



Elphel NC353L

highly reconfigurable network camera





Elphel Inc.

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Elphel NC353L

highly customizable and high performance network cameras

The Company

Elphel Inc. has been creating the worlds first open camera systems based on free (GNU/GPL) software and open hardware. Elphel Inc. is an Utah based company which went into business in 2001 and was founded by the digital imaging specialist Andrey Filippov (PhD) who before worked for the General Physics Institute in Moscow, Russia, in the area of high-speed high-resolution, mixed signal design, application of PLDs and FPGAs, microprocessor-based embedded system hardware and software design, with a special focus on image acquisition methods for laser physics studies and computer automation of scientific experiments.

The Mission

We provide out-of-the-box* imaging systems or reconfigurable devices with the flexibility to modify software as well as hardware to suit a variety of applications. We actively pursue the users freedom to use, modify and share our hard- and software for any purpose with the GNU GPL.

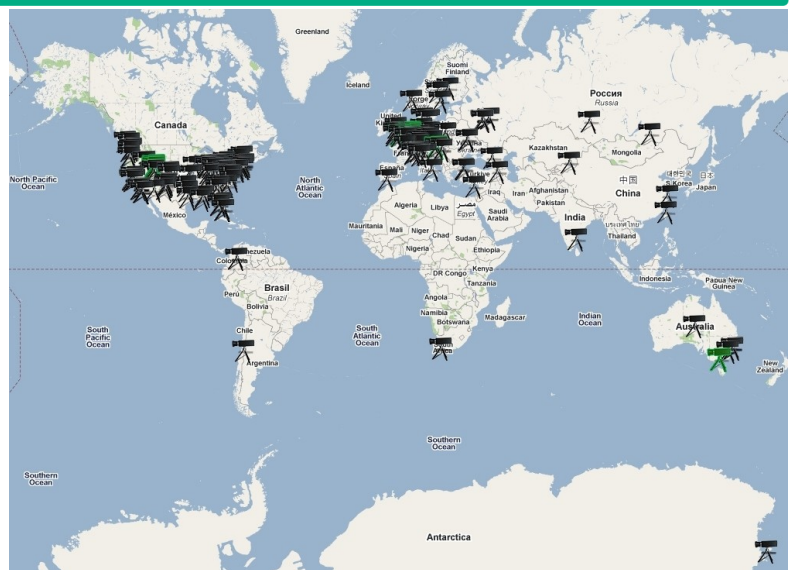
* the out-of-the-box system includes:

- Elphel high performance network camera (see different models below)
- High resolution lens
- midspan power supply (48V DC) plus all required cables
- Latest software with web-based user interface, accessible from any Internet-browser to get you started within minutes

Our Customers

Elphel cameras are used on all 7 continents (including under the ice in Antarctica). Elphel cameras have been proving their reliability under drastic climate conditions, operating day and night continuously for several years.

Elphel cameras are being used by Google for both the Google StreetView panoramic camera system as well as the Google Book-Scan Project. NASA is operating Elphel cameras on their near-space exploration missions on the Global Hawk UAV and the *Moss Landing Marine Laboratories* use them with their exploration robot under the ice of Antarctica to name just a few applications.





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The Camera

The Elphel NC353L (or just "Elphel 353") is a multi purpose camera with a camera-internal FPGA that takes care of pipelined high performance image processing and an embedded system running Linux that deals with peripherals, communication, etc.

Technical Specifications

Color Image Sensor	1/2.5" Bayer-pattern
Effective number of pixels	2592x1936 (5,018,112 pixels)
Aspect Ratio	Chip 4:3, Region of interest freely adjustable in 16 pixel steps
Sensor Features	Region of interest, on-chip binning and decimation
Dynamic Range	70 db (76 db at 2x2 binning)
Sensor Output	12Bit ADC
Electronic Shutter	25 μ s (at full resolution) to hours
White Balance	Auto, Manual
Gain	Analog & Digital (0 db to 12 db continuous)
Exposure Control	Auto, Manual
Lens Mount	C/CS/M12
Sync	System Internal / External
Interfaces	100Mbit Ethernet, SATA, USB 1.1, ZIF IDE, RS-232, GPIO (for ext. sync)
Power Consumption	2.4-5.8 W (depending on operation and load)
Weight	230 g (without lens or accessories)

Hardware Specifications

CPU	200MHz 32-bit Axis ETRAX FS CPU
RAM	128 MB SDRAM (64MB system + 64MB Video)
Flash	128 MB NAND flash memory
FPGA	Xilinx Spartan®3e 1200K gate reconfigurable FPGA



Elphel NC353L-369-HDD:

← dimensions
and
connectors →





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Key Features

- Free Software and Open Hardware - specially designed to allow creation of new products
- Camera software is based on highly reliable and flexible software such as Linux kernel, busybox, lighttpd, PHP5, and other GNU software.
- User/Developer friendly and open scripting: PHP (API, examples), CGI, C, C++, etc.
- Software Development Kit (SDK) and full hardware documentation freely available
- Color and B/W Sensor Frontends available: Aptina 5MPix CMOS with/without IR Cutoff Filter
- High speed hardware (FPGA) accelerated image/video compression: up to 75 MPix/s
- Recording formats: Quicktime, OGM, JPEG Image Sequence, JP4 RAW Image Sequence, RAW sensor data, HDR (experimental)
- Available Mediums: Stream over 100Mbit Ethernet (unicast or multicast), 2 Compact Flash Card slots, ZIF IDE Connector for camera internal 1.8" HDD, SATA Connector for external HDD, SSD or RAID
- USB Peripherals: GPS & compass modules allow recording geotagged images & video, audio devices allow synchronous recording of audio/video, other sensors (motion triggers, switches, photoelectric barrier, etc.) can be interfaced from the camera software.
- Power supply: 48V DC, 12V-36V DC (mobile applications) or regulated 3.3V
- Power consumption: 2.4 - 5.8 W (depending on operation and load)
- Firmware Upgrade (both GNU/Linux and FPGA) over network
- Sensor data can be embedded in image metadata (e.g. EXIF)
- Web-based GUI accessible from any Internet-browser
- Live video streaming using VLC, Mplayer, Gstreamer framework, etc.
- GPIO for external synchronization/triggering
- Precise capture synchronization for multiple cameras
 - 1-2 ms jitter over the network
 - 1 μ s - using external synchronization cable (GPIO)



Elphel NC353L-369-GEO with lens, CF card and compass module (internally installed) opened enclosure



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Applications

- Scientific Imagery and Video Applications
- High Speed Video
- Machine Vision
- R&D
- Microscopy
- Observation of Nature/Wildlife
- Underwater Imagery
- Medical Imagery
- Timelapse Filming (including HDR Support)
- Geotagging Applications
- Aerial Applications
- Digital Cinematography
- Robotics
- HD Video
- Security
- Document Scanning
- Panoramic Imagery and Video Applications (Panoramic Setups available)
- 3D Reconstruction
- Stereo/3D Imagery & Video
- Barcode Reading
- Sport (Photofinish)
- Computer Vision
- Education (Verilog, Image Processing,
- Networking, Circuit Design, Mechanical
- DesigVideo Conferencing

Some Available Camera Setups

- **NC353L** is a network camera series 353 capable of streaming high resolution video or images.
- **NC353L-369** is an NC353L camera with an additional IO-board that allows to simultaneously recording video and/or images to the external SATA mass storage device or internal CF cards. Serial port provides access to the root console that simplifies firmware development and a USB port allows to connect additional peripherals. The IO-board also features the external sync/triggger port.
- **NC353L-369-GEO** is an NC353L-369 camera with attached USB GPS signal receiver and digital compass (mounted camera internally) to record geotagged video and images.
- **NC353L-369-HDD** is an NC353L-369 camera with an enclosed 1.8" HDD for direct recording of images and/or video.
- **NC353L-359-STEREO** utilises 2 sensors front ends and the 10359 multiplexer board to record synced stereoscopic video. With optional IO-board you can connect internal/external mass storage, CF cards, peripherals or trigger external sync.





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Resolution/FPS Table

Standard	Resolution	max. FPS (RGB)	max. FPS (JP4 RAW)
Full Sensor	2592x1936	10.6	14
Full HD (1080p)	1920x1088	25.2	30.9
HD (720p)	1280x720	57.9	60
NTSC DV	640x480	126	126
PAL DV	720x576	100	100
	512x512	129	129
	320x240	310	310
Line Scan Mode	2536 Pixels	2300 lines per second	2300 lines per second



Elphel NC353L-369-HDD with lens and internal 1.8" HDD



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Elphel Model 353 - PRICELIST

NC353L	Basic network camera (with 10353 main board + SF338M5C sensor installed)	\$800
NC353L-369	Network camera with 10369 IO board (provides IDE, SATA, USB, RS232, and other interfaces)	\$1300
NC353L-369-HDD	Network camera with 10369 IO board and 1.8" 80 GB HDD (mounted internally)	\$1700
NC353L-369-GEO	Network camera with 10369 IO board, one 4GB CompactFlash, internal OS5000 compass, and external GPS	\$2000
NC353L-STEREO	Network camera with 2 Sensor Front Ends (using 10359 multiplexer board) in custom enclosure	\$1400
NC353L-369-STEREO	Network camera with 2 Sensor Front Ends (using 10359 multiplexer board) with 10369 IO board in custom enclosure	\$1700

Additional Options for Model 353

Monochrome Sensor	By default the camera is mounted with a 5 MPix color sensor. On request, we mount a 5 MPix monochrome sensor instead.	\$0
3 MPix Color Sensor	For some applications, the 3 MPix sensor is more suitable than the default 5 MPix one. On request, we mount a 3 MPix color sensor instead.	\$0
Remove IR-Cut	By default, we install an IR-Cut filter in front of the sensor. On request, we remove this filter for particular applications.	\$0
12-36V DC/DC	On request we modify the camera to operate on 12-36V DC (for use with external batteries - not compliant with equipment that provides 48V DC)	\$50

Accessories

PW-130	Midspan power supply [by Ault or equivalent]	\$30
EMS120150-P5P-SZ	XFRMR 18W 12V Power Supply 1.5A MULTI PLUG [by CUI Inc] (for 12-36V DC modified camera only)	\$25
EZPOEPA02	Passive Ethernet cable power injector with cat5 cable [by E-zy] (required for 12-36V DC modified camera)	\$10
CompactFlash	Add one 4 GB Compact Flash to your NC353L-369 model (up to two CF cards can be installed in the camera)	\$50
H2Z0414C-MP	Computar Varifocal Lens, 4-8mm F1.4 Manual Iris Vari-Focal C-Mount, 3 MPix	\$155
H3Z4518CS-MPIR	4.5-13.2mm F1.8 Manual Iris Vari-Focal CS-Mount, 3 MPix, Day/Night, IR	\$275
Case	Specially designed foam mold case to hold one Elphel camera with lens plus power supply and cables	\$50

OEM options also available