Quick Start Guide

Internet of Things

CampbellCloud

Onboarding a CR Data Logger

02/2026

RELIABLE MONITORING SINCE 1974

Campbell SCIENTIFIC®

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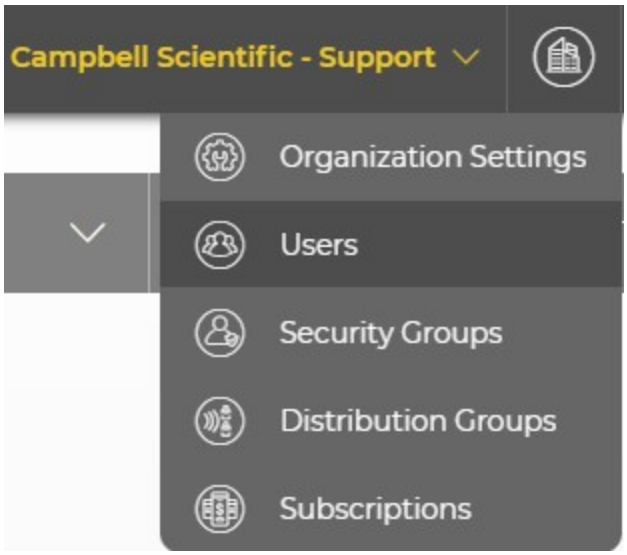
1. Creating a CampbellCloud organization account

If you are not an organization owner but need to join an organization as a user, an owner should invite you to join the organization. The email invitation will be from *hello@campbell-cloud.com* and will include instructions to join the organization as a user. An owner can invite users to their organization by logging into their CampbellCloud account, clicking the building icon in the top right corner, and choosing **Users**.

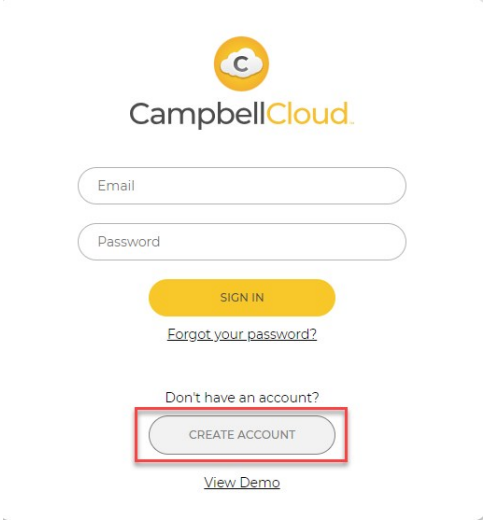


From there, the owner can add additional users by clicking **Add** and filling out the required information.

> **CAUTION:**
> If you or your organization already has a ***CampbellCloud*** organization account, do not create another one.

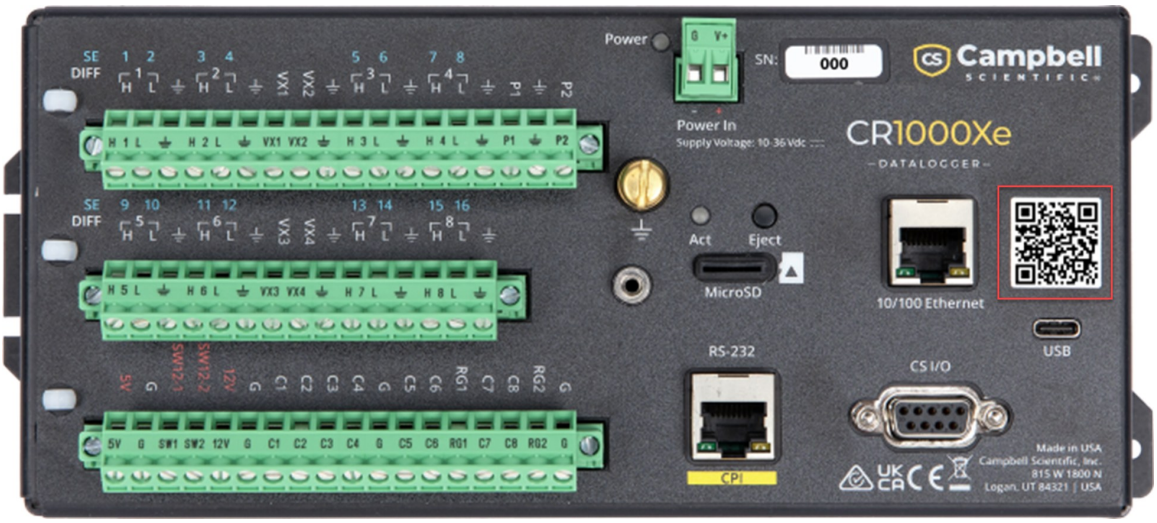
If you are an organization owner, follow these steps to create an account:

1. Using a web browser go to https://iot.campbell-cloud.com.
2. Click **REGISTER**.
3. Click **CREATE ACCOUNT** and follow the remaining instructions.



2. Obtaining a Unique Identification Number (UID) to use with CampbellCloud

New Campbell Scientific data loggers are configured as "Secure by Default." As part of this configuration, each data logger is given a Unique Identification Number (UID) at the factory. The UID is also used as a password specific to each data logger. A data logger with a UID set at the factory will have a QR code on the data logger with the UID information.



If your data logger has this sticker or has a serial number higher than the following numbers, you may ignore the "Obtaining a Unique Identification Number (UID) to use with CampbellCloud" section.

CR1000X 59843

CR6 25311

CR350 9273

CR310 23126

CR1000X data loggers with OS 8.01 or higher, CR6 data loggers with OS 14.01 or higher, CR350 data loggers with OS 1.08 or higher, and CR310/CR300 data loggers with OS 11.02 or higher, which were released prior to the UID being implemented, can also be assigned a UID. This is done using the ***Device Configuration Utility*** found in ***LoggerNet***, ***PC400***, or downloadable directly from the Campbell Scientific website. ***Device Configuration Utility*** version 2.31 or later is required.

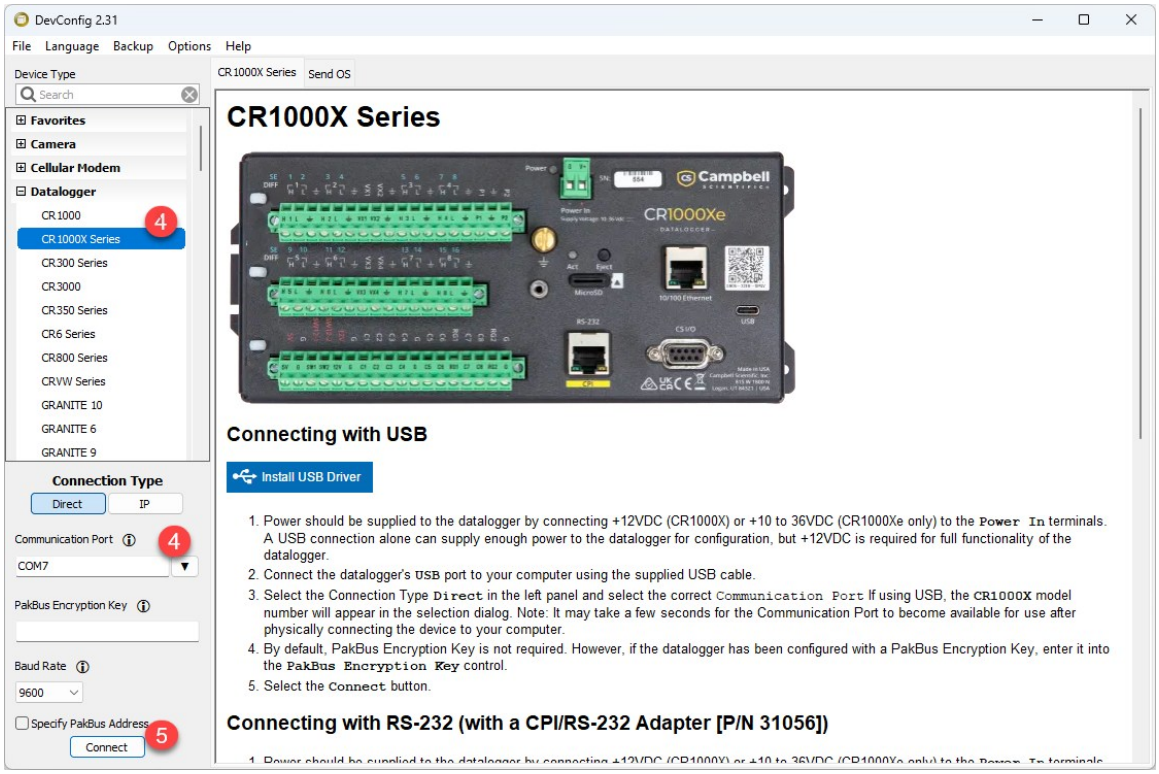
> **NOTE:**
> A UID cannot be obtained without a CampbellCloud account. (To create an account, see Creating a CampbellCloud organization account [p. 1]).

> **NOTE:**
> When a UID is assigned to a data logger, it is written to one-time programmable memory. Therefore, any future OS updates or factory default resets of the device will not delete the UID.

> **NOTE:**
> The CR300/CR310 can only retrieve a UID over a remote connection in OS versions 11.03 or higher.

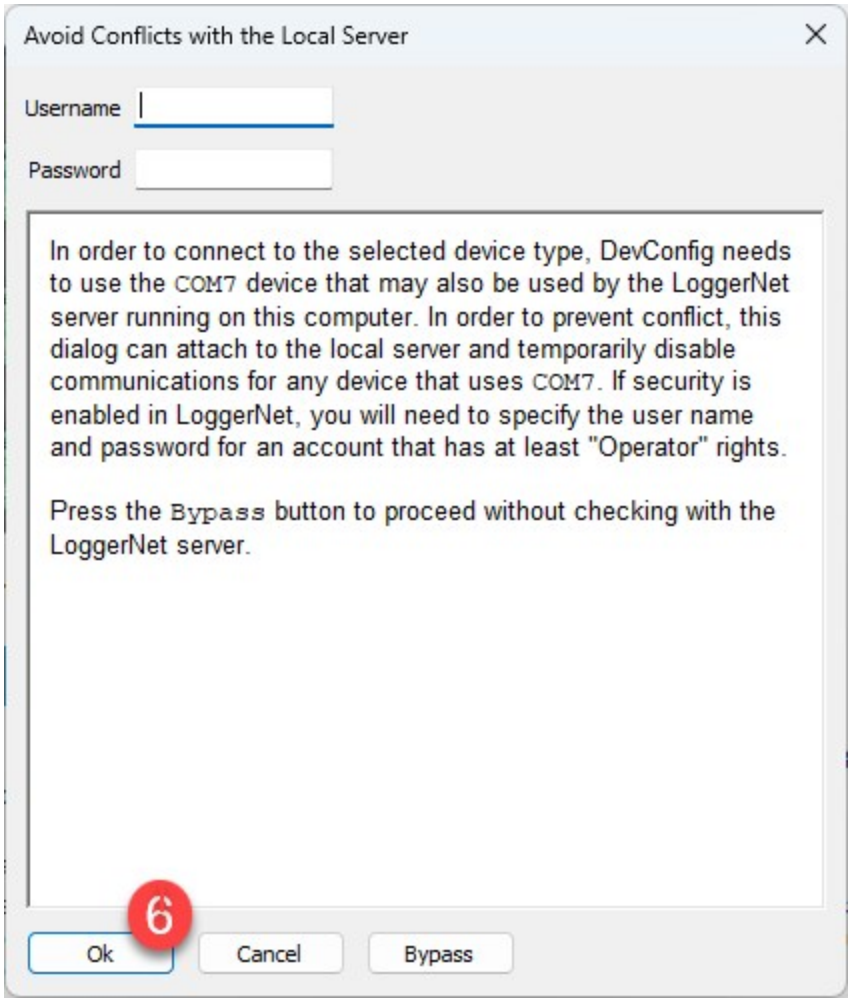
Follow these steps to obtain a UID for your data logger:

1. Ensure the data logger has the latest operating system installed. Operating systems are available from the Campbell Scientific website: https://www.campbellsci.com/downloads/operating-systems-datalogger.
2. Connect the data logger to a computer using a USB cable or establish a connection via TCP.
3. Open ***Device Configuration Utility*** on the computer.
4. Select the appropriate data logger from the left side. Select the appropriate **Connection Type** (**Direct** or **IP**) and then select the correct **Communication Port** or **Server Address**, respectively.



5. Click **Connect**.

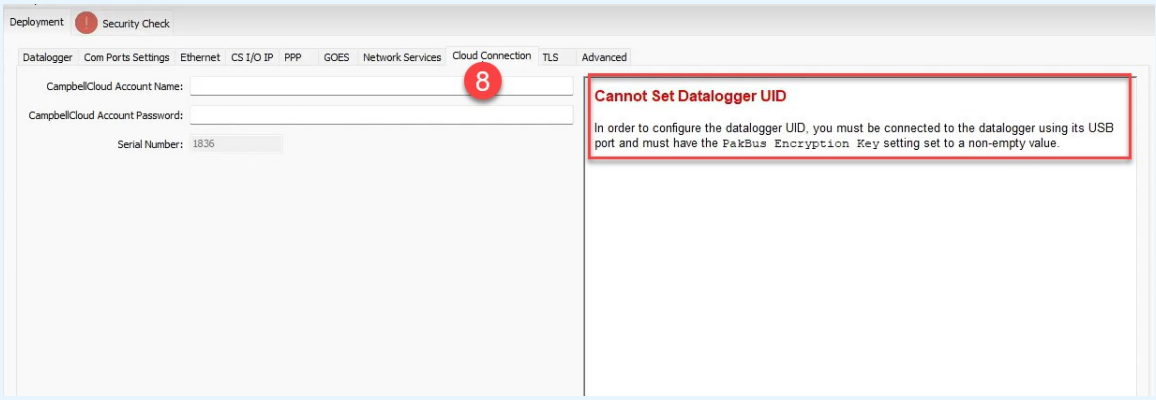
6. If ***Device Configuration Utility*** was opened from ***LoggerNet*** or ***PC400***, a window opens titled **Avoid Conflicts with the Local Server**. Click **OK**.



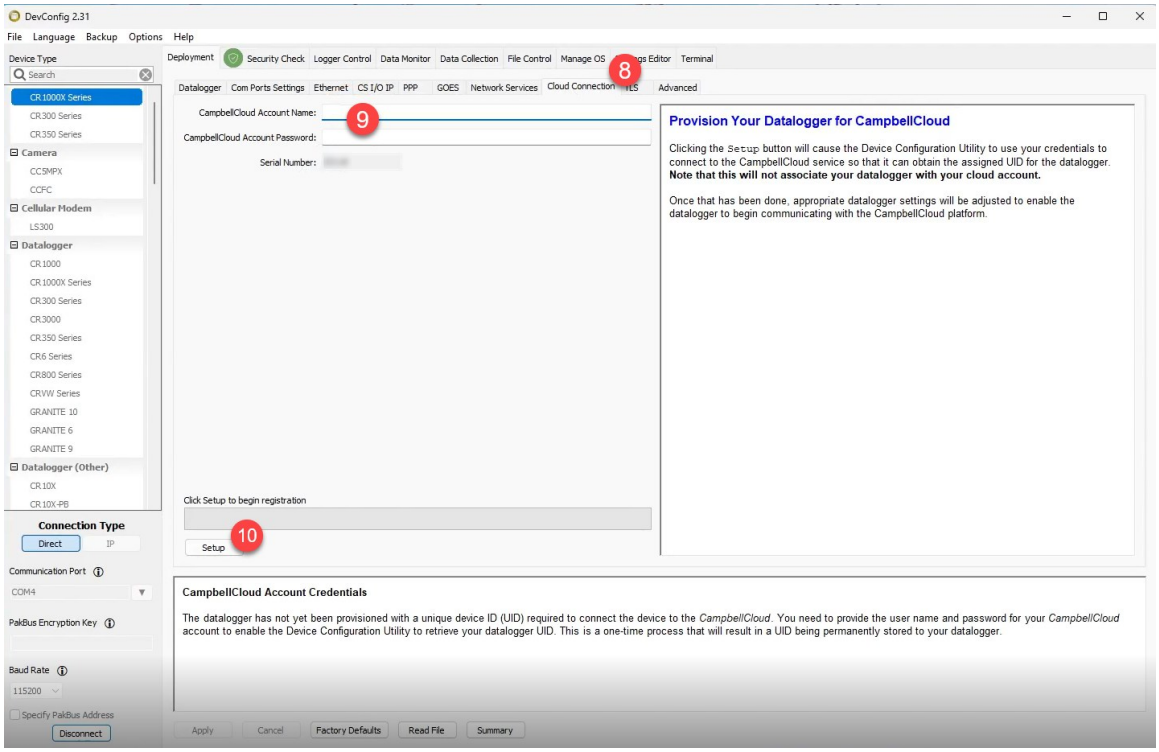
7. ***Device Configuration Utility*** will identify the PakBus address of the data logger and connect to it. Once connected to the data logger, ***Device Configuration Utility*** will open the **Datalogger** tab under **Deployment**.
8. Select the **Cloud Connection** tab.

> NOTE:
> If a **PakBus Encryption Key** is not set, ***Device Configuration Utility*** will prompt you to set one set before obtaining a UID. This is for security purposes as the data logger reaches out to acquire TLS information and private/sensitive settings. To do this, navigate back to the **Deployment** tab, click **Edit** next to **PakBus Encryption Key**, and enter a key. Once a **PakBus Encryption Key** is set it will be required for users and other devices to

communicate with the data logger. Be sure to record it for future reference. Click **OK**, then **Apply** and **Confirm** your setting changes. Finally, click **OK** on the resulting dialog box and return to Step 5. Once this section is completed, the Pakbus Encryption Key may be removed if desired.

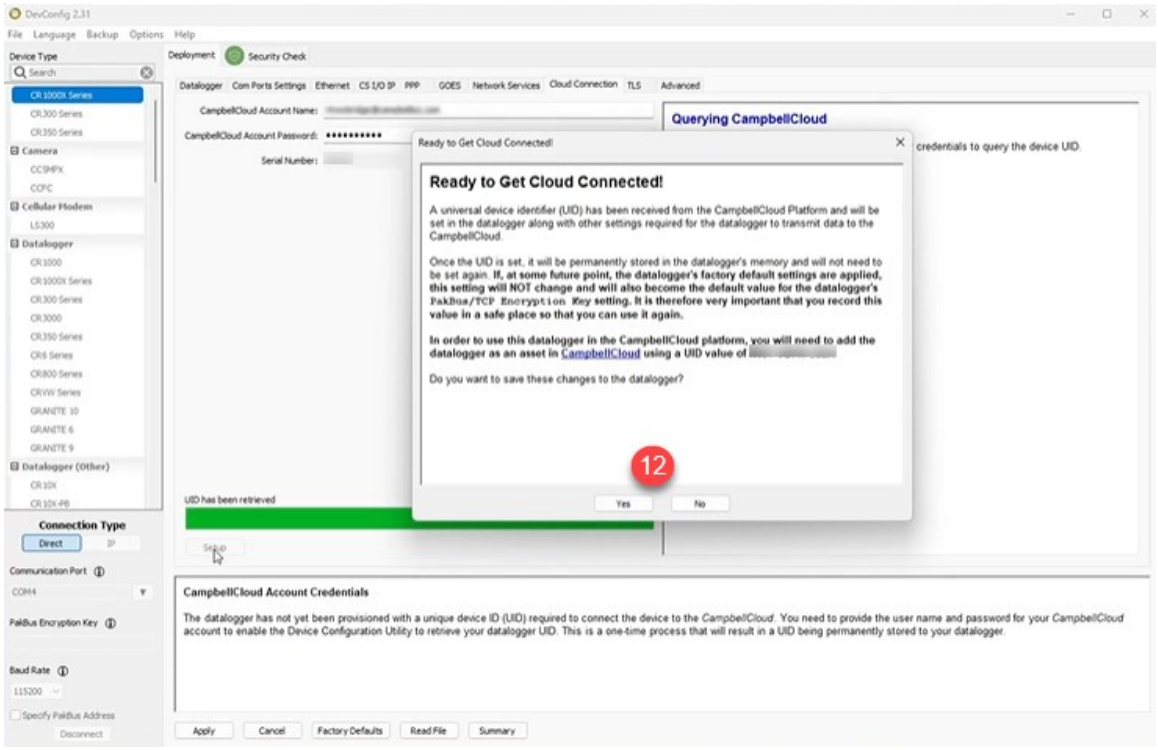


9. To receive a UID, enter a valid **CampbellCloud Account Name** and **Password**.

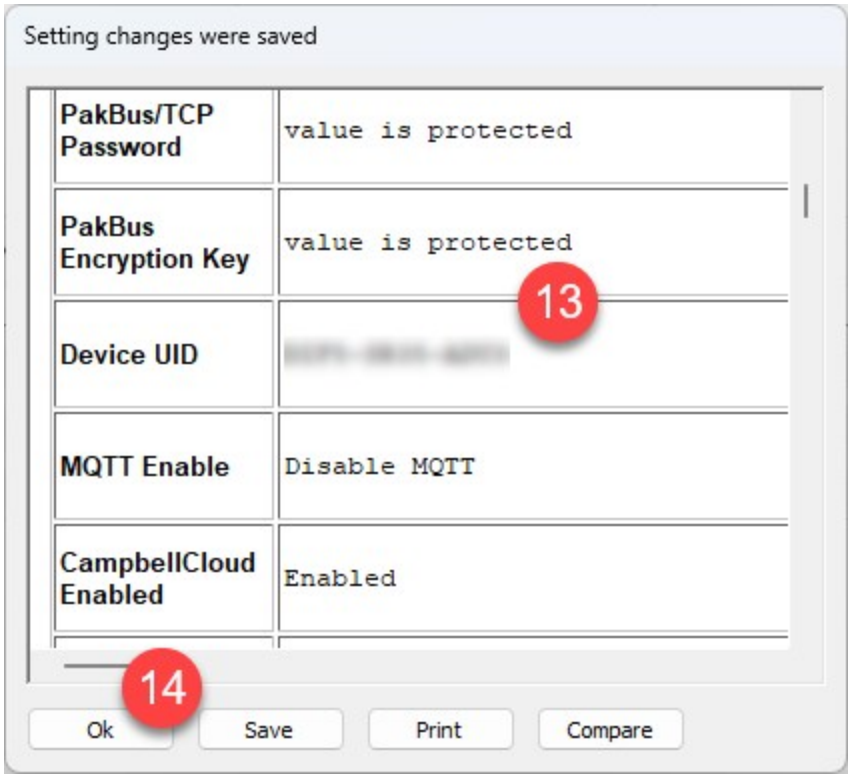


10. Click **Setup**.
11. ***Device Configuration Utility*** uses the entered credentials to connect to CampbellCloud and retrieve the UID. A progress bar displays the progress of the UID retrieval process.

12. When complete, a new window opens with information about the UID, including the new UID number. The window includes a prompt to save the changes to the data logger. Click **Yes** to close the window.



13. Another window opens with the new data logger configuration. Scroll down through the settings to find the UID number. Record this number for future reference.

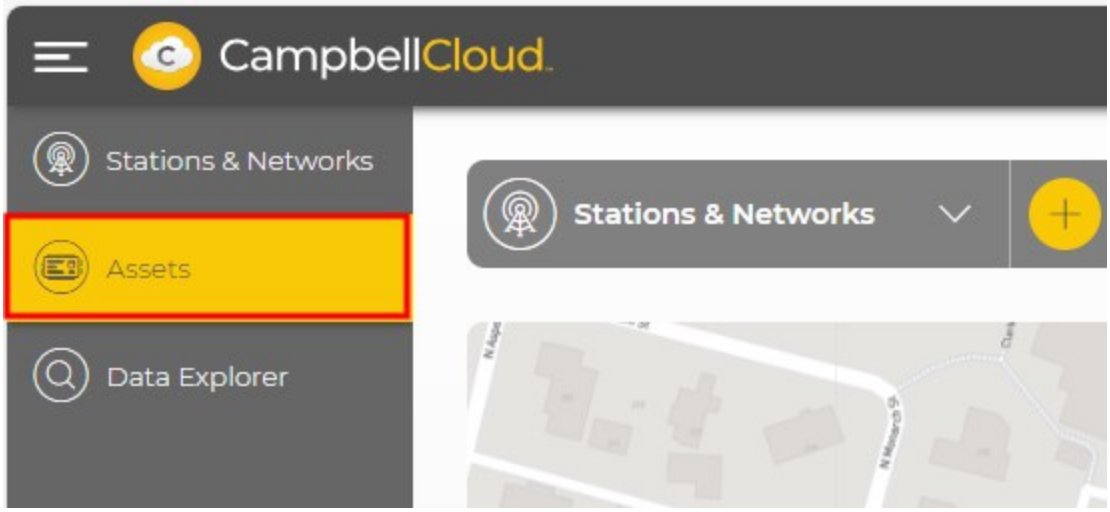


14. Click **OK**.

3. Adding your data logger as an asset in the Assets app

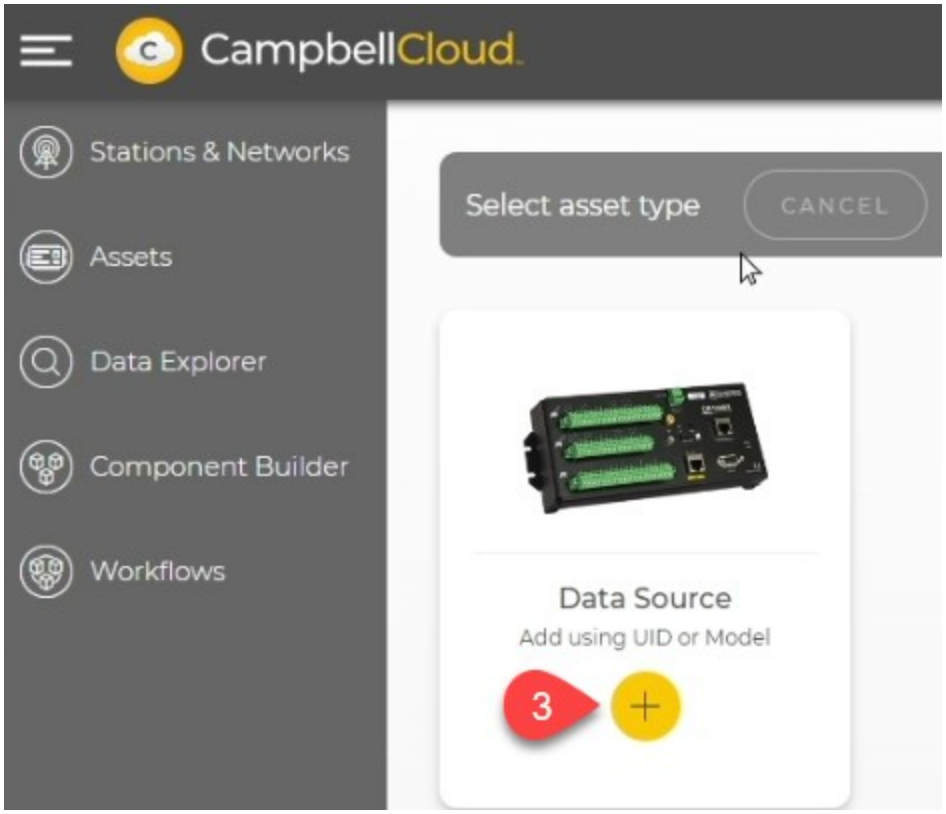
A Data source is provided through assets. All data logger specific settings can be set through the asset, such as the units of variables coming in and the time zone of the data logger. The following steps demonstrate adding an asset using the **Assets** app directly in CampbellCloud.

1. On the CampbellCloud home screen, select **Assets** from the application menu.



2. Click the plus symbol.

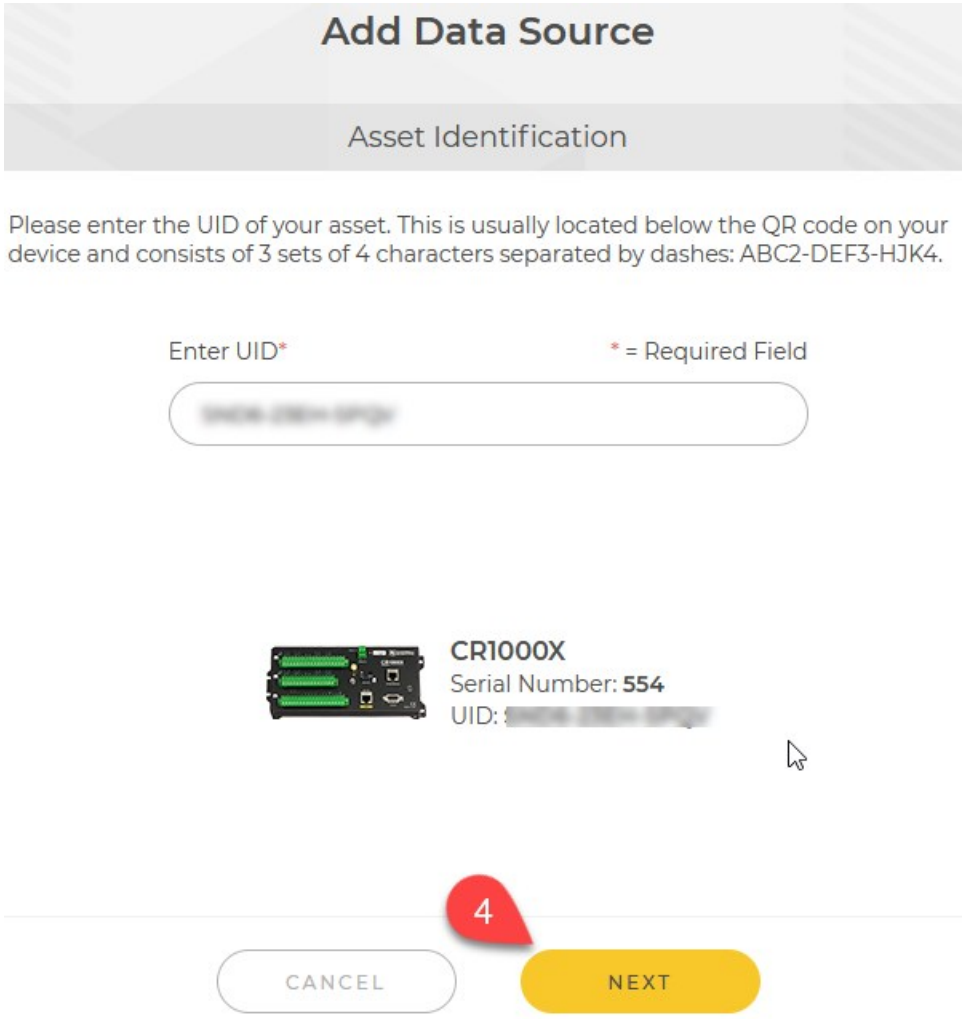
3. Click the plus symbol below **Data Source**.



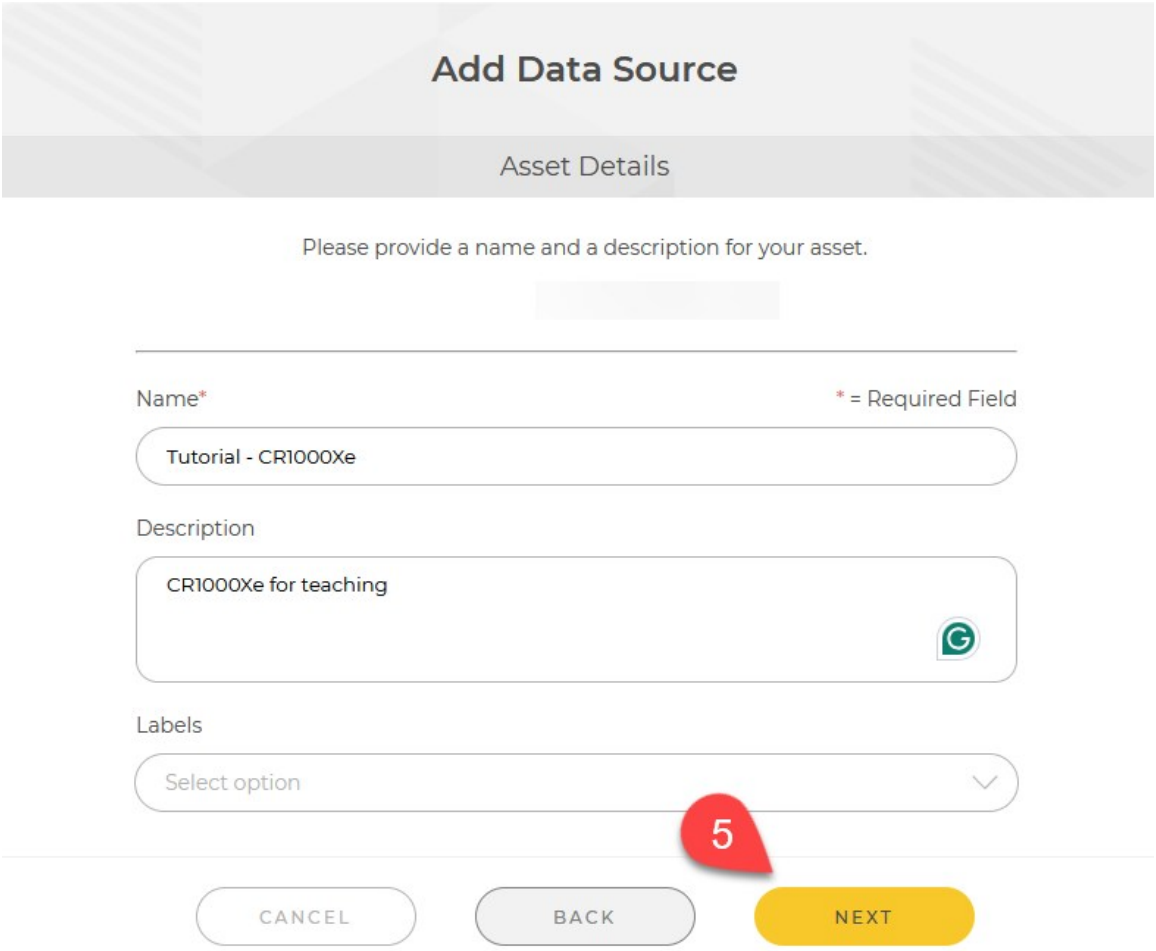
4. Enter the UID number of the asset. This UID number can either be found on the QR code sticker shipped on the data logger or within the **Cloud Connection** tab in ***Device Configuration Utility***.

   CampbellCloud verifies that the asset has not already been added to another network. Click **NEXT**.

> **NOTE:**
> If the **Campbell Cloud** tab does not appear, make sure ***Device Configuration Utility*** and the data logger operating system is up to date.

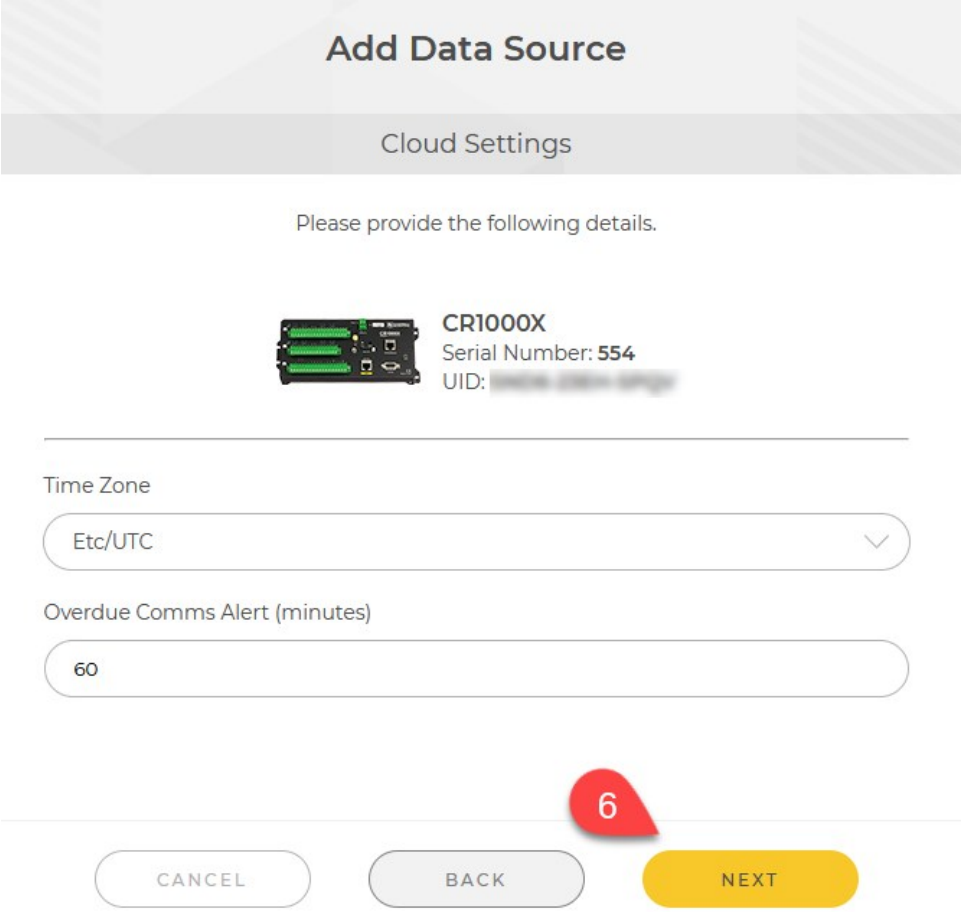


5. Enter a **Name** and optional **Description** for the asset. Click **NEXT**.



6. Set the preferred **Time Zone** and **Overdue Comms Alert** (minutes). Click **NEXT**.

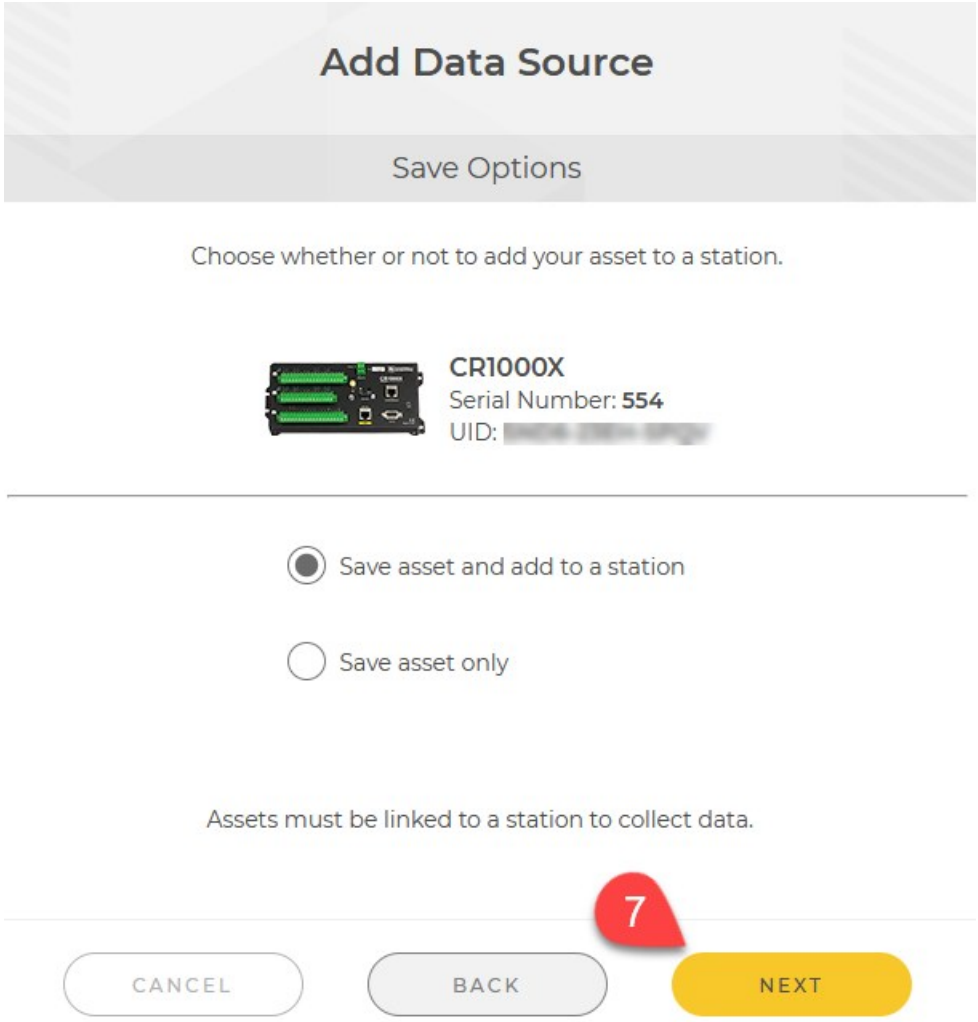
> **NOTE:**
> This is the time zone that the data logger is on, not the time zone that you would like to see. Failure to set this to the correct time zone will cause the data ingested to have an incorrect timestamp in CampbellCloud.



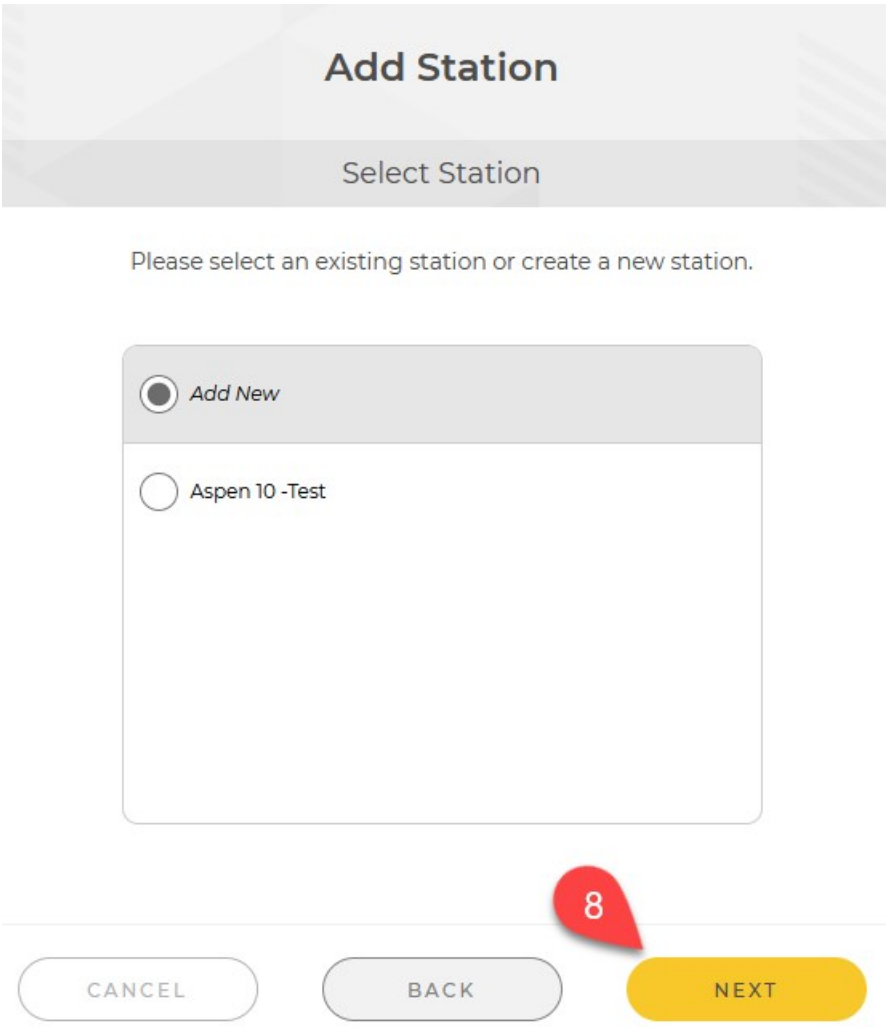
> **NOTE:**
> CampbellCloud automatically adjusts data timestamps for daylight savings in applicable time zones.
>
> • When clocks "fall back" one hour, timestamps for the repeated hour will appear twice.
>
> • When clocks "spring forward" one hour, timestamps will skip the hour that is lost.
>
> These adjustments align with the daylight savings rules of the selected time zone. If your time zone is set to Etc/UTC, no adjustments will be made since UTC does not observe daylight savings.

7. Select **Save asset only** or **Save asset and add to a station**. Click **NEXT**.

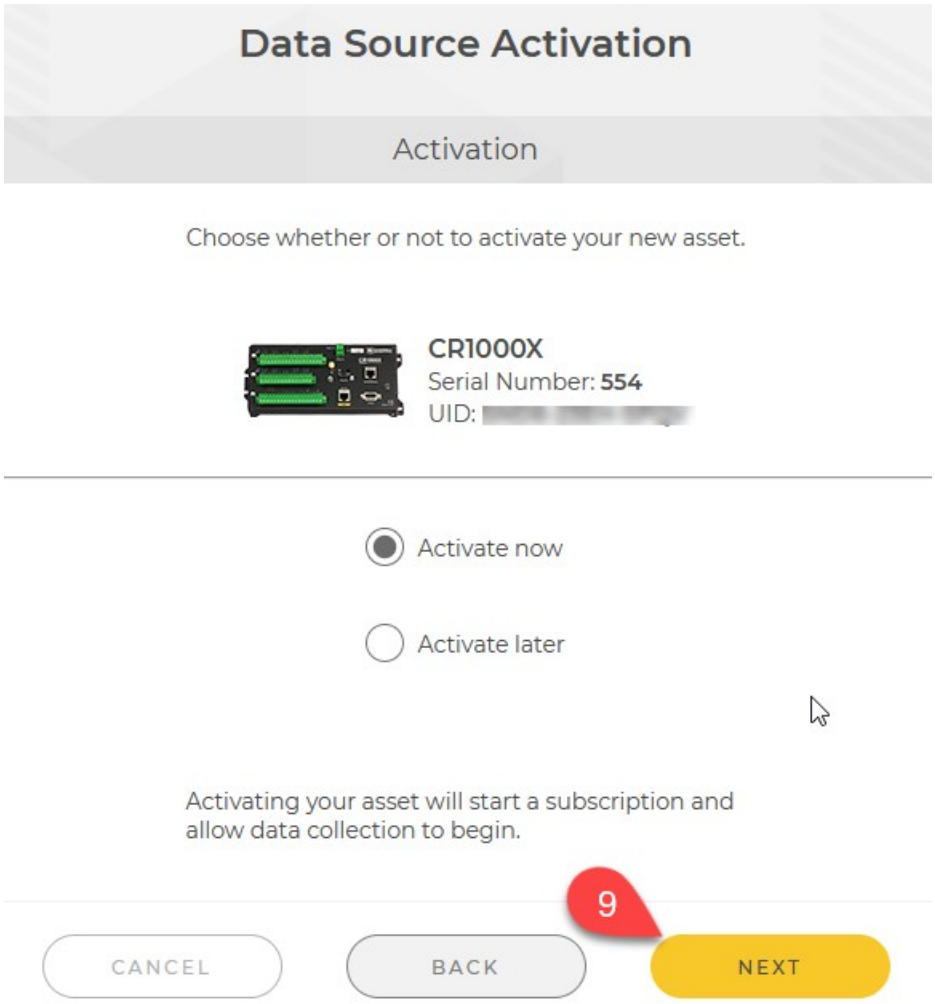
> **NOTE:**
> Adding an asset to a station will start ingesting data for historical purposes. If you do not wish to start recording historical data yet, choose to only save the asset and create/add the station when you wish to record data.



8. If adding the asset to a station, click **Add New** or select an existing station. Click **NEXT**



9. Select **Activate now**, or **Activate later**. Click **NEXT** to complete activation.



For more information on adding an asset directly in CampbellCloud, watch an instructional video at: https://www.campbellsci.com/videos/cloud10.

4. Configuring a CR data logger for onboarding

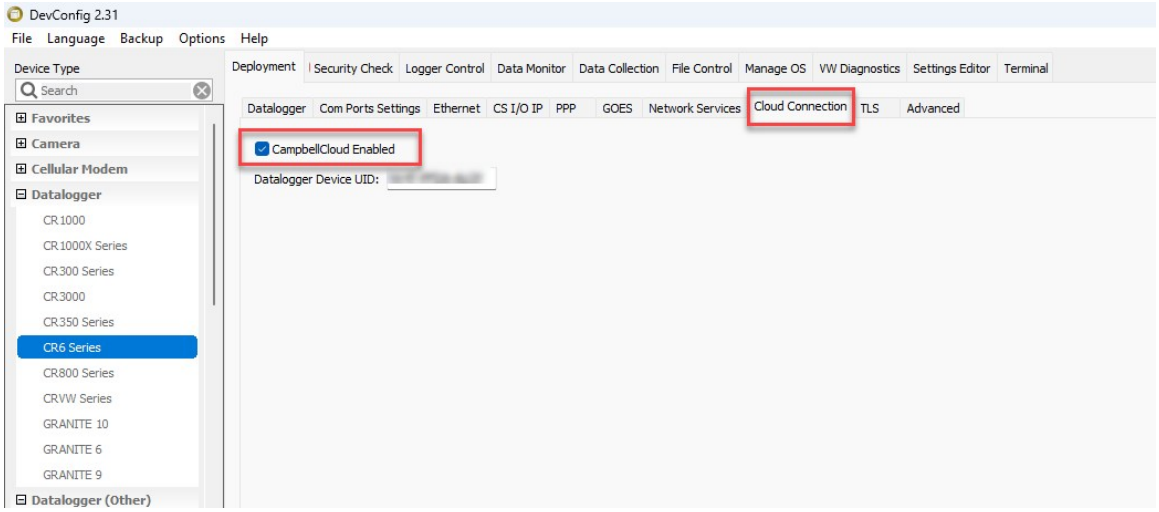
> **NOTE:**
> It is best practice to add the data logger as an asset in CampbellCloud before configuring it for onboarding (see Adding your data logger as an asset in the Assets app [p. 8]). When a

data logger is configured prior to being added to CampbellCloud, it may be assigned a temporary ("dummy") base topic (for example, cs/v2/111111111111111). If the data logger remains in this state for any period of time, it can repeatedly attempt to connect using that temporary topic, and those connection attempts can conflict with other devices using the same placeholder topic. This can lead to repeated disconnect/reconnect behavior and unnecessary data transmission, potentially resulting in unexpectedly high data usage. Adding the data logger as an asset first ensures it is registered and receives the correct, unique Cloud topic before onboarding, preventing these connectivity conflicts and avoiding excess data consumption.

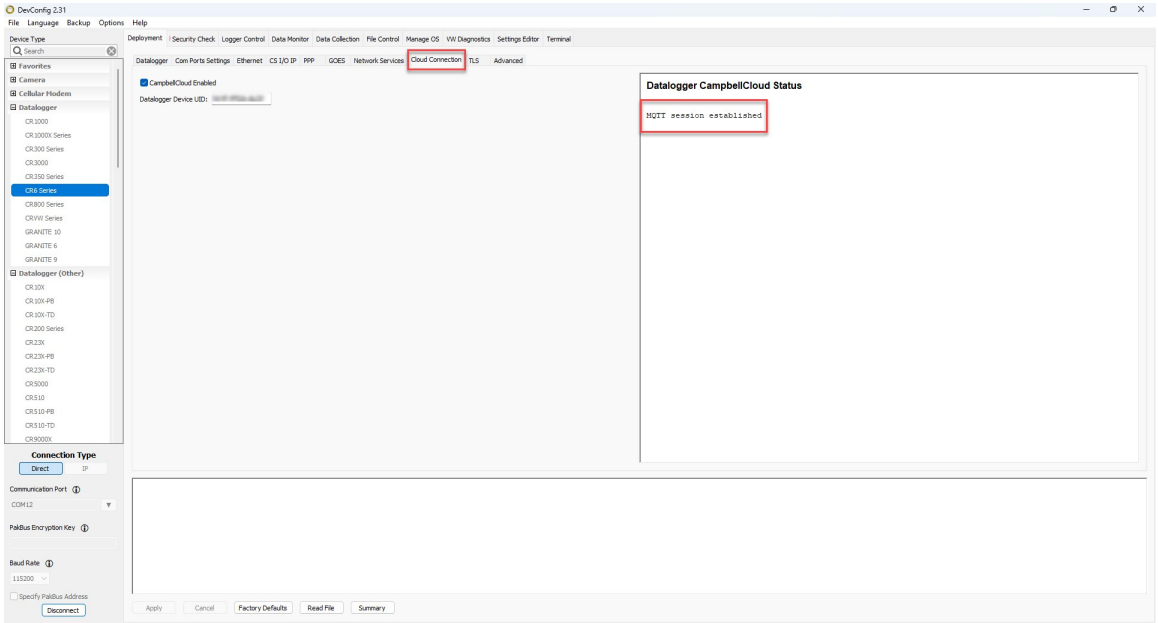
Follow these steps to prepare your data logger for CampbellCloud:

WARNING:
To avoid data loss, collect any unsaved data prior to configuring the data logger for onboarding to CampbellCloud.

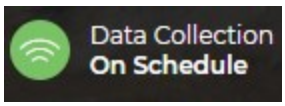
1. Ensure the data logger has the latest operating system installed. Operating systems are available from the Campbell Scientific website: https://www.campbellsci.com/downloads/operating-systems-datalogger. Also ensure that ***Device Configuration Utility*** is up to date.
2. Ensure that your data logger has internet access. (See the Troubleshooting section in Appendix B for more details.)
3. Connect to your data logger with ***Device Configuration Utility***.
4. Navigate to the **Cloud Connection** tab.
5. Select the **CampbellCloud Enabled** checkbox.



6. **Apply** the settings. The data logger will then restart and begin connecting to CampbellCloud, including authentication with the platform. This process may take a few minutes.
7. Reconnect to your data logger with ***Device Configuration Utility***. Navigate to the **Cloud Connection** tab. The **Datalogger CampbellCloud Status** box on this tab displays the status of MQTT communications. Once the device is successfully connected, you should see **MQTT session established** in this box. If not, see the Troubleshooting section in Appendix B.



Your data logger should start at least publishing status information to CampbellCloud and the **Data Collection** state should say **On Schedule**.



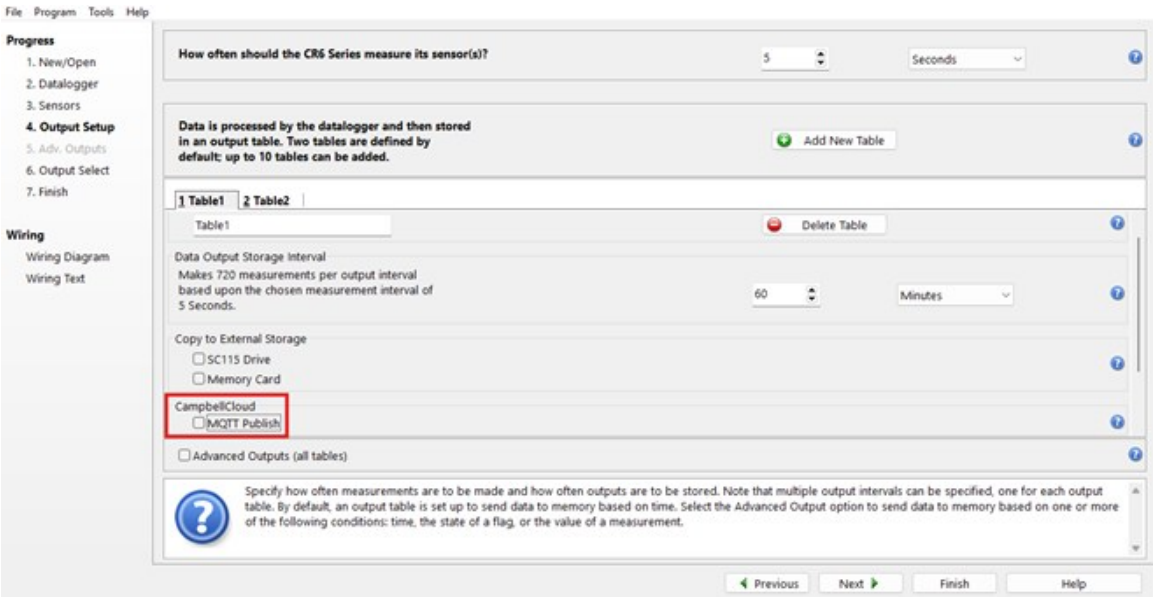
5. Publishing your data to CampbellCloud

At this point your data logger should be visible on CampbellCloud and publishing status information. CR1000X/Xe/CR6 data loggers have a feature that enables automatic publishing to CampbellCloud. Auto-Publish can be a convenient way to get started quickly. For the most consistent and transparent results—especially when programs are updated or expanded—we

recommend explicitly defining your MQTT publish settings in the program (for example, by specifying the publish table/settings directly). This approach makes the publishing behavior easier to verify and troubleshoot, and it keeps the setup process consistent across platforms (including 300 Series and CR6/CR1000X/Xe).

5.1 Publishing tables using *Short Cut*

Short Cut offers the option to enable MQTT publishing for specific tables to CampbellCloud. On the **Output Setup** page, choose the table you would like to publish and check the **MQTT Publish** box. You must select the box for each table you would like to publish to CampbellCloud. Data will be published every 10 minutes or at the **Data Output Storage Interval** of the table if it is greater than 10 minutes.



5.2 Publishing tables using CRBasic

To publish a specific table toCampbellCloud, you must add the `MQTTPublishTable()` instruction to that data table. This is what the **MQTT Publish** checkbox does in ***Short Cut***.

> NOTE:
> It is best to add this instruction to the end of the associated data table as opposed to the beginning. This will cause the most recent record to be published.

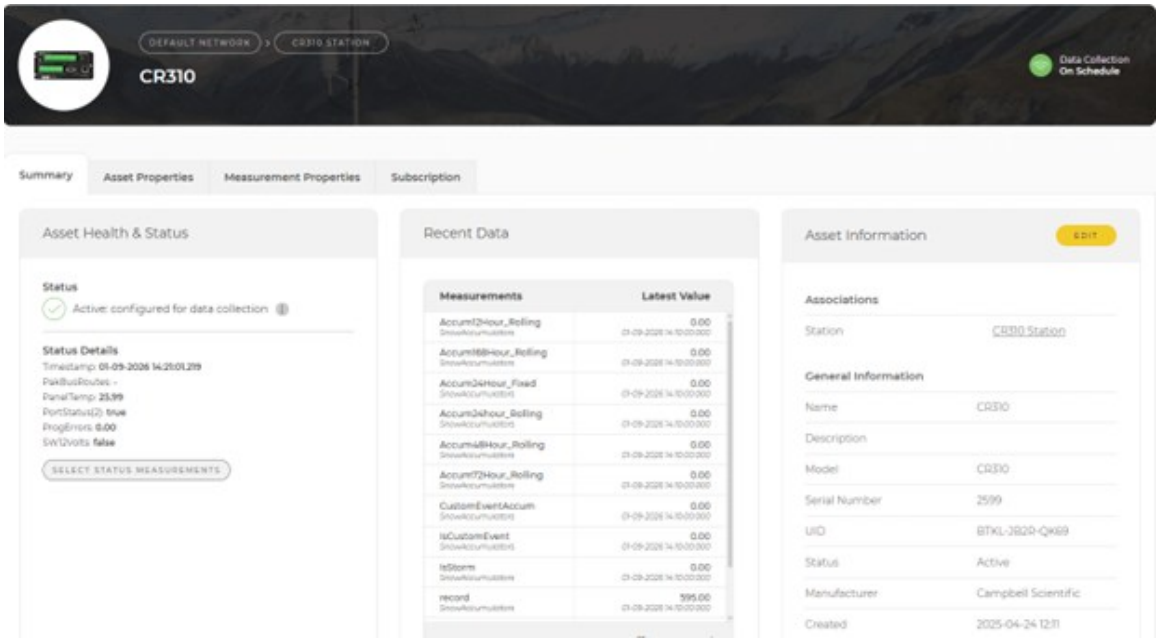
The `OutputFormat` parameter in the `MQTTPublishTable()` instruction must be set to 2, GeoJSON. `Latitude`, `Longitude`, and `Altitude` values must be entered as well. If they are not known or unimportant, zero may be entered for those values.

```
DataTable (Test,1,-1) 'Set table size to # of records, or -1 to autoallocate.
  DataInterval (0,15,Min,10)
  Minimum (1,Batt_volt,FP2,False,False)
  Sample (1,PTemp,FP2)
  MQTTPublishTable (0,0,1,Hr,2,0,0,0)
EndTable
```

This example will publish 4 records every hour. If a publish fails, it will publish the records that previously failed as well as the current ones.

> **WARNING:**
> CR300/CR310 series data loggers have substantially less RAM than the other models and can experience memory issues while onboarding with CampbellCloud. One way to remediate this is to decrease the number of tables that include the `MQTTPublishTable` instruction. Therefore, try to consolidate data into a single data table for publishing if possible.

Now you may send the associated program to the data logger and view the data coming into CampbellCloud.



Appendix A. FAQs

What is the difference between Assets, Stations, and Networks?

You can think of Assets, Stations, and Networks (and how they relate to Accounts and Organizations) as a tree, where each level contains the level below it.

The tree structure (what can contain what)

Account → Organization → Network → Station → Asset

- One User Account can be associated with multiple Organizations.
- One Organization can have multiple Networks.
- One Network can have multiple Stations.
- One Station can have multiple Assets.

What each level in the tree does

Asset (leaf level) — subscription + device specific settings

Think of an Asset as a leaf on the tree; it's the individual unit you configure.

- The Asset holds the subscription.
- It's where you set unit-specific properties, such as:
  - variable units and classifications
  - the unit's time zone

Station (branch level) — location + historical data storage

Think of a Station as a branch that the leaves grow from.

- The Station holds location information.
- The Station stores historical data.

Because historical data "lives" on the Station branch (not on the Asset leaf):

- An Asset without a Station will not ingest historical data.
- Deleting an Asset does not delete historical data (the branch still exists).

- Deleting a Station does delete all historical data for that Station (you're removing the entire branch and everything attached to it).

Network (trunk level) — grouping stations for filtering, dashboards, alerts

Think of a Network as the trunk that groups multiple Station branches together.

- A Network groups Stations so large organizations are easier to manage and filter.
- This grouping is especially useful when creating dashboards and alerts.

Organization (grove level) — the entity managing multiple networks

Think of an Organization as a grove of trees: it represents the entity using CampbellCloud to manage its networks, stations, and assets.

- An Organization contains the Networks (and everything beneath them) owned or managed by that entity.

Account (caretaker level) — the user identity that can access one or more groves

Think of an Account as the caretaker: it's an individual user's CampbellCloud login that can be granted access to one or more Organizations (groves).

- A single Account can have access to multiple Organizations, depending on permissions.

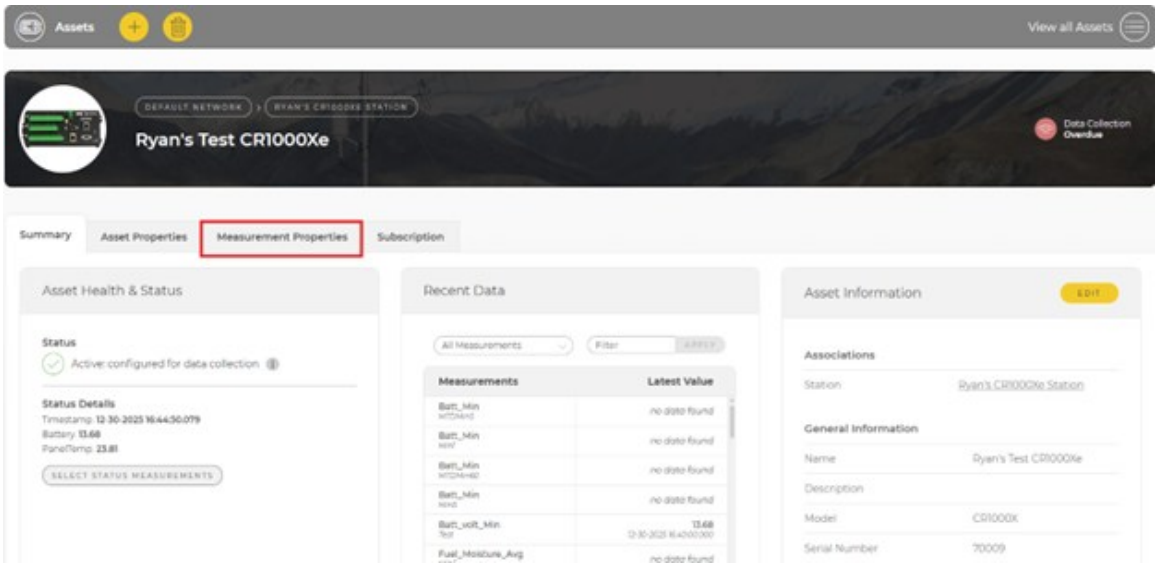
I already paid for a subscription but cannot see it with the Subscriptions app. How do I add that subscription to my organization?

After ordering subscriptions via a sales order, the contact that ordered the subscriptions should receive an email shortly after the sales order is invoiced with links to claim your subscriptions to a specific account. If you do not receive this e-mail, please contact Campbell Scientific Order Processing (435-227-9090).

What's up with all these different unit options? How do I set them all correctly?

Aspen10 Public table Display_Imperial_Units: This Boolean can be set to either true or false to see only live Public table data in imperial or metric units. This setting only applies to viewing the data via ***CampbellGo*** and has no affect on how data comes into CampbellCloud.

Measurement Properties: These units should be set to the units you expect to receive from your data logger. For example, if your data logger is reading and storing a variable called "Temp" from a temperature sensor in degrees Celsius, the variable "Temp" in **Measurement Properties** should be set to units of Celsius.



My Settings: These are the units that you would like to see in CampbellCloud. Using the previous example, if you would like the variable "Temp" to be shown in degrees Fahrenheit instead of Celsius, apply that unit preference in this menu.

Why is my data coming in with an incorrect timestamp?

Make sure that in **Assets** > **Asset Properties** > **Cloud Settings** tab, you use the time zone that your data logger is currently set to.

Appendix B. Troubleshooting

MQTT relies on many protocols to operate correctly. Here are some steps you can take to fix most of the issues you may encounter on your way to connecting your data logger with CampbellCloud.

B.1 General connectivity issues

While connected in ***Device Configuration Utility***, navigate to the **Terminal** tab and perform the following commands (make sure to uncheck **All Caps** at the bottom of the screen):

ping 8.8.8.8

ping www.google.com

The first scenario is the ping to 8.8.8.8 fails.

```
CR300>ping 8.8.8.8
Ping failure!
```

In this case, double check your respective internet connection and network configurations with IT, as the device is not able to reach the internet (or can only reach certain portions of the internet).

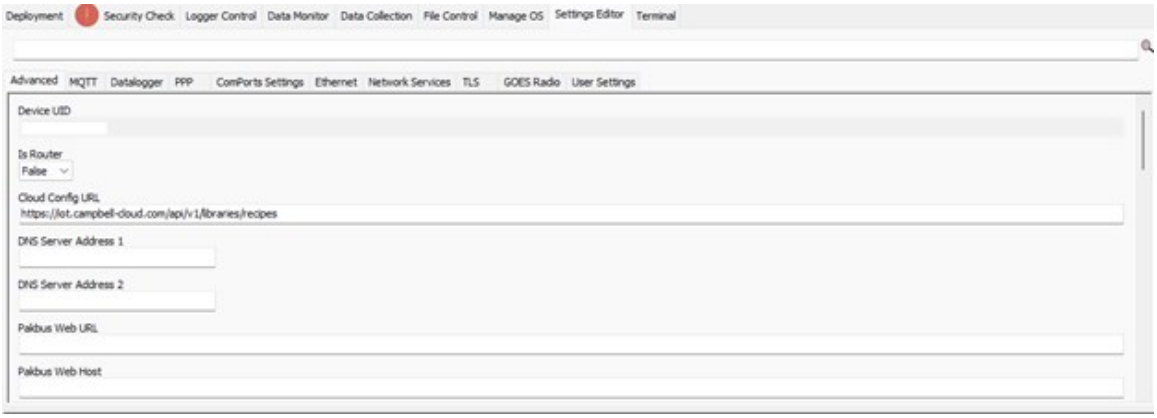
If you are connected via cellular, visit appendix H and G in the CELL200-Series manual for further cellular module connection troubleshooting: https://s.campbellsci.com/documents/us/manuals/cell200-series.pdf.

The second scenario is the ping to 8.8.8.8 is successful, but the ping to Google fails.

```
CR1000X>ping 8.8.8.8
PING 8.8.8.8 with 8 bytes
Reply from 8.8.8.8: time=130ms
1 packets send, 1 packets recv, time 130ms

CR1000X>ping www.google.com
Failed to lookup host: www.google.com error: Illegal value.
0 packets send, 0 packets recv, time 0ms
```

This would likely indicate a DNS issue. Go to **Settings Editor** > **Advanced** to make sure the DNS Server Addresses are populated. Consult with your IT for verified and approved addresses to use. Common addresses are 8.8.8.8 for DNS Server Address 1 and 8.8.4.4 for DNS Server Address 2.



This is how two successful pings would look:

```
CR300>ping 8.8.8.8
Ping time : 20
CR300>ping www.google.com
Ping time : 19
```

B.2 CR300/CR310 out of memory

Introduction

If your CR300 series data logger is having trouble connecting to CampbellCloud you can follow the diagnostic steps below to try and resolve your issue. If none of these resolve your issue, please reach out to Campbell Scientific Technical Support at 435-227-9100 or support@campbellsci.com.

Memory

The CR300 series was designed to be a cost effective data logger at the cost of some components. One of these components is the memory. Compared to the CR1000X the CR300 has significantly less memory. This usually is not an issue; however, when integrating a CR300 series with CampbellCloud this limitation becomes a bottleneck.

Symptoms

When sending the data logger program, compile results will show an "Out of memory" error. There may be a line number with the error, which indicates how far into compiling the program the CR300 reached.

Checking Memory

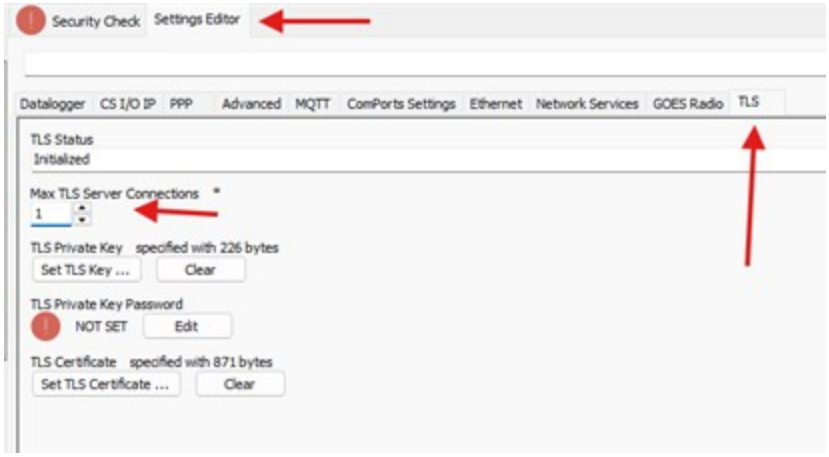
To see if the memory is being affected by the onboarding of the CR300 Series to CampbellCloud you will have to connect to the data logger in ***Device Configuration Utility*** and go to the **Terminal** tab.

1. Press **ENTER** until you get your data logger's prompt.
2. Issue the M command by typing **M** and hitting **ENTER**.
3. Check the **Main Memory Total Free** category that gets listed. If it is close to 0, you will need to free up memory on your CR300 series data logger.

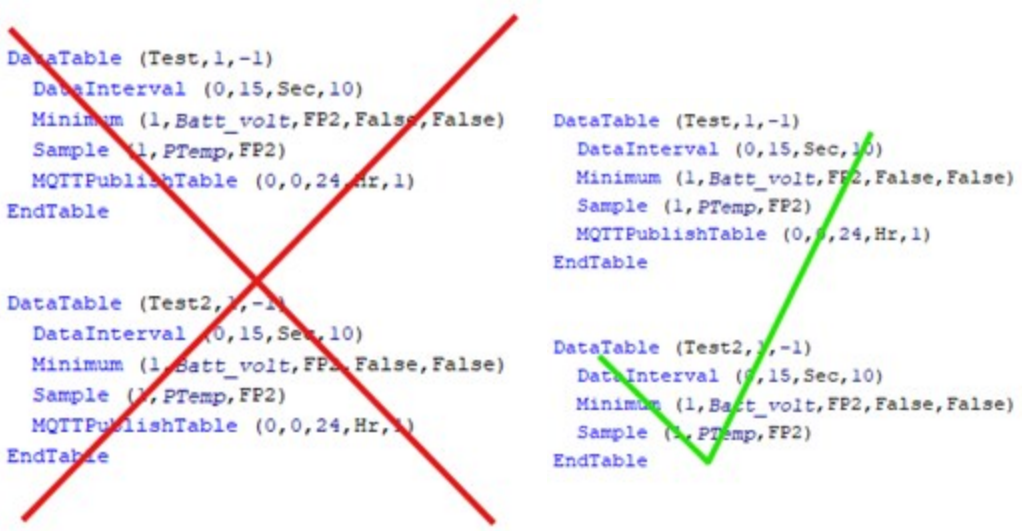
Freeing Memory

After checking your memory and realizing you have no available memory left, here are some steps to free up memory on your CR300 series.

1. Reduce **Max TLS Server Connections** to 1 (**Settings Editor** > **TLS**).



2. Only have one `MQTTPublishTable()` instruction in your program.

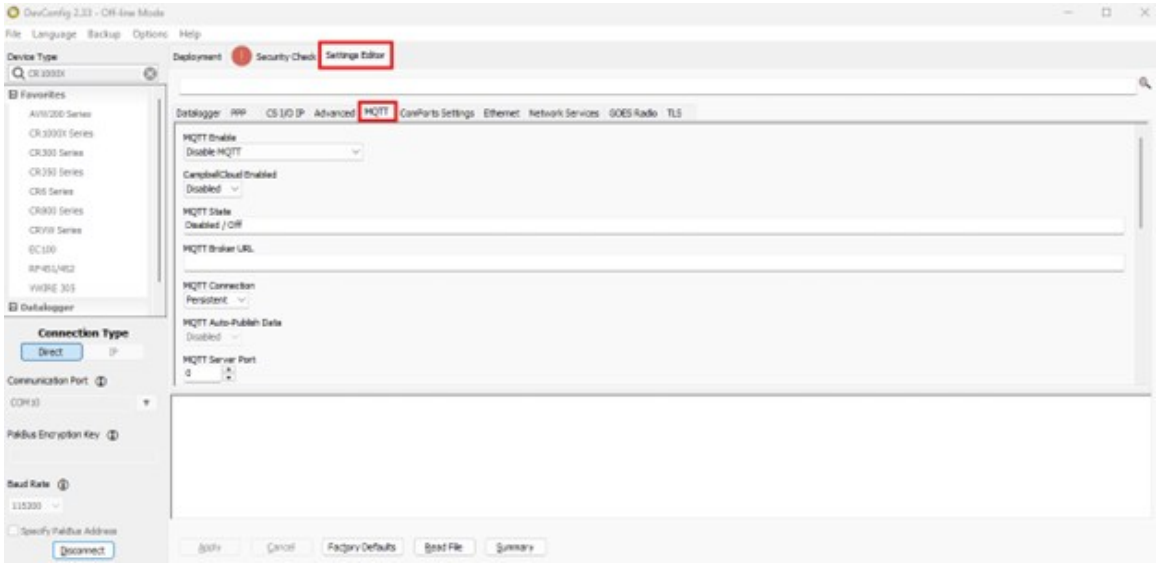


3. Turn off web services on the CR300 if not needed. The settings can be accessed with ***Device Configuration Utility***. Services such as TLS, MQTT, FTP, and HTTP(S) require allocated communication buffers.
4. Hide variables that don't need to be seen in real time. A variable declared with Public requires more RAM than a variable declared with Dim. Hidden variables can be stored in data tables just as well as public variables. If you don't need to see the value in the Public table for real time monitoring or site visits, hide the variable by declaring it as Dim.
5. Size string variables properly. String variables can use a lot of RAM. Declare the length of strings to 1 byte larger than the biggest data they need to contain. A string declared with a size of 10,000 will always use 10,000 bytes even if only holding 1 character. Default string size is 24. Declare a smaller string size if not needing the full length. This will also speed up data collection.
6. Reduce serial buffers to the appropriate size. `SerialOpen()`, `TCPOpen()`, and `UDPOpen()` have a buffer size parameter. Size the buffer to double the amount of expected data received between reads, plus 1. For example, if you expect 25 bytes on a serial port between scans using `SerialIn()` size the buffer to 51 in `SerialOpen()`. If opening a port for only Pakbus communication, the buffer can be set to 0.
7. Shorten long variable names. Having many long variable names in the Public table uses extra RAM.
8. Use arrays for large numbers of variables. Arrays are an efficient way to process large sets of variables. They are also more efficient in use of RAM. Of course, don't oversize the array.

9. Use sub routines for actions repeated within a scan. That will decrease the size of the compiled program. Comments in a program do not increase the compiled size, so leave your documentation in.

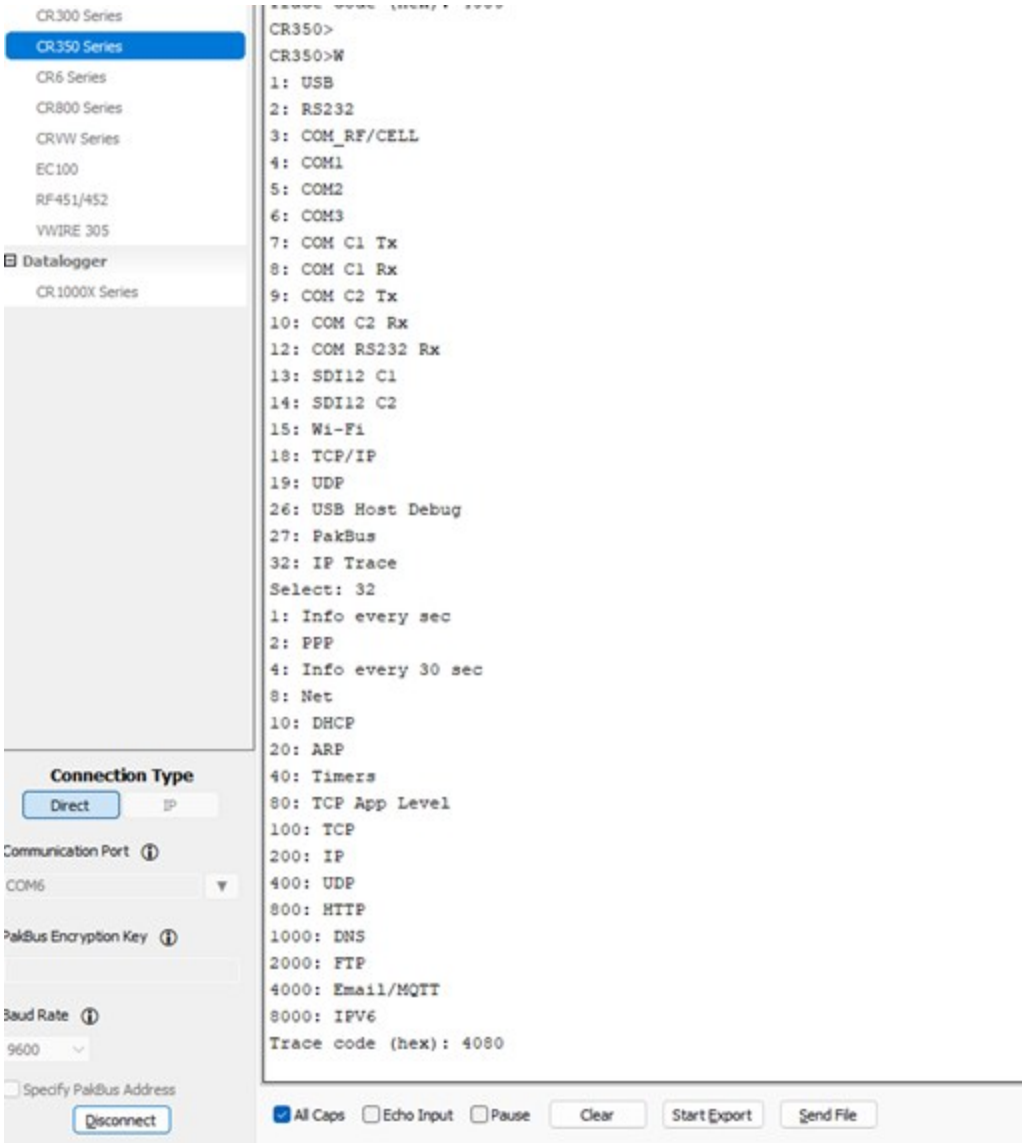
B.3 General troubleshooting notes

- In *Device Configuration Utility*, you can go to **Settings Editor** > **MQTT** to view current MQTT settings and states.



  - Note the **MQTT State**. We would hope to see "MQTT Session Established". Two other common states are "TLS Handshake Started" and "Onboard Retry". If they are stuck on either of these, see General connectivity issues (p. 25).
  - **Base Topic** and **Last Will Topic** should be filled with a somewhat random string of letters and numbers starting with cs/v2/. If they do not look somewhat random and include a lot of the same number repeated, make sure to add the associated data logger as an asset in CampbellCloud.

- In *Device Configuration Utility*, check terminal traffic by clicking **Terminal** in the top right corner, typing **W** then enter, and choosing **IP Trace**. From there, type **4080** to watch MQTT and HTTP traffic. Feel free to provide this traffic to Campbell Scientific Technical Support for further assistance.



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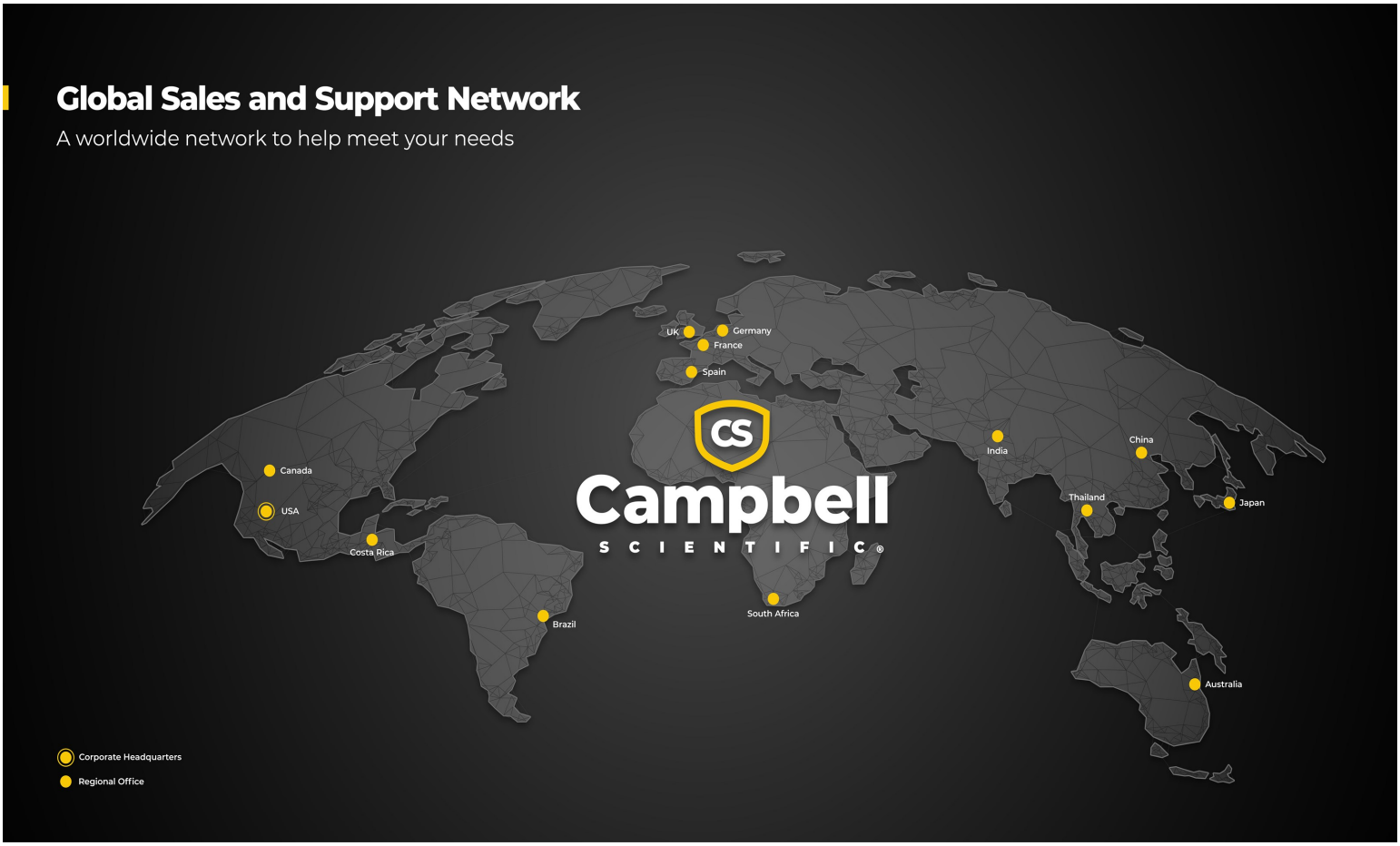

Campbell Scientific Regional Offices

Australia

Location:	Garbutt, QLD Australia
Phone:	61.7.4401.7700
Email:	info@campbellsci.com.au
Website:	www.campbellsci.com.au

Brazil

Location:	São Paulo, SP Brazil
Phone:	11.3732.3399
Email:	vendas@campbellsci.com.br
Website:	www.campbellsci.com.br

Canada

Location:	Edmonton, AB Canada
Phone:	780.454.2505
Email:	dataloggers@campbellsci.ca
Website:	www.campbellsci.ca

China

Location:	Beijing, P. R. China
Phone:	86.10.6561.0080
Email:	info@campbellsci.com.cn
Website:	www.campbellsci.com.cn

Costa Rica

Location:	San Pedro, Costa Rica
Phone:	506.2280.1564
Email:	info@campbellsci.cc
Website:	www.campbellsci.cc

France

Location:	Montrouge, France
Phone:	0033.0.1.56.45.15.20
Email:	info@campbellsci.fr
Website:	www.campbellsci.fr

Germany

Location:	Bremen, Germany
Phone:	49.0.421.460974.0
Email:	info@campbellsci.de
Website:	www.campbellsci.de

India

Location:	New Delhi, DL India
Phone:	91.11.46500481.482
Email:	info@campbellsci.in
Website:	www.campbellsci.in

Japan

Location:	Kawagishi, Toda City, Japan
Phone:	048.400.5001
Email:	jp-info@campbellsci.com
Website:	www.campbellsci.co.jp

South Africa

Location:	Stellenbosch, South Africa
Phone:	27.21.8809960
Email:	sales@campbellsci.co.za
Website:	www.campbellsci.co.za

Spain

Location:	Barcelona, Spain
Phone:	34.93.2323938
Email:	info@campbellsci.es
Website:	www.campbellsci.es

Thailand

Location:	Bangkok, Thailand
Phone:	66.2.719.3399
Email:	info@campbellsci.asia
Website:	www.campbellsci.asia

UK

Location:	Shepshed, Loughborough, UK
Phone:	44.0.1509.601141
Email:	sales@campbellsci.co.uk
Website:	www.campbellsci.co.uk

USA

Location:	Logan, UT USA
Phone:	435.227.9120
Email:	info@campbellsci.com
Website:	www.campbellsci.com