



syn1588<sup>®</sup>

IEEE1588-2008 End-to-End Transparent Clock

# syn1588<sup>®</sup> Gbit Switch

Data Sheet

Version 3.1 – September 21<sup>st</sup> 2016

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# 1 Overview

## 1.1 Introduction

The syn1588® Gbit Switch is a standard 8+1port 10/100/1000 Mbit/s Ethernet switch with enhancements to provide a network with numerous features for highly accurate clock synchronization according to IEEE1588-2008. Additionally the syn1588® Gbit Switch is manageable via SNMP. This feature can be used for traffic monitoring and the configuration of the syn1588® Gbit Switch.



**Figure 1 syn1588® Gbit Ethernet Switch**

Beside the eight copper Ethernet ports equipped with RJ45 connectors, there is also a ninth port available that may be used as an uplink port. This ninth port is implemented as a SFP interface allowing connection of both fibre (1000BASE-X) and copper (1000BASE-T).

The syn1588® Gbit Switch is basically made up of three major components:

- An Ethernet switch device (Marvell 88E6185) responsible for performing all layer 2 Ethernet switching tasks
- A high performance FPGA responsible for all real-time IEEE1588 operations
- A microcontroller providing the SNMP Management interface

## 1.2 19" 1HE Case: 8+1 Port Configuration



Figure 2 syn1588® Gbit Switch in 19" 1HE case: front view 8+1 port configuration



Figure 3 syn1588® Gbit Switch in 19" 1HE case: rear view 8+1 port configuration

### 1.3 Features

- Standard 8-port 10/100/1000 Mbit Ethernet switch following IEEE802.3-2005
- 9<sup>th</sup> port for uplink implemented as SFP interface
- Support for 1000BASE-X and 1000BASE-T SFP transceivers
- SFP transceivers are not within scope of delivery
- IEEE1588-2008 compliant one-step end2end transparent clock with on-the-fly time stamping
- Oregano Systems' patented syn1588® technology:  
On-the-fly time stamping while sending IEEE1588 packets
- 2 ns resolution of timestamps
- Timestamping of Layer 2 and Layer3 packets following IEEE1588-2008
- Peer-delay packets are timestamped as well  
(transparent clock following IEEE1588-2008)
- VLAN support
- IPv6 support
- Support for high sync rates  
(sync rates of 256 per second and more) simultaneously on all ports
- SNMPv2 management interface
- Serial interface on rear side
- On-board wide-range AC power supply with mains plug following IEC-60320 C14  
(three pole, with fuse)
- 19" 1HE rack-mount case (8+1 ports)

### 1.4 Options

- Stable TCXO oscillator available to enable cost/performance optimization
- High precision OCXO oscillator available to enable cost/performance optimization



## 1.5 Functional Description

Using the syn1588® Gbit Switch is very simple. Just connect the syn1588® Gbit Switch to the mains and plug-in your network cables. The syn1588® Gbit Switch immediately starts processing the network traffic without any prior setup. IEEE1588-2008 packets are automatically detected on all ports and will be timestamped accordingly. However, using the SNMP management interface requires a simple network setup (see section 2.2.2).

IEEE1588-2008 packets embedded in VLAN packets, as well as those sent via IPv6 (as defined in Annex E of IEEE1588-2008), will be automatically detected and timestamped.

## 2 Management

### 2.1 Overview

The syn1588® Gbit Switch can be remotely managed using the SNMPv2 protocol after an initial network setup. Apart from the SNMP management, the syn1588® Gbit Switch can be used “out-of-the-box” without any setup. Use any MIB browser to make use of the following features:

- Monitor the network traffic in detail
- Control over the syn1588® Gbit Switch’s features like VLAN
- Configuration of the syn1588® Gbit Switch
- Authentication feature to avoid accidental misconfiguration by unauthorized users
- View device specific information like the SNMP software version and the hardware firmware revision
- More features will be added in future releases of the SNMP firmware. In order to be able to use the latest set of features the SNMP firmware can be updated via TFTP

### 2.2 Using SNMP

#### 2.2.1 Pre-Requisites

In order to make use of the SNMP management of the syn1588® Gbit Switch the following pre-conditions have to be met:

An initial network setup is required to be able to use the SNMP management function. If one does not require the SNMP management functions, the syn1588® Gbit Switch can be used “out-of-the-box” without any setup.

Please note that one has to have the necessary rights to install software (the MIB browser) as well as the right to modify the network adapter’s configuration in order to perform the initial network setup. For more information on the initial network setup of the SNMP management, please refer to section 2.2.2.

### 2.2.1.1 MIB Browser

The following MIB files have to be loaded in your MIB browser (e.g. “iReasoning” <http://ireasoning.com/>) in order to use the SNMP management feature of the syn1588® Gbit Switch:

MIB File	Description	OIDs
RFC 1213 (or successors)	Standard MIB file needed for general data about the syn1588® Gbit Switch as well as to monitor the network traffic	.1.3.6.1.2.1.1 .1.3.6.1.2.1.2
Oregano	Oregano Systems specific MIB file needed to access the syn1588® Gbit Switch as well as all Oregano Systems specific features	.1.3.6.1.4.1.40659.1.1

**Table 1 Required MIB files**

#### Note

In order to use all available SNMP management features, the latest version Oregano Systems’ MIB in combination with the corresponding firmware has to be used. Please contact Oregano Systems support to request a copy of the most recent update file and the corresponding MIB files.

### 2.2.1.2 TFTP Server

For performing an update of the SNMP firmware a TFTP server is required. Using the “tftp32” (<http://tftpd32.jounin.net/>) TFTP server is recommended but not mandatory.

## 2.2.2 Initial Network Setup

This setup is only needed for the SNMP management and has to be performed initially as well as after every reset to factory default. When not using the SNMP management, the syn1588® Gbit Switch can be used “out-of-the-box” without any setup.

Before proceeding with the initial network setup, please make sure that all pre-requisites are met (see section 2.2.1) and that the UDP port 161, which is used by SNMP, is not blocked by any firewall. Accessing the syn1588® Gbit Switch from your PC requires that the syn1588® Gbit Switch’s IP address to be within the netmask range of your PC’s network connection. The standard IP address of the syn1588® Gbit Switch, as well as all other standard configuration values, can be found in Table 2.

1. Connect the syn1588® Gbit Switch to the network. Ping the standard IP address of the syn1588® Gbit Switch to verify that the unit is visible from your IP range.
2. Log in as admin using “admin” for the SNMP “User” leaf and “oregano snmp” for the “Password” leaf (see Table 2). If logged in successfully, a ‘Get’ operation on the SNMP

- “User”/“Password” leaf now reads “logged in as admin”. Now specify the network settings that should be used by the syn1588® Gbit Switch in accordance with your local network setup by setting the configuration accordingly.
- Now you may log out. Logging out is not mandatory but advised to prevent accidental misconfiguration of the syn1588® Gbit Switch by unauthorized users. This may be done by setting the SNMP “User” leaf as well as the “Password” leaf to an invalid string (e.g. blank spaces). If logged out successfully, a ‘Get’ operation on the SNMP “User”/“Password” leaf does not display “logged in as admin” anymore, but displays instructions on how to log in as admin instead. The SNMP Management is now ready to be used.

Parameter	Default Values	Description
DhcpEnable (1.3.6.1.4.1.40659.1.1.1.1)	Off (0)	Enabling this parameter via ‘Set(1)’ causes the syn1588® Gbit Switch to obtain its network settings via DHCP.
IpGateway (1.3.6.1.4.1.40659.1.1.1.2)	192.168.102.1	If the DHCP server is disabled, this standard gateway is used by the syn1588® Gbit Switch.
IpAddress (1.3.6.1.4.1.40659.1.1.1.3)	192.168.102.201	If the DHCP server is disabled, this static IP address is used by the syn1588® Gbit Switch.
IpNetMask (1.3.6.1.4.1.40659.1.1.1.4)	255.255.254.0	If the DHCP server is disabled, this standard netmask is used by the syn1588® Gbit Switch.
User (1.3.6.1.4.1.40659.1.1.1.5)	- (not logged in as admin)	Login name, set this field to “admin” and the password (see below) to “oregano snmp” to log in as admin.
Password (1.3.6.1.4.1.40659.1.1.1.5)	- (not logged in as admin)	See above (“User”).
TFTPSAddr <sup>1</sup> (1.3.6.1.4.1.40659.1.1.1.8)	192.168.102.61	IP address of the TFTP server used to perform a SNMP firmware update the syn1588® Gbit Switch.
TFTPSPort <sup>1</sup> (1.3.6.1.4.1.40659.1.1.1.9)	69	UDP port used by the syn1588® Gbit Switch to connect to the TFTP server.
TFTPCPort <sup>1</sup> (1.3.6.1.4.1.40659.1.1.1.10)	51327	UDP port used by the syn1588® Gbit Switch to connect to the TFTP server.

**Table 2 SNMP Network Settings and their Default Values**

### Notes

<sup>1</sup>Does not have to be set during first setup as it is only required to perform the firmware update (see section 2.3).



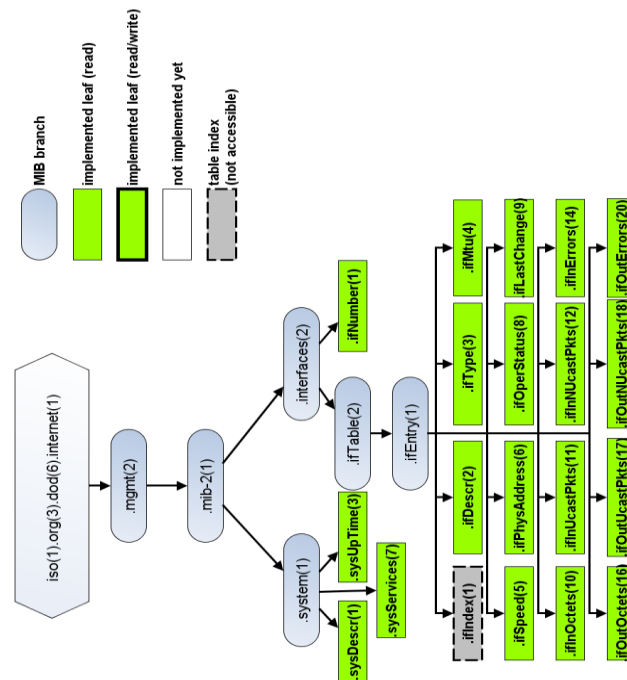


Figure 5 syn1588® Gbit Switch SNMP supported parameters (RFC Standard leaves)

MIB files are made up of a tree-like structure with different “branches” used to divide each MIB file into its subsets of related parameters. All SNMP parameters (the so called “leaves”) are being identified using their object identifier (OID). Standard parameters like the device description or standard (= non-PTP specific) frame counters are defined in standard MIB files (RFC MIBs). All non-standard parameters are to be found in the Oregano MIB, which is reserved for PTP specific parameters as well as parameters used to configure the syn1588® Gbit Switch device.

Figure 4 shows all supported SNMP parameters and their position in the MIB tree structure. While “.mgmt” MIB subset (OID 1.3.6.1.2) is part of the RFC standard MIB, the “OreganoSystems (OID 1.3.6.1.4.1.40659)” MIB implements Oregano Systems specific SNMP features.

### Important Notes

- Reading SNMP leaves is always possible by applying the MIB Browser’s ‘Get ’ command on the corresponding OID. Most leaves can only be set using the ‘Set’ command while being logged in as admin.
- All network packet counters are being updated every 30 sec unless noted otherwise.
- Some SNMP leaves are only supported from a certain SNMP firmware version on. Please check the “SW” column of the SNMP leaf description tables to see the minimum firmware revision required for the corresponding leaf. To update the firmware of the SNMP interface, please refer to section 2.3.

### 2.3.1 Oregano MIB

The following tables list all supported SNMP leaves of the Oregano Systems specific “.mib” file. Please note that they are sorted by their corresponding SNMP branch.

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
DhcpEnable	all	R/W	If set to '1', the syn1588® Gbit Switch tries to obtain its IP address via DHCP, otherwise (DhcpEnable set to '0') its standard static IP settings will be used. Disable DHCP by setting this leaf to '0'. The static network configuration can be set via IPAddress / IPGateway / IPNetMask. Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.1
IPGateway	all	R/W	Specifies the gateway used by the syn1588® Gbit Switch to connect to the local network if DHCP has been disabled. Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.2
IPAddress	all	R/W	Specifies the IP address used by the syn1588® Gbit Switch to connect to the local network if DHCP has been disabled. Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.3
IPNetMask	all	R/W	Specifies the netmask used by the syn1588® Gbit Switch to connect to the local network if DHCP has been disabled. Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.4
User	all	R/W	Login name, set this field to “admin” and the password (see below) to “oregano snmp” to log in as admin.	1.3.6.1.4.1.40659.1.1.1.5
Password	all	R/W	See above (“User”).	1.3.6.1.4.1.40659.1.1.1.6

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
ForceGold	all	R/W	<p>If set to '1', a basic firmware with a reduced featureset will be loaded and all settings are reverted to their factory defaults. Please note that this option causes the syn1588® Gbit Switch to restart with its default network settings enabled. This process can take up to 3 minutes. During this time the syn1588® Gbit Switch is not manageable via SNMP.</p> <p>This basic firmware is intended to only be used temporarily. Updating the SNMP Add-on Board to the latest firmware afterwards is highly recommended.</p> <p>Setting this parameter requires admin rights.</p>	1.3.6.1.4.1.40659.1.1.1.7
TFTPSAddr	all	R/W	<p>IP Address of the TFTP server which shall be used to receive firmware updates from.</p> <p>Setting this parameter requires admin rights.</p>	1.3.6.1.4.1.40659.1.1.1.8
TFTPSPort	all	R/W	<p>UDP port of the TFTP server which shall be used to receive firmware updates from. (recommended: 69)</p> <p>Setting this parameter requires admin rights.</p>	1.3.6.1.4.1.40659.1.1.1.9
TFTPCPort	all	R/W	<p>UDP port of the TFTP client which shall be used to receive firmware updates from.</p> <p>Setting this parameter requires admin rights.</p>	1.3.6.1.4.1.40659.1.1.1.10
StartUpdate	All	R/W	<p>Setting this leaf to '1' starts the updating process via TFTP. Please make sure to specify the correct TFTP Address/Ports before starting the updating procedure.</p> <p>Setting this parameter requires admin rights.</p>	1.3.6.1.4.1.40659.1.1.1.11



SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
Restart	All	R/W	Setting this leaf to '1' immediately triggers a soft reset of the SNMP Management software (the syn1588® Gbit Switch excluding the SNMP Management feature continues to operate as usual during the restart). Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.12
TXPHYDelay1000	>1425	R/W	This leaf sets the TX PHY Delay for 1Gbit to the specified value in ns. Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.13
RXPHYDelay1000	>1425	R/W	This leaf sets the RX PHY Delay for 1Gbit to the specified value in ns. Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.14
SFPRXERRCNT	>1425	R	This leaf gets the SFP RX Error Counter.	1.3.6.1.4.1.40659.1.1.1.15
TXPHYDelay100	>1425	R/W	This leaf sets the TX PHY Delay for 100 Mbit to the specified value in ns. Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.16
RXPHYDelay100	>1425	R/W	This leaf sets the RX PHY Delay for 100 Mbit to the specified value in ns. Setting this parameter requires admin rights.	1.3.6.1.4.1.40659.1.1.1.17

**Table 3 Oregano MIB: SNMP leaves used to configure the SNMP Management Interface (Control Branch)**

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
MAC	all	R	syn1588® Gbit Switch MAC address	1.3.6.1.4.1.40659.1.1.2.1
ClockID	all	R	syn1588® Gbit Switch Clock ID	1.3.6.1.4.1.40659.1.1.2.2
BuildIDSyn	all	R	syn1588® Gbit Switch HW Build ID (Synthesis)	1.3.6.1.4.1.40659.1.1.2.3
BuildID Backend	>1262	R	syn1588® Gbit Switch HW Build ID (Backend)	1.3.6.1.4.1.40659.1.1.2.4

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
SWRev	>1262	R	software revision of the syn1588® Gbit Switch Management interface	1.3.6.1.4.1.40659.1.1.2.5

**Table 4 Oregano MIB: SNMP leaves with general information about the syn1588® Gbit Switch (Info Branch)**

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
VlanMode	>1262	R/W	0 => VLAN disabled 1 => Port-based VLAN enabled: Traffic may only if the VlanID of the ingress port equals the one of the egress port. Setting this parameter requires admin rights and only applies to the standard RJ45 ports.	.1.3.6.1.4.1.40659.1.2.1
VlanID	>1262	R/W	This ID is used for port-based VLAN to divide the ports of the syn1588® Gbit Switch into separate logical networks. It is only used if port-based VLAN is enabled via the VlanMode leaf. Setting this parameter requires admin rights.	.1.3.6.1.4.1.40659.1.2.3.1.2

**Table 5 Oregano MIB: SNMP leaves used to configure the syn1588® Gbit Switch's ports (Interface Branch)**

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
TX Layer 3	>1300	R	Number of received syn1588® TX Layer 3 Packets (always shows the latest counter value).	.1.3.6.1.4.1.40659.1.2.4.1.2
RX Layer 3	>1300	R	Number of received syn1588® RX Layer 3 Packets (always shows the latest counter value).	.1.3.6.1.4.1.40659.1.2.4.1.3
TX Layer 2	>1300	R	Number of received syn1588® TX Layer 2 Packets (always shows the latest counter value).	.1.3.6.1.4.1.40659.1.2.4.1.4
RX Layer 2	>1300	R	Number of received syn1588® RX Layer 2 Packets (always shows the latest counter value).	.1.3.6.1.4.1.40659.1.2.4.1.5

**Table 6 Oregano MIB: SNMP syn1588® PTP traffic counters (syn1588CntrTable)**

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
InGoodOctets	>1320	R	The sum of lengths of all good Ethernet (=all incoming frames - InBadOctets) frames received (64 Bit).	1.3.6.1.4.1.40659.1.2.5.1.2
InBadOctets	>1320	R	The sum of lengths of all Ethernet frames transmitted from this MAC.	1.3.6.1.4.1.40659.1.2.5.1.3
InUnicast	>1320	R	Number of good incoming Unicast frames.	1.3.6.1.4.1.40659.1.2.5.1.4
InMulticast	>1320	R	Number of good incoming Multicast frames.	1.3.6.1.4.1.40659.1.2.5.1.5
InBroadcast	>1320	R	Number of good incoming Broadcasts frames.	1.3.6.1.4.1.40659.1.2.5.1.6
InPause	>1320	R	Number of good incoming Flow Control (=PAUSE) frames. This counter does not increment when the interface is operating in half-duplex mode.	1.3.6.1.4.1.40659.1.2.5.1.7
OutOctets	>1320	R	The sum of lengths of all Ethernet frames transmitted from this MAC (64 Bit).	1.3.6.1.4.1.40659.1.2.5.1.8
OutUnicast	>1320	R	Number of outgoing Unicast frames.	1.3.6.1.4.1.40659.1.2.5.1.9
OutMulticast	>1320	R	Number of outgoing Multicast frames.	1.3.6.1.4.1.40659.1.2.5.1.10
OutBroadcast	>1320	R	Number of outgoing Broadcasts frames.	1.3.6.1.4.1.40659.1.2.5.1.11
OutPause	>1320	R	Number of outgoing Flow Control (=PAUSE) frames. This counter does not increment when the interface is operating in half-duplex mode.	1.3.6.1.4.1.40659.1.2.5.1.12

**Table 7: SNMP frame counters (frameCntrTable)**

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
InFragment	>1320	R	Number of incoming frame fragments (less than 64 Bytes and invalid FCS).	1.3.6.1.4.1.40659.1.2.6.1.2
InOversize	>1320	R	Number of incoming irregular big frames that have a valid FCS.	1.3.6.1.4.1.40659.1.2.6.1.3
InUndersize	>1320	R	Number of incoming irregularly small frames (less than 64 Bytes but valid FCS).	1.3.6.1.4.1.40659.1.2.6.1.4
InJabber	>1320	R	Number of incoming non-standard frames (Jabber) using a length more than MaxSize <sup>1</sup> and invalid FCS.	1.3.6.1.4.1.40659.1.2.6.1.5
InRxErr	>1320	R	Number of frames received with an RxErr signal from the PHY.	1.3.6.1.4.1.40659.1.2.6.1.6
InFCSErr	>1320	R	Number of received frames with a CRC error not already counted by InFragment, InJabber or InRxErr.	1.3.6.1.4.1.40659.1.2.6.1.7
Collisions	>1320	R	Number of collisions sensed by the MAC excluding those counted by Single/Multiple/Excess/Late. Is applicable in half-duplex mode only.	1.3.6.1.4.1.40659.1.2.6.1.8
OutFCSErr	>1320	R	Number of transmitted frames with an invalid FCS. Whenever a frame is modified during transmission (e.g. to add or remove a tag) the frames original FCS is inspected before adding a new FCS to the modified frame. If the original FCS is invalid, the new FCS is made invalid too and this counter is incremented.	1.3.6.1.4.1.40659.1.2.6.1.9

**Table 8: SNMP error counters (errCntrTable)**

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
Octets64	>1320	R	Number of frames (tx and rx) with a length of exactly 64 Bytes (including erroneous 64 Byte frames).	1.3.6.1.4.1.40659.1.2.7.1.2
Octets65to127	>1320	R	Number of frames (tx and rx) with a length of 65 to 127 Bytes (including erroneous 65 to 127 Byte frames).	1.3.6.1.4.1.40659.1.2.7.1.3
Octets128to255	>1320	R	Number of frames (tx and rx) with a length of 128 to 255 Bytes (including erroneous 128 to 255 Byte frames).	1.3.6.1.4.1.40659.1.2.7.1.4
Octets256to511	>1320	R	Number of frames (tx and rx) with a length of 256 to 511 Bytes (including erroneous 256 to 511 Byte frames).	1.3.6.1.4.1.40659.1.2.7.1.5
Octets512to1023	>1320	R	Number of frames (tx and rx) with a length of 512 to 1023 Bytes (including erroneous 512 to 1023 Byte frames).	1.3.6.1.4.1.40659.1.2.7.1.6
Octets1024toMax	>1320	R	Number of frames (tx and rx) with a length of 1024 to MaxSize <sup>1</sup> Bytes (including erroneous 1024 to MaxSize <sup>1</sup> Byte frames).	1.3.6.1.4.1.40659.1.2.7.1.7

**Table 9: SNMP histogram counters (histTable)**

### 2.3.2 RFC 1213 MIB

The following tables list all supported SNMP leaves of the RFC1213 “.mib” file. Please note that they are sorted by their corresponding SNMP branch.

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
ifNumber	all	R	Total number of network interfaces (regardless of their current state) present on the syn1588® Gbit Switch. If logged in as admin, this number includes the SNMP Management interface itself as well.	1.3.6.1.2.1.2.1
sysDescr	all	R	Description of the syn1588® Gbit Switch including its MAC address, the software version as well as the hardware revision.	1.3.6.1.2.1.1.1
sysUpTime	all	R	The time (in hundredths of a second) since the system was last re-initialized.	1.3.6.1.2.1.1.3
sysContact <sup>1</sup>	>1262	R/W	An administratively-assigned contact info for the syn1588® Gbit Switch.	1.3.6.1.2.1.1.4
sysName <sup>1</sup>	>1262	R/W	An administratively-assigned name for the syn1588® Gbit Switch.	1.3.6.1.2.1.1.5
sysLocation <sup>1</sup>	>1262	R/W	An administratively-assigned description of the syn1588® Gbit Switch's location.	1.3.6.1.2.1.1.6
sysServices	all	R	A value which indicates the set of services that the syn1588® Gbit Switch primarily offers. Defined in accordance with RFC1213.	1.3.6.1.2.1.1.7

**Table 10 RFC1213 MIB: global SNMP leaves (System Branch)**

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
ifIndex	all	R	A unique value, assigned contiguously starting from 1, used to identify each interface.	1.3.6.1.2.1.2.2.1.1
ifDescr	all	R	A textual string containing information about the interface. Includes the name of the manufacturer, the product name and the version of the interface hardware/software.	1.3.6.1.2.1.2.2.1.2
ifType	all	R	Type of interface according to IANAifType (see IANA Interface Type MIB at <a href="http://www.iana.org">http://www.iana.org</a> ).	1.3.6.1.2.1.2.2.1.3
ifMtu	all	R	Largest Packet which can be received / transmitted via this Port.	1.3.6.1.2.1.2.2.1.4
ifSpeed	all	R	Nominal link speed of this port (link state has to be 'up') in bytes per second.	1.3.6.1.2.1.2.2.1.5
ifPhysAddress	all	R	MAC Address of the syn1588® Gbit Switch.	1.3.6.1.2.1.2.2.1.6
ifOperStatus	all	R	Link state of this port [up (1), down(2), unknown <sup>2</sup> (4)].	1.3.6.1.2.1.2.2.1.8
ifLastChange	all	R	The value of sysUpTime at the time the syn1588® Gbit Switch entered its current operational state.	1.3.6.1.2.1.2.2.1.9
ifInOctets	all	R	Total number of octets received on this port.	1.3.6.1.2.1.2.2.1.10
ifInUcastPkts	all	R	Total number of good incoming Unicast frames on this port.	1.3.6.1.2.1.2.2.1.11
ifInNUcastPkts	all	R	Total number of good incoming Multicast Broadcast frames on this port.	1.3.6.1.2.1.2.2.1.12
ifInErrors	all	R	Total number of inbound packets on this port that contained errors. Includes packets with oversize, undersize, fragmented packets, jabber and frames with an invalid FCS.	1.3.6.1.2.1.2.2.1.14
ifOutOctets	all	R	Total number of octets received on this port.	1.3.6.1.2.1.2.2.1.16
ifOutUcastPkts	all	R	Total number of outgoing Unicast frames on this port.	1.3.6.1.2.1.2.2.1.17
ifOutNUcastPkts	all	R	Total number of outgoing Multicast Broadcast frames on this port.	1.3.6.1.2.1.2.2.1.18

SNMP Leaf	SW	R/W	Description	Object Identifier (OID)
ifOutErrors	all	R	Total number of outbound packets that could not be transmitted on this port because of errors.	1.3.6.1.2.1.2.2.1.20

**Table 11 RFC1213 MIB: SNMP leaves used for traffic monitoring and general port information**

#### Notes

<sup>1</sup> Note that this is a SNMPv1 leaf. Setting this leaf requires a SNMPv1 ‘Set’ command. Please refer to your MIB-Browser’s settings for more information on how to issue a SNMPv1 ‘Set’.

<sup>2</sup> As the port status of the SFTP port currently cannot be determined, it is always set to “up”.

## 2.4 SNMP Firmware Update

The SNMP firmware update requires the initial network setup to be performed (see section 2.2.2) and all pre-requisites to be met (see section 2.2.1). Additionally a TFTP server with access to the latest firmware file (which is named “update”) has to be setup as described below in section 2.2.1.2.

### 2.4.1 Check the Network Connection

First, please verify that you can connect to the syn1588® Gbit Switch via SNMP. If you have not setup the syn1588® Gbit Switch yet, please perform the initial network setup first (see section 2.2.2).

Additionally, please check that the UDP port 69 (or your own specified TFTP server port “TFTPSPort” (see Table 4) is not blocked by any firewall as this port is needed for the TFTP file transfer. The same goes for the TFTP client port “TFTPCPort”.

### 2.4.2 Configuration of the TFTP Server

Start up your TFTP server software. Using tftpd32 (see <http://tftpd32.jounin.net>) is recommended, but any other TFTP server may be used as well. Please verify that the TFTP server has access to the firmware file “update”.

The TFTP server has to be configured as follows:

- Disabled option negotiation (as defined in RFC 2347) between client and server
- No security options enabled
- Disabled PXE compatibility



### 2.4.3 Start MIB Browser and login as Admin

Load all necessary MIBs in your MIB browser (see Table 1) and log in as admin using “user” and “password” using “admin” for the SNMP “User” leaf and “oregano snmp” for the “Password” leaf (see Table 2). If logged in successfully, a ‘Get’ operation on the SNMP “User”/“Password” leaf will now read “logged in as admin”. In case of a timeout error, please check your network connection to the syn1588® Gbit Switch.

### 2.4.4 Initiate the Updating Process

The server port (which typically is 69) and client port (often defined as a local ports pool, which in this case includes one port only) have to be set to the same values on both the syn1588® Gbit Switch and the TFTP server. To verify this, please check the SNMP leaves “TFTPSPort” (server port), “TFTPCPort” (client port) as well as “TFTPSAddr” (IP address of TFTP server). The standard configuration of these parameters can be found in Table 3.

Perform a ‘Set 1’ on “StartUpdate” via your MIB Browser. Check your TFTP server’s progress bar, once the transfer is finished the syn1588® Gbit Switch immediately restarts. You can also verify the status of the TFTP transfer by performing the ‘Get’ command on the “StartUpdate” entry.

If no progress bar appears and the ‘Get’ command on the “StartUpdate” entry indicates that the updating process is not running, please make sure that you are still logged in as admin by performing, a ‘Get’ operation on the SNMP “User”/“Password” leaf which should read “logged in as admin”.

After the TFTP transfer has finished, the syn1588® Gbit Switch restarts. The syn1588® Gbit Switch requires approximately two minutes to adapt the new firmware. During this period the SNMP management feature will be not available.

### 2.4.5 Verify Update

One can easily verify that the update had been performed successfully by reading the “SysDescr” parameter (OID 1.3.6.1.2.1.1.1), which includes the currently used SNMP firmware version. If the software version has changed to the expected version, the updating process has now been completed. If the firmware version number indicates an older version as expected and “(Factory Default)” has been appended, the update file has been corrupted and a reset to factory default has been performed. In this case, please go through the updating process once again. If the process fails again, please contact Oregano Systems.

## 2.5 Reset to Factory Default

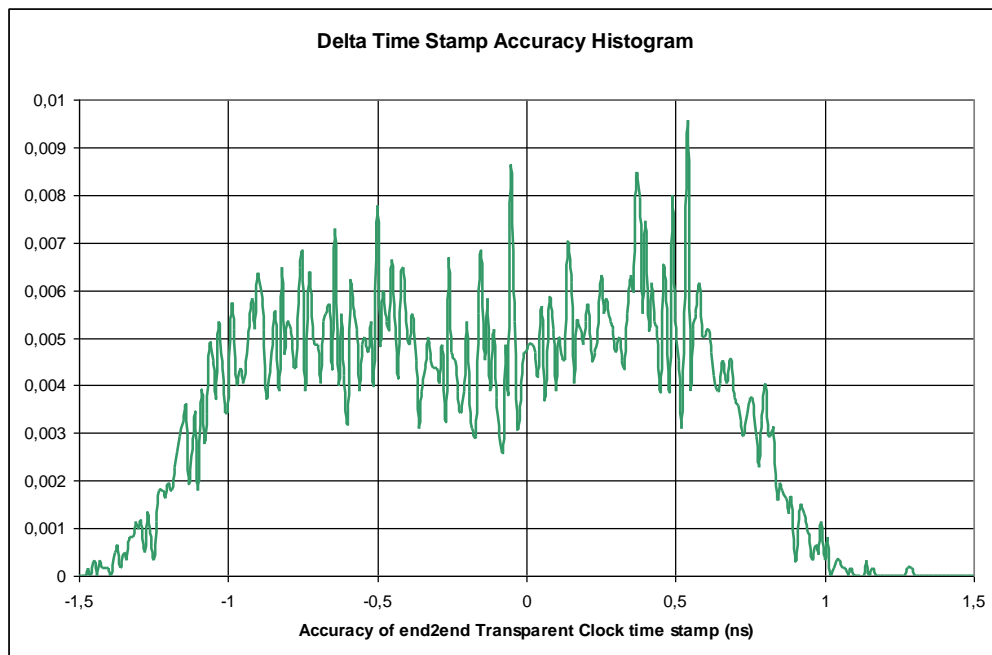
A reset to factory default may be performed either to downgrade from a flashed firmware version or to reset an invalid configuration. After the factory default reset is performed, a basic “golden” firmware is loaded and the syn1588® Gbit Switch’s configuration is reset to its standard values (see Table 2).

There are two ways to perform a factory default; either by simply using the “ForceGold” SNMP leaf while logged in as admin (see Table 3) or by shorting two lines of the UART as described below.

1. Power-off the syn1588® Gbit Switch; disconnect the mains cable.
2. Short both the Rx (receive) and the Tx (transmit) lines of the syn1588® Gbit Switch’s UART connection. When using the desktop case version of the syn1588® Gbit Switch, these lines are the two outer lines of the RJ11 plug. For the rack version of the syn1588® Gbit Switch, the Rx and Tx lines are located at pin 2 and 3 of the DB9 plug.
3. Reconnect the syn1588® Gbit Switch to mains and wait for the syn1588® Gbit Switch for power-up. This process will take about two minutes. The SNMP leaf “SysDescr” should now have “(Factory Default)” appended. Now, the syn1588® Gbit Switch is running its golden firmware with the factory default user configuration.
4. Remove the short from the serial interface connector. Power-off the syn1588® Gbit Switch and wait 10 seconds before powering on the syn1588® Gbit Switch again. Please note that a power-cycle has to be performed, a soft reset via the “Restart” SNMP leaf is not sufficient.
5. As configuration of the syn1588® Gbit Switch is set to its default values, performing the initial network setup (see section 2.2.2) is necessary to set the correct network settings again. To make use of the latest set of SNMP features, an update to the latest firmware is recommended (see section 2.3).

### 3 Accuracy

Due to full utilization of the high performance FPGA Oregano Systems can offer the syn1588® Gbit Switch with a time stamp accuracy in the nanosecond (ns) range. This has been made possible by adding special high speed pre-scaler to the time stamping unit effectively pushing the resolution to 2 ns at which the residence time of the IEEE1588 timing packet on the syn1588® Gbit Switch can be determined.



**Figure 6 syn1588® Histogram of Delay Jitter**

Figure 3 shows a normalized histogram of the delay variations caused by measurement inaccuracies of the end-2-end transparent clock. It can be seen that those are well within 1 ns. The measurement has been made using an external high precision counter timer (STANDFORD RESEARCH) as an independent means of measuring the time a packet resides on the syn1588® Gbit Switch.

## 4 Specifications

### 4.1 RoHS Conformance

The syn1588® Gbit Switch is manufactured RoHS compliant. Please find the RoHS Certificate of Conformance attached to this datasheet.

### 4.2 Copper Ethernet Interfaces

The eight copper ports (RJ45 connectors) conform to IEEE802.3-2008 and support the 10/100/1000 Mbit full duplex mode. 10/100 Mbit half duplex mode may be operational but is not tested. For IEEE1588 operation full duplex mode is required.

### 4.3 SFP Ethernet Interface

The SFP interface (ninth uplink port) supports the following SFP transceivers (3V3 single power supply, SGMII interface).

Vendor	Type	Mode	Range	Connector	Order Number
Teosco	fibre	1000BASE-X	short (550 m)	LC	TEO-1.25GSFP-02
Teosco	fibre	1000BASE-X	long (10 km)	LC	TEO-1.25GSFP-10
Teosco	copper	1000BASE-T		RJ45	TEO-1.25GSFP-T
Finisar	fibre	1000BASE-X	short (550 m)	LC	FTLF8519P3BNL
Finisar	fibre	1000BASE-X	long (10 km)	LC	FTLF1318P2BCL
Fiberstore	fibre	1000BASE-X	short (550 m)	LC	SFP1G-SX-85
Fiberstore	fibre	1000BASE-X	long (10 km)	LC	SFP1G-LX-31
Fiberstore	copper	1000BASE-T		RJ45	SFP-GB-GE-T

**Table 12 Supported SFP transceivers**

The SFP interface supports 1000 Mbit full duplex mode, i.e. 1000BASE-T or 1000BASE-X.

## 4.4 Serial Interface

### Caution

The serial interface is intended to perform the reset to factory default of the syn1588® Gbit Switch only (see section 2.5)! Do not connect this interface during the device's normal operation.

### 4.4.1 Serial Interface Pinout

The pinout of the serial interface connector (9-pin female sub-D connector) follows the DCE (data communication equipment) pinout and thus allows a connection to a host computer using a simple straight cable.



Figure 7 serial interface connector for the 19" rack-mount case

Pin	Function	Direction
reserved	1	-
TxD	2	out
RxD	3	in
reserved	4	-
GND	5	-
reserved	6	-
reserved	7	-
reserved	8	-
reserved	9	-

Table 13: Pinout of the serial interface connector for 19" rack-mount case

<b>Baudrate</b>	115200
<b>Databits</b>	8
<b>Parity</b>	None
<b>Stopbits</b>	1
<b>Hardware Flow Control</b>	None

Table 14 Serial interface configuration

## 4.5 ESD

The syn1588® Gbit Switch is protected against ESD damage following IEC61000-4-2 15 kV air 8 kV contact.

## 4.6 Temperature Range

Operating Temperature Range	0°C to +50°C
Storage Temperature Range	-40°C to +85°C
Humidity	5% to 90% non-condensing

Table 15 Temperature range

## 4.7 Power Supply

The syn1588® Gbit Switch is operated directly from mains.

AC Characteristics	
Mains voltage range	90-264 VAC
Mains frequency range	47-440 Hz

Table 16 Mains power supply: characteristics

The mains connector is compliant to IEC 60320 C14 and includes fuses (primary side).

### 4.7.1 Mains Fuse



Figure 8 Mains connector with fuse drawer

The syn1588® Gbit Switch mains connection is protected by two fuses. See the mains connector on rear side in Figure 8.

#### Caution:

Opening of mains fuse socket is restricted to authorized service personnel.

When ordering the syn1588® Gbit Switch it will be equipped with the correct fuses for your local mains settings. If you plan to use the syn1588® Gbit Switch in a different region with other mains voltage you have to adapt the mains fuse accordingly the following tables.

**Caution:**

Change the fuses only when disconnected from mains! Never open the fuse socket when unit is still connected to mains!

AC Mains	Required fuse	Fuse Type
230 VAC	2 x 0,8 A slow blow	IEC 5x20mm e.g. Littlefuse 0218.800MXP Digikey F1744-ND
120 VAC	2 x 1,6 A slow blow	IEC 5x20mm e.g. Littlefuse 021801.6MXP Digikey F1749-ND

**Table 17 8+1 port in 19" 1HE case:  
Proper mains fuses for different mains voltages**

**Caution:**

Using the wrong mains fuses may lead to a severe damage of the device or even cause fire hazard. In case of doubt please contact Oregano Systems support in advance.

## 4.8 Handling & Safety Information

The syn1588® Gbit Switch may be mounted fixed into e.g. a 19" rack or used as a desktop unit.

The mains plug is used as the separator for the mains supply. Thus the socket for connecting the mains of the syn1588® Gbit Switch shall be located in close distance to the unit and shall be easily reachable.

We recommend a 10 A fuse for this mains socket.

## 4.9 Weight

Total weight of the syn1588® Gbit Switch 8+1 port configuration approx. 3730 g.

## 5 Mechanics

### 5.1 19" 1HE Case

The depth of the 19" 1HE case is 254 mm.

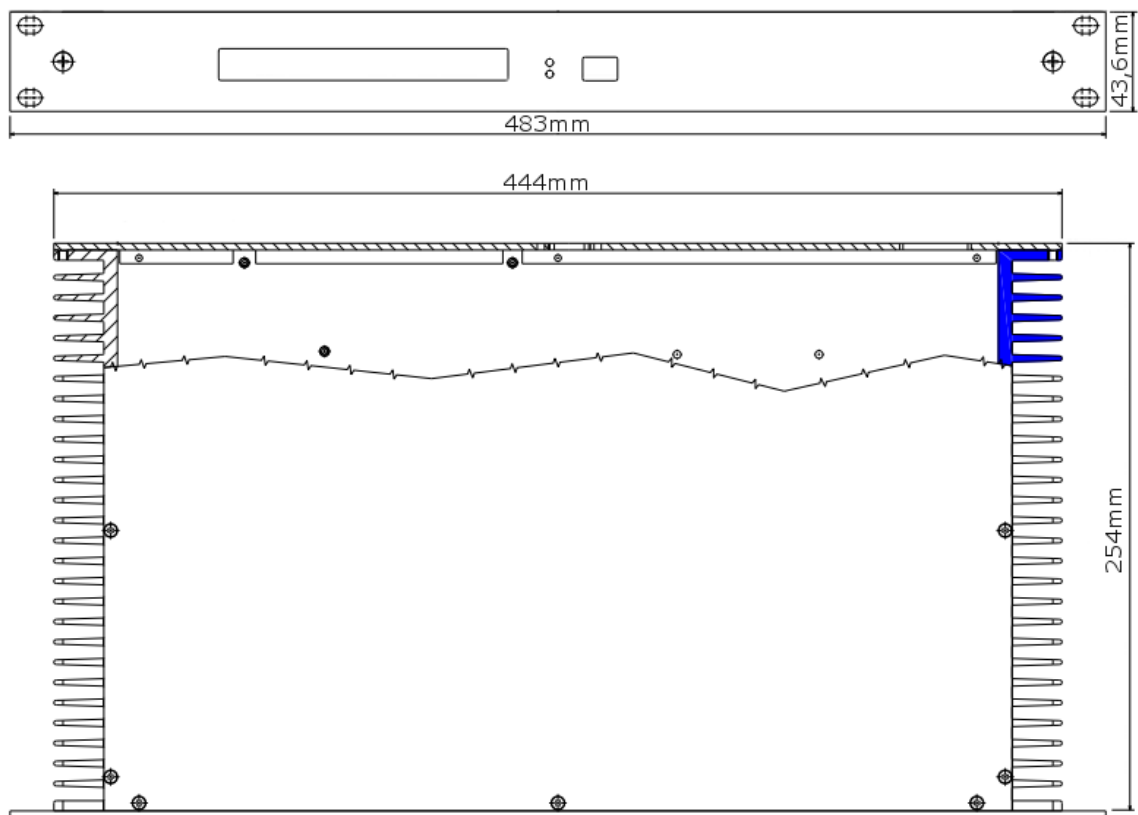


Figure 9 syn1588® Gbit Switch: Dimensions 19" 1HE case front plate – 8+1 port version



## 6 Further Information

You are looking for further information not included in this datasheet? Please contact Oregano Systems support! We will be pleased to provide you all the required information.



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Vienna, July 2016

## RoHS Certificate of Conformance

The Oregano Systems' syn1588<sup>®</sup> products listed below is (are) in compliance with Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directives).

- syn1588<sup>®</sup> Gbit Switch (board revision 1.7)
- syn1588<sup>®</sup> Gbit Switch (board revision 1.8)
- syn1588<sup>®</sup> Gbit Switch (board revision 1.9)
- syn1588<sup>®</sup> PCIe NIC (board revision 1.5)
- syn1588<sup>®</sup> PCIe NIC (board revision 2.0)
- syn1588<sup>®</sup> VIP Evaluation Board (board revision 2.1)

Oregano Systems – Design & Consulting GesmbH

Gerhard R. Cadek  
(CEO)

