Nikon

# ECLIPSE FN1

## Fixed Stage Microscope for Electrophysiological Research

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# FN1

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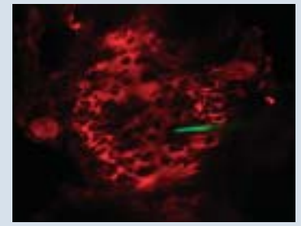
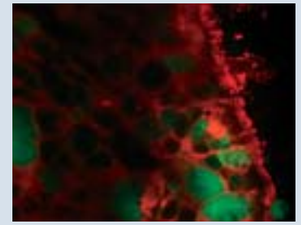
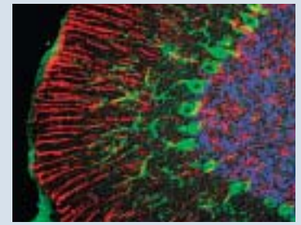
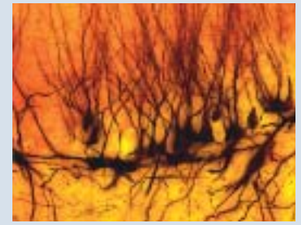






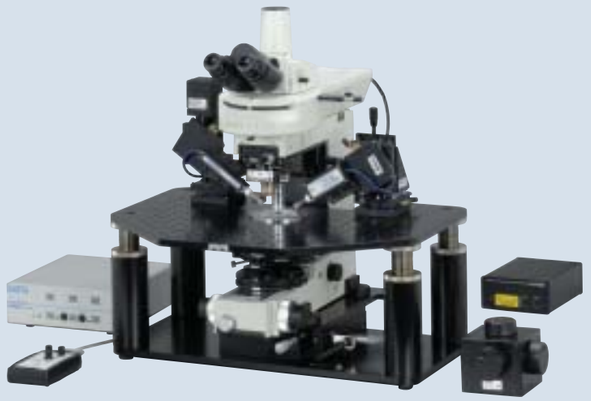


## State-of-the-art research microscope dedicated to electrophysiological experiments

Configuration with Narishige equipment

**Developed in conjunction with Electrophysiologists of all levels, specifically to meet the demands of electrophysiology research; legendary Nikon optics and effortless functionality.**

The Eclipse FN1 is the result of Nikon's close work with scientists to re-engineer what was the world's first research microscope for patch-clamp experiments—the Eclipse E600FN. Nikon carefully studied all aspects of the microscope, from the very essence of optical performance, through to functionality and expandability.
The results show that the FN1 enables visualization of minute details within thick specimens with perfect clarity, while offering streamlined manipulation, and minimal noise. With upgraded performance and powerful innovative features, it meets and exceeds the rigorous demands of challenging electrophysiological experiments, taking your research to new horizons.



Configuration with Burleigh equipment

Configuration with Nikon stage

# Objectives completely reengineered for streamlined electrophysiological experiments


Water dipping objective Plan 100xW

## Image deeper areas with ultimate clarity

### The world's first water dipping objective with depth-induced aberration correction *New!*

The Plan 100xW objective (NA 1.1, W.D. 2.5mm) is the world's first water dipping lens with a correction ring. This ring corrects spherical aberration induced by imaging deep in tissue or by working at physiological temperatures—providing outstanding z-axis resolution in IR-DIC imaging, as well as a tight point spread function for confocal applications. With excellent IR transmission, this lens is a terrific choice for Multi-Photon imaging.

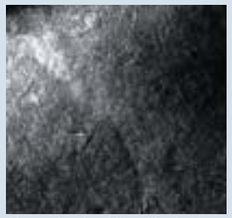




Images courtesy of:
Hiroyuki Hakozaki MS, Ellisman Laboratory, University of California, San Diego, Center for Research in Biological Structure, NCMIR (National Center for Microscopy & Imaging Research)

### Simple wavelength/illumination switchover

Alternating wavelength from visible to IR (infrared), or illumination technique from DIC and Oblique Light is carried out simply by rotating the wavelength selection and illumination selection turrets. This can be very useful when positioning stimulation electrodes and local perfusion pipettes.



Observed under oblique illumination



Observed under IR-DIC illumination

Images courtesy of:
Dr. Hiroyoshi Miyakawa, Dr. Shigeo Watanabe, Tokyo University of Pharmacy and Life Science

**Illumination selection turret**

Oblique illumination provides high contrast with deeper shadows by providing incident illumination at a shallow angle. Moreover, the direction of the contrast can be freely adjusted by rotating the incident illumination 360°, making it easy to identify the microelectrode position.

**Wavelength selection turret**

Deeper tissue penetration into a specimen can be clearly visualized by choosing infrared wavelengths between 850 and 950nm.

## High resolution imaging with Infra Red-DIC

### New objective series—ideal for IR-DIC imaging

Axial chromatic aberration in the visible to near-infrared region (up to 850nm) has been corrected in CFI APO 40xW NIR and 60xW NIR objectives. This enables the user to observe/document minute structures of a thick specimen with ample resolution. In addition, transmittance of every objective is exceptionally high thanks to wide-range spectrum anti-reflection coatings.

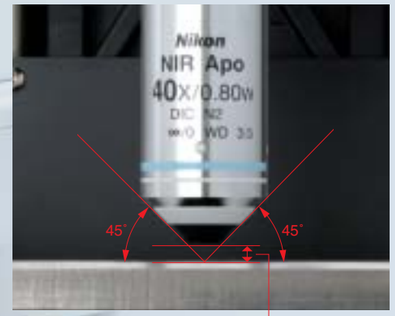
### 16x objective covers a wide range of magnifications

The high NA 16x objective lens allows high magnification observation over a wider field of view (2mm). When combined with a magnification module it provides 4x, 16x, 32x, and 64x magnifications with a 45° approach angle and 3.0mm of working distance.

Dedicated objectives

### Easy microelectrode placement

The objectives boast a long W.D. of 2.5-3.5mm, taking advantage of the 60mm parfocal distance of the CFI60 optics. Since there is ample space above the specimen, microelectrodes can be easily inserted. The diameters of the objectives are 17% slimmer than previous lenses, and provide broad approach angles up to 45°, facilitating dramatically enhanced access of microelectrodes to the specimen. The lens top has a special coating to prevent bubbles from becoming attached to it.




45° approach angle, long working distance

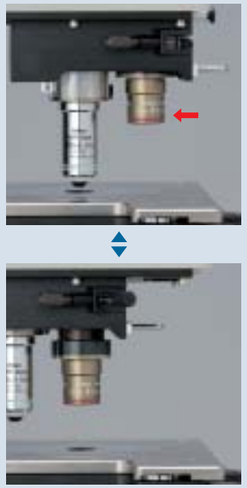
### Parfocal distance correction and centering mechanism

The parfocal distance of both the front and rear objectives can be finely tuned to achieve perfect parfocality. The front objective has a centering mechanism, which ensures perfect parcentricity, making it simple to find your cell when switching to a higher magnification.

Parfocal distance correction knob

### Smoother objectives changeover

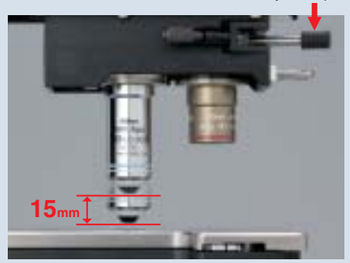
The FN1 comes with a 2-position sliding nosepiece. A high magnification objective can be mounted on either the front or back position.



Front/back sliding objective changeover

The objectives can be raised by the lever to prevent collision with the manipulator or the chamber when they are being changed. The retraction distance is 15mm, so even a thick glass dish is protected.

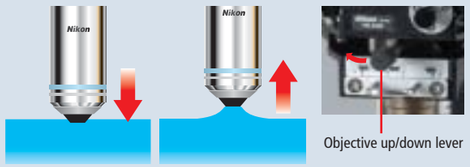
Objective up/down lever




Objective retraction mechanism

### Safe, accurate dipping operation

After the objective has been lowered, it can be further lowered by approximately 1mm by depressing the lens up/down lever to gently dip the lens top into the bath solution. This eliminates the risk of specimen disturbance due to the lowering of the objective deep into the solution.



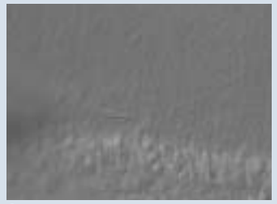

Simple lever operation ensures safe dipping

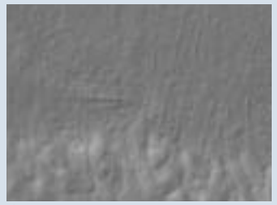

# Open design facilitates simple positioning of multiple electrodes

## The true one-lens solution: LWD 16X objective

With a variable magnification double port (optional), which allows you to vary magnifications between 0.35x, 2x, and 4x, it is possible to observe from a low magnification wide field to a high magnification high resolution field with the 16x objective alone. Vibrations caused by switching objectives are no longer a problem. This feature provides the flexibility to image large structures, such as the hippocampus, as well as small structures, such as axons and dendrites, with the same lens. 0.35x intermediate magnification allows a 2.0mm viewfield, enabling easy electrode handling under macro observation.

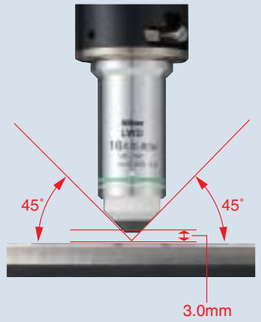

0.35x


2x


4x

## I-shaped slimline body creates more space above and below the stage

The simple and slim I-shaped body has no projection on the body other than the focus knob, so there is more space in the working area for your experiment. This also provides better access around the microscope to position manipulators and other peripherals. With the eye-point of the body 25mm lower than conventional models, you can work in greater comfort.



As the 16x objective has a wide 45° approach angle and 3.0mm long working distance, it is possible to patch what you see.

## Streamlined operation

The focus knob and field diaphragm ring are located on the front part of the base to enable efficient focusing. Moreover, there are no cumbersome belts outside the base. The coarse/fine focus knob is located on both the left and right sides, so it can be operated with either hand. In addition, the optional remote handle enables ON/OFF and light intensity adjustment of the fiber illumination from outside the cage.

## Waterproof LWD condenser with increased flexibility

Nikon has developed a new LWD condenser that can easily be switched between brightfield, DIC, and Oblique Light illumination techniques by simply rotating the turret. The new condenser has a long working distance, providing a wide space between it and the specimen. In addition, the condenser surface is waterproof and comes with a solution reservoir to catch spills. The condenser can be easily removed—even if you are using a fixed stage—and it can be cleaned without causing vibration to the manipulator.


The condenser and polarizer turret can be simply and quickly removed.

# Enhanced noise reduction

## Minimizing electronic noise

Nikon has succeeded in significantly reducing electrical noise by utilizing fiber illumination to bring light into the system from outside the cage. Noise can be dramatically reduced by connecting ground pins to all main parts of the microscope.

## Ultimate vibration noise reduction

Nikon has achieved both improved rigidity and vibration resistance for the FN1 body by undertaking critical measurement and simulation analysis of its structure. Nikon has succeeded in suppressing vibration noise by reducing the tremor generated when the nosepiece or the magnification module is switched.



# Responsive to a broad range of experimental needs

## Compatible with large specimens

The FN1 enables the microscope height to be raised 10-30mm by inserting a spacer* between the body and the arm. This is particularly advantageous for applications that require the observation of larger specimens such as intravital preps.

*Under development

## Responds to various illuminators

The condenser, sub-stage and turret can be removed entirely from the FN1 body to allow for more free space, depending on the purpose of the experiment. In addition, the height of the fixed stage can be easily and quickly changed by the operator.



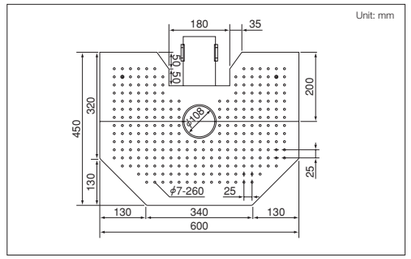



## ITS-FN1 Stage

When Nikon and Narishige jointly developed the exclusive stage for the FN1, they placed priority on ease of use. The operator can easily sustain the stage in the horizontal position or switch the position of each pair of double magnet pillars and screwed pillars to suit individual experiments. Moreover, the stage can be directly attached to an antivibration table, making it extremely stable for demanding experiments.

With the microscope XY mover it is possible to easily and precisely move to the region of interest by translating the whole microscope body in the X or Y axis direction. The attached scale provides confirmation of the relative position of the system.

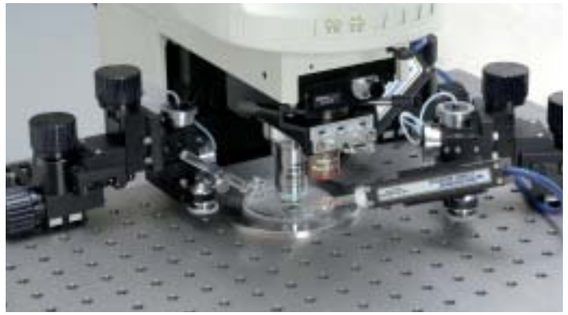
Manufactured by Narishige Co., Ltd.




## Micromanipulator

A wide variety of Narishige micromanipulators are available, from motorized hydraulic to oil-type. They are all of compact design and can be easily and solidly mounted to the ITS-FN1 stage.

Manufactured by Narishige Co., Ltd.



## Fiber-optics illuminators

Two types with fiber light-guides are available. They free the experiment from additional electrical noise and heat since the power unit is placed outside the cage.

**LS-DWL-N for diascopic illumination**

Accepts a 12V-100W halogen lamp. Light intensity can be finely tuned via the light control knob or external controller, which can also turn the lamp on/off.

Manufactured by SUMITA Optical Glass, Inc.

**X-Cite 120 for epi-fluorescence illumination**

This precentered illuminator is ideally suited to epi-fluorescence applications and its powerful 120W lamp requires no alignment and provides rich spectrum with high excitation intensity. Bulbs have a typical life of 1500 hours. A motorized model with RS-232 interface and software that enables control of the iris, lamp, and built-in shutter via a computer is also available.

Manufactured by EXFO Electro-Optical Engineering Inc.

## Episcopic illuminators

The D-FL Universal Epi-Fluorescence Attachment accepts 6 filter cubes and is suitable for episcopic brightfield, darkfield, DIC and fluorescence applications when configured with additional accessories. Its built-in noise terminator cuts stray light to achieve an exceptionally high signal:noise ratio. The J-FL Epi-Fluorescence Attachment accepts 4 filter cubes.

**D-FL Universal Epi-Fluorescence Attachment**

**J-FL Epi-Fluorescence Attachment**

## Magnification variable turret

The FN-MT Mag Variable Turret allows the flexibility of changing intermediate magnifications between 1x, 1.25x, 1.5x and 2x. Vibration-free zooming can be achieved with every objective lens.

## Digital Measuring unit (FN-MS Magnet Scale)

This compact sized Digital Measuring unit (Magnet Scale) enables accurate readout of the Z axis position at 1mm resolution. A digital gauge can be easily mounted inside the microscope for precise measuring.

## Tilting Trinocular Eyepiece Tube LV-TT2

It delivers erect images as opposed to the inverted images seen through ordinary tubes. Its height-adjustable design ensures a comfortable viewing posture even when an intermediate module is mounted.

## IR-DIC attachment

IR-DIC allows the visualization of minute structure deep within thick tissue of up to 300 or 400µm. Extremely high quality DIC images can be obtained using the IR polarizing set (850-950 nm) with a dedicated IR-CCD camera for image detection.

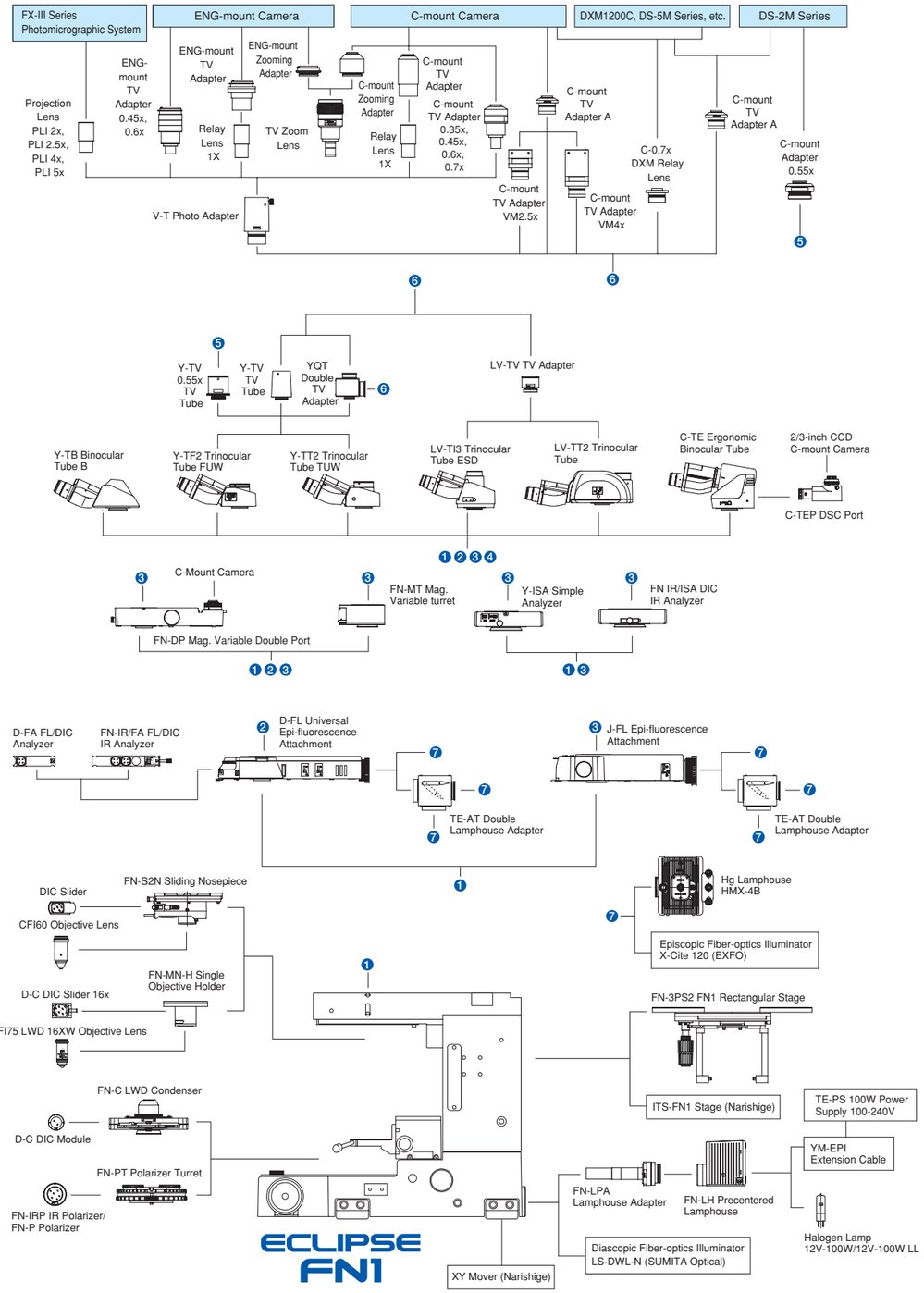
The IR-CCD Camera in the photo is manufactured by Hamamatsu Photonics K. K.

## Digital cameras for microscopes— Digital Sight series

The camera head and controller can be specifically configured according to use. The camera head is available in 2- and 5- megapixel types, with or without a cooling mechanism. The controller comes in a PC linked (via USB) type or a standalone type with a large LCD monitor.





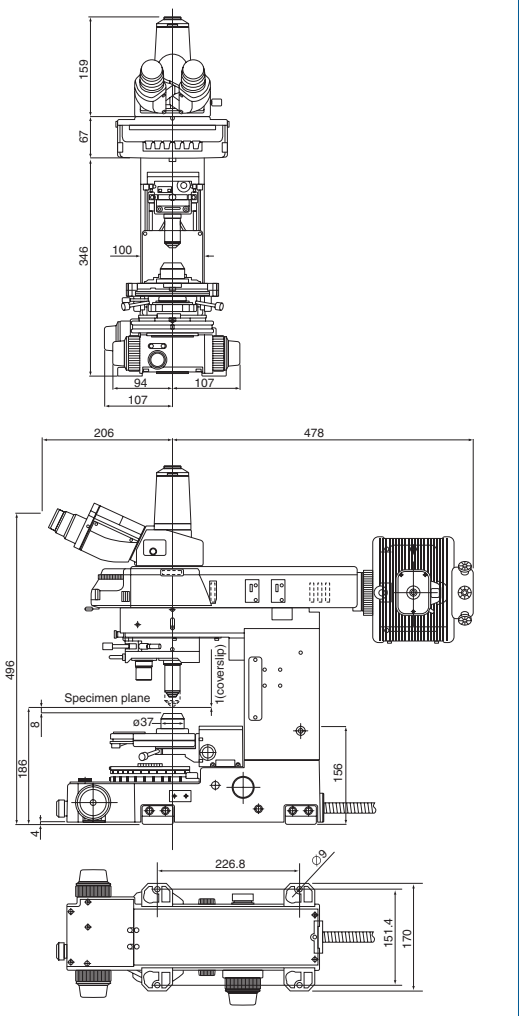


## Specifications

| | |
|---|---|
| Optical system | CFI60 and CFI75 infinity optical system |
| Main body | I-shaped, external power supply |
| Focusing | Via nosepiece up/down movement<br>Manual coaxial coarse/fine focus knobs (on both sides) |
| Nosepiece | FN-S2N Sliding Nosepiece (for CFI60 objectives)<br>Front/back 2-position; DIC prism attachable<br>FN-MN-N Single Objective Holder (for CFI75 objective)<br>1-position; DIC prism attachable |
| LWD condenser | Universal turret type<br>NA: 0.78 W.D.: 8.2mm<br>DIC and Oblique Light observations possible |
| Eyepiece | 10x, F.N.: 22, 25 |
| Eyepiece tubes | Y-TB Binocular Tube (Bino 100%)<br>C-TE Ergonomic Binocular Tube (Bino 100%, Bino : DSC port = 50 : 50)<br>(DSC port cannot be used with variable magnification double port)<br>Y-TF Trinocular Tube FUW (Bino : Photo = 100 : 0, 0 : 100)<br>Y-TT Trinocular Tube TUW (Bino : Photo = 100 : 0, 20 : 80, 0 : 100)<br>LV-TI3 Trinocular Tube ESD<br>LV-TT2 Tilting Trinocular Tube |
| Stage | FN-3PS2 FN1 Rectangular Stage (3-plate mechanical stage)<br>Stroke: 30 (X) to 27.5 (Y) mm |
| Light source | FN-LH Pre-centered Lamphouse: 12V-100W long-life halogen lamp<br>LS-DWL-N Optical Fiber Illuminator (Sumita Optical Glass, Inc.): 12V-100W halogen lamp |
| Operating conditions | Temperature: +10ºC to +40ºC<br>Humidity: 85%RH max. (no condensation) |
| Dimensions and weight | 214 (W) x 346 (H) x 422 (D)mm, approx. 12kg<br>(Main body) |

## System Diagram

Unit: mm




Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. December 2005 

**WARNING** TO ENSURE CORRECT USAGE, READ THE CORRESPONDING MANUALS CAREFULLY BEFORE USING YOUR EQUIPMENT.

* Monitor images are simulated.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