KPN Internet

Modem/router specifications on Fiber Optic

Target audience: customer and manufacturer.

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General

Select, connect, set up and use your own equipment

Before purchasing/connecting your own equipment, check your connection.

Step 1. Inform yourself and see what connection you have.
Are you not yet aware of the type of connection your subscription is connected to? Request this via the service tool.
This can be found at kpn.com/eigenapparatuur

Step 2. First check the technical requirements of your connection before choosing your own equipment.
Tip: If you buy your own equipment, make sure it is future-proof. Therefore, choose equipment with at least a 1Gbps ethernet connection

The current connection technology of your home connection:
a. xDSL over Copper Wire (see other document)
b. Fiber Optic (this document)
- EoF/ GoF = (AON technique)
- GPON / XGSPON = (PON technology)

Important!
It is best to connect your own equipment, such as your own WiFi router, with a network cable to the Ethernet connection of the (O)NT (Optical Network Terminal) installed by KPN.

This (O)NT is supplied as standard and serves as a fibre optic modem. It ensures that light signals (which enter your home via the fibre optic network) are converted into the usual electrical signals for your KPN box or own router.

Please note: use the (O)NT that we supply (with Ethernet connection and RJ45 plug). The glass fiber in the glass fiber connection point (FTU where the glass is mounted) is very vulnerable. We therefore strongly advise against disconnecting the (O)NT from the FTU.

A damaged or dirty fiber optic connection can cause a malfunction. A defect in the connection point can only be repaired by a specialist technician. This can interrupt your services for a few days. There are also costs involved for repairing the connection point.

Technical requirements of your fiber optic connection

Please note: each fibre optic technology; AON, PON or XGSPON is different and has its own specifications and is therefore not interchangeable. Connecting unsuitable equipment can cause a disruption.

Please note: when removing the (O)NT you must keep it. This is part of the house connection.
You will need this again if you stop using your own equipment, a fault investigation needs to be carried out or you move.

EOF / GOF (AON technique)

In this technique the NT is a media converter. The modem function to convert the light signal into an electrical network signal.

We will first convert a connection with EoF technology to GoF for you free of charge. Use the service tool on kpn.com/eigenapparatuur for this.

Specifications	Explanation
IEEE 802.3	1Gbps (1000Base-BX-10-U) (bidirectional Full duplex transmission, no auto-negotiation, no pause frames)
SFP Specs	- TX 1310 nm / RX 1490 nm - 14 km range - >15 dB power budget - Class 1 laser product
Transmit power	3 ... -9 dBm
Receive power	-3 ... -22 dBm
Type Fiber is singlemode Fiber (9/125)	With SC/PC connector (blue) or SC/APC connector (green). The connector used in the FTU can vary. Connect it via a coupling block of the correct type (colour). Attention: never connect different colours!

GPON / XGSPON (PON technology)

Do you have a connection on GPON technology? We will first convert this to XGSPON1 for you free of charge . Use the service tool on kpn.com/eigenapparatuur

Please note: equipment is not interchangeable between GPON and XGSPON.

Note:

1. KPN chooses to only give free choice of equipment with an XGSPON ONT. At addresses where a GPON ONT is already active, a migration to XGSPON must be performed. Only then can you switch to a free XGSPON ONT choice.

In XGSPON technology, the ONT is an indispensable part of the connection. The XGSPON ONT must not only meet the specifications (as stated below). The serial number must also be passed on to KPN for activation in the network. Use the service tool at kpn.com/eigenapparatuur for this. to request this.

Specifications	Explanation
Transmission	Rec. ITU-T G.9807.1
TX	1260 .. 1280nm
RX	1575 .. 1580nm
Transmit power	+4 .. +9dBm
Receive power	-28 .. -9dBm
FTU/ Fiber interface	FTU-TK01 (SC/APC)
OMCI	ITU-T Rec. G.988
Conformance test protocol	BBF 247 issue 4
Profile	A / B / C / D
Implementation	BBF TR-156 issue2
Authentication	Serial Number
Encryption	1:1 1:N 3, 4 TLS Multicast
KPN configures in the HAVE 3 VLANs	Internet: VLAN = 6 with priority P-bit = 1 Fixed Calling5 : VLAN = 7 with priority P-bit = 5 TV: VLAN = 4 (DHCP based which must also support IGMPv2) with priority P-bit = 5
Interface identification	Speed capability = 10 Gb/s Slot id = 1 Port id = 1
Operations	Dying gasp, automatic laser shutoff
Rogue Detection, Continuing	Serial rogue self-detection, rogue self-isolation, remote start and shutdown optical interface

The fiber optic connection point and the fiber optic techniques are described in the WBA service description. You can find the information in VULA-WBA Annex 2 (technical specifications). This document can be found on the KPN Wholesale website.
These specifications are leading with regard to the broadband connection.

Note:

2. XGS-PON upstream encryption support is expected in the near future. This function is optional and determined by the OMCI protocol.
3. The ONT shall support unique symmetric translation from Q-VID to S-VID as described in TR-156 : R-13, R-14, R-15.
4. The ONT must support downstream multicast IGMP messages on the multicast GEM port.
   This implementation choice is based on R-81 as described in TR-156 issue 2.
5. VLAN 7 is only used with older types of Experiabox for calling.

Step 3. Check the specifications of the services you want to use

We provide 3 services.

- By phone
- Internet access
- TV (IPTV)

For these services we use virtual networks, or VLANs. Your modem splits these VLANs and allocates the bandwidth: first telephony, then IPTV and then internet. VLAN 6 provides internet access and telephony (VoIP). VLAN 4 handles the television signal.

Technical details of Telephony (VoIP) (see other document)

Technical details Internet

- PPPoE via VLAN 6 (802.1q).
- PPPoE authentication PAP with a username and password (e.g. Internet / Internet).
- Maximum packet size (mtu) 1500 bytes (rfc4638)
- Obtain IPv4 address + DNS servers via PPPoE
- IPv6 address range + DNS servers (IPv6) via DHCPv6-PD request (in PPPoE). Use an address from range for router.

Note: If you set the DNS settings to “Automatic”, the correct DNS settings will be used automatically. Fixed DNS server settings are not recommended. In case of migrations, changes or activation of malware filter, this will block the operation.

To check whether your equipment is using the correct DNS servers.

- 195.121.1.34 to 195.121.1.66
- 2a02:a47f:e000::53 a 2a02:a47f:e000::54

If you use the KPN malware filter, other DNS servers are used for this Malware service

- 195.121.97.202 at 195.121.97.203
- 2a02:a47f:ac::202 en 2a02:a47f:ac::203

Malware filter information: https://www.kpn.com/service/internet/veilig-internetten/malwarefilter.htm

At KPN we use DNSSEC as standard to make your internet use more secure. https://www.kpn.com/service/internet/safe-internet/dnssec.htm

Technical details of Television (IPTV)

KPN uses the Routed IPTV configuration. The traditional bridge method cannot be used.

By using a router that supports VLANs and routing rules in the router, the TV receiver can communicate with both the internet and the TV platform. In the routed method, the IPTV platform and the TV receiver are connected to the router.

In this case, the router functions as the last device from the TV platform, so you must enable the IGMP proxy (IGMPv2). In addition, you must enable IGMP snooping on the router (and any switches) between the router and the TV receiver. This ensures that the multicast TV traffic is only offered on the ports of the switch to which the TV is connected. IGMP fast-leave is necessary to close unnecessary streams, such as the process of switching from channel to channel.

TV technical details (network specification and configuration)

- Ethernet VLAN 4 (802.1q)
- Address via DHCP required to send option60 (Vendor Class Identifier) with value: IPTV_RG.
- Specific route information can be requested via DHCP (option 55 contains 1, 3, 28 and 121)
- Extra; Do not use DNS servers + do not use default gateway. Specific routes only.
- Enable IGMP proxy including fast-leave option required for TV signal in home network (min. IGMPv2).
- Routed mode. KPN uses routed mode, not bridge mode

Note: in the broadcast TV signal, an announcement is regularly sent to the TV receiver (STB) stating that new software is available. The TV receiver will then, if new software is available (security updates and/or menu updates), reboot during the night and retrieve new software.

Note: If you have a lot of upstream traffic, you want calling and Interactive TV to have priority on your connection here. To avoid any loss of quality, prioritize calling and Interactive TV using value 5 (802.1p).

Note: To connect a TV to the TV receiver (STB), consult the Connecting and Using the TV page on KPN.com.

Note: Preferably connect your TV receiver with an Ethernet cable. However, do you want to connect the TV receiver via a wireless connection (wifi)? Then, in addition to the settings mentioned, it is important that your WiFi network supports efficient transport of IPTV via multicast. This 'multicast to unicast' (mc2uc) functionality is described in RFC 9119. In addition, a good WiFi signal is important to prevent loss of quality. Ensure sufficient signal strength and do not place the TV receiver too far from the nearest WiFi point and also ensure that the WiFi network can transport the TV signal. Preferably use a WiFi network with the WiFi 5 standard (802.11ac) or better.

Local network (home network)

- Assign IPv4 addresses (private range rfc1918) + DNS server(s) via DHCP server.
- Assign IPv6 addresses and DNS server(s) (range of obtained prefix) via SLAAC and/or DHCPv6.
- Enable IGMP snooping function for the network ports in your equipment (prevents TV signal on all ports)
- Enable IPTV support in WiFi network if TV receiver (STB) is connected wirelessly.

FAQ

What should I do if I want to use the KPN Experia Box again?

Have you installed your own equipment behind the (O)NT and do you want to use the Experia Box again? Then you should take the following into account: the KPN Internet and TV services will start working again almost immediately. The Fixed Calling service requires a reset of the KPN Experia Box. You can do this by resetting the Experia Box on the back of the modem with a paperclip. After this, the latest software, settings and SIP data will be retrieved from the network. You may also have to switch the other equipment connected to the modem off and on again once.

What should I do if I want to use the KPN XGSPON ONT again?

Have you installed your own XGSPON ONT and do you want to use the KPN ONT again? Then you should take the following into account: the KPN ONT is easy to place back by means of the slide-click system. However, you will have to register it again with KPN

References

- **AON:** Active Optical Network, is an active point-to-point fiber optic network located between the telephone exchange (CO) and the end user and that consists of components such as switches in street cabinets with power supply. https://en.wikipedia.org/wiki/Fiber_to_the_x#Active_optical_network
- **PON:** Passive Optical Network, is a passive fiber optic network. The architecture consists of a point-to-multipoint topology in which a single optical fiber serves multiple endpoints using passive fiber splitters to distribute the fiber bandwidth to the endpoints (purely passive components, so no switches, routers, and no power supply) https://en.wikipedia.org/wiki/Passive_optical_network
- **FTU:** The Fiber Termination Unit (FTU) is the base plate on which the incoming fiber is terminated. In the loop Over time, a number of variations of this have been developed and installed.
- **NT:** in the AON technique, the NT is a media converter and converts light signal into electrical signal, often offered on an Ethernet connection and RJ45 plug
- **ONT:** in PON technology, the Optical Network Terminal (ONT) is part of the broadband connection (from the Optical Line Terminal (OLT) and therefore more than a media converter. The ONT at the end point is identified by a unique serial number in the OLT. The ONT converts a light signal into an electrical signal, often offered on an Ethernet connection and RJ45 plug

- **ITU-T G.9807.1:** 10-Gigabit-capable symmetric passive optical network (XGS-PON) • **BBF 247 issue 4.** The BBF.247 certification program is open to all (XGS)-PON products with Ethernet interfaces and is based on the Broadband Forum TP-247/IR-247 test plan. It tests conformance to TR-156 and TR-280 using OMCI as defined in ITU G.988. https://www.broadband-forum.org/testing-and-certification-programs/bbf-247-gpon-onu-certification