

## Consistent, accurate underwater exposure with "S-TTL"

Inon newly developed "S-TTL" is a TTL Auto System where D-2000 strobe pre-flash light, reflecting from subject and passing through camera lens, is metered by the camera's CCD, with the camera then determining the D-2000's main flash output for proper exposure. And, any attachment lens or filter can be used, so even if the angle of view or lens brightness changes, because the metering is TTL, only the actual light is measured, ensuring correct exposure.

The difference between the camera's version of TTL and the D-2000's S-TTL version is that while the camera uses electrical control signals, the D-2000 uses optical signals. This optical control signal starts when the camera's pre-flash fires. The light reaches a Clear Photo System filter which blocks all visible light, only allowing the invisible infra red light to pass. This infra red control signal can pass

through and be picked up from outside transparent housings, so leak prone electrical bulkhead connectors are not necessary.

The optical control signal is picked up by a special ultra durable and reliable multi-filament core fiber optic cable, and guided to the D-2000 strobe. This system enables wide compatibility with any pre-flash capable camera in transparent housings, and in housings having an optical window.

Because S-TTL uses an optical signal, as long as fiber optics can be positioned and secured to the housing, theoretically there is no limit to the number of strobes that can be connected. Multi-strobe lighting set-ups are simple to configure and modify - even underwater during the shoot, because there's no risk of water leakage when plugging and unplugging fiber optics underwater.

S-TTL: the ideal external strobe control method.

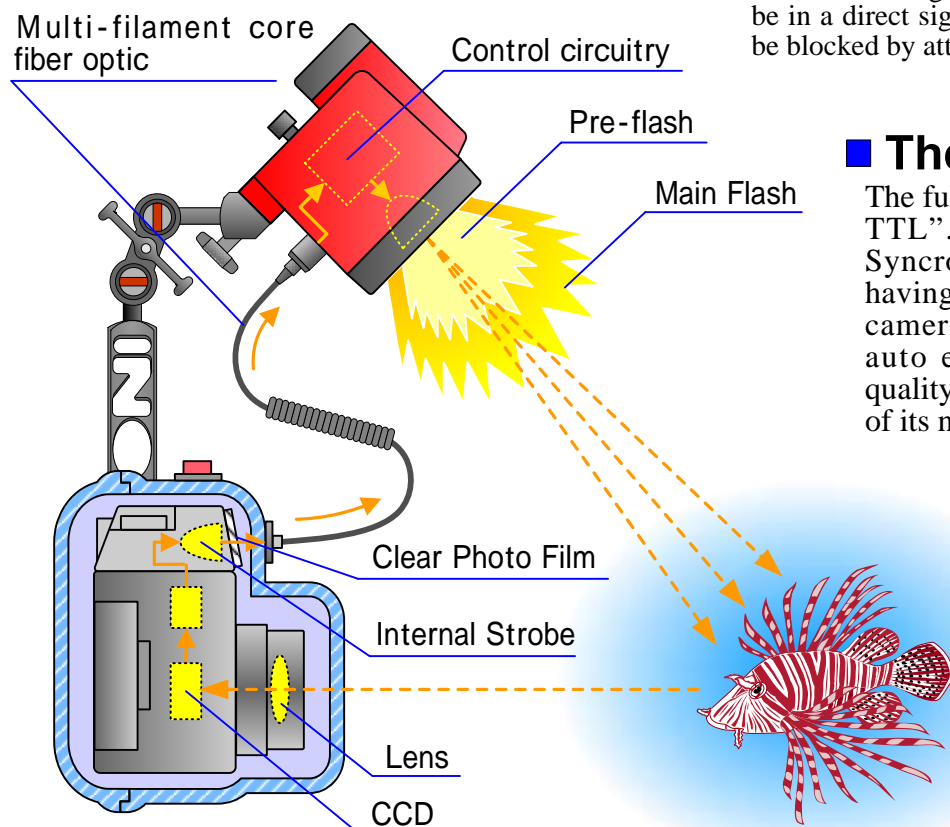
### ■ D-2000 Pre-flash S-TTL

S-TTL is a pre-flash type strobe control method\*.

Pre-flash is a small flash fired before the main flash, to measure the light reflecting off the subject so the strobe will fire its main flash correctly, ensuring proper exposure. Like the camera's

electrical TTL control signal, the S-TTL of the D-2000 also sends out a pre-flash, which the camera thinks is its own and so meters it accordingly.

(\*One flash type (no pre-flash) digital cameras are theoretically compatible, but the camera's strobe sensor, and the housing's corresponding window receptor must be in a direct sight line with the subject, and should not be blocked by attachment lenses.)



### ■ The "S" in S-TTL

The full name of S-TTL is "Optical Syncro TTL". The "S" is an abbreviation of Syncro. With an optical control signal having wide compatibility with available cameras and excellent underwater TTL auto exposure performance in a high quality reliable package, S-TTL is worthy of its namesake.

### ■ S-TTL Compatible Digicams

Until now, obtaining good auto exposure with external strobes has been difficult when used with full "auto" type cameras not having settable aperture, such as the Stylus 300, 400, 410, IXY400, 450, 500, CP4100, 4200, 5200 etc. (see example on opposite page)

Because S-TTL is TTL, even point-and-shoot full automatic digicams can be used underwater just like that - automatically. Proper first-shot exposure

as simple as pressing the shutter button. TTL auto is possible on any camera having an internal pre-flash, regardless of brand, model or available shooting modes. From now on digital cameras can be freely chosen without worrying about how they will perform with external strobes.

As of October 2004, except for one model\*, all camera/housings compatible with Inon AD or M67 mounts are compatible with this system.

(\*except Fujifilm F710)

\* S-TTL System Patent Pending in U.S.A. and Japan.

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## Why achieving consistent accurate exposure is difficult with full-auto digicams.

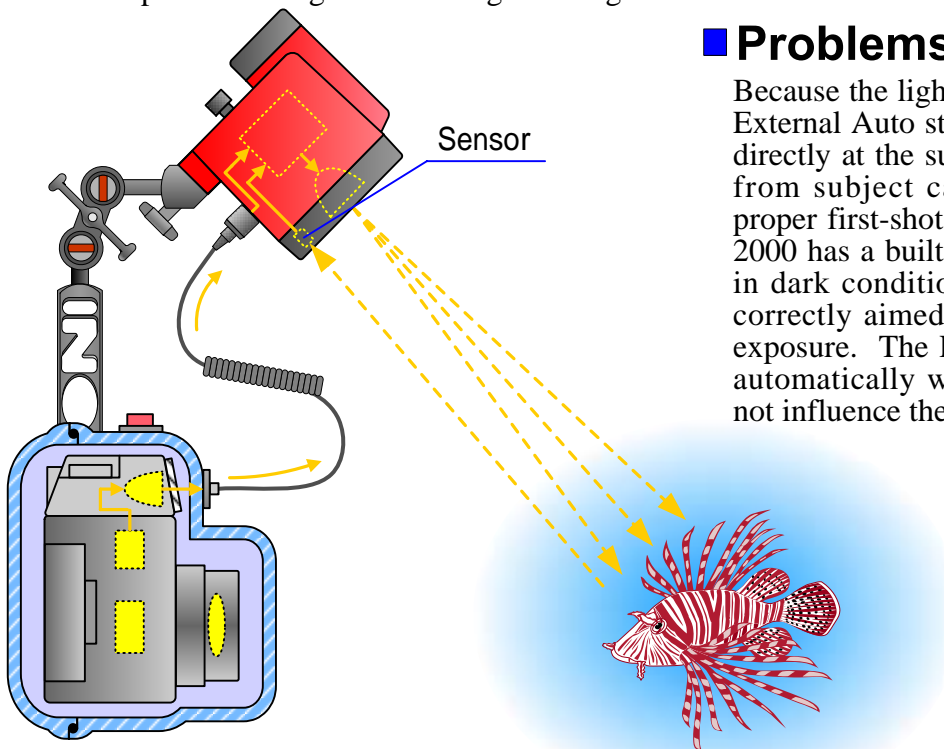
Fully automatic cameras such as the Stylus 300, 400, 410, IXY400, 450, 500, CP4100, 4200, 5200 etc. do not show aperture value or allow much manual exposure adjustment. The difficulty is to speculate what aperture the camera will choose at time of exposure, and pre-set the aperture value on External Auto strobes, or adjust power output of manual slave strobes. Also difficult is that such cameras do not show or allow setting of ISO sensitivity. Despite the seeming convenience of such "full-auto" cameras, for use with underwater external strobes, the lack of camera exposure information and settability makes achieving proper consistent exposure a challenge.

With the many step adjustability of some External Auto strobes, evaluating the first shot and then fine tuning the strobe's aperture value setting is straightforward and easy, and similar effects could be achieved by attaching a diffuser or just zooming a little, making the camera automatically adjust the aperture up or down according to its program. But true underwater "TTL Auto" exposure with external strobes has not been possible with such full-auto digital cameras.

### ■ External Auto

With External Auto strobes there is a strobe light metering sensor mounted on the face of the strobe head. Unlike S-TTL, with External Auto, the camera's CCD does not meter the strobe's light, so the external auto strobe's aperture setting must be matched to the camera's aperture setting before taking the image.

But, unlike TTL when using dual strobes, switching to the D-2000's 24 step adjustable external auto mode enables individual fine tuning of each strobe's output to freely balance light and create shadows.



### ■ Problems with External Auto

Because the light sensor is mounted on the face of External Auto strobes, unless the strobe is pointed directly at the subject, strobe light reflecting back from subject cannot be metered properly and proper first-shot exposure will not result. The D-2000 has a built-in Focus Light to aid in focusing in dark conditions, and to confirm the strobe is correctly aimed at the subject, to ensure correct exposure. The Focus Light can be set to turn off automatically when the shutter opens so it does not influence the exposure.

### ■ Slave Type Configurations

Slave type flash systems start with the camera's internal strobe firing into a sensor which in turn triggers the external strobe to fire. In this case, the camera's strobe contributes the main light, with the external strobe firing supplementary light.

In such systems the benefit of image three dimensionality possible by having an external strobe positioned off at an angle is reduced because the camera's strobe is contributing to the exposure, making the image appear "flat". In turbid low visibility conditions, the internal strobe will illuminate suspended particles in the water, causing "backscatter", or cause light to reflect within the housing or lens causing image ghosting.

