Gigaclear Engineering
Network Self-Install Guidance

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2. Introduction and Scope

Gigaclear Networks builds and operates a Fibre to the Home network which can replace existing BT copper telephone infrastructure and provide Ethernet services up to and beyond 10 Gigabits per second with existing technology.

This network uses fibre optic cables, which are more complicated to work with than copper cables and can be easily broken or damaged. This guide aims to explain the practicalities and recommended approaches for potential customers who wish to reduce their installation costs by installing the "last leg" into their home themselves ready for final installation by Gigaclear. This may be a practical solution for customers whose houses are set back far from public land, but whom have access to excavation equipment, such as farmers.

You'll still need an engineer to visit your home and make the connections to activate your service. Just connecting fibre cables together requires specialist equipment, even if the cables are fitted with connectors, to avoid damage to the delicate glass fibre. We'll also test the fibre before activating the service, to make sure it'll work properly, and then connect the other end of your cable in the nearby cabinet.

This guide covers only single dwelling unit scenarios, where a single internet connection is required. Multiple dwelling units (MDUs – blocks of flats, etc) are typically are approached as a joint project with Gigaclear due to their complexity. However, large-bore ducts can also serve MDUs in some cases.

This guide may also be of interest to those who wish to understand better at a technical level what Gigaclear's network to the home looks like.

2.1. When self-installation is appropriate

We have a range of installation services, generally provided for free with an order of our services from one of our retail partners, where we will arrange a date to visit your property, dig between the network and your home, and install our standard equipment. This is always the preferred option and if you're covered by our standard installations, we won't generally support a customised installation.

The most common reason for doing self-installation is to reduce costs where the distance between the network and your home is very long and you're able to do that excavation work yourself; or if you have a more complicated estate or property where you want complete control over the last mile installation.

<div style="color:red; text-align:center;">

We do not recommend that you attempt to self-install a fibre optic network connection!
Fibre optic networking is complicated, and even experienced cabling engineers have gotten self-installation wrong in the past.
Our engineers reserve the right to refuse to install, support, or repair connections that have been self-installed.

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You are responsible for your own safety and the safety of others – this guide is not a safe working guide

This guide does not cover safe working practices for underground works – if you are conducting underground works then you must be appropriately qualified

If we attend your site and are concerned about the safety of the installed ducts or cable we may refuse to work on your installation – the safety of our staff and the public comes first.

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3. Planning your Installation

Before you evaluate your approach for self-installation you should understand what sort of Gigaclear network area you're in. This is typically best done by calling us and asking, or by finding and looking in your pot, which is a small black box that will have been placed on the boundary of your property. This will usually have been placed to make it easy to install from, as close as we can get to your home. Gigaclear can also provide guidance on where your pot is.

The pot lid can be opened with a flat-bladed screwdriver. Inside, you'll either find a small black box, or a white and orange tube. If you've found a small box, you're in what we call a *direct burial* area where we've built the network by laying cable directly in the ground; don't open the box, as it keeps the fibre clean and must be carefully closed. If you find a tube, you're in a *blown fibre* area. This is where we install small tubes to the home and then use an air compressor to blow a thin fibre cable back to a connection point.

In a direct burial area, we install a cable from the pot to your home, drill a hole in the wall and then terminate the connection in a box inside your house. In a blown fibre area we'll take a duct all the way to your home and terminate it on a box on the outside of your house. A hole is drilled through from this box and a final fibre termination made on a box inside your house once the cable is blown in.

Either way, the expensive part is most often getting from your pot to your home – so this is why we'd always recommend you just install a duct to make it easy for us, so we can do the rest for you. Our standard installation rate will cover most installations if there's pre-existing duct that's easy for us to use, though we'll always survey and quote before installation if appropriate.

3.1. Installing a large-bore duct

Installing a rigid or semi-rigid duct of at least 20mm diameter and leaving it with a draw rope installed is the safest and easiest approach to reducing your installation cost and will result in a network we'll support with no costs beyond our normal maintenance charges.

This is the most popular approach with farmers, contractors, and enthusiastic DIYers. It works in both direct burial and blown fibre areas, as we can pull either a microduct or cable through your duct. If you've already got a duct, it may be suitable for us to use, but you should make sure that it complies with the rules set out below and in the technical specifications in section 4.

You do need to make sure that the duct makes no sudden turns or twists (with a minimum radius on all turns of at least 10 centimetres) and is not crushed or damaged during installation. The draw rope should be a quality nylon rope with a breaking strain above 2 kilonewtons and should be a continuous run of rope with no knots in the duct – standard 8mm nylon draw rope will normally fulfil these requirements.

We recommend that you don't run more than 300 metres of continuous duct without installing an access box of some sort, and that the duct is buried at least 30 centimetres underground, or deeper – we aim for about a metre down in soft ground.

If there is more than one property at the end of the duct, we recommend using a larger diameter duct such as a 50mm duct. This will give us additional room for larger ducts or cables as required.

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3.2. Installing a cable to the home

If you're in a direct burial area, then you can install a cable between the home and the pot. We can provide you with a standard length of cable or you can purchase cable that meets our technical specifications (see section 4). **We don't recommend this approach and may not be able to resolve any faults or perform your installation under our standard charges.** We'll always try to accommodate you, but strongly recommend you stick to installing a duct.

Installing a cable requires much more care than installing a duct – you must keep the dust caps on (tape them on, if you're likely to bang them about a lot), follow a route that has no sharp bends or corners (no bends tighter than a 15 centimetre radius, and be gentle with the cable – don't pull it harshly or kink it, as you'll damage the fibre.

If working with a pre-terminated cable (cable that is already fitted with the right connectors, which is definitely preferable) you'll need to bring this to the outside of your home and coil some slack there (no more than a few metres). We'll install it into a box on the outside of your home and install the last bit of cable to the inside of your house.

If your cable isn't pre-terminated, leave at least 5 to 10 metres of cable at each end. We'll need to use a machine called a fusion splicer to put a connector on each end, which requires us to cut back a bit of the cable to access the fibre.

The cable we use isn't designed to be used internally and is quite thick, so must be terminated as soon as it enters the home or on the outside of the home. We can provide a smaller internal cable if you need to put the router somewhere else in the home, or you can put the router on the wall and use Ethernet cables (Cat5e or Cat6A) to connect Wi-Fi hotspots to it.

3.3. Using existing ducts

If you have existing ducts, such as a long driveway that has a cable duct down one side, our installers can use this to install your microduct or cable – so long as there's a draw rope we can use, and there's access every few hundred metres. This is usually a very cost-efficient option.

However, we will need to survey any existing infrastructure before we commit to using it – for instance, ducts might have sharp bends in that make it difficult or impossible to pull cable through, or ducts might be damaged or otherwise unusable.

We may be able to install cables in ducts that carry existing services such as power cables, but only if you own the ducts; if they were installed by another utility operator we'll generally need their permission to use them, and most operators don't have duct-sharing schemes in place.

We generally can't make use of BT's own ducts and may prefer to install our own duct as we incur recurring charges from BT to use their duct which can often outstrip the cost of our own installation. This option will only be considered if there's no other way to perform an installation cost-effectively.

3.4. Using existing cables

We may be able to make use of existing fibre optic cables so long as you own them and they're compliant with our technical specification (see below). We won't normally repair or interact with third-party fibre cables, so you should only consider using pre-existing cabling if you're happy to conduct repairs on the cable section yourself or have a contractor who can do this for you. Any installation will be at your own risk, and we'll usually have to exclude you from our usual repair SLAs for faults beyond our own fibre.

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4. Technical Specifications

Gigaclear doesn't generally supply cable or ducts directly, but these can be bought from a large range of suppliers, including CEF, Edmunson Electrical, Comtec, Mills, RS Components, or CPC Farnell. Your local builders' merchants may also be able to supply some components.

4.1. Ducts

If you'd like us to use an existing duct, or want to install a duct we can run cable or microduct through, it must meet the following requirements:

- Inside diameter of at least 16mm
- Rigid or semi-rigid design
- Buried without crushing or intrusion by rocks
- Draw rope of nylon or similar construction, at least 2kN breaking strain, must be accessible at both ends and be continuous with no knots inside the duct ("BT draw rope" can be bought from various suppliers and is suitable)

We recommend burying ducts on top of and surrounded by a layer of fine sand at least 2cm thick – your local builder's merchant can supply suitable fine sand. This helps to protect the duct against rocks and other crushing forces. We strongly recommend using rigid duct and burying it at least 300mm deep if you're crossing a private track over which vehicles pass.

If you want us to leave a draw rope for future use of the duct, make sure you have enough draw rope spare for us to pull through with the cable – we won't provide you with any extra.

4.2. Cables

For direct burial areas we can supply a pre-connectorised cable fitted with SC UPC connectors as part of our standard installation charges but blown fibre cables must be installed by our installers.

If you've already got fibre or have cables already laid, we may be able to use them but only if they are:

- Single mode fibre (OS2), ITU-T G.657.A1, G.657.A2, or G.652.D compatible
- Uninterrupted along their route (i.e. the fibre is a single continuous piece of glass, not split)
- Terminated with SC/UPC or SC/APC connectors

We may be able to use other connectors or unterminated cable, but extra charges may apply.

We may not be able to support you in the event of a fault which is determined to be on your own cable segment, so you should only use your own cable if you are able to repair it yourself!

If you wish to run a cable inside your home, for instance to place the router closer to the middle of your home, we can provide interior cables suitable for this purpose, but generally recommend you install Ethernet cables instead.

We use wavelengths between $1250nm$ and $1650nm$ and require the "in-property" cabling plant including connectors to introduce no more than $2dB$ of optical loss across these wavelengths, though we can accommodate more loss in some cases. If you're having someone install fibre on your behalf with a view to using it for a Gigaclear service in future, you should make sure they measure loss at

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1310nm and 1550nm at a minimum, and provide OTDR tests if more than a hundred metres of fibre is being installed.

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5. Installing Ethernet cables

As of late 2019, Gigaclear normally installs two boxes – a network termination unit or "bridge" which turns the fibre connection into a copper Ethernet connection, and a router. Prior to late 2019, we installed an all-in-one fibre router, which can be turned into a "bridge" by enabling bridge mode (achieved by contacting our customer care team). Both the bridge and the router require a standard mains (13A) power socket; the fibre bridge is normally installed on a wall.

We will usually install the fibre box where the fibre enters the house to limit the risk of damage to the fibre. Copper is more robust and performs just as well (up to 1Gbps) for short (<100m) runs of cabling, such as within homes. It's also much easier to work with – you don't need microscopes or specialised cleaning supplies to connect Ethernet cables, whereas microscopic bits of dust or dirt can damage fibre optic cables.

If you wish to install your router somewhere else in your house relative to where we install the fibre "bridge" – for instance, to put it centrally so the Wi-Fi covers your home better – you can install a copper Ethernet cable, also known as "Category 5e" or "Category 6A" wiring. This can also be used to directly connect computers, set-top-boxes, and other stationary equipment to a router, which will help to reduce the load on your WiFi.

Ethernet is always preferred over Wi-Fi, as it is practically guaranteed – so long as it's installed correctly – to provide you with high performance. Cables aren't susceptible to interference from your neighbours or things like microwaves that can emit signals that interfere with Wi-Fi. Ethernet cables will perform much more consistently and are ideal for things like TVs where the last thing you want is buffering! Taking devices that don't need to move around off your Wi-Fi can also free up capacity for mobile devices like phones or laptops.

If you need multiple ports at either end of a cable you can use a device called a "switch"; gigabit switches can be bought at low cost and will allow devices to perform at full speed. This can be helpful behind a television if you have more than one set-top-box or smart TV device that requires an Ethernet connection. You can also use Ethernet cables to attach Wi-Fi access points or mesh devices, some of which have integrated gigabit switches; this can be a great way to extend your network and improve your Wi-Fi. Even mesh devices will benefit from wired connections.

5.1. Short links

If you're just connecting things in the same room, just buying a long Ethernet "patch cable" may be enough – you can clip these to walls and plug them directly into equipment. The downside is that because the connector is already attached onto the far end it requires large holes to be drilled if you need to go through walls.

5.2. Longer cable runs

For longer cable runs, you'll need to run cables and put sockets on each end of the cable. Many handymen, IT installers, and aerial installers will also be familiar with this cabling if you want someone to do this for you. However, if you're handy with a drill it's quite straightforward to do. We strongly recommend that you terminate your cable in Ethernet modules instead of making up cables, as it's much easier to do and much more likely to work properly.

You'll need the following parts:

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- Ethernet cable – we recommend Category 6A for longer runs (>80m) and where your cable will run alongside mains or aerial cables, but Category 5e cable is enough for most uses (and is cheaper)
- Ethernet modules (also called keystone jacks) – these should match the type of cable you're using. They will have a socket on the front, IDC (insulation displacement crimp) contacts on the back, and fit into a faceplate (often available as a pack, with module and faceplate)
- Faceplates and boxes – either flush or surface mount boxes will house the modules and attach to the wall or sit within the wall
- Patch cables – short cables that connect between the socket in the module and your equipment

In addition to whatever tools you need to make holes through walls, you will need:

- A wire jacket remover to strip the outer jacket from the cable
- Punch-down tool – a cheap plastic tool will suffice
- Wire cutters

You may also find some thin rope or string useful for "fishing" through holes to pull cable through; for longer routes through walls, "fish tape" and rods may be more appropriate.

Installation is straightforward – pull the cable through and secure it in place with cable clips, making sure not to kink the cable during installation. Attach the boxes to the wall or cut and mount them according to the supplier's instructions. Pull the cable into your boxes and leave about 10 centimetres of slack. You should leave some slack in the wall if you're mounting the boxes flush – a metre or two will let you make repairs easily if you need to.

Remove the cable jacket and cut the plastic strength member back to leave just the four pairs of wires. Install your module in the faceplate; the module has a "punch-down block" on the back with slots that are labelled with colours that match each wire.

Don't un-twist these completely – just un-twist enough (normally 1 or 2 twists) to let you push the wire into the slot in the punch-down block corresponding to the wire's colour and markings. Push down fully with the punch-down tool – this will make the electrical connection and secure the cable. You'll need to push down firmly to make a good connection. Try and leave the same short (5-10mm) amount of wire sticking out from the end of the punch-down block. Once all wires are secure, trim any wire sticking out with the wire cutters.

Repeat the same thing at the other end and test your wiring by connecting your devices at each end and looking for link lights. Verify performance with a speed test. If everything is working, screw the faceplates onto the boxes; otherwise, check all your wire colours and push down all the wires firmly – if your connections aren't complete or solid you might only see speeds up to 100Mbps, or it might not work at all.

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6. Version History

Version	Date	Notes
1.0	2019-09-20	First issue
1.1	2019-10-07	Revised some sections and clarified some areas on costing

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