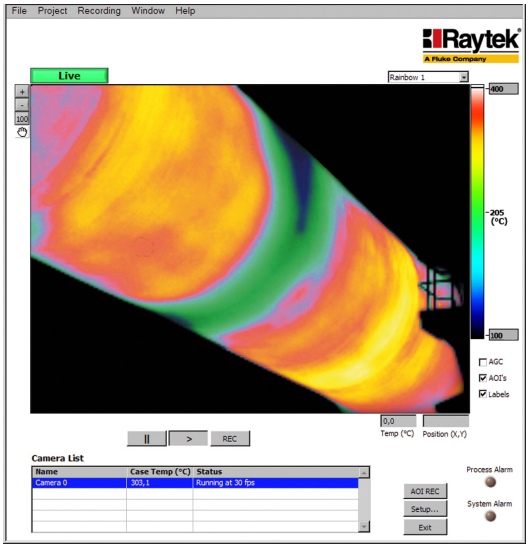
DataTemp® DTPi

Software for ThermoView Pi20



Manual

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Specifications subject to change without notice.

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1 System Overview

1.1 Description

This document serves as a reference for the DataTemp (DTPi) Software for the ThermoView Pi20 imager. For technical specifications, mounting instructions and other hardware related issues, please refer to the operating instructions for the ThermoView Pi20 process imager.

Main features of the DTPi software package:Multi-camera support for up to 16 cameras

- Alarm outputs can be assigned to specific relay outputs for feedback control of your process.
- DTPi software can also provide multiple system alarm outputs to indicate overall health of the Raytek® Pi20 camera and that the DTPi software is operating properly
- Digital inputs into the DTPi software allow for triggering of various events, such as Clip and Trend file capture.
- Automatic clip file or AOI trend data collection capabilities allows continuous or time based capturing of events for later review
- Export Trend data - The AOI data (maximum, average, and minimum temperature) is archived to a spreadsheet file for post processing review.
- Project file storage to save all Pi20 cameras and DTPi settings for a specific product

A computer operates the DTPi software that interfaces with the Pi20 camera. In addition, multiple analog/digital I/O modules may be added to this system for initiating tests and monitoring alarm statuses. This allows for automatic actions through the I/O modules by interfacing to other control systems.

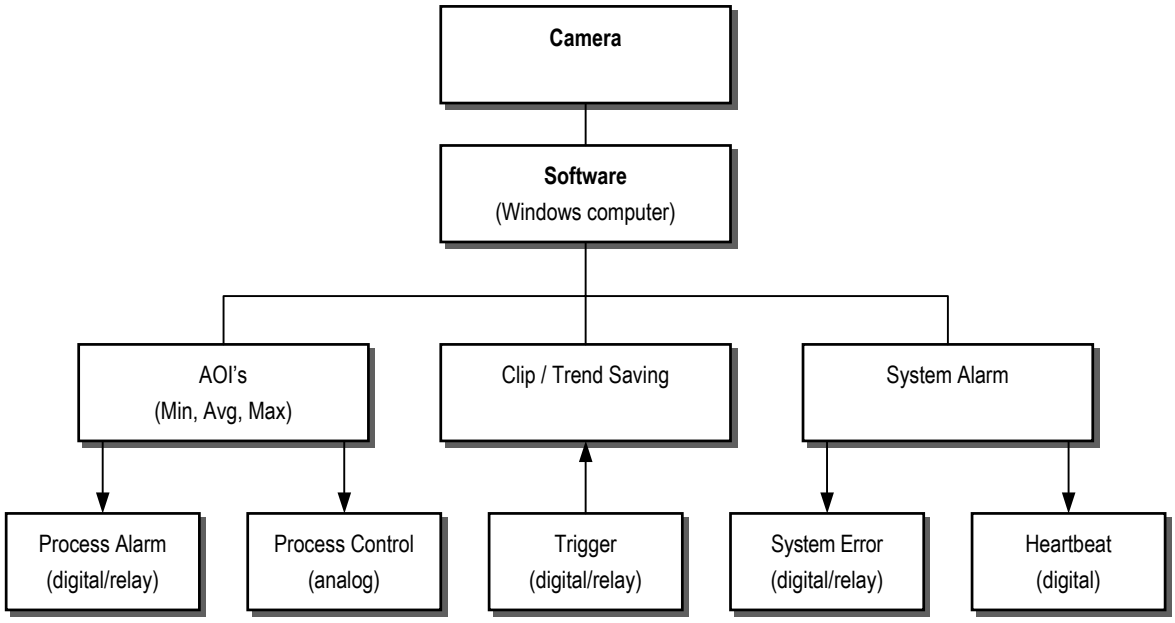

Figure 1: Software Structure

There are multiple alarms that are involved in error handling:

- **<Process Alarm>** is a signal that indicates a temperature is outside the limit driven by an AOI, based on its math function and the corresponding threshold.
- **<System Error>** indicates the following failure statuses:
  Error on the detector stabilization
  Error on the internal memory
  Loss of camera communication
  Missed frames
  Camera case temperature
- **<Heartbeat>** is a signal that toggles approximately every 1 sec. Its purpose is to allow the factory automation system to detect if the DTPi software has stopped functioning for any reason (PC hardware failure, DTPi software crash, Windows operating system crash, etc.). It can only be assigned to a true digital output via the 6024 module. It cannot be assigned to a relay output via the 6060 module.

1.2 System Requirements

Minimum requirements for the PC (provided by the user):

- CPU – dual core with clock speed 2.4 GHz
- 4 GB RAM @ 1066 MHz
- Graphics card with 256 MB memory (important: not "integrated graphics")
- 1152 x 864 graphics capability (high color 16 bit)
- 40 GB hard drive
- DVD drive
- Ethernet port (TCP/IP protocol, 100 Mbit/s)
- Windows XP SP2, Vista, Windows 7

Make sure that a possible firewall does not block the DTPi.exe software application!

It is strongly recommended to run the DataTemp Pi software in the latest version exclusively on the PC. Other applications could affect function and performance! A permanent CPU usage above 80% can effect the functionality of the whole system!

For demos, less capable machines can probably be used, but be aware of performance issues. Suggestions:

- Avoid running other apps at the same time.
- Turn off WiFi.
- Disconnect from any external Ethernet network.
- Get out of Email/Messengers, etc.
- Be aware of "Power Saver" settings on laptops that reduce CPU performance in order to conserve battery life.
- Make sure the laptop is AC powered.
- If necessary, connect to the camera at a lower frame rate.

1.3 Software Installation

Complete the following steps to install the software on a PC:

- Insert the installation CD into the CD-ROM drive
- Click on the <Start> button on the Windows Desktop, then select <Run>.
- Type "D:\setup.exe" (assuming D is your CD-ROM drive).
- Click <OK>.

Follow the Installation Wizard's instructions on the screen. The installation program creates a new program group in the start menu. Clicking on the <DTPi> icon automatically starts the program with the last project.

2 Software Operation

2.1 Live View

This viewer provides a thermal image of the camera you have selected. If multiple cameras are connected to your network, simply select the camera you want to view and it will be displayed. Process and system alarm indicators are also displayed in this viewer.

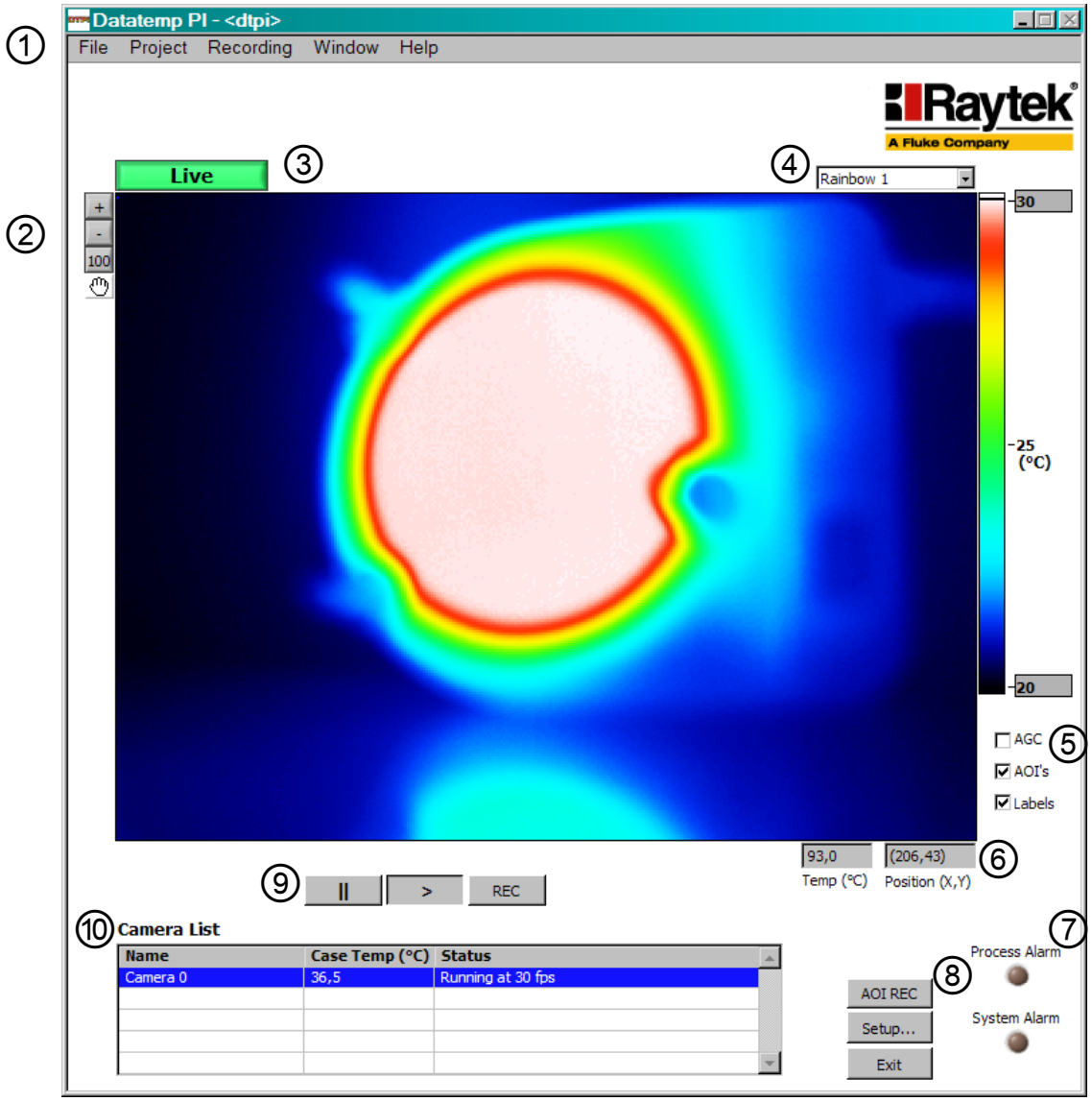

Figure 2: Live View

The view has several options to allow for easy analysis of the image.

①		**Title Bar**	shows the project file currently in use. An <*> will appear to the right of the project's name when it has been modified.
		Main Menu	see section 2.3 Main Menu, on page 9
②		**<Zoom>**	allows you to zoom in/out the image. <100> returns to the 100% sized image.
		**<Pan>**	allows you to pan through the image. To operate this function, simply hold the left mouse button down, while moving the mouse across the image. Panning is available when the image is zoomed.
③			… toggles between the live view and the playback view.
④		**<Palette>**	there are multiple color palettes one could choose from.
⑤		**<AGC>**	the **A**utomatic **G**ain **C**ontrol provides an automatic scaling for the displayed temperature range. This is helpful when initially setting up the system. The contrast enhancement allows you to see relatively cool background objects, while aiming and focusing the camera.
		<AOI's>	contains the option for overlaying the AOI's onto the image.
		<Labels>	contains the option for labelling the AOI's.
⑥		**<Position (X, Y)>**	shows the location of the current cursor position.
		<Temp(°C)>	shows the temperature at the current cursor position.
⑦		**<Process Alarm>**	the indicator goes on if any AOI global alarm is active see Figure 1: Software Structure, page 1.
		**<System Alarm>**	the indicator goes on if a system error occurs see Figure 1: Software Structure, page 1.
⑧		**Record**	Start/stops the recording of AOI results in a dedicated file. The file name is generated dynamically based on the <Project Name> plus a date/time stamp in a csv format editable e.g. under MS Excel. The recording rate is fixed at 4 Hz. The file location is given with the subfolder <Trend> under the

			<Project File Directory> (see main menu <File> <Set Defaults>)
	Setup...	**Setup**	setup the settings for the camera, the AOI's, the alarms and the I/O modules, see section 3 Software Setup, on page 13.
	Exit	**Exit**	exits the program
⑨	II		pauses/freezes the display of live images
	>		plays the display of live images
	REC		Starts/stops the recording of an image stream in a dedicated file. The image stream can be replayed under the Playback View. The clip file length is limited to 1 GB. The file name is generated dynamically, based on the <Project Name> plus a date/time stamp in a program specific tdms format. The file location is given with the subfolder <Clip> under the <Project File Directory> (see main menu <File> <Set Defaults>)
⑩		**<Camera List>**	<Name> shows the name of each camera <Case Temp.> displays the internal temperature of all units <Status> reports the current operating status of each camera

2.2 Playback View

The <Playback> view plays recorded images back.

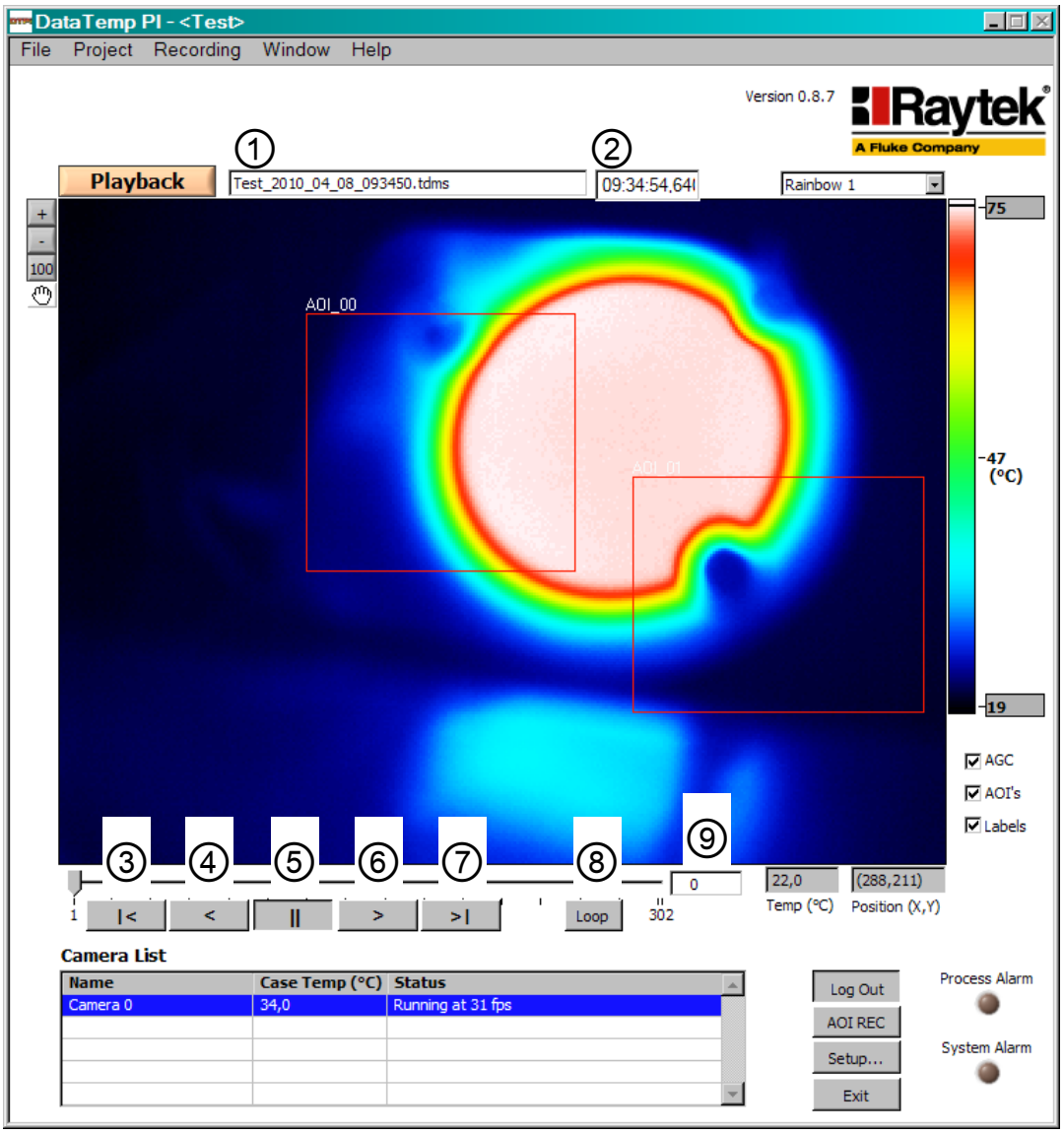

Figure 3: Playback View

①		File name for the image stream.
②		Timer
③		jumps to the last frame of the image stream
④		reversing the image stream like a video
⑤		pauses the running image stream
⑥		forwarding the image stream like a video
⑦		jumps to the first frame of the image stream
⑧		plays the image stream in an endless loop
⑨		displays the current frame number

2.3 Main Menu

File

<Exit>	exits the program

Project

<Open>	opens an existing project file
<New>	creates a new project file
<Save as>	saves the current project file under a new name
<Save>	saves the current project file
<Options>	allows to change the temperature unit

Window

<Digital Display>

<Gauge View>

<Alarms View>

<Analog Outputs View>

<Digital Outputs View>

<AOI Data Viewer>

2.3.1 Digital Display

Go to the main menu: <Window> <Digital Display>

The <Digital Display> shows an AOI result as a digital number in a dedicated window. You can have multiple windows opened at the same time. To configure the display, you can choose the camera, the AOI of interest, and the desired AOI math calculation.

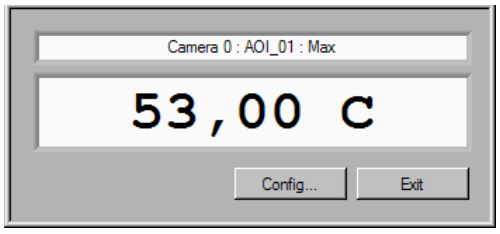

Figure 4: <Digital Display> Window

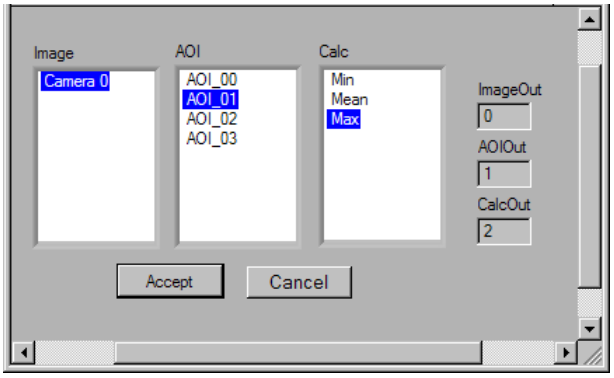

Figure 5: <Digital Display> Configuration

2.3.2 Gauge View

Go to the main menu: <Window> <Gauge View>

The <Gauge View> shows an AOI result using an analog meter in a dedicated window. You can have multiple windows opened at the same time. To configure the view, you can choose the camera, the AOI of interest, and the desired AOI math calculation. In addition, the user can specify the zero and full scale of the gauge viewer.

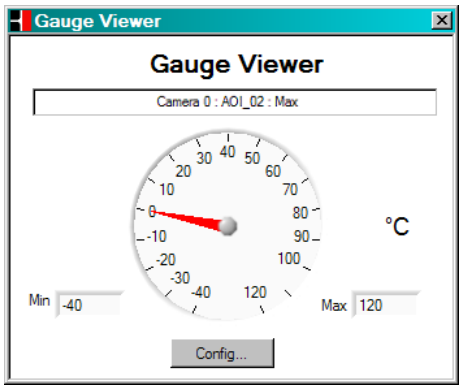

Figure 6: <Gauge View> Window

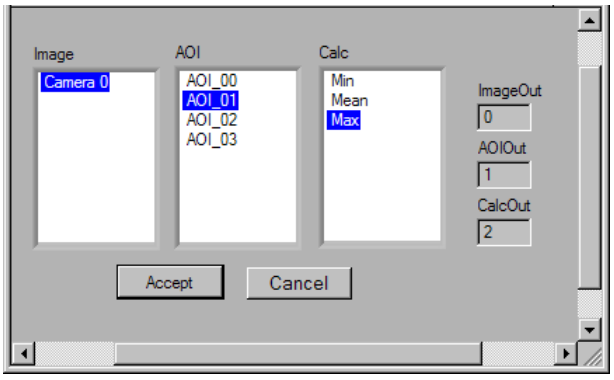

Figure 7: <Gauge View> Configuration

2.3.3 Alarms View

Go to the main menu: <Window> <Alarms>

The <Alarms> view lists a grid containing all defined alarms including their current statuses.

Camera	Alarm Name	Statistic	Low Limit	High Limit	Value	Low Alarm	High Alarm
Camera 0	Alarm 0	Mean	-40,00	120,00	115,32	False	False
Camera 0	Alarm 6	Mean	-40,00	120,00	0,00	False	False

Figure 8: <Alarms> List

2.3.4 Analog Outputs View

Go to the main menu: <Window> <Analog Outputs>

The <Analog Outputs> view lists a grid containing all defined analog outputs, including their current statuses.

Camera	Device	Channel	Value
Camera 0	0	0	0,00
Camera 0	0	1	118,60

Figure 9: <Analog Outputs> List

2.3.5 Digital Outputs View

Go to the main menu: <Window> <Digital Outputs>

The <Digital Outputs> view lists a grid containing all defined digital outputs, including their current statuses.

Camera	Device	Channel	Value
Camera 0	0	0	0,00
Camera 0	0	1	118,60

Figure 10: <Digital Outputs> List

2.3.6 AOI Data Viewer

Go to the main menu: <Window> <AOI Data Viewer>

The <AOI Data Viewer> lists a grid containing all defined AOI's, including their current math results.

Camera	AOI	Min	Mean	Max
Camera 0	AOI_00	19,93	46,61	75,09
Camera 0	AOI_01	19,55	32,96	74,79

Figure 11: <AOI Data Viewer>

3 Software Setup

Use this viewer to configure cameras, add or manipulate AOI's, alarms, digital and analog outputs, and set up recording of clip files and trending files.

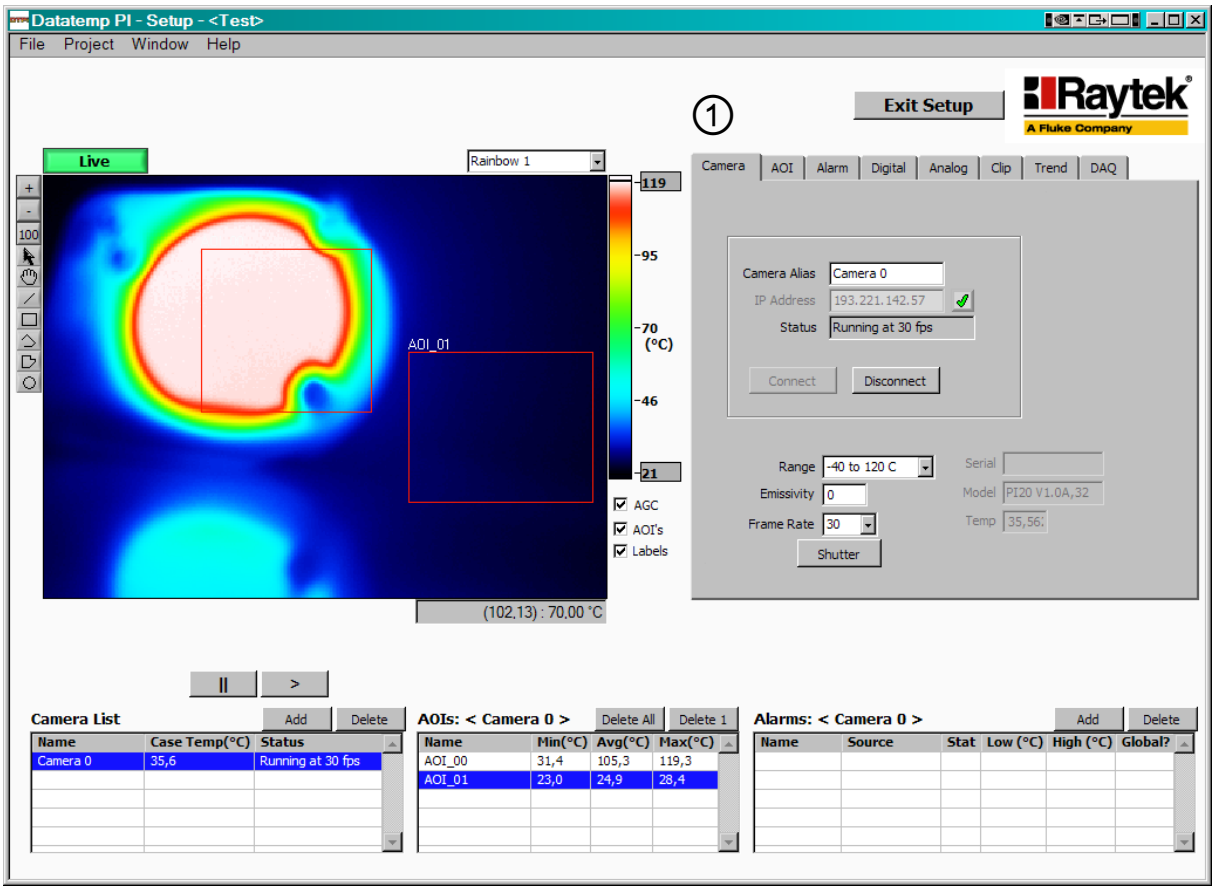

Figure 12: Setup Dialog

① **Setup Dialogs**	Multiple tabs for setting up the camera system. See sections below: 3.1 <Camera> Setup, on page 14 3.2 <AOI> Setup, on page 16 3.3 <Alarm> Setup, on page 18 3.4 <Digital> Setup, on page 20 3.5 <Analog> Setup, on page 21 3.6 <Clip> Setup, on page 22 3.7 <Trend> Setup, on page 23 3.8 <DAQ> Setup, on page 24

3.1 <Camera> Setup

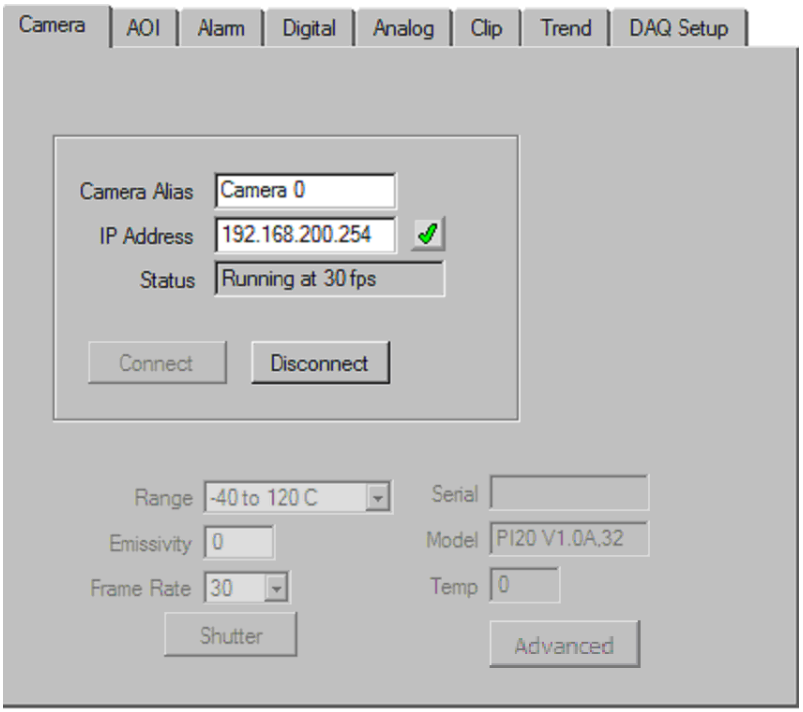

Figure 13: <Camera> Setup

<Camera Alias>	assigns a describing name to the camera
<IP Address>	sets the IP address of the camera. Setting of <IP Address> does not change the device's IP address. It only tells the software to use this IP address to find the device! **Factory default IP address: 192.168.200.254, subnet mask: 255.255.255.0** Make sure that the network adapter on the PC side is set to an appropriate IP address. See Pi20 manual for detailed information!
<Status>	provides information to the current status of the camera
<Range>	selects the temperature sub ranges of the camera.
<Emissivity>	changes the global emissivity. The global emissivity is used to correct the temperature reading of the target. The target may read lower than its true temperature, due to the target emissivity being less than 1, or there could be something in the optical path, such as a window that absorbs a percentage of the radiation before it gets to the camera. The emissivity value is a composite correction factor. For example, if the target emissivity is 0.9, but the camera must look through a window with an absorption factor of 0.7, then the emissivity setting should be set to 0.63 to compensate for both (0.9 x 0.7 = 0.63).
<Frame Rate>	defines the number of frames (images) per second.

<Shutter>	The clicking on that button closes the camera shutter for a reference recalibration to improve camera performance. It is not a substitute for a factory blackbody calibration. With the shutter closed, no temperature measurements are taking place.
<Serial>	provides the serial number of the camera.
<Model>	read-back the model type of the camera.
<Temp>	read-back camera case temperature
<Advanced>	launches the advanced setup for the camera, see section 3.1.1 <Advanced> Camera Setup, below.

3.1.1 <Advanced> Camera Setup

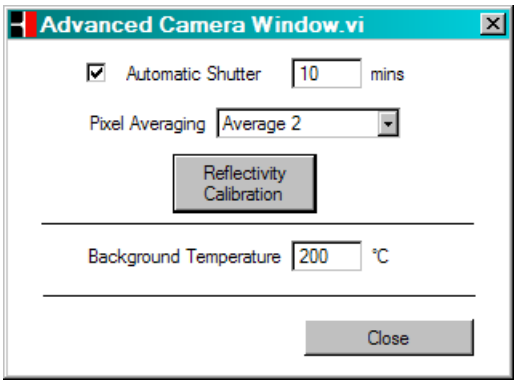

Figure 14: <Advanced> Camera Setup

<Automatic Shutter>	closes the camera's shutter based on the given time. Regular shuttering the camera is necessary for a reference recalibration to improve camera performance. It is not a substitute for a factory blackbody calibration. With the shutter closed, no temperature measurements are taking place.
<Pixel Averaging>	applies an averaging to the thermal image to reduce noise effects. Always the same pixel is averaged over time.
<Background Temperature>	compensates the background temperature of the surrounding area that might be in the field of view. When the target's emissivity is less than 1.000, the background temperature can interfere with measurement accuracy. The error is reduced by accurately setting the background temperature. Sometimes it is not possible to completely reduce background induced errors because there could be various background objects of different temperatures reflecting off of the target. The best way to minimize these errors is to shield the target as best as possible from stray radiation paths. The effect of background compensation is that as emissivity is decreased, indicated temperatures above the background temperature will increase while indicated temperatures below the background temperature will decrease.

3.2 <AOI> Setup

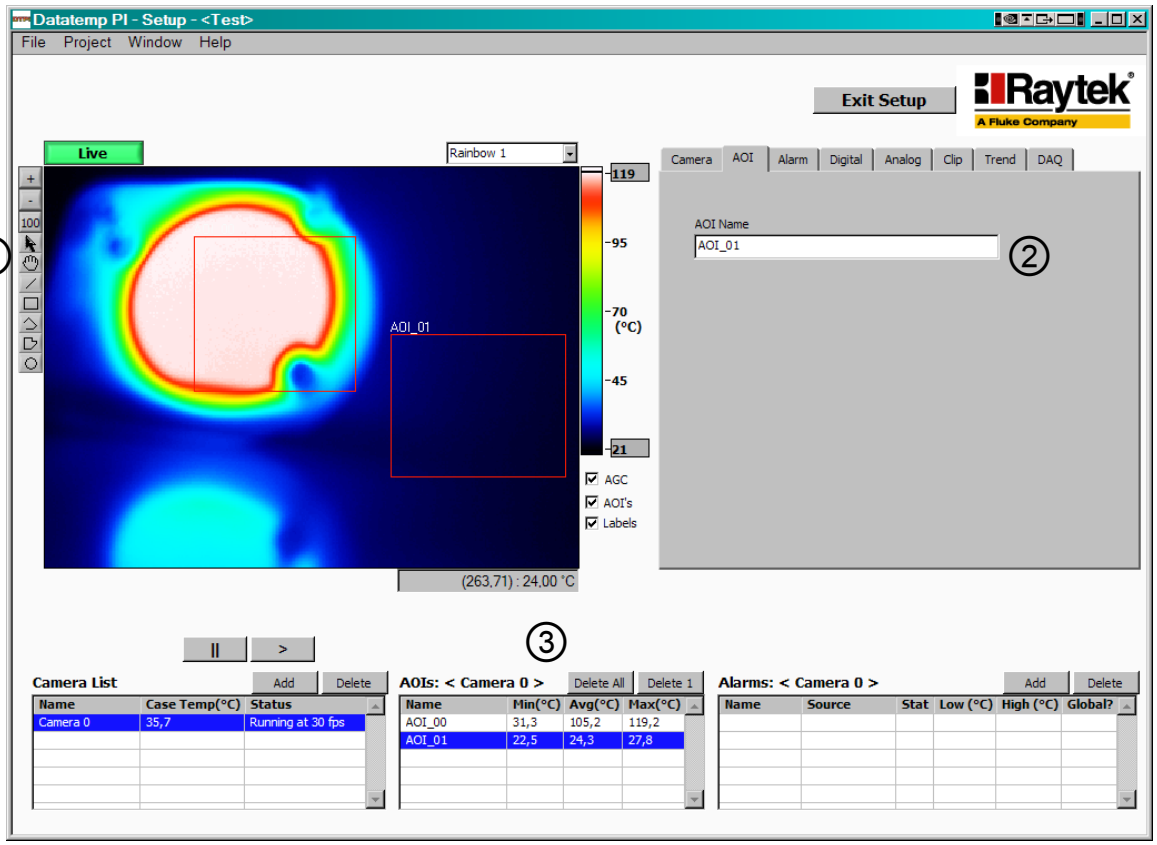

Figure 15: <AOI> Setup

An Area of Interest (AOI) is a user-defined region that is created over a specific area of the cameras image and allows for greater control in the manufacturing and inspection processes. The purpose of an AOI is to monitor an area that may possess different temperature requirements from another area on the image.

An AOI is defined by giving it geometrical dimensions using the drawing tool ① located to the left of the thermal image. As new AOI's are created, they are added to the AOI's list at the bottom of the window. Up to 64 AOI's may be defined, although boundaries of some AOI's may overlap the boundaries of others.

Each AOI will have its own math calculations providing one value for each: Min, Avg, and Max.

①		**<Zoom>**	allows you to zoom in/out the image. <100> returns to the 100% sized image.
		**<Edit>**	allows you to edit a dedicated AOI for moving or resizing.
		**<Pan>**	allows you to pan through the image. To operate this function, simply hold the left mouse button down while moving the mouse across the image. Panning is available when image is zoomed.

		**<Line>**	creates a line AOI
		**<Rectangle>**	creates a rectangle/square AOI
		**<Poly-line>**	creates a poly-line AOI
		**<Polygonal>**	creates a polygonal AOI
		**<Ellipse>**	creates an ellipse/circle AOI
②		**<AOI Name>**	assigns a describing name to an AOI
③		**<AOI's>**	lists the set of defined AOI's which are assigned to the selected camera under the <Camera List> grid

3.3 <Alarm> Setup

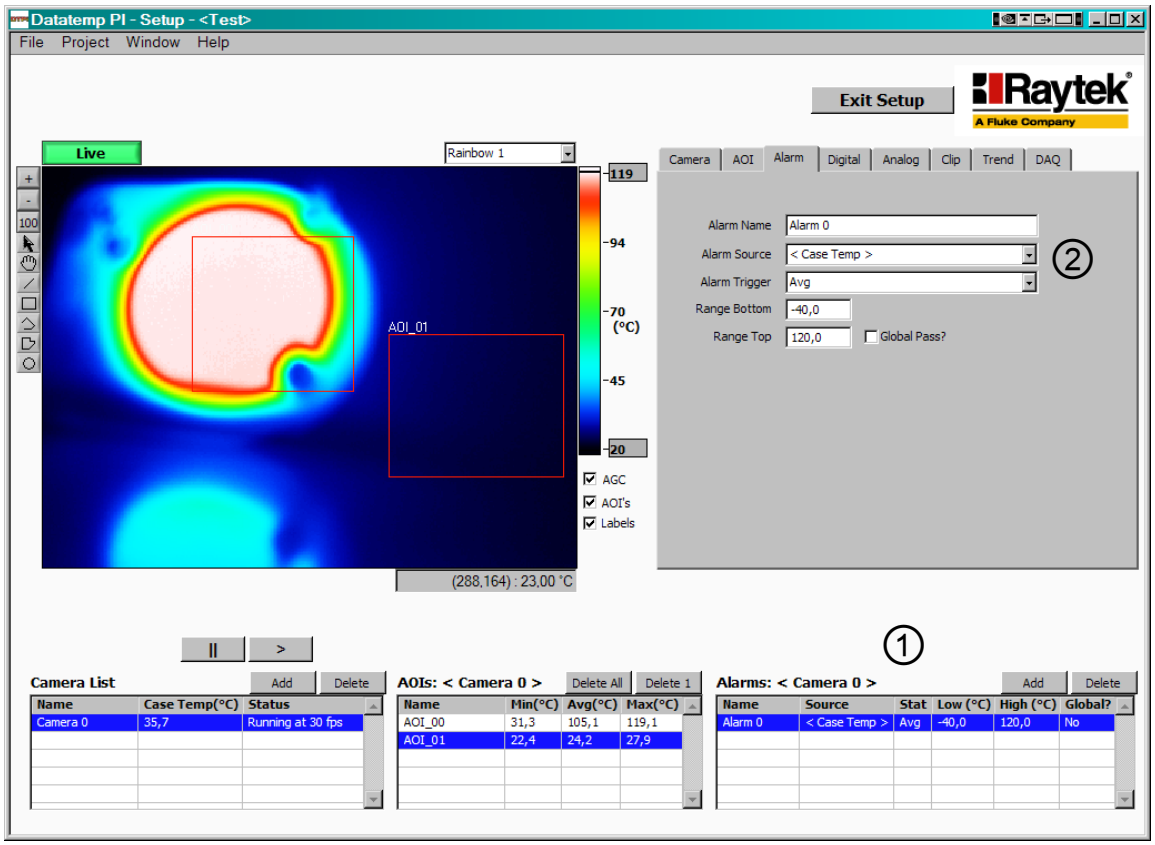

Figure 16: <Alarm> Setup

The systems provides two different types of alarms:

- Process alarm from an AOI caused by a violated alarm threshold
- System alarm driven by abnormal system statuses

All alarm events are stored into a log file called <System Log.txt>, which is saved in the subfolder <application> under the <Project File Directory> (see main menu <File> <Set Defaults>).

①	**<Alarms>**	lists the set of defined alarms. A new alarm will be created by pressing the <Add> button.
②	**<Alarm Name>**	assigns a describing name to the alarm.
	<Alarm Source>	can be either an already defined AOI or a system internal parameter like the case temperature. Multiple alarms can be assigned to each AOI.
	<Alarm Trigger>	refers to the AOI result (in accordance with the math function) to be monitored

<Range Bottom>	defines the lower alarm threshold
<Range Top>	defines the upper alarm threshold
<Global Pass>	Map alarm to global process pass

3.4 <Digital> Setup

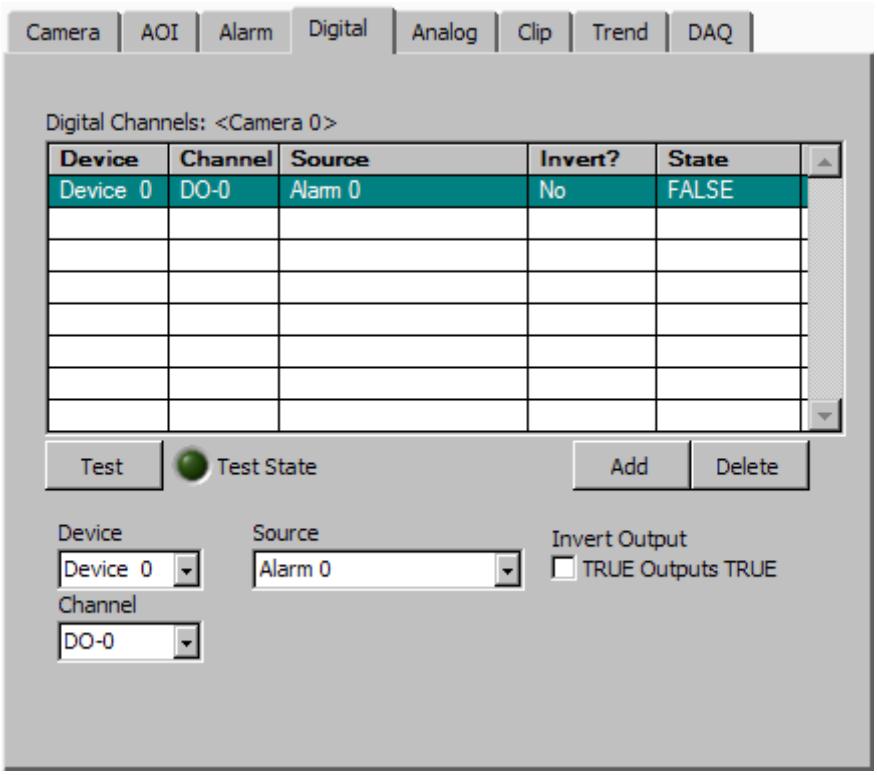

Figure 17: <Digital> Setup

<Digital Channels>	displays the list of digital channels assigned to the specified camera
<Test>	performs an output test to the selected <Channel> of the specified <Device>
<Device>	selects a previously under the <DAQ> tab defined device
<Channel>	selects a dedicated digital output channel
<Source>	selects an alarm source for driving the specified digital channel
<Invert Output>	toggles to a high active or low active output polarity for the digital channel

3.5 <Analog> Setup

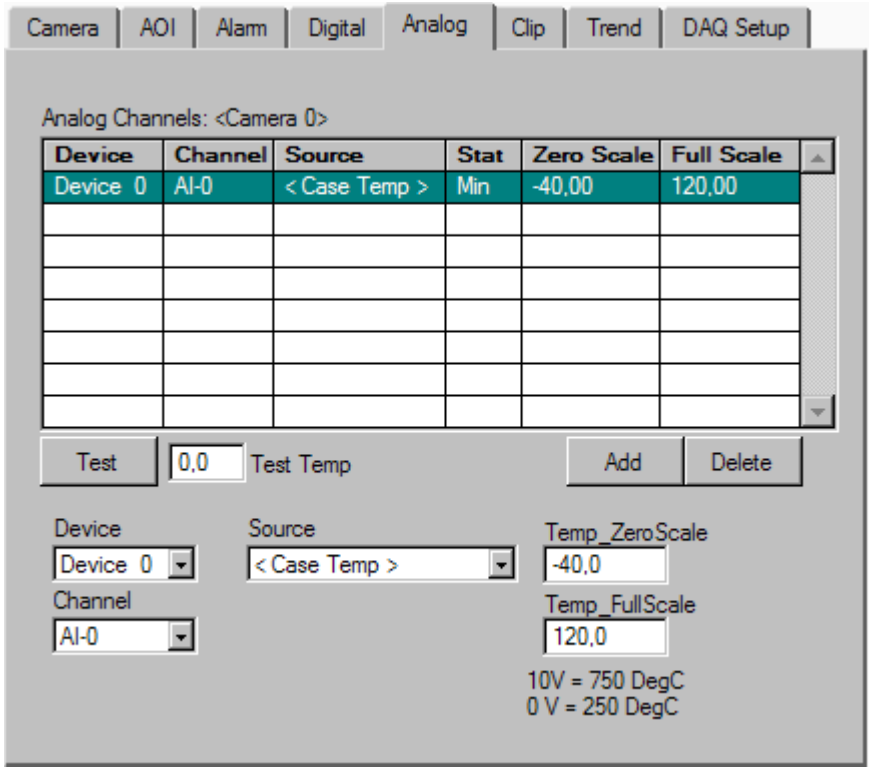

Figure 18: <Analog> Setup

<Analog Channels>	displays the list of analog channels assigned to the specified camera
<Test>	performs a test to the selected device to drive the output in accordance with the given <Test Temp>
<Device>	selects a previously under the <DAQ> tab defined device
<Channel>	selects a dedicated analog output channel
<Source>	selects a source for driving the specified analog channel
<Temp_ZeroScale>	defines the bottom temperature to be scaled to the minimum value of the analog output
<Temp_FullScale>	defines the top temperature to be scaled to the maximum value of the analog output

3.6 <Clip> Setup

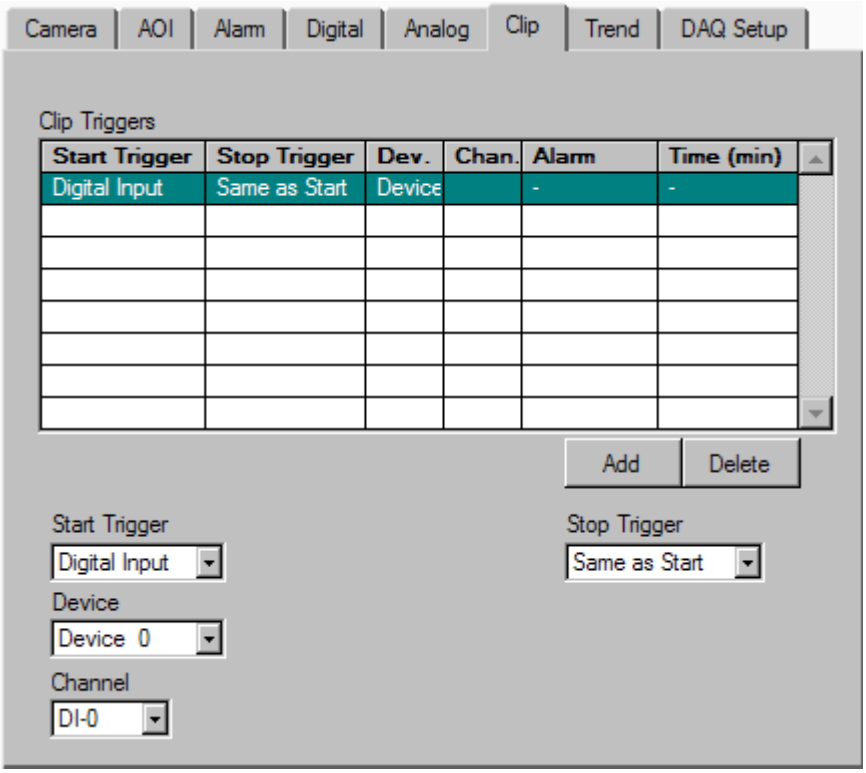

Figure 19: <Clip> Setup

<Clip Triggers>	displays the list of defined trigger conditions to save clip files (image streams) automatically. Clip files can be replayed at a later time. The clip file length is limited to 1 GB. The file name is generated dynamically based on the <Project Name> plus a date/time stamp in a program-specific tdms format. The file location is given with the subfolder <Clip> under the <Project File Directory> (see main menu <File> <Set Defaults>)
<Start Trigger>	defines the start condition which can be triggered either via a <Digital Input> or an <Alarm>
<Device>	selects a previously under the <DAQ> tab defined device
<Channel>	selects a dedicated input channel for the trigger
<Stop Trigger>	defines the stop condition, which can be either the <Same as Start> condition or <Time> based.

3.7 <Trend> Setup

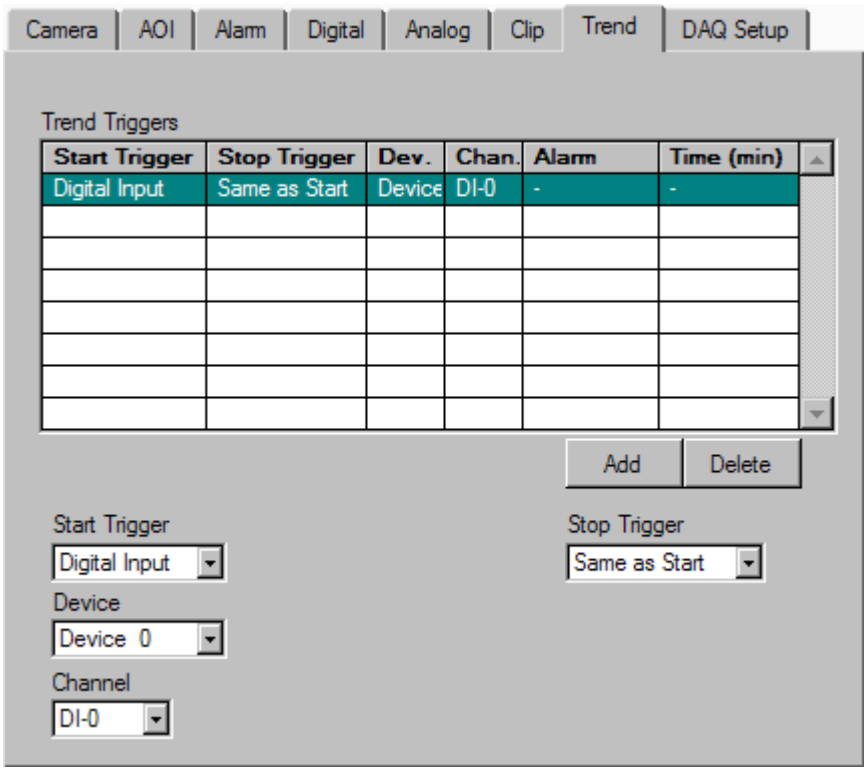

Figure 20: <Trend> Setup

<Trend Triggers>	displays the list of defined trigger conditions to save a trend file (AOI results) automatically. The file name is generated dynamically based on the <Project Name> plus a date/time stamp in a csv format (editable with MS Excel). The file location is given with the subfolder <Trend> under the <Project File Directory> (see main menu <File> <Set Defaults>).
<Start Trigger>	defines the start condition which can be triggered either via a <Digital Input> or an <Alarm>. The recording rate is fixed at 4 Hz.
<Device>	selects a previously under the <DAQ> tab defined device
<Channel>	selects a dedicated input channel for the trigger
<Stop Trigger>	defines the stop condition, which can be either the <Same as Start> condition or <Time> based

3.8 <DAQ> Setup

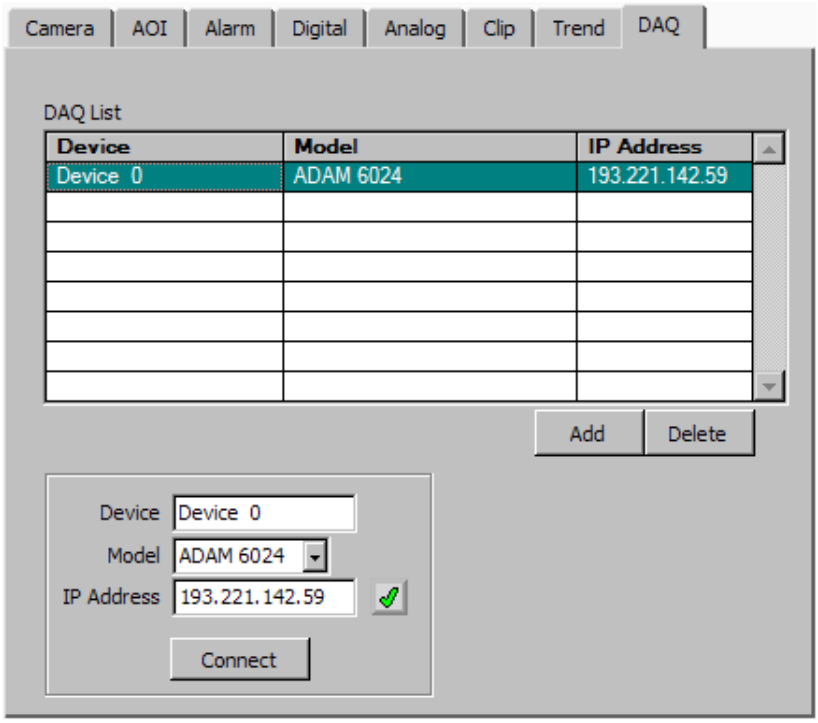

Figure 21: <DAQ> Setup

<DAQ List>	displays the list of defined I/O devices
<Device>	assigns a describing name to the device
<Model>	selects the model type for the selected device: 6024 or 6060
<IP Address>	sets the IP address of the device. Setting of <IP Address> does not change the device's IP address. It only tells the software to use this IP address to find the device! **Factory default IP address: 10.0.0.1, subnet mask: 255.0.0.0** The procedure to configure the I/O modules is to be found in the Pi20 manual!

4 Software Licence