Watec 933 Camera Documentation

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1) New Camera Spreadsheet https://docs.google.com/spreadsheets/d/1HkeTYAVQ3RaVRUFHyAiKlf5FlizRkfooBxWkuCNOLkc/edit#gid=0
2) Watec User Manual https://drive.google.com/file/d/1hmxL5e7SJMkztWb8NpXOMxQa4R7WxiXF/view?usp=sharing
3) All_reset.bin https://drive.google.com/file/d/1d34jDYIjwuBzf9ph53bu5fn5DB1mxrl5/view?usp=drive_link
4) Camera settings https://drive.google.com/drive/folders/1ein_ycJGoXDxwvxqVLbZZHRgHMuEGonK?usp=drive_link

Quick Note

These settings were created in 2024 to get the SMALLE devices up and running. We spent a few weeks troubleshooting the cameras, as they were not able to connect. We got smalle 1.1 to work by just switching the left and right cameras, but we were not as lucky with Smalle 2 and 4. I believe the cause of the problems was that the cameras reset to default/previous IP addresses, which caused some conflicts when trying to connect them to the Jetson Nano. My advice for future engineers; just do the hard reset if you are spending too much time debugging. I was initially scared to do it but it is not as bad as it seems.

A. Jetson/Camera Configurations

One of the changes that I made was to standardize the IP addresses across all left cameras, right cameras, and the Jetson IPv4 settings. Here is the table with the current camera information, and what their corresponding IP addresses should be.

Camera Physical Label	Side	Old Camera Label	SMALLE	Mac Address	Serial Number	Camera IP	Working
SMALLE 1	LEFT	DNE	1	c4:7c:8d:30:62:70	W51400625	192.168.0.250	Yes
SMALLE 1	RIGHT	DNE	1	c4:7c:8d:30:62:58	W51400601	192.168.0.251	Yes
SMALLE 4 Watec 8	LEFT	oakley-watec5	4	c4:7c:8d:30:63:38	W51400825	192.168.0.250	Yes
SMALLE 4 Watec 9	RIGHT	oakley-watec4	4	c4:7c:8d:30:63:37	W51400824	192.168.0.251	Yes
SMALLE 2 Watec 4	LEFT	oakley-watec6	2	c4:7c:8d:30:63:20	W51400801	192.168.0.250	Yes
SMALLE 2 Watec 5	RIGHT	oakley-watec9	2	c4:7c:8d:30:63:1F	W51400800	192.168.0.251	Yes

Table 1: Camera Configurations

Notice all **left** cameras have assigned IP **192.168.0.250**, and all **right** cameras have IP **192.168.0.251**. This means that any right camera can be interchangeable, and any left cameras can be interchangeable.

In order for the Jetson to communicate with the cameras, it should also have the correct IPv4 settings configured for the left and the right cameras.

Smalle Label	Jetson Label	IPv4 Address	IPv4 Gateway	Software IP 1	Software IP 2	Camera Left	Camera Right	SSD Card
SMALLE 1.1	SMALLE 2	192.168.0.100	192.168.0.1	192.168.0.250	192.168.0.251	SMALLE1 LEFT	SMALLE1 RIGHT	SMALLE 1
SMALLE 4	SMALLE 4	192.168.0.100	192.168.0.1	192.168.0.250	192.168.0.251	SMALLE4 W.9 L	SM.4 W.8 R	SMALLE 4
SMALLE 2	SMALLE 3	192.168.0.100	192.168.0.1	192.168.0.250	192.168.0.251	SMALLE2 W.4 L	SMALLE2 W5 R	SMALLE 3

Table 2: Jetson Configurations

Notice the **IPv4 address** should be **192.168.0.100,** and the **IPv4 gateway** should be **192.168.0.1**

B. TroubleShooting The Cameras

When we were working with the cameras, the most difficult problem to tackle was initially connecting them, as it might feel like a shot in the dark. Luckily, with the IP addresses above and the next section you should be able to get them connected. Here is the order I recommend troubleshooting.

1. Power

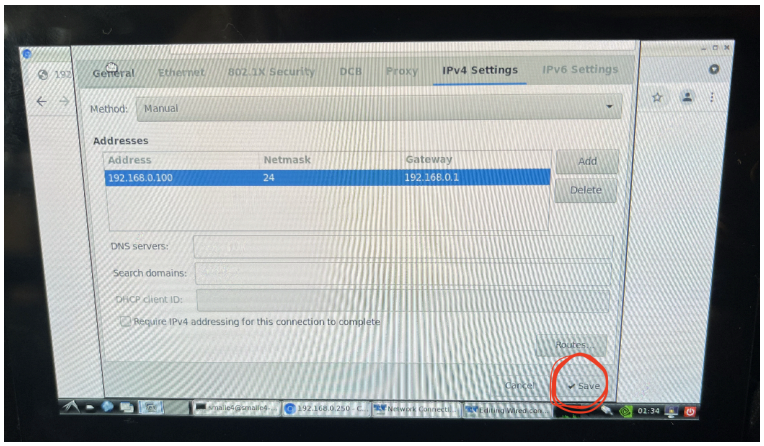
Make sure that the Buck converters are supplying 12V to the cameras through the power. Even though the ethernet port says PoE (power over ethernet), it has a different power source because the network switch and Nano don't have the capabilities to power the cameras through Ethernet. You can confirm that the cameras are getting power by plugging them in for a few minutes, and they should be hot to the touch. Also, what worked for us once was switching the cameras around, but that could have been a fluke.

2. Jetson IPv4 address and IPv4 gateway.

Next, make sure that the Jetson Nano is configured to accept the correct IP address.

Preferences → Network Connections → Wired Connection 1 → IPv4 Settings

Method = manual, the IPv4 Address = 192.168.0.100, and the IPv4 Gateway = 192.168.0.1.



Picture 1: Jetson Nano IPv4 settings for Wired Connection

*** Note, in the window you have to push the save button on the bottom right. It might not be visible so you have to "move" the screen using the options on the top left of the page*

Once you do this, reboot the Jetson nano for the changes to take effect. To see if the cameras are connected, you can ping them individually with "**ping 192.168.0.25X"** in the terminal, where "X" is replaced with "0" (for the left camera) and "1" (for the right camera), and you should see packets coming through. If you are not getting anything through, I learned the hard way the next easiest thing to do is a hard reset.

3. Hard Reset

The easiest option to do next is to do a hard reset, which is explained in the Watec User Manual section 6.7 (link 1). It includes creating and copying a file (link 3) and placing it in the camera. For this I only had power plugged in, and not ethernet.

Once this hard reset is done, the IP address of the camera will revert to **192.168.1.250.** Intentionally, this IP address will require the Jetson Nano to have a slightly different IPv4 address and IPv4 gateway, which you can change temporarily to connect to the camera with default settings.

To do this, go to the IPv4 Settings on the Jetson (location in B.2), and change the settings as follows.

Address = 192.168.1.100, Mask = 24, Gateway = 192.168.1.1

Once you add the temporary settings press save, and reboot the Jetson. You should be able to ping the camera in the terminal with "**ping 192.168.1.250**". If not, your hard reset failed, your camera is broken, or you are going to have to go deeper in the rabbit hole than I did.

Go to chromium and type in the IP address into the browser **192.168.1.250.** You should be directed to enter a username in password. Follow the instructions in the *User Manual (link 2) section 6.1 to login to the Camera Settings*, which is based on Serial Number and Mac Address.

> The default username and password are:
>
> User name: root
>
> Password: "Serial Number" & "Last two digits of MAC address"

You Have Two Options for how to Proceed to Change The IP Address:

i. Loading Default Settings

This is explained in step C, which will configure all the camera settings based on if it is a right or left camera. The benefit is that the IP address will be changed, and also the camera settings will be transferred like Brightness, camera mode, and other settings for filming the dark.

ii. Manually changing IP address

In the settings, view User Manual section 6.5 to change the IP address to what it is supposed to be in Table 1, based on left or right.

Final step. Once you change the IP address in the settings browser, you will no longer be able to connect to the camera with your Jetson IPv4 settings. This means that you will have to go back to step B2 in this document, to configure the Jetson settings to what they are supposed to be.

C. Loading the Settings

This will ensure that we have settings that are the same across all cameras. I have included the settings for the camera in the google drive at link 4, just so they will be tracked for now on. Note that there are settings for the left and the right camera, which are copied from Smalle 1.1 cameras. To load/save the settings, follow the instructions in the User Guide section 6.2.4.

First thing to note is that the IP address might change on your camera, so your Jetson Nano IPv4 settings might have to be changed to the required ones in B2.

Second thing to note is that this will also change the password on your current camera (sorry). Below is a table with the relevant information.

Load Settings	Folder Name	Loaded IP Address	Loaded Password
Right Cameras	Right_251	192.168.0.251	W5140060158
Left Cameras	Left_250	192.168.0.250	W5140062570

Table 3: Loaded Camera Settings Information

I recommend changing the password back to the default to avoid confusion, which is in section 6.2.1 of the user manual. (New password is from the original 1.1 cameras).

When going through the load settings steps, it asks for your password but I found you can sometimes just cancel it, the process is a bit buggy. I recommend rebooting the nano after the settings are loaded.