

Chromium X Series: Network Connectivity Guidelines

Introduction

This Technical Note provides an overview of network connectivity guidelines for the Chromium X Series instrument in order to describe:

- remote performance monitoring
- data collected by 10x Genomics
- security considerations
- additional connectivity details

The Chromium X Series instrument enables high-throughput single cell experiments. It is designed to be connected to the 10x Cloud. The instrument provides an easy way to connect to Wi-Fi or Ethernet. Ethernet connections are recommended for optimal performance.

Refer to the Chromium X Series instrument user guide (CG000396) for details regarding various instrument components, user interface navigation, firmware upgrade options, and all additional features.

Remote Performance Monitoring

Monitoring the performance of the Chromium X Series helps ensure that the instrument is performing optimally and maximizes instrument uptime. This also gives 10x Genomics the ability to respond quickly and troubleshoot issues that may occur. While the user focuses on processing samples and data collection, the instrument will proactively collect performance data to allow the 10x Genomics Support Team to address potential instrument downtime.

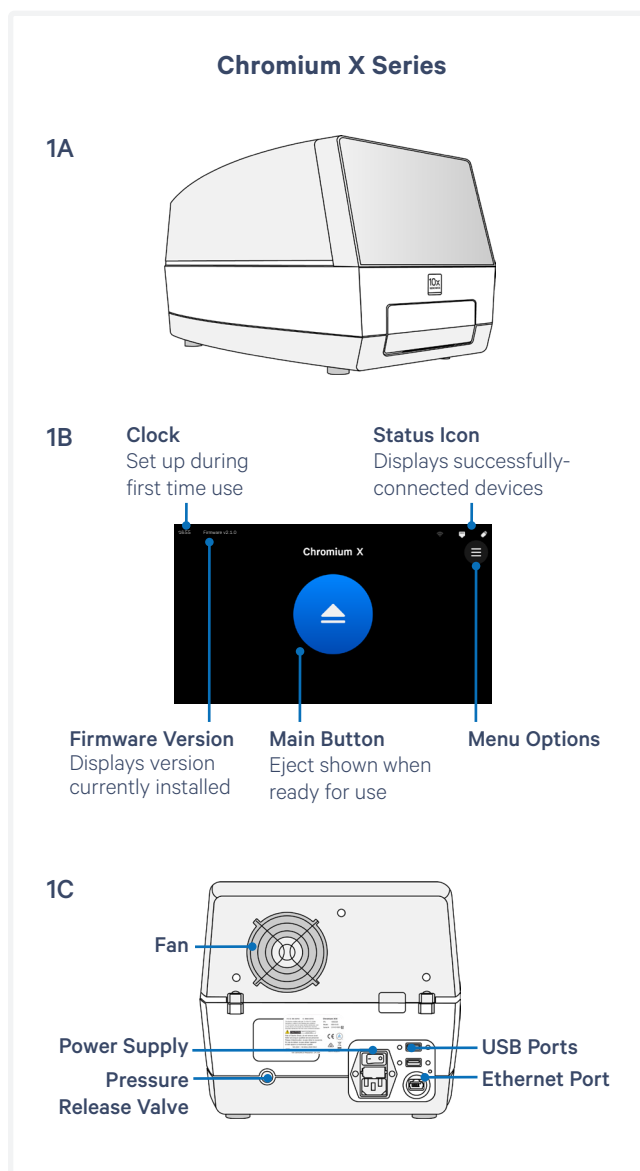


Figure 1. Chromium X Series instrument (1A) has a user-friendly interface (1B). The back of the instrument includes various connection ports, including a port of Ethernet connectivity (1C).

Data Collected by 10x Genomics

No biological sample data is being collected by 10x Genomics. Remote data collection is limited to the following items:

- Calibration data
- Instrument operation logs
- Mechanical and fluidic system logs
- Computer system logs

Security Considerations & Features

Topic	Feature
Data NOT collected	Biological sample data, personal health information
Required inbound ports	No open inbound ports required
Data center encryption at rest	Encrypted at rest with AES-256
Data encryption in transit	Encrypted with TLS
Instrument firewall	Blocks all inbound connections
On instrument restrictions	No installed browser, account runs with restricted permissions
Operating System	Linux-based OS
Topic	Feature
Updates & Patches	Provided by 10x Genomics directly to the instrument

Table 1. Security considerations.

Detailed Whitelisting of Hosts & Ports

The table below lists the complete set of hosts, ports and protocols in use by the Chromium X Series instrument. Use of DNS entries is recommended in your firewall rules instead of the IP addresses, as the IP addresses may be updated from time to time.

Application	Protocol	Source IP:Port	Destination IP:Port
10x Telemetry	TCP	<Chromium IP>.*	envoy.10xgenomics.com:443 10x-cloud-saas-instrument-assets.s3.us-west-2.amazonaws.com:443

Table 2. Complete set of hosts, ports and protocols in use by the Chromium X Series instrument.

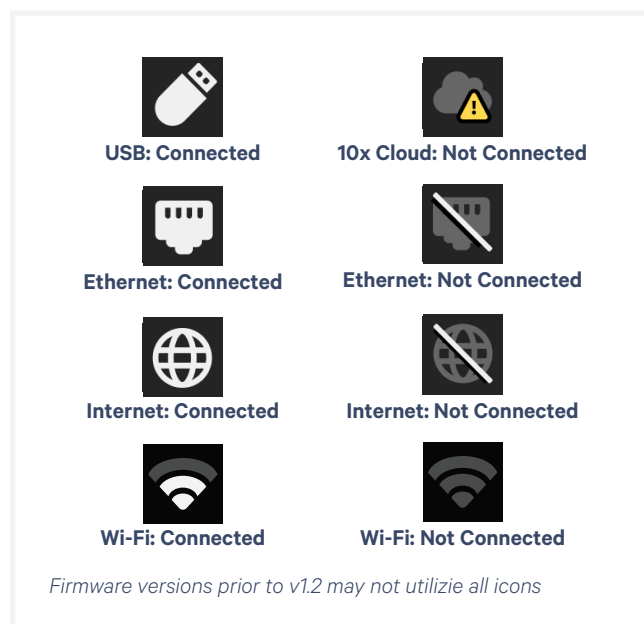
Local Connectivity

The Chromium X Series is designed to integrate into the customer’s local network without the need for joining a specific local domain. It is also shipped as a complete software system, without the option to install additional software or security solutions.

Additional Technical Details

Connectivity

The following connectivity icons may be found in the upper right corner of the screen:



To access Connectivity options from the home screen (see Figure 1B), click the Menu Options button in the top right corner > Connectivity. If your network supports DHCP, plugging in an ethernet cable to your local network should automatically configure the connection. Contact your IT department if the Chromium X Series shows that it cannot reach 10x Genomics servers.

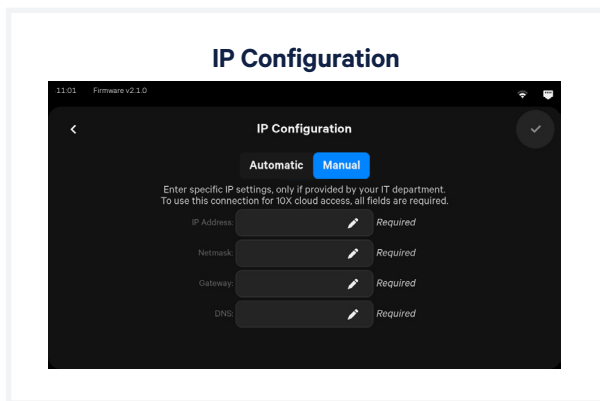
Setting Up a Static IP

If your IT department requires a static IP, obtain the reserved IP address, the DNS servers, netmask and gateway for the Chromium X Series. Once these are available:

- Navigate to the Connectivity page on the user interface.
- For firmware version 2.1.0 or higher: The instrument will automatically try to find an IP configuration.

If the instrument is unable to find an IP configuration after ~5 min, the screen will become active for manual input.

- Select either Ethernet or Wi-Fi.
- Select on the IP configuration, which is set to automatic by default.
- When presented with the option of Automatic or Manual, select Manual.
- Input the manual IP, Netmask, Gateway, and DNS values.

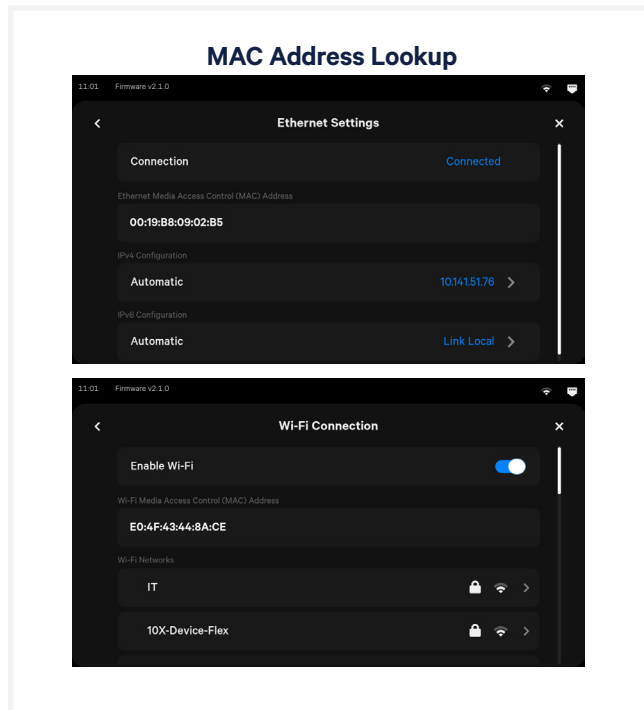


Identifying Instrument Hostname

In firmware v1.1 or later, the instrument's hostname is set to its serial number. The serial number can be found in the back of the instrument as well as in the "About" section of the Systems menu on the screen.

MAC Address Lookup

The Ethernet and Wi-Fi adapters each have a MAC address, however, for Wi-Fi it will only appear if the instrument is connected to a Wi-Fi network. The address can be found by navigating to the Connectivity menu and selecting either Ethernet or Wi-Fi. The MAC address will be listed right below



the connection status bar, and listed as either "Wi-Fi Media Access Control address" or "Ethernet Media Access Control address." The MAC address is only visible on instruments running firmware version 1.1.0 and beyond. Instruments running older firmware versions will not see the MAC address.

Supported Wi-Fi Authentication Schemes

The Chromium X Series supports the following Wi-Fi authentication schemes:

- Open
- WEP
- WPA1 PSK
- WPA2 PSK
- WPA2-Enterprise with PEAP-MSCHAPv2 (firmware version v2.1.0 or higher required)

Guest Wi-Fi Networks

The Chromium X Series may connect to any available Wi-Fi network. However, if the Wi-Fi network requires accepting a popup in a browser (similar to an airport or coffee shop network), the instrument connection may not be successful.

Document Revision Summary

Document Number	CG000508
Title	Chromium X Series: Network Connectivity Guidelines
Revision	Rev C to Rev D
Revision Date	August 2024

Description of Changes:

- Removed NTP from the list of complete set of hosts, ports and protocols in Table 2 (p.2).
- Updated the instructions for setting up a Static IP (p.3).
- Updated the list of supported Wi-Fi authentication schemes (p. 3).
- Updated screenshots to include the firmware version number in the upper left corner.
- Updated the name of the instrument throughout to read “Chromium X Series instrument” for consistency.

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