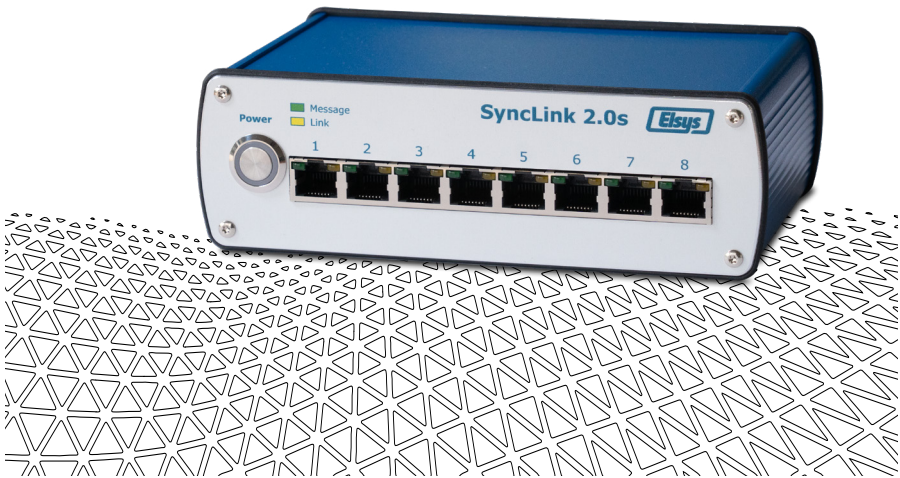


# SyncLink

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Device Synchronization



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User Manual

SyncLink 2.0  
SyncLink 2.0s



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## Warning

Lethal voltages exist inside the TraNET instrument. Only qualified technicians of supplier staff are authorized to open the TraNET case. Otherwise warranty will be lost!

Always ensure that power cord is removed before opening the case.

## Safety Information

This instrument is intended for indoor use and should be operated in a clean, dry environment. Do not block any ventilation openings.

Make sure this product's operating environment is kept within the parameters as specified in the chapter Operating Condition!

The design of the instrument has been verified to conform to the EN 61010-1 safety standard per the following limits:

- Installation (Over voltage)
- Category II (Main Supply Connector) and Category I (Measuring Terminals)
- Pollution Degree 2
- Protection Class I

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# 1. Introduction

The SyncLink 2.0 and SyncLink 2.0s is built to synchronize multiple TraNET transient recorders for having sample precision clock timing and trigger distribution from and to all connected devices. This makes it possible for one device to trigger all other devices connected to the SyncLink without a time delay.

Compared to the 2.0s devices, the SyncLink 2.0 devices have an optical interface with which several SyncLink 2.0 devices can be connected in series over very long distances.

## 2. Hardware Setup and Wiring

The connection between TraNET devices and the SyncLink is made via RJ45 cable. Although this cable is the same type as for the Ethernet connection of the devices, there is no data transfer via the SyncLink connection, only synchronization. Therefore, a multi-device system must be connected with an Ethernet switch and SyncLink.



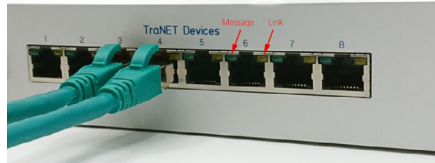
Use CAT6 cables for SyncLink connections. Note that all cables must be the same length, the maximum length is 50m!

Up to 8 TraNET devices can be connected to one SyncLink. All sockets from 1 to 8 are equivalent.

The yellow LED on the right side of each connector is switched on once the TraNET device

has detected successfully the SyncLink device. **SyncLink detection is done only during powering up the TraNET device, therefore the SyncLink must be turned on and connected before turning on the TraNET device!**

The green LED on the left side is blinking each time a trigger, stop or ping message is received from the TraNET device.



### 2.1 Distributed Multi-Device Synchronization

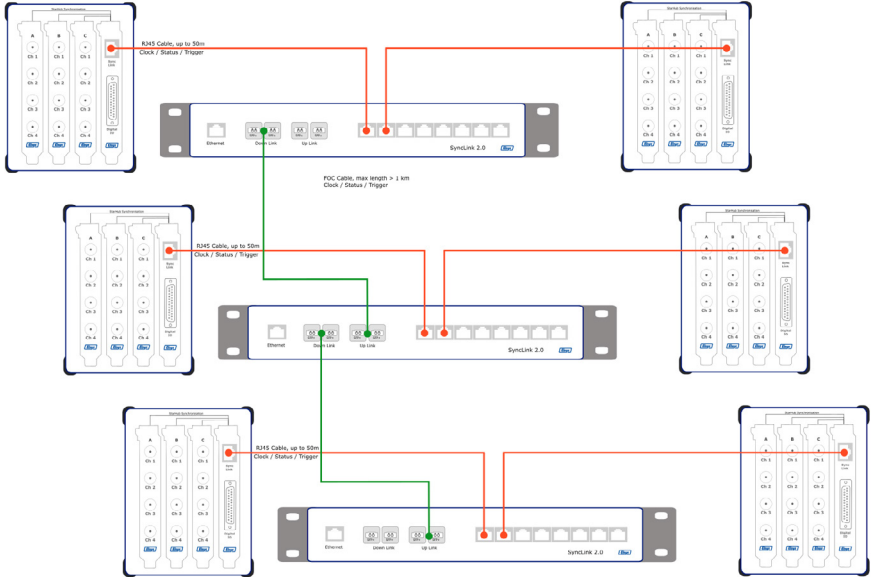
The SyncLink 2.0 is the highest level of synchronization and allows to daisy-chain several SyncLink units together. The connection between them is established over fiber optical cables (FOC) allowing much larger distances between the DAQs than possible with the SyncLink 2.0s.

Each SyncLink 2.0 has an Up-Link and a Down-Link interface consisting of two SFP+ converters each. The UpLink interface must be connected to a DownLink interface on the second device. Each



It is important to use the same type of SFP+ module on each slot. The type of module must be adapted to the used fiber cable and cable length!





# 3. Web-Interface

(SyncLink 2.0 only)

The SyncLink 2.0 can be configured and monitored over a built-in web interface. The standard IP address is 192.168.0.29. The interface has only a JSON output interface, for visual representation use the SyncLink2.html file provided on the USB stick.

Enter the IP address of the SyncLink device and press connect. The Connection Status table will be filled out as shown above where one TraNET device is connected on the port 1. The "TraNET detected" field indicates that the SyncLink has detected a device on that port. The "Sync. Enabled" field indicates that the TraNET device has also detected the SyncLink device and the synchronization is activated. The Down-Link and Up-Link report only the detection status, the enabled status is always false! This table is automatically updated.

## 3.1 Set new IP address

Proceed as follows for setting a new IP address:

- Set the actual IP address of the device in the IP address field and press "Connect"
- Be sure the message "Connected" appears and the "Connection Status" table is filled out.
- Enter the new IP address in the "IP address" field and press "Set new IP"
- Power down the SyncLink and restart.
- Press F5 in the browser
- Set the new set IP address in the "IP address" field and press "Connect"
- The message "Connected" should now appear.

### Reset the IP address to default

Press the Reset button on the rear side of the device during power up. This will set the IP address back to 192.168.0.29

### Device Information

IP Address:

Connected

Connection Status			Delay Settings		External Synchronisation	
	<b>Channel</b>	<b>TraNET detected</b>	<b>Sync. Enabled</b>	Measured Delay to the Master: 1	Status: off	
				Additional Delay: 33	Actual Regulation Value: 4096	
1		true	true	<input type="text" value="Set Delay"/> <input type="text" value="33"/>	<input type="button" value="Ext. Sync On"/>	<input type="button" value="Ext Sync Off"/>
2		false	false			
3		false	false			
4		false	false			
5		false	false			
6		false	false			
7		false	false			
8		false	false			
Down-Link		true	false			

## 3.2 Raw Command List

The RAW information can be read out as a JSON message with the following list of terms:

<code>http://IPAddress/home</code>	JSON response: [ {"Nr":0,"Connected":false,"Enabled":false}, {"Nr":1,"Connected":false,"Enabled":false}, {"Nr":2,"Connected":false,"Enabled":false}, {"Nr":3,"Connected":false,"Enabled":false}, {"Nr":4,"Connected":false,"Enabled":false}, {"Nr":5,"Connected":false,"Enabled":false}, {"Nr":6,"Connected":false,"Enabled":false}, {"Nr":7,"Connected":false,"Enabled":false}, {"Nr":8,"Connected":false,"Enabled":false}, {"Nr":9,"Connected":false,"Enabled":false}, {"gps_sync_state":true,"pwm_value":4927}, {"sync_delay":0}, {"delaycounter":1}]
<code>http://IPAddress/setdelay?d=x</code>	Set the Multi-Sync delay, x = 0 to 255
<code>http://IPAddress/gps_on</code>	Turn on external GPS/PPS synchronisation
<code>http://IPAddress/gps_off</code>	Turn off external GPS/PPS synchronisation
<code>http://IPAddress/ipset?ip=NEWIP</code>	Set a new IP address in the form xxx.xxx.xxx.xxx

### 3.3 Delay Line Compensation

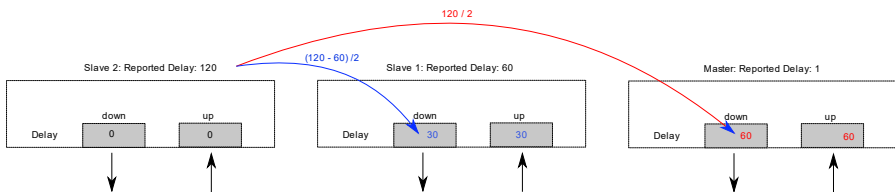
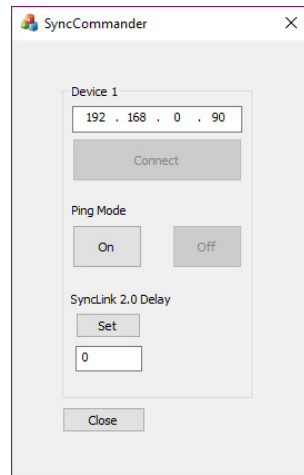
When using only one SyncLink 2.0 device, the delay based on the cable length between the device is compensated automatically by the TraNET device. No further actions are necessary.

In a Multi-SyncLink setup, the delay added by the FOC connection must be compensated manually by the following procedure:

1. A Ping message must be sent from all connected devices to the master SyncLink (SyncLink on which nothing is connected to the Up-Link port). This can be done with the SyncCommand Tool:
2. Enter the IP address of your TraNET device, press connect and turn Ping Mode on. The device starts sending out ping messages to the SyncLink. The message LED on the SyncLink connector will start blinking with a 1 Hz frequency. TraNET FE indicate sent and received messages by blinking with the "Recording" LED when the ping is sent, and with the "Armed" LED when the ping is successfully sent back from the SyncLink to the device.
3. Repeat point 2 with at least one device per SyncLink
4. Open the SyncLink2.html page in a web browser, enter the IP address of your SyncLink and connect. Note the value under "Measured delay to the Master". Repeat this for each SyncLink.

5. The reported delay must now be used for configuring the Delay of each SyncLink as shown on the image.
6. Set the delays on the SyncLink2.html page for each device.

Now the system is synchronized. The additional delay added to each node has the effect that the trigger line is delayed from the effective trigger condition.



# 4. Working with Multiple Devices in TranAX

## 4.1 Device connection

Start the TranAX application software and choose "Redefine device connection..." when the start screen shows up.

All devices to which you are connected are now listed in the control panel.

Select all the devices you want to connect using Ctrl and the left mouse button. Then push "connect".

Name	Description	Address	Visible	Status
<input checked="" type="checkbox"/> FE371043	TranAX T_2045_FE_2044 1x45/05/16	192.168.0.33/10010	<input type="checkbox"/>	
<input checked="" type="checkbox"/> FE371040	TranAX T_404_FF_4046 open base	192.168.0.43/10010	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Desktop BA	TranAX	192.168.0.76/10010	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Backup Mirror	Backup/Recovery Mirror (FPC)	192.168.0.75/10010	<input type="checkbox"/>	
<input checked="" type="checkbox"/> TransMac2	TransMac 1x45/05/16, Master, AdjTrio, ECR	TransMac2.local/10010	<input type="checkbox"/>	

Connect Search IP-Address 127 . 0 . 0 . 1 10010 Connect Manually



The correct function of the SyncLink is shown with the double-arrow symbol.



Only the devices with this symbol are in sync.

These devices can be handled and configured afterwards in the Control Panel. Open your Experiment.

	Ch.	Name	Mode	Coupl.	Range	Offset	Input Range
Device: FE371043 (192.168.0.33/10010) 192.06 GB							
<input checked="" type="checkbox"/>	A1	A1	SE	DC 1M	10	50	-5 .. 5 V
<input checked="" type="checkbox"/>	A2	A2	SE	DC 1M	10	50	-5 .. 5 V
<input checked="" type="checkbox"/>	A3	A3	SE	DC 1M	10	50	-5 .. 5 V
<input checked="" type="checkbox"/>	A4	A4	SE	DC 1M	10	50	-5 .. 5 V
<input checked="" type="checkbox"/>	A5	A5	SE	DC 1M	10	50	-5 .. 5 V
<input checked="" type="checkbox"/>	A6	A6	SE	DC 1M	10	50	-5 .. 5 V
<input checked="" type="checkbox"/>	A7	A7	SE	DC 1M	10	50	-5 .. 5 V
<input checked="" type="checkbox"/>	A8	A8	SE	DC 1M	10	50	-5 .. 5 V
Device: FE371040 (192.168.0.43/10010) 88.04 GB							
<input checked="" type="checkbox"/>	A1	A1	SE	DC 1M	20	50	-10 .. 10 V

## 5. Trouble shooting

### 5.1 No connection

Check all cables for correct connection.

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The SyncLink must be switched on before any TraNET devices.

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### 5.2 Devices are in Sync-Mode but the SyncLink is disconnected

To use the TraNET device back in normal, non-synced mode, disconnect the SyncLink and restart the TraNET device.

Until a restart of the TraNET devices, the SyncLink mode will not disappear in the TranAX application software even if the Sync cables are disconnected or the SyncLink is switched off.

## 6. External Synchronization

(Only SyncLink 2.0)

The master clock of the SyncLink 2.0 can be synchronized to a 3rd part measurement systems by applying an external 1 Hz (1 PPS) signal on the PPS input plug on the rear side of the device. The synchronization must be activated over the Web interface by clicking on "Ext. Sync On".

The actual regulation value gives an indication of the actual synchronization state between the internal and external clock. Stable values ( $\pm 20$ ) means the synchronization is under 1 $\mu$ s. Values of 0 or 8192 means the applied clock has more than 150pps deviation from 1 Hz and so the internal clock cannot follow it.

The 1 Hz signal can be produced from various timing device like GPS receiver, IRIG receiver or PTP receiver.

## 7. Hardware Specification

	SyncLink 2.0	SyncLink 2.0s
Max. Number of Connected Devices	8	8
TraNET Device Connector	RJ45	RJ45
Cable Type	Cat. 6	Cat. 6
Max cable length	50m	
Synchronization Precision	< 12.5 ns (80 MS/s)	
Internal clock precision	< 50 ppm	
Trigger Output	5V TTL Level 50 Ω output impedance	
External PPS input	1 HZ ±150ppm, TTL Level, max 10V	not available
PPS sync. precision	Short term: ±1μ long term: 0 μs	not available
FOC Interface	SFP+ Transceiver (not included)	not available
Power	100 - 240VAC, 50 or 60 Hz	12V DC
Dimensions	19", 1 U	