

Application Note

IP7330 Dual-Band IR Cut Filter

Revision History

Version	Issue date	Author	Comment
1.0	2009/04/09	Peggy Li	First release
1.1	2009/06/05	David Liu	Grammer check and modification

Tables of contents

Introduction	3
Why Use an IR Cut Filter	5
Types of IR Cut Filters	6
A. Removable IR Cut Filter:.....	6
B. Single-band IR Cut Filter:	8
C. Dual-band Lens:.....	9

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Introduction

IP7330 is a cost-effective bullet network camera designed for outdoor applications. With a weatherproof IP66-rated housing, the camera can be shielded from rain and dust. By integrating the components for day and night functionality into one compact design, the IP7330 provides an all-in-one solution without the need for additional accessories. Equipped with a dual-band lens and built-in IR illuminators with an effective range of up to 10 meters, the camera can achieve excellent day and night performance.

Most day/night cameras use a removable IR cut filter for day and night surveillance; the IP7330 is designed with a dual-band lens to achieve night view surveillance without the filter. In addition, built-in IR illuminators enhance the intensity of infrared light and, allowing for a brighter view in night mode. With both a dual-band lens and built-in IR LEDs, the IP7330 is the economical and practical camera for 24 hour outdoor surveillance.



Picture-1

With dual-band lens and IR illuminators, IP7330 achieves superior nighttime surveillance.

However, because of the dual-band lens used for night vision, there will be some color deviations during daytime. In this Application Note, we will explain why this occurs and that it is normal behavior of the IP7330.



Picture-2

In daytime, some objects such plants have a slight color deviation.

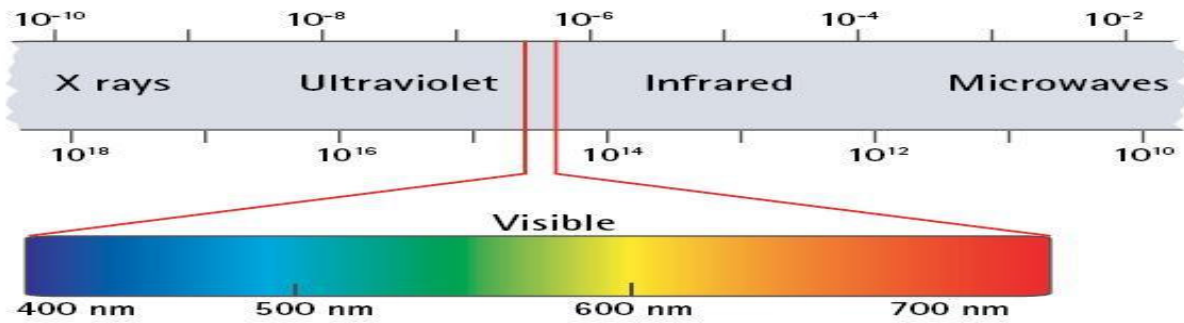
Terminology in this document:

1. **IR:** Infrared
2. **Wavelength:** The distance between repeating units of a propagating wave of a given frequency. Examples of wave-like phenomena are light, water waves, and sound waves.

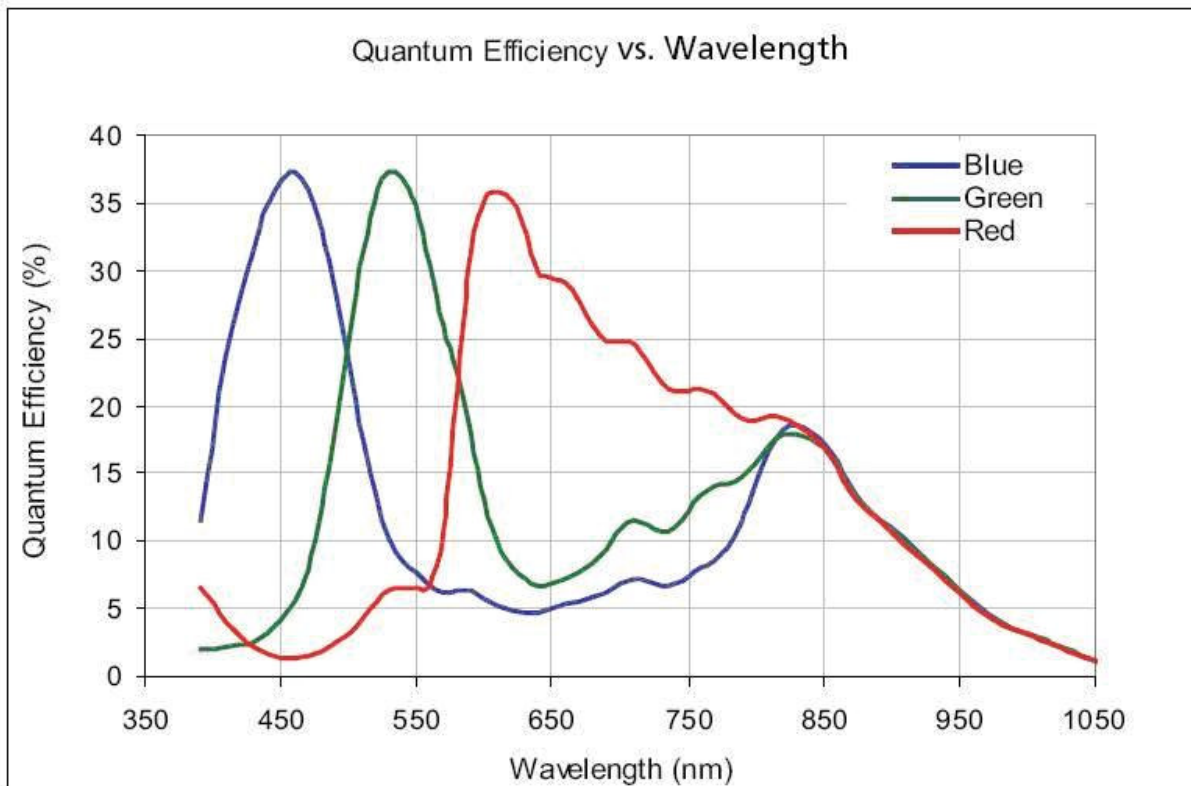
Why Use an IR Cut Filter

Human eyes only recognize "visible light". However, the CCD/CMOS sensor in an IP Camera can sense IR light energy that will cause color distortions. The process by which a CCD/CMOS sensor senses photo energy to calculate the color result is a topic for another course. Please refer to Picture-3 and Picture-4, You can see that there is a wide range of wavelengths for IR light.

Wavelength (λ) in meters



Picture-3



Picture-4

To make the colors similar to that detected by the human eye, we need to prevent IR light from entering the CCD/CMOS sensor. Therefore, an IR cut filter is necessary.

Types of IR Cut Filters

There are three types of IR cut filters: removable IR cut filter, single-band IR cut filter, and dual-band IR cut filter.

A. Removable IR Cut Filter: Used in IP7151/IP7152/FD7132/IP7142/SD7151/FD7141, etc.

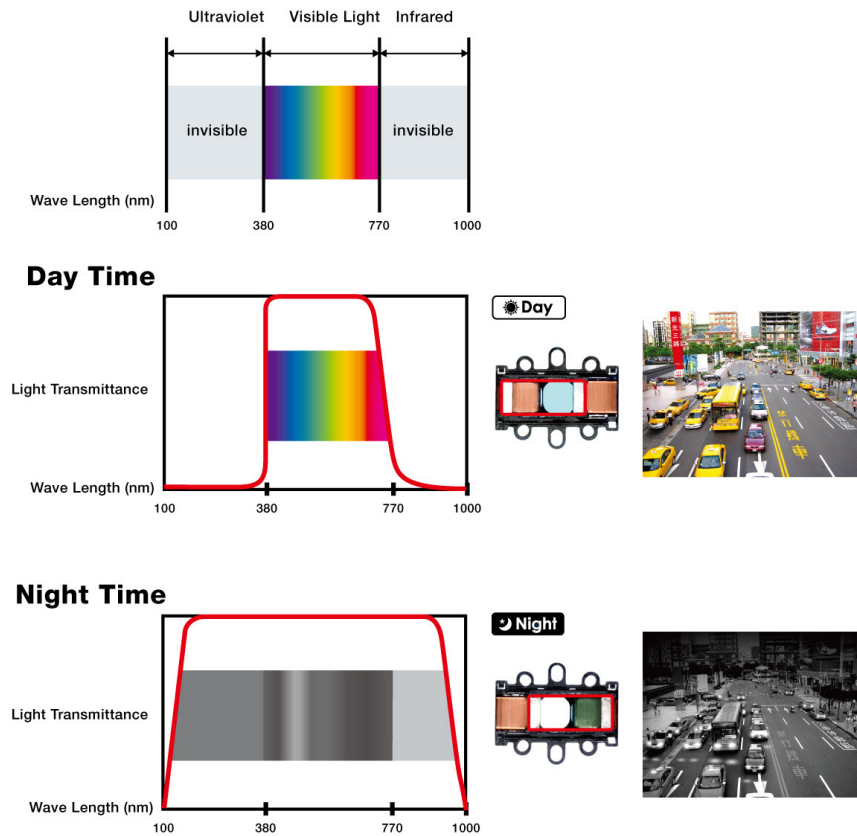


Picture-5

Example of removable IR cut filter in IP7151.

Advantages:

1. During daytime, the IR-cut filter is placed in front of the sensor so that it can prevent IR light from entering. That means that the sensor senses only "visible light" so that the image color is similar to the colors detected by the human eye. During nighttime, the IR-cut filter is removed so that the sensor can sense IR light at night for better night vision. Please refer to Picture-6.



Picture-6

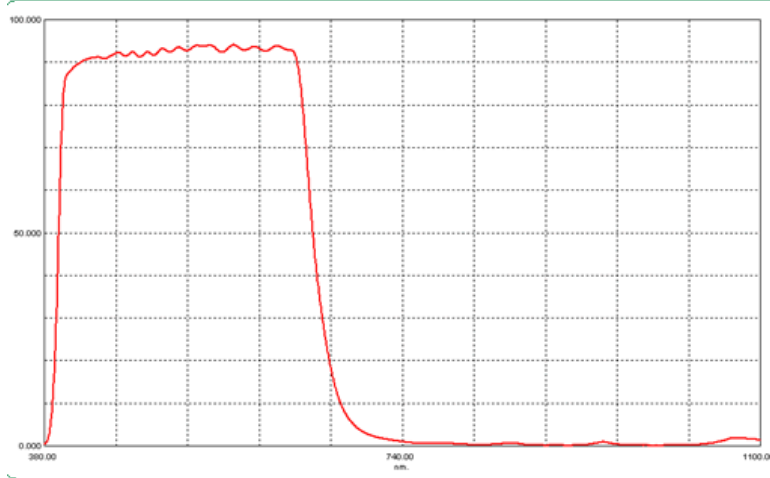
2. It can accept all ranges of IR light, which means that you can use 850nm or 940 nm IR illuminators for night vision.

Disadvantages:

1. Removable IR-cut filters cost more than dual-band lenses and single-band IR cut filter coating.

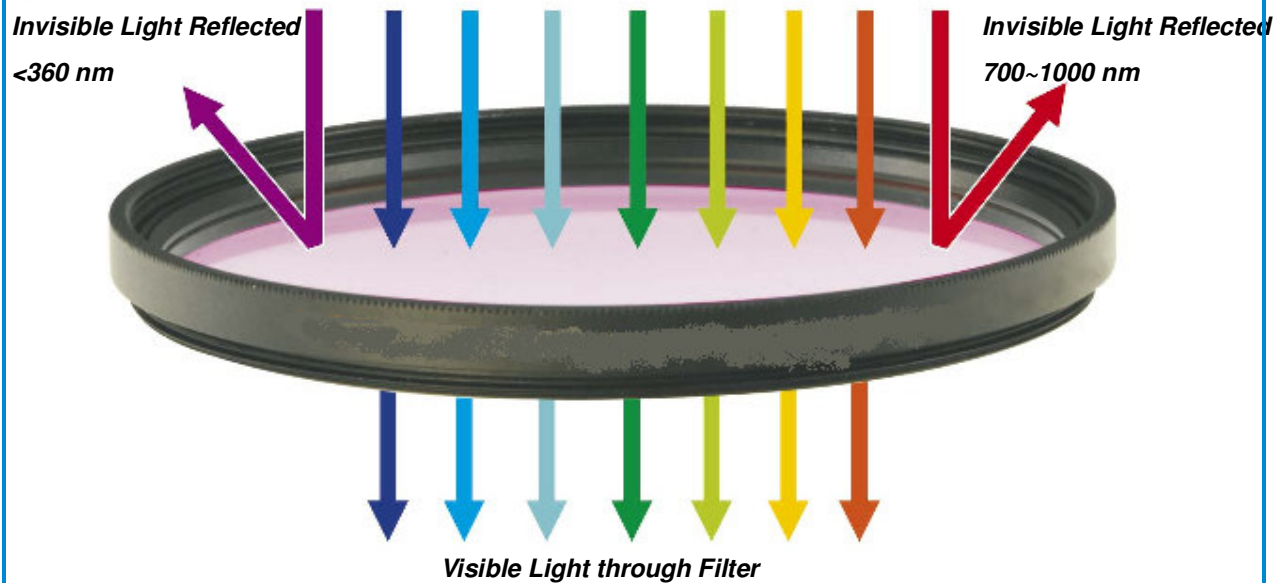
B. Single-band IR Cut Filter: Usually consists of a coating on the surface of the sensor and used in cameras that do not support night vision such as IP7138/IP7139/IP7137/IP7135, etc.

This kind of coating only allows ONE band of light wavelength (visible light) to enter the sensor. Please refer to Picture-7 and Picture-8.



Picture-7

A Single-band IR Cut Filter allows only the wavelength range of visible light.



Picture-8

Advantages:

1. During daytime, a Single-band IR Cut Filter coating can prevent IR light from entering the sensor. Therefore, the sensor can only sense image colors as human eyes see them.
2. A Single-band IR Cut Filter is less expensive than a Removable IR Cut Filter.

Disadvantages:

1. Light sources at night will be reduced because the Single-band IR Cut Filter coating prevents IR light from entering the sensor.

C. Dual-band Lens: Used in IP7330

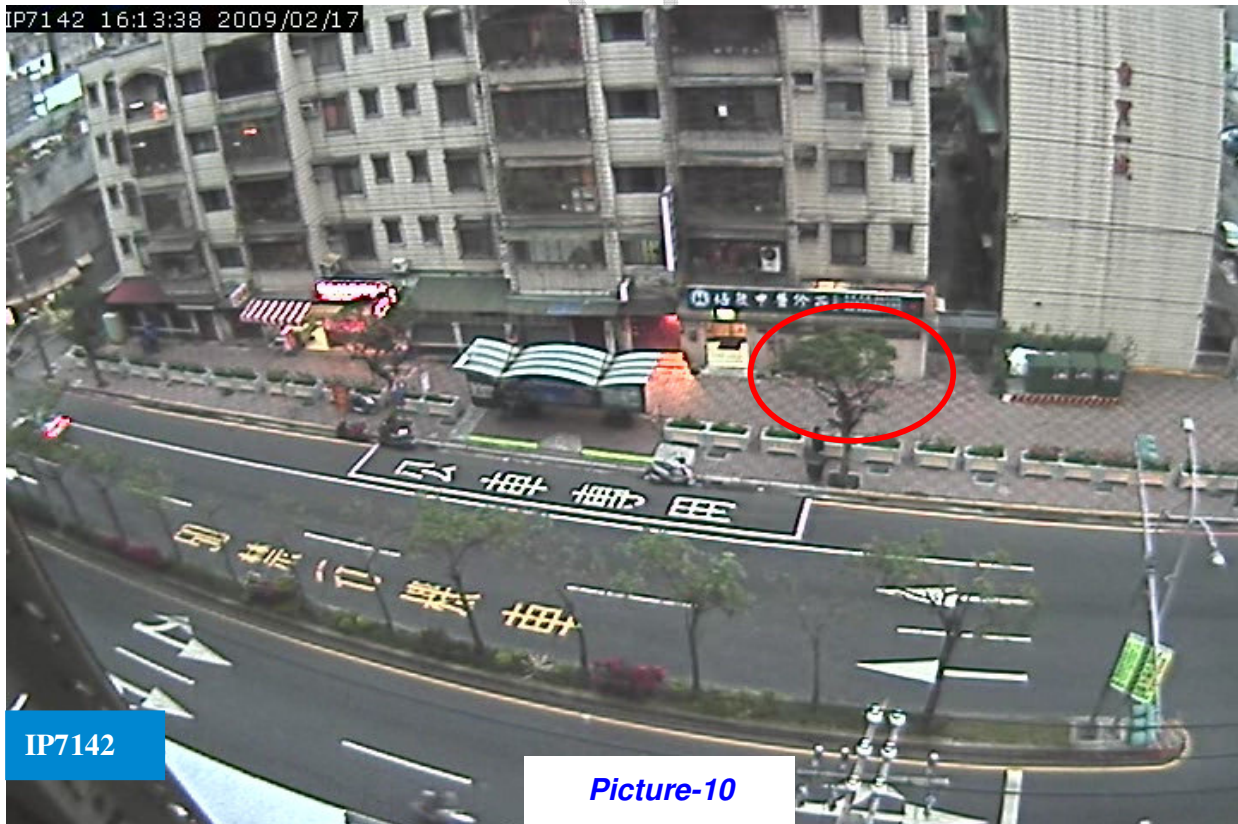
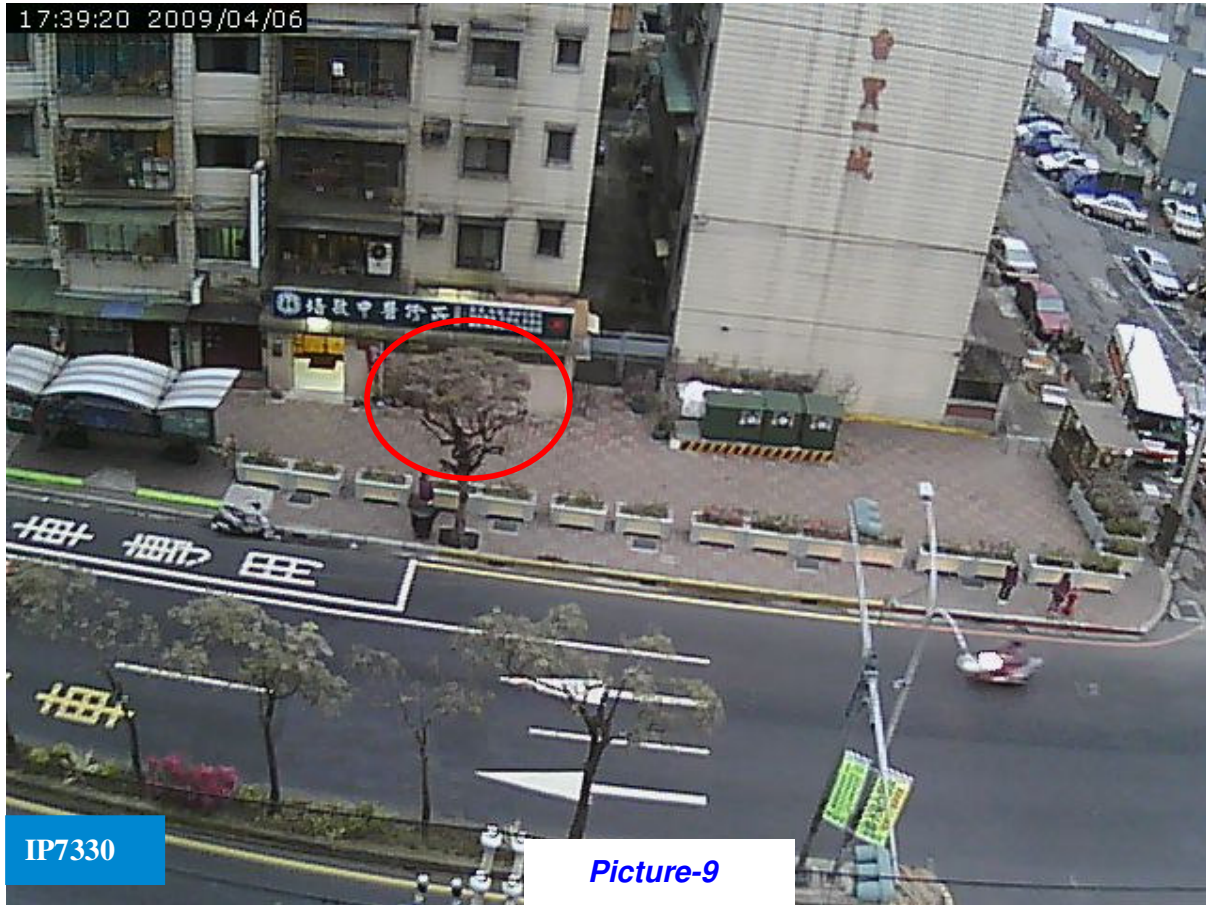
What is Dual-band? The coating mentioned above allows only "visible light" to enter the sensor, while with the IP7330, its dual-band lens allows both visible light and IR light with 850 \pm 20nm wavelengths.

Advantages:

1. At night, it allows 850 nm IR light to enter the sensor for clearer images.
2. ***It is less expensive than Removable IR Cut Filters and provides night vision surveillance capabilities that Single-band IR Cut Filters cannot achieve.***

Disadvantages:

Although a dual-band lens allows "850 nm IR light" to enter the sensor, this range of IR light will cause color distortions during daytime. Compared with Picture-9 and Picture-10, you may find that certain objects will have an abnormal color. That is because some objects, such as plants, cannot absorb IR light, but instead reflect all IR light, which will result in the sensor sensing this reflected light. Thus, the color of the video will be different from that detected by the human eye.



This phenomenon occurs because different objects have different light absorption properties. Some objects can absorb IR light and will not reflect it, so the sensor will not sense the IR light from the object. Thus, the color will be similar to that seen by the human eye. Take the following experiment for example: Place several black objects composed of different materials and place them in front of an IP7142 and IP7330, and you will find that some objects retain their black color when viewed through the camera (Picture-11); however, some do not (Picture-12).



Picture-11

The color of the black cloth for the IP7330 has a slight color deviation.



Picture-12

The color of the VIVOTEK bag for the IP7330 is normal.