

# Gigaclear Documentation

## Optical Build and Testing Standard

### Fibre Inspection and Cleaning SOP

#### Standard Operating Procedure

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## 2. Scope and Purpose

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This document explains the standard process for inspecting fibre connectors on the Gigaclear network. When working on the network, this document must be read alongside:

- the Optical Build and Testing Standard document
- the Gigaclear Health and Safety policy and relevant documents

Equipment required for inspection and cleaning of fibre connectors is covered in the Optical Build and Testing Standard document, as is general guidance on fibre hygiene.

### 3. Risks and Safety

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Working on Gigaclear's network generally involves outdoor work at the roadside. **Risks, hazards, required PPE and safe working practices are covered in Gigaclear's civils documentation and this document should be read alongside the civils documentation for a full view of the risks.** This document will only discuss hazards specific to fibre optic working.

Additional risks encountered while cleaving, splicing, cleaning and testing fibre include:

- Risk of fibre shards and sharps contaminating clothing or coming into contact with skin
- Risk of fibre shards or sharps being ingested, causing internal damage
- Solvent risks from the use of isopropyl alcohol and similar chemicals
- Optical risks from the use of test equipment or active equipment connected to fibre
- Risk of gas near ducts and buried assets

Gigaclear recommends contractors conduct a risk assessment for all activities; at a minimum the following PPE is required, in addition to civils PPE appropriate to the site:

- Safety goggles or glasses with side shields to be used when cleaving or splicing fibre
- Gloves (latex or nitrile) to be worn when cleaving or splicing fibre
- Sharps bins must be used for disposal of waste when cleaving or splicing fibre
- Overalls or disposable aprons used to minimise risk of fibre sharps contaminating clothing
- Laser safety glasses when working on live fibre that may carry high power

Whenever work is being done on a fibre, no matter when the work is done, fibres **must be treated as live**, and therefore unsafe to observe. This must be strictly enforced by contractors to ensure the safety of operatives working on the network. The ends of fibres must always be kept at least 30cm from the eye to avoid eye damage from live fibre.

Gigaclear generally uses low-power (<3dBm), short-range optical transceivers. These have few safety implications in and of themselves. However, Gigaclear also operates high power (~24-30dBm, Raman amplified) transmission systems. These systems are equipped with safety cut-out devices, but these must not be relied upon to ensure the safety of operatives, as automated restart procedures can still result in short pulses (eye-safe without magnification or focusing). These systems are used across Gigaclear's network, including access segments, so **all fibres must be treated as if they were carrying high power transmission systems. Optical microscopes must never be used anywhere in the network, and direct viewing of fibre ends must never be performed.**

The highest moments of risk are when cutting, stripping, cleaving, and splicing fibre, as well as when inspecting connectors. During these phases, care should be taken to keep fibres well away from the eyes, so that reflected or emitted light remains at a safe level and sharps are kept away from the face. Indirect viewing, such as using the screen on an automated inspection microscope, or the alignment microscope in a fusion splicer, should be used to inspect fibres when needed.

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#### **Always treat fibres as live!**

*Never view the end of a fibre or connector endface directly – use an automated inspection microscope with a camera to check connector cleanliness safely*

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## 4. Preparation and Materials

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### 4.1. Documentation and Location

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Before starting work, ensure that you are at the correct site. Check the site's label (if working on a cabinet) and location. If your work requires you to disconnect fibres in use, ensure you have notified the network operations centre and have any required permissions to begin work.

Fibre inspection reports are typically performed using EXFO TestFlow, using either an EXFO MaxTester or a mobile phone alongside the EXFO FIP probe. TestFlow allows Gigaclear to provide the pre-labelled tests to be performed.

For tests that are being performed in an ad-hoc manner or where tests are performed prior to connecting further test equipment or active equipment, TestFlow is not required. However, the use of EXFO FIP430-series inspection probes and automated test sequences is always recommended.

### 4.2. Equipment Preparation

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Refer to the Optical Build and Testing document, section 5, for more information about what equipment you will need to take with you to site. Particularly, check which inspection probe tips you will need and make sure you take them to site.

Before testing, ensure that you have configured your inspection probe and any other required devices in accordance with the guidance in section Appendix – . TestFlow will automatically configure tests, but manual tests must follow the same configuration.

### 4.3. Consumables

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Unless fibres are being inspected immediately before connection, once inspection has been performed the dust cap must be replaced. It is recommended that contractors take spare dust caps to site, of both bulkhead and connector types, and keep them in a clean condition prior to fitting.

Cleaning is likely to form part of the work of inspection; swabs, wipes, isopropyl alcohol and one-click cleaning devices are likely to be required. Refer to the main standard document for a comprehensive list of cleaning supplies.

## 5. Process

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### 5.1. Site Preparation

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#### 5.1.1. Paperwork and Consumables

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Ensure that you have all the consumables required to complete the whole job without leaving site.

Proceed to the site indicated on the splicing schedule and proceed with the site arrival process, including filling out your job site safety pack (JSSP).

#### 5.1.2. Safety of Site

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Ensure that the site is safe to work at, and will remain safe as you work, by setting out required roadwork and pedestrian guarding. This must include any required signage to indicate the safe route for vehicles and pedestrians.

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**You must refer to Gigaclear's HSE policy for the current information on safe working at the road-side, as well as the required safety equipment**

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Make sure your vehicle is parked safely and considerately.

#### 5.1.3. Cabinet and Chamber Access

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Open the cabinet or chamber being worked on, making sure to check in to the site with the Network Operations Centre (NOC) if required.

When working on connectorized closures, be sure to draw the closure out carefully to a location it can be worked on safely, rather than working on the closure in situ.

It may be appropriate to erect a tent if the weather is poor to avoid rain being blown into equipment or fibre ends.

### 5.2. Inspecting Connectors

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## **ALWAYS TREAT FIBRES AS LIVE**

**Optical microscopes must never be used on the Gigaclear network!**

Do not bring optical microscopes to site. Do not have them in your toolbox. Do not allow your colleagues to use them. They are unsafe, and can cause instant, permanent blindness if used to observe a live fibre. Damage an inspection probe, not your eye!

**ALWAYS USE AN AUTOMATED INSPECTION PROBE**

**NEVER USE OPTICAL MICROSCOPES**

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#### 5.2.1. Test Configuration and Probe Setup

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Connect the inspection probe to the tester or mobile phone being used to perform the tests. A cabled connection is recommended where it is possible to do so.

Start TestFlow or open the CMax2 application for ad-hoc testing. If not using TestFlow, configure your test as per the guidance in section Appendix – EXFO FIP Configuration.

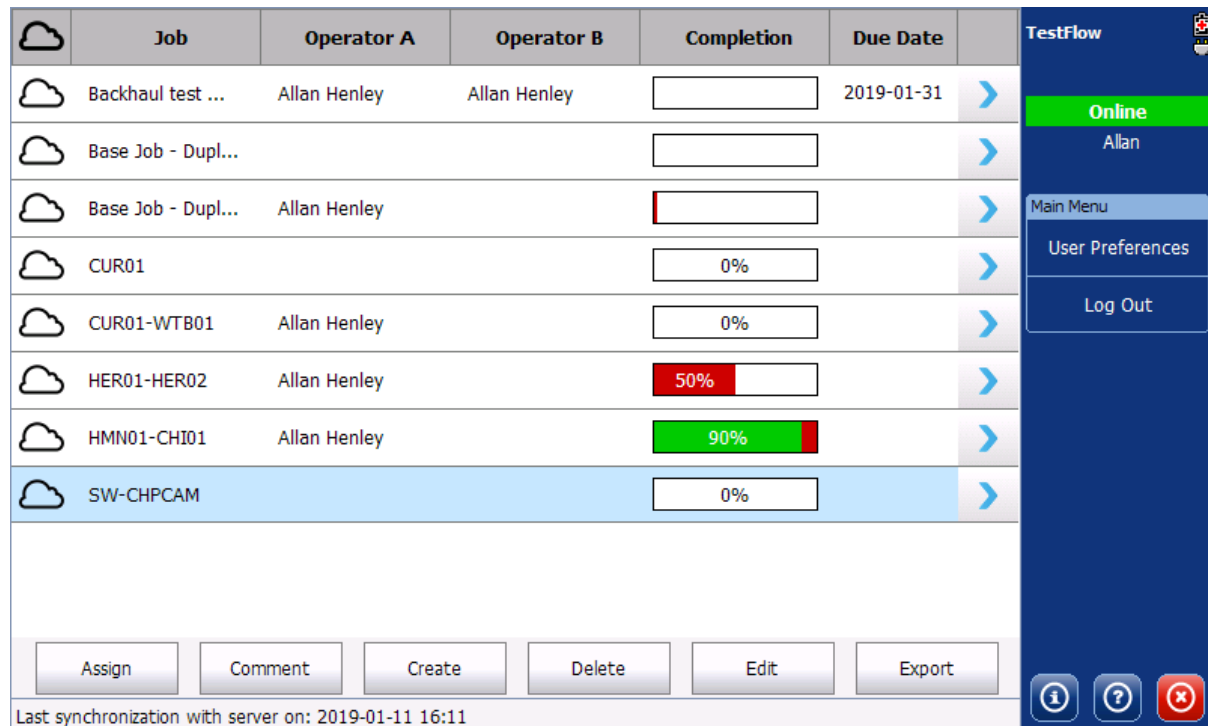
Before removing dust caps, ensure the correct tip is fitted to your inspection probe. Refer to section **Error! Reference source not found.** for guidance on the appropriate tip to use.

Now proceed to inspection with TestFlow (Inspection with TestFlow) or ad-hoc inspection with CMax2 (Inspection with CMax2).

### 5.2.2. Inspection with TestFlow

Normally, inspection is being done as part of final acceptance tests alongside OTDR/iOLM testing of the network. This is done with TestFlow, with Gigaclear issuing test configurations for the area to be tested.

Open TestFlow and log in if needed. Select the job you are working on from the list.



Job	Operator A	Operator B	Completion	Due Date
Backhaul test ...	Allan Henley	Allan Henley	<div></div>	2019-01-31
Base Job - Dupl...			<div></div>	
Base Job - Dupl...	Allan Henley		<div></div>	
CUR01			<div>0%</div>	
CUR01-WTB01	Allan Henley		<div>0%</div>	
HER01-HER02	Allan Henley		<div>50%</div>	
HMN01-CHI01	Allan Henley		<div>90%</div>	
SW-CHPCAM			<div>0%</div>	

Assign Comment Create Delete Edit Export

Last synchronization with server on: 2019-01-11 16:11

**TestFlow**

Online  
Allan

Main Menu

User Preferences

Log Out

Figure 1: TestFlow home screen, showing the user logged in

You will be presented with a list of test configurations, and on the right a set of circles that represent the current state of the sub-test (pass, fail, not attempted).

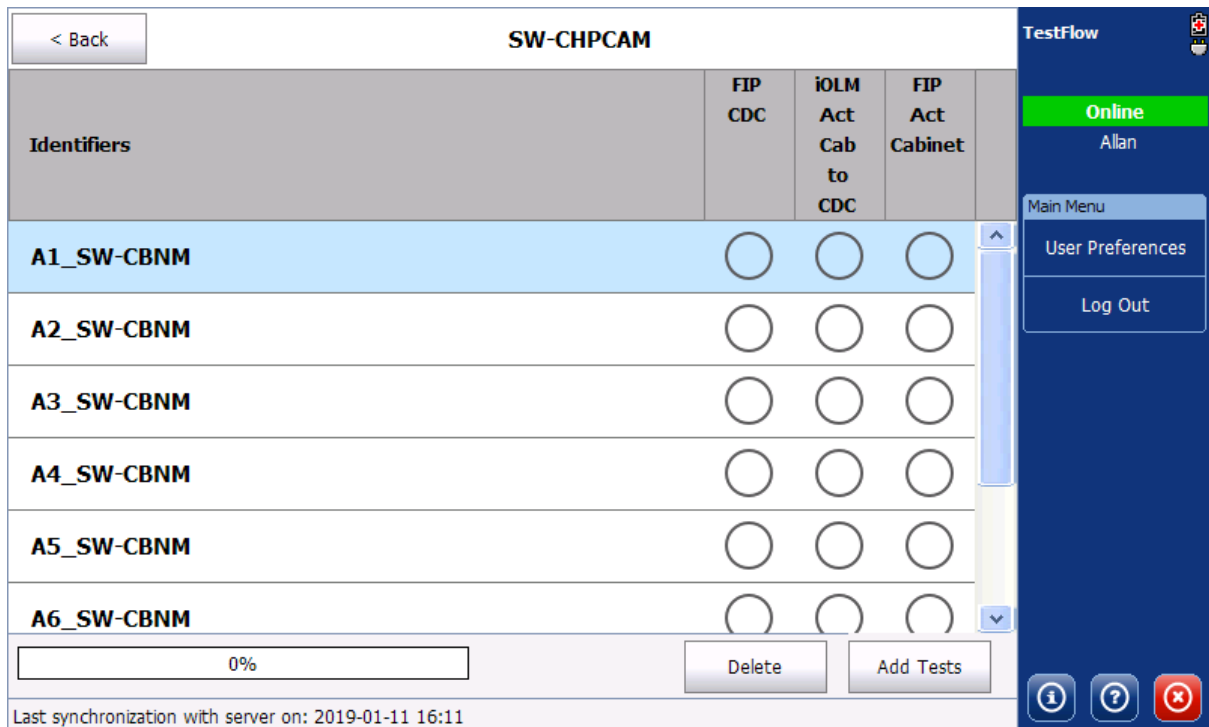
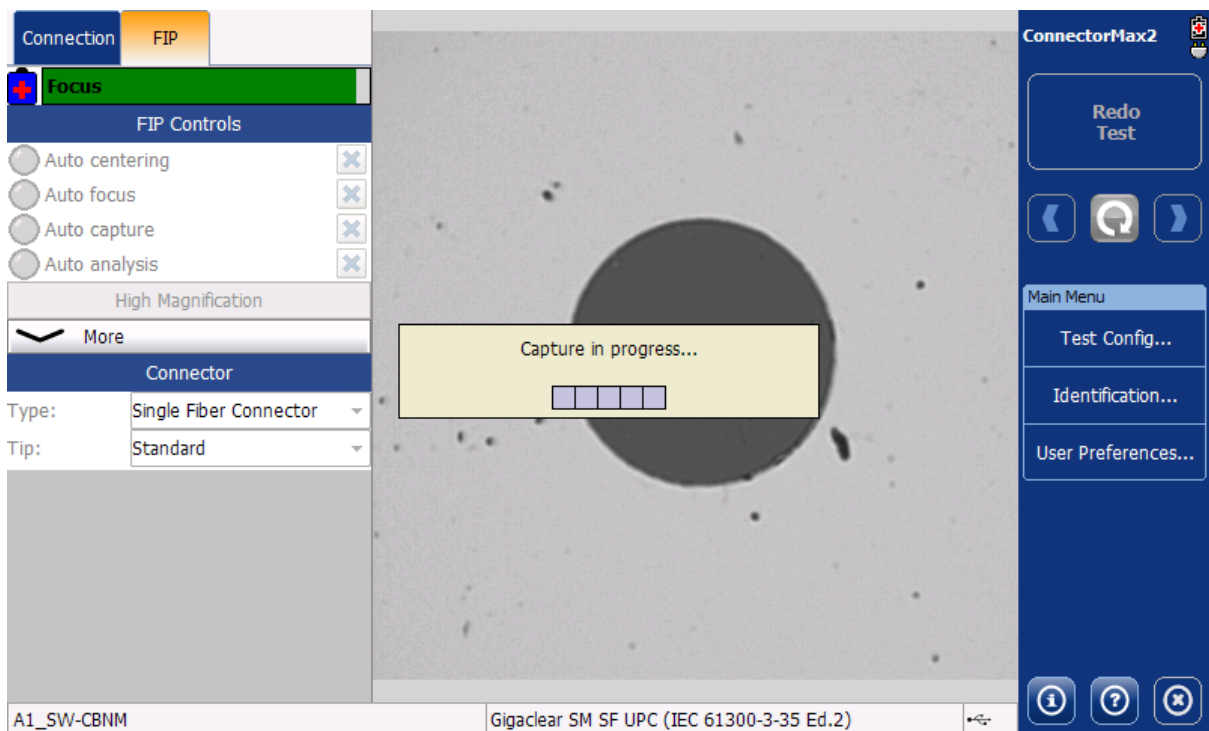


Figure 2: TestFlow job screen

Find the connector you want to inspect, remove the dust cap, attach the inspection probe, and click the circle corresponding to the connector's FIP test. The test will automatically open CMax2 and show the test running.

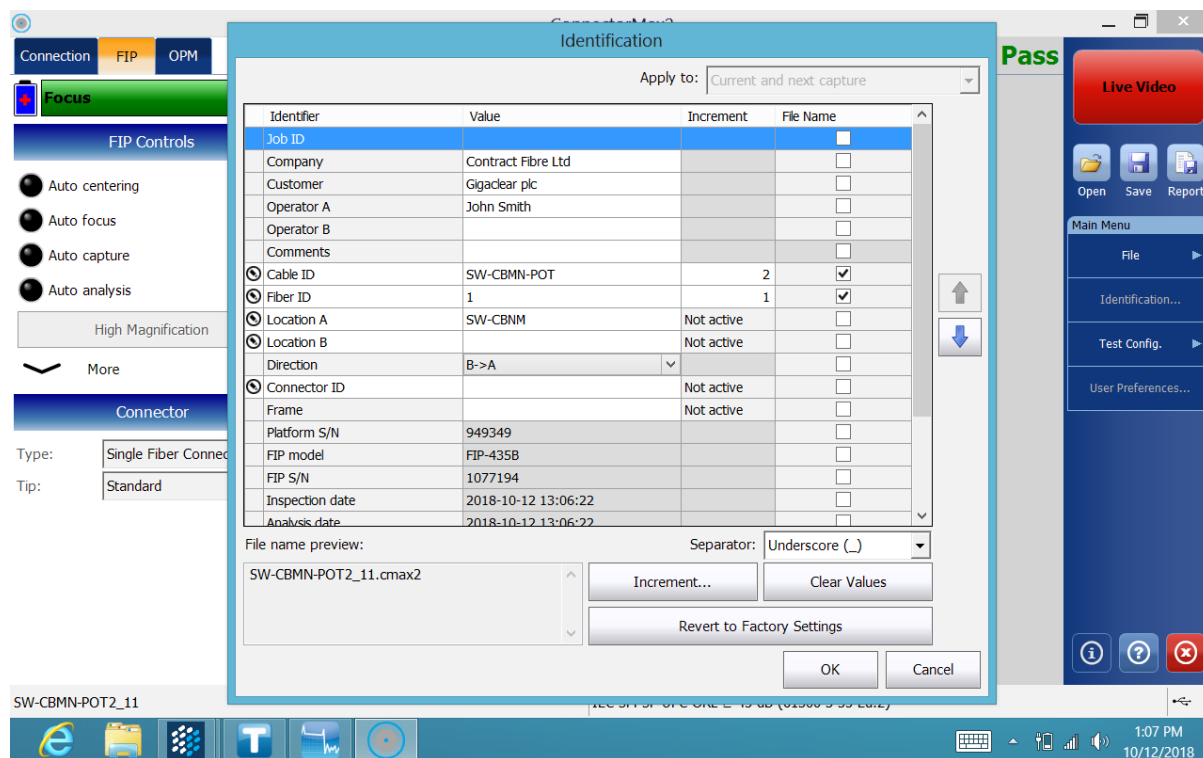


If the test fails or has visible debris, proceed to clean the fibre and repeat the inspection.



### 5.2.3. Inspection with CMax2

For ad-hoc testing, CMax2 can be used outside of TestFlow. It is still advisable to open the Identification window and set at a minimum the Company, Customer, Operator A and Location A fields; for example:



## 5.3. Cleaning Connectors

Cleaning connectors is a repetitive process done alongside inspection. Cleaning shouldn't ever be done without inspection, and inspection must be done after cleaning to prove the result of the cleaning and determine if more cleaning is needed (or if other damage was masked).

Once you have identified that a connector requires cleaning, the following process is used to clean the connector.

### 5.3.1. Cleaning Bulkhead and Cable Connectors

If the connector appears to have a very slight amount of debris or grease/oil coating the endface, a "one-click" cleaner can be used. Take the cap off the one-click tool, and insert it into the connector (or, if cleaning a cable, push the connector into the top of the tool's cap). Gently push the tool against the connector until it clicks and replace the cap on the one-click tool.

If the connector is more heavily contaminated – for instance, dust or dirt has found its way onto the connector – then one-click cleaners *must not* be used as this can lead to fibre damage. Instead, use a fibre cleaning swab (eg Cleanstix) lightly wetted with isopropyl alcohol (IPA) to remove the debris by gently inserting the swab and rotating it. Do not use excessive IPA – this may lead to residue being left on the connector. Use a second swab to dry the connector.

Once complete, re-inspect the connector. If the connector can not be cleaned within three cleaning attempts, see section Restoring Damaged Connectors for further guidance.

### 5.3.2. Cleaning Equipment Connectors (SFP/SFP+ etc)

Cleaning equipment connectors is a similar process to that followed when cleaning bulkhead and cable connectors. However, when cleaning transceivers care should be taken not to put too much pressure on the endface of the transceiver; in some transceivers where the optical sub-assembly is not mechanically bonded to the case, putting pressure on the OSA while cleaning can cause permanent damage to the transceiver.

### 5.3.3. Restoring Damaged Connectors

If cleaning fails to get the connector to a passing state – for instance, a scratch is present in the endface – then it must be polished or replaced. Generally, replacing the connector is the preferred option, as field-polished connectors typically have worse performance than factory-polished connectors.

Field polishing should be considered a last resort where replacement of connectors is expensive or requires service disruption. In this case a discussion should be had with Gigaclear to establish the best route forward.

## 5.4. Site Closure

### 5.4.1. Cabinet or Chamber Closure

Close the cabinet or chamber, ensuring that mating surfaces are clean and any locks are fully engaged and secure.

If a closure was accessed to reach the connectors, ensure the O-ring is clean and the sealing surfaces are free of debris.

### 5.4.2. Site Closure Paperwork

Once all works are complete, clear your site up and remove any barriers.

Complete any required paperwork such as your JSSP.

Ensure the site is clean and clear, and all waste has been recovered.

## 6. Appendix – EXFO FIP Configuration

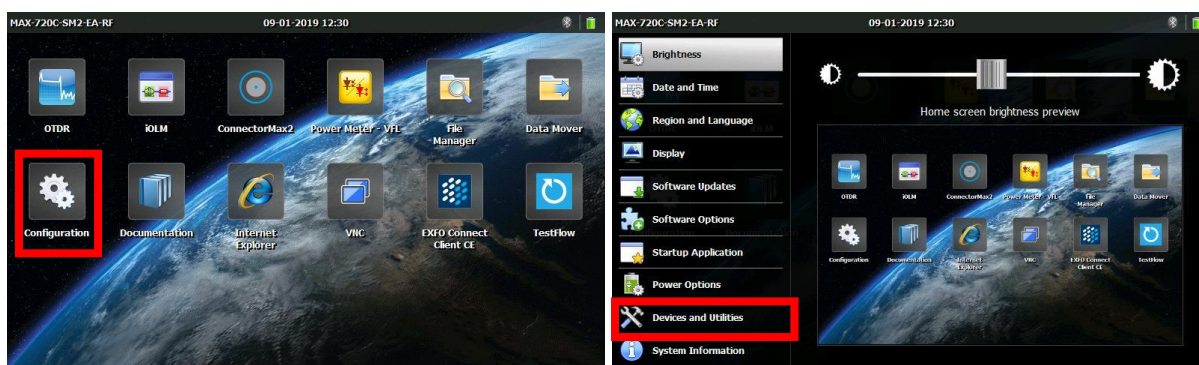
### 6.1. Using MaxTester/FTB CMax2

The typical workflow as documented by EXFO's own documentation packs can be followed for use of CMax2 on the MaxTester and FTB platforms.

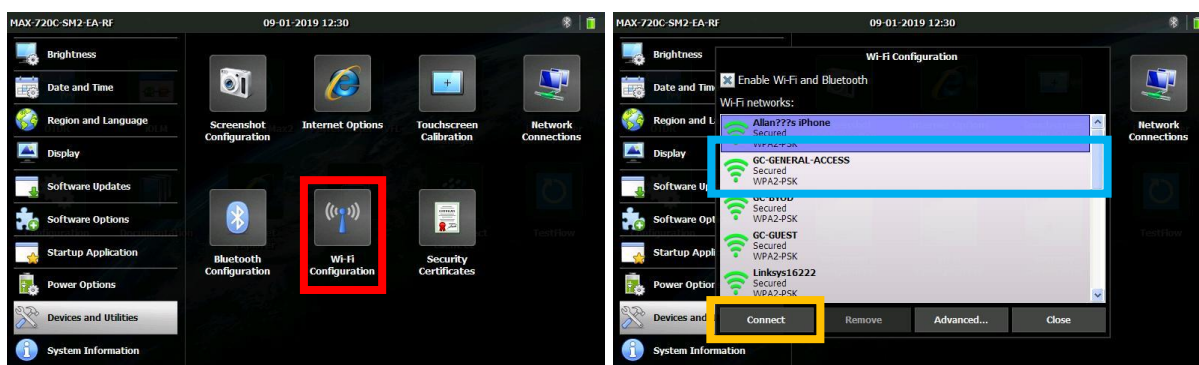
If your device is synchronised with TestFlow then the Gigaclear connector inspection profiles will be pre-loaded; however, otherwise the ITU Edition 2 test criteria should be used.

### 6.2. Configuring WiFi on MaxTester platforms

On the home screen, select "configuration" and then "devices and utilities"



Next, pick the WiFi hotspot to connect to, and then click Connect. Enter the network password when prompted.



## 7. Version History

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Version	Date	Notes
<b>1.0</b>	2019-01-08	First issue
<b>1.1</b>	2019-06-12	Tidied up for release