

SUMMARY

This document provides an overview of the various communication techniques (ports and services) the Twig-MC (controller) will use when connected to the internet, so that an IT department can best reconcile an operational Twig-MC with the security practices they have in place.

INITIALIZATION

Before establishing connection to a Twig-MC via the internet with a mobile device (phone/tablet), it must first pair via Bluetooth® Low Energy (BLE). To establish the BLE connection:





- Download the Twig-MC app to the mobile device (Android and iOS only),
- Enable Bluetooth services,
- The Twig-MC app must be given permission to use Bluetooth,
- The mobile device must be in close proximity (within ~30 ft) of the Twig-MC,
- Search for a Twig-MC within range using the “Nearby” mode.

When the mobile device is connected via BLE to the Twig-MC, keys are exchanged between the mobile device and the Twig-MC that will allow the mobile device to also connect to the Twig-MC via an internet connection.

Note: A small number of “privileged” operations (such as firmware updates) are reserved for BLE connections only. The BLE service on the Twig-MC itself can be disabled via a small switch located inside the Twig-MC on the smaller circuit board on the right hand side of the enclosure. If desired, this allows a site to use conventional, physical “lock and key” mechanism to secure access to the BLE service, rather than relying on proximity alone.

INTERNET CONNECTIVITY

To connect the Twig-MC to the internet, an ethernet cable must be connected to the port (jack) on the bottom of the enclosure. Two lights on the main internal circuit board show the status of the internet connection, as summarized below:

LIGHTS	STATUS
	No active ethernet link is found to the internet. Make sure cable is attached, and that internet providing device (e.g. modem) is powered.
	An active ethernet link exists, but the controller does not yet have a path to the internet. This will occur for a moment during startup. If it persists, the network that the controller is connected to (e.g. local LAN or modem) is not vending an IP address to the controller via DHCP. May need to review the DHCP capabilities of the providing network/modem.
	The MC has a route to the internet, but communication with the MQTT broker has not been established yet. This will occur for up to one minute (approximately) during startup or reconnection. If it persists, the network providing device is not allowing MQTT traffic to make it from from the controller to the MQTT broker. Should look into firewall settings.
	The controller has a route to the internet AND has established a connection with the MQTT broker. The mobile device should be able to communicate with the controller when (and only when) the lights are in this state.

ESTABLISHING A REMOTE CONNECTION

When both lights on the Twig-MC are GREEN, it is ready for remote connections via the internet. To connect a mobile device to the Twig-MC via the internet:

- **The mobile device must have first been paired to the Twig-MC via BLE** to obtain the necessary authorization (as explained on page 1).
- If currently connected to the Twig-MC via Bluetooth (“Nearby”), you must disconnect before connecting remotely. To do this, navigate to “Settings” and tap on “Disconnect”.
- Search for available controllers in the “Remote” menu of the Twig-MC app.
- Tap the name of the listed controller you want to connect to.

GRANTING REMOTE ACCESS

A mobile device that has connected to the controller via BLE can share remote access to other devices by following the procedure described in this video:

<https://youtu.be/sV9tx6Bf1A4>



Note: To grant permanent remote access, the device that is sharing the access must currently be connected to the controller via BLE in “Nearby” mode. When connected remotely, only temporary access can be granted to others.

ADDITIONAL INFO FOR IT PROFESSIONALS

The Twig-MC will use standard DHCP to request an ethernet address from the network it is connected to. The MAC ID of the Twig-MC can be found by looking at the diagnostics in the Twig-MC app, retrieved by pressing the “stethoscope” button at the top of the app on the settings/system page, shown in the “link_eth1” section.

The primary mechanism of communication the controller uses is the MQTT protocol. The controller makes an outgoing connection to the URL springboard.twigwirelesscontrols.com on port **8883**. This is a TLS secured MQTT connection. For a Twig-MC to be operated via its internet connection, it needs to be able to initiate a connection to this port and resolved address. Once the MQTT connection exists, all commands and events are relayed between connected mobile devices and Twig-MC via this broker. The data is encrypted end to end. Nelson Irrigation has no means of logging or tracking any of the data that passes over this brokerage.

To “reprovision” a Twig-MC’s network settings, it is necessary for the Twig-MC to be able to make a short https query to springboard.twigwirelesscontrols.com:7444.

Note: When the firmware on a Twig-MC is updated, it must be done via BLE. Data is transferred from the mobile device to the Twig-MC via BLE; however, if the MC can reach https request against springboard.twigwirelesscontrols.com (port 443), then the download can be accelerated and performed much quicker.

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