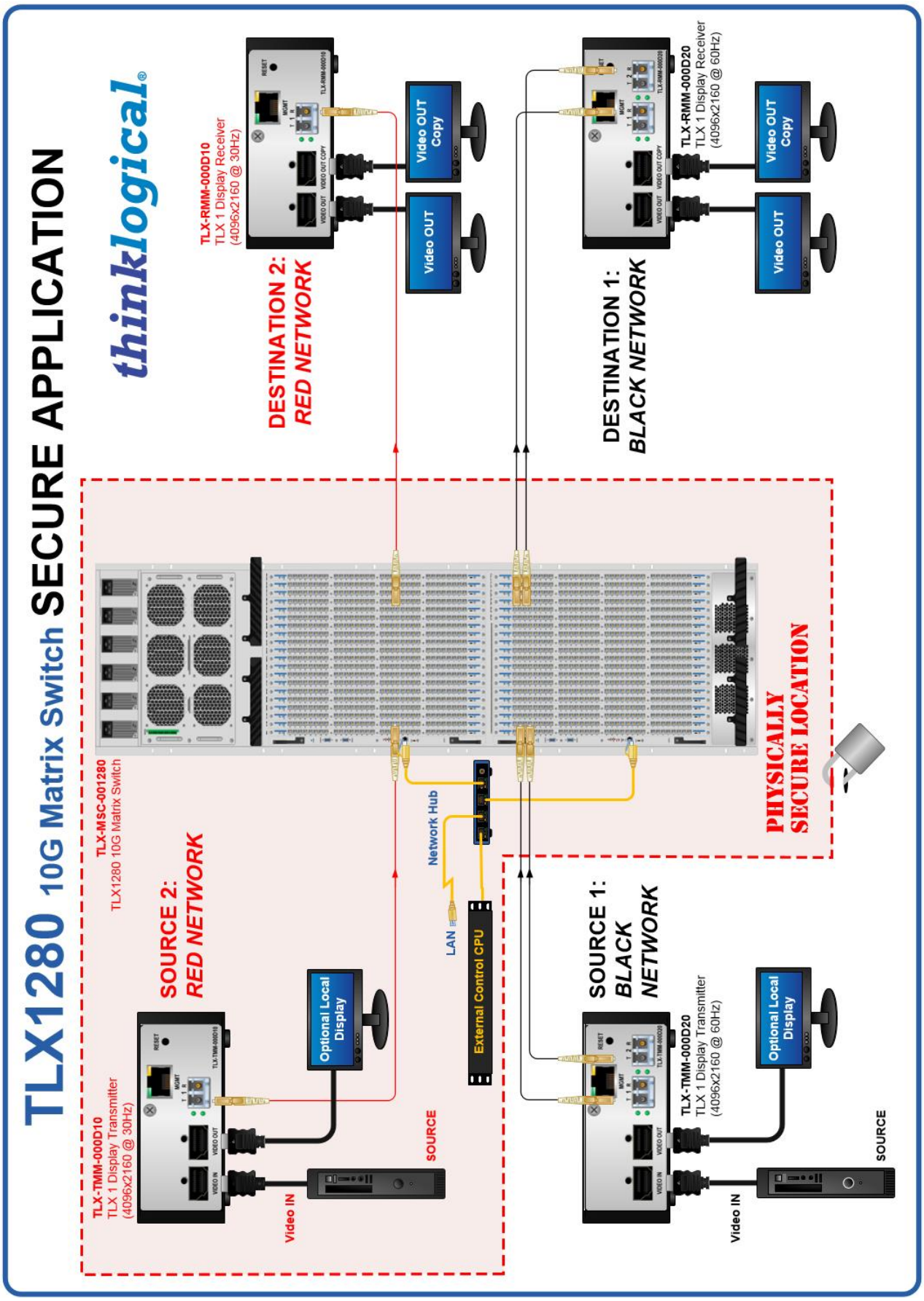
**The following connection rules apply:**

- SOURCE 2 can be connected only to DESTINATION 2
- SOURCE 1 can be connected to both DESTINATION 1 and DESTINATION 2

**Note: The TLX Matrix Switch and the computer server used to manage the Switch must be protected according to the highest security classification of any component in the entire network application. The optical connections and Destination Receiver designated as *Red Network* must be kept physically secure.**

**The configuration of the TLX Matrix Switch should be reviewed regularly to ensure that it continues to meet organizational security policies concerning:**

- Changes in the TLX Matrix Switch configuration
- Changes in the organizational security policy
- Changes in the threats presented from non-trusted network interfaces
- Changes in the administration, operation staff or the physical environment of the TLX Matrix Switch




TLX1280 10G Matrix Switch Secure Application