NETWORK INSTALLATION GUIDE*

*Fibrus offer wholesale access in areas where public funding has been used to build the Network. Fibrus Networks is currently building the Network to achieve optimal performance and to support future Services. Fibrus Networks will inform you of product availability during the onboarding and ordering process.

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Introduction

This is a Network Installation Guide for Fibrus Ethernet Access Services and is designed for use by Retail Service Providers (RSPs) who are Wholesale partners of Fibrus Networks (Fibrus). For information on how to become a Wholesale partner with Fibrus please see our guide *How to Become a Wholesale Customer* available at https://hyperfastni.com/wholesale-partners or https://hyperfastgb.com/wholesale-partners.

This document contains important information and should be read in conjunction with the current Fibrus Networks Wholesale Services Framework Agreement, Wholesale Price List, Wholesale Access Service Level Agreement, Installation Services and Wholesale Access Order & Fulfilment documentation, which are available on the Fibrus website at https://hyperfastni.com/wholesale-partners or https://hyperfastgb.com/wholesale-partners.

Fibrus' approach is to enable wholesale customers to self-serve their customer requirements via direct digital access to the systems capable of high-volume transactions alongside dedicated relationship management to ensure their needs are met and to deal with specific requirements. The Operator Wholesale Gateway (OWG) is the ordering and fault management system for Fibrus wholesale products and services.

It is essential to understand what will happen so that your customers can prepare for our technician's visit. We hope you will find this guide useful, and if you have any questions about our installation process please contact your Wholesale Partner Manager.

Please note, Fibrus 'standard installations' are subject to an installation charge, Fibrus 'non-standard' installations require an installation survey to be performed by a Fibrus technician, are subject to quote and may be chargeable. Please refer to our wholesale price list for further information which is available at https://hyperfastni.com/wholesale-partners or https://hyperfastgb.com/wholesale-partners.

The criteria of a 'non-standard' installation is contained within this document. You must pass this information to your customer before any installation work is performed.

How we connect customers to the Fibrus network?

To connect a property to our network, we need to bring a fibre optic cable from the local Optical Distribution Point (ODP) to a location in the property where the customer agrees our Optical Network Termination box (ONT) is to be located.

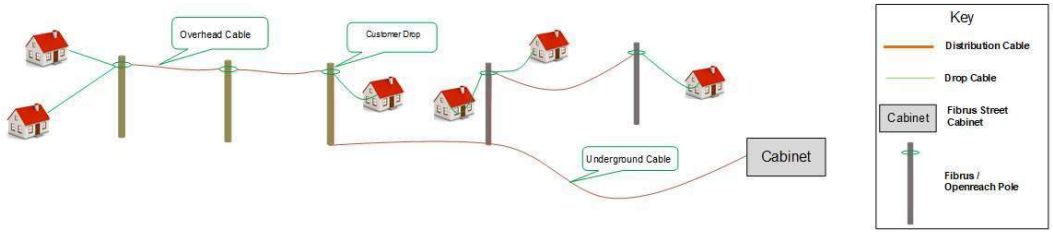

Figure 1: Fibrus access network overview

The majority of installations will be overhead, however in some cases we also use existing third party (e.g. Openreach) underground duct or a combination of Fibrus and third party underground duct.

Overhead Components

The Access network can be delivered from the cabinet to the customer via underground, overhead or a combination of both methods.

The aerial network is fed by an Ultra-Light-Weight (ULW) multi-fibre cable with strategically placed joints/splitters in pole mounted enclosures. During the build phase the customer drop ports are left with a terminated network fibre, so that on the receipt of a customer order, the port is ready to accept a drop cable from the customer premise without the need to open the enclosure.

Each aerial distribution node has the capability of housing fibre splitters and splice joints, which enables a number of premises to be connected by our multi-core aerial fibre. It is possible that multiple aerial fibre cables may be deployed on an aerial route.

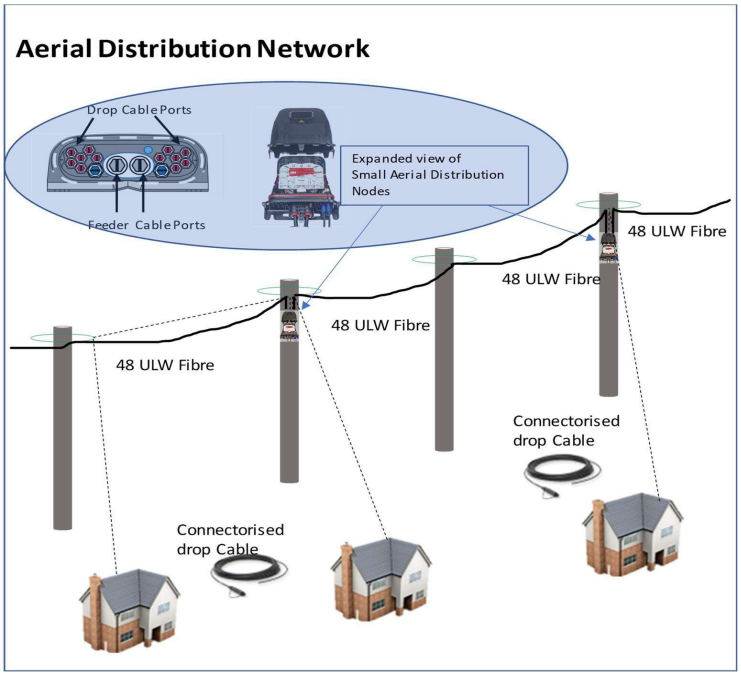

Figure 2: Aerial Distribution

Feeder cables are used to distribute fibre to customers along the pole route. Feeder cables are passed through the distribution points while individual customer drops are made available for customer connections. The capacity of the multi-fibre (eg 48 fibre) can be optimised with strategic placement of splitters within specific distribution nodes.

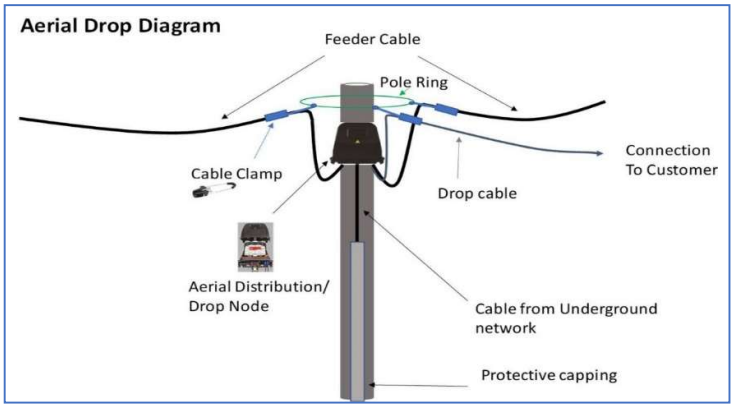

Figure 3: Pole with Aerial Feeder and Drop Cables

The fibre is connected to the initial pole in the aerial network from the underground network as shown in the Aerial Drop Diagram above. Stress on the connections to the aerial node is prevented by using aerial clamps that are connected to the metal pole ring. Feeder cables can be routed in different direction from the initial pole.

For an overhead installation a cable is installed from the pole to a location at an appropriate height on the premise. An eye-bolt and clamps are used to tension the cable, which is routed down the wall and into the premise. In most instances this will be a direct installation of the fibre, however, there may also be instances where a fibre splice is required. A cable entry cover will be placed over the entry point for the cable enters the premise.

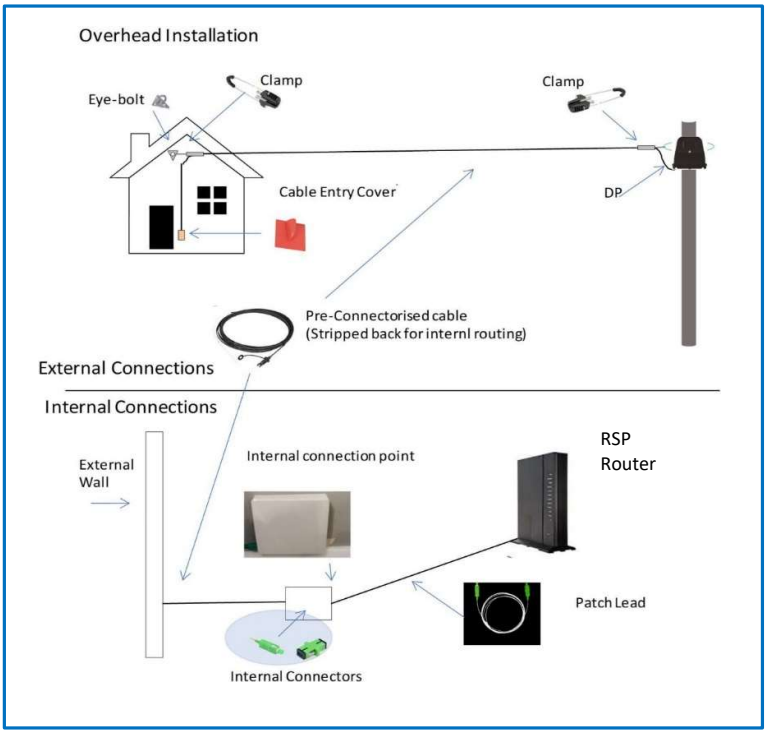

Figure 4: Home installation (Overhead)

The Fibrus ONT must be fixed to a wall inside the property, close to a power socket. The fibre cable runs from outside through a hole we will drill in the wall, and terminates at the ONT. If the ONT is located away from the point of entry into the property, we will run up to 3m of internal cable to the point where the ONT is to be fixed (unless a non-standard order has been placed which may incur additional cost).

Before commencing the installation, our technician will ask the customer representative (who must be authorised to make the decision and over 18 years of age) to agree the route of the fibre optic cable into the property.

NOTE: There must be someone over the age of 18 at the property during the installation with authority to agree the route and ensure that the installation is carried out as agreed.

Please ensure that the route of the installation is within the boundaries of the property. If

we are asked to install across a route where we do not believe we have the necessary consents or permission, we will not be able to carry out the installation and there may be an abortive visit or cancellation charge raised for a failed installation.

When the work is complete the customer should find the work area left neat and tidy, holes sealed with silicone and the area outside reinstated as close as possible to it's original state.

Standard Installation - Underground

In many cases, Fibrus expect to use standard overhead installation, however if there is usable underground duct on the premise Fibrus may opt to use this which may require some element of on site digging work to access the duct. If fibre is to be provided underground and duct is not available or is unusable (eg congestion or blockages), then this will be considered a Non-Standard Installation.

The internal connections for an underground delivered installation are similar to the overhead above.

Note: Process flow diagrams for both Underground and Overhead installations can be found in Annex A.

Non - Standard Installation

Our non-standard installation service covers underground installations where there is no usable existing duct (including congestion or excessive blockages) and installations with exceptions, as referred to in the Wholesale Services Framework Agreement, Wholesale Price List, Wholesale Access Service Level Agreement and Wholesale Access Order & Fulfilment documentation (which are available on the Fibrus website at https://hyperfastni.com/wholesale-partners or https://hyperfastgb.com/wholesale-partners) and installations which meet any of, but not limited to, the following typical non-standard criteria:

Example Non Standard Criteria:

a. Where hot lay tarmac is required to reinstate the ground
b. Unusual surface that will need specialist skills to lift and reinstate
c. Premise cannot be reached directly from the Distribution Point (eg due to the length of driveway or remoteness from the DP)
d. The ONT location cannot be reached with a standard fibre distribution cable

e. The eyelet bracket cannot be safely installed using standard access procedures (eg due to location or building requiring hoist access)
f. Installation route requested crosses a third party boundary
g. Onsite routing, access or safety issues prohibit a standard installation service
h. Exceptional issue that prohibits a standard installation service
i. Installation that requires survey

RSPs must check with their customer to ensure that the installation does not meet any of the above criteria before booking the installation. If the customer installation does meet any of the above criteria then RSPs must arrange a survey prior to the installation to make sure we have the correct equipment, materials and time available on the day of the installation. There will be an extra charge for non-standard installations.

Additional Services

The following additional services are available, please let us know if any are required. There may be a charge for these services.

- Internal cable run over 3m (using additional cable kit)
- Post installation relocation
- Site Survey (a site survey is included in all non-standard installations)

Reinstating at the property

Fibrus will reinstate the surface where we have installed our apparatus as close as reasonably possible to its original state, however it is not possible to dig trenches without leaving any trace. We will make good any damage to the property caused while carrying out the installation service, however we are not responsible for the cost of repairing any pre-existing faults or damage to property that are discovered while providing the installation services. Please report any customer concerns about work completed at the property to us as soon as possible.

Testing

This section is to help RSPs understand the testing phases expected to be completed before handing any circuits as Ready for service.

Once an NNI has been handed over with a certificate of service, Fibrus will provide a set of test data for you to use on your edge device to confirm connectivity between both parties.

Example of Test data

Test VLAN	**Test IP**
99	10.100.100.10/31

Once both parties have completed a series of tests, a return of the Certificate of Service and Fibrus Ready For Service will be confirmed between both parties

Example Test

Name Of Test	**Outcome**
Ping Test	Pass
Latency Test	Pass
Light Level Test	Pass (Light levels captured)

Circuit Testing

Fibrus will terminate all services on a layer 2 ONT (Fig 5). This device terminates the fibre coming into the building to provide an ethernet hand over to the customer.

When a Circuit is handed over as Ready for Service we will hand over the activated ONT with confirmed Light Levels.

You will be in a position to pass traffic across the ONT and do your own testing. It is suggested that you complete the following:

Example Test

Name Of Test	**Outcome**
Ping Test	Pass
Latency Test	Pass
Bandwidth Test	Pass (Speed Documented)

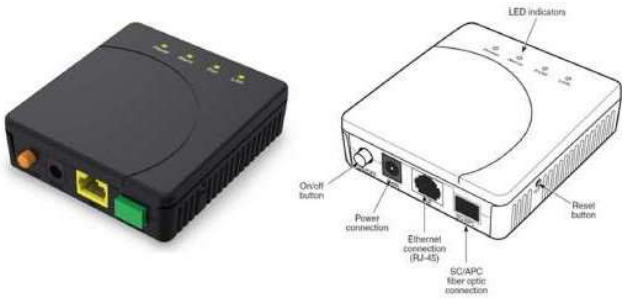

Figure 5: Typical ONT

The typical ONT has the following Characteristics

- One RJ-45 IEEE 802.3 compliant 10/100/1000 Base-T Ethernet port
- Auto-negotiation and MDI/MDIX auto-sensing
- Data transfer at wire speed
- Fixed MTU size of 2kb
- Dimensions H x W x D (mm) : 89 x 82 x 27
- Operating environment: -5°C to +45°C (23°F to 113°F)

Handover into service

Upon completion of the installation and successful testing, the service will be deemed complete an in service.

Note: NNIs will be handled with the named contact who sent the ready for service notification, however if an escalation is required please follow the escalation matrix found in the Customer Service Plan.

Things to consider

This is a list of things to think about to make your customer installation a quick and easy experience.

1. What surfaces will we need to dig?

   Turf, Loose soil, Loose gravel then soil, Compacted gravel, Concrete, Tarmac, Block paving, Flag stones.

2. Are there any garden walls or other structures to take into account?

   For example – walls, sheds, ponds, fountains, swimming pools, garages etc

3. Where will the ONT and router be situated (usually this is on the ground floor)?

   First floor – this can usually be accommodated, but may require more time and needs to meet the distance specification if a Standard Installation.

   Basement – installation in the basement may require a full survey and risk assessment, prior to commencing the works. This may mean that the customer property falls outside the Standard Installation service.

   Rear access - if the customer requires the ONT to be located at the back of the property this is likely to increase the time and cable length required to do the job and may move the installation into the non-standard category.

   Thickness of walls (if known) - If any external wall is over one meter thick, please let Fibrus know at the time of booking the appointment.

4. Is there anything unusual inside the property?

   For example – if we are installing close to a radiator or water supply, in a cupboard or any other obstruction, please let us know at the time of booking the appointment.

Important information about our network

Our network is made up of apparatus (fibre optic cables and related equipment) which is installed in the public highway and private property using rights granted to Fibrus under the part of the telecommunications legislation known as the Electronic Communications Code. This Code, in conjunction with the customers permission enables Fibrus to place apparatus on the customers property, to keep it there and maintain it.

The customer should ensure that any future purchaser of the property is made aware that the apparatus has been installed with these rights.

The customer should also ensure that any future owner or any other person doing work to the property is aware of the position of the apparatus, to enable them to avoid causing damage.

Important safety information

The Fibrus authorised technician will carry out a risk assessment before commencing any work. Please note the following safety rules which apply to all installations:

1. Technicians are not permitted to work at any premises unless a person over the age of 18 is present at all times.
2. Technicians are not permitted to enter loft spaces or eaves cupboards unless they are correctly boarded, well lit and have a walk-in entrance and are not permitted to work in confined spaces.
3. Technicians are not permitted to use customer ladders, stepladders, access equipment or tools.
4. Technicians are not permitted to lend their tools or equipment to customers to complete parts of the job or any other work.
5. Technicians cannot disturb or work in the vicinity of areas where they believe that asbestos is present.
6. Technicians are not permitted to access flat roofs or roof structures.
7. Technicians cannot access underground structures, spaces or excavations or lift floor boards or drill through floors or ceilings.
8. Technicians are not permitted to move electrical equipment, furniture, fixtures or fittings.

ANNEX A INSTALLATION FLOW DIAGRAMS

The installation process for both Underground and Overhead installations are illustrated below.