C3POwen's LGEO Update Pack 23rd Nov 2014

The **LGEO Library for POV-Ray** is a set of virtual LEGO® parts that are POV-Ray compatible. This allows LDraw models to be converted to the POV-Ray format (using a tool such as LDView) and then rendered to create lifelike images.

Created by Lutz Uhlmann, work began on the LGEO library in 1997 and ceased in 2000. A number of fixes were implemented by others, and the last updated from Lutz was released in 2008. Since work on the LGEO library had ceased, I stepped in to create some new parts (either based on older parts or created from scratch) and also fix any other parts that seemed to have issues. This zip archive contains those files, as well as other files that are required for these parts to function properly within POV-Ray and render with more accurate colours and finishes.

Important changes

As of the version released on 28th June 2013, the LGEO Update Pack uses the SRGB colour space for defining colours, rather than the standard RGB used before. This change was implemented to keep LGEO in line with the future of POV-Ray, which will be using a more realistic gamma setting of 1.0. Some information on this can be found here: **Fix old scenes to work with the new gamma system**

By using SRGB, colours can still be easily defined using the usual RGB nomenclature, but will not appear washed out when rendered using a gamma of 1.0.

Because of this change, the **lg_color.inc** file now tries to force POV-Ray to use an "assumed_gamma" setting, otherwise POV-Ray will fail to run render the file and display an error. If you have already defined "assumed_gamma", a warning message will be generated, but this can be ignored.

A side-effect of this is that shadows, and other effects, will now generally appear lighter, and adjustments may need to be made to any custom colours that have been created.

Parts preview

The **FIXED**, **UPDATED** and **NEW** LGEO parts from the 2014-01-16 update

Requirements

I recommend using POV-Ray 3.7, which at the time of writing is now in its final version. The LDraw All-in-One-Installer (AIOI) currently ships with POV-Ray 3.6, but 3.7 allows for advanced effects such as radiosity, as well as being able to utilise multiple CPUs.

If you are not using the LDraw AIOI, then I recommend ensuring that you have the most recent version of the official LGEO library before importing these files. A link to this can be found near the end of this document.

Installation

Firstly, all files that begin with "lg_" need to be copied to LGEO's "lg" folder. If you have installed LGEO via the LDraw All-in-One Installer, it should be found at the following location:

```
C:\Programs Files\LDraw\LGEO\lg
```

If you have installed it elsewhere, then you will need to locate this folder. Also, if you are using a 64-bit operating system, the "Program Files" folder will be named "Program Files (x86)".

Secondly, the "LGEO.xml" file needs to be copied to LDView's installation folder. Again, if you have used the LDraw installer, this should be located here:

```
C:\Programs Files\LDraw\LDView
```

Once you have installed all of these you will then be able to export LDraw models from LDView and take advantage of these parts.

Special parts

lg_62503.inc LED for Electric Light Brick 2 × 3 × 1.333

This part has been created to simulate the light produced from an LED, which is found in current light brick elements. By default, no light is emitted, to emulate the standard state of a light brick.

However, by adding a simple declaration to your POV-Ray file, the LED will illuminate:

```
#declare LG_LIGHT_SWITCH = 1;
```

This must be placed somewhere near the beginning of the file, but preferably *after* any "#version" or "global_settings" declarations.

To turn off the light, simply remove this line or change the "1" to "0".

New LGEO parts

Below is a list of all new LGEO parts. Parts marked with * still need a little work done to get them perfect. Parts marked with † are not yet available in an official release of LDraw.

2012-06-06 [8]

- **lg_63864** Tile 1 × 3
- **lg_72454** Slope Brick 45° 4 × 4 Inverted with Center Holes
- **lg_85984** Slope Brick 31° 1 × 2 × 0.667
- **lg_87079** Tile 2 × 4 with Groove
- **lg_87580** Plate 2 × 2 with Groove and 1 Center Stud
- **lg_91988** Plate 2 × 14
- **lg_92593** Plate 1 × 4 with 2 Studs
- **lg_98138** Tile 1 × 1 Round with Groove

2012-07-14 [1]

- **lg_4865b** Panel 1 × 2 × 1 with Rounded Corners

2012-07-15 [1]

- **lg_88646** Tile 3 × 4 with 4 Studs

2012-08-11 [15]

- **lg_4032a** Plate Round 2 × 2 with Axlehole Type 1 [LDraw variant of lg_4032.inc]
- **lg_30027a** Wheel Rim 8 × 8 [Now also shows LEGO logo]
- **lg_42022** Slope Brick Curved 6 × 1 *
- **lg_44126** Slope Brick Curved 6 × 2 *
- **lg_50950** Slope Brick Curved 3 × 1 *
- **lg_60477** Slope Brick 18° 4 × 1
- **lg_61068** Sloped Brick Curved 2 × 4 without Underside Studs *
- **lg_61678** Slope Brick Curved 4 × 1 *
- **lg_87087** Brick 1 × 1 with Stud on 1 Side
- **lg_87994** Bar 3L
- **lg_87994p01** Bar 3L with White Ends
- **lg_88930** Sloped Brick Curved 2 × 4 with Underside Studs *
- **lg_91405** Plate 16 × 16 [Underside not yet completely accurate]
- **lg_93606** Slope Brick Curved 4 × 2 *
- **lg_99784** Bar 12L with Plate 1 × 2 and 3 Hollow Studs

2012-08-28 [12]

- **lg_3068bp91** Tile 2 × 2 with 1 Black Dots Pattern
- **lg_3068bp92** Tile 2 × 2 with 2 Black Dots Pattern
- **lg_3068bp93** Tile 2 × 2 with 3 Black Dots Pattern
- **lg_3068bp94** Tile 2 × 2 with 4 Black Dots Pattern

- **lg_3068bp95** Tile 2 × 2 with 5 Black Dots Pattern
- **lg_3068bp96** Tile 2 × 2 with 6 Black Dots Pattern
- **lg_3942c** Cone 2 × 2 × 2 with Hollow Stud Open
- **lg_30367** Cylinder 2 × 2 with Dome Top and Blocked Stud
- **lg_30592** Brick 2 × 2 with Vertical Pin and 1 × 2 Side Plates
- **lg_59900** Cone 1 × 1 with Stop
- **lg_64644** Minifig Telescope
- **lg_85861** Plate 1 × 1 Round with Open Stud

2012-09-02 [4]

- **lg_30648** Tyre 24 × 14 with Shallow Staggered Treads *
- **lg_87414** Tyre 6/50 × 8 Offset Tread with Center Band †
- **lg_87697** Tyre 12/40 × 11 Wide with Center Band
- **lg_89201** Tyre 24 × 14 with Shallow Staggered Treads and Center Band *†

2012-09-16 [4]

- **lg_750** Hose Flexible End 1 × 1 × 0.67 with Tabs
- **lg_30391** Tyre 30.4 × 14 *
- **lg_85975** Minfig Hat Fez
- **lg_92402** Tyre 30.4 × 14 with Center Band *†

2012-12-15 [6]

- **lg_3943b** Cone 4 × 4 × 2 with Axle Hole
- **lg_4599b** Tap 1 × 1 without Hole in Spout
- **lg_4162p05** Tile 1 × 8 with "Burj Khalifa" pattern
- **lg_4162p0b** Tile 1 × 8 with "Empire State Building" pattern
- **lg_93273** Slope Brick Curved 4 × 1 Double
- **lg_99206** Plate 2 × 2 × 0.667 with Two Studs On Side and Two Raised

2012-12-26 [3]

- **lg_3005p04** Brick 1 × 1 with Minecraft Micromob Creeper Face Pattern
- **lg_3024ptc2** Plate 1 × 1 with Minecraft Micromob Steve Eyes Pattern
- **lg_3024ptc3** Plate 1 × 1 with Minecraft Micromob Steve Nose/Mouth Pattern

2013-01-01 [8]

- **lg_3003pe1** Brick 2 × 2 with Black Eye Pattern on Both Sides
- **lg_3003pe2** Brick 2 × 2 with Black and White Eye Pattern on Both Sides
- **lg_3747b** Slope Brick 33° 3 × 2 Inverted with Ribs between Studs
- **lg_11203** Tile 2 × 2 Inverted with Groove
- **lg_55013** Technic Axle 8 with Stop
- **lg_87083** Technic Axle 4 with Stop
- **lg_98284** Plate 2 × 2 Round with Hole and 4 Vertical Bars
- **lg_99008** Technic Axle 4 with Middle Cylindrical Stop

2013-01-06 [13]

- **lg_10202** Tile 6 × 6 with Groove and Underside Studs
- **lg_11211** Brick 1 × 2 with Two Studs on One Side
- **lg_11212** Plate 3 × 3
- **lg_32125** Technic Rotor 3 Blade with 6 Studs
- **lg_61184** Technic Pin 1/2 with Bar 2L
- **lg_91501** Panel 2 × 2 × 1 Corner with Rounded Corners
- **lg_92946** Slope Plate 45° 2 × 1 *
- **lg_93095** Panel 1 × 2 × 1 with Rounded Corners and Thin Central Divider
- **lg_98100** Brick 2 × 2 Round Sloped *†
- **lg_98280** Panel 1 × 6 × 3 with 1 × 3 Studs on Sides
- **lg_98287** Bracket 3 × 4 - 3 × 4 Up
- **lg_99207** Bracket 1 × 2 - 2 × 2 Up
- **lg_99780** Bracket 1 × 2 - 1 × 2 Up

2013-01-13 [6]

- **lg_2436b** Bracket 1 × 2 - 1 × 4 Down with Rounded Corners
- **lg_10197** Technic Axle and Pin Connector Hub with 2 Axles at 90°
- **lg_10288** Technic Angle Connector (3 × 120°)
- **lg_30367b** Cylinder 2 × 2 with Dome Top with Axle Hole and Blocked Stud
- **lg_30367c** Cylinder 2 × 2 with Dome Top with Axle Hole and Hollow Stud
- **lg_93274** Bracket 1 × 2 - 2 × 4 Down

2013-01-16 [8]

- **lg_336** ~Technic Pneumatic Cylinder 2 × 2 Piston Rod 5.5L
- **lg_337** ~Technic Pneumatic Cylinder 2 × 2 Piston Rod 4L
- **lg_2796** ~Technic Pneumatic Cylinder 2 × 2 Piston Rod 4L Cylindrical
- **lg_2944** Technic Pneumatic Cylinder 1 × 1 Piston Rod
- **lg_11213** Plate 6 × 6 Round with Hole and Snapstud
- **lg_11458** Plate 1 × 2 with Offset Peghole
- **lg_11833** Plate 4 × 4 Round with Hole 2 × 2 †
- **lg_60474** Plate 4 × 4 Round with Hole and Snapstud

2013-01-29 [5]

- **lg_11272** Technic Axle Connector 2 × 3 Quadruple †
- **lg_60581** Panel 1 × 4 × 3 Reinforced with Hollow Studs
- **lg_85940** Technic Beam 2 with Angled Bar
- **lg_87544** Panel 1 × 2 × 3 Reinforced with Hollow Studs
- **lg_87552** Panel 1 × 2 × 2 Reinforced with Hollow Studs

2013-04-05 [9]

- **lg_572a** String End Stud
- **lg_577** Minifig Lightsaber Hilt

- **lg_3876** Minifig Shield Round
- **lg_4162p0g** Tile 1 × 8 with "Big Ben" pattern
- **lg_4288** Tyre Balloon *
- **lg_32123b** Technic Bush ½ Smooth with Axle Hole
- **lg_43888** Brick 1 × 1 × 6 Round with Square Base
- **lg_57585** Technic Bush with Three Axles
- **lg_63868** Plate 1 × 2 with Clip Horizontal on End

2013-06-28 [8]

- **lg_752** Hose Flexible End 1 × 1 × 0.75 without Tabs
- **lg_2815** Technic Wedge Belt Wheel Tyre
- **lg_32530** Technic Tile 1 × 2 with Two Holes
- **lg_62503** LED for Electric Light Brick 2 × 3 × 1.333 *
- **lg_63965** Bar 6L with Thick Stop
- **lg_64799** Plate 4 × 4 with Open Centre 2 × 2
- **lg_87609** Plate 2 × 6 × 0.667 with Four Studs on Side and Four Raised
- **lg_88072** Plate 1 × 2 with Vertical Bar on Long Side and Short Arm

2013-07-27 [10]

- **lg_3614** Plate 1 × 1 Round with Towball
- **lg_3794b** Plate 1 × 2 with 1 Centre Stud and Groove
- **lg_11215** Bracket 5 × 2 × 1.333
- **lg_11477** Slope Brick Curved 2 × 1
- **lg_11610** Cone 1 × 1 Inverted with Shaft
- **lg_14769** Tile 2 × 2 Round with Round Underside Stud
- **lg_30106** Tile 2 × 2 Round with Globe 2 × 2 × 2 [Crystal Globe]
- **lg_57908** Brick 2 × 2 with 2 Ball Joints
- **lg_57909** Brick 2 × 2 with Ball Joint and Axle Hole
- **lg_74698** Tile 2 × 2 Round with Technic Half Beam

2013-12-31 [11]

- **lg_756** Hose Flexible Segment Centre Section
- **lg_4255** Technic Shock Absorber 6.5L Cylinder
- **lg_6254** Minifig Food Ice Cream Scoops
- **lg_13547** Slope Brick Curved 4 × 1 Inverted
- **lg_15332** Fence Spindled 1 × 4 × 2 with 4 studs
- **lg_15444** Brick 1 × 1 × 2 with 1 Hole in Side
- **lg_15456** Plate 2 × 2 with Towball and Centre Hole *
- **lg_30256** Tile 2 × 2 Roadsign Base
- **lg_33176** Finial Round (Decoration Ball)
- **lg_ls40** LSynth Technic Flexible Axle – End Piece
- **lg_ls41** LSynth Technic Flexible Axle – Cross Section

2014-01-15 [30]

- **lg_128** ~Technic Pneumatic Cylinder 2 × 2 Cap
- **lg_335** ~Technic Pneumatic Cylinder 2 × 2 × 5
- **lg_757** ~Hose Flexible 12L Top 1 × 1 × 0.667 with Stud
- **lg_758** ~Hose Flexible 12L Segment
- **lg_759** ~Hose Flexible 12L End Segment
- **lg_2527** Minifig Cannon 2 × 4 Base
- **lg_2533** ~Minifig Cannon Shooting Barrel
- **lg_2534** ~Minifig Cannon Shooting Plunger *
- **lg_2535** ~Minifig Cannon Shooting Breech
- **lg_2793** ~Technic Pneumatic Cylinder 2 × 2 × 5 with 2 Ports
- **lg_2795** ~Technic Pneumatic Cylinder 2 × 2 × 1 Cap with Port Slot
- **lg_2797** ~Technic Pneumatic Cylinder 2 × 2 Base Type 2
- **lg_2798** ~Technic Pneumatic Cylinder 2 × 2 × 4
- **lg_2799** ~Technic Pneumatic Cylinder 2 × 2 Piston with Large Knob Handle *
- **lg_2804** ~Technic Pneumatic Cylinder 2 × 2 × 1 Cap without Port Slot
- **lg_4697a** Technic Pneumatic T-Piece - Type 1
- **lg_4697b** Technic Pneumatic T-Piece - Type 2
- **lg_4701** ~Technic Pneumatic Cylinder 2 × 2 Base Type 1
- **lg_6542a** Technic Gear 16 Tooth with Clutch
- **lg_6542b** Technic Gear 16 Tooth with Clutch Smooth
- **lg_10247** Plate 2 × 2 with Hole and Complete Underside Rib
- **lg_14716** Brick 1 × 1 × 3
- **lg_15068** Slope Brick Curved 2 × 2 × 0.667
- **lg_30162** Minifig Tool Binoculars Town
- **lg_30219** Bar 16L with Hollow Studs, Towball and Slit
- **lg_41531** Technic Cylinder 4 × 4 × 2 with 3 Pin Holes and Centre Bar
- **lg_45590** Technic Axle Joiner Double Flexible
- **lg_59426** Technic Axle 5.5 with Stop
- **lg_61485** Turntable Flat Base 4 × 4
- **lg_62462** Technic Pin Joiner Round with Slot

2014-02-10 [12]

- **lg_208** Minifig Chain Link End
- **lg_209** Minifig Chain Link
- **lg_14718** Panel 1 × 4 × 2 Reinforced with Hollow Studs
- **lg_15460** Technic Steering Arm with 3 Ball Joints with 1L Arm Side Connection
- **lg_30285** Wheel Hub 14.8 × 16.8 with Centre Groove
- **lg_33291** Plate 1 × 1 Round with Tabs
- **lg_60212** Car Mudguard 2 × 4 with Central Hole
- **lg_71184** Bar 4.5L with Stop Ends
- **lg_86208** Minifig Torch without Grooves
- **lg_90258** Brick 2 × 2 with Slots and Axlehole
- **lg_98138p07** Tile Round 1 × 1 with Eye Pattern
- **lg_98374** Minifig Pot Small with Handle Holders

2014-06-11 [12]

- **lg_3626c** Minifig Head with Closed Hollow Stud
- **lg_4151b** Plate 8 × 8 with Grille and Hole
- **lg_4162p0s** Tile 1 × 8 with "The Eiffel Tower" Pattern
- **lg_4162p0t** Tile 1 × 8 with "La tour Eiffel" Pattern
- **lg_4162p0u** Tile 1 × 8 with "Marina Bay Sands®" Pattern
- **lg_4162p0v** Tile 1 × 8 with "Trevi Fountain" Pattern
- **lg_14417** Plate 1 × 2 with Ball Joint-8
- **lg_14769p01** Tile 2 × 2 Round with Round Underside Stud and Black Eye Pattern
- **lg_32474** Technic Ball Joint with Axlehole Blind *
- **lg_32474p01** Technic Ball Joint with Axlehole Blind with Eye Pattern *
- **lg_64451** Technic Link 4 × 6 Bent 53.13°
- **lg_91049** Plate 1.5 × 1.5 × 0.667 Round

2014-11-23 [6]

- **lg_2959** Magnet Cylindrical Casing
- **lg_4162p0w** Tile 1 × 8 with "LOM Building B" Pattern
- **lg_50951** Tyre 6/30 × 11
- **lg_59443** Technic Axle Joiner Inline Smooth
- **lg_70023** Magnet Cylindrical
- **lg_88393** Brick 1 × 2 × 5 with Groove

Updated LGEO parts

Where parts are listed as "updated" I have only made very minor changes.

2012-08-11 [2]

- **lg_4624** Wheel Centre Small [Added *LEGO* logo]
- **lg_30027** Wheel Rim 8 × 8 [Redirects to lg_30027a, but retains correct orientation]

2012-12-15 [1]

- **lg_4599a** Tap 1 × 1 [Redirected from lg_4599; smoothed edge of hole in spout]

2012-12-26 [7]

- **lg_2780** Technic Pin with Friction and Slot [Redirected from lg_4459]
- **lg_3815** Minifig Hips [Redirected from lg_0970]
- **lg_3816** Minifig Leg Right [Redirected from lg_0971]
- **lg_3817** Minifig Leg Left [Redirected from lg_0972]
- **lg_3818** Minifig Arm Right [Redirected from lg_0982]
- **lg_3819** Minifig Arm Left [Redirected from lg_0981]
- **lg_3820** Minifig Hand [Redirected from lg_0983]

2013-01-01 [1]

- **lg_3747a** Slope Brick 33° 3 × 2 Inverted [Redirected from lg_3747]

2013-01-06 [1]

- **lg_2496** Wheel Trolley [Added *LEGO* logo]

2013-01-13 [2]

- **lg_30367** Cylinder 2 × 2 with Dome Top and Blocked Stud [Redirects to lg_30367a]
- **lg_98138** Tile 1 × 1 Round with Groove [Increased roundness of top edge]

2013-01-29 [4]

- **lg_0122c01** Plate 2 × 2 with Red Wheels [Added *LEGO* logo]
- **lg_10197** Technic Axle and Pin Connector Hub with 2 Axles at 90° [Updated with lg_tech_tube primitive]
- **lg_10288** Technic Angle Connector (3 × 120°) [Updated with lg_tech_tube primitive]
- **lg_11458** Plate 1 × 2 with Offset Peghole [Updated with lg_tech_tube primitive]

2013-04-05 [1]

- **lg_32123a** Technic Bush ½ Smooth with Axle Hole Reduced [Redirects from lg_32123]

2013-06-28 [1]

- **lg_30028** Tyre 8/40 × 8 Slick Smooth [Minor adjustment to tyre edge roundness]

2014-01-16 [4]

- **lg_336** ~Technic Pneumatic Cylinder 2 × 2 Piston Rod 5.5L [Technic hole]
- **lg_337** ~Technic Pneumatic Cylinder 2 × 2 Piston Rod 4L [Technic hole]
- **lg_757** ~Hose Flexible 12L Top 1 × 1 × 0.667 with Stud [Cone shape]
- **lg_2796** ~Technic Pneumatic Cylinder 2 × 2 Piston Rod 4L Cylindrical [Technic hole]

2014-02-10 [4]

- **lg_14769** Tile 2 × 2 Round with Round Underside Stud [Roundness of top edge]
- **lg_50746** Slope Brick 31° 1 × 1 × 0.667 [Added rounded corners]
- **lg_59900** Cone 1 × 1 with Stop [Rewritten using "lg_macro.inc"]
- **lg_85984** Slope Brick 31° 1 × 2 × 0.667 [Added rounded corners]

Fixed LGEO parts

Where I have come across them, I have attempted to fix any existing LGEO parts that have not been done so already. In some instances, it is simply that the files are missing semicolons [;] at the end of certain declarations, which renders them incompatible with more recent versions of POV-Ray.

2012-06-06 [2]

- **lg_2539** Plate 6 × 6 Open Center without 4 Corners with 4 Clips [Fixed part orientation to match LDraw]
- **lg_3626bp01** Minifig Head with Standard Grin Pattern [Pattern shows at correct size]

2012-06-28 [1]

- **lg_32068** Technic Cross Block 1 × 3 (Axle/None/Pin) [Fixed position on Y axis]

2012-08-11 [5]

- **lg_3005** Brick 1 × 1 [Fixed stud orientation]
- **lg_3023** Plate 1 × 2 [Fixed stud orientation for clear variant]
- **lg_4592** Hinge Control Stick Base [Rewrote entire part to appear more accurate]
- **lg_4735** Bar 1 × 3 with Clip and Stud Receptacle [Fixed position issue with cylinder]
- **lg_42445** Bar 12L with Plate 1 × 2 and Hollow Stud [Fixed stud orientation]

2012-08-30 [4]

- **lg_4475** Wing 8 × 8 [Added missing semicolon]
- **lg_40620** Exhaust Pipe with Pin [Added missing semicolon]
- **lg_51011** Tyre 6.4/75 × 8 Shallow Offset Tread [Added missing semicolon and fixed central hole]
- **lg_71137** Exhaust Pipe [Added missing semicolon]

2012-09-16 [1]

- **lg_4740** Dish 2 × 2 Inverted [Fixed underside cylinder]

2012-12-15 [31]

- **lg_0962** Slope Brick 45° 2 × 2 Double Concave / Double Convex [Fixed tip height]
- **lg_2875** Slope Brick 45° 2 × 6 × 0.667 [Fixed tip height]
- **lg_3037** Slope Brick 45° 2 × 4 [Fixed tip height]
- **lg_3038** Slope Brick 45° 2 × 3 [Fixed tip height]
- **lg_3039** Slope Brick 45° 2 × 2 [Fixed tip height]
- **lg_3040a** Slope Brick 45° 2 × 1 without Center Stud [Fixed tip height]
- **lg_3040b** Slope Brick 45° 2 × 1 [Fixed tip height]
- **lg_3041** Slope Brick 45° 2 × 4 Double [Fixed tip height]
- **lg_3042** Slope Brick 45° 2 × 3 Double [Fixed tip height]
- **lg_3043** Slope Brick 45° 2 × 2 Double [Fixed tip height]
- **lg_3044a** Slope Brick 45° 2 × 1 Double with Hollow Bottom [Fixed tip height]

- **lg_3044b** Slope Brick 45° 2 × 1 Double [Fixed tip height]
- **lg_3045** Slope Brick 45° 2 × 2 Double Convex [Fixed tip height]
- **lg_3046** Slope Brick 45° 2 × 2 Double Concave [Fixed tip height]
- **lg_3048** Slope Brick 45° 1 × 2 Triple [Fixed tip height]
- **lg_3298** Slope Brick 33° 3 × 2 [Fixed tip height]
- **lg_3678a** Slope Brick 65° 2 × 2 × 2 without Center Tube [Fixed tip height]
- **lg_3678b** Slope Brick 65° 2 × 2 × 2 with Center Tube [Fixed tip height]
- **lg_3684** Slope Brick 75° 2 × 2 × 3 [Fixed tip height]
- **lg_3685** Slope Brick 75° 2 × 2 × 3 Double Convex [Fixed tip height]
- **lg_4286** Slope Brick 33° 3 × 1 [Fixed tip height]
- **lg_4445** Slope Brick 45° 2 × 8 [Fixed tip height]
- **lg_4460** Slope Brick 75° 2 × 1 × 3 [Fixed tip height]
- **lg_4861** Slope Brick 45° 3 × 4 Double [Fixed tip height]
- **lg_30028** Tyre 8/40 × 8 Slick Smooth [Increased roundness of edges]
- **lg_30368** Slope Brick 18° 4 × 2 [Fixed tip height]
- **lg_50950** Slope Brick Curved 3 × 1 [Fixed tip height]
- **lg_60477** Slope Brick 18° 4 × 1 [Fixed tip height]
- **lg_60481** Slope Brick 65° 2 × 1 × 2 [Fixed tip height]
- **lg_61678** Slope Brick Curved 4 × 1 [Fixed tip height]
- **lg_93606** Slope Brick Curved 4 × 2 [Fixed tip height]

2012-12-26 [1]

- **lg_4459** Technic Pin with Friction [Removed slot and created lg_2780 in place]

2013-01-01 [5]

- **lg_3003** Brick 2 × 2 [Fixed outer brick shape]
- **lg_3818** Minifig Arm Right [Fixed torso connection point]
- **lg_3819** Minifig Arm Left [Fixed torso connection point]
- **lg_6069** Wedge 4 × 4 Triple [Fixed tip height]
- **lg_48933** Wedge 4 × 4 Triple with Stud Notches [Fixed tip height]

2013-01-29 [2]

- **lg_0122c02** Plate 2 × 2 with White Wheels [Solid wheel colour / LEGO logo]
- **lg_2876** Slope Brick 33°/45° 6 × 6 with 4 × 4 Cutout [Fixed tip height]

2013-04-05 [3]

- **lg_3675** Slope Brick 33° 3 × 3 Double Convex [Fixed tip height]
- **lg_4161** Slope Brick 33° 3 × 3 [Fixed tip height]
- **lg_4593** Hinge Control Stick [Fixed size of hinge connection]

2013-06-28 [3]

- **lg_3297** Slope Brick 33° 3 × 4 [Fixed tip height]
- **lg_6628** Technic Pin Towball with Friction [Fixed position and orientation]
- **lg_32209** Technic Axle 5.5 with Stop [Fixed length]

2013-12-31 **[1]**

- **lg_32271** Technic Beam 3 × 7 Liftarm Bent 53.13° [Fixed axle holes]

2014-01-16 **[3]**

- **lg_3049a** Slope Brick 45 1 × 2 Double / Inverted with Centre Tube [Fixed tip height]
- **lg_3049b** Slope Brick 45 1 × 2 Double / Inverted [Fixed tip height]
- **lg_3049c** Slope Brick 45 1 × 2 Double / Inverted without Centre Stud [Fixed tip height]

2014-02-10 **[1]**

- **lg_30350** Tile 3 × 2 with 2 Clips [Fixed clear version and underside plate cylinders]

2014-06-11 **[3]**

- **lg_3941** Brick 2 × 2 Round [Minor fix to stud logos]
- **lg_4032a** Plate 2 × 2 Round [Minor fix to stud logos]
- **lg_30407** Hinge Plate 1 × 8 with Angled Side Extensions [Fixed edge cylinder colour]

2014-11-23 **[3]**

- **lg_2346** Tyre 12/50 × 16 Offset Tread [Fixed radius to match LDraw part]
- **lg_6267** Windscreen 2 × 12 × 4 [Fixed position]
- **lg_32013** Technic Angle Connector #1 [Fixed axle teeth showing in connector hole]

Primitive replacement

LDView already converts non-LGEO parts so that they are rendered using LGEO studs based on the "lg_defs.inc" file mentioned below. I've now added a few entries to the LGEO.xml file to also automatically replace the following LDraw primitives:

- **connect.dat** Technic pin with base collar [lg_connect.inc]
- **stud2.dat** Hollow stud
- **stud2a.dat** Hollow stud without edge around base
- **stud4.dat** Ring underside stud [lg_stud4.inc]
- **stud4a.dat** Ring underside stud without edge around base [lg_stud4.inc]
- **wpin.dat** Wheel holding pin [lg_wpin.inc]

The "lg_color.inc" and "lg_defs.inc" files

These two files contain definitions required for the LGEO library to render correctly within POV-Ray.

The "lg_color.inc" file does what it says, and contains definitions to all of the colours that LGEO uses. Where no colour definition is defined for a particular LDraw colour, LDView will use the colour as it appears within LDraw.

The "lg_defs.inc" file contains definitions for things such as brick height, stud radius, etc., and this ensures that the same measurements are used throughout the LGEO library.

I have updated the "lg_defs.inc" file with the below changes:

- **2013-01-01** Added **lg_hollow_brick_column** primitive for some sloped parts and updated appearance of all underside columns.
- **2013-01-29** Added **LG_TECH_BEAM_WIDTH** measurement (0.72) and **lg_tech_tube** primitive.
- **2013-07-27** Added **LG_TILE_GROOVE** measurement (0.04).
- **2014-01-16** Added **LG_TECH_HOLE_RADIUS** measurement (0.30) and **lg_tech_hole** "negative" primitive for creating Technic holes.
- **2014-02-20** Added **LG_INNER_CORNER_SPACE** measurement and **lg_inverted_slope_knob** primitive.

The "lg_macro.inc" file

This new file contains mathematical functions that can be repeatedly called when creating new parts. There are currently ten macros available, each with solid and clear versions:

- lg_connect_tori
- lg_curved_slope_top
- lg_brick_cylinder_group
- lg_plate_cylinder_group
- lg_knob_group
- lg_tech_knob_group
- lg_tech_knob_logo_group
- lg_tech_axlehole
- lg_tech_axlehole_reduced
- lg_tech_hole_group

Please see the "lg_macro.inc" file for usage on the above.

Future plans

Outside of adding new parts, my main aim is to fix the radius of a (fairly large) number of Technic parts.

Technic beams within the LGEO library, for instance, are as wide as one brick, regardless of which way you orientate them. In real life, as in LDraw, this is not actually the case. I've already implemented the appropriate **LG_TECH_BEAM_WIDTH** variable, so it would simply be a matter of going through a lot of the existing parts and updating them. However, there are a lot of them, and it's not as straightforward as it sounds!

Support

Updates to my LGEO parts pack are posted on a semi-regular basis to the Eurobricks forums, for which the appropriate thread can be found here.

Although I certainly don't visit Eurobricks every day – and sometimes not even every week – I do stop by occasionally and, if there are any bugs or issues with the library, this is probably the best place to report them.

Links

- Digitalbricks.org
  Lutz Uhlmann's LGEO site. Although now essentially defunct, it still contains a link to the latest version of Lutz's LGEO library. The download also includes parts fixed by Lars C. Hassing and other contributors.
- LDraw.org
  The site from which to download the LDraw library, as well as the LDraw All-In-One-Installer.
- LDView
  The official LDView site, from which the latest beta versions can be obtained.
- POV-Ray
  The official POV-Ray site, from which the latest version can be obtained.
- Friedrich A. Lohmüller's POV-Ray Tutorial
  A very helpful POV-Ray site, which has been utilised many times in the creation of a lot of these new parts.

Legal information

Release history

- **2012-06-06** Initial release, containing 8 new parts and 2 fixed parts
- **2012-06-28** Added 1 fixed part
- **2012-07-14** Added 1 new part
- **2012-07-15** Added 1 new part
- **2012-08-11** Added 15 new parts, 2 updated parts and 5 fixed parts
- **2012-08-14** Updated LGEO.xml file to use more native LGEO primitives
- **2012-08-28** Added 12 new parts
- **2012-08-30** Added 4 fixed parts
- **2012-09-02** Added 4 new parts
- **2012-09-16** Added 4 new parts and 1 fixed part
- **2012-12-15** Added 6 new parts, 1 updated part and 30 fixed parts
- **2012-12-26** Added 3 new parts, 7 updated parts and 1 fixed part
- **2013-01-01** Added 8 new parts, 1 updated part and 5 fixed parts
- **2013-01-06** Added 13 new parts and 1 updated part
- **2013-01-13** Added 6 new parts and 2 updated parts
- **2013-01-16** Added 8 new parts
- **2013-01-29** Added 5 new parts, 4 updated parts and 2 fixed parts
- **2013-04-05** Added 9 new parts, 1 updated part and 3 fixed parts
- **2013-06-28** Added 8 new parts, 1 updated part and 3 fixed parts
- **2013-12-28** Added 11 new parts and 1 fixed part
- **2014-01-16** Added 30 new parts, 4 updated parts and 3 fixed parts
- **2014-02-10** Added 12 new parts, 4 updated parts and 1 fixed part
- **2014-06-11** Added 12 new parts and 3 fixed parts
- **2014-11-23** Added 6 new parts and 3 fixed parts