Thermoeye Inc.

THERMOEYE

TMC256

Sensor Control SDK Manual

Contact help@thermoeye.co.kr
Technical Support https://github.com/ThermoEye

5F, 169, Sadang-ro, Dongjak-gu, Seoul, Republic of Korea (07003)

Revision

Version	Date	Contents
0.1	SEP.12.2023	Draft
1.0	OCT.12.2023	1st Release
1.1	NOV.27.2023	Added distance parameter for Flux Parameters
1.2	JAN.08.2024	Modified Flux Parameters UI, Gain Mode State API Added Store Config Permanently & Restore to Factory Default buttons
1.3	JAN.16.2024	Added FFC Parameters Changed model name
1.4	MAR.07.2024	Fixed typo

Chapter

1. ThermoCamSDK GUI

ThermoCamSDK provides the GUI required to control the InfiRay Tiny1-C thermal imaging sensor on the camera device.

1.1. Flux Parameters

Figure 1. Flux Parameters

User can read the various Flux Parameters set on the sensor and configure them to the desired values.

The **Get** button allows you to read the values set on the sensor and display them in the input box for each parameter.

After you change each parameters to the desired values within the configurable range, the **Set** button allows you to set the changed values to the sensor.

1.2. Gain Mode State

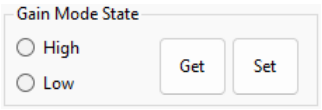

Figure 2. Gain Mode State

User can read the Gain Mode state set on the sensor and change it to the desired configuration.

The **Get** button allows you to read the state set on the sensor and display it on the High / Low selection button.

After selecting **High**, the **Set** button allows you to change the state to the High Gain Mode. It provides higher responsivity and lower noise metrics for normal operation.

After selecting **Low**, the **Set** button allows you to change the state to the Low Gain Mode. It provides lower responsivity and higher noise metrics, but with the benefit of increased intra-scene range necessary to view hotter scenes.

1.3. FFC Parameters

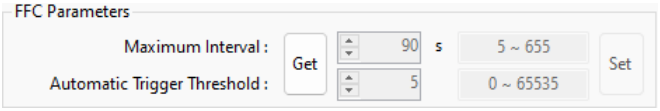

Figure 3. FFC Parameters

User can read the various FFC Parameters set on the sensor and configure them to the desired values to adjust the conditions for the sensor's automatic Flat Field Correction behavior.

The **Get** button allows you to read the values set on the sensor and display them in the input box for each parameter.

After you change each parameters to the desired values within the configurable range, the **Set** button allows you to set the changed values to the sensor.

1.4. Flat Field Correction

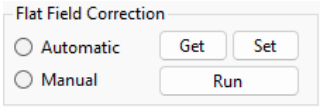

Figure 4. Flat Field Correction

User can read the Flat Field Correction mode set on the sensor and change it to the desired configuration, and perform the FFC behavior manually.

The **Get** button allows you to read the mode set on the sensor and display it on the Automatic / Manual selection button.

After selecting **Automatic**, the **Set** button allows you to change the mode to the Automatic FFC. The sensor will perform the FFC automatically.

After selecting **Manual**, the **Set** button allows you to change the mode to the Manual FFC. The sensor will perform the FFC manually if you push the **Run** button.

1.5. Store Config Permanently and Restore to Factory Default

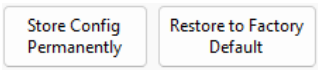

Figure 5. Store Config Permanently and Restore to Factory Default

The **Store Config Permanently** button allows you to store the configured Flux Parameters, Gain Mode State, Flat Field Correction and FFC Parameters information to the sensor's internal memory. Even if the power of the camera device is turned off, the configurations is maintained, and the sensor operates in the configured state after restart.

The **Restore to Factory Default** button allows you to restore factory default configurations to the sensor after restart.

2. ThermoCamSDK C# API

ThermoCamSDK provides the C# APIs to control the functionalities of thermal sensor.

The sample project was created on Microsoft Visual Studio Community 2022 and was implemented on Windows .NET Framework 4.8.

2.1. `ThermoEngine.ICameraControl` Interface

2.1.1. Definition

```
public interface ICameraControl
```

- The **`ICameraControl`** Interface provides functionalities to control the sensor of camera device.
- Each method requires the creation of an **`ICameraControl`** Interface instance and must call the **`Control`** Field as shown in the example below.

  ```
  mCamera.Control.GetSensorModelName();
  ```

- Methods

GetFluxParameters	Gets flux parameters of camera sensor
SetFluxParameters	Sets flux parameters of camera sensor
SetDefaultFluxParameters	Sets flux parameters of camera sensor to factory default values
GetGainModeState	Gets Gain Mode state of camera sensor
SetGainModeState	Sets Gain Mode state of camera sensor
GetFlatFieldCorrectionParameters	Gets Flat Field Correction parameters of camera sensor
SetFlatFieldCorrectionParameters	Gets Flat Field Correction parameters of camera sensor
GetFlatFieldCorrectionMode	Gets Flat Field Correction mode of camera sensor
SetFlatFieldCorrectionMode	Sets Flat Field Correction mode of camera sensor
RunFlatFieldCorrection	Executes Flat Field Correction of camera sensor
StoreUserSensorConfig	Stores user configurations of camera sensor permanently
RestoreDefaultSensorConfig	Restores sensor configurations to factory default of camera sensor

2.1.2. `GetFluxParameters` Method

```
public bool GetFluxParameters(
    out double emissivity,
    out double atmosphericTransmittance,
    out double atmosphericTemperature,
    out double ambientReflectionTemperature,
    out double distance
)
```

- Gets flux parameters of camera sensor
- Parameters

  `emissivity`: obtained ratio value for emissivity, 0.01 ~ 1

  `atmosphericTransmittance`: obtained ratio value for atmospheric transmittance, 0.01 ~ 1

  `atmosphericTemperature`: obtained Celsius value for atmospheric temperature, -43.15 ~ 226.85 (high gain), -43.15 ~ 626.85 (low gain)

  `ambientReflectionTemperature`: obtained Celsius value for ambient reflection temperature, -43.15 ~ 226.85 (high gain), -43.15 ~ 626.85 (low gain)

  `distance`: obtained meter value for distance, 0 ~ 200, Not support

- Return Value

  True if this method gets values from device successfully; otherwise, false if an exception is raised.

- Remarks

Parameter	Minimum	Maximum	Default	Unit
`emissivity`	0.01	1	1	
`atmosphericTransmittance`	0.01	1	1	
`atmosphericTemperature`	-43.15	226.85(high gain) 626.85(low gain)	26.85	℃
`ambientReflectionTemperature`	-43.15	226.85(high gain) 626.85(low gain)	26.85	℃
`distance`	0	200	0.25	m

2.1.3. `SetFluxParameters` Method

```
public bool SetFluxParameters(
    double emissivity,
    double atmosphericTransmittance,
    double atmosphericTemperature,
    double ambientReflectionTemperature,
    double distance
)
```

- Sets flux parameters of camera sensor
- Parameters

  `emissivity`: ratio value to be set for emissivity, 0.01 ~ 1

  `atmosphericTransmittance`: ratio value to be set for atmospheric transmittance, 0.01 ~ 1

  `atmosphericTemperature`: Celsius value to be set for atmospheric temperature, -43.15 ~ 226.85 (high gain), -43.15 ~ 626.85 (low gain)

  `ambientReflectionTemperature`: Celsius value to be set for ambient reflection temperature, -43.15 ~ 226.85 (high gain), -43.15 ~ 626.85 (low gain)

  `distance`: meter value to be set for distance, 0 ~ 200, Not support

- Return Value

  True if this method sets values to device successfully; otherwise, false if an exception is raised.

- Remarks

Parameter	Minimum	Maximum	Default	Unit
`emissivity`	0.01	1	1	
`atmosphericTransmittance`	0.01	1	1	
`atmosphericTemperature`	-43.15	226.85(high gain) 626.85(low gain)	26.85	℃
`ambientReflectionTemperature`	-43.15	226.85(high gain) 626.85(low gain)	26.85	℃
`distance`	0	200	0.25	m

2.1.4. `SetDefaultFluxParameters` Method

```
public bool SetDefaultFluxParameters(
    out double emissivity,
    out double atmosphericTransmittance,
    out double atmosphericTemperature,
    out double ambientReflectionTemperature,
    out double distance
)
```

- Sets flux parameters of camera sensor to factory default values
- Parameters

  `emissivity`: obtained default ratio value for emissivity, 0.01 ~ 1

  `atmosphericTransmittance`: obtained default ratio value for atmospheric transmittance, 0.01 ~ 1

`atmosphericTemperature`: obtained default Celsius value for atmospheric temperature, −43.15 ~ 226.85 (high gain), −43.15 ~ 626.85 (low gain)

`ambientReflectionTemperature`: obtained default Celsius value for ambient reflection temperature, −43.15 ~ 226.85 (high gain), −43.15 ~ 626.85 (low gain)

`distance`: obtained default meter value to be set for distance, 0 ~ 200, Not support

- Return Value

  True if this method sets values to device successfully; otherwise, false if an exception is raised.

- Remarks

Parameter	Minimum	Maximum	Default	Unit
`emissivity`	0.01	1	1	
`atmosphericTransmittance`	0.01	1	1	
`atmosphericTemperature`	−43.15	226.85(high gain) 626.85(low gain)	26.85	℃
`ambientReflectionTemperature`	−43.15	226.85(high gain) 626.85(low gain)	26.85	℃
`distance`	0	200	0.25	m

2.1.5. `GetGainModeState` Method

```
public int GetGainModeState()
```

- Gets Gain Mode state of camera sensor
- Return Value

  0 if mode is high or 1 if mode is low or 2 if mode is auto; otherwise, −1 if an exception is raised.

- Remark

  The parameter state, "2 = auto" is only support for TMC80 & TMC160.

2.1.6. `SetGainModeState` Method

```
public bool SetGainModeState(int state)
```

- Sets Gain Mode state of camera sensor
- Parameters

  `state`: Gain Mode state value to be set, 0 = high or 1 = low or 2 = auto

- Return Value

0 if mode is high or 1 if mode is low or 2 if mode is auto; otherwise, -1 if an exception is raised.

- Remark

  The parameter state, "2 = auto" is only support for TMC80 & TMC160.

2.1.7. `GetFlatFieldCorrectionParameters` Method

```
public bool GetFlatFieldCorrectionParameters(
    out double maxInterval,
    out double autoTriggerThreshold
)
```

- Gets Flat Field Correction parameters of camera sensor
- Parameters

  `maxInterval`: obtained time value in seconds for maximum interval, 5 ~ 655

  `autoTriggerThreshold`: obtained count value for automatic trigger threshold, 0 ~ 65535

- Return Value

  True if this method gets values from device successfully; otherwise, false if an exception is raised.

- Remarks

Parameter	Minimum	Maximum	Default	Unit
`maxInterval`	5	655	90	s
`autoTriggerThreshold`	0	65535	5	Counts

2.1.8. `SetFlatFieldCorrectionParameters` Method

```
public bool SetFlatFieldCorrectionParameters(
    double maxInterval,
    double autoTriggerThreshold
)
```

- Sets flux parameters of camera sensor
- Parameters

  `maxInterval`: time value in seconds to be set for maximum interval, 5 ~ 655

  `autoTriggerThreshold`: count value to be set for automatic trigger threshold, 0 ~ 65535

- Return Value

  True if this method sets values to device successfully; otherwise, false if an exception is raised.

- Remarks

Parameter	Minimum	Maximum	Default	Unit
`maxInterval`	5	655	90	s
`autoTriggerThreshold`	0	65535	5	Counts

2.1.9. `GetFlatFieldCorrectionMode` Method

```
public int GetFlatFieldCorrectionMode()
```

- Gets Flat Field Correction mode of camera sensor
- Return Value

  0 if mode is manual or 1 if mode is automatic; otherwise, -1 if an exception is raised.

2.1.10. `SetFlatFieldCorrectionMode` Method

```
public bool SetFlatFieldCorrectionMode(int mode)
```

- Sets Flat Field Correction mode of camera sensor
- Parameters

  `mode`: Flat Field Correction mode value to be set, 0 = manual or 1 = automatic

- Return Value

  True if this method sets mode to device successfully; otherwise, false if an exception is raised.

2.1.11. `RunFlatFieldCorrection` Method

```
public bool RunFlatFieldCorrection()
```

- Executes Flat Field Correction of camera sensor
- Return Value

  True if camera sensor executes Flat Field Correction successfully; otherwise, false if an exception is raised.

2.1.12. `StoreUserSensorConfig` Method

```
public bool StoreUserSensorConfig()
```

- Stores user configurations of camera sensor permanently
- Return Value

True if camera sensor stores user configurations successfully; otherwise, false if an exception is raised.

- Remarks

  Only support for TMC256.

2.1.13. `RestoreDefaultSensorConfig` Method

```
public bool RestoreDefaultSensorConfig()
```

- Restores sensor configurations to factory default of camera sensor
- Return Value

  True if camera sensor restores user configurations successfully; otherwise, false if an exception is raised.

- Remarks

  Device will reboot automatically. Only support for TMC256.