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A BELDEN BRAND

TLX640

10G MATRIX SWITCH PRODUCT MANUAL

Full 4K & 60Hz
Video and KVM
Hybrid Switching &
Extension Solutions
over the
Fewest Cables

Rev. H, February 2020

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

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Subject: TLX640 10G Matrix Switch Product Manual
Revision: H, February 2020

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Table of Contents

PREFACE ..... **v**
About Thinklogical® v
About This Product Manual 1
Note and Warning Symbols 1
Class 1 Laser Information 1
SECTION 1: THE TLX SYSTEM FEATURES **2**
The TLX640 Design 3
Power Supply Modules 4
The Controller Cards 4
The Processor 5
The Network Interfaces 5
SNMP Support 6
NTP Support 6
System Log File Support 7
Serial/RS-232 Interfaces 7
The Interconnect Module 7
The Fan Tray Module 7
Alarms 8
The Input/Output Cards 8
Port Numbering 8
The Swich Card Modules 10
TLX640 Features 10
Status LEDs 11
Product Compatability 12
Technical Specifications 12
SECTION 2: SET-UP AND INSTALLATION **13**
Contents 13
Unpacking the TLX640 13
Connecting to the TLX640 14
Ethernet Control 14
TLX640 DIP Switch Settings 14
Redundancy and Network Requirements 14
External Control CPU Minimum Requirements 15
Pluggable SFP+ Modules 15
LC-Type Fiber-Optic Cable 16
TLX Extender Fiber-Optic Cable Configurations 17
TLX Extender CATx Cable Configurations 18
Input/Output Cards 19
Routing Thinklogical Extenders through the TLX640 20
Connecting to a Receiver 20
Connecting to a Tranmitter 20
Connecting to a Control CPU 21
Firmware 22
On Screen Display (OSD) - Firmware Option 22
Order Of Installation Events 22
Updates 22
Safely Remove an Active Control Card or Shut Down of the System 22
How to Install and Replace Modules 23
How to Install and Replace an *Input/Output Card* 23
How to Install and Replace an *Interconnect Module* 24

How to Install and Replace a *Switch Card* 24
How to Install and Replace a *Controller Card* 25
How to Install and Replace a *Fan Tray* 25
How to Install and Replace a *Power Supply* 26
Ordering Information 26

SECTION 3: REGULATORY & SAFETY REQUIREMENTS 27
Symbols Found on Our Products 27
Regulatory Compliance 27
North America 27
Australia & New Zealand 27
European Union 27
Declaration of Conformity 27
Standards with Which Our Products Comply 27
Supplementary Information 28
Product Serial Number 28
Connection to the Product 28

SECTION 4: 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: TLX640 QUICK START GUIDE 30

APPENDIX B: SETTING THE DIP SWITCH INSTRUCTION 31

APPENDIX C: FPGA UPDATE APPLICATION INSTALLATION 32

APPENDIX D: SD CARD REPLACEMENT PROCEDURE FOR THE TLX640 CONTROLLER CARD. 33

APPENDIX E: SECURE APPLICATIONS 35

MADE IN USA

PREFACE

About Thinklogical A BELDEN BRAND

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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.

ANAB ACCREDITED MANAGEMENT SYSTEMS CERTIFICATION BODY

Certified to ISO 9001:2015

TÜVRheinland Precisely Right.

Information Assurance

Common Criteria

TEMPEST

NATO Information Assurance Product Catalogue NIAPC

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 four sections: **TLX System Features, Set-Up & Installation, Regulatory & Safety Requirements** and **Thinklogical Support.** These are sub-divided to help you find the topics and procedures you are looking for. This manual also contains Appendices.

Section 1 – The TLX System Features: **Pg. 2.** Details the features and functions of your equipment.

Section 2 – Set-Up and Installation: **Pg. 13.** Contains all the requirements and procedures necessary to connect and install your equipment, including FPGA updates.

Section 3 – Safety & Regulatory Requirements: **Pg. 27.** Thinklogical® strongly recommends that you read this section prior to starting the hardware assembly.

Section 4 – Thinklogical Support: **Pg. 29.** Thinklogical provides the best customer support available. If you have any questions or need to contact us for any reason, please refer to this section of the manual.

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.

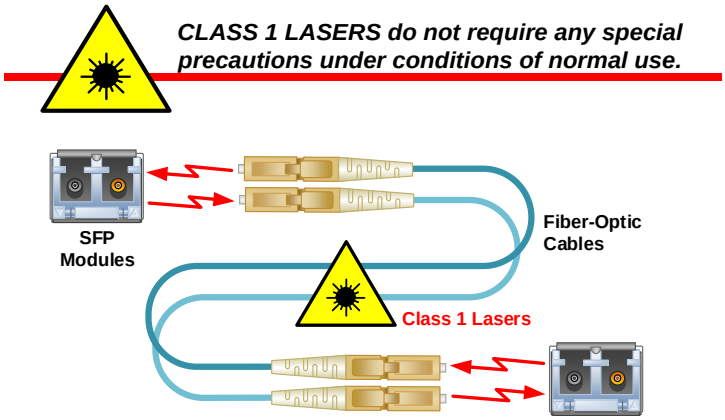
Warning! All Warnings appear in red text, followed by blue text, and preceded by a red stop sign, as shown here.

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.

READ THE INSTRUCTIONS THOROUGHLY BEFORE STARTING ANY PROCEDURE!

Class 1 Laser Information

The TLX640, 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).



Section 1: TLX System Features

The Logical Solution

The TLX640 is a 10G high performance modular, non-blocking matrix switch that supports full, uncompressed 4K video with full color depth at 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 reliable and resilient matrix switch is expandable from 20x20 ports up to 640x640 ports, which allows for highly flexible deployment configurations. In addition, the TLX640 series 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 and audio.

HYBRID SWITCHING SOLUTION

For Uncompressed, High Resolution Video & KVM Systems

Thinklogical's TLX Matrix Switches are *high performance, modular, non-blocking switches* for complete end-to-end switching of video, audio and peripheral signals **over multi-mode or single mode fiber-optic cable or CATx cable**.

TLX switches are *protocol agnostic*, supporting most video, audio and peripheral signals and allow users to consolidate all their system switching requirements in a single chassis. TLX Matrix Switches are ideal for small to large system applications, with switch sizes ranging from **12 ports to 1280 ports**. Each port supports **10Gbps** bandwidth, preserving signal integrity to provide *uncompressed, high resolution video* with no artifacts, latency or lost frames. Thinklogical's re-clocking technology ensures that every video and data stream is delivered in perfect synchronization.

SECURITY

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 E: Secure Applications*, pg. 35.)

Note: CATx Matrix Switching applications do not offer an EAL4 rated level of security. CATx is not available with the TLX80.

RESILIENCY

TLX switches are designed to maximize system uptime. The modular approach of the TLX allows user to **hot-swap all critical system components**, including power supplies (in dual supply models), fan trays, control cards, input/output cards and pluggable optics. Furthermore, the system can be easily reconfigured, such as adding additional input/output cards for expansion, without ever turning off the switch or interrupting active signals. **Redundant and current-sharing power supplies** ensure continuous, uninterrupted power to the switch. Matrix switches are also configurable to include **redundant control cards with automatic fail-over**. Enhanced diagnostics and alarms provide extensive real-time monitoring and diagnostics of critical functions of the switch.

THE TLX640 DESIGN

The modular approach of the TLX640 Matrix Switch (sometimes referred to as a Switch or Router) allows all critical system components, including switch cards, power supplies, cooling fans and pluggable optics (SFP+) to be hot-swappable, thus minimizing business impact during reconfigurations, updates or failures.

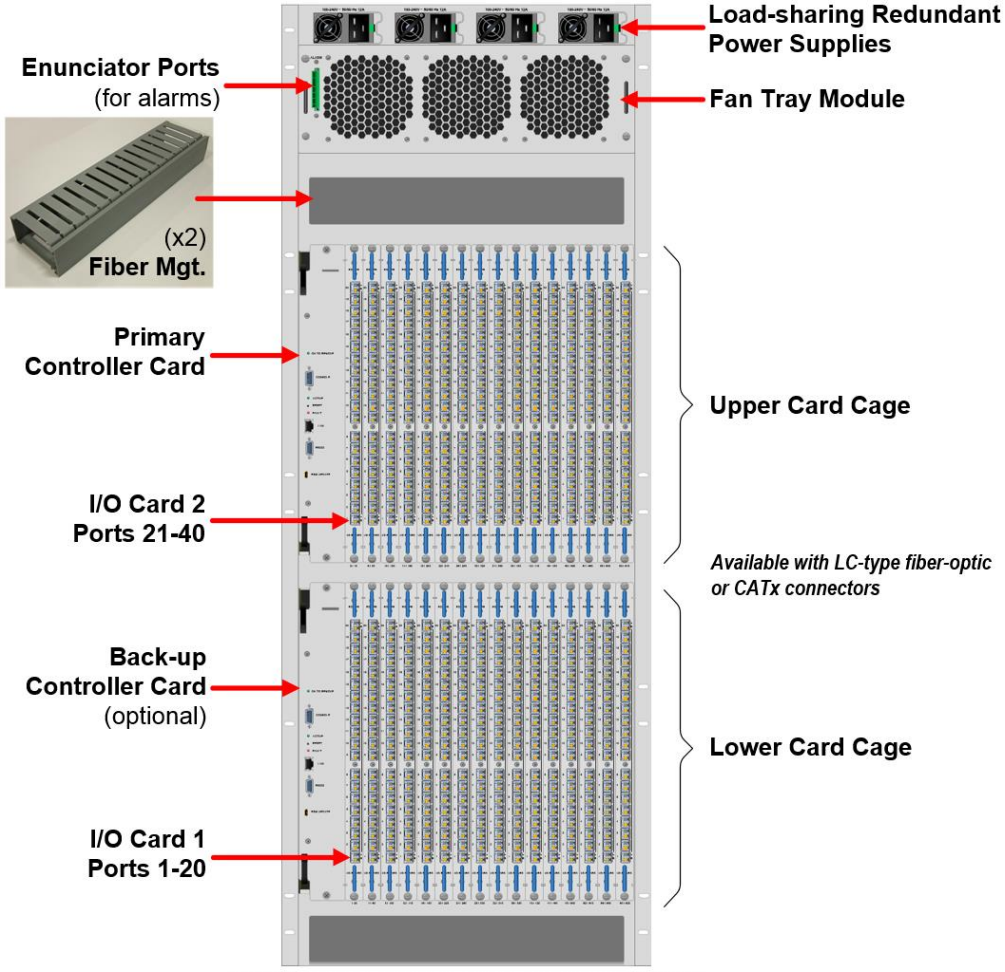
The Interconnect Card module is not hot-swappable and the system must be shut down for replacement. If you suspect a problem with the Interconnect Card, call us at 203-647-8700 for assistance.

Thinklogical's TLX640 line replaceable modules include:

- (2) Redundant, Current Sharing Power Supply Modules for the Upper Card Cage
- (2) Redundant, Current Sharing Power Supply Modules for the Lower Card Cage
- Fan Tray Module (includes three fans and enunciator ports)
- Controller Cards (primary/back-up)
- (8) Switch Cards
- Interconnect Card
- (Up to 32) TLX640 Data Input/Output Cards, 20 Ports, fiber or CATx
- Cable management racks

Optional Modules (Spares):

- TLX640 Data Input/Output Card, 20 Ports, fiber or CATx
- TLX640 Back-up Controller Card
- TLX640 Switch Card
- TLX640 Fan Tray
- TLX640 Power Module



Note: All modules may be replaced without interruption to other module functions

POWER SUPPLY MODULES

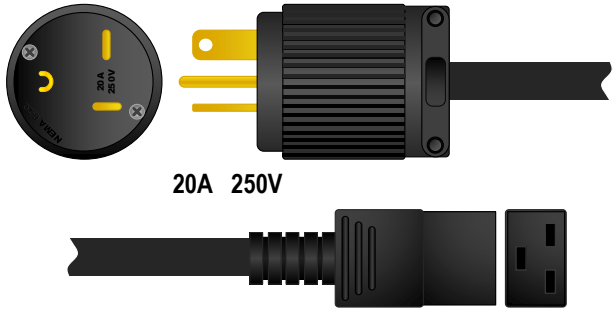
The dual, redundant power supplies for each card cage ensure continuous, uninterrupted power. The supplies are current sharing which means the supplies share the load equally. If a power supply fails, the redundant power supply can support the entire current load of one fully populated card cage. Although the TLX640 functions properly with one Power Module per card cage, Thinklogical recommends that both modules be used, preferably connected to independent power sources for redundancy.

Additionally, the hot-swappable feature allows easy replacement of a module without interrupting the TLX640's system functionality.

All four power supplies should be turned on during normal use, even if one of the card cages is not populated with modules.

The Power Supply Modules support an input of 200-240VAC (1200 W) 50-60Hz. Use the proper power cord for your region: 250V/20A (4 supplied with the unit).

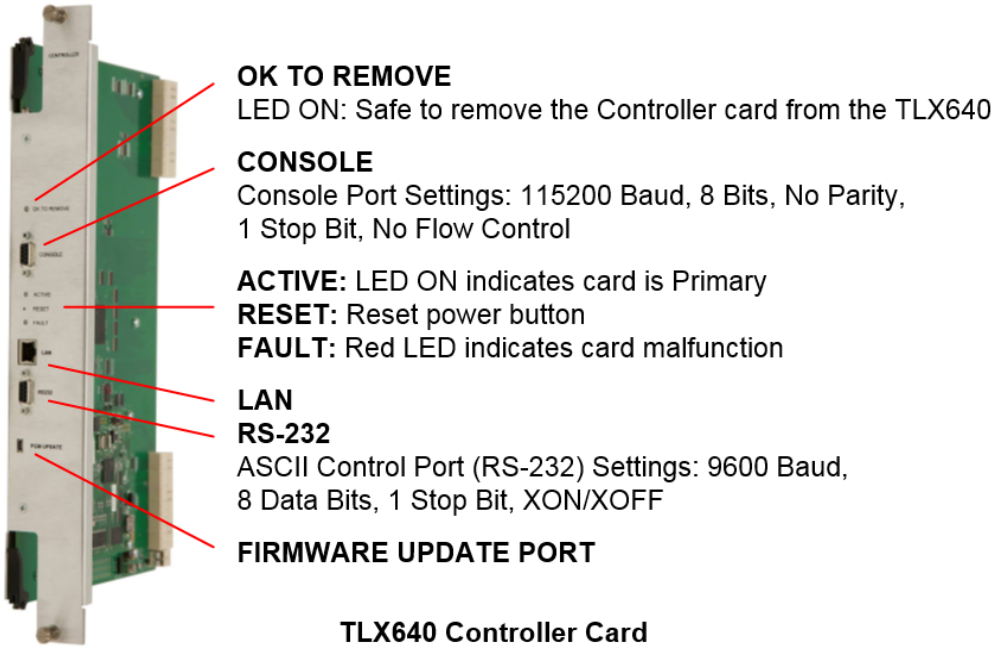
NOTE: High line is required to achieve 1200 W.



THE CONTROLLER CARDS

The hot-swappable Controller Card connects the Matrix Switch to an External CPU. The RS-232 serial port may be used for third party controller integration (such as Crestron, AMX or home-spun interfaces). Also, the Configurator Software may be used to control the switch via the LAN port.

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



TLX640 Controller Card

THE PROCESSOR – i.MX 6 QUAD (Freescale)

The Processor platform key features:

- 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 TLX640 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 internal DIP switch. (See Appendix B: *Setting the DIP Switch Instruction*, Pg. 31.) The primary's IP address can be set from 15 to 45. **The default subnet used by the TLX640 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 TLX640 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 TL 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 TxDisable bits
- SFP TxFault 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 TLX640 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 TLX640 broadcasts an 'Attention Request' message over the network. This message contains the IP address of the 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 TLX640 can be monitored via SNMP *Simple* *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 a few 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 easiest method to change the trap address is to modify the `/etc/hosts` entry and not change the trap2sink setting in the configuration file. You may have multiple trap2sink entries in the configuration file to specify multiple trap destinations.

NTP SUPPORT

NTP, or *Network Time Protocol*, is used to keep the internal clock on the switch 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 TLX640 records system events into 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/`

SERIAL/RS-232 INTERFACES

The Controller Card has two RS-232 serial ports. One Controller Card is for the Linux command line interface (labeled CONSOLE), and the other is for the switch's ASCII command interface (labeled RS232*). If a Back-up Controller card is installed, then its Linux console port is active, but only the RS232 port on the active Controller Card will function.*

Linux Command Console (Console)

- 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 (RS232)

- 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 INTERCONNECT MODULE

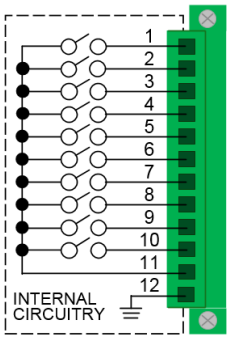
The Interconnect Card connects the Upper Card Cage to the Lower Card Cage. It is located within the chassis of the TLX640 beside the Switch Cards and contains no active components. The Interconnect Card is not hot-swappable and requires a system shut-down to replace. *It is not user serviceable.* Call Thinklogical at 203-647-8700 if you suspect problems with the Interconnect Card.

THE FAN TRAY MODULE

The TLX640 uses 3 DC fans located in one modular, hot-swappable fan tray designed for easy replacement without interrupting system functionality. The Fan Tray introduces air into the chassis through air baffles in the front door. This cools the vertically mounted I/O cards, the integrated circuits on the Switch Cards, the backplane and the power supply modules.

The Fan Tray is also equipped with an annunciator port for system alarms which can be configured to trigger an external control system.

ALARMS: The Fan Tray is equipped with an annunciator port for system alarms that can be configured to trigger an external control system. The dry alarm contacts are *Normally Closed* when unpowered, *Normally Open* when powered (OK condition) and *Closed* for an alarm condition.
Maximum switching capacity is 2A at 12V.



TLX640 Matrix Switch Critical Hardware Alarms:

POWER SUPPLY 1 (LEFT): *Fan failure, temperature/DC voltage/current range, AC interruption or module removed*
POWER SUPPLY 2: *Fan failure, temperature/DC voltage/current range, AC interruption or module removed*
POWER SUPPLY 3: *Fan failure, temperature/DC voltage/current range, AC interruption or module removed*
POWER SUPPLY 4 (RIGHT): *Fan failure, temperature/DC voltage/current range, AC interruption or module removed*
FANS: *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*
ANY OF THE ABOVE
COMMON
GROUND

TLX640 Power supplies, Left to Right:
1 Upper Cabinet Primary
2 Upper Cabinet Back-up
3 Lower Cabinet Primary
4 Lower Cabinet Back-up

Alarm Descriptions for the TLX640

THE INPUT/OUTPUT CARDS

The TLX640 10G contains up to 32 I/O Cards. I/O Cards provide the 1st (ingress) & 3rd (egress) stages of the three stage Clos switch fabric.

The hot-swappable Input/Output (I/O) cards provide in-service expansion capabilities in sets of 20 ports per I/O card, thus allowing re-configuration without interrupting signal processing.

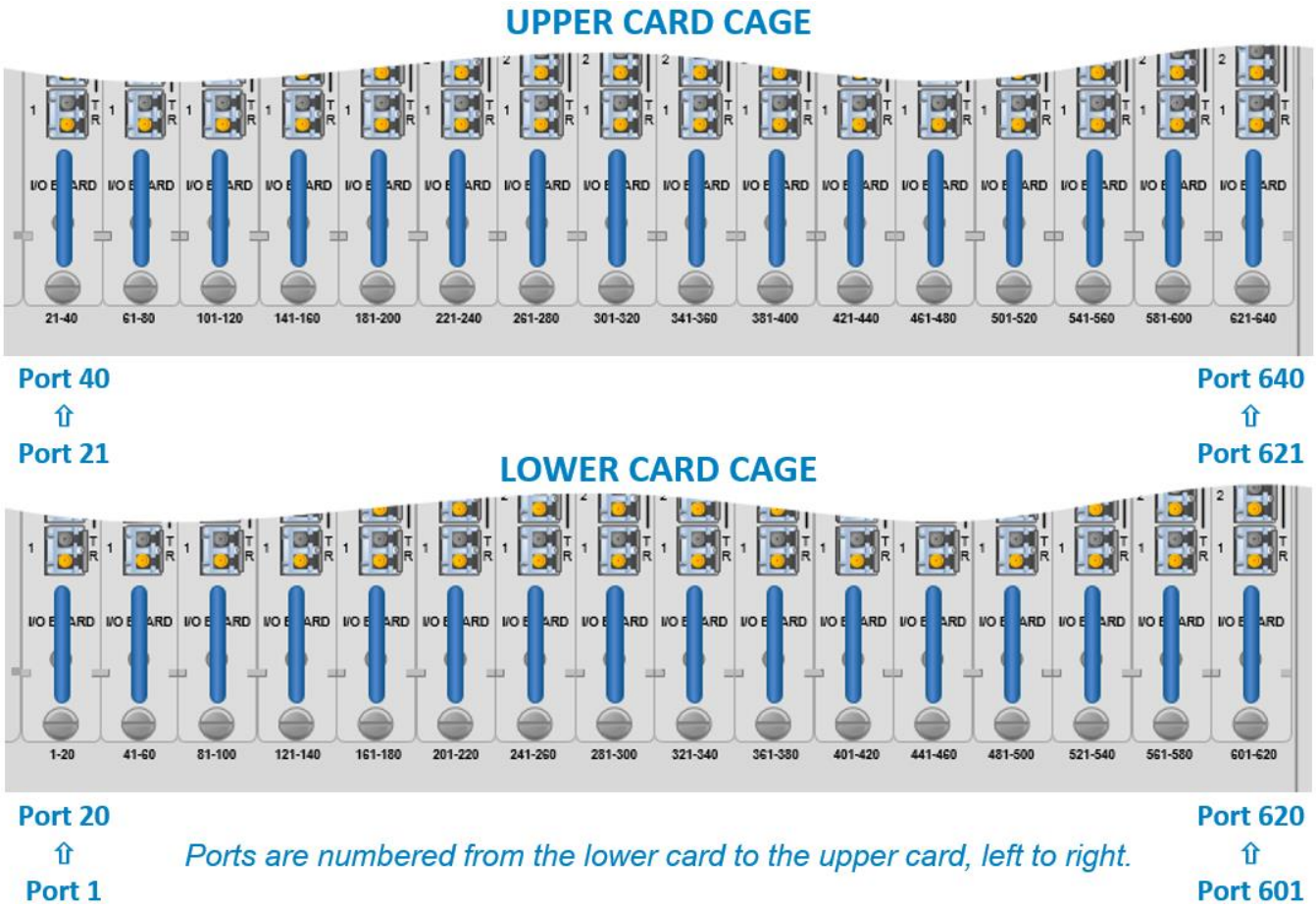
Each I/O card consists of one Transmit (T) and one Receive (R) optic per port. I/O Cards are available with CATX or LC-type fiber connectors and can be assembled with Single-mode or Multi-mode optics (SFP+). Individual I/O Cards list the ports as 1 through 20 on the TLX640. A blue LED located on each I/O card indicates when power is ON to that card.

PORT NUMBERING

The TLX640 can have a minimum of one I/O Card and a maximum of 32 I/O Cards. Each TLX640 I/O card contains 20 ports, so that when fully configured, the TLX640 will contain 16 I/O cards in the Upper Card Cage and 16 I/O cards in the Lower Card Cage. The 32 I/O cards provide a total of 640 Optical Input/Output connections (SFP+ T/R) described as Ports 1-640. The TLX640 switching matrix connects any port's optical output (SFP+ T) to any port's optical input (SFP+ R).

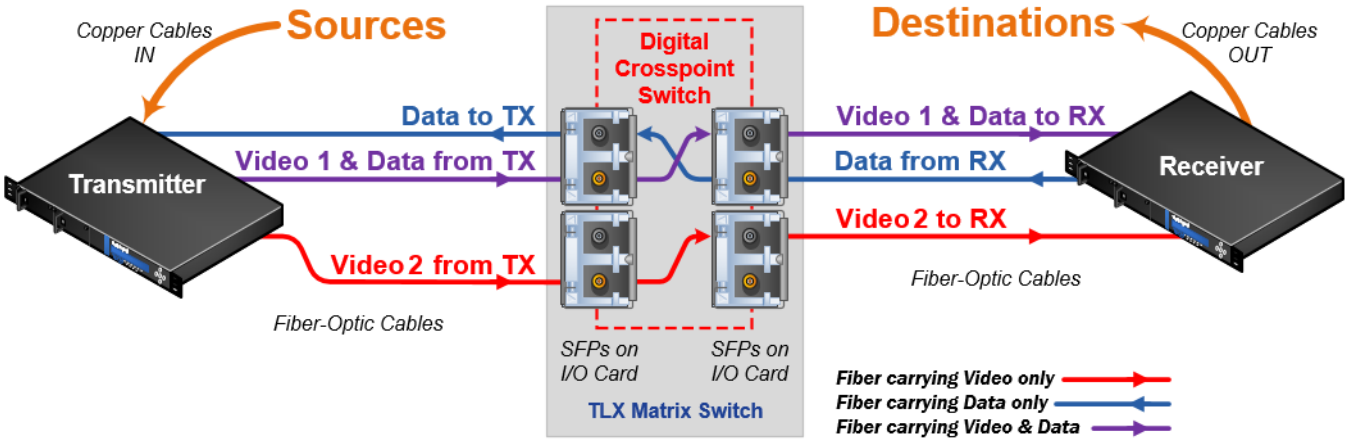
Port numbering begins with the I/O Card in the Lower Card Cage at the bottom of the chassis and moves straight up to the I/O Card directly above it in the Upper Card Cage, starting with the leftmost I/O card. **When installing less than the full complement of 32 I/O Cards, cards should be mounted beginning left to right, and bottom to top.** Each card slot has a port number designation printed below the card for easy reference. (See diagram, next page.)

Note: The TLX640 supports the VX640's I/O Cards in support of legacy Velocity extenders.



THE DIGITAL CROSSPOINT SWITCH

The Digital Crosspoint Switch is 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 at the end-user's workstation.



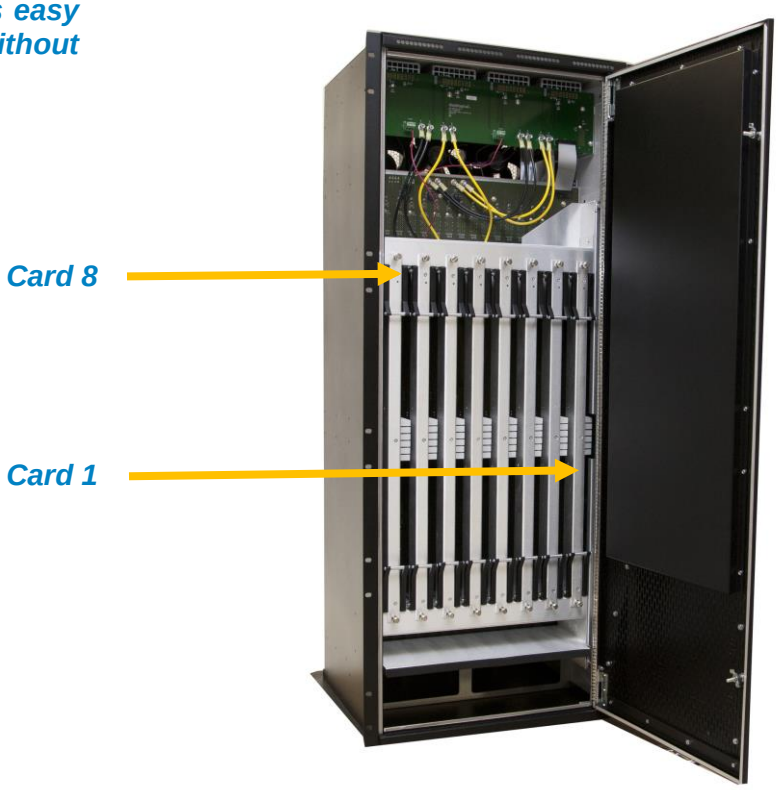
The Digital Crosspoint Switch

SWITCH CARD MODULES

The TLX640 contains 8 Switch Cards. These 8 Switch Cards provide the mid-stage switch portion of a three-stage Clos switch fabric. (The ingress and egress stages are located on the input output cards. The mid-stage is distributed across the 8 switch cards).

The Switch cards are labeled from right (Card 1) to left (Card 8). These cards contain the cross-point fabric of the switch and they allow 8 possible paths for making connections. *If a Switch Card fails, some connections will not be allowed.* The hot-swappable feature allows for easy replacement of a Switch Card without shutting down the TLX640.

The hot-swappable feature allows easy replacement of a Switch Card without shutting down the TLX640.



TLX640 Switch Cards

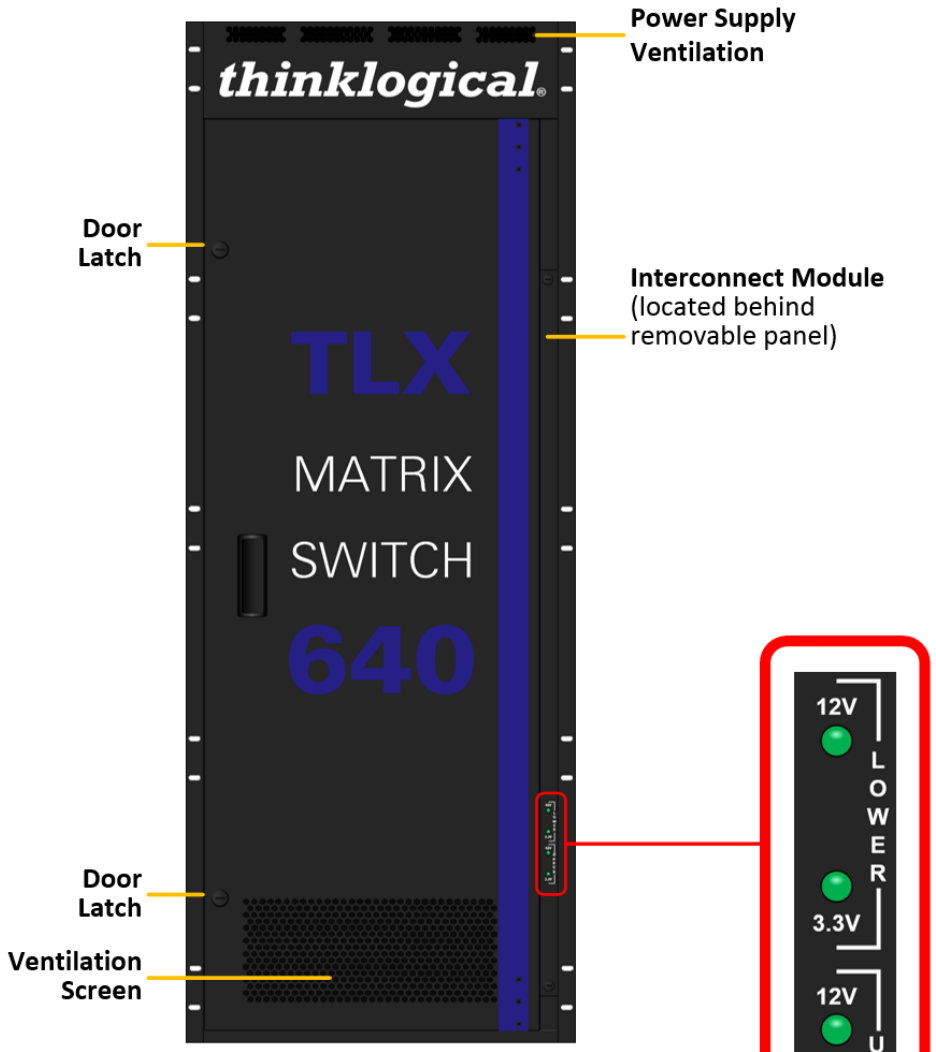
TLX640 FEATURES

Each **TLX640** includes the following features:

- Each connection supports 10Gbps/6.25 Gbps with re-clocking input
- Multi-mode fiber, single mode fiber, CATx and hybrid configurations
- Controllable via LAN or serial connection
- Scalable from 20 ports to 640 ports – In and Out for non-blocking matrix switching
- Critical system components are hot-swappable: power supplies, fan trays, control cards, data input/output cards
- Supports multicasting and macros
- SNMP control protocol
- Expected to achieve the same Common Criteria EAL4, TEMPEST SDIP 27 Level B and NATO NIAPC Evaluation Scheme: Green information assurance (IA) accreditations as our VX line of Matrix Switches.

STATUS LEDS

The TLX640 has status LEDs located on the front of the unit. These LEDs give a visual indication (LED on) that the System Power (12V) and the Controller Power (3.3V) in both the Upper and Lower Card Cages is applied.



TLX FRONT PANEL STATUS LEDs

Lower Card Cage
12V – Status of System Power in Lower Card Cage
3.3V – Status of Controller Card Power in Lower Card Cage

Upper Card Cage
12V – Status of System Power in Upper Card Cage
3.3V – Status of Controller Card Power in Upper Card Cage

Warning! KEEP THE DOOR CLOSED WHEN IN USE! The TLX640 Front Door contains air-flow baffles that are integral to the unit's cooling system. Do not leave the front door open or off the chassis for more than a few minutes if the unit is running. Keeping the front door open for an extended period may lead to a malfunction or damage to the TLX640.

PRODUCT COMPATIBILITY

The TLX640 is compatible with these Thinklogical® products:

- Single & Multi-Mode **TLX 10G KVM & Video Extenders** (10G to 10G only)
- Single & Multi-Mode **Velocity 6G KVM & Video Extenders** (6G to 6G only)
- **SDI Xtreme 3G+ Extenders**
- **Configurator/Hot-Key Manager/System Management Interface**
- 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**
- **VX640 Matrix Switch 6G I/O cards** (6G to 6G only)

TECHNICAL SPECIFICATIONS

PHYSICAL	
TLX640 Chassis	**Dimensions:** Rack Size: **EIA 19.00"** (482.6 mm) Height: **28 RU-49.00"** (1244.6 mm) Depth: **16.07"** (408.2 mm) Width: **17.16"** (435.9 mm) Weight (Fiber or CATx): **132.0 lbs.** (59.9 kg) Shipping Weight: **160.0 lbs.** (72.6 kg)
Ports	**20 x 20 min., 640 x 640 max.**
ENVIRONMENTAL	
Temperature	Operating: **0° to 50°C** (32°F to 122°F) **Ambient** Storage: **-20°C to 70°C** (-4°F to 158°F)
Humidity	Operating: **5% to 95%, non-condensing** Storage: **Unlimited**
Altitude	Operating: **Thinklogical components are rated to 1000m max. elevation. Max. operating temp. de-rates by 3% for every 330m > 1000m** Storage: **Unlimited**
ELECTRICAL	
Alarm Relay Contacts	Maximum DC: **1A at 30VDC** Maximum AC: **0.3A at 125VAC** Contact resistance max.: **.1Ω**
Input Rating	**200-240VAC, 50-60Hz**
Max. DC Power Consumption	**1200 Watts, 7A** ***(Equal to max. output of a single Power Supply.)***
THERMAL	**3800 BTU** 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.**

Section 2: Set-Up & Installation

Contents

When you receive your Thinklogical® TLX640 KVM Matrix Switch, you should find the following items in the quantities specified in your order:

- TLX640 Chassis *(includes 4 Power Modules, Fan Tray, Up to 8 Switch Cards, Upper and Lower Interconnect Cards and one or two Controller Cards)*
- Power Cord – Qty. 1 per power supply – PWR-000056-R (International connections may differ)
- Product Manual CD
- Product Quick Start Guide
- Chassis **Options (Spares)**:
  - Back-up Controller Card
  - Spare Switch Card
  - Spare Fan Tray
  - Spare Power Module
  - Data Input/Output Card, 20 Ports

The TLX640 KVM Matrix Switch ships configured to customer specifications. All physical connections to the product use industry-standard connectors.

Unpacking the TLX640

The TLX640 is designed to be mounted in a standard EIA 19" rack. 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.

READ THE INSTRUCTIONS THOROUGHLY BEFORE STARTING ANY PROCEDURE!

1 Carefully remove the TLX640 KVM Matrix Switch from its shipping container. Inspect the unit to make certain that no damage occurred during shipment.

2 All of the I/O cards are installed at the factory to meet your specific configuration. Ensure that the I/O cards are properly seated in the unit and that all the SFP modules are sealed with a removable dust plug. All I/O cards are held in place by thumb screw retainers.

Note: Ensure that all thumb screws are finger tight so that all the modules are properly held in the chassis.

3 Verify that the four power supplies above the fan tray are secure in the chassis.

4 Verify that the fan tray is fully seated in the chassis and that the thumb screws are secure.

5 When the TLX640 has been inspected and found to be in suitable condition, the installation process can begin.

Connecting to the TLX640

Thinklogical's line of TLX Extenders come in both fiber-optic cable and CATx cable versions.

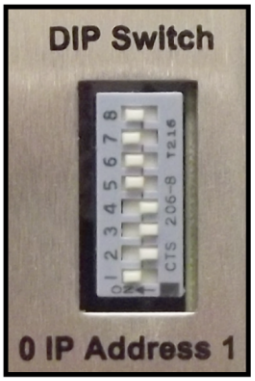
Thinklogical's proprietary multiplexing technology combines video, audio and peripheral data on a single data stream for up to 80km over a single fiber or up to 100m over a single CATx cable.

The TLX640 is 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 Interface**
- 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**
- **VX640 Matrix Switch 6G I/O cards** (6G to 6G only)

Ethernet Control

If the TLX640 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 module. See **Appendix B, Setting the DIP Switch Instruction Guide** (pg. 31) for detailed instructions on how to access and set the DIP Switch. The factory default setting is **192.168.13.15** (00000000).



Example: Switch is set for **192.168.13.43 (01110000)**

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

TLX640 DIP Switch Settings

The simplest network connection is an isolated network with only the TLX640, the control server, and any control clients using static IP addresses. The TLX640 can be set to any of the above settings. The control server must be at **192.168.13.9**, and the control clients could 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 TLX640 KVM 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 Control Card (sometimes called a Secondary or Fail-Over Control Card) is optional and ensures uninterrupted functionality if the Primary Control Card ever fails or needs to be replaced. Two network requirements need to be in place for a switchover to occur:

The Back-up Control Card must have a LAN connection to the server with the IP address as specified in the "*TLX640 DIP Switch Settings*" section above. Without this connection, the Back-up Control Card will NOT take control of the Switch under any circumstances.

The Back-up Control Card must also have a LAN connection that allows it to communicate with the Primary Control Card.

Note: It is important that the Network connections be tested. The user should log into the Back-up Control Card via SSH or Console port and ping the server as well as the Primary Control Card to verify the connections.

External Control CPU Minimum Requirements

The External Control CPU must meet the following minimum requirements (including requirements for using Thinklogical's System Management Portfolio)**:**

- **System Management Interface** package requires Debian 32 or 64 bit.
- **Configurator** and **Hot Key Manager** run on Linux (RedHat 32 & 64 bit, Debian 32 & 64 bit or Windows XP, 7, and 8).
- **RAM** (minimum): **Linux:** 1GB **Windows:** 4GB **OSX:** 4GB
- **VIDEO:** Works with all video adapters. (Not required if the computer is used as a headless server.)
- **KEYBOARD/MOUSE:** Works with any keyboard/mouse/touchpad. (Not required if the computer is used as a headless server.)
- **NETWORK:** One port minimum, although two ports are recommended for security considerations.
- **DISK SPACE:** Thinklogical programs typically use less than 40 MB.
- **SERIAL PORT:** 1 optional RS-232 serial port (Crestron/AMX serial access)

A Back-up (sometimes called a Secondary) Controller Card is optional to ensure uninterrupted functionality if the Primary Controller Card fails or needs to be replaced. The **Primary Controller Card should always be in the upper controller slot**. The Back-up Controller must have a LAN connection that allows it to communicate with both the Primary Controller and a server with the IP address **192.168.13.9**. Without this interface, the Back-up Controller cannot take control of the switch.

Pluggable SFP+ Modules

Each Input and Output Card contains rows of SFP+ modules that serve as the fiber-optic couplers for the fiber cables to and from the Thinklogical Transmitter and Receiver Extenders. Individual cards can be removed for easy access to the SFP+ modules.

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.

Actual Size

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

Each TLX640 I/O card has 20 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).

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

SFP+ Latch Closed

SFP+ Latch Open

LC-Type Fiber-optic Cable

Installing Fiber-optic Cable: The TLX640 switching matrix connects any SFP's optical output port (Transmit) to any other SFP's optical input port (Receive) with LC-type connectors.

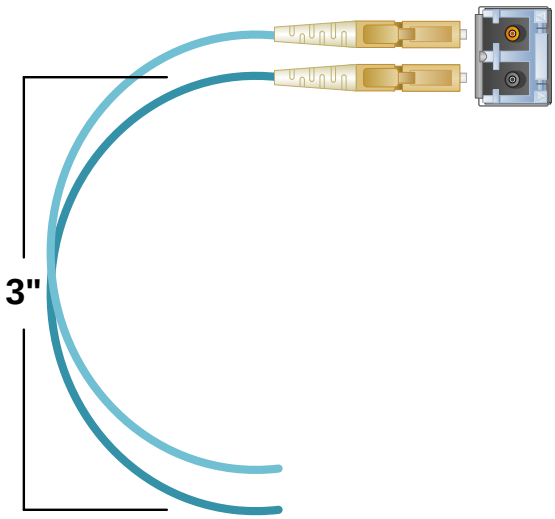
Requirements: Thinklogical recommends LC-type, SX+ Laser Enhanced (50µm) fiber for your TLX640 KVM Matrix Switch and Velocity Extension System. Multi-mode OM4 fiber can extend up to a maximum of 400m and Single-mode fiber can extend up to 80km.

Handling Fiber-optic Cable: Unlike copper cabling, fiber-optic cable requires special handling. A small speck of dust or a scratch to the ferrule tip (the end of the connector) can attenuate the optical signal, rendering the cable inoperable.

Warning! 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.

Dust cap installed on the ferrule.

Warning! Minimum bend diameter must be no less than 3". Be careful not to kink or pinch the fiber when using ties.

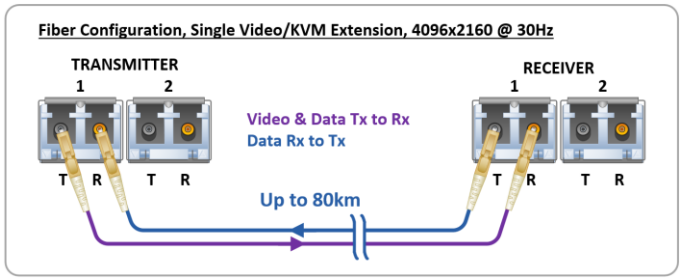


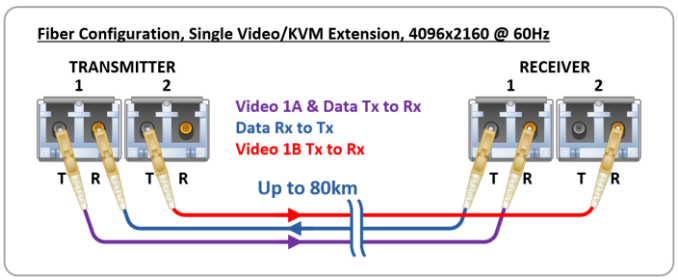
Thinklogical recommends SX+ Laser Enhanced Fiber-optic Cable, 50 or 62.5 microns, terminated with LC type connectors.

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**

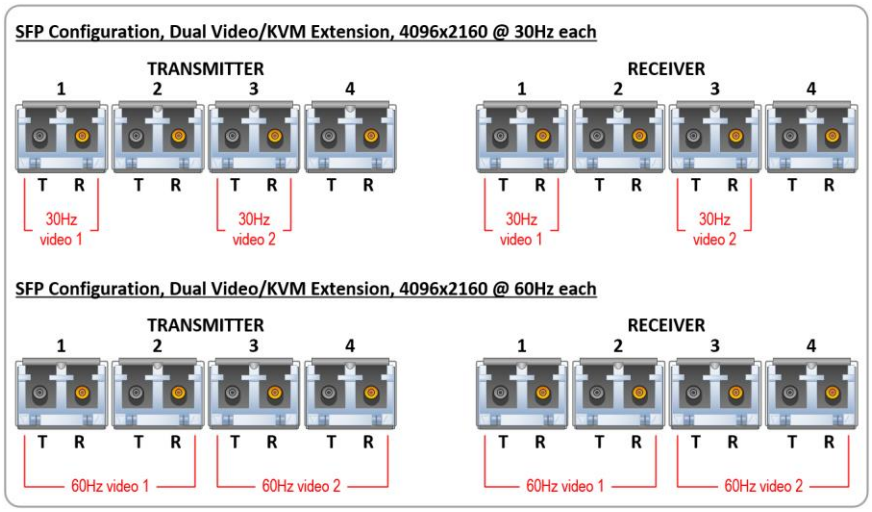
TLX Extender Fiber-Optic Cable Configurations

SINGLE VIDEO MODULES

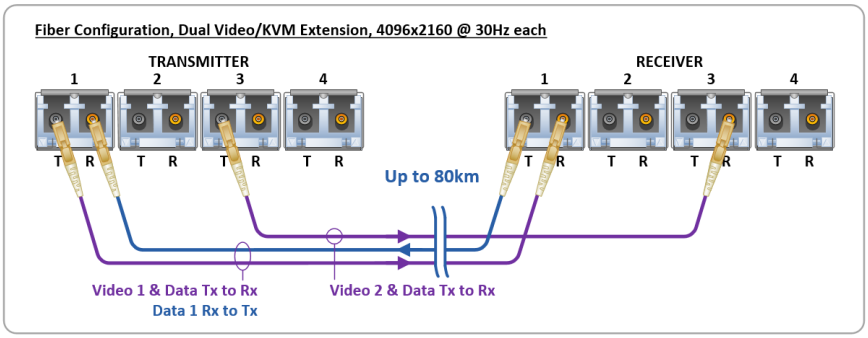


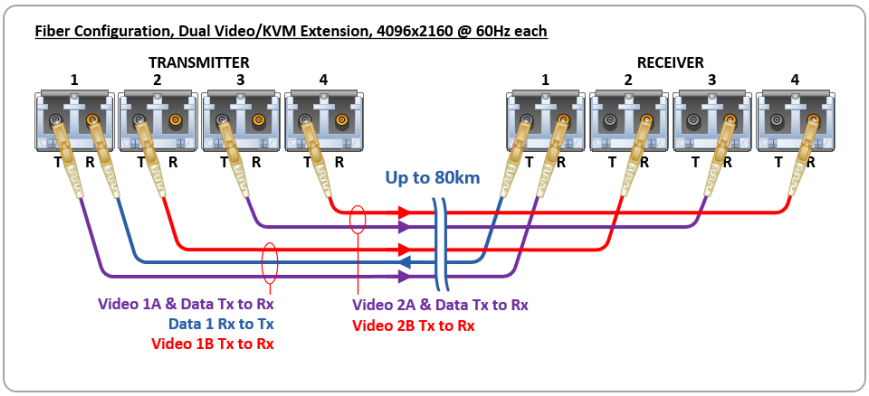


DUAL VIDEO MODULES



Note: On Dual Video models, SFPs 1 & 2 are Video 1 and SFPs 3 & 4 are Video 2.

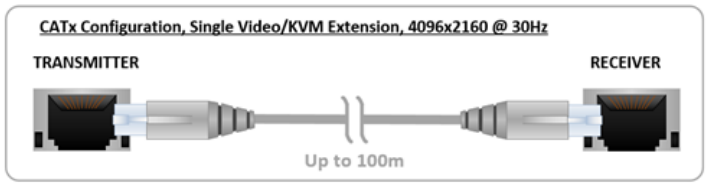


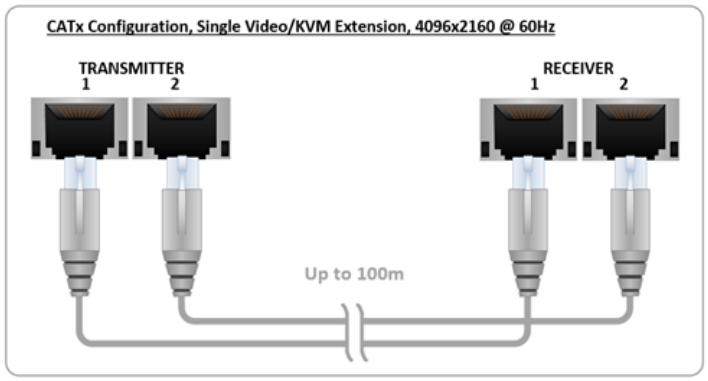


TLX Extender CATx Cable Configurations

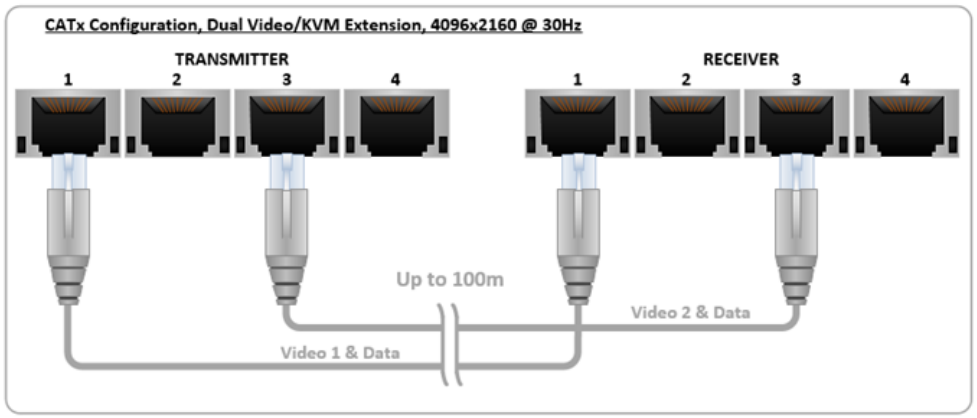
There are currently several versions of CATx (category 5/5a/6/6a/etc.) cables on the market. **Thinklogical recommends using a minimum of CAT6 for your TLX KVM Matrix Switch and Extension System (CAT6a 23 AWG recommended).** All cables CAT6 or higher can extend up to a maximum of 100m.

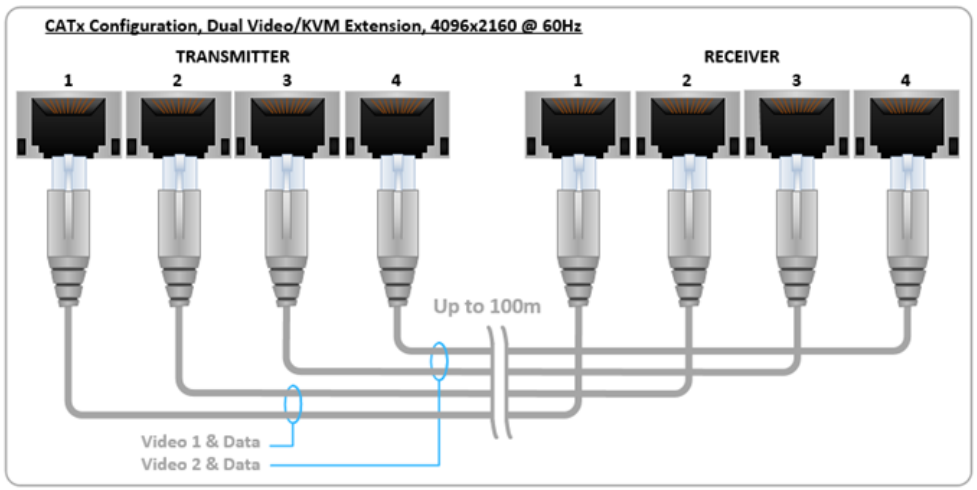
SINGLE VIDEO





DUAL VIDEO



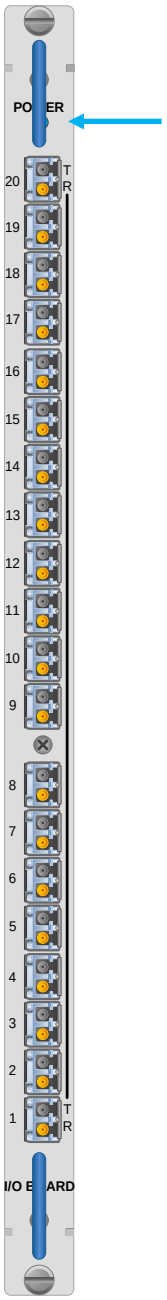


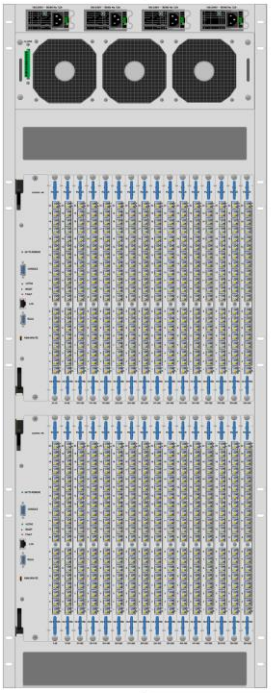
Note: On Dual Video models, Ports 1 & 2 are Video 1 and Ports 3 & 4 are Video 2.

Input / Output Cards

The hot-swappable Input/Output (I/O) Cards provide excellent in-service expansion capabilities in convenient sets of 20 ports per card, allowing re-configuration without interrupting signal processing. The TLX640 will support up to 32 Input/Output Cards.

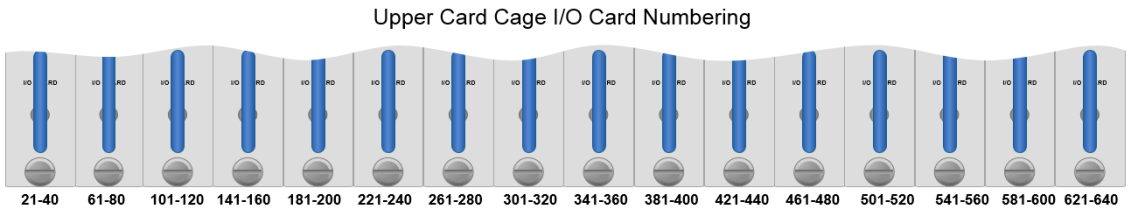
Each I/O card consists of one Transmit (T) and one Receive (R) optic per port. I/O Cards are available with LC-type fiber connectors and can be assembled with Single-mode or Multi-mode optics (SFP+). Each individual TLX640 I/O Card numbers the ports 1 through 20. An LED located on each card indicates when power is applied to that card.

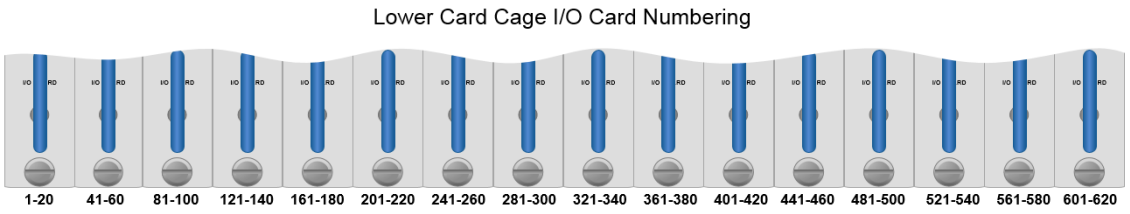




Input/Output Port Numbering on the TLX640

At the bottom of the Lower Cage and at the bottom of the Upper Cage, the port numbers for each slot are listed (all numbering is bottom to top, left to right.



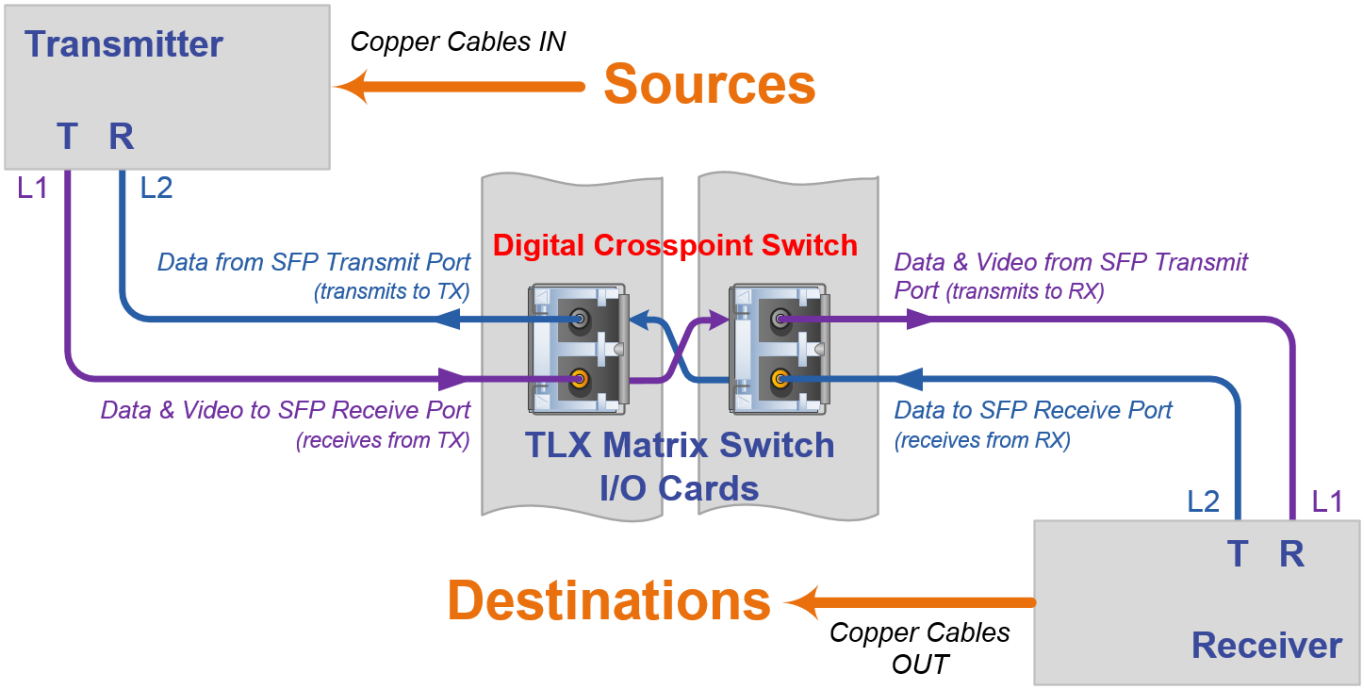


The TLX640 configuration can have a minimum of one I/O Card (20 x 20) and a maximum of 32 I/O Cards. Each TLX640 I/O card contains 20 ports. When fully configured, the TLX640 contains 16 I/O cards in the Upper Card Cage and 16 I/O cards in the Lower Card Cage. The 32 I/O cards provide a total of 640 Optical Input/Output connections described as Ports 1-640.

Routing Thinklogical Extenders through the TLX640

Comprised of a fiber-in, fiber-out matrix switch and fiber-optic 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.

READ THE INSTRUCTIONS THOROUGHLY BEFORE STARTING ANY PROCEDURE!



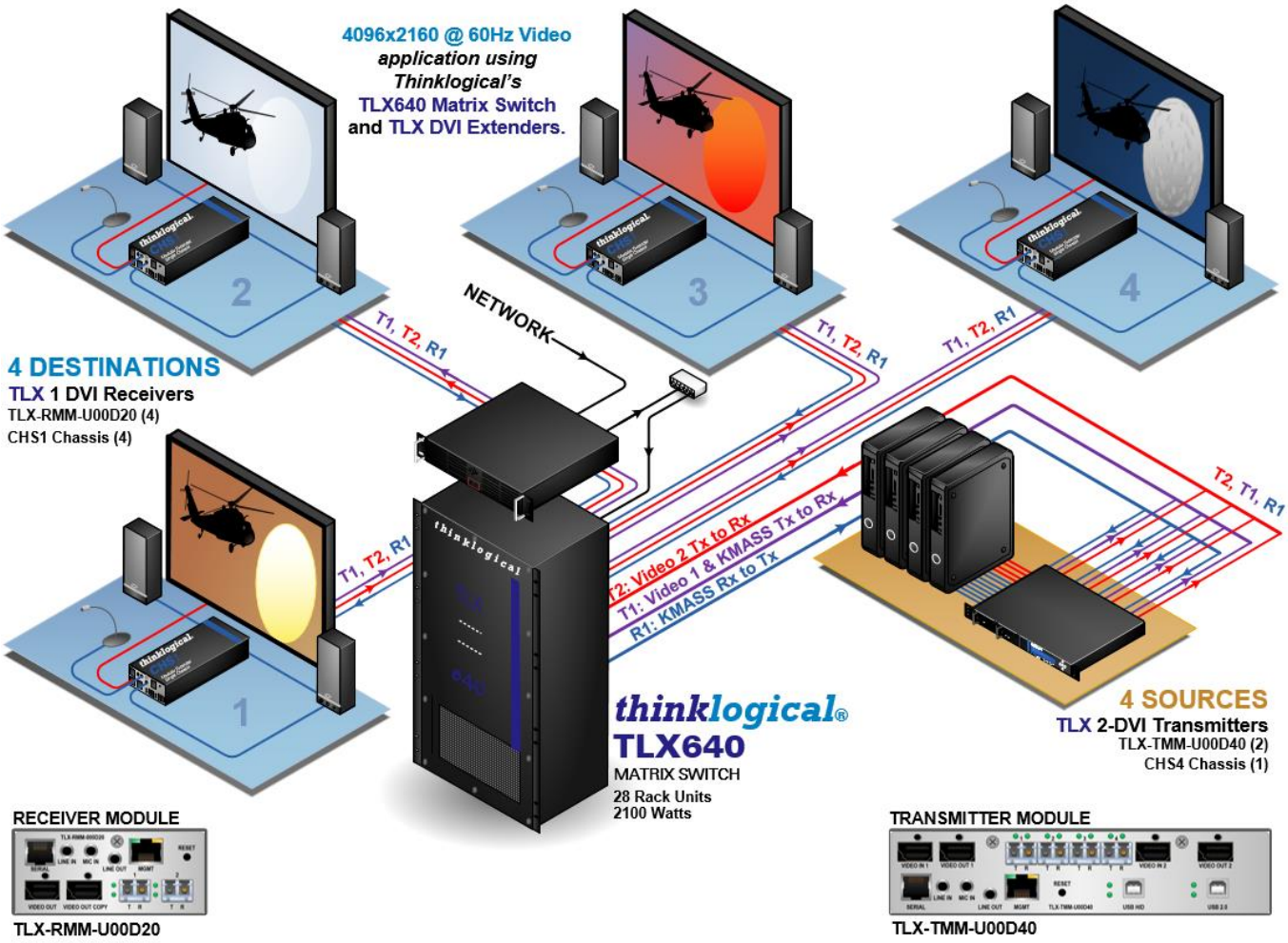
TLX640 Transmit / Receive Concept

Connecting to the Receiver

The Velocity Receiver serves as the Destination (desktops, theaters, conference rooms, editing suites, control consoles, video walls, etc). Depending on your configuration, your KMASS devices (audio, keyboard, mouse, etc.) are connected to the Receiver first, using standard cables. Power can then be applied to the unit. The Receiver then connects to the TLX640 Receiver ports using fiber (Multi-mode fiber for distances up to 400m; Single-mode fiber for distances beyond 80km).

Connecting to the Transmitter

The Transmitter serves as the Source (computer and video entities). If the source includes a workstation, depending on your configuration, your local KMASS devices (audio, keyboard, mouse, etc.) should be connected first. The video sources (e.g. computers, tape decks, etc.) are connected next, followed by any local video devices. Power can then be applied to the unit. The Transmitter connects to the TLX640 Transmitter ports using fiber (Multi-mode fiber for distances up to 400m; Single-mode fiber for distances beyond 80km).



Routing *Thinklogical*® TLX Extenders through the TLX640

Connecting to a Control CPU

The TLX640 is controlled via a dedicated external Control CPU. This allows for customization as well as ease of control and administration. Access is provided via a network connection or serial RS-232.

Note: The Control CPU (Computer) is supplied separately.

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**. 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. You may use telnet to manually open a connection and control the TLX640 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.

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 (RS-232) Settings

- 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

Firmware

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 straight to the user's desktop monitor. The user can then select the defined sources and destinations that they wish 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.

Order of Installation Events

Please refer to the **Quick Start Guide** included with your products for detailed instructions. The **TLX640 Quick Start Guide** is also available in **Appendix A** (pg. 30).

Updates

See **APPENDIX C: FPGA Program Code Update Procedure**, pg. 32.
Firmware updates are available through Thinklogical®. For technical assistance, please call us at **1-203-647-8700**.

Safely Remove an Active Control Card or Shut Down the System

During normal, non-maintenance operation, the **Primary Control Card should always be the Active controller for the system.** However, there may be times when other conditions temporarily exist, such as during maintenance, updates, repairs, etc.
Although the system will run normally on the Back-up (or Secondary) Control Card, not having a second card eliminates the fail-over protection afforded by a redundant, two-card system.

The following commands allow the safe removal of a Control Card and the switch of activity from one Control Card to the other without interruption of connections

Note: During normal operation, the Primary Control Card should always be the active controller for the system.

During normal operation the Primary or Back-up Controller can be managed via the console port or over an SSH connection.

The HALT Command

- Typing **`halt`** at the command line will perform an orderly shut-down of the active Control Card.
- Once the Control Card is inactive, it will stop signaling the other Control Card. This prompts the other card to become active. This will take only a few seconds.
- Remove any cables (LAN, RS-232, Console, etc.) from the inactive card. It can now be safely removed from the chassis.
- At this point, the system is now running on the Back-up Control Card.

Note: Re-inserting the Primary Control Card restores the system back to running on the Primary Control Card. Ensure that the LAN connection to the card is restored promptly.

The PWROFF Command

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

Note: I/O card slot power will be turned off on the TLX640.

- Remove the AC power cord(s) from the Matrix Switch or from the AC source for a complete system shut-down.
- Remove any cables (LAN, RS-232, Console, etc.) from the Control Cards.
- The Control Cards can now be removed, swapped or replaced as needed.

Upon turn-on, the Control Card in the top or the left slot will become Primary and the Card in either the bottom or the right slot will be the Back-up.

How to Install and Replace Modules

How to Install or Replace an Input / Output Card

Note: No shutdown is required prior to installing/replacing Input/Output Cards.

1 Turn the card's two thumbscrews counterclockwise until they disengage from the chassis. Pull the card straight out using both handles. **Do not pull on the thumbscrews when removing the module – damage may occur! Use the handles!**

2 Place the new module upright so that the POWER LED is on the top. Grasp the module by the handles. The card should slide freely until it reaches the backplane connector. At this point, use just enough force to firmly engage the card with the mating connector. **If the module does not slide into the connector, do not force it! Damage may occur. Remove the card and start over.**

3 Once the module is completely seated, hand-tighten the thumbscrews. **Do not tighten the thumbscrews with a screwdriver.**

How to Install or Replace an Interconnect Module

Note: Replacing the Interconnect Module will interrupt service.

To replace the Interconnect Module, the front door and front panel must first be removed. (See **Appendix B**, pg. 31.)

1 Turn both front door latches one quarter turn clockwise (arrow on knob pointing up) to release the door.

2 While holding the door steady with one hand, pull down the upper spring-loaded hinge release and pull the upper portion of the door outward until the latch clears the mounting hole. The door can now be removed and set aside.

Warning! KEEP THE DOOR CLOSED WHEN IN USE! The TLX640 Front Door contains air-flow baffles that are integral to the unit's cooling system. Do not leave the front door off the chassis for an extended length of time if the unit is running. Keeping the front door open for an extended period may lead to a malfunction of, or damage to, the TLX640.

3 There are two thumb screws holding the front panel to the chassis. Loosen the thumb screws, remove the front panel and set it aside.

4 There are two thumbscrews on the Interconnect Module; turn the thumbscrews counterclockwise until they disengage from the chassis. Pull the Interconnect Module out using both black ejector handles (red arrows, right).

5 Place the new module upright so that the four Status LEDs are at the bottom. Grasp the module by the handles. The card should slide in freely until it reaches the backplane connector. At this point, use just enough force to firmly engage the card with the mating connector. **If the module does not slide easily into the connector, do not force it! Damage may occur. Remove the card and start over.**

6 Once the module is completely seated, hand-tighten the thumbscrews. **Do not tighten the thumbscrews with a screwdriver.**

7 Replace the front panel that was removed in **Step 3**.

8 Replace the front door that was removed in **Steps 1 and 2**.

How to Install or Replace a Switch Card

Note: The Switch Cards are hot-swappable; the TLX640 system does not need to be shutdown to replace.

1 Turn the thumbscrews counterclockwise until they disengage from the chassis. Pull the Switch Card straight out using both black ejector handles.

2 Place the new module upright so that the integrated circuitry/components are on the right side of the card. Grasp the module by the handles or by the outer edge of the aluminum housing. The card should slide freely until it reaches the backplane connector. At this point, use just enough force to firmly engage the card with the mating connector. **If the module does not slide into the connector, do not force it! Damage may occur. Remove the card and start over.**

3 Once the module is completely seated, hand-tighten the thumbscrews. **Do not tighten the thumbscrews with a screwdriver.**

How to Install or Replace a Controller Card

Note: When using a single Controller, the top Controller slot is always Primary. Replacing the Controller Card will interrupt service if a Back-up (Secondary) Controller Card is not installed.

1 Turn the thumbscrews counterclockwise until they disengage from the chassis. Pull the Controller Card straight out using both black handles.

2 Place the new module upright so that the ACTIVE LED is on the top. Grasp the module by the handles or by the outer edge of the aluminum housing. The card should slide freely until it reaches the backplane connector. At this point, use just enough force to firmly engage the card with the mating connector. **If the module does not slide into the connector, do not force it! Damage may occur. Remove the card and start over.**

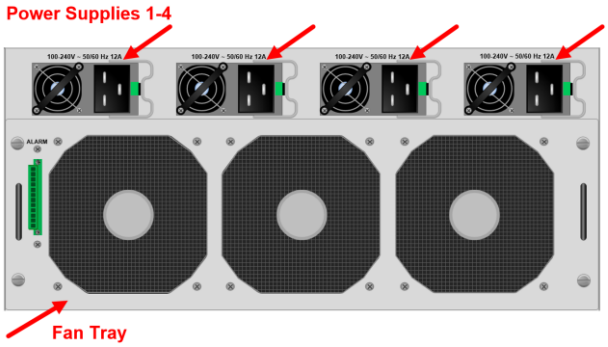
3 Once the module is completely seated, hand-tighten the thumbscrews. **Do not tighten the thumbscrews with a screwdriver.**

How to Replace a Fan Tray

The TLX640 uses three DC fans to move air horizontally through the enclosure. Be sure to not block the air vents on the front and rear of the unit and leave at least 2" of space on both sides.

Note: Leave adequate ventilation space on both sides of the units (2" minimum), especially if units (e.g. Extenders) are being stacked above or below the TLX640 KVM Matrix Switch.

Note: No shutdown is required prior to replacing the Fan Tray.



1 Turn the four thumbscrews counterclockwise until they disengage from the chassis.

2 Pull the Fan Tray module straight out using both handles.

3 Place the new module so that the aluminum housing is on the bottom. Hold the new Fan Tray by the black handles and slide the aluminum housing into the black card guides.

Warning! Do not operate the unit without a Fan Tray installed.

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

How to Replace a Power Supply

Warning! Disconnect the power cord before proceeding!

Note: If only TWO primary power supplies (1 & 3) are installed, shutdown IS required. If TWO primary power supplies (1 & 3) *AND* TWO back-up power supplies (2 & 4) are installed, shutdown IS NOT required.

The Power Modules are universal input 200-240VAC (1200 W) 50-60Hz. Use the proper power cord for your region (supplied with the unit). Although the TLX640 functions properly with two Primary Power Modules, it is recommended that all four Modules (two Primary, two Back-up) be connected to two independent power sources (for redundancy).

1 Grasp the handle with one hand.

2 Slide the green tab to the left with the other hand.

3 Pull the Power Module straight out of the chassis.

4 Insert the new Power Module into the chassis and slide it in until it reaches the backplane connector. The module should slide freely until it reaches the backplane connector. At this point, use just enough force to firmly engage the card with the mating connector. Ensure the locking mechanism snaps closed. **If the module does not slide easily into the connector, do not force it! Damage may occur. Remove the module and start over.**

Ordering Information

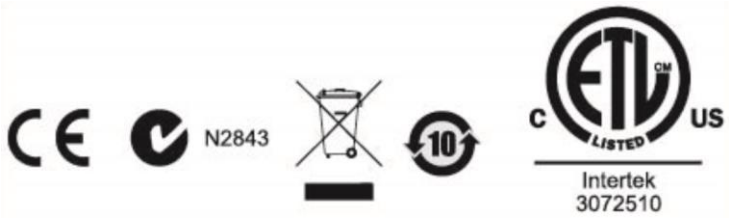
Part numbers of the various components of the TLX640 Matrix Switch are as follows:

PART NUMBER	FEATURES
TLX 640 Matrix Switch	
TLX-MSC-000640	TLX640 Matrix Switch Chassis for up to 32 20-port Data Input/Output Cards
TLX 640 Matrix Switch Data Input/Output Modules	
TLX-MSD-M00020	TLX Matrix Switch Data Input/Output Card **20** Multi-Mode Fiber Ports
TLX-MSD-S00020	TLX Matrix Switch Data Input/Output Card **20** Single-Mode Fiber Ports
TLX-MSD-000020	TLX Matrix Switch Data Input/Output Card **unpopulated** for up to **20** Multi- or Single-Mode SFP+ modules
TLX-MSD-C00020	TLX Matrix Switch Data Input/Output Card **20** CATx Ports
TLX 640 Matrix Switch Spare Modules	
TLX-MSM-C00640	TLX640 Matrix Switch Module Controller Card
TLX-MSM-S00640	TLX640 Matrix Switch Module Switch Card
TLX-MSM-F00640	TLX640 Matrix Switch Module Fan Tray
TLX-MSM-P00640	TLX640 Matrix Switch Module Power Supply

Section 3: Regulatory & Safety Requirements

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.

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:
07-190128 indicates the unit was built in the **7**th month of **2019** and is unit number **128**.

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.

Section 4: How to Contact Us

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

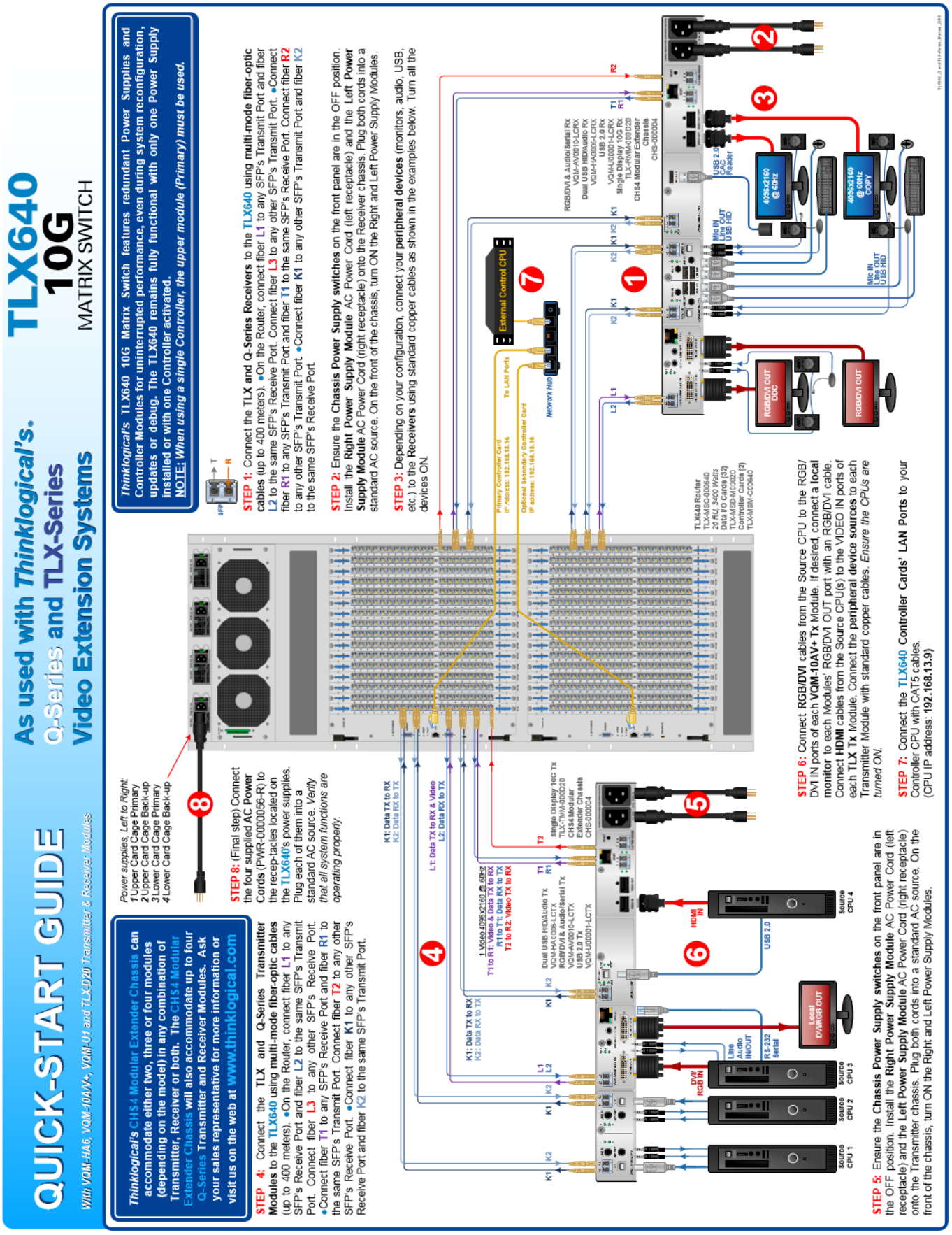
If you must return a product to Thinklogical directly, please contact us at **1-203-647-8700**. Customer Support will ask you to describe the problem and will issue you a **R**eturn **M**erchandise **A**uthorization **number** (RMA#). Pack the device in its original box, if possible, and return it with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

Our Address

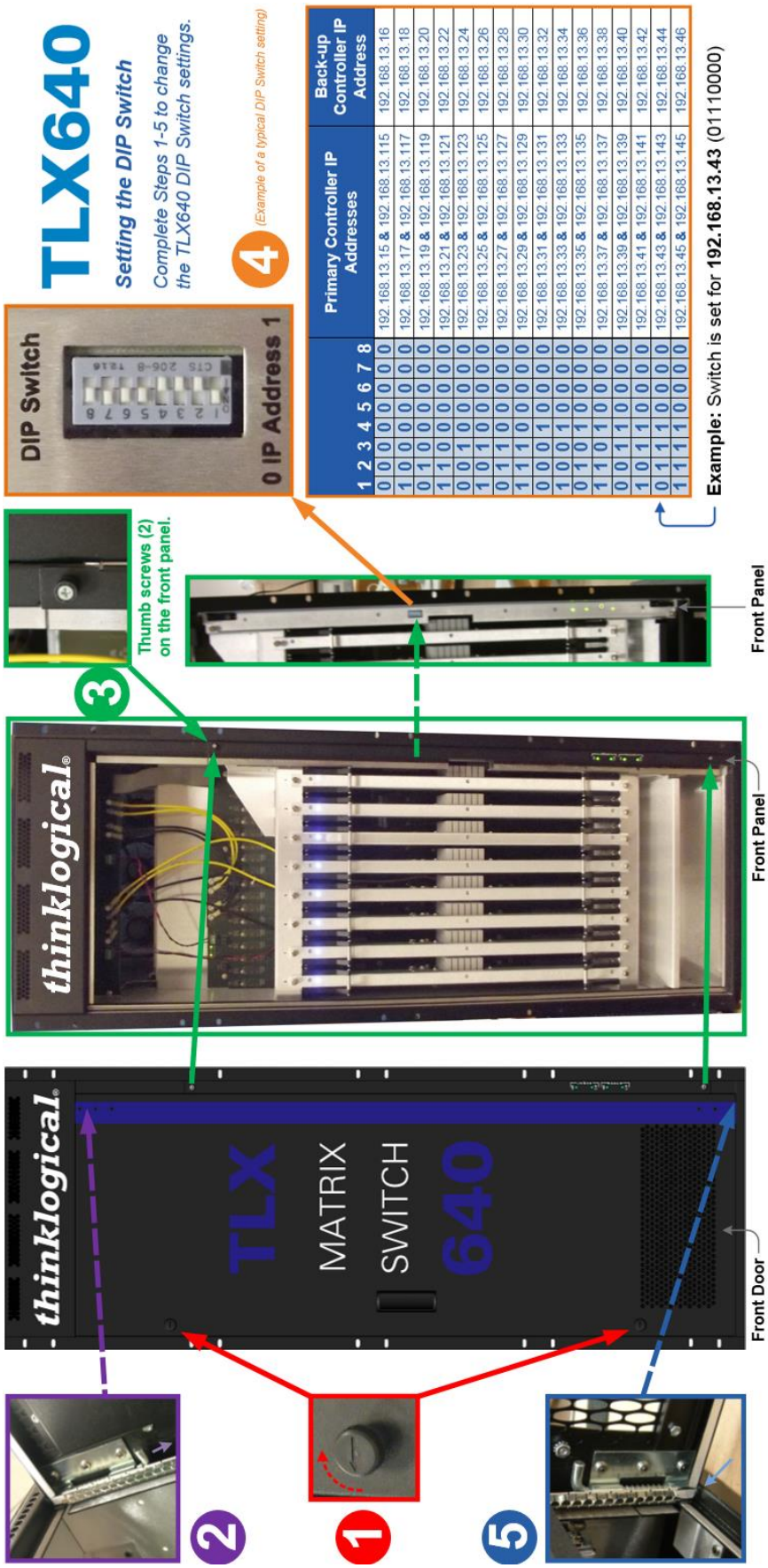
If you have any product issues or questions or need technical assistance with your Thinklogical system, please call us at **1-203-647-8700** and let us help. If you need to write us or return a product, please use the following address:

Please include the Return Merchandise Authorization number: **Thinklogical,** A **BELDEN** BRAND
100 Washington Street
Milford, CT 06460 USA
Attn: *RMA#*

APPENDIX A: TLX640 QUICK START GUIDE



Appendix B: Setting the DIP Switch Instruction



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

Example: Switch is set for **192.168.13.43** (01110000)

To set the TLX640 DIP Switch, the front door and front panel must first be removed.

STEP 1: Turn both **front door latches** one quarter turn clockwise (arrow pointing up) to open the door .

STEP 2: Holding the door steady with one hand, **pull down the upper spring-loaded hinge release** and pull the upper portion of the door outward until the latch clears the mounting hole. The door can now be removed and set aside. See ***Note*** below.

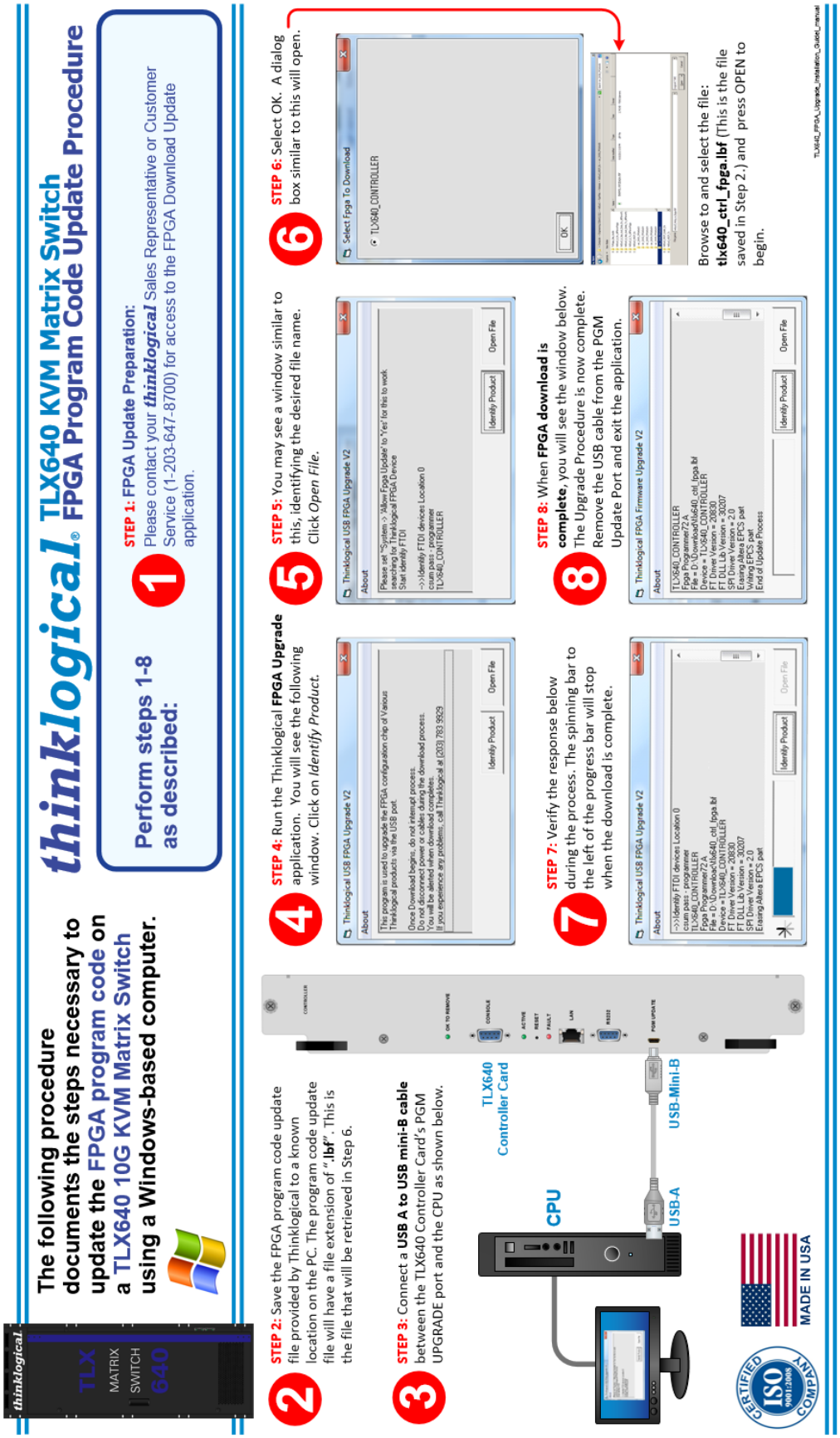
STEP 3: There are **two thumb screws** holding the front panel to the chassis. Loosen the thumb screws, remove the front panel and set it aside. The DIP Switch will now be exposed.

STEP 4: Using the chart on the right, **set the 8 DIP switches** to the desired settings and **reinstall the front panel** that was removed in Step 3.

STEP 5: When reinstalling the door, insert the lower hinge first, then, while pulling down the **upper hinge spring-release**, guide the door into place and allow the upper hinge to insert itself into the mounting hole. Close the door and turn the **front door latches** (see Step 1) one quarter turn counter-clockwise (arrow pointing left) to secure the door.

Note: The TLX640 Front Door contains air-flow baffles that are integral to the device's cooling system. Do not leave the front door off the chassis for an extended period if the unit is running.

Appendix C: FPGA Program Code Update Procedure



APPENDIX D: SD Card Replacement Procedure for the TLX640 Controller Card

This procedure assumes a normally operating TLX system 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 `system halted` 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 `system halted` 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 `system halted` 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.

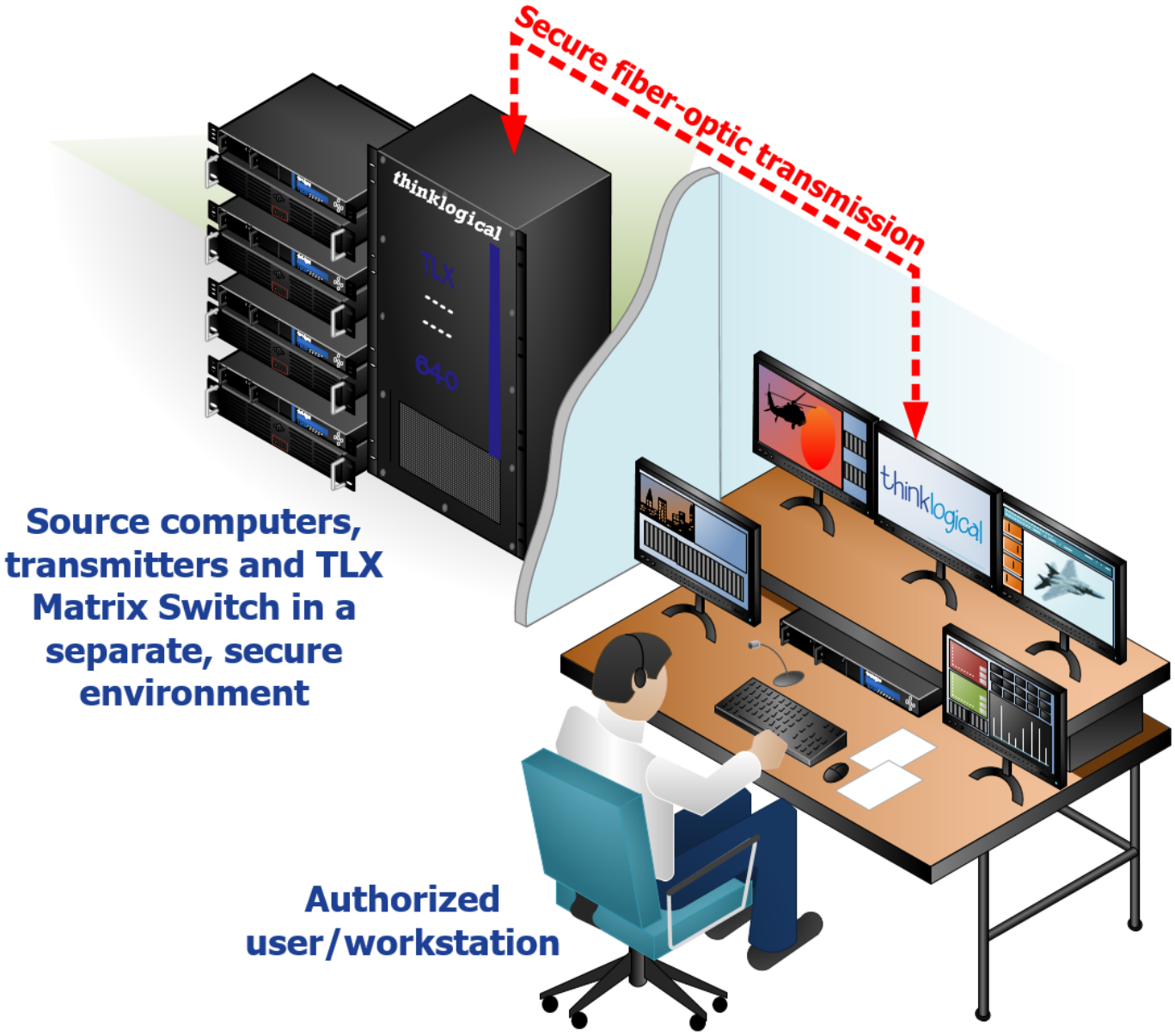
INITIATOR(S):	DATE:
	5/21/2019

APPROVALS:	DATE:
Project Engineer:	5/21/2019

APPENDIX E: 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. 5) 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. 22).

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. 22). 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.

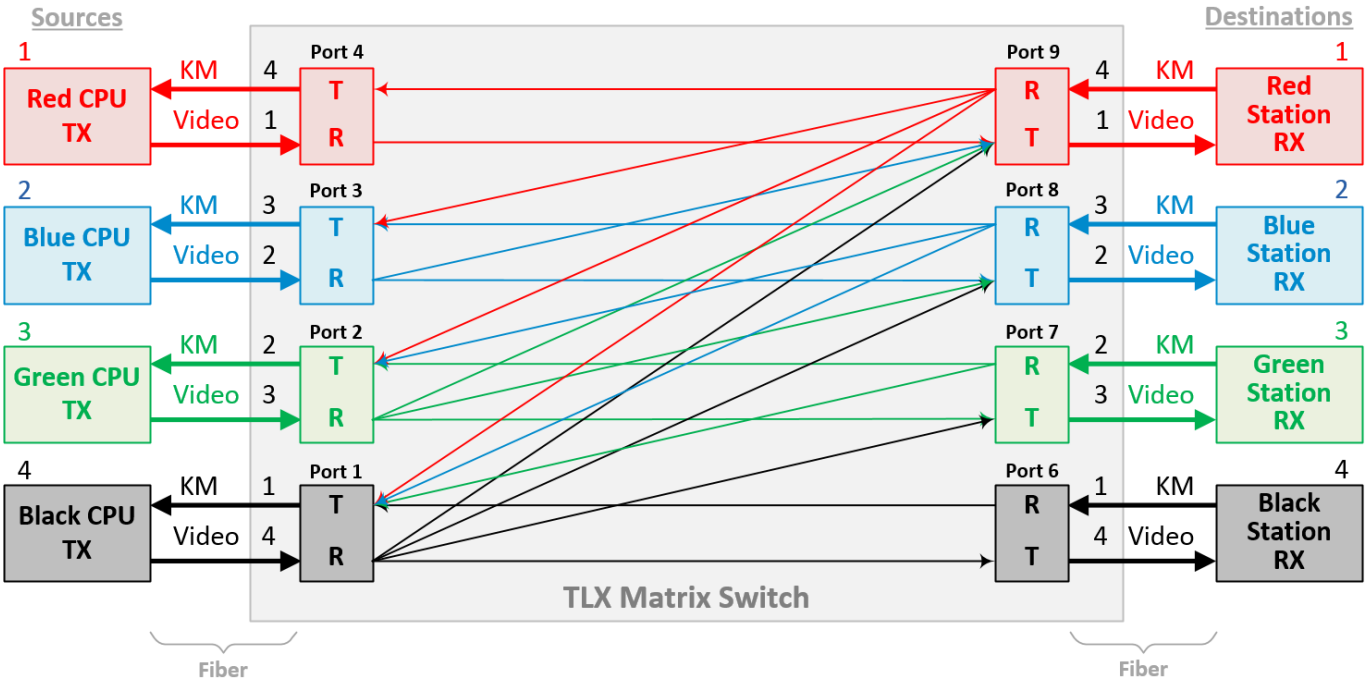
Note: When using a Back-Up Controller configuration, both controllers must have the same Restricted Switching Table file(s) to maintain the security of the system.

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. →

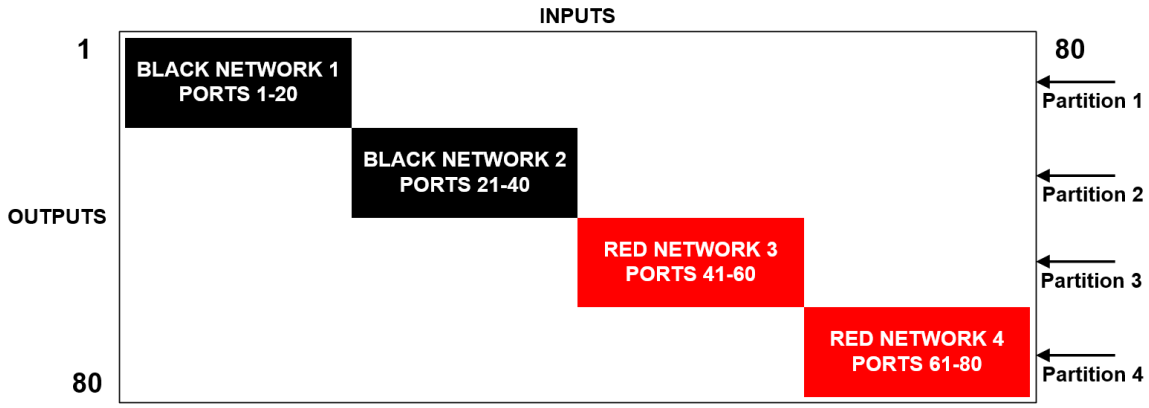
I/O	Number	Priority
"i"	1	4
"i"	2	3
"i"	3	2
"i"	4	1
"i"	6	1
"i"	7	2
"i"	8	3
"i"	9	4
"o"	1	1
"o"	2	2
"o"	3	3
"o"	4	4
"o"	6	4
"o"	7	3
"o"	8	2
"o"	9	1

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:**

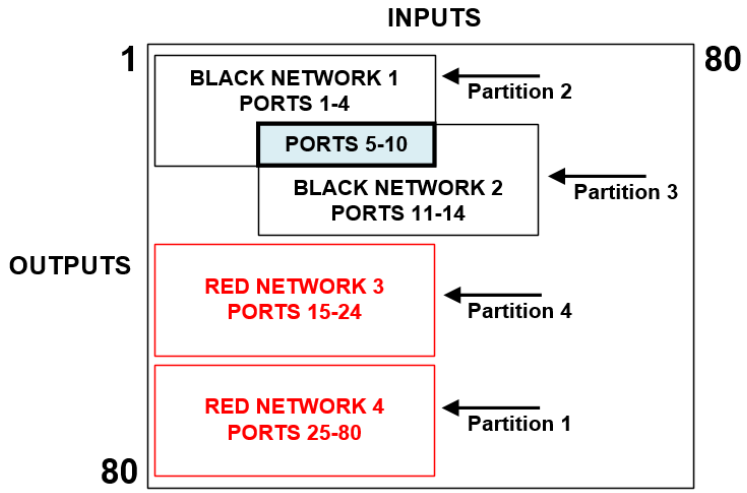


Four partitions set up for secure routing and extension applications. Signals are only capable of transmitting and receiving within a single partition and not across partitions

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. 5) 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. 22).

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. 22). 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. 43 shows the TLX12 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

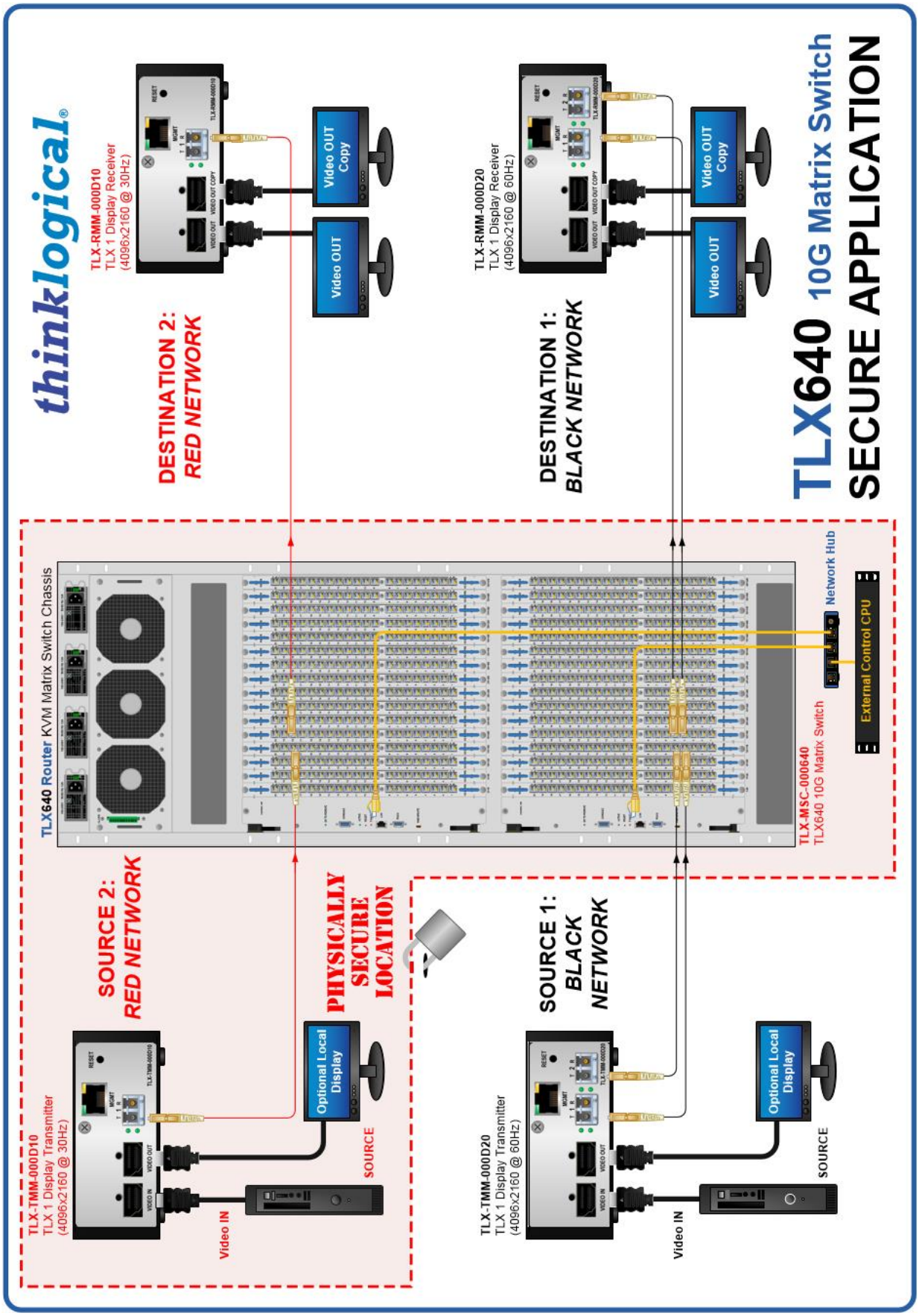
The following connection rules apply:

- 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



TLX640 10G Matrix Switch Secure Application