Bandweaver

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PRODUCT TRAINING: FenceSentry

04 July 2019

Product Training: FenceSentry

Bandweaver

1	System Overview and Capabilities
1.1	System Components
1.2	Software Installation
1.3	Hardware Setup
1.4	OFSSCM and Razor
1.5	Detectors, recognisers and zones

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System Overview and Capabilities

- Fence mounted distributed acoustic detection system;
- Affected by:
  - Fence types
  - Fence mounting
  - Attachment of fiber to the fence
  - Signs or other items attached to the fence
  - Proximity of trees, wildlife and other items that can come into physical contact with the fence
- Think about anything that can cause an acoustic signal, and how this signal can propagate
- Installation aim is to maximise the acoustic coupling between the cable and the fence;
- Best to discuss new or irregular fence types with Bandweaver when designing a new system

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Examples of installation types

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FenceSentry System Components

Software

OFSSCM

MaxView for Fence

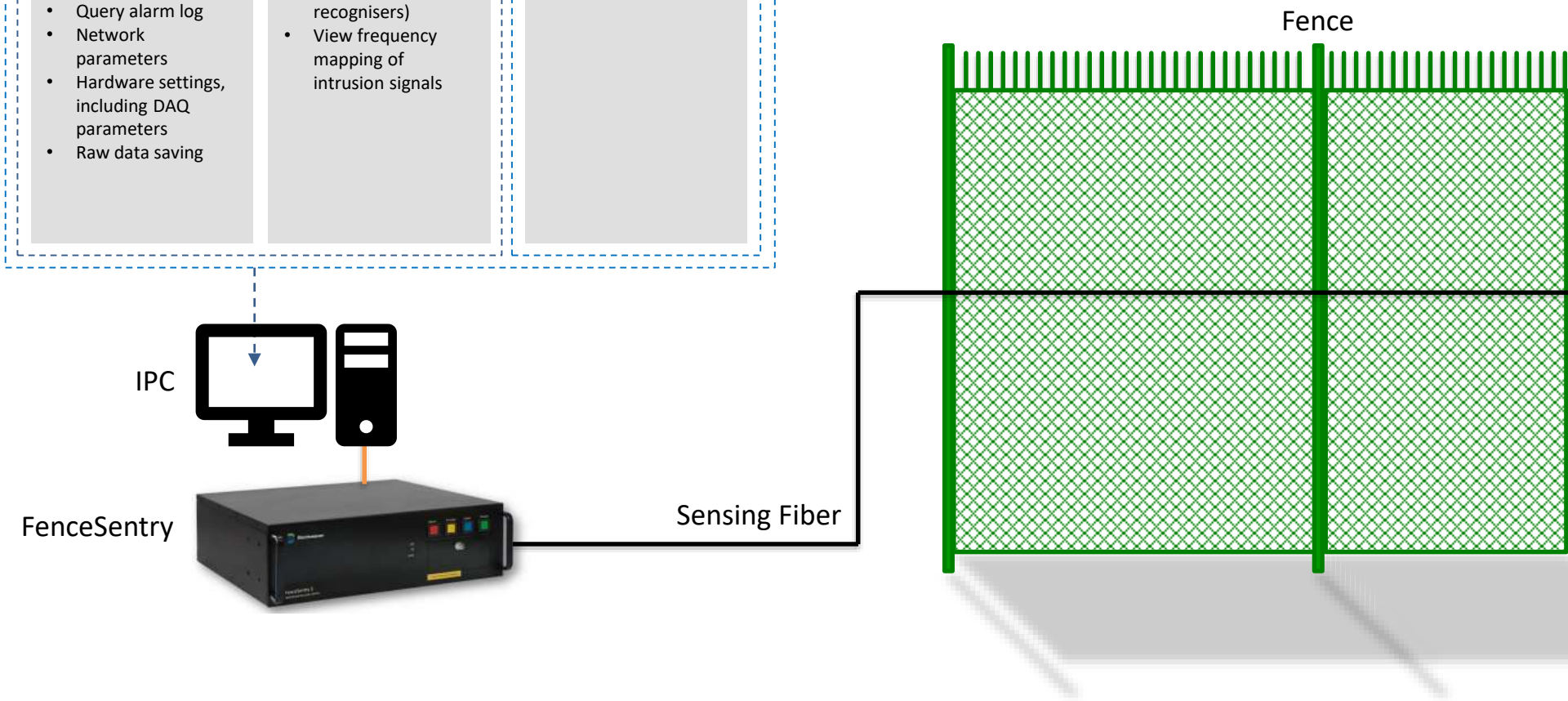
OFSSCM GUI

- Zone Setup
- Alarm arming and disarming
- Relay settings
- Query alarm log
- Network parameters
- Hardware settings, including DAQ parameters
- Raw data saving

Razor

- Tuning
- Algorithm Configuration (detectors and recognisers)
- View frequency mapping of intrusion signals

- GUI for user
- Map view
- Video display



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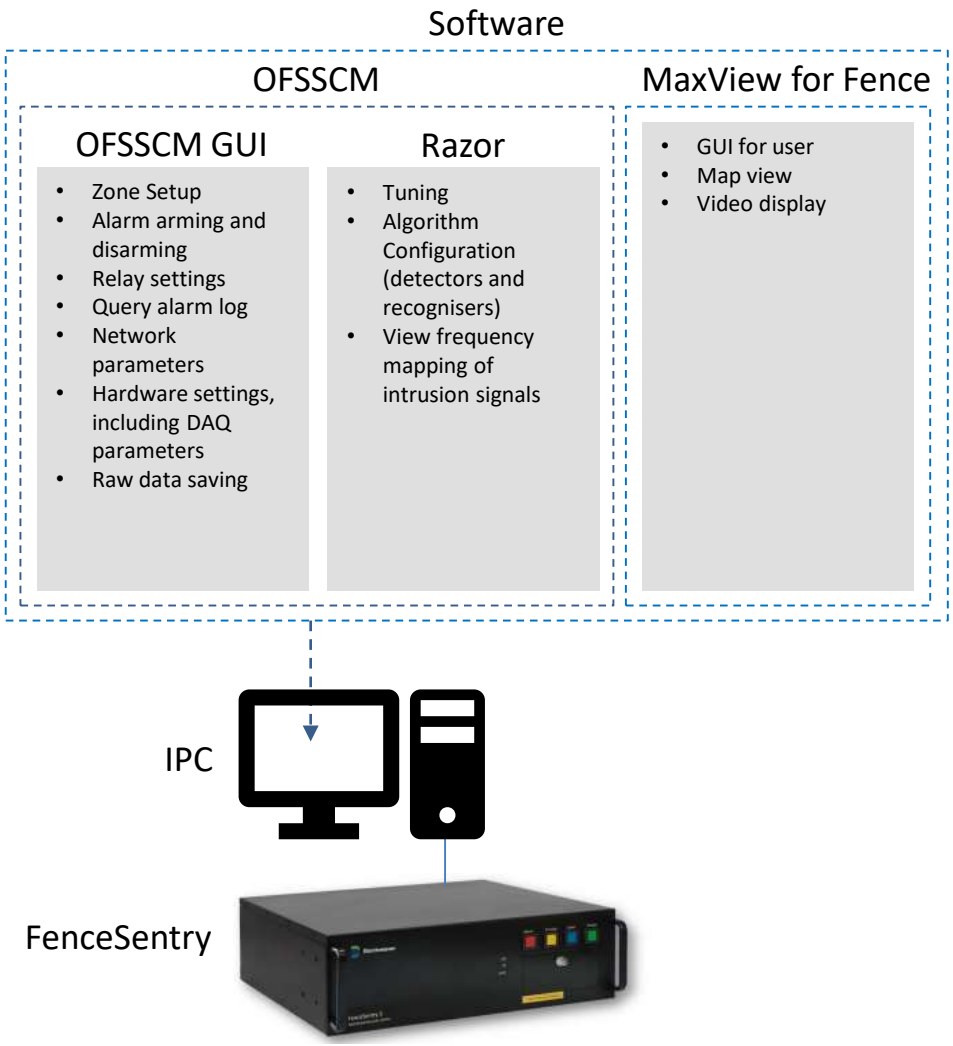
System Components - Software



The Engineer responsible for the installation and commissioning of a FenceSentry system, must be familiar with 3 different software interfaces:

- OFSSCM, which includes
  - OFSSCM main GUI
  - Razor
- MaxView for Fence

OFSSCM is the main interface for all setup and configuration of the FenceSentry.

Razor can be called from within the OFSSCM interface and is an integral tool for tuning the detectors and recognisers. It is also the tool used for playback of raw data.

MaxView for Fence is the visualisation software for the End User. It is a scaled down version of Bandweaver's powerful MaxView platform and incorporates key components like:

- Site layout or map, for locating the intrusion events
- Interface to the CCTV cameras or NVR/DVR

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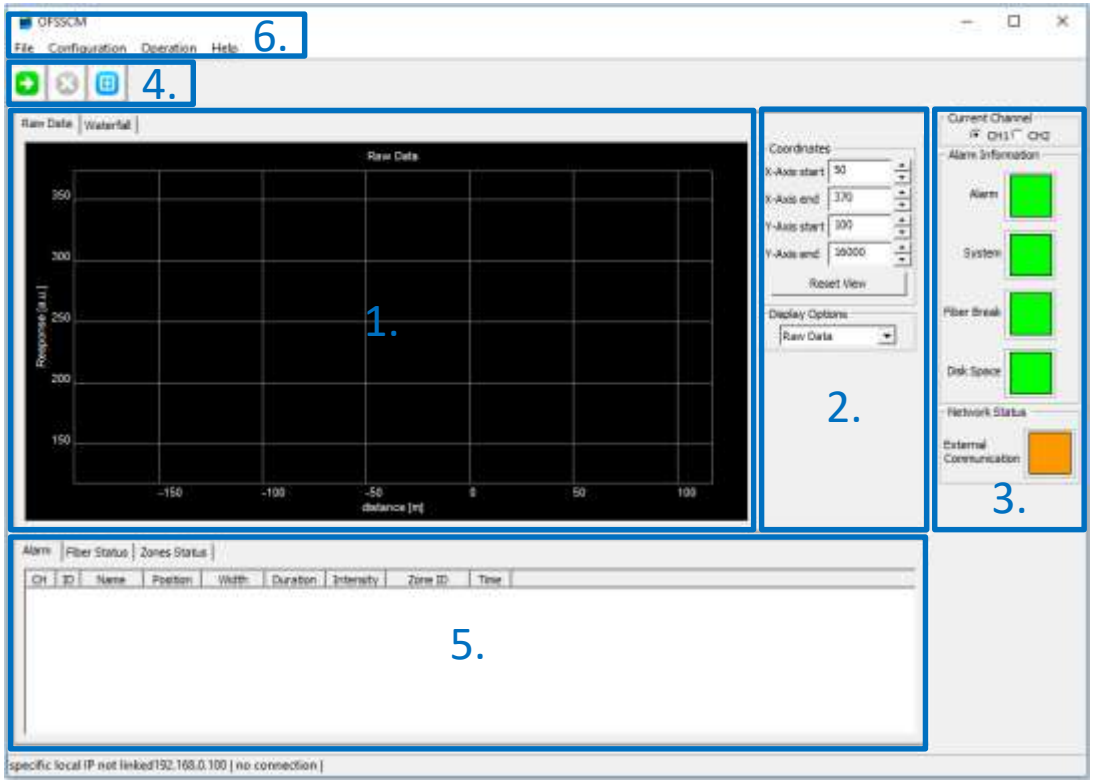
Software Components - OFSSCM

Beta version of OFSSCM software: **V2.5.3.24 A25**

All training attendees to install the software.

OFSSCM GUI	Razor
• Zone Setup • Alarm arming and disarming • Relay settings • Query alarm log • Network parameters • Hardware settings, including DAQ parameters • Raw data saving	• Tuning • Algorithm Configuration (detectors and recognisers) • View frequency mapping of intrusion signals



The main OFSSCM display is shown above:

1. Tabs for Raw Data display or Waterfall display
2. Co-ordinates panel for graph axes configuration
3. Channel selection and Alarm Information Panel
4. Start Measurement, Stop Measurement and Zone setup quick access buttons
5. Alarm List and Status panels
6. Main Menu bar along the top

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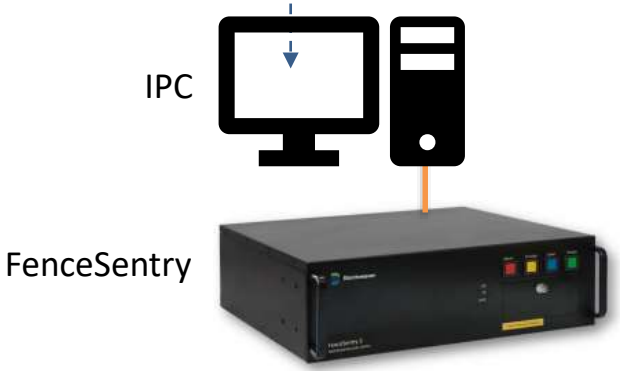
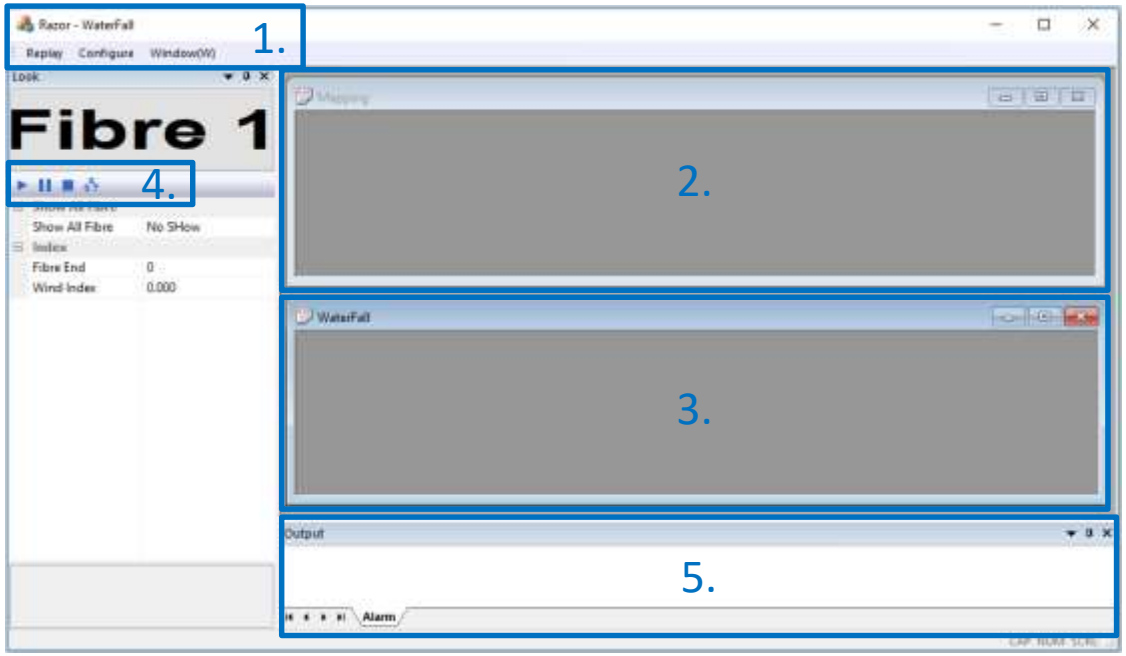
Software Components - Razor

Engineer level access is required to run Razor.

Default Password: **12345**

OFSSCM GUI	Razor
• Zone Setup • Alarm arming and disarming • Relay settings • Query alarm log • Network parameters • Hardware settings, including DAQ parameters • Raw data saving	• Tuning • Algorithm Configuration (detectors and recognisers) • View frequency mapping of intrusion signals





Razor is accessed from ***OFSSCM < Configuration < Algorithm Parameter Settings***

The main Razor display is shown above:

1. Main Menu bar along the top
    1. Detection: Detector settings, incl. frequency band, waterfall intensity
    2. Recognition: Recogniser settings, incl. alarm thresholds
    3. Calibration: Scaling for special areas within a detector
2. Frequency "Mapping" view
3. Waterfall display view
4. Controls for playback of raw data
5. Alarm output list

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System Components - Hardware

Industrial PC (IPC):
- OFSSCM, Razor and MaxView
- Processing of raw data (algorithms)
- Storage of raw data

RJ45

Ethernet cable

Let's have a look at the FenceSentry

RJ45

FenceSentry:
- 1ch. or 2ch.: Max. 5Km per ch.
- No internal storage for raw data

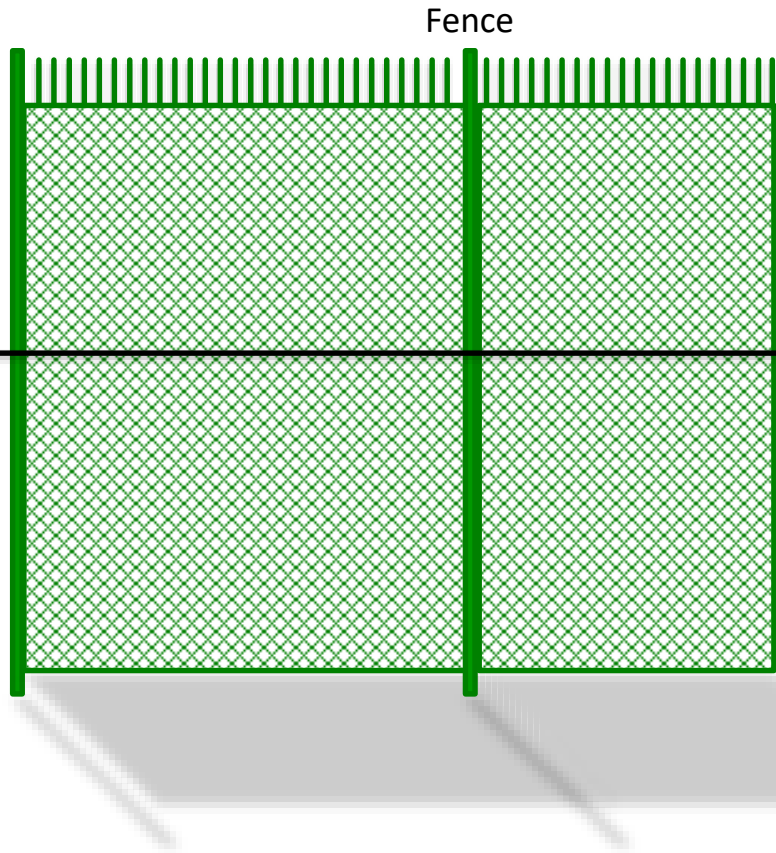
IEC C13

110V-220V VAC in

FC/ APC

FC/ APC

Fiber optic sensing cable



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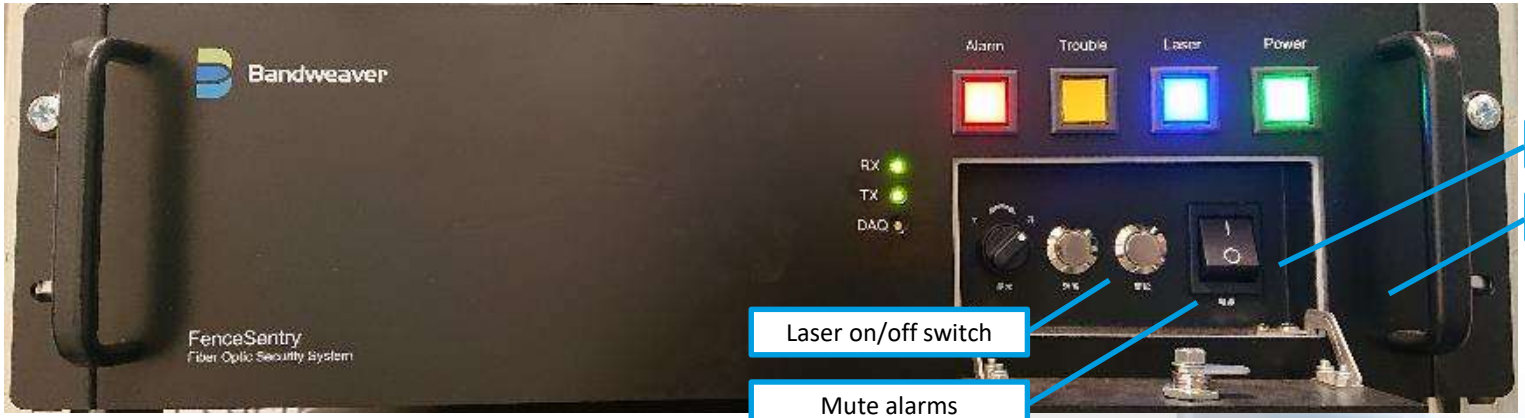
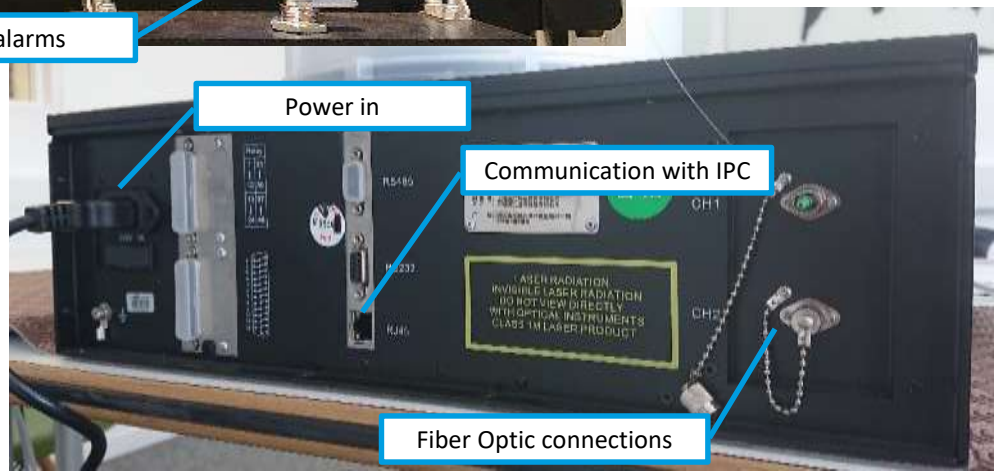
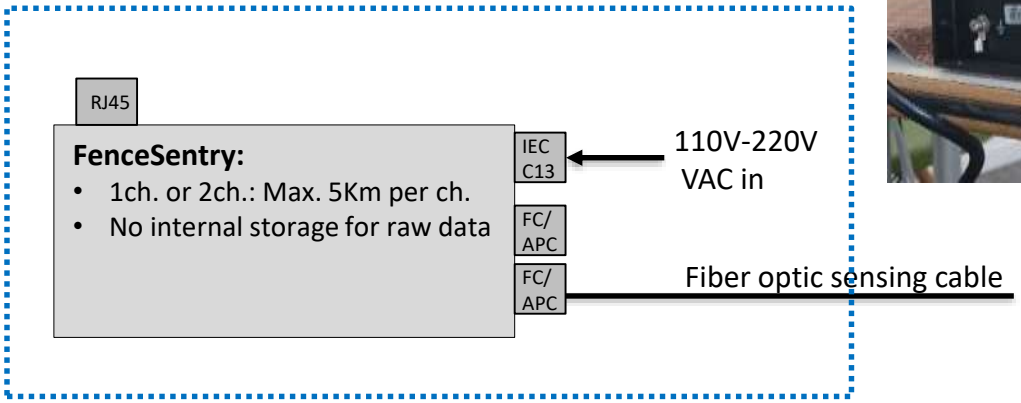
System Components - FenceSentry





Let's have a look at the FenceSentry



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System Components - FenceSentry

General Safety and Good Practice:

- Turn the laser off before disconnecting / connecting the sensing fiber;
- Do not look directly at the connector when the laser is on;
- When plugging into DU, be sure to match the alignment key on the edge of the connector to the slot of its counterpart;
- Do not force the connectors. This can deviate the optical fiber from its original position and affect communication;

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System Components - Network

Industrial PC (IPC):
- OFSSCM, Razor and MaxView
- Processing of raw data (algorithms)
- Storage of raw data

RJ45 Use IP address: 192.168.0.xxx
Eg: 192.168.0.16

Ethernet cable

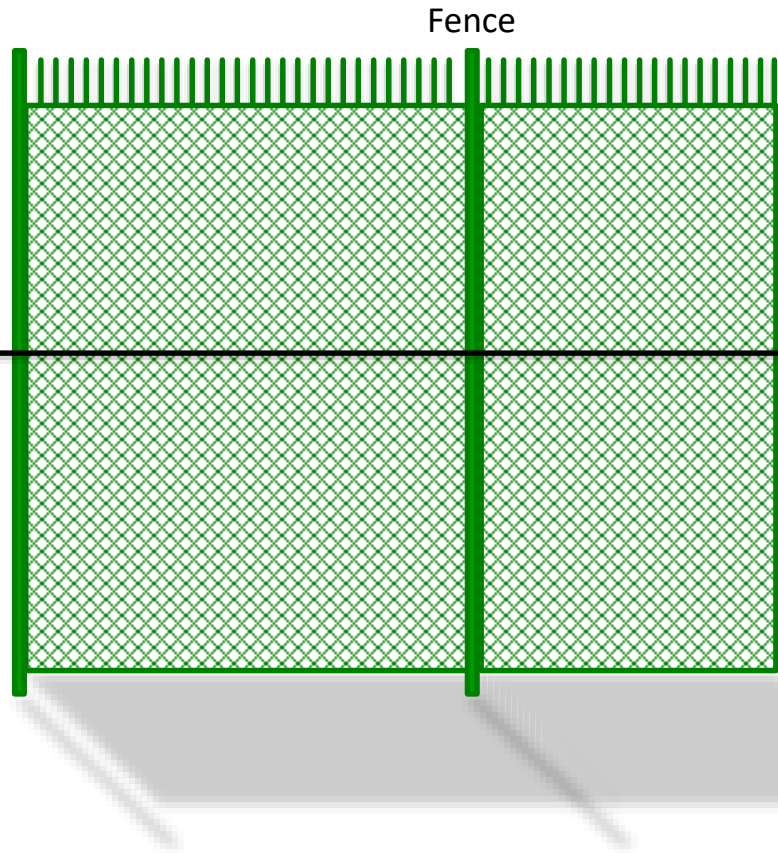
RJ45 Default IP address: 192.168.0.100

FenceSentry:
- 1ch. or 2ch.: Max. 5Km per ch.
- No internal storage for raw data

IEC C13 ← 110V-220V VAC in

FC/APC

FC/APC Fiber optic sensing cable



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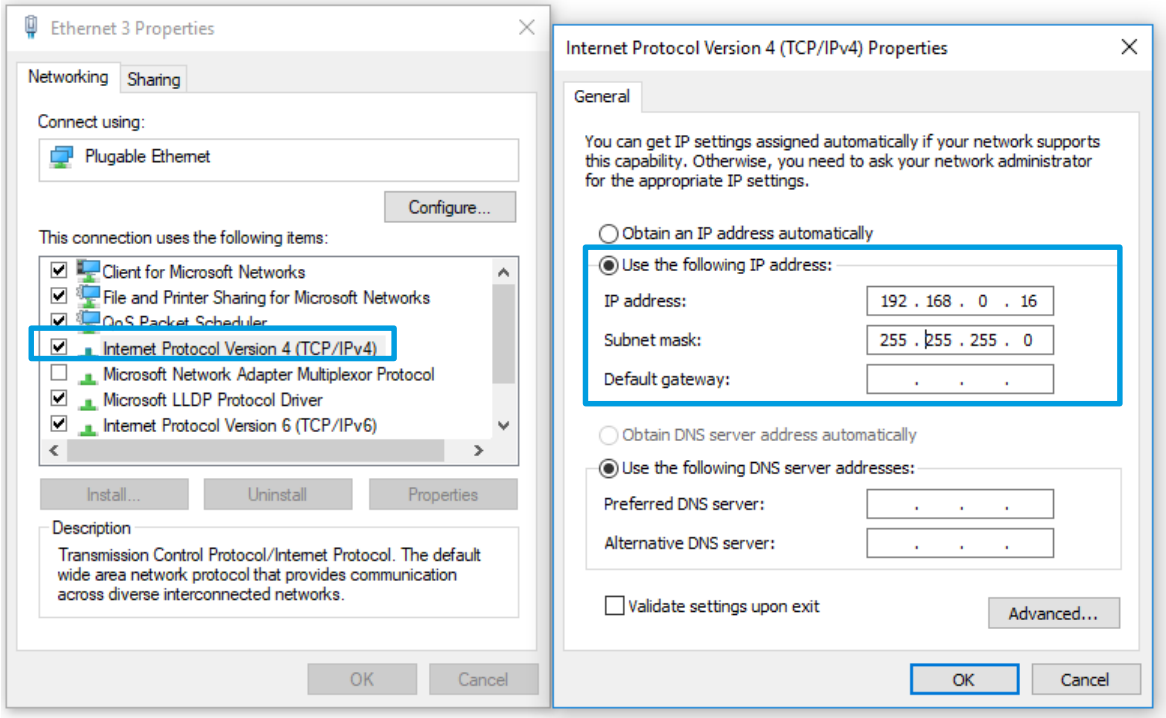
FenceSentry System Components - Hardware

Industrial PC (IPC):
- OFSSCM, Razor and MaxView
- Processing of raw data (algorithms)
- Storage of raw data

RJ45 Use IP address: 192.168.0.xxx
Eg: 192.168.0.16

How to change the IP address of the IPC port:

Open ***Control Panel\Network and Internet\Network Connections***
Right-click on the Ethernet port to which the FenceSentry is connected and select ***Properties***
Select ***Internet Protocol Version 4 (TCP/IPv4)*** and click ***Properties***
Change the radio button to ***Use the following IP address*** and enter the details as shown below
Select OK to save and OK again to make the changes



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FenceSentry System Components - Hardware

Industrial PC (IPC):
- OFSSCM, Razor and MaxView
- Processing of raw data (algorithms)
- Storage of raw data

RJ45 Use IP address: 192.168.0.xxx
Eg: 192.168.0.16

Ethernet cable

RJ45 Default IP address: 192.168.0.100

FenceSentry:
- 1ch. or 2ch.: Max. 5Km per ch.
- No internal storage for raw data

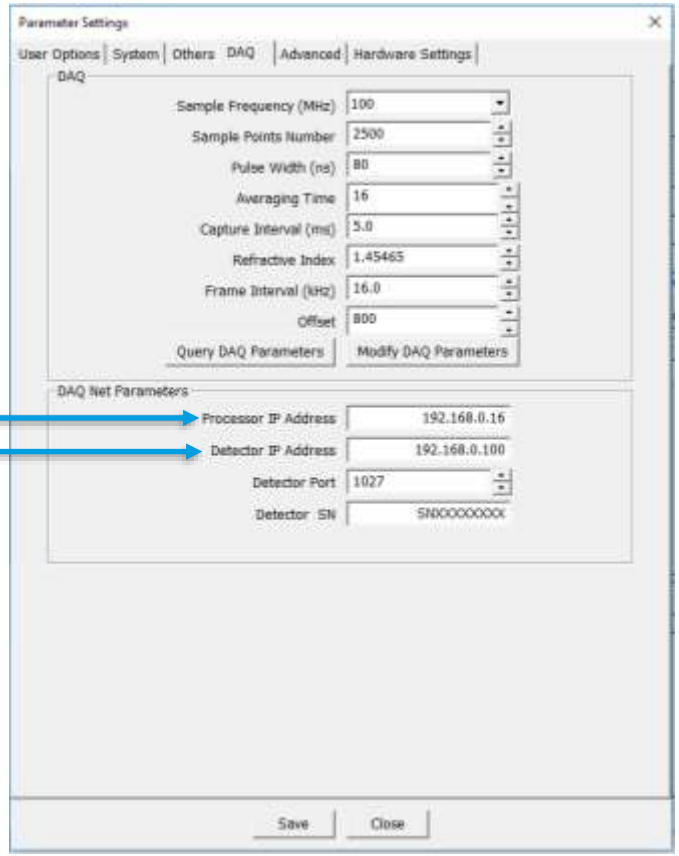
IEC C13

FC/APC

FC/APC

IP Addresses must match

<u>How to connect the FenceSentry to the IPC:</u>
Open ***OFSSCM*** and log in as an ***Engineer*** – password is ***12345***
Open ***Configuration < Parameter Settings < DAQ***
Update the ***DAQ Net Parameters*** as shown below



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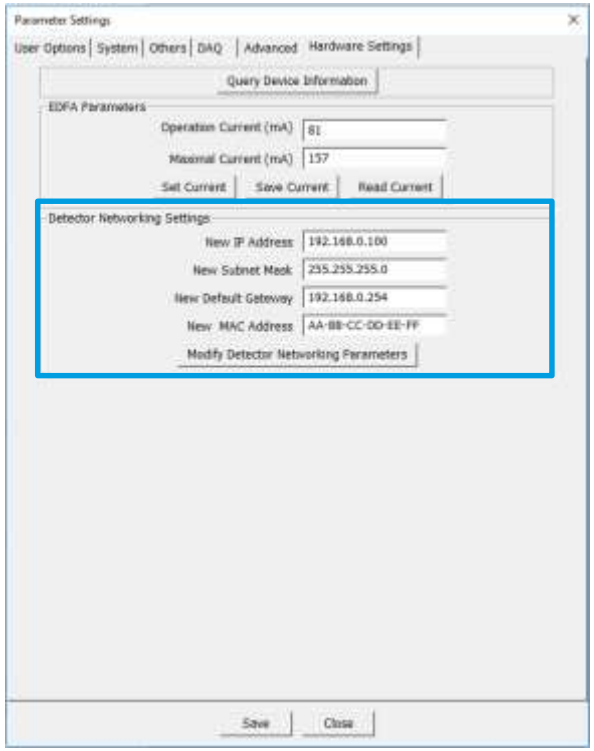
FenceSentry System Components - Hardware

How to change the default IP address of the FenceSentry:
Open ***OFSSCM*** and log in as an ***Engineer*** – password is ***12345***
Open ***Configuration < Parameter Settings < Hardware Settings***
Update the ***Detector Networking Settings*** as required and ***Save***
When the settings are successfully saved, you will lose connection with the FenceSentry
To restore the connection, the new ***Detector Networking Settings*** must be updated in ***Configuration < Parameter Settings < DAQ < DAQ Net Parameters***



Warning:
Be sure to make a note of the changed networking settings. Without these you will no longer be able to connect to the FenceSentry unit.

RJ45 Default IP address: 192.168.0.100

FenceSentry:
- 1ch. or 2ch.: Max. 5Km per ch.
- No internal storage for raw data

IEC C13
FC/APC
FC/APC

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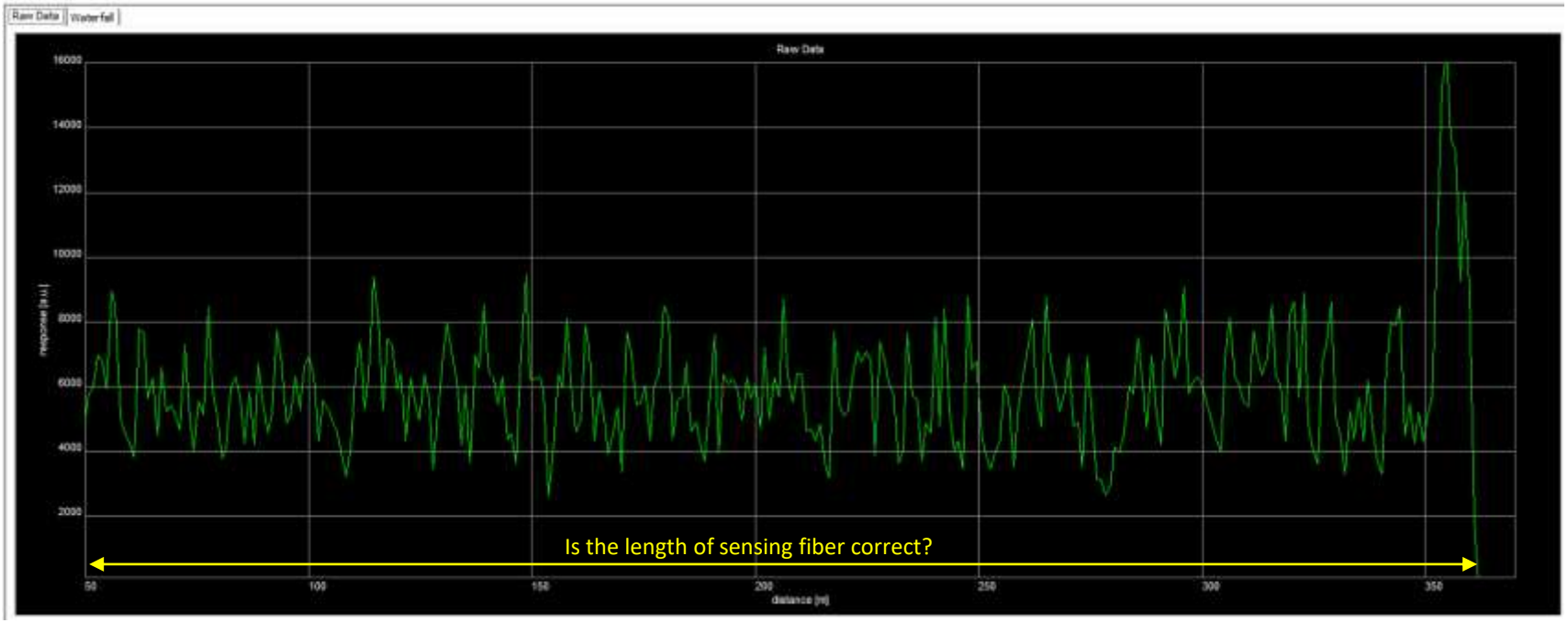
OFSSCM – Raw Signal



- Check that the length approximately matches the length of the sensing fiber. If the average value of the original data drops abruptly at some position before the end of the fiber, this means that the cable loss at that position is large. In this case, check the cable for kinks at that location and ensure the signal intensity is back to normal.
- The average value of the original signal intensity at the starting position should be close to 8000 but not less than 4000. If less, check that the optical connector is clean and connected securely. Normally, no other adjustment should be necessary. However, if this does not help, adjust as follows:
  - Adjust the Offset in ***Parameter Settings < DAQ < DAQ*** to raise the whole signal up on the Y-axis to above 2000. This will make it easier for fiber break detection
  - Increase the ***Operation current*** in ***Parameter Settings < Hardware Settings < EDFA Parameters***

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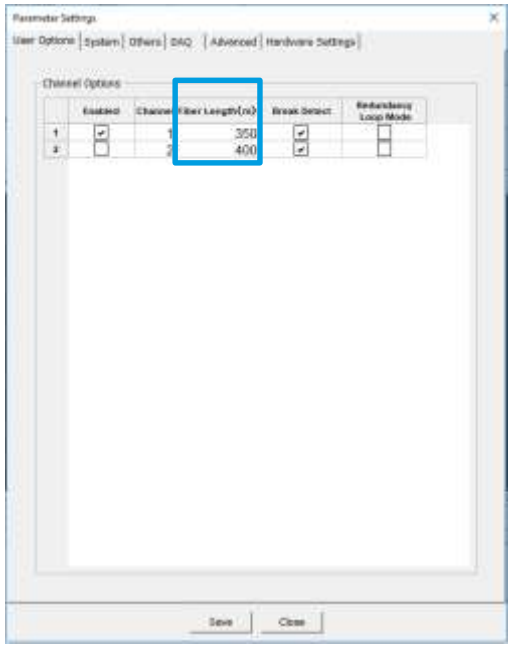
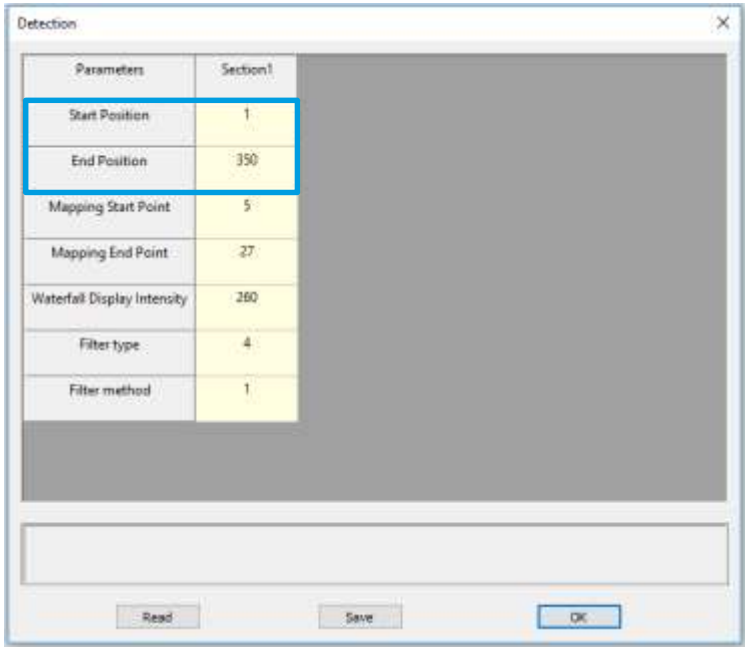
Fiber length

Once the length of the fiber has been determined, it must be set in the following locations for each channel:

OFSSCM < Configuration < Parameter Settings



Razor < Configure < Detection



- Enable the channel to which the fiber is connected.
  - The fiber length must be set equal to, or greater than, the actual fiber length as seen from the raw data curve.
  - The 2 channels can be used independently, or in a cut resistant configuration where channel 2 is used as the backup for channel 1.
  - Set the start and end positions to match the fiber. The quantity and configurations of the detectors can be changed later.

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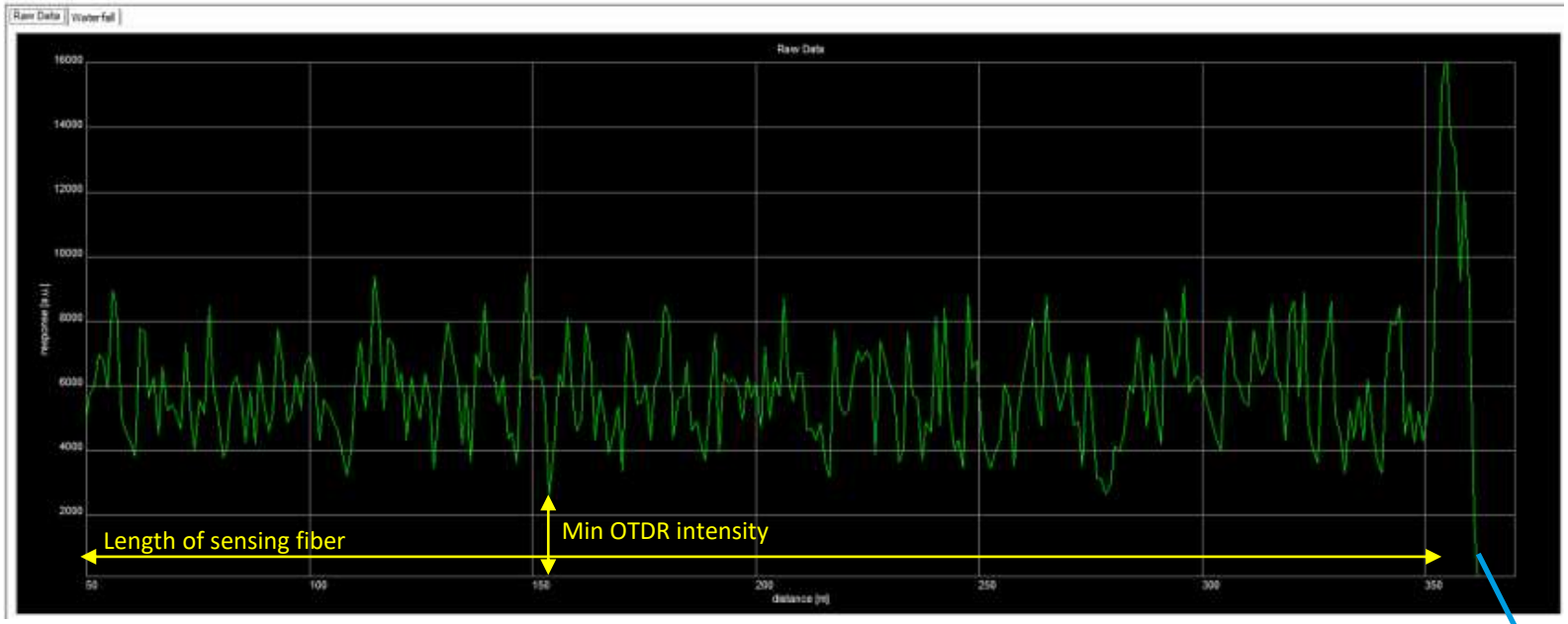
Fiber break detection

Let's take another look at the raw data curve:



Notice the sharp drop at the end of the fiber. We expect this same drop if the fiber is cut or broken.

We will use this to detect a fiber break.

We need to set 2 parameters: (1.) Length of the fiber (2.) Min. OTDR intensity

(1.) Set the length of the fiber to the required length.

(2.) For the OTDR intensity, monitor the signal for 30 seconds over the length of the fiber to check the minimum level that the raw signal attains. Set the Min OTDR intensity safely less than this value. For example, 1000.

Now the system will report a fiber break alarm if the signal drops below 1000 at any length less than the fiber length that has been set.

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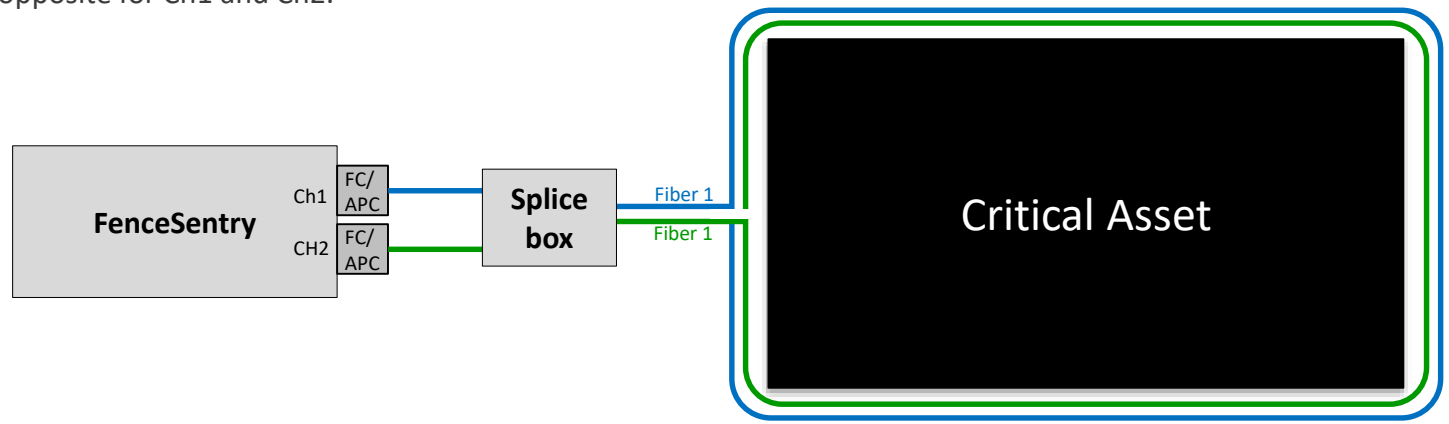
Cut Resistant Configuration

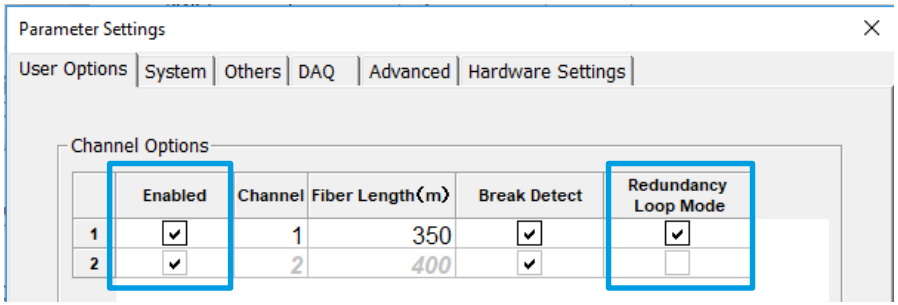
For cut resistance, the fiber must be installed and connected in the configuration shown below. Note that the detection direction is opposite for Ch1 and Ch2.



Note: Fiber 1 and Fiber 2 are two cores in the same cable

To use the loop redundancy mode:

- Enable Ch2
- Select the check box for loop redundancy mode in ***OFSSCM < Configuration < Parameter Settings***. Only channel 1 can be selected.
- No further settings are available for Ch2. Ch2 will now act as the backup of Ch1. When a fiber break occurs, the two channels will complement each other.



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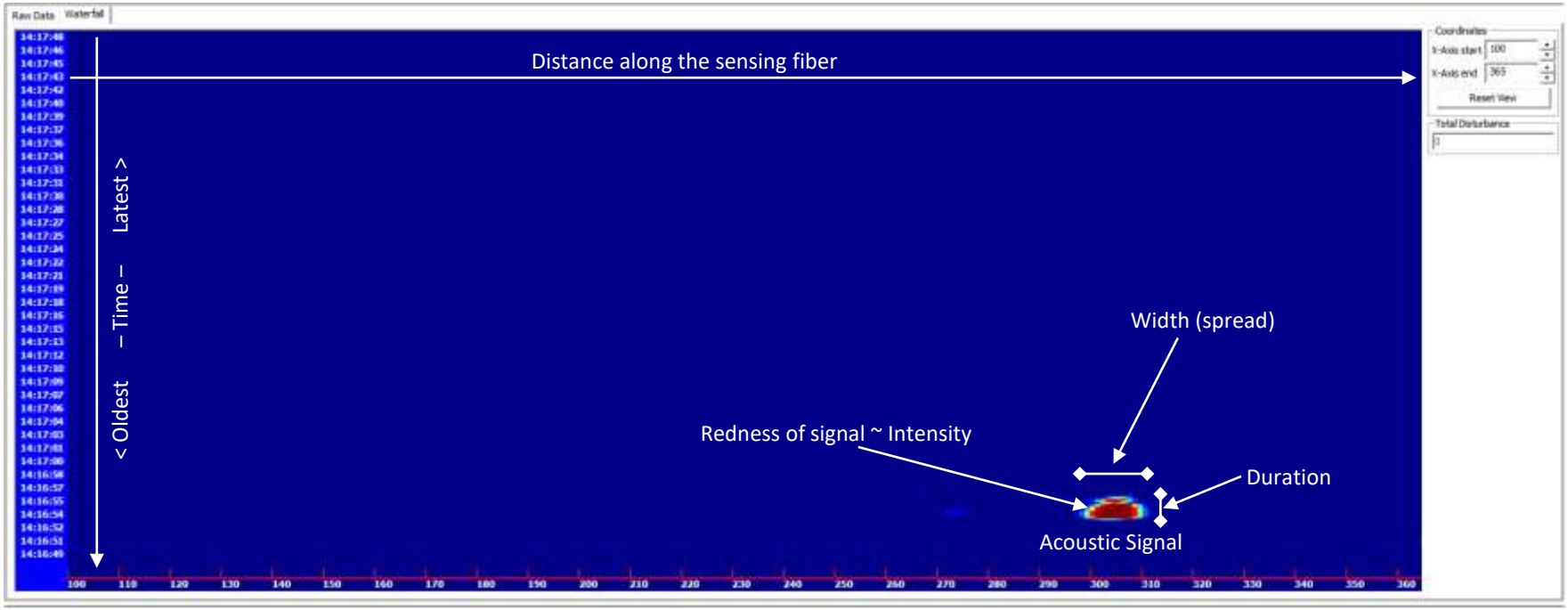
The Waterfall



- The Waterfall shows the acoustic information across the length of the sensing fiber over time. The newest information is at the top of the waterfall, and the oldest is at the bottom.
- Acoustic signals appear on the waterfall as blotches, coloured on a scale from blue to red, with blue representing low intensity, and red representing high intensity signals. This scale is relative, and can be set in:
  - Razor < Configure < Detection < *select correct fiber* < Waterfall Display Intensity
- Three parameters are crucial for detecting intrusions and filtering out nuisance signals: Width, Duration and Intensity

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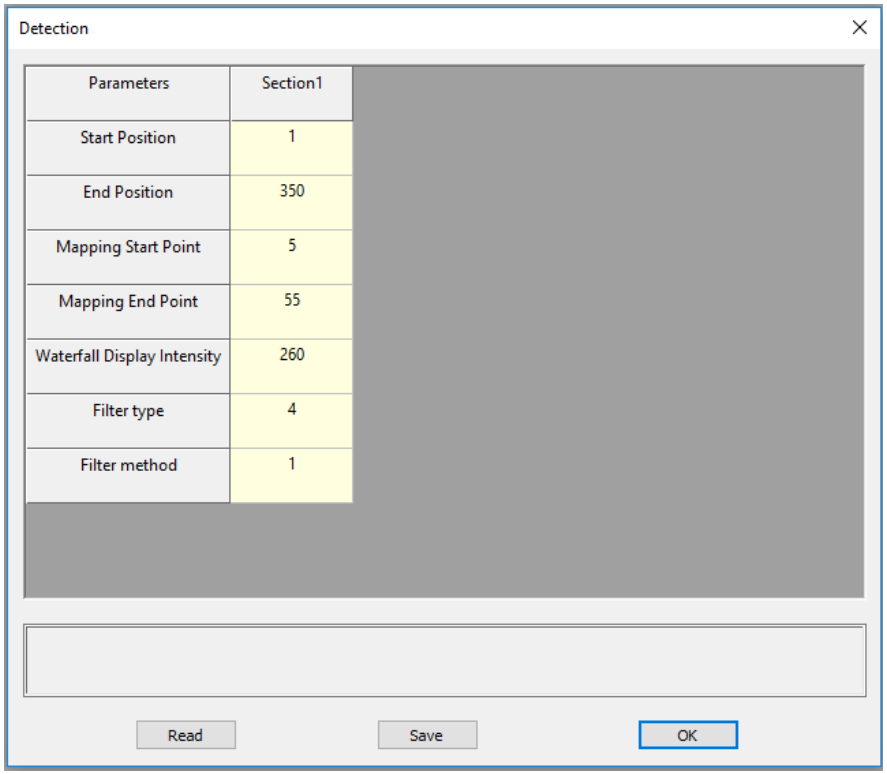
Detector

A Detector contains the settings for how the data is displayed on the waterfall. This processed waterfall data is what's displayed in OFSSCM and used to generate alarms.

- There is no correlation between the Detectors and Recognisers.
- Multiple non-overlapping detectors may be configured for a system. These can be added by right-clicking anywhere within the Detector parameters area and selecting ***Insert column***.
- The start and end positions must be set for each section and the sections must be configured sequentially.
- The Detectors must not overlap.
- The Mapping Start and End points are related to which frequencies are displayed on the waterfall. This frequency band can be set after viewing sample intrusion data on the Mapping display of Razor.



- The waterfall display intensity sets a scale factor of how intense the signals appear on the waterfall. The final value will generally be in the region of 200 to 300 in normal operation. It can be set lower or higher for specific tasks;
  Eg: set high for position mapping where precise positioning is required.
- Filter type and Filter method: Set to 0, 0 for tuning and configuration and 4, 1 for normal operation (as shown here).

Note:
If no Detector is set up for a region, the waterfall will still show, but the system will not detect for that area.

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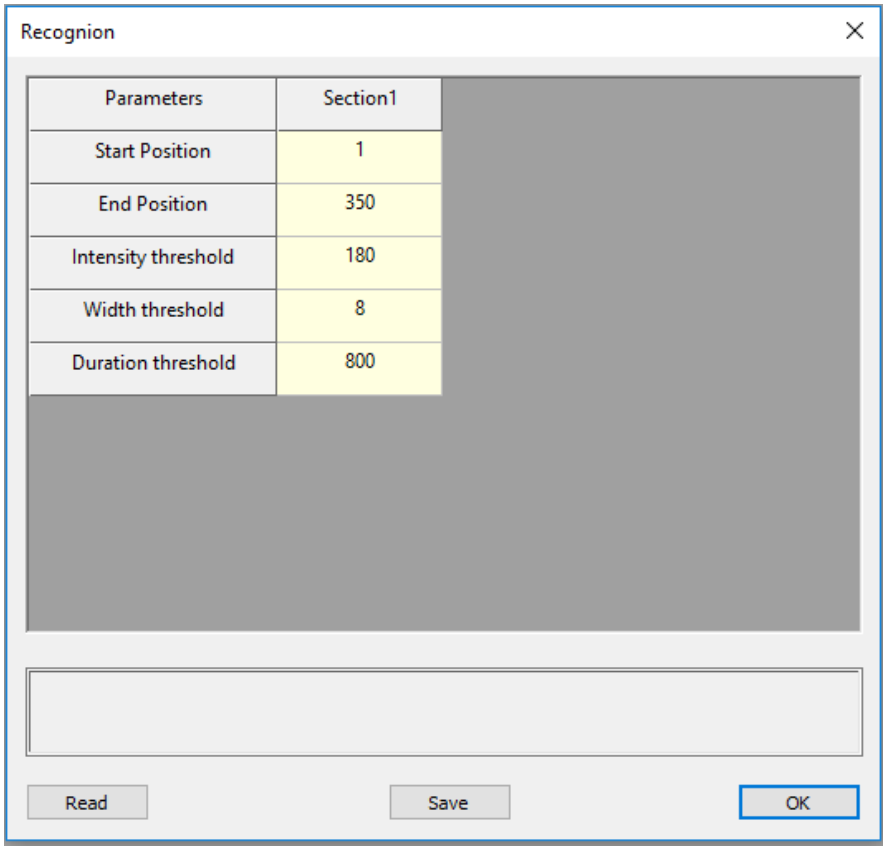
Razor – Recogniser

A Recogniser contains the alarm thresholds for a section of fiber.

- There is no correlation between the Detectors and Recognisers.
- Multiple non-overlapping recognisers may be configured for a system. These can be added by right-clicking anywhere within the Recognition parameters area and selecting ***Insert column***.
- The start and end positions must be set for each section and the sections must be configured sequentially.
- The Recognisers must not overlap.
- The alarm thresholds are the minimum values required to raise an alarm:
  - Intensity threshold
  - Width threshold
  - Duration threshold
- All three criteria must be met for an alarm to be raised



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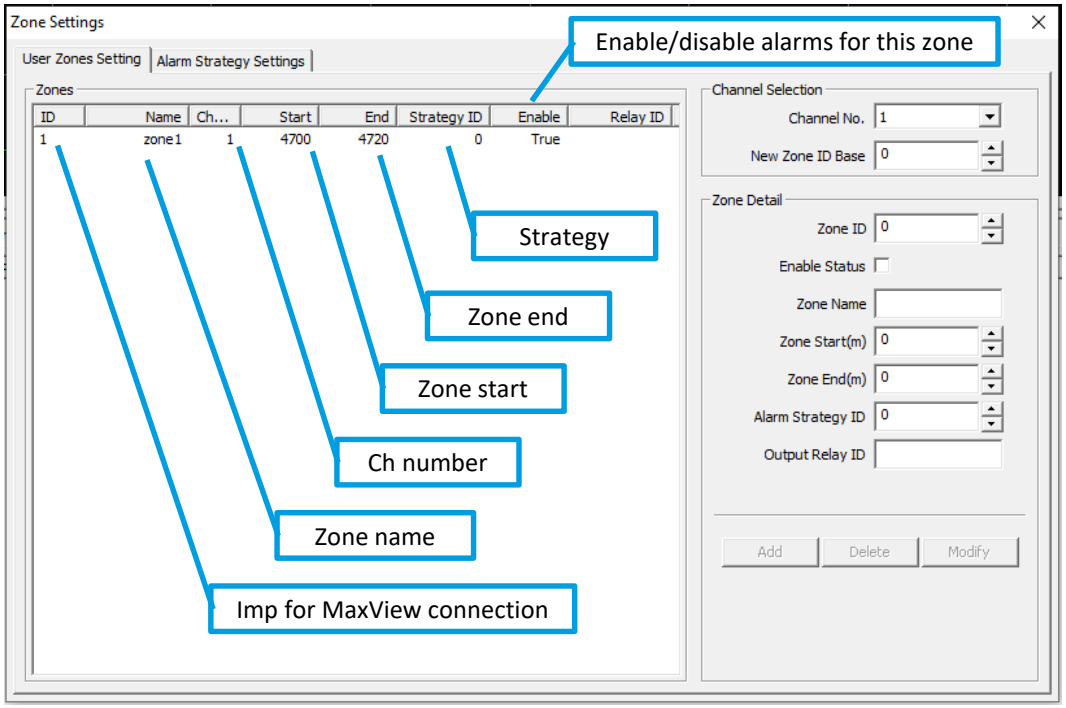
Zones

Zones are a User parameter. Number of zones and start and end points are usually set by the customer.

Factors to consider when setting the zones:

- Recommended length for general zones: > 30m
- Ensure that the full perimeter of interest is part of a zone(s).
  Alarms are a property of a zone. At least one zone must be configured for alarms to be generated for that zone.
- If the system integrates with CCTV cameras, consider any associations between the zones and the areas covered by the CCTV cameras.
- Are relay triggers required for alarms from certain zones.



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Alarms and Relays

Alarms are a property of a Zone, so you must have a zone set up, to generate an alarm for that region.

Alarm strategies can also be set in OFSSCM to arm/disarm alarms between certain periods of the day, but this is not recommended. If the end user is using MaxView, this can be configured in MaxView instead.

The FenceSentry has 48 on-board relays that can be used to interface to external systems.

Relays 1-4 are reserved for system status outputs:

1. Power
2. System Fault
3. Fiber break: Ch1
4. Fiber break: Ch2

The rest are available for external interfacing

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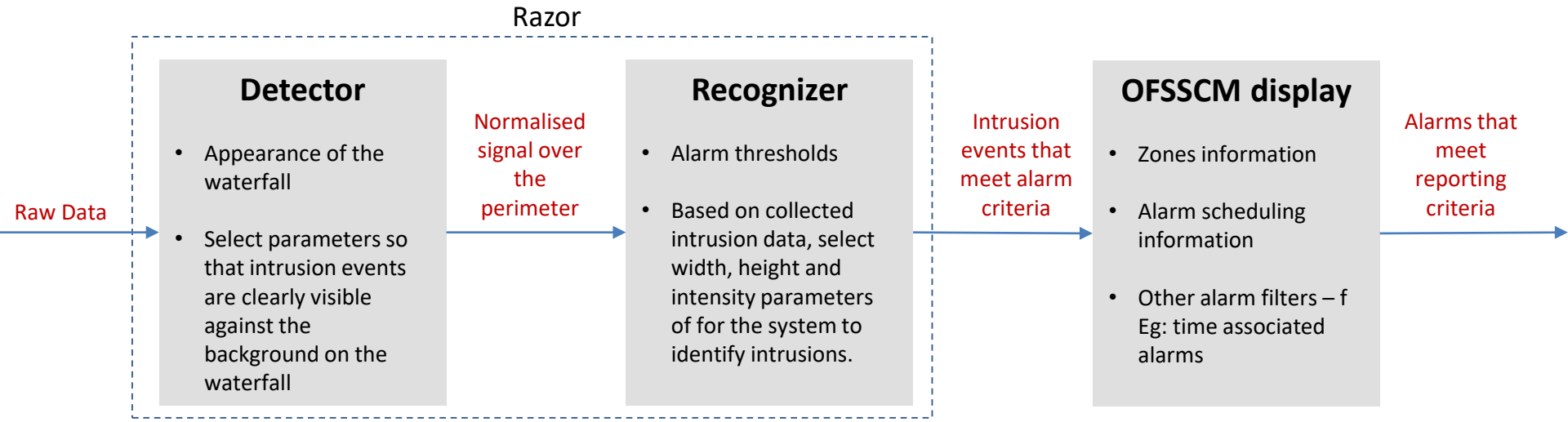
Detectors, Recognisers and Zones

There is no correlation between zones, detectors and recognisers.

Detectors and recognisers are set by the commissioning engineer to achieve correct detection of intrusion identification.

Zones are used to meet the End User's reporting, alarming and interfacing needs.

Flow of information:



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Razor – Detectors vs. Recognisers

The Detector determines the waterfall display, while the Recogniser sets the alarm thresholds for that section of fiber.

- Minimise number of detectors and recognisers
- Where possible set up new detectors for special areas, rather than multiple recognisers. Minimise use of multiple recognisers where possible.

Reasons to set up Detectors	Reasons to set up Recognisers
Different fence types	Separate, unconnected sections of fence
Special conditions for certain areas – eg: construction noises with different frequencies etc.	

Notes:

If there is no detector set up for a certain section of the waterfall, the waterfall will show for that section, but it will not detect for that section.

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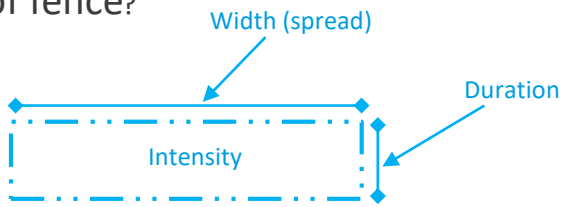
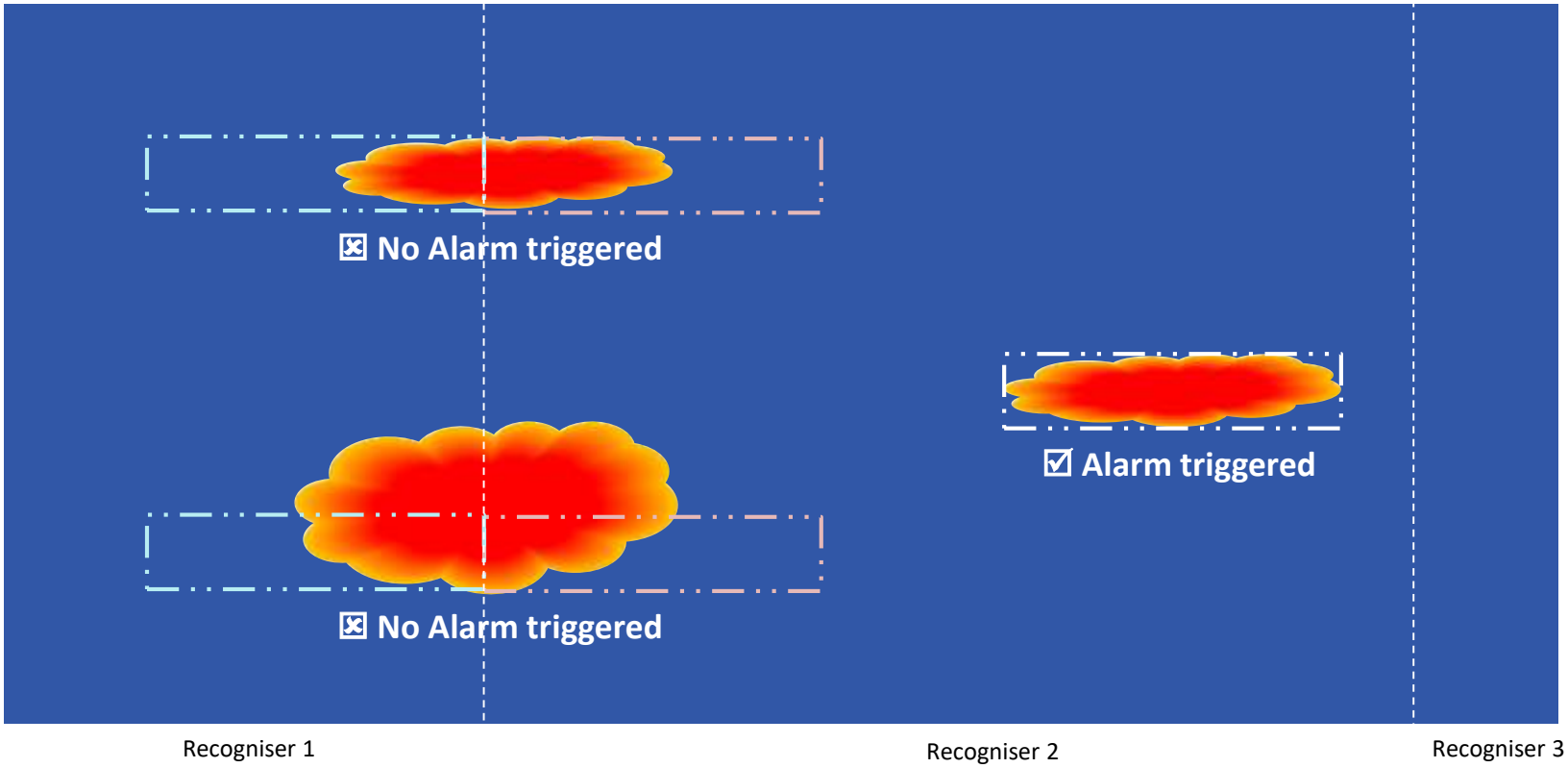
Razor – Detectors vs. Recognisers

Why minimise the use of recognisers for a continuous section of fence?





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Razor – Exercise: Raw Data playback

- Save some raw data
- Playback the raw data in Razor

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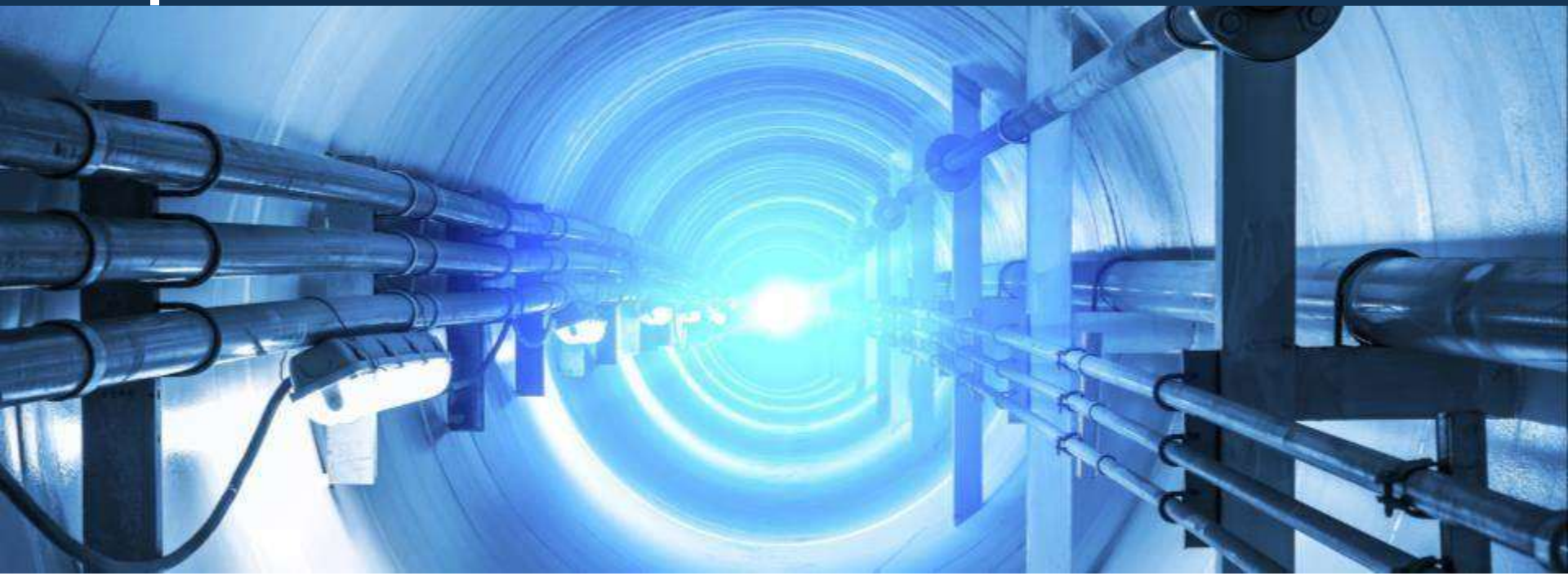
Product Training: FenceSentry

2 Commissioning



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Product Training: FenceSentry – DAY 2

2	System Commissioning
2.1	Calibration
2.2	Key Parameters
2.3	Intrusion Data
2.4	Configuration
2.5	Verification
2.6	Monitoring

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Commissioning

1. **Calibration:**
   Record meter positions of real world points of interest: zone start and end, position of problem areas, points of interest etc.
2. **Set Key parameters:**
   Configure the system so that the detection sensitivity is as consistent as possible over the perimeter to be protected.
3. **Gather Intrusion data:**
   Gather sample data of intrusion types of interest. This will be used to set the site parameters to detect this type of intrusion.
4. **Configuration:**
   Set recognition parameters
5. **Verification:**
   Perform intrusion tests in random locations to ensure the system alarms.
6. **Monitoring:**
   Monitor the system for nuisance alarms. Use these to tune the system further.

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Commissioning – Calibration

- The goal of this process, is to determine the meter positions of:
  - Start and end of the fence;
  - Start and end of each zone;
  - Maintenance or other loops – loops should be buried/isolated if possible (NOT attached to the fence)
  - Points of interest;
  - Besides the above, select points every 30-50m (or the centre of longer zones);

Let’s take the example of Bandweaver’s demo Fence site

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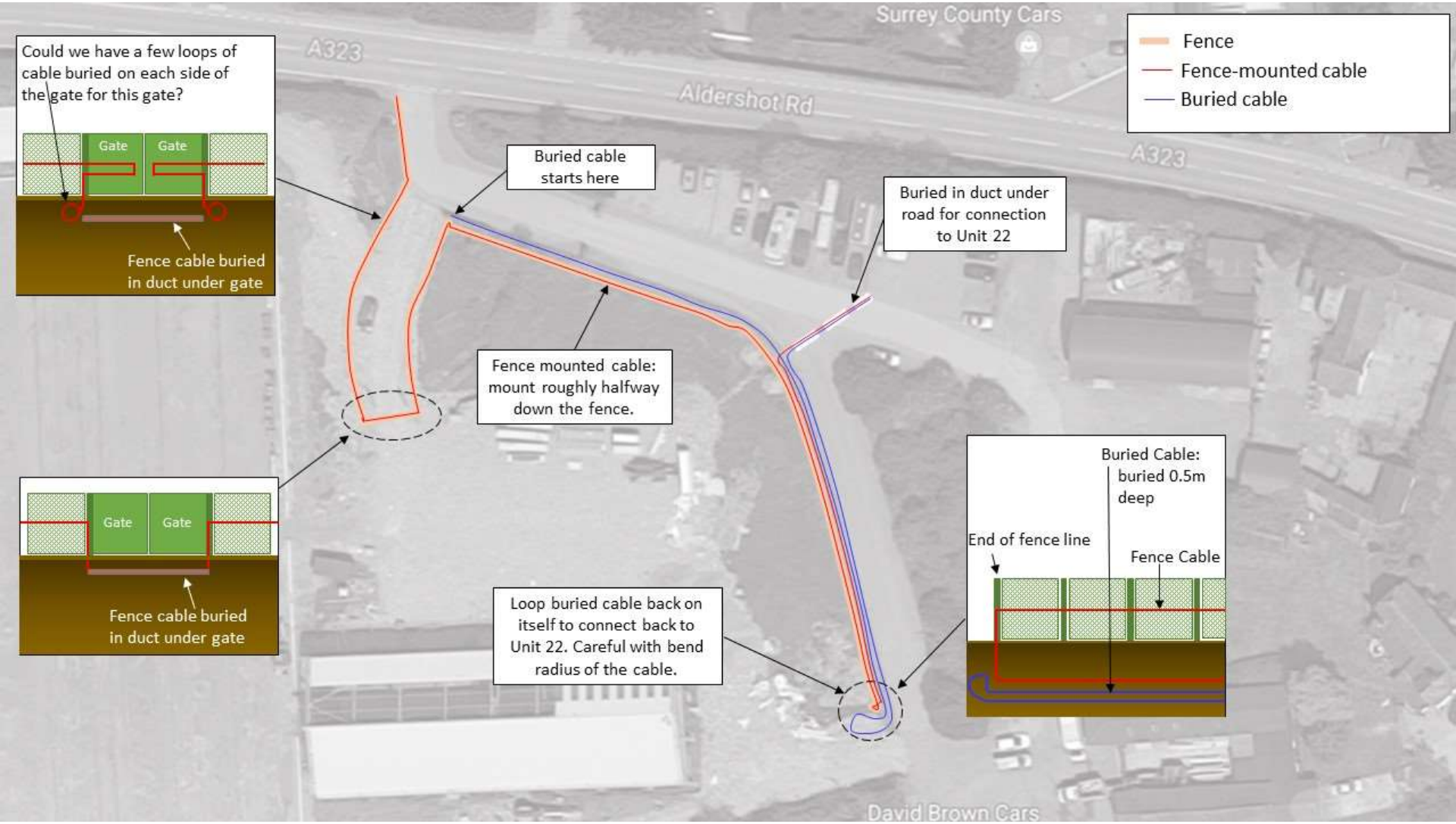
Commissioning – Calibration



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Commissioning – Calibration

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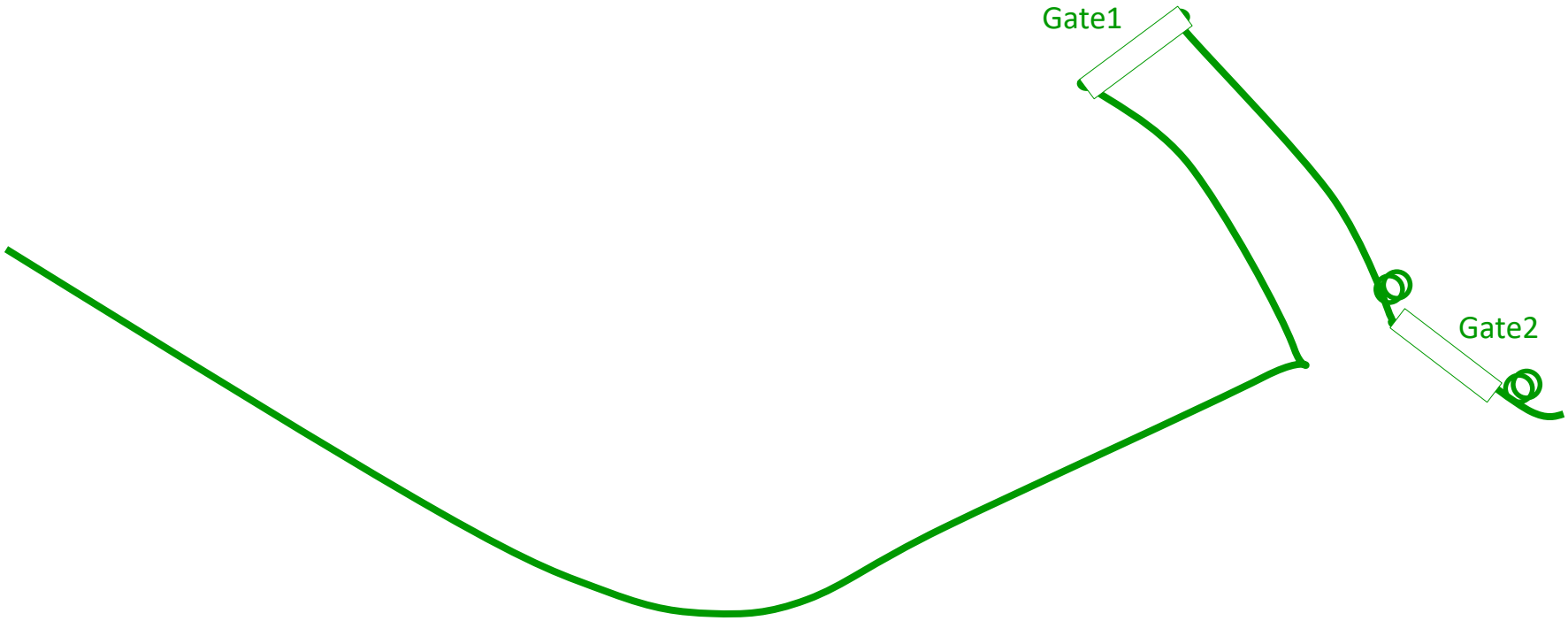
Commissioning – Calibration

- Selection of calibration points



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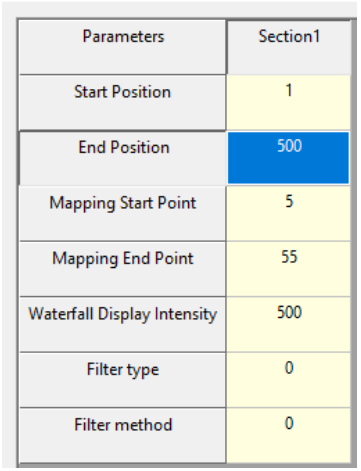
Commissioning – Calibration

1. **Detector Settings for Calibration:**
   We need to determine the meter position with as much accuracy as possible. In order to do this, we will set the sensitivity of the system very high, and use very light taps to visualise their location on the waterfall.
   Set the following parameters in the Detector(s):

1.	Mapping Start Point	15	*for full range of frequencies*
2.	Mapping End point	55	
3.	Waterfall Display Intensity	500	*for high sensitivity*
4.	Filter type	0	
5.	Filter method	0	



Parameters	Section1
Start Position	1
End Position	500
Mapping Start Point	5
Mapping End Point	55
Waterfall Display Intensity	500
Filter type	0
Filter method	0

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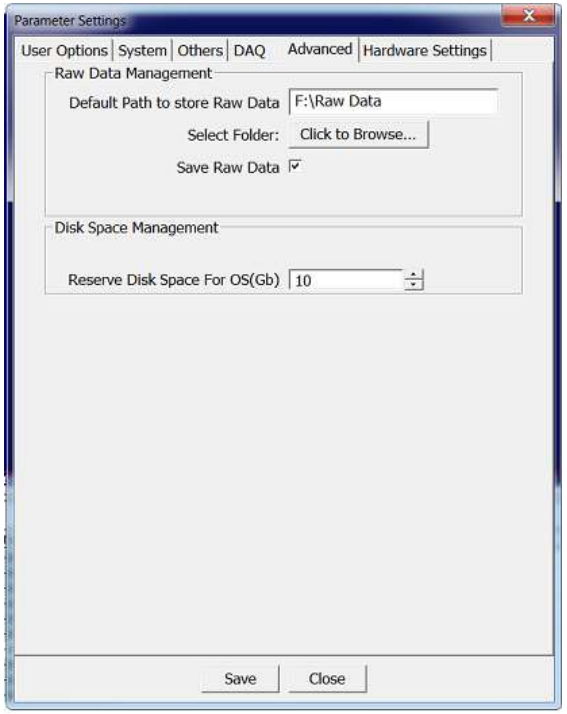
Commissioning – Calibration

2. **Check disk space**
   We will be storing large amounts of raw data over the course of the commissioning. Check the hard disk to ensure there is sufficient storage space.
   For Clasford Site (Bandweaver site), approx. 80Gb per day.
3. **Set the system to save raw data:**
   Parameter Settings < Advanced



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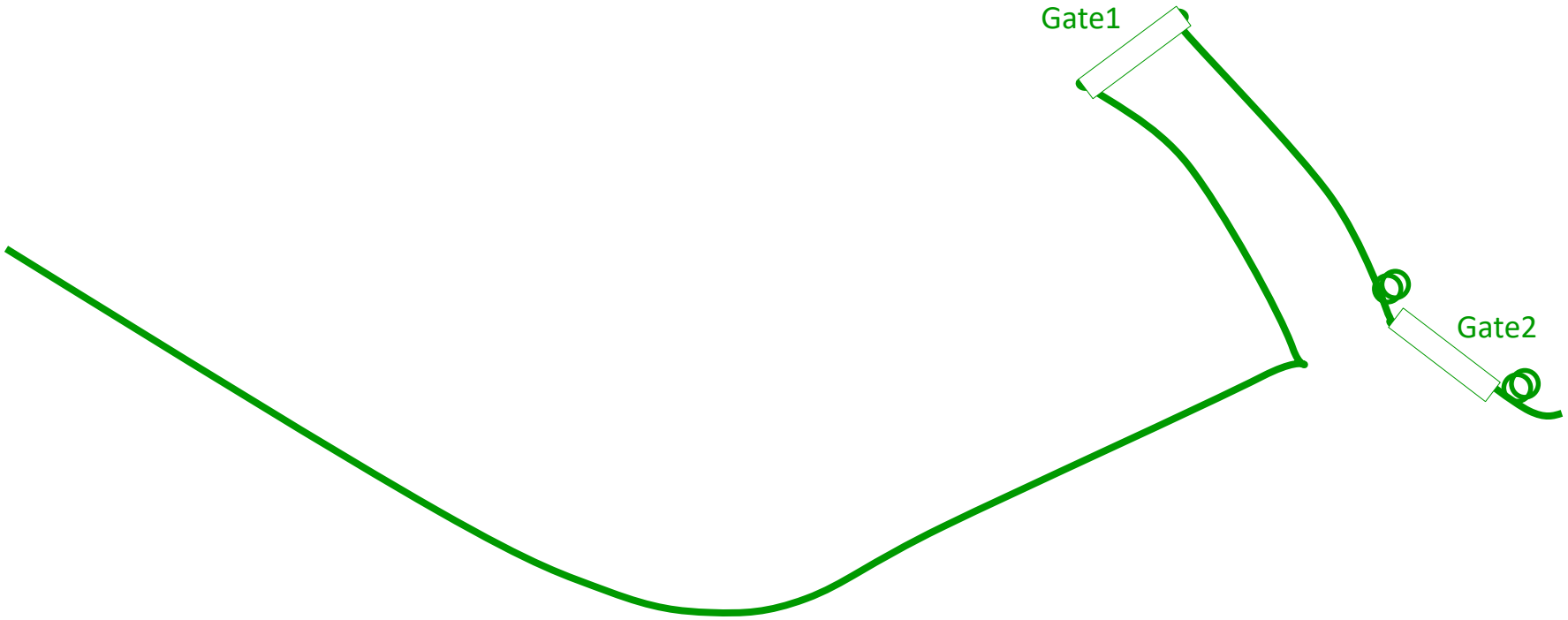
Commissioning – Calibration: **Exercise**

- Selection of locations for calibration points



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Commissioning – Intrusion Data

Where should the intrusions be simulated?

1. If conditions are homogeneous around the perimeter, choose random locations every 30-50m;
2. Locations where fence type or size (width or height) are different;
3. Locations where fence installation method is different;
4. Customer's areas of interest;
5. All gates;
6. Corners;
7. If there are loops, at the location of the loops;

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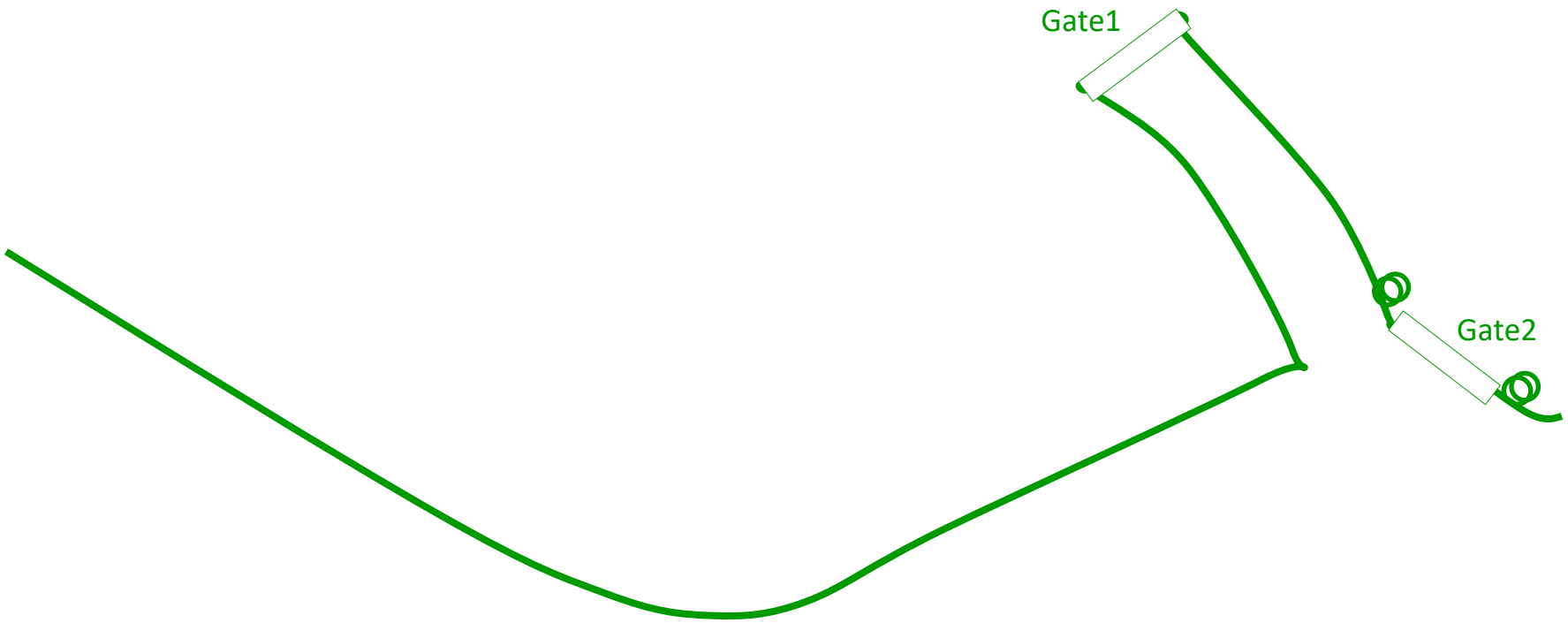
Commissioning – Intrusion data: **Exercise**

- Selection of locations for gathering intrusion data



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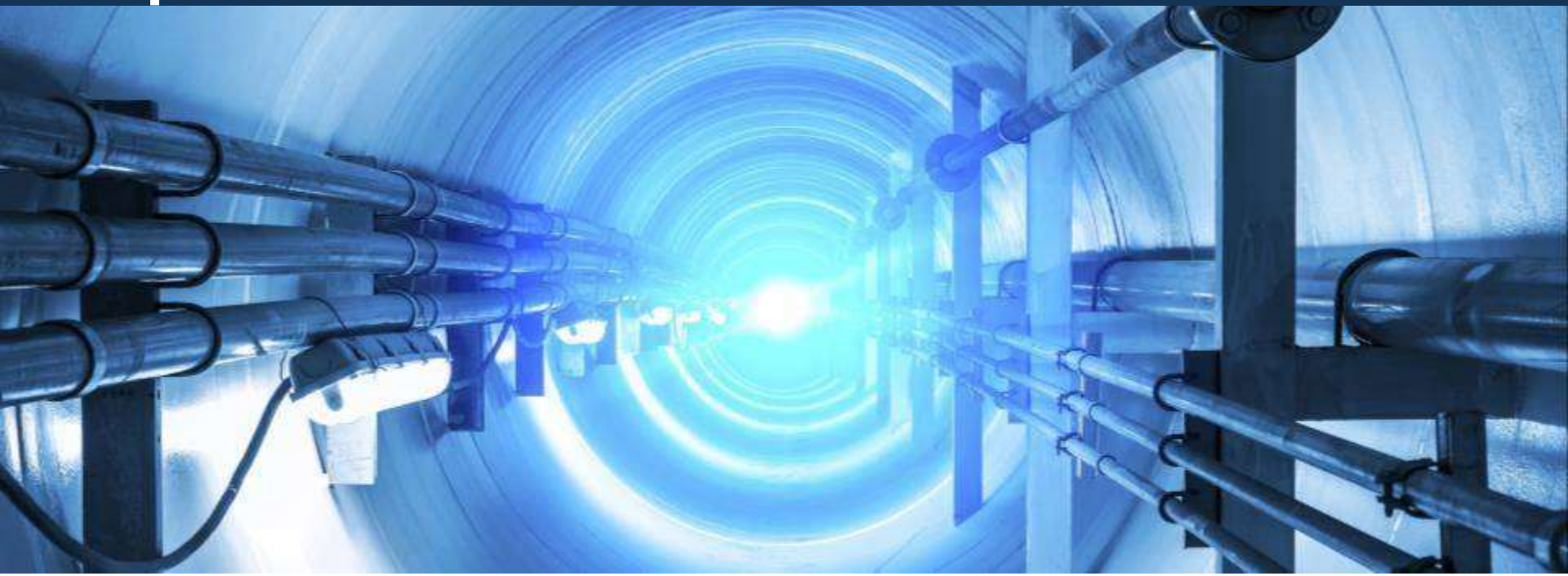
Product Training: FenceSentry

1 General tips



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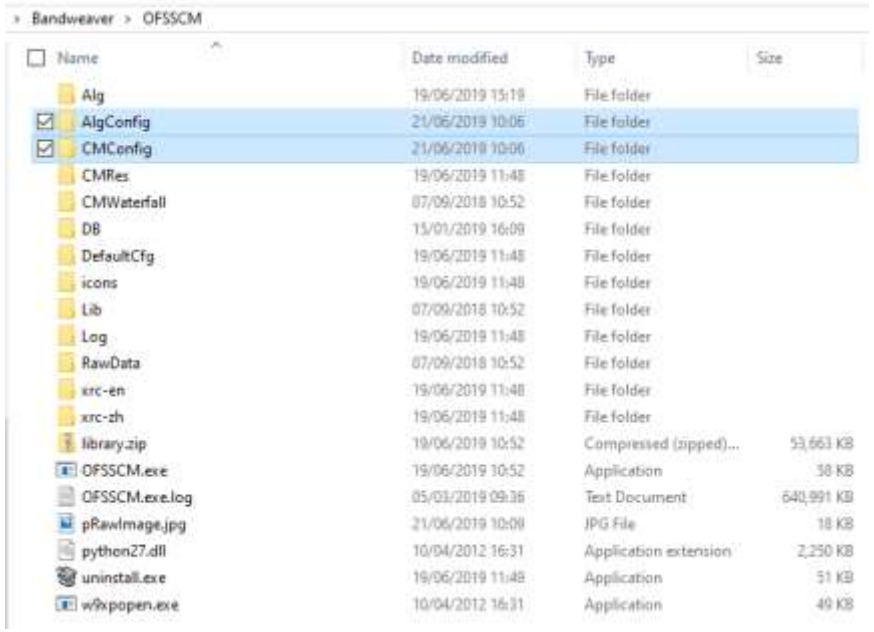
Tips: Saving a Project Configuration

Make a copy the following 2 folders to save a copy of the project configuration:

- **CMConfig** *Contains parameter, zone and alarms settings*
- **AlgConfig** *Contains algorithm settings – Detector and Recogniser configuration*

When replaying project raw data to replicate Customer issues, ensure these 2 folders are the same as those used by the Customer.



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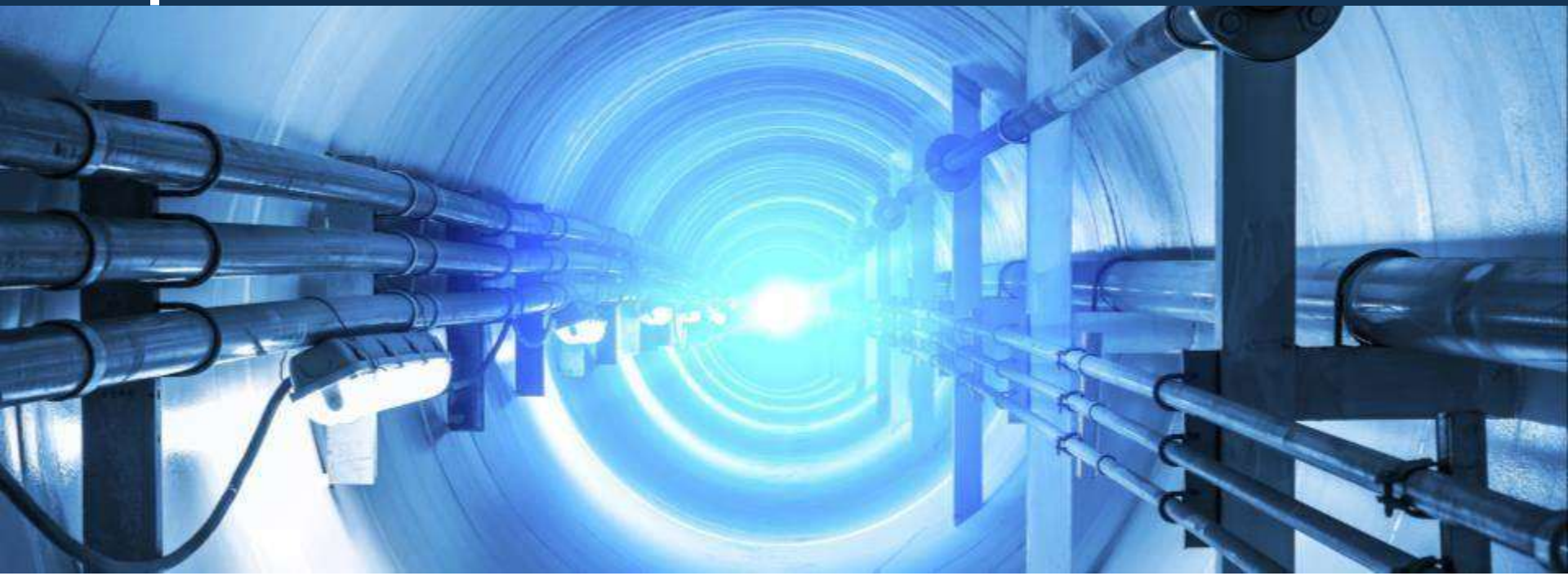
Product Training: FenceSentry

1 MaxView for Fence



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MaxView for Fence

MaxView is always installed and configured by Bandweaver, so this training covers MaxView from a Customer support perspective.

It assumes MaxView is already installed and that the Customer has a license for the use of MaxBuilder.

MaxView is a web-based interface, and is accessed via Internet Explorer.

MaxBuilder is required to build and configure the pages that are displayed on MaxView

Components of MaxView for Fence:

- One page per FenceSentry
- Offline map or site drawing
- Fiber route
- Zone detail
- Camera View
- Fiber Status Indicators
- Relay reset control
- Partner logo

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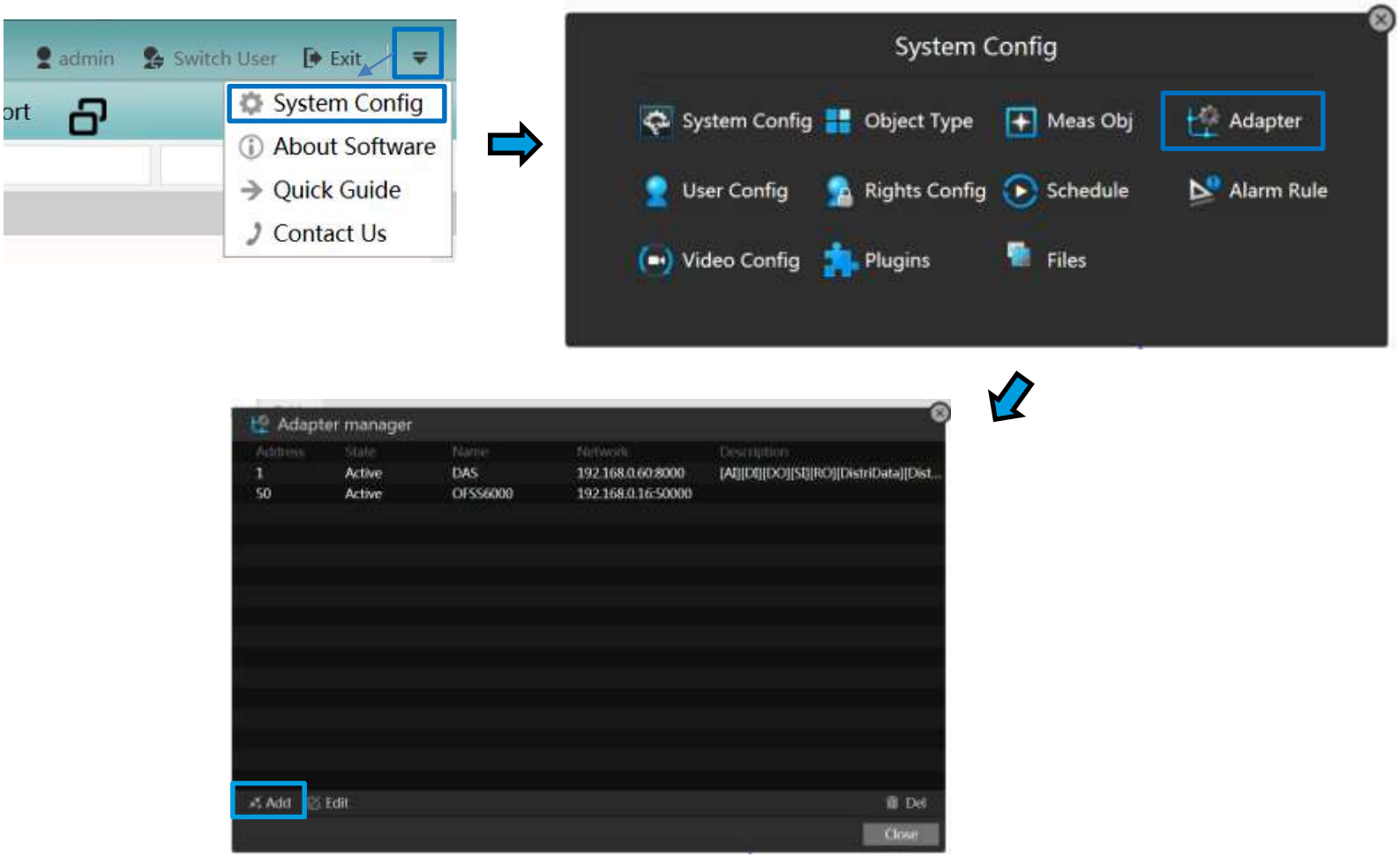
MaxView for Fence: Connect to FenceSentry

1. Add an **Adapter**



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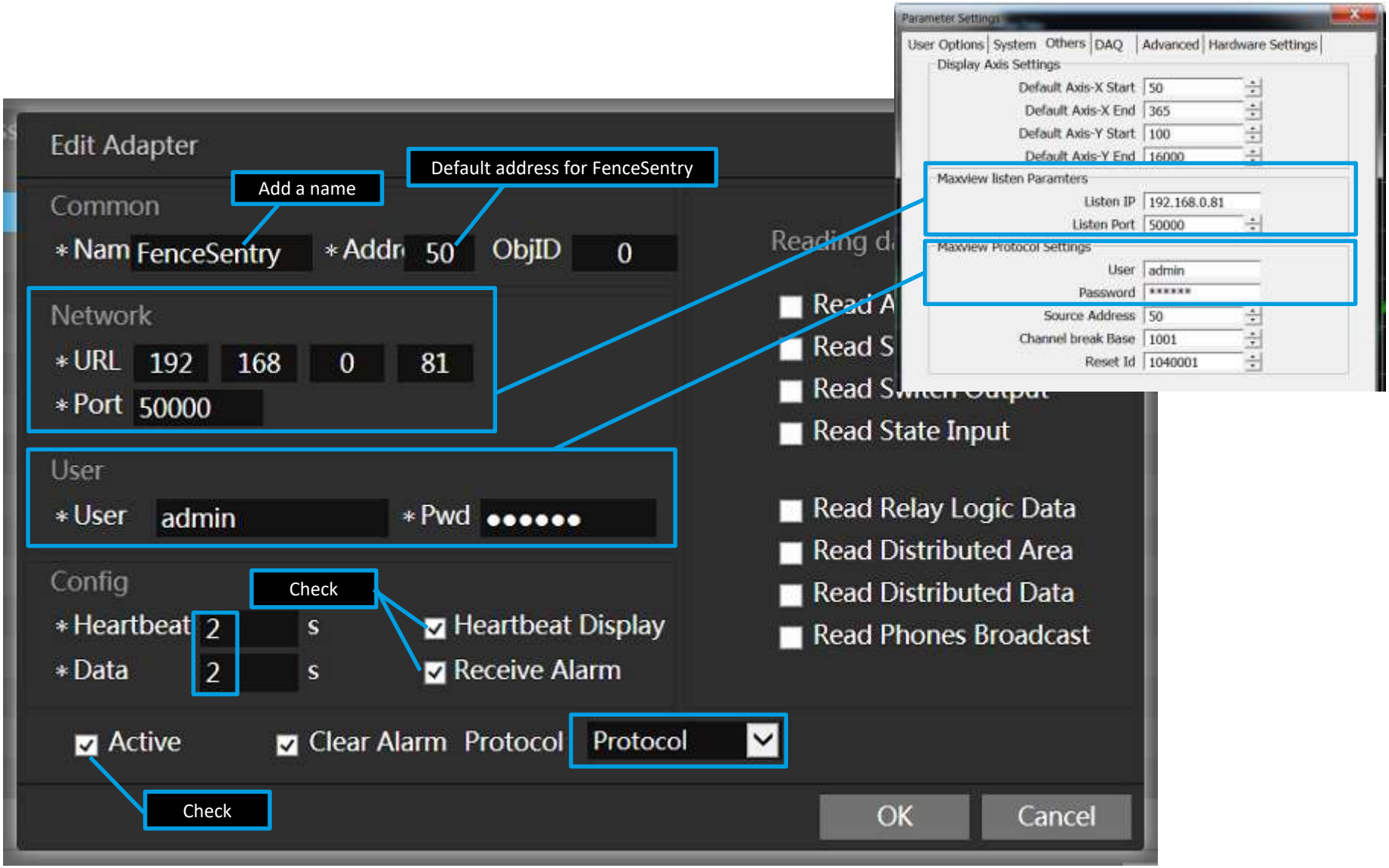
MaxView for Fence: Connect to FenceSentry



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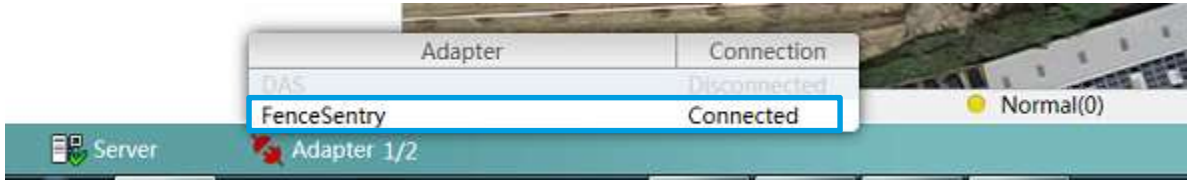
MaxView for Fence: Connect to FenceSentry

Check Adapter status
The status of the configured adapters are shown in the bottom status bar of the MaxView web interface.

The following screenshot shows a system where a Horizon and FenceSentry adapter are both configured, but only the FenceSentry is currently connected.



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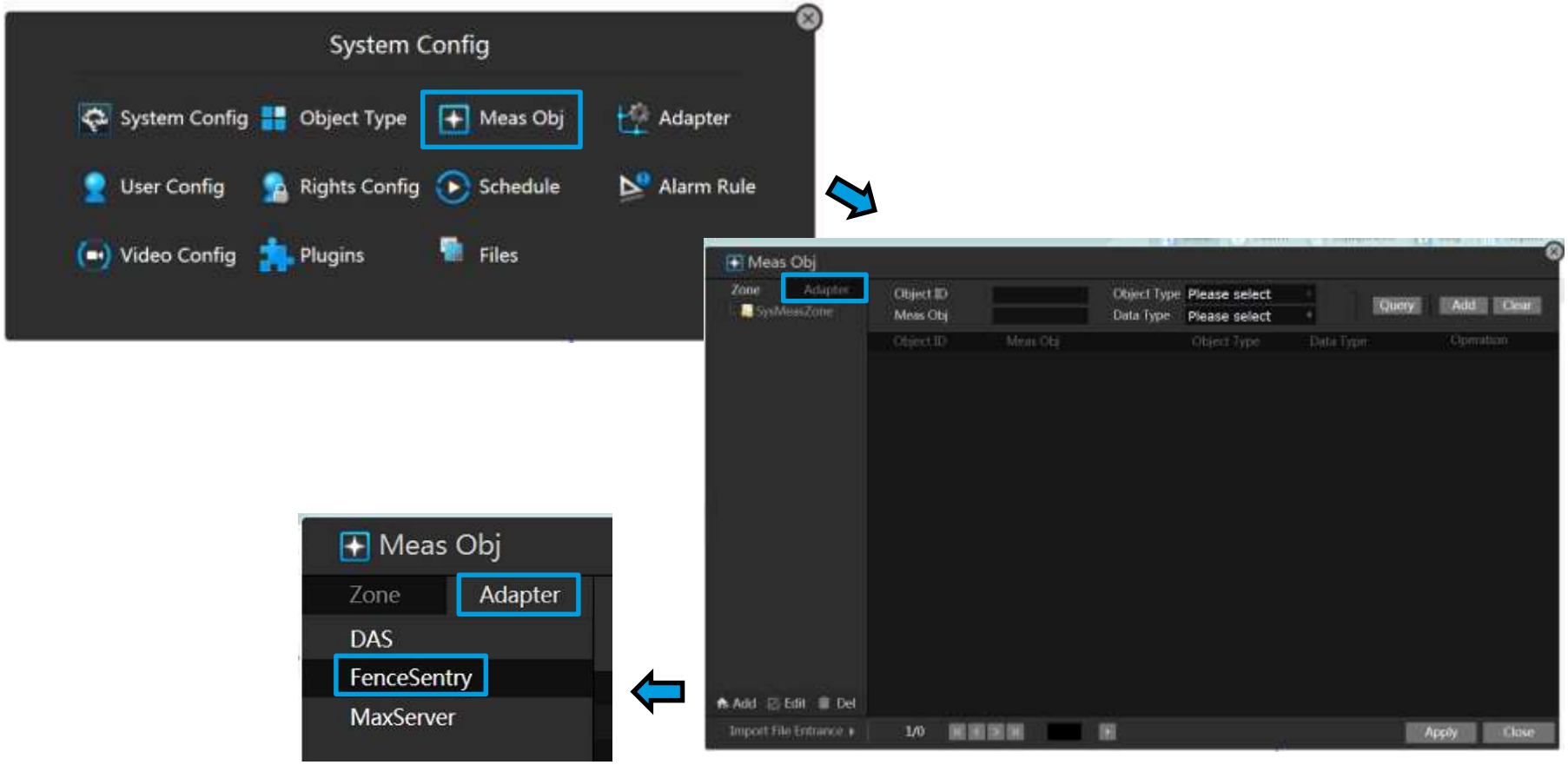
MaxView for Fence: Link Zones

2. Add a **Measurement Object**
   For the FenceSentry, each Zone is a Measurement Object. The Measurement Objects can be added in batches.
   For our example, we have 7 Zones, (5 zones + 2 gates) and they can be added as follows:



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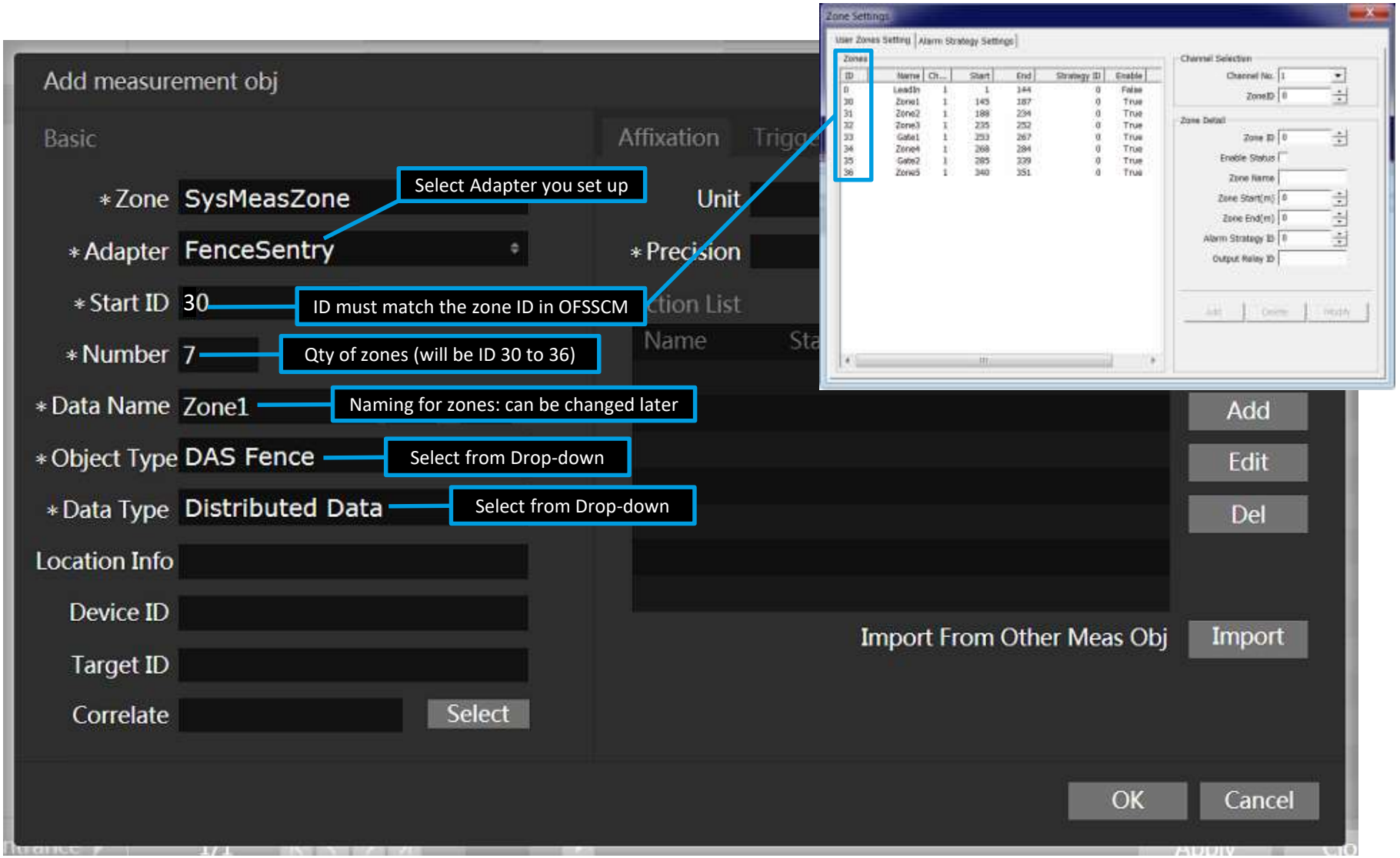
MaxView for Fence: Link Zones



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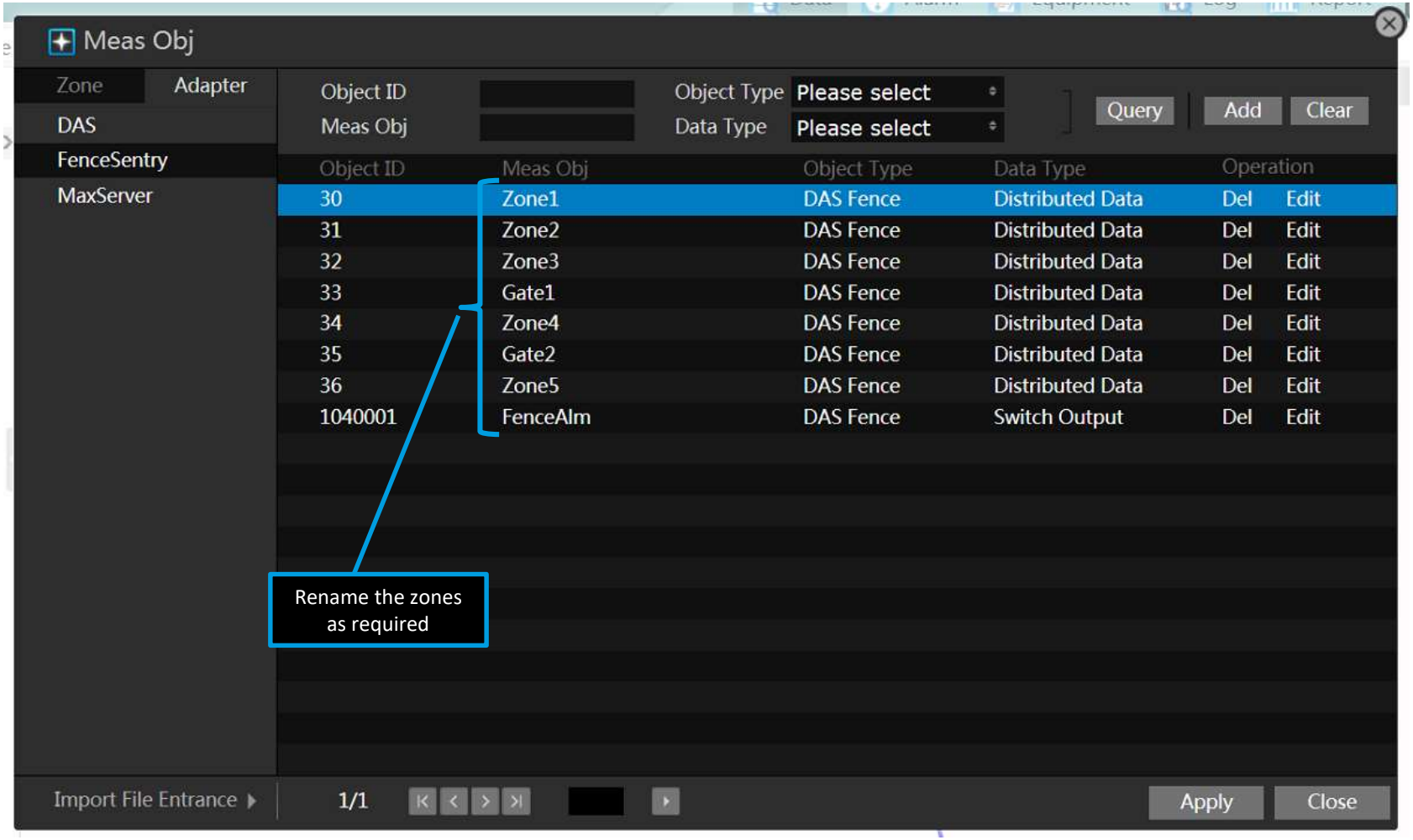
MaxView for Fence: Link Zones



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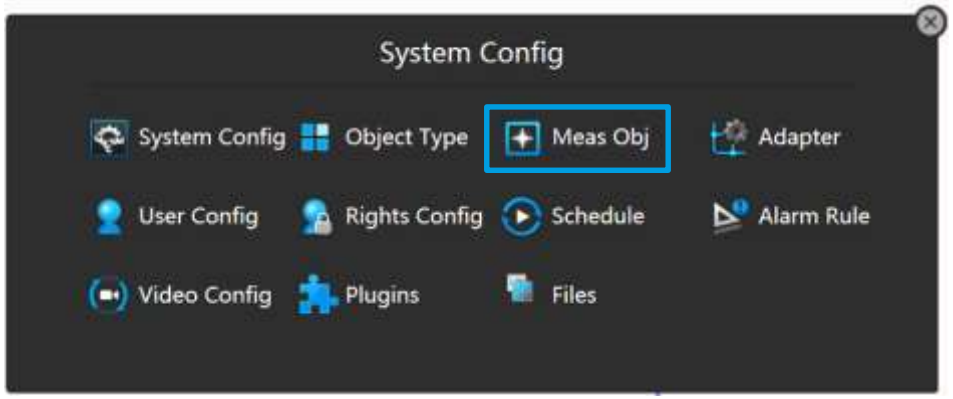
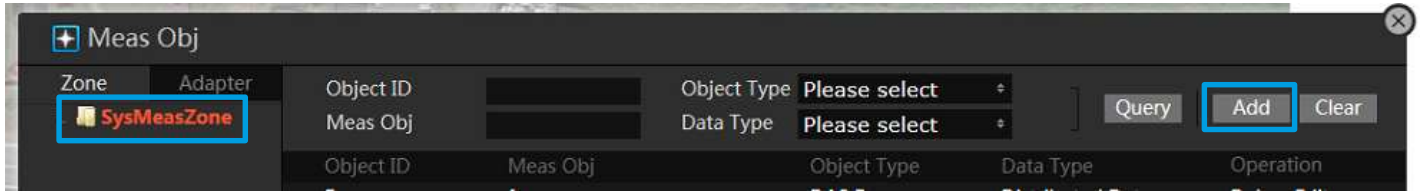
MaxView for Fence: Add Video

1. Add another **Measurement Object**





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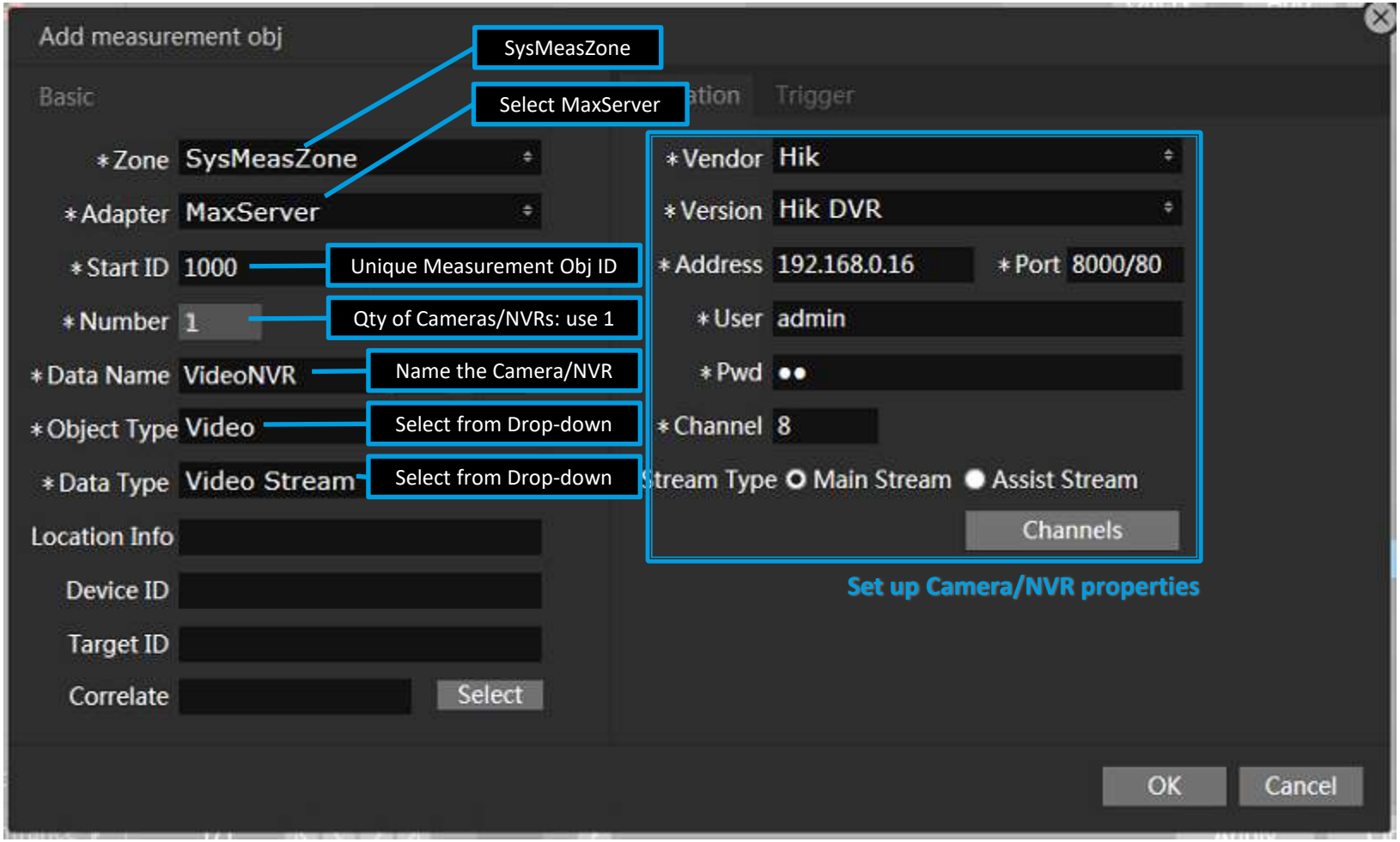
MaxView for Fence: Add Video



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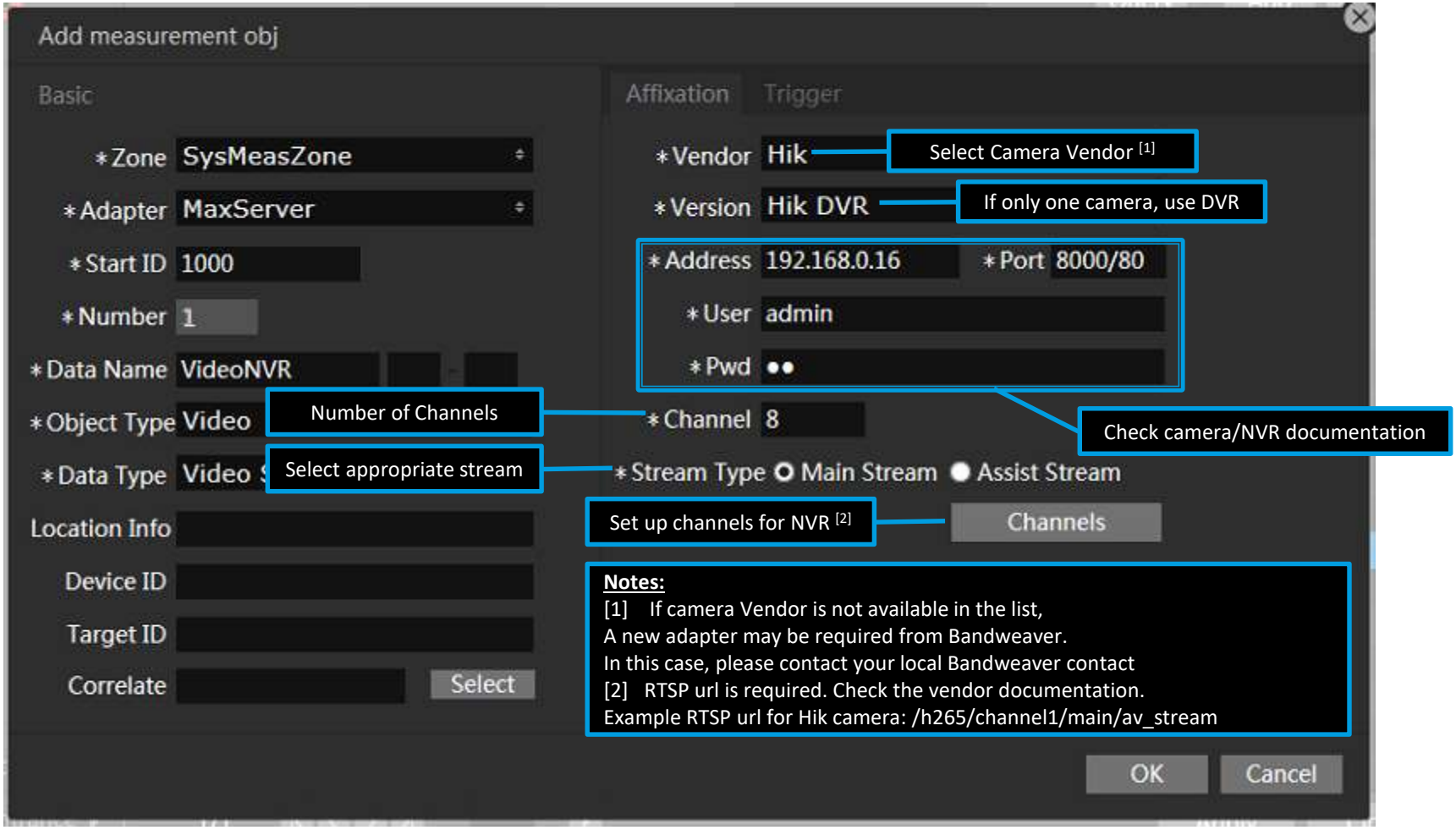
MaxView for Fence: Add Video



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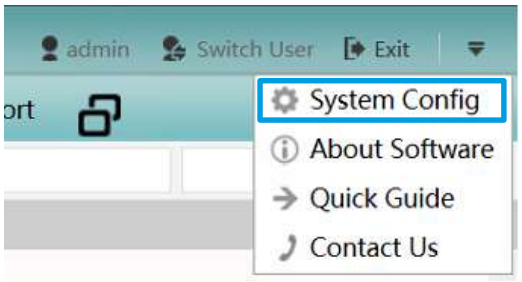
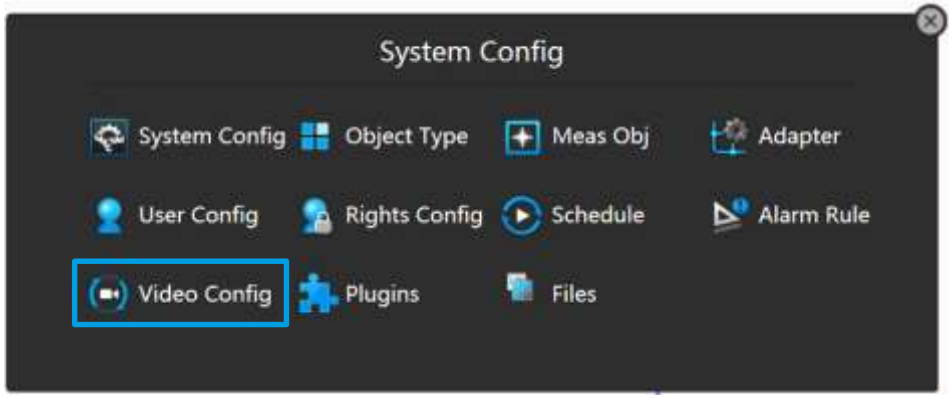
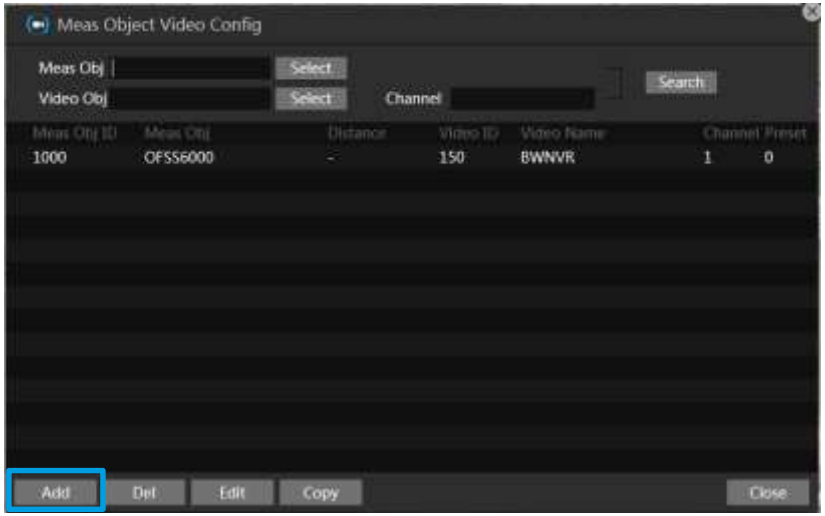
MaxView for Fence: Add Video

2. Go to **Video Config**







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Thank you. Any questions?

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support@bandweaver.com