

Manual: Video In Situ Snowfall Sensor (VISSS)

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Username is 'viss', all passwords (including VNC remote control) are 'viss'.

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1 Setup

*Important: The lens is not rated for temperatures below 0°C. Even though it survived a cold chamber test at -24°C, be careful in sub-zero conditions. **Avoid abrupt temperature changes!** Do not open the Pelican case at temperatures below -15°C! Do not take the Pelican case inside and open the case without waiting approximately 1 hour.*

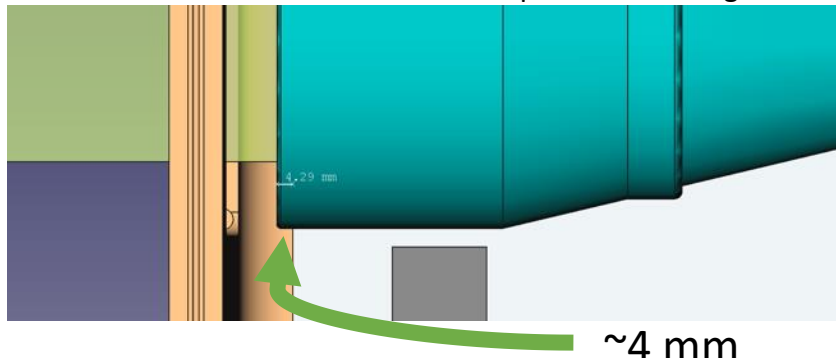
1.1 Install Lens in Pelican case

For transport safety reasons, the lens and camera are packed separately from the orange Pelican case used as housing. Never remove the camera from the lens to make sure no dust is trapped between camera and lens. I recommend installing the lens in the Pelican case indoor to avoid temperature shocks etc.

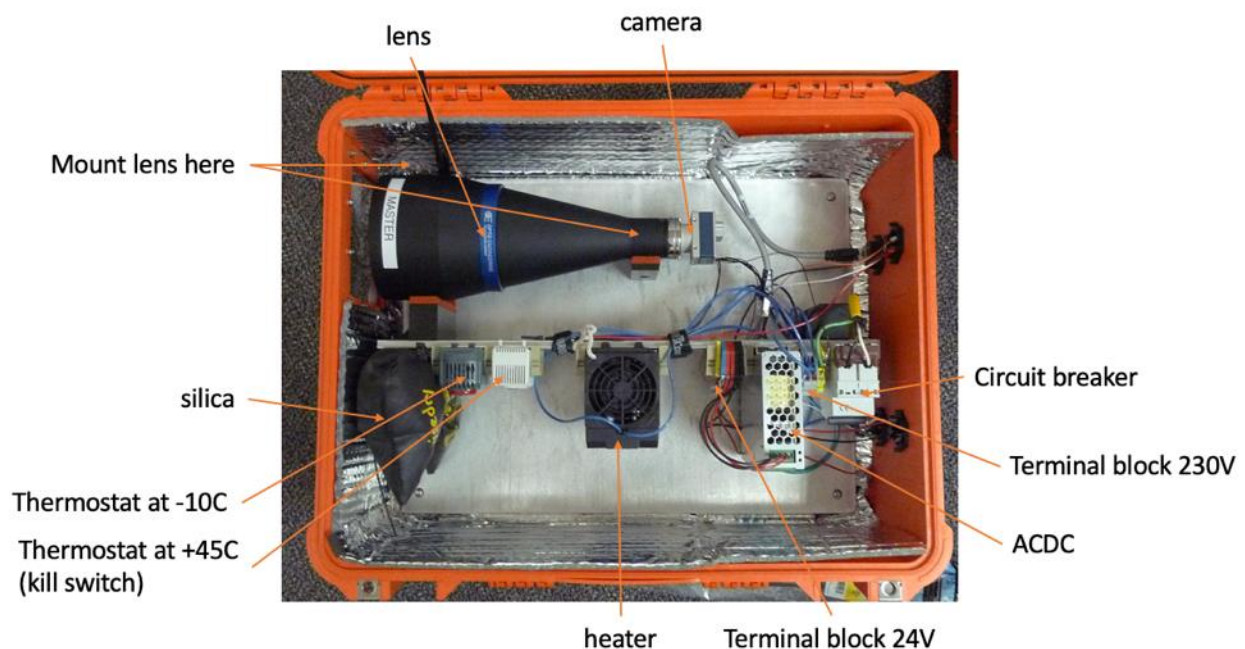


The lens/camera is installed using the provided cable ties. Attach the lens at two locations! Putting a cable tie under the baseplate can be tricky, therefore I prepared a couple of cable ties. However, it is usually not required to remove the aluminum baseplate in the Pelican case to add another cable tie. **Don't pull the cable ties too tight to make sure the red silicone can**

protect the lens from damage if the case drops etc. On the other hand, the cable ties should be tight enough to make sure the lens does not move in the case. Use the bulls eye scale to ensure horizontal alignment of the camera housing. The lens edge is supposed to be about 4 mm closer to the window than the aluminum baseplate. Estimating the 4 mm by eye is precise enough.



Connect network (RJ45) and power cables (black squared 10 pin plug) to the camera. The gray thermostat with the big red knob regulates the heater, I recommend setting it to a temperature between -5°C and -10°C to avoid refreezing of liquid at the window. The white thermostat should be at +45°C to shut the whole system off in case of heater malfunctions.

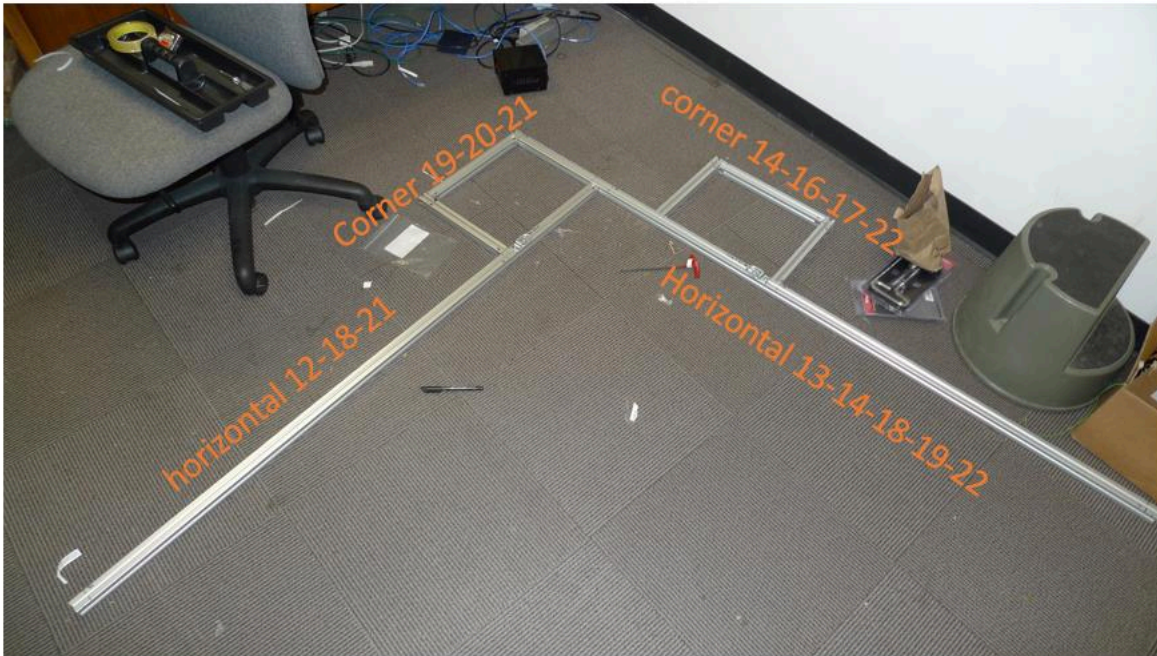


1.2 Setup frame

See the toolbox for spare parts!

All pieces are named. Hex-tools are available in the orange toolbox. Start with **Horizontal-13-14-18-19-22** (longest piece) and connect to **Corner-14-16-17-22** (U-shaped) at the connections

14 and 22. Then, take **horizontal-12-18-21** and connect **Corner-19-20-21** (L-shaped) at 21. Connect both pieces at 18 & 19. The result should look like this:



Now, we start with 3 vertical profiles and slide **Vertical-2-8-21** on **Horizontal-12-18-21** and connect at 21. Next, slide **Vertical-6-10-14** and **Vertical-4-18** (double profile) on **Horizontal-13-14-18-19-22** and connect at 14 and 18, respectively. See image for location of D-ring. Make sure that markings for connections 8 and 10 face towards the backlight. The smaller connection numbers are facing upwards.



Next, we install the 4 remaining vertical profiles. Make sure the black V-shaped rings for tie down straps are facing outside, the silver D-rings for the support ties are facing inside. Slide **Vertical-5-16**, **Vertical-7-17**, **Vertical-1-20**, and **Vertical-3-19** on the existing horizontal framing. The smaller numbers are facing upwards.



We continue with the backlight support frames, they are already pre-assembled. Make sure to not swap master and slave frame and make sure that the t-slot nuts in the horizontal bar are

facing the camera (i.e. face the rest of the frame). Connect the slave frame at 13, the master at 12.



Continue with the horizontal support bars **Horizontal-8-9** and **Horizontal-10-11**. They connect the profiles supporting the backlight and the camera. Make sure, the support for the diagonal bars faces inside. They slide in from the top if you remove the anchor at the top of the vertical bars.



Next, install the pre-assembled camera support frame on top of the 7 vertical profiles. Make sure the bolts for supporting the camera case are facing upwards:



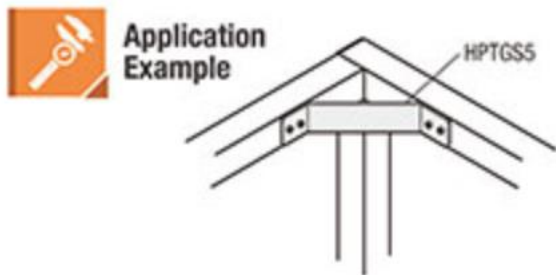
Finally, install the diagonal bars **Diagonal-A-B**, **Diagonal-C-D**, **Diagonal-E-F**, and **Diagonal-G-H**. Start with the last one, using screws from bag labeled “diagonal” in the toolbox.



Finally, connect and tighten the cable ties A, B, and C:



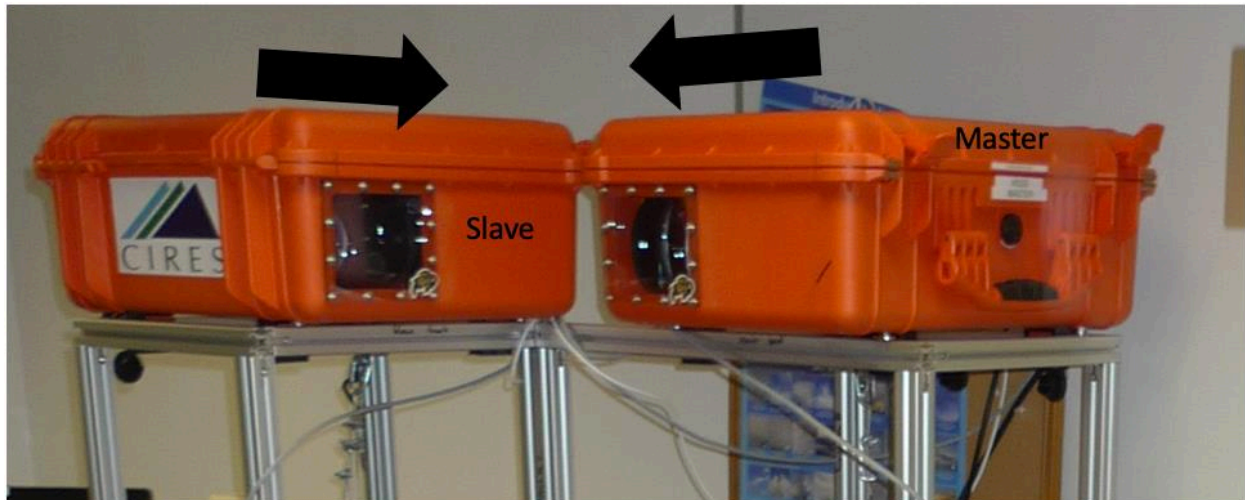
Now, you should have three aluminum profiles left: A calibration tool installed only during calibration, and two spare diagonal profiles with attached connectors. Use them to stiffen the frame if required. Also, you find additional parts for (cables, turn buckles, d-rings, t-slot nuts) for additional support cable ties in the toolbox as well as four metal triangle enforcements:



Use these additional parts after installing the camera and the backlights if needed for making the frame more stable.

1.3 Install Pelican cases

Don't swap master and slave pelican case! Use the screws in the bag labeled 'Pelican case'. First, make sure the t-slot nuts (which are already in the profile) are in the middle of the profiles. Then, put the cases on the frame:



Make sure not to break the silicone 'washers', there are supposed to be 6 per Pelican case. Replacement is in the toolbox.

The screws are NOT supposed to be tightened all the way!! There is a gap between the plastic block and the frame to allow for temperature expansion. Be careful, otherwise you will rip off the plastic blocks from the Pelican case!

Installing the screws can be a little tricky, but here is what I found working best:

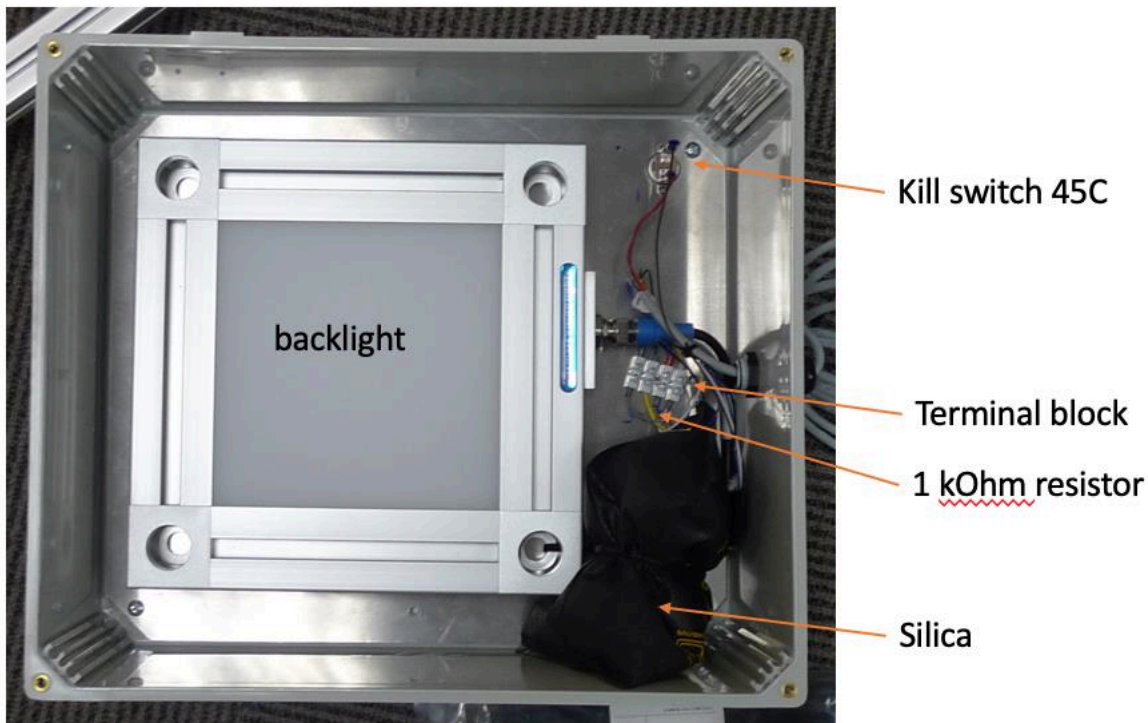
1. Start with the two screws facing the backlight of the OTHER camera
2. Make sure the t-slot nuts (which are already in the frame) are **not** covered by the black plastic blocks
3. Insert screw all the way into plastic block
4. Use hex key to move t-slot nut until stopped by the screw
5. Move screw out until t-slot nut can move again
6. Continue pushing the nut with the hex key slowly.
7. Feel when nut and screw are aligned, **do not tighten the screw all the way yet.**



Repeat for other screws. Move the frame all the way in the direction of the arrows in the image above and tighten the screws carefully! **Potentially, tightening the screws by hand without a**

hex key is sufficient! As said, there is a gap between the plastic blocks and the profiles to allow for different temperature expansions.

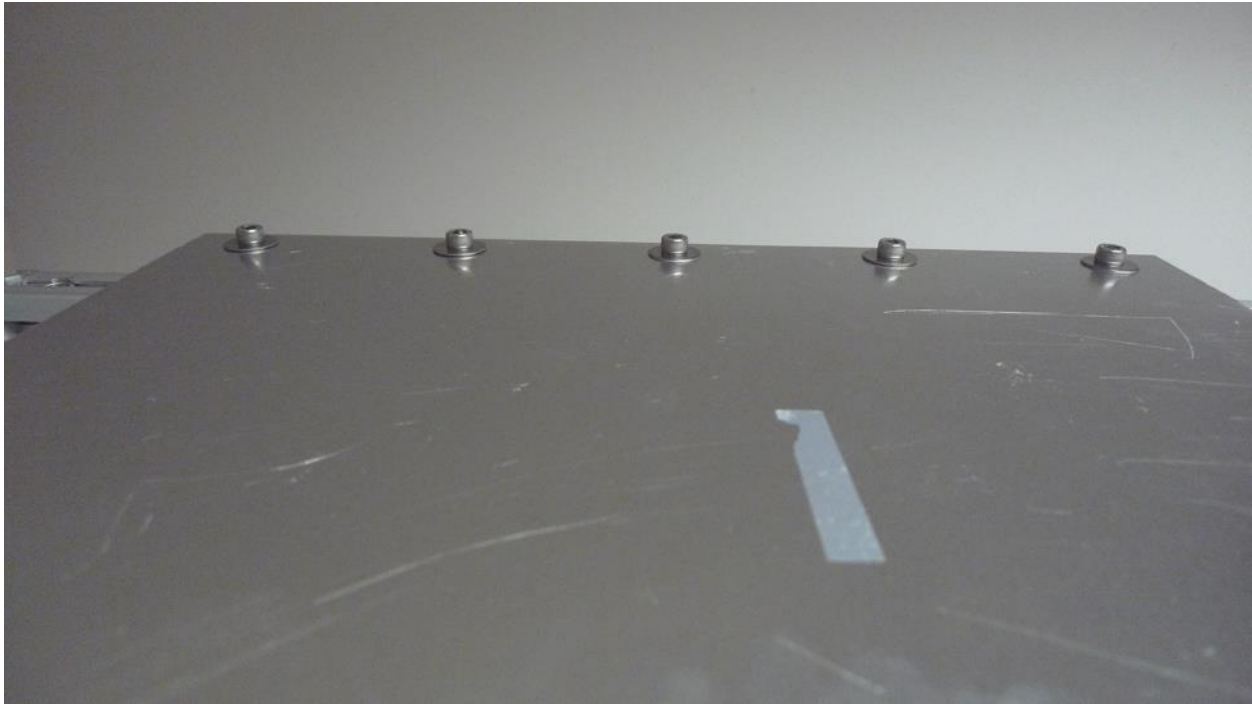
1.4 Install backlights



The frame is not 100% symmetrical, so please make sure to not mix up master slave backlights. Mount the backlight on the frame with the screws in the 'backlight' bag. T-slot nuts are already in place. Make sure to match the markings and that the cable feedthrough is on the left for the slave and on the right for the master.



After this, install the visors for the backlights with the screws in the 'backlight visor' bag. The t-slot nuts are already in place.



1.5 Tie downs

Use the ice screws to bolt the frame to the ice. Connect the tie downs with the black V-rings on the frame. Note that there is a drill adaptor for the ice screws!

1.6 Power & cables

All connectors are different:

Power: three pin Bulgin. Both Pelican case need their own power cable. 230V, 50-60 Hz

Data: RJ45 Bulgin. Both Pelican cases have their own data cable.

Backlight: six pin Bulgin. Connect each Pelican case to the backlight **opposite** of the camera

Sync: four pin Bulgin. Connect both Pelican cases to each other with the white sync cable

No backup power is required but try to avoid longer exposure to very cold conditions ($\leq -30^{\circ}\text{C}$) without the heater. The power consumption **per system** is

1. Camera & backlight ~30W
2. Heater 150 W
3. Computer during data acquisition ~90W

1.7 Setup computer hardware

Connect Master camera to Master computer, Slave to Slave computer. Connect camera Ethernet cable to internal Ethernet port (intel chip), Network Ethernet port to PCI Ethernet port (Broadcom chip). Look at the labels on the computer ecause the cameras do not work with the

computers' Ethernet ports on the PCI cards! Connect the monitor to both computers (one with Display port, one with VGA) use Button marked with 'X' to switch computers. Username is 'viss', all passwords (including VNC remote control) are 'viss'. **If possible, connect computers to buffer battery and install software for gentle shutdown in case of power failures.** In case software needs to be installed, a local repository with Ubuntu 18.04 has been installed on viss2. In other words, standard Ubuntu install commands (e.g. 'sudo apt install firefox') should work as normal. Windows installer for VNC remote control is on the Desktop in case remote control software needs to be installed on field laptops.

1.8 Setup computer software

All data acquisition software is ready to go and should start automatically on boot up. AWI provided the IPs in advance:

192.168.202.61 (master)

192.168.202.62 (slave)

Two things need yet to be configured in advance:

1.8.1 Time synchronization

Accurate timing is extremely important! Without accurate timing, it will be next to impossible to combine the measurements of both cameras.

According to AWI, 192.168.20.3 is the preferred NTP time server. At the time of shipping, this wasn't clear yet. Therefore, . Please remove the other two time servers (192.168.20.1 and 192.168.20.2) and from '/etc/ntp.conf' (edit with 'sudo nano /etc/ntp.conf')/ If you need to edit /etc/ntp.conf, don't forget to restart the time server with 'sudo service ntp restart' after editing.

After setup, please test the status with 'ntpq -p' on both computers and make sure the columns for 'when' and 'delay' contain numbers which are not 0 for at least one of the Polarstern timeservers.

Please reach out to the IT team on Polarstern in case of issues. Synchronize data with Polarstern storage

1.8.2 Storage

Available data storage should be sufficient on the computer, but synchronizing with the Polarstern data center allows for a backup. The IP etc. of the Polarstern SMB share was not available at the shipping deadline, so scripts need to be adjusted. You need to add the Polarstern server to /etc/fstab (use 'sudo nano /etc/fstab') to make sure the server directory is

automatically mounted during startup. So please find, uncomment (remove trailing #) and edit the following line

```
#//10.173.84.1/visssshare /media/polarstern_share cifs  
username=visss,password=visss,icharset=utf8,uid=visss,file_mode  
=0777,dir_mode=0777,noperm 0 0
```

You need to change the IP, the share name ('visssshare' in the example) as well as username and password. Do **not** change uid=visss! You can check whether everything worked with 'sudo mount -a' and the server should appear in the File Browser's side bar and under '/media/polarstern_share'. Reach out to the Polarstern IT team in case of problems.

1.8.3 Cronjobs

Cron is a linux system program to run scheduled jobs. Here, it makes sure that the synchronization script in /home/visss/Desktop/VISSS/sync/rsync.py is run every day and local and SMB storage are synchronized. With 'crontab -e' you can edit the cron schedule. I entered:

```
0 5 * * * /home/visss/Desktop/VISSS/sync/rsync.py  
/data/mosaic/ /media/polarstern_share/ >  
/home/visss/Desktop/cronlog.txt 2>&1
```

Which means that the script is launched every morning at minute 0 and hour 5 UTC. You might want to change the timing in case there are load balancing issues. If you configured the SMB mount as described in the previous section, there is no need to modify the script.

My script /home/visss/Desktop/VISSS/sync/rsync.py synchronizes always the last 7 days, so it doesn't matter if the script doesn't run for some days. For longer breaks, start the script by hand in the terminal and increase the nDays variable in line 21. Note that the current day is not synchronized. Make sure the shared SMB drive on Polarstern is always mounted, otherwise no data is synchronized.

1.9 Calibration

There is no time pressure for calibration. Wait for good weather conditions. The lenses may change their optical properties in cold conditions, so please do at least one calibration at <= -10°C during MOSAiC. See calibration chapter for details.

1.10 Make a picture

Please make a nice picture of the setup and send it to me. As you can see on the front page, I do not have any nice pictures!

Congratulations, you are ready to go!

See below for how to operate the software and check out the maintenance part for some basic checks. Also, have a look at the 'During first snowfall' section.

2 Operation

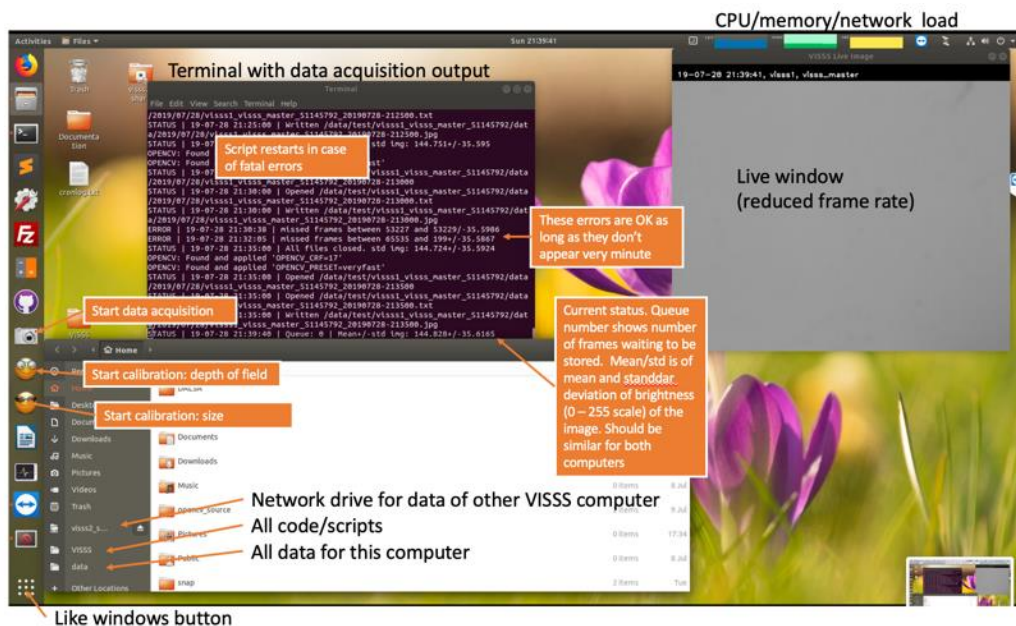
2.1 Logbook

Please use the digital logbooks provided on the desktop of the computers.

2.2 Software

- Username is 'viss', all passwords (including VNC remote control) are 'viss'.
- The computers can be remote controlled with VNC (available on CU Windows tablet, client installer for Windows on Linux desktops in software folder. Note that VNC is different from the standard Windows remote desktop). VNC password 'viss'. If you observe increased errors from data acquisition when remote controlling, the computer is not fast enough for data acquisition AND remote control VNC. Try minimizing the live camera window.
- Master Computer IP 192.168.202.61, Slave Computer IP 192.168.202.62. Cameras are in internal network and connect automatically.
- Everything should start automatically on reboot. If data acquisition is not running, click on the camera symbol in the dock on the left.
- The sublime text editor is installed if needed (see dock)

2.2.1 Quick overview



2.2.2 File structure

- All programs, scripts are in /home/viss/Desktop/VISS
- Git is setup in these directories. If you change anything, feel free to use git (or not) for documentation using the command line or Github Desktop. Changes are committed by cronjob every night for documentation.

- All **data** is in the ROOT directory /data/mosaic/\$(COMPUTER HOSTNAME)_\$(CAMERA CONFIGURATION)_\$(CAMERA SERIAL NUMBER) on 20TB RAID5 arrays. RAID5 means that one of the three HDs can fail without losing any data.
- Dumps of the full camera configuration are created every time data acquisition starts in \$(ROOT)/applied_configuration
- In the \$(ROOT)/data/\$(YEAR)/\$(MONTH)/\$(DAY) directory, a movie file, an image and a text file are created every 5 minutes. The text file contains the camera and corresponding computer timestamps in microseconds. The image shows the first frame during acquisition. It is for convenience only and can be deleted if storage is sparse.

2.2.3 Software structure

If data acquisition is not running (**for the master computer this means that both backlights are off!**), click the camera symbol in the Dock.

There are four relevant files/programs/scripts which are introduced in the following

2.2.4 Launcher desktop files:

In dock in the side there are three launchers (in case you ever need to change them, look the .desktop files in VISSS/scripts), see camera symbol and smiles in the figure above. This is the preferred way to start data acquisition. . Also, they can be launched by pressing the ‘Windows’ key and typing the name. Note that these scripts only open a terminal, they are not a real application. This means you need to look for a terminal window as an indication whether data acquisition is running, not for the launcher. **Also, you can start the launcher multiple times which leads to multiple terminal windows opening. Of course, only one process can connect to the camera and the other fail. Make sure only on terminal is running.**

2.2.5 Launcher bash scripts (background information):

If you need to change a setting of data acquisition, look here

The shortcuts in the dock launch one of several bash scripts (Linux equivalent of a batch file)

Two bash scripts are provided for data acquisition:

```
launch_viss_data_acquisition_master.sh
```

```
launch_viss_data_acquisition_slave.sh
```

For calibration, three more scripts are provided:

```
launch_viss_data_acquisition_calibration_size.sh
```

```
launch_viss_data_acquisition_calibration_depth_master.sh
```

```
launch_viss_data_acquisition_calibration_depth_slave.sh
```

They make sure the network stack is configured properly, and the data acquisition is started with the right options. If there is an error (note the sound), it restarts data acquisition after a few seconds. **If you need to swap the camera configuration file or change a command line option (see below), do it in the configuration scripts!** The crucial commands are around line 29:

```
if $EXE -p=superfast -q=21 -o=$OUTDIR $ROOTPATH/camera-  
configuration/visss_slave.config | /usr/bin/tee  
$OUTDIR/logs/$HOST-`timestamp`.txt
```

Here you define all command line parameters of visss-data-acquisition (see below)

2.2.6 visss-data-acquisition (background information):

visss-data-acquisition is the core C++ program. See Desktop/VISSS/data-acquisition/src for source code. It configures the camera and starts data acquisition. Press 'q' or 'Esc' to stop. It has the following options:

help h		Print usage
output o	./	Output Path
camera n	0	camera number
quality q	16	quality 0-51
preset p	veryfast	preset (ultrafast - placebo)
liveratio l	70	every Xth frame will be displayed in the live window
fps f	140	frames per seconds of output
maxframes m	-1	stop after this many frames (for debugging)"
@config	<none>	camera configuration file

Always provide a configuration file (last option, see below). Note that '=' is always required to define an option, e.g.

```
visss-data-acquisition -p=superfast -l=20 -o=/data/test  
/home/visss/Desktop/VISSS/camera-configuration/visss_master.config
```

The compression presets are: ultrafast, superfast, veryfast, faster, fast, medium, slow, slower, placebo. Only ultrafast to veryfast are fast enough to store 140 frames per seconds in real time. Note that movies obtained with the ultrafast preset are very large.

You do not start the C program by yourself, this is done the launcher_... bash scripts. Modify these bash scripts in case you need to change anything!

During data acquisition, status information is always provided (see screenshot above). The first number after the timestamp shows how many images are waiting to be compressed. This is because compressing the images is not done in real time but slightly delayed. Ideally this number is 0-10, but processing stops if it is >1000. The last number shows the mean brightness of the images +/- it's standard deviation (0-255 scale). Because the cameras are not calibrated, some differences are normal, but differences of 10 and more indicate that there is a timing error between the backlight and camera exposure for one of the cameras.

If the program needs to be recompiled for some reason, do

```
cd ~/Desktop/VISSS/data-acquisition  
make clean && make
```

2.2.7 Camera configuration:

The cameras are controlled by .config configuration files in the camera-configuration folder. Frame rate, exposure time, backlight duration, etc. is controlled here.

Master file

```
TestImageSelector Off
fastReadoutMode Off
ExposureMode Timed
ExposureTime 200
GainSelector SensorAnalog
Gain 1
BlackLevelRaw 1
TriggerMode Off
AcquisitionFrameRate 140
LineSelector Line3
outputLineSource PulseOnStartofExposure
outputLinePulseDuration 60
outputLinePulseDelay 40
LineSelector Line4
outputLineSource PulseOnStartofExposure
outputLinePulseDuration 30
outputLinePulseDelay 0
sensorFpnCorrectionMode Off
```

Slave file

```
TestImageSelector Off
fastReadoutMode Off
ExposureMode Timed
ExposureTime 200
GainSelector SensorAnalog
Gain 1
BlackLevelRaw 1
TriggerSelector FrameStart
TriggerMode On
TriggerSource Line1
sensorFpnCorrectionMode Off
```

This is how the cameras and backlights work: When the master camera starts exposure, it also sends a pulse to the slave camera to start exposure, too (Line 4, camera pin 8). Note that this causes a ~5 us delay. A few us after start of camera exposure (to account for slave camera delay, outputLinePulseDelay), the master also sends a 60 us (outputLinePulseDuration) pulse to **both** backlights to make a flash (line 3, camera pin 6). The backlight is turned on ~43 us longer than the actual camera pulse. The actual exposure time (ExposureTime) is 200us, but brightness is controlled by the length of the backlight pulse (outputLinePulseDuration) and the delayed response time. In total, the pulse is roughly 103 us. I found the highest working frame rate (AcquisitionFrameRate) to be 140 frames per seconds.

2.3 Software miscellaneous

- See the top bar for the systems load, I also recommend the terminal command `htop` to check the system's load. Note the 'load average' in the upper right which can go as high as 8 (because of 8 processors). During testing, this was typically below 5.
- You can connect to the other VISSS computer without switching the screen input by using 'ssh IP_address' or if you prefer a GUI with the Remmina program. Windows installer for VNC remote control is on the Desktop.
- There is a full Ubuntu 18.04 repository on visss2. Both computers are configured to use it. I.e., software can be installed with `sudo apt-get install "package name"`. To search for packages, use `apt-cache search "package name"`

2.4 Maintenance

2.4.1 Daily

- Login into computer to check whether images are clear and data is stored. The brightness should look uniform for the full field of view. If it is not uniform, backlight and camera are not aligned. Mean brightness (last number in status line of terminal) should be similar for both instruments. I recommend to use VLC (not to be confused with VNC remote control) for checking the videos in `/data/mosaic/data`. By pressing 'E', the movie advances a single frame.
- Available disk space can be checked in the terminal with
 - `df -h | grep /data`
- Check whether backlights are turned on constantly. If backlights are off, master data acquisition has stopped.
- Check instrument for snow/ice accumulation. Avoid scratching on the camera window.
- Check whether tie downs ice screws are still in place

2.4.2 Weekly to Monthly

- Check for frame order issue: The camera software library has a bug so that single old frames are embedded into the video if the data cannot be transferred quickly enough from the camera to the computer. The reason is that the camera compresses the data (with 'TurboDrive') and the performance of the compression depends on the noise in the image. To test without snowfall, simply wave your hand slowly in front of the cameras. Open the movie file (wait until a new one is generated (every 5min) or restart data acquisition) and check for both cameras whether the frames with the shadow of your hand are in the right order. Watch for a single frame which is 5-20 measurements old. See error guide in case of problems.

2.5 During first snowfall

Please send me sample data of the first snowfall if possible! A movie is likely to be large, but maybe you can send one of the jpgs?

The data output of the camera is gigantic (~16TB per camera per day uncompressed) so efficient data compressing is crucial. The data acquisition program takes care of this in real time, but I couldn't test this in real conditions. Computer speed is the limiting factor.

In the launcher scripts of master and slave (`launch_viss_data_acquisition_master.sh` and `launch_viss_data_acquisition_slave.sh`) there are two configurations prepared.

```
if $EXE -p=superfast -q=21 -o=$OUTDIR $ROOTPATH/camera-configuration/viss_slave.config | /usr/bin/tee $OUTDIR/logs/$HOST-$timestamp.txt
#if $EXE -p=veryfast -q=17 -o=$OUTDIR $ROOTPATH/camera-configuration/viss_slave.config | /usr/bin/tee $OUTDIR/logs/$HOST-$timestamp.txt
```

(note that config file for master is `viss_master.config`). Only the first one is active, the second is commented out with a '#'.

The second one has superior image quality (i.e. lower quality value -q), smaller files, but puts more burden on the CPU (veryfast instead of superfast). I was not able to test whether the computers are fast enough for the second setting even during heavy snowfall. This is because the speed of compression depends on the image and the numbers of moving snowpartciles. Therefore, I chose the first one to be safe side and made the first option default. However, please test the second configuration (by uncommenting the second line and commenting the first one) during heavy snowfall. If the queue (see first number in the STATUS message, see quick overview below) stays constantly below 1000 even during heavy snowfall, then always choose the second, slower version with better image quality. You can easily notice when the master computer cannot keep up with compression: The queue fills up, data acquisition turns off and is restarted after 5 seconds. **During these 5 seconds, both backlights turn off!**

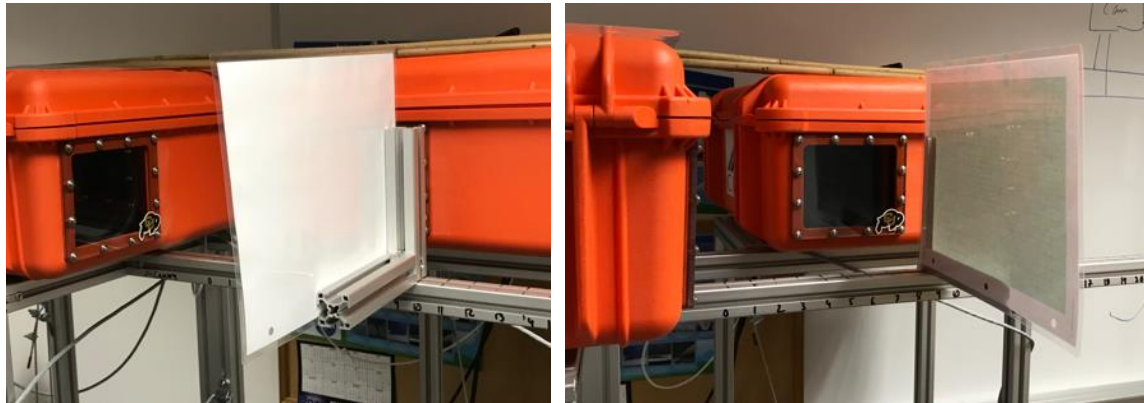
2.6 After a leg

I provided two external USB 4TB hard drives. If possible, copy the data of a leg (in /data) to one of the USB drives and bring the drive back to Boulder.

2.7 Calibration

There is no time pressure for calibration. Wait for good weather conditions. The lenses may change their optical properties in cold conditions, so please do at least one calibration at $\leq -10^{\circ}\text{C}$ during MOSAiC.

There are two kinds of calibration: field of depth and size calibration. Both use the aluminum frame marked with 'calibration tool' which needs to be installed just under the camera window.



Glue the laminated targets on the frame (with the provided double stick tape), you can change the distance to the lens. Align the back of the movable profile with the numbers/bars on the aluminum profile. Remove the calibration tool when not in use.

To start the calibration, stop data acquisition and start calibration **on both computers**

2.7.1 Size calibration

Use the target with the mm grid, click the smiley in the Dock with the big glasses. It is normal that the image is dark and the backlights are turned off. Choose a position where the target is sharp (e.g. 7) and write down the timestamp of the recording. Repeat for second camera. Check the created movies (see terminal output for exact locations).

2.7.2 Depth of field calibration

Use the target with the dandelions. Click the smiley in the Dock with the sunglasses to start the script. Note that the calibration script needs to run on both computers. Move the target from position 0 and to 27 and write down the timestamp for every position. Repeat for second camera. Check the created movies (see terminal output for exact locations). If you sync your watch to the computer time, this can be even done alone.

3 Error management

Have you tried to turn it on and off again?

3.1 Lens/window dirty

Use provided microfiber cloths only

3.2 Acrylic camera window has scratches

If scratches cannot be removed with acrylic window cleaner, use provided spare windows. You can also try the Acrylic cleaner of the CU team.

3.3 Backlight window has scratches

Can be neglected unless image quality is visibly impacted.

3.4 Dust between camera and lens.

Use **clean** compressed air (most compressors do not provide clean compressed air) to remove dust from the sensor and the lens.

3.5 ACDC breaks

One ACDC can provide power for both Systems. Connect red 24V terminal block to free connector of the sync cable (see wiring diagram) for both Pelican cases.

3.6 Master fails

The slave can be easily reconfigured to act as a standalone. Connect camera #6 to blue terminal block (see wiring diagram, last page). Disconnect white sync cable. On slave computer, use master scripts instead of slave scripts (otherwise backlight won't be triggered)

3.7 Parts lost

Check spare parts in orange toolbox.

3.8 /data disk full

Manually delete nice weather periods. Delete .jpg files. Compress log files in /data/mosaic/CONFIGURATION/logs

Disk space can be check with `df -h | grep /data`

3.9 No connection to camera

Check whether correct Ethernet port was used

Restart cameras (turn power off and on)

Restart Computers

Check camera status LED (**beware of temperature shocks!**). See documentation below

Camera Status LED Indicator

The camera is equipped with one LED to display its operational status. When more than one condition is active, the LED color indicates the condition with the highest priority (such as – an acquisition in progress has more priority than a valid IP address assignment).

Once the Genie Nano connects to a network and an IP address is assigned, the Status LED will turn to steady blue. Only at this time will it be possible by the GigE Server or any application to communicate with the camera. The following table summarizes the LED states and corresponding camera status.

LED State	Definition
LED is off	No power to the camera
Steady Red	Initial state on power up before flashing. Remains as steady Red only if there is a fatal error. Camera is not initialized **
Flashing Red	Initialization sequence in progress ** Wait less than a minute for the Nano to reboot itself.
Steady Red + Flashing Blue	Fatal Error. If the Genie Nano does not reboot itself contact Technical Support.
Slow Flashing Blue	Ethernet cable disconnected. The camera continuously attempts to assign itself an IP address.
Fast Flashing Blue	File Access Feature is transferring data such as a firmware update, etc.
Steady Blue	IP address assigned; no application connected to the camera
Steady Green	Application connected
Flashing Green	Acquisition in progress. Flashing occurs on frame acquisition but does not exceed a rate of 100ms for faster frame rates.

Note: Even if the Nano has obtained an IP address, it might be on a different subnet than the NIC it is attached to. Therefore, if the Nano LED is blue but an application cannot see it, this indicates a network configuration problem. Review troubleshooting suggestions in the Network Imaging manual.

LED States on Power Up

The following LED sequence occurs when the Genie Nano is powered up connected to a network.

```

graph TD
    A([Red  
power connected]) --> B([Flashing Red  
initialization])
    B --> C([Flashing Blue  
waiting for IP])
    C --> D([Blue  
IP assigned])
    D --> E([Green  
application connected])
    
```

If camera doesn't connect at all, boot computers under Windows (select windows a few seconds after startup) and try 'DALSA Sopera Network Configuration Tool'

3.10 Errors in the terminal output during image acquisition

As long as errors are rare (< 1/minute), 'ERRORS' can be neglected. If they are more frequent, it is likely related to connection quality. Try spare cable or remove sources of potential interference.

3.11 Frame order in the video is messed up

The camera software library has a bug so that old frames are embedded into the video if the data cannot be transferred quickly enough from the camera to the computer. The reason is that the camera compresses the data (with 'TurboDrive') and the performance of the compression depends on the noise in the image. If you encounter that frame problem, try to lower the acquisition frame rate in the camera configuration file. You can also test the maximum possible frame rate by launching the save_data demo program in `/home/viss/DALSA/GigeV/examples/archive_data/save_data_demo` and store a single image (doesn't need to contain snow) by pressing '@' and '1'. Then, convert this image to tiff with `restore_nano_data_demo` and pressing '@', 'R' and the number of the image. Save this image on a Flash drive, reboot in windows (both computers have a working Windows, press arrow key when the boot menu comes up and select Windows), and use the 'Turbodrive Performance Tool' on the Desktop to obtain the maximum frame rate. During testing, maximum frame rate was around 150 fps. Alternatively, the Windows program is in the software folder on the Linux desktop and can be installed on any Windows computer.

3.12 Both backlights off

Master camera is not recording data. Check data acquisition.

3.13 Both backlights turn off periodically

The data load is too high for the computer. The data acquisition restarts when more than 1000 frames are in the queue. In the launcher scripts (`launch_viss_data_acquisition_master.sh` and `launch_viss_data_acquisition_slave.sh`) there are two configurations

```
if $EXE -p=superfast -q=21 -o=$OUTDIR $ROOTPATH/camera-  
configuration/viss_slave.config | /usr/bin/tee  
$OUTDIR/logs/$HOST-$timestamp.txt  
#if $EXE -p=veryfast -q=17 -o=$OUTDIR $ROOTPATH/camera-  
configuration/viss_slave.config | /usr/bin/tee  
$OUTDIR/logs/$HOST-$timestamp.txt  
(note that config file for master is viss_master.config)
```

The second one has superior image quality (i.e. lower quality value -q), smaller files, but is slower (veryfast instead of superfast). Make sure the first one is uncommented (and the second commented) in case the computer is too slow.

3.14 Slave backlight off

Check sync cable connection

3.15 Slave records black images

Slave is not synced with the backlight, did you use a master camera configuration?

3.16 Window is foggy

Dry silica gel in microwave/stove

3.17 IPs are wrong

Use settings program (see dock) to change IPs of the Linux machines. Make sure to select and configure the Broadcom controller, NOT the intel controller which is for the cameras. Make sure to remember to put the **IP of the other computer** in
/etc/apt/sources.list
/etc/fstab

3.18 Something is wrong with a hard disk

The /data directory is on a RAID5 array, i.e. one of three hard disks can fail. In the terminal, do 'cat /proc/mdstat' to check the status, the raid should consist of sdb1,sdc1, and sdd1.

4 Dismantle and ship

Please follow the installation instructions for dismantling. Please make sure to remove camera & lens from the Pelican case and pack them separately with the provided special cardboard box.



The Slave and the Master instruments were in separate gray plastic boxes. Put the Pelican case and the backlight (with visor) in the bottom



Then add computer, telecentric lens and cables etc.



The profiles can be wrapped to one piece like this:



The monitor (in cardboard box 3) and the toolbox are separate.

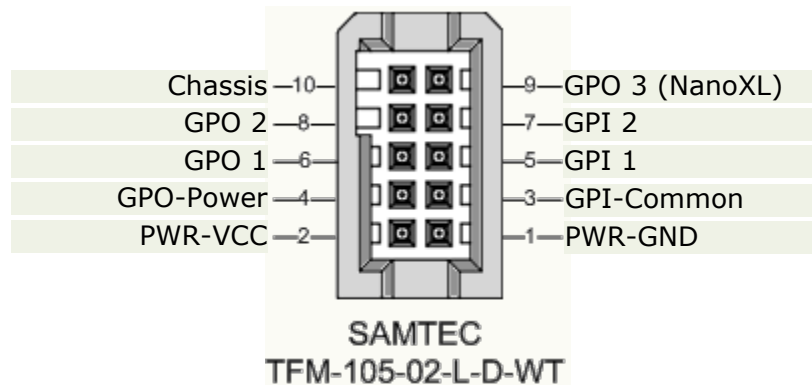
Camera

10-pin I/O Connector Pinout Details (Standard Models)

Teledyne DALSA makes available optional I/O cables as described in [Optional Cable Accessories](#). Contact Sales for availability and pricing.

Pin Number	Genie Nano	Direction	Definition
1	PWR-GND	—	Camera Power – Ground
2	PWR-VCC	—	Camera Power – DC +10 to +36 Volts
3	GPI-Common	—	General Input Common Ground
4	GPO-Power	—	General Output Common Power
5	GPI 1	In	General External Input 1
6	GPO 1	Out	General External Output 1
7	GPI 2	In	General External Input 2
8	GPO 2	Out	General External Output 2
9	Reserved		
	GPO 3	Out	<i>NanoXL—General External Output 3 for G3-Gx3 ‡</i>
10	Chassis		Camera Chassis

‡ **NanoXL:** “G3-Gx3” models come standard with 2 Inputs and 3 Outputs. Output 3 only supports Software Controlled logic High or Low signals.



See [AC Characteristics of 1 Input / 3 Output Models](#) for additional information.

Camera DC Power Characteristics

DC Operating Characteristics		
Input Voltage	+10 Volts minimum	
Input Power Consumption	@ +12 Volt Supply	3.99 Watts typical
Input Power Consumption	@ +24 Volt Supply	3.96 Watts typical
Input Power Consumption	@ +48 Volt Supply	4.22 Watts typical

Absolute Maximum DC Power Supply Range before Possible Device Failure		
Input Voltage	-58 Volt DC	+58 Volts DC



PRODUCT DESCRIPTION

The ODMOBL Backlight Series is designed for maximum output. This series operates with either an NPN or PNP trigger signal and runs on an industry-standard 24V DC. The 1–10V DC analog control line gives the user total control over intensity. Proper heat dissipation is achieved using the side extrusion and the heat sink installed on the bottom of the light. The 45 mm extrusion makes mounting the light easy when using drop-in T-nuts. The ODMOBL Backlight has a built-in driver. No external driver is required.



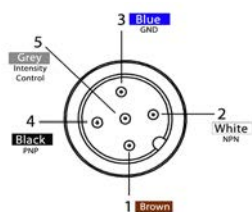
PRODUCT SPECIFICATIONS

Electrical Input	24 V DC +/-5%
Strobe Input	PNP: +4V DC to +24V DC to activate NPN: GND (<1V DC) to activate
PNP Line	4 mA @ 4V DC 10 mA @ 12V DC 20 mA @ 24V DC
NPN Line	15 mA @ Ground (0V DC)
Analog Intensity	The output is adjustable from 10–100% of brightness by a 1–10V DC analog signal line. For maximum intensity, use +24V DC. Jumpering pin 5 to pin 1 will provide maximum intensity
Strobe/Pulse Time	Max. 5000 SPS (Strobes Per Second) Max. Single Pulse = 125 ms (see SafeStrobe™ Technology for more information)
Duty Cycle	Max. 10%
Connection	5-pin M12 connector
Ambient Temperature	-18°–40° C (0°–104° F)
IP Rating	IP50
Compliances	CE, RoHS, IEC 62471
Warranty	

Standard Light Sizes	Input Current	Wattage	Weight
150 mm x 150 mm	1.1 A	26.4 W	~2.22 kg
300 mm x 150 mm	2.2 A	52.8 W	-
300 mm x 300 mm	4.4 A	106 W	-



WIRING CONFIGURATION



Pin layout for light (Male Connector)

Pin	Function	Signal	Wire Color
1	Power In	+24 V DC	BROWN
2	NPN	Sinking Signal	WHITE
3	GND	Ground	BLUE
4	PNP	Sourcing Signal	BLACK
5	Intensity Control	1–10 V DC	GREY*

*Some cables use green/yellow for pin 5.

For maximum intensity, tie pin 5 to pin 1 at +24 V DC.

For continuous mode, PNP (pin 4) can be tied to +24 V DC (pin 1) or NPN (pin 2) can be tied to Ground (pin 3).

For maximum intensity, connect pin 5 to pin 1 at +24V DC. Otherwise intensity is adjustable via the 1-10V DC analog control line.



MULTIPLE CONNECTORS

Some ODMOBL backlights have multiple connectors. Each of these connectors are independent and are wired separately of each other.

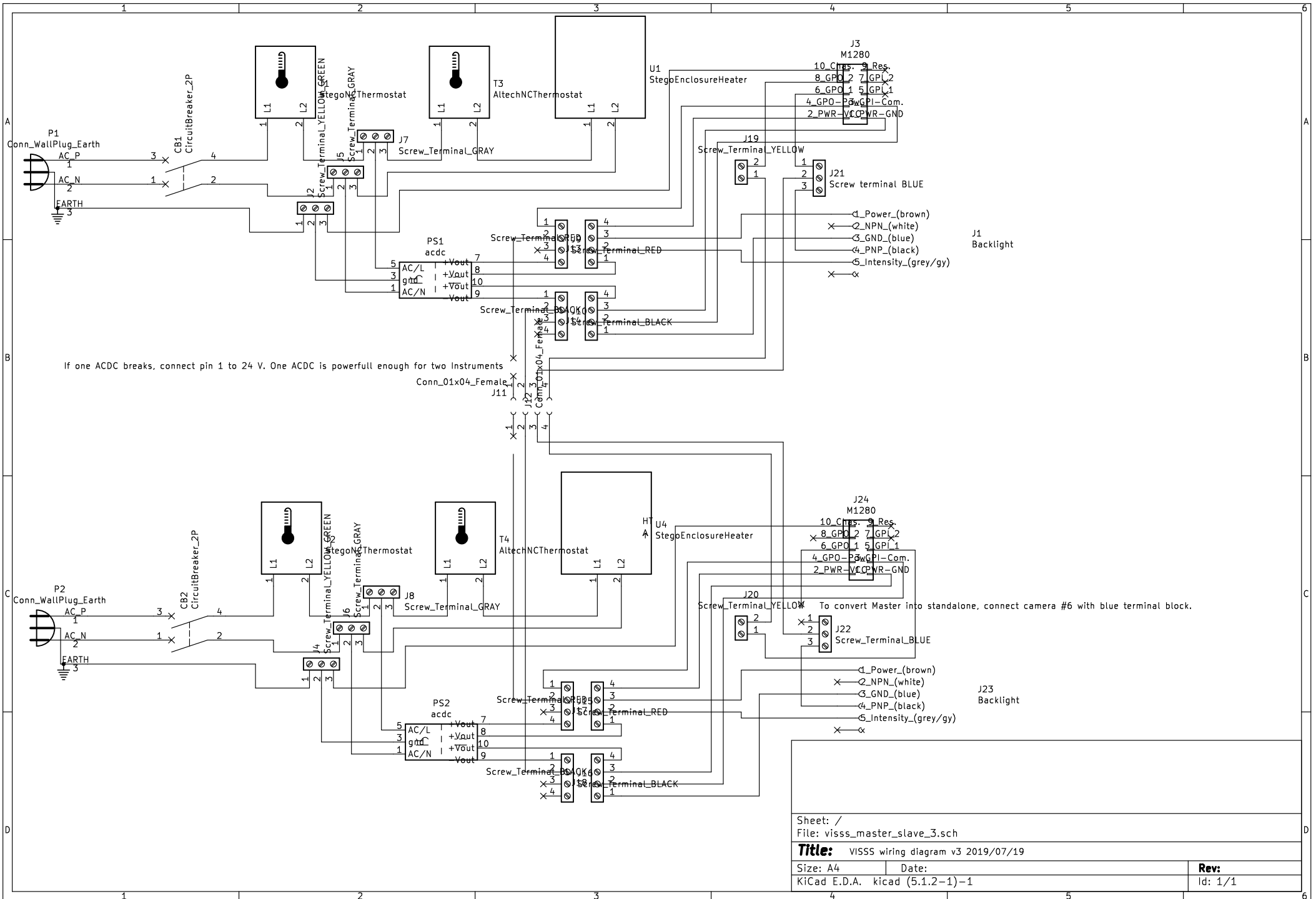
RESOURCE CORNER



Additional resources, including CAD files, videos, and application examples, are available on our website.

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Open: Monday – Friday | 8am–5pm ET



If one ACDC breaks, connect pin 1 to 24 V. One ACDC is powerfull enough for two Instruments

Sheet: /	
File: visss_master_slave_3.sch	
Title: VISSS wiring diagram v3 2019/07/19	
Size: A4	Date:
KiCad E.D.A. kicad (5.1.2-1)-1	Rev: Id: 1/1