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TLX

Matrix Switch Interfaces

Complete Descriptions of the Serial and Network Interfaces on Thinkogical TLX Matrix Switches

TLX12
TLX24
TLX48
TLX80
TLX160
TLX320
TLX640
TLX1280

Rev. H, January 2019

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

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Subject: Manual, TLX Matrix Switch Interfaces
Revision: H, January 2019

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Thinklogical, A BELDEN BRAND
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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.

CERTIFIED ISO 9001:2015 COMPANY

Information Assurance

JITC · 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 www.thinklogical.com.

About this Manual

This document describes the serial and network interfaces for Thinklogical's® TLX family of Matrix Switches.

Note and Warning Symbols

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

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

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

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

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

Font Conventions Used in this Document

The following fonts and colors are used throughout this document to help differentiate between file names, commands, outputs and document names (lower & upper-case letter **o** and **zero**, shown right):

Filenames	**Font: Courier New – 35-35-220**	**oO0**
Linux Command Entered by the User	Font: Consolas - 196-89-17	oO0
Output from a Command	Font: Consolas – 0-128-128	oO0
Document_Name*	Font: Georgia – 83-129-53	oOo

* These and other documents may be found on our web site:

http://www.thinklogical.com/user_manuals

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: **09-180129** indicates the unit was built in the **9**th month of 20**18** and is unit number **129**.

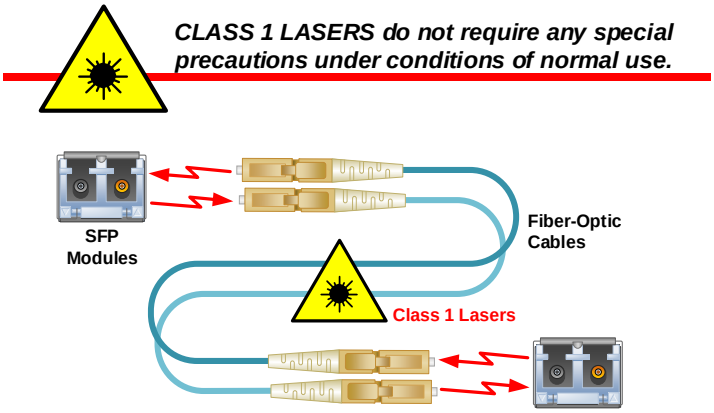
Connection to the Product

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.

Regulatory & Safety Compliance

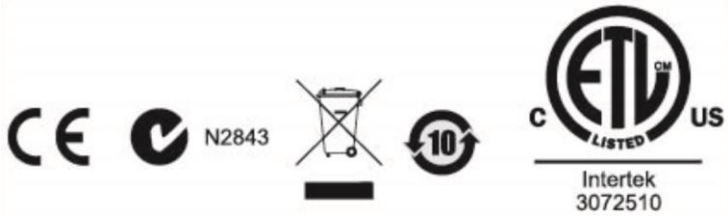
Class 1 Laser Information

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



Symbols Found on Our Products

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



Regulatory Compliance

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

North America

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

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

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

Australia & New Zealand

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

European Union

Declaration of Conformity

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

Thinklogical's products comply with the requirements of the Low Voltage Directive 2006/95/EC, the EMC Directive 2004/108/EC, the RoHS Directive 2011/65/EU, the WEEE Directive 2012/19/EU and carry the CE markings 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
EN61000-3-2:2000 Harmonics
EN61000-3-3:2008 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
EN61000-4-11:2004 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.

The TLX Switch Interfaces

Documentation

This document describes the serial and network interfaces for Thinklogical's® TLX family of Matrix Switches. Further documentation is available concerning the ASCII interface API, SNMP MIB definitions and other information on the Thinklogical® web site. Other manuals and Quick Start Guides may also be downloaded from our web site:

http:/www.thinklogical.com/user_manuals

Related documents:

Manual_TLX_Matrix_Switch_ASCII_API_V5
Manual_Configuring_The_TLX_ASCII_Interface
Manual_TLX_Matrix_Switch_SNMP_Traps

Matrix Switch SNMP MIB definition files that are available for downloading:

LSI-ROOT.mib
LSI-ROUTER-API-INTERFACE.mib
LSI-SFP.mib
LSI-TLXSWITCH.mib

Byte Order for the 'Switch Connection Status Broadcast' on Port 17564

Warning! The 16-bit values documented here store the most significant byte first. *This is called Big Endian format.* (For example, a hexadecimal value of 1235H is stored with 12H in byte zero and 23H in byte one.)

Big Endian - The most-significant byte of a multi-byte value is stored first, followed by lesser significant bytes, and ending with the least-significant byte.

Example: `0x12345678` is stored as **`12 34 56 78`**.

Little Endian - The least-significant byte of a multi-byte value is stored first, followed by more significant bytes, and ending with the most-significant byte. This is the format used by x86 processor family.

Example: `0x12345678` is stored as **`78 56 34 12`**.

If your receiving system is not a Big Endian CPU (*Intel processors are not*), then you will have to swap the byte order before you can use the value. If you don't swap the bytes, then a value of 1 from the switch will be interpreted as 256, 2 as 512, and 640 as 32770.

Serial/RS-232

The switch CPU card has two RS-232 serial ports. One 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 CPU is installed, then its Linux console port is active. However, only the 'RS232' port on the active CPU will function. *The FAULT LED will not be illuminated on the active CPU.*

Linux Command Console (Console)

- Baud Rate: 115200
- Data Bits: 8
- Parity: none
- Stop Bits: 1
- Flow Control: none
- DB9 DCE

ASCII API (RS232)

- Baud Rate: 9600
- Data Bits: 8
- Parity: none
- Stop Bits: 1
- Flow Control: XON/XOFF (Software)
- DB9 DCE

NOTE: A straight (NOT a null-modem) cable is needed to connect to a PC.

Network

The switch will use up to three IP addresses. The primary CPU card will use address X and address X+100. The back-up CPU will use address X+1 and it will take over address X in the event of a failure in the primary CPU.

The factory default value for 'X' is 192.168.13.15. Steps for changing the IP address are described in the manual: Manual_How_To_Change_A_TLX_Matrix_Switch's_IP_Address

The switch has several network ports reserved for internal use. Port 17567 accepts commands to control the switch. The command API is described in the manual: Manual_TLX_Matrix_Switch_ASCII_API_V5

There are several 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:

1. **Switch Connection Status** (broadcast over port **17564** every 4 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**, switch localhost only)
    - Port output level value
    - Port input enable status
    - Input port number (big-endian format)
3. **Hardware Sensor Status** (TCP port **17566**)
    - This is the text output from the lm_sensors 'sensors' command and is reserved for future use.
4. **Alarm, Inventory and Power Supply Status** (TCP port **17600**)
    - State of the alarm contacts
    - Card Inventory
    - Reset Bits
    - Power Supply Status
5. **I/O Card Data** (TCP ports **17601** through **17640**, 1 port per I/O card)
    - SFP TxDisable & TxFault bits
    - SFP installed flag
    - I/O card type
    - SFP serial ID data
    - SFP Diagnostic data

Switch connection status is broadcast over the network every 4 seconds. The information in the data block is not enough to identify the model of the switch. Users should use the IP address in the data to identify which switch sent the message.

The data in the status block is stored in big-endian format. This means the MSB of the data is stored first, and then the LSB. *This is NOT the standard for x86 based data storage.*

The other ports must be opened as TCP connections to then have the data read, after which the user MUST close the connection.

There are several useful network applications running that may aid in monitoring the hardware. Three of these are: **SNMP, NTP and syslog**. These are described in subsequent sections.

Multicast vs. Broadcast

Version 4.5 (and later) of the API and version 2.05 of the LOS manager now offer the option of using multicast in place of broadcast for sending status messages. Multicast will use the same ports as broadcast; 17564 for the API and 17560 for the LOS manager. The default multicast IP address is **239.255.13.9**.

References to *broadcast* are valid for *multicast* in this document.

TLX12

17564 – Switch Connection Status Broadcast

- 32-bits, TLX12's primary IP address
- 16-bits, 0 for the Upper (only) switch chassis
- 16-bits, first port number in the list (which starts from 1, not 0)
- 16-bits, last port number in the list
- N * 16-bits, the input port that is connected to output port X. Zero means the port is NOT connected

Example: `c0 a8 0d 19  00 00  00 01  00 0c  00 11  00 12`…
IP address = **192.168.13.25**
Chassis = 0
First Port number = 1
Last Port number = 12 (`0x000c`)
Output 1 is connected to input 17 (`0x0011`)
Output 2 is connected to input 18 (`0x0012`)

17565 – Port Settings (localhost only)

12 sets of the following data:

- (8 bits) output level 0 is off
- (8 bits) input level
- (8 bits) connected to input port number, starting from `0`

A 'C' data structure for this will be:

```
struct s_block {
        unsigned char       output_level;
        unsigned char       input_level;
        unsigned char       connectedTo;
} data_block [12];
```

17566 – Hardware Status

Reserved for future use.

17600 – System Data

System data consists of 10 bytes. The first byte has the current alarm contact settings. The next byte is for the installed card inventory. A '0' bit means the card is installed and a '1' bit means the card is removed. The other bytes are for internal use.

	ALARMS	INVENTORY
BIT	Byte 0	Byte 1
0	PS	Card 1
1	Fan	
2	Temp	
3	Card	
4		
5		
6		
7		

Table 1: *TLX12 System Data*

17601 – Card Data

The I/O card in the Matrix Switch is associated with TCP port 17601. The data is formatted as follows:

- 12 bytes, internal use
- 1 byte, card type
  0 24 Hybrid
  1 24 Fiber
  2 24x CATx
  3 12x CATx
  4 12 Fiber
- SFP data, 256 bytes per SFP, 12 SFPs
  - 128 bytes, SFP ID data
  - 128 bytes, SFP diagnostic data
- CATx port data is 256 bytes of `0xff`

TLX24

17564 – Switch Connection Status Broadcast

- 32-bits, TLX24's primary IP address
- 16-bits, 0 for the Upper (only) switch chassis
- 16-bits, first port number in the list (which starts from 1, not 0)
- 16-bits, last port number in the list
- N * 16-bits, the input port that is connected to output port X. Zero means the port is NOT connected

Example: `c0 a8 0d 19  00 00  00 01  00 18  00 11  00 12`…

IP address = **192.168.13.25**
Chassis = 0
First Port number = 1
Last Port number = 24 (`0x0018`)
Output 1 is connected to input 17 (`0x0011`)
Output 2 is connected to input 18 (`0x0012`)

17565 – Port Settings (localhost only)

24 sets of the following data:

- (8 bits) output level 0 is off
- (8 bits) input level
- (8 bits) connected to input port number, starting from `0`

A 'C' data structure for this will be:

```
struct s_block {
        unsigned char       output_level;
        unsigned char       input_level;
        unsigned char       connectedTo;
} data_block [24];
```

17566 – Hardware Status

Reserved for future use.

17600 – System Data

System data consists of 10 bytes. The first byte has the current alarm contact settings. The next byte is for the installed card inventory. A '0' bit means the card is installed and a '1' bit means the card is removed. The other bytes are for internal use.

	ALARMS	INVENTORY
BIT	Byte 0	Byte 1
0	PS	Card 1
1	Fan	
2	Temp	
3	Card	
4		
5		
6		
7		

Table 2: *TLX24 System Data*

17601 – Card Data

The I/O card in the Matrix Switch is associated with TCP port 17601. The data is formatted as follows:

- 12 bytes, internal use
- 1 byte, card type
  0 24 Hybrid
  1 24 Fiber
  2 24x CATx
  3 12x CATx
  4 12 Fiber
- SFP data, 256 bytes per SFP, 24 SFPs
  - 128 bytes, SFP ID data
  - 128 bytes, SFP diagnostic data
- CATx port data is 256 bytes of `0xff`

TLX48

17564 – Switch Connection Status Broadcast

- 32-bits, TLX48's primary IP address
- 16-bits, 0 for the Upper (only) switch chassis
- 16-bits, first port number in the list (which starts from 1, not 0)
- 16-bits, last port number in the list
- N * 16-bits, the input port that is connected to output port X. Zero means the port is NOT connected

Example: `c0 a8 0d 19  00 00  00 01  00 30  00 11  00 12`…

IP address = **192.168.13.25**
Chassis = 0
First Port number = 1
Last Port number = 48 (`0x0030`)
Output 1 is connected to input 17 (`0x0011`)
Output 2 is connected to input 18 (`0x0012`)

17565 – Port Settings (localhost only)

48 sets of the following data:

- (8 bits) output level 0 is off
- (8 bits) input level
- (8 bits) connected to input port number, starting from `0`

A 'C' data structure for this will be:

```
struct s_block {
        unsigned char       output_level;
        unsigned char       input_level;
        unsigned char       connectedTo;
} data_block [48];
```

17566 – Hardware Status

Reserved for future use.

17600 – System Data

System data consists of 6 bytes. The first byte has the current alarm contact settings. Bit 0 (lsb) is the bit for the Power Supply alarm, and bit 3 is the bit for the 'any' alarm. The next byte is for the installed card inventory. A '0' bit means the card is installed and a '1' bit means the card is removed. The other bytes are for internal use.

	ALARMS	INVENTORY
BIT	Byte 0	Byte 1
0	Alarm 1	Card 1
1	Alarm 2	Card 2
2	Alarm 3	Card 3
3	Alarm 4	
4		
5		
6		
7		

Table 3: *TLX48 System Data*

17601:17603 – Card Data

Each I/O card in the Matrix Switch has an associated TCP port. Card 1 uses port 17601, card 2 uses 17602, and so on. The data is formatted as follows:

- 12 bytes, internal use
- 1 byte, card type (other card types may be added in the future)
  - `0xff` missing
  - `0x02` normal
  - `0x05` reclocked
  - `0x0c` HDMI
  - `0x0a` 10 Gig
  - `0x0b` CATx
- SFP data, 256 bytes per SFP, 16 SFPs per card
  - 128 bytes, SFP ID data
  - 128 bytes, SFP diagnostic data

TLX80

17564 – Switch Connection Status Broadcast

- 32-bits, TLX80's primary IP address
- 16-bits, 0 for the Upper (only) chassis
- 16-bits, first port number in the list (list starts from 1, not 0)
- 16-bits, last port number in the list
- N * 16-bits, the input port that is connected to output port X, zero means the port is NOT connected

Example: `c0 a8 0d 19  00 00  00 01  00 50  00 11  00 12…`

IP address = **192.168.13.25**
Chassis = 0
First Port number = 1
Last Port number = 80 (`0x0050`)
Output 1 is connected to input 17 (`0x0011`)
Output 2 is connected to input 18 (`0x0012`)

17565 – Port Settings (localhost only)

80 sets of the following data:

- (8 bits) output level 0 is off
- (8 bits) input level
- (16 bits) connected to input port number, starting from 0

A 'C' data structure for this will be:

```
struct s_block {
        unsigned char       output_level;
        unsigned char       input_level;
        unsigned short      connectedTo;/* assumes a short is 16 bits */
} data_block [80];
```

17566 – Hardware Status

Reserved for future use.

17600 – System Data

System data consists of 10 bytes. The first byte has the current alarm contact settings. Each bit corresponds to a contact. Bit 0 (lsb) of byte 0 is the bit for the Power Supply 1 alarm, and bit 7 (msb) is the bit for the 'any' alarm. The second byte is all zeros. The next two bytes are for the installed card inventory. A '0' bit means the card is installed and a '1' bit means the card is removed. The remaining bytes are for internal use.

	ALARMS		INVENTORY	
BIT	Byte 0	Byte 1	Byte 2	Byte 3
0	Alarm 1	0	Card 1	Card 9
1	Alarm 2	0	Card 2	Card 10
2	Alarm 3	0	Card 3	Card 11
3	Alarm 4	0	Card 4	Card 12
4	Alarm 5	0	Card 5	Card 13
5	Alarm 6	0	Card 6	Card 14
6	Alarm 7	0	Card 7	Card 15
7	Alarm 8	0	Card 8	Card 16

Table 4: *TLX80 System Data*

17601:17616 – Card Data

Each I/O Card in the Matrix Switch has an associated TCP port. Card 1 uses port 17601, Card 2 uses 17602, and so on. The data is formatted as follows:

- 12 bytes, internal use
- 1 byte, card type (other card types may be added in the future)
  - `0xff` missing
  - `0x0f` normal
  - `0x05` reclocked
  - `0x0f` 10 Gig
- SFP data, 256 bytes per SFP, 5 SFPs per card
  - 128 bytes, SFP ID data
  - 128 bytes, SFP diagnostic data

TLX160

17564 – Switch Connection Status Broadcast

- 32-bits, TLX160's primary IP address
- 16-bits, 0 for the Upper (only) chassis
- 16-bits, first port number in the list (list starts from 1, not 0)
- 16-bits, last port number in the list
- N * 16-bits, the input port that is connected to output port X, zero means the port is NOT connected

Example: `c0 a8 0d 19  00 00  00 01  01 A0  00 11  00 12…`

IP address = **192.168.13.25**
Chassis = 0
First Port number = 1
Last Port number = 160 (`0x00A0`)
Output 1 is connected to input 17 (`0x0011`)
Output 2 is connected to input 18 (`0x0012`)

17565 – Port Settings (localhost only)

160 sets of the following data:

- (8 bits) output level 0 is off
- (8 bits) input level
- (16 bits) connected to input port number, starting from 0

A 'C' data structure for this will be:

```
struct s_block {
        unsigned char       output_level;
        unsigned char       input_level;
        unsigned short      connectedTo;/* assumes a short is 16 bits */
} data_block [160];
```

17566 – Hardware Status

Reserved for future use.

17600 – System Data

System data consists of 10 bytes. The first byte has the current alarm contact settings. Each bit corresponds to a contact. Bit 0 (lsb) of byte 0 is the bit for the Power Supply 1 alarm, and bit 7 (msb) is the bit for the 'any' alarm. The second byte is all zeros. The next two bytes are for the installed card inventory. A '0' bit means the card is installed and a '1' bit means the card is removed. The remaining bytes are for internal use.

	ALARMS		INVENTORY	
BIT	Byte 0	Byte 1	Byte 2	Byte 3
0	Alarm 1	0	Card 1	Card 9
1	Alarm 2	0	Card 2	Card 10
2	Alarm 3	0	Card 3	Card 11
3	Alarm 4	0	Card 4	Card 12
4	Alarm 5	0	Card 5	Card 13
5	Alarm 6	0	Card 6	Card 14
6	Alarm 7	0	Card 7	Card 15
7	Alarm 8	0	Card 8	Card 16

Table 5: *TLX160 System Data*

17601:17616 – Card Data

Each I/O Card in the Matrix Switch has an associated TCP port. Card 1 uses port 17601, Card 2 uses 17602, and so on. The data is formatted as follows:

- 12 bytes, internal use
- 1 byte, card type (other card types may be added in the future)
  - `0xff` missing
  - `0x0f` normal
  - `0x05` reclocked
  - `0x0d` 10 Gig
- SFP data, 256 bytes per SFP, 10 SFPs per card
  - 128 bytes, SFP ID data
  - 128 bytes, SFP diagnostic data

TLX320

17564 – Switch Connection Status Broadcast

- 32-bits, TLX320's primary IP address
- 16-bits, 0 for the Upper (only) TLX320 chassis
- 16-bits, first port number in the list (list starts from 1, not 0)
- 16-bits, last port number in the list
- N * 16-bits, the input port that is connected to output port X, zero means the port is NOT connected

Example: `c0 a8 0d 19  00 00  00 01  01 40  00 11  00 12…`

IP address = **192.168.13.25**
Chassis = 0
First Port number = 1
Last Port number = 320 (`0x0140`)
Output 1 is connected to input 17 (`0x0011`)
Output 2 is connected to input 18 (`0x0012`)

17565 – Port Settings (localhost only)

320 sets of the following data:

- (8 bits) output level 0 is off
- (8 bits) input level
- (16 bits) connected to input port number, starting from 0

A 'C' data structure for this will be:

```
struct s_block {
        unsigned char       output_level;
        unsigned char       input_level;
        unsigned short      connectedTo;/* assumes a short is 16 bits */
} data_block [320];
```

17566 – Hardware Status

Reserved for future use.

17600 – System Data

System data consists of 18 bytes. The first two bytes have the current alarm contact settings. Each bit corresponds to a contact. Bit 0 (lsb) of byte 1 is the bit for the Power Supply 1 alarm, and bit 7 (msb) is the bit for the 'any' alarm. The next three bytes are for the installed card inventory. A '0' bit means the card is installed and a '1' bit means the card is removed. The remaining bytes are for internal use.

	ALARMS		INVENTORY		
BIT	**Byte 0**	**Byte 1**	**Byte 2**	**Byte 3**	**Byte 4**
0	**Alarm 1**	**0**	**Card 1**	**Card 9**	**Card 17**
1	**Alarm 2**	**0**	**Card 2**	**Card 10**	**Card 18**
2	**Alarm 3**	**0**	**Card 3**	**Card 11**	**Card 19**
3	**Alarm 4**	**0**	**Card 4**	**Card 12**	**Card 20**
4	**Alarm 5**	**0**	**Card 5**	**Card 13**	
5	**Alarm 6**	**0**	**Card 6**	**Card 14**	
6	**Alarm 7**	**0**	**Card 7**	**Card 15**	
7	**Alarm 8**	**0**	**Card 8**	**Card 16**	

Table 6: *TLX320 System Data*

17601:17620 – Card Data

Each I/O Card in the Matrix Switch has an associated TCP port. Card 1 uses port 17601, Card 2 uses 17602, and so on. The data is formatted as follows:

- 12 bytes, internal use
- 1 byte, card type (other card types may be added in the future)
  - `0xff` missing
  - `0x02` normal
  - `0x05` reclocked
  - `0x0c` HDMI
  - `0x0a` 10 Gig
  - `0x0b` CATx
- SFP data, 256 bytes per SFP, 16 SFPs per card
  - 128 bytes, SFP ID data
  - 128 bytes, SFP diagnostic data

TLX640

17564 – Switch Connection Status Broadcast

- 32-bits, TLX640's primary IP address
- 16-bits, 0 for the Upper (only) TLX640 chassis
- 16-bits, first port number in the list (list starts from 1, not 0)
- 16-bits, last port number in the list
- N * 16-bits, the input port that is connected to output port X, zero means the port is NOT connected

Example: `c0 a8 0d 19  00 00  00 01  02 80  00 11  00 12…`

IP address = **192.168.13.25**
Chassis = 0
First Port number = 1
Last Port number = 640 (`0x0280`)
Output 1 is connected to input 17 (`0x0011`)
Output 2 is connected to input 18 (`0x0012`)

17565 – Port Settings (localhost only)

640 sets of the following data:

- (8 bits) output level 0 is off
- (8 bits) input level
- (16 bits) connected to input port number, starting from 0

A 'C' data structure for this will be:

```
struct s_block {
        unsigned char       output_level;
        unsigned char       input_level;
        unsigned short      connectedTo;/* assumes a short is 16 bits */
} data_block [640];
```

17566 – Hardware Status

Reserved for future use.

17600 – System Data

System data consists of 28 bytes. The first two bytes have the current alarm contact settings. Each bit corresponds to a contact. Bit 0 (lsb) of byte 0 is the bit for the Power Supply 1 alarm, and bit 2 of byte 1 is the bit for the 'any' alarm. The next five bytes are for the installed card inventory. A '0' bit means the card is installed and a '1' bit means the card is removed. The other bytes are for internal use.

Note: Card 1 has ports 1 to 20, card 2 has ports 21 to 40, card 3 has ports 41 to 60, …card 32 has ports 621 to 640.

	ALARMS		INVENTORY				
BIT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
0	Alarm 1	Alarm 9	Card 2	Card 18	Card 1	Card 17	Switch 1
1	Alarm 2	Alarm 10	Card 4	Card 20	Card 3	Card 19	Switch 2
2	Alarm 3	0	Card 6	Card 22	Card 5	Card 21	Switch 3
3	Alarm 4	0	Card 8	Card 24	Card 7	Card 23	Switch 4
4	Alarm 5	0	Card 10	Card 26	Card 9	Card 25	Switch 5
5	Alarm 6	0	Card 12	Card 28	Card 11	Card 27	Switch 6
6	Alarm 7	0	Card 14	Card 30	Card 13	Card 29	Switch 7
7	Alarm 8	0	Card 16	Card 32	Card 15	Card 31	Switch 8

Table 7: *TLX640 System Data*

17601:17620 – Card Data

Each I/O card in the Matrix Switch has an associated TCP port. Card 1 uses port 17601, card 2 uses 17602, and so on. The data is formatted as follows:

- 16 bytes, internal use
- 2 bytes, card type (*other card types may be added in the future*)
  - `0xff, 0xff` missing
  - `0x06, 0x00` 6Gig I/O card
  - `0x08, 0x00` 10Gig I/O card
- Signed 16-bits, card temperature (little-endian, bits 15-7)
  - example: 0x80 0x1d -> 0x1d80 -> 29.5°C
- 5 bytes, internal use
- SFP data, 256 bytes per SFP, 16 SFPs per card
  - 128 bytes, SFP ID data
  - 128 bytes, SFP diagnostic data

TLX1280

17564 – Switch Connection Status Broadcast

- 32-bits, TLX1280's primary IP address
- 16-bits, 0 for the Upper (only) TLX1280 chassis
- 16-bits, first port number in the list (list starts from 1, not 0)
- 16-bits, last port number in the list
- N * 16-bits, the input port that is connected to output port X, zero means the port is NOT connected

Example: `c0 a8 0d 19  00 00  00 01  02 80  00 11  00 12…`

IP address = **192.168.13.25**
Chassis = 0
First Port number = 1
Last Port number = 640 (`0x0280`)
Output 1 is connected to input 17 (`0x0011`)
Output 2 is connected to input 18 (`0x0012`)

Note: The TXL1280 outputs status in two blocks. The first is for Ports 1-640 and the second is for Ports 641-1280.

17565 – Port Settings (localhost only)

1280 sets of the following data:

- (8 bits) output level 0 is off
- (8 bits) input level
- (16 bits) connected to input port number, starting from 0

A 'C' data structure for this will be:

```
struct s_block {
        unsigned char       output_level;
        unsigned char       input_level;
        unsigned short      connectedTo;/* assumes a short is 16 bits */
} data_block [1280];
```

17566 – Hardware Status

Reserved for future use.

17600 – System Data

System data consists of 26 bytes. The first 5 bytes are the installed card inventory. A '0' bit means the card is installed and a '1' bit means the card is removed.
The next 2 bytes have the current alarm contact settings. Each bit corresponds to a contact. Bit 0 (lsb) is the bit for the Power Supply 1 alarm, and bit 4 of byte 1 is the bit for the 'any' alarm.
After the alarm bytes, the next byte is the Backplane Switch Card inventory, '0' meaning the card is installed.
The other bytes are for internal use.

BIT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 8	Byte 9	Byte 10
0	Card 1	Card 9	Card 17	Card 25	Card 33	Alarm 1	Alarm 9	Switch 1
1	Card 2	Card 10	Card 18	Card 26	Card 34	Alarm 2	Alarm 10	Switch 2
2	Card 3	Card 11	Card 19	Card 27	Card 35	Alarm 3	Alarm 11	Switch 3
3	Card 4	Card 12	Card 20	Card 28	Card 36	Alarm 4	Alarm 12	Switch 4
4	Card 5	Card 13	Card 21	Card 29	Card 37	Alarm 5	Alarm 13	Switch 5
5	Card 6	Card 14	Card 22	Card 30	Card 38	Alarm 6	0	Switch 6
6	Card 7	Card 15	Card 23	Card 31	Card 39	Alarm 7	0	Switch 7
7	Card 8	Card 16	Card 24	Card 32	Card 40	Alarm 8	0	Switch 8

Table 8: *TLX1280 System Data*

17601:17640 – Card Data

Each I/O card in the Matrix Switch has an associated TCP port. Card 1 uses port 17601, card 2 uses 17602, and so on. The data is formatted as follows:

- 16 bytes, internal use
- 2 bytes, card type (*other card types may be added in the future*)
  - `0x12, 0x00` 1280 10G
- Signed 16-bits, card temperature (little-endian, bits 15-7)
  - example: 0x80 0x1d -> 0x1d80 -> 29.5°C
- 5 bytes, internal use
- SFP data, 256 bytes per SFP, 32 SFPs per card
  - 128 bytes, SFP ID data
  - 128 bytes, SFP diagnostic data

Service Request (LOS) Signaling

TLX Matrix Switches have an optional mode that can broadcast a message over the network when a remote receiver requests attention. When enabled, the receiver will toggle its TX pin, causing an LOS (loss of signal) event to occur at the switch. When detected, the switch 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. This process is controlled by the program `tlxoobm`.

17560 – Attention Request (UDP)

- 32-bits, switch's primary IP address
- 16-bits, 0 for the Upper (only) 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

Example: `c0 a8 0d 19  00 00  00 06  00 55`
IP address = **192.168.13.25**
Chassis = 0
Port number = 6
key code 85, 0x55

SNMP

The switch can be monitored via SNMP (***S**imple **N**etwork **M**anagement **P**rotocol)*. The MIB (***M**anagement **I**nformation **B**ase)* definition files are located on the switch in the directory **`/usr/share/snmp/mibs/`**. The SNMP program may be configured by modifying the file **`/etc/snmp/snmpd.conf`**. Configuring SNMP is beyond the scope of this document, but many excellent sites on the web exist that explain configuration. One such site is: **`http://www.net-snmp.org/docs/man/snmpd.conf.html`**.

There are a few entries in the SNMP configuration file that you 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 is '**`snmp.trap`**' and is listed in **`/etc/hosts`** as pointing to **127.0.0.1.** The easiest method to set the trap address is to modify the **`/etc/hosts`** entry and not change the trap2sink setting in the configuration file.

MIB

Management Information Base – Used in conjunction with SNMP, an MIB is a database definition used to define management entities on a network. The MIB file is written using a subset of *Abstract Syntax Notation One* defined in RFC 2578. While readable by users, it is typically compiled into a network management software package.

NTP

Network Time Protocol - Used to keep the switch's internal clock set to the correct time. All internal clocks drift slightly over time. By enabling this service, you keep the switch's clock synchronized to an external time reference. To use the service, you must have a time server running on your 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 can be found at: **`http://tldp.org/LDP/sag/html/basic-ntp-config.html.`**

System Log Files

The switch 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. This is a standard feature of Linux's rsyslog program. This redirection is enabled by entries in the **`rsyslog`** configuration file **`/etc/rsyslog.conf`** or in configuration files located in **`/etc/rsyslog.d/.`**

The two log files with the most interesting information are: **`/var/log/daemon.log`** and **`/var/log/api.`** The former contains system events and the latter contains switch events and API commands and responses. More information about the API log file can be found in: Manual_Configuring_the_TLX_ASCII_Interface

The TLX switch defaults to sending **all** log entries to the server at **`vxcontrol.vx.net`**. This name is defined in the file **`/etc/hosts`** and defaults to **192.168.13.9**.

Linux systems can receive external syslog messages (from the switch). Please refer to the documentation for your version of Linux to enable the logging of remote messages.

Windows will require third-party software to receive syslog messages.

SD Firmware Version

There is a text file on the router's internal SD card called **`/etc/vxr-release`** that contains the firmware version.

Example contents are:

- TLX320 V5.01
- TLX48 V5.02
- TLX640 V5.05

Quick Reference

Open Ports

Ports		Function	Program
22/tcp		open ssh	ssh
80/tcp		open http	lighttpd (TLX48 only)
2583/tcp		open monitor	mon (backup CPU only)
+ 17563/tcp		open interproc	interproc
* 17565/udp		open portstatus	tlxcntl
! 17567/tcp		open tlxapi	tlxapi
! 17600/tcp		open tlxstatus	1280:tlxcardd, else tlxcntl
! 17601/tcp		open tlxcard01	1280:tlxcardd, else tlxcntl
⇩	*One for each Card, 1 through 40*	⇩	⇩
! 17640/tcp		open tlxcard40	1280:tlxcardd, else tlxcntl
^ 17700/tcp		open tlxcip	tlxcntl
* 27567/tcp		open tlxlocalapi	tlxcntl

Output Ports

Ports	Function	Program
17560/udp	send LOS event	tlxoobm (network broadcast/multicast)
* 17564/udp	send connection status	tlxapi

* *localhost only*
! *Option exists to restrict to localhost*
^ *Can be restricted to localhost (software mod)*
\+ *Can be restricted to internal eth1 (software mod)*

Switch MIB files:

- **LSI-ROOT.mib**
- **LSI-ROUTER-API-INTERFACE.mib**
- **LSI-SFP.mib**
- **LSI-TLXSWITCH.mib**

Important files or directories on the switch Configuration files:

- **/etc/hosts**
- **/etc/logrotate.d/***
- **/etc/network/interfaces**
- **/etc/ntp.conf**
- **/etc/rsyslog.conf**
- **/etc/rsyslog.d/***
- **/etc/snmp/snmp.conf**
- **/etc/snmp/snmpd.conf**
- **/etc/vxr-release**
- **/etc/default/restore**
- **/etc/default/tlxapi**
- **/etc/default/tlxoobm**
- **/usr/share/mibs/netsnmp/**
- **/var/local/router/**

Log files:

- **/var/log/api**
- **/var/log/messages**
- **/var/log/daemon.log**
- **/var/log/tlxoobm.log**
- **/var/log/errors.log**
- **/var/log/snmpd.log**

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