GT New Horizons

Lapotronic Supercapacitor

Mod	GregTech
Type	Tile Entity
Relevant Quest	Take Charge!
Tier	EV
Size	5x5x4-50 (LxWxH)

The **Lapotronic Supercapacitor** (LSC) is an EV tier multiblock for storing and transforming power. The total energy storage, or capacity, of the LSC depends on the number and tier of the capacitors built into the structure. Capacitors range from EV to UMV and increase in energy storage by an order of magnitude with each tier, except the last few tiers (UHV and up) which instead increase the wireless EU threshold. There is no transfer limit on energy/dynamo hatches, but at least UV borosilicate glass is needed for laser hatches. The only downside to the LSC is that it suffers from passive energy loss of 1% of the total energy storage per 24 hours, but that is a very small price to pay for centralized power. Although highly recommended to build as soon as possible, the LSC is mandatory for progression to UXV because it is the only machine capable of uploading an incredible amount of power into a wireless network for use of the Eye of Harmony.

Construction

The LSC can be anywhere between 4 and 50 blocks tall depending on the number of capacitors the player wishes to have. No air is allowed inside the structure, but not all capacitors need to be the same tier and only a majority need to be non-empty. For example, a minimum height LSC may contain 3 IV capacitors, 2 EV capacitors, and 4 empty capacitors. Additionally, the borosilicate glass must be no less than three tiers below the highest tier capacitor. Multi-amp energy and dynamo hatches are supported, but laser energy hatches require at least UV borosilicate glass. The Multiblock Structure Hologram Projector can show/build the LSC for the player with subchannel "glass" to specify the tier of the borosilicate glass, subchannel "capacitor" to specify the tier of the capacitor, and subchannel "height" to specify the total height of the capacitor stack (1-47).

Requires:

- 1 Lapotronic Supercapacitor (Controller)
- 41-777 Borosilicate Glass [1]
- 9-423 Lapotronic Capacitor [1]
- 17-48 Lapotronic Supercapacitor Casings
- 0+ Energy Hatches (any casing)
- 0+ Dynamo Hatches (any casing)
- 1 Maintenance Hatch (any casing)

1. These are independently TIERED components. Not all the capacitors need to be the same tier, but all the

Wallsharing

Multiple LSC's can wallshare some of the casings and borosilicate glass, but it is highly unnecessary and not recommended. There is really no point to having more than one in the same vicinity because a single LSC can have many energy/dynamo hatches and up to 423 capacitors which is more than enough energy storage at all stages of the game.

Usage

The LSC is fundamentally a large battery buffer. The total energy storage, or capacity, depends on the number and tier of the capacitors built into the structure. More specifically, it is the sum of the capacitors' individual capacities. Not all capacitors need to be the same tier and only a majority (>50%) need to be non-empty. The last few tiers also support wireless EU which is covered in the next section.

Passive Power Loss

While running, the LSC loses 1% of its *total* energy storage per 24 hours. This loss is increased by an additional 0.2% per maintenance issue before ultimately shutting down with six maintenance issues. The loss should never be a significant problem for the player as long as the total capacity does not far exceed the average power intake. This means do not add capacitors to an LSC if they are never going to be filled. Use the following equation to calculate the loss in EU/t from the total capacity of the LSC, assuming no maintenance issues.

$$-EU/t = \frac{Capacity}{100 * 24 * 60 * 60 * 20} = \frac{Capacity}{172,800,000}$$

The last few tiers of capacitors have incredibly high capacities and do not follow the same equation. Instead, the passive power loss starts at 1,000,000 EU/t for each UHV capacitor and increases by two orders of magnitude (100-fold) for every tier above. The following table lists all the available capacitors as well as their individual capacity and minimum loss. Note that filling one UMV capacitor with 128 Eye of Harmony and zero power consumption takes approximately 8.22e13 years or 18,108 times the age of the Earth.

Capacitor	Capacity (EU)	Loss (EU/t)	Wireless EU
Empty	0	0	No
EV	60,000,000	-0.3472	No
IV	600,000,000	-3.472	No
LuV	6,000,000,000	-34.72	No
ZPM	60,000,000,000	-347.2	No
UV	600,000,000,000	-3,472	No
UHV	9,223,372,036,854,775,807	-1,000,000	Yes
UEV	9,223,372,036,854,775,807	-100,000,000	Yes
UIV	9,223,372,036,854,775,807	-10,000,000,000	Yes
UMV	85,070,591,730,234,615,847,396,907,784,232,501,249	-1,000,000,000,000	Yes

Power is inserted via energy hatches and extracted via dynamo hatches. There is no limitation on the tier, amount, or size of the hatches other than the minimum casing requirement of the structure. The energy and dynamo hatches do not even need to be the same tier; the player can mix and match different voltages almost like a transformer. However, at least UV borosilicate glass is needed for laser source and laser target hatches.

The only other type of hatch that the LSC requires is a maintenance hatch. The player should check the maintenance hatch regularly because it increases the passive power loss of the machine. It may be useful to place a Needs Maintenance Cover on the LSC and connect that to a howler alarm or other signal that immediately notifies the player of the issue.

Operational Data

View the operational data (used capacity, total capacity, etc.) in the GUI of the controller, or by right-clicking the controller with a Portable Scanner. To display the data externally, right-click the controller with a GregTech sensor kit to receive a sensor card for an industrial information panel. Add information panel extenders around it to widen the screen and provide a redstone signal to turn it on. All lines are displayed by default, but the less useful ones can be hidden by unchecking the corresponding box in the GUI of the information panel. There is also an advanced version which does not require a redstone signal and allows customization of the color, thickness, and tilt of the screen.

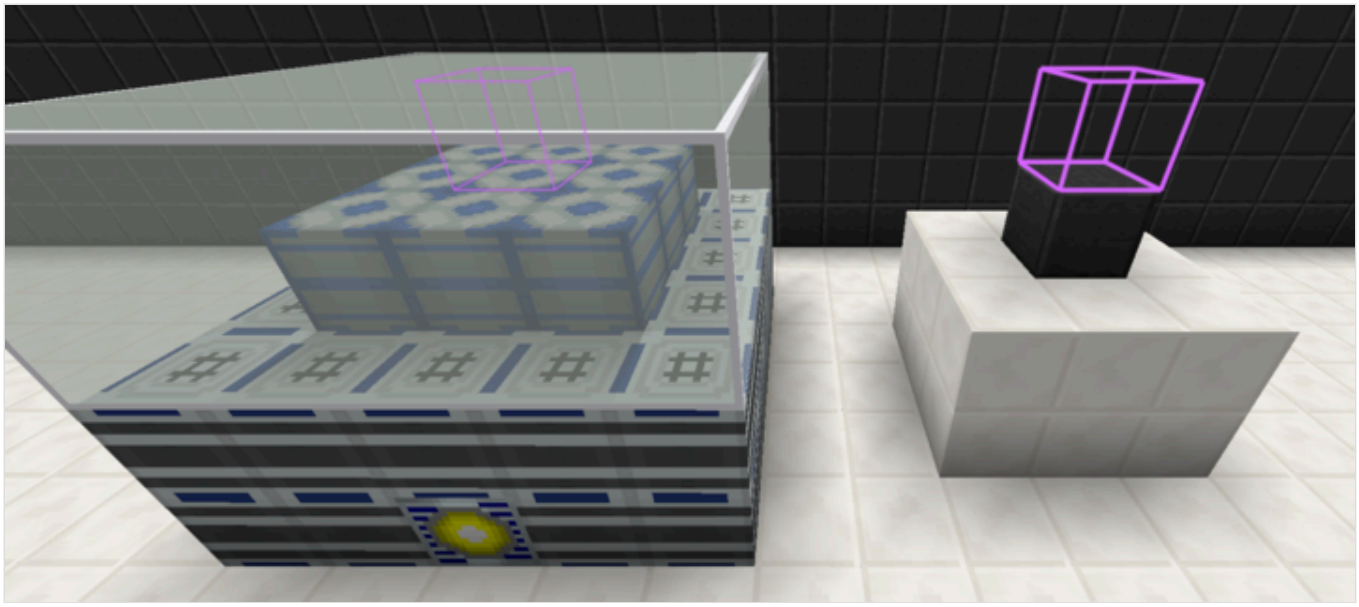
The operational data can even be displayed on the player's HUD through OpenComputers AR Glasses. Setting that up from scratch can be quite complicated so try using the Networked Information Display & Automation Software (NIDAS) software instead. NIDAS is a custom OpenComputers package developed by one of GTNH's very own developers, Sampsa. Instructions for setting it up can be found on the NIDAS wiki page and/or his GitHub repo (https://github.com/S4mpsa/NIDAS).

Advanced Industrial Information Panel on an LSC.

Upgrading

The capacitors, borosilicate glass, and energy/dynamo hatches constantly need to be upgraded as the player progresses. However, it can be very problematic if the centralized power of a base is shut down for even a few seconds to make adjustments. Many machines will power fail and require a manual restart afterwards. The Drone Centre makes it easy to re-enable machines, but the better solution is to *hot-swap* components. The

Hot-swapping an energy/dynamo hatch should be easy enough, but the other components are slightly more difficult. The capacitors, for instance, require breaking and replacing a borosilicate glass block in addition to the capacitor itself--two different blocks within the same time window. Alternatively, the capacitors can be replaced directly with the Ring of Loki by creating an offset that reaches perfectly inside the LSC as shown in the image below. Ensure Loki breaking mode is enabled and the player has sufficient mana before attempting this.



Using the Ring of Loki to hot-swap a capacitor in the center of the LSC. The player need only break and replace the polished shale (black block) to replace the center capacitor.

Hot-swapping the borosilicate glass is even more troublesome because they ALL need to be replaced within the same time window. The Ring of Loki can once again do that fairly easily for the player, but that requires setting many different offsets (highlighted blocks). An alternative option is to use the Wand Focus of Equal Trade, but that has a much higher risk of power failing because not all the borosilicate glass can be replaced at once. Good luck.

The last option is to setup multiple battery buffers (or even a second LSC) to temporarily supply power to a base. There is no risk when swapping out components this way, but it is far more expensive and time consuming. Note that laser hatches naturally function as a temporary battery buffer because they have very large internal capacities.

Wireless Mode

The last few tiers of capacitors (UHV and up) unlock the ability for the LSC to transfer EU wirelessly. Once formed, enable wireless mode in the GUI of the controller or by using a screwdriver on the controller. Nothing will really change about the LSC itself, but now it will either *upload* or *download* EU from a player's wireless network every 6,000 ticks (**five minutes**). The direction depends on whether the internal capacity is above or below the wireless threshold. If below, the LSC attempts to download EU from the wireless network up to the wireless threshold. If above, the LSC uploads all EU over the wireless threshold to the wireless network. Note that there is a button in the GUI of the controller to force a wireless rebalance outside the typical five minute cycle, but it has a one time use.

The wireless network itself is effectively an infinite amount of storage or 2^(2^31) EU with no passive power loss. The current wireless EU in a network is visible with the rest of the operational data in the various locations discussed earlier. Wireless networks are normally private, but all members of a team can join the same network by using the global_energy_join command below. Other related commands are also provided.

- `/gt global_energy_join <name> <host>` adds a player to the host's wireless network. Only the host can execute this command.
- `/gt global_energy_join <name> <name>` returns a player to their own wireless network.
- `/gt global_energy_display <name>` displays the current EU in a player's wireless network.
- `/gt global_energy_set <name> <amount>` (Must be OP) sets a player's wireless network to a specific amount of EU.
- `/gt global_energy_add <name> <amount>` (Must be OP) changes a player's wireless network by a specific amount of EU (positive/negative).

Wireless Threshold

The wireless threshold of an LSC is determined by the number and tier of the capacitors built into the structure. More specifically, it is the sum of the capacitors' individual thresholds. For example, an LSC with two UHV capacitors has a wireless threshold of 60T + 60T = 120T EU which means that it will download EU from a wireless network until its internal capacity exceeds 120T EU, and then begin uploading to the wireless network instead. Every capacitor tier above UHV increases the wireless threshold by two orders of magnitude (100-fold).

Note that the wireless threshold mechanic really only limits the download speed of the LSC and NOT the upload speed. This means a single UHV capacitor is more than enough for any number of Dyson Swarm Ground Units uploading to the wireless network, but at least a UEV capacitor is required to download all the power from just one.

The following table summarizes the effective EU/t of each of the wireless capacitors based on their wireless thresholds and the time between rebalances. For example, an LSC equipped with a brand new UEV capacitor gains 6P EU at the start of the next cycle and should not use more than 476,837A UHV to avoid running out of power within the next 5 minutes.

Capacitor	Threshold		Max EU/t		Amps (UHV)	Amps (UEV)	Amps (UIV)	Amps (UMV)	Amps (UXV)
UHV	6e+13	60 T	1e+10	10 B	4,768	1,192	298	74	18
UEV	6e+15	6 P	1e+12	1 T	476,837	119,209	29,802	7,450	1,862
UIV	6e+17	600 P	1e+14	100 T	47,683,715	11,920,928	2,980,232	745,058	186,264
UMV	6e+19	60 E	1e+16	10 P	4,768,371,582	1,192,092,896	298,023,224	74,505,806	18,626,451

Automation

The LSC is often accompanied by an RS latch to automatically turn off generators such as Large Steam Turbines or Large Gas Turbines when the energy capacity is close to full. The goal is to prevent excess fuel consumption during periods of low power consumption. The following guide walks through how to set this

RS latch stands for set-reset latch and it is a basic circuit for storing a single binary value. The RS latch outputs a high value (1) whenever the *set* signal is activated and outputs a low value (0) whenever the *reset* signal is activated. If neither signals are activated, then the RS latch maintains its last known state. It should not be possible for both signals to be activated at the same time because that can lead to an unpredictable output. How this actually translates to the LSC is very simple. When the LSC has a nearly full capacity, an energy detector cover can send a reset signal to disable any generators and when the LSC has a nearly empty capacity, an energy detector cover can send a set signal to enable any generators.

STEP 1

Place an energy detector cover on the bottom of the LSC and change the settings to read INTERNAL EU. Also set the tick rate to 5 seconds.

The energy detector cover can also go on the side of the LSC, but it must be right-clicked with a soldering iron to set the signal strength to HIGH.

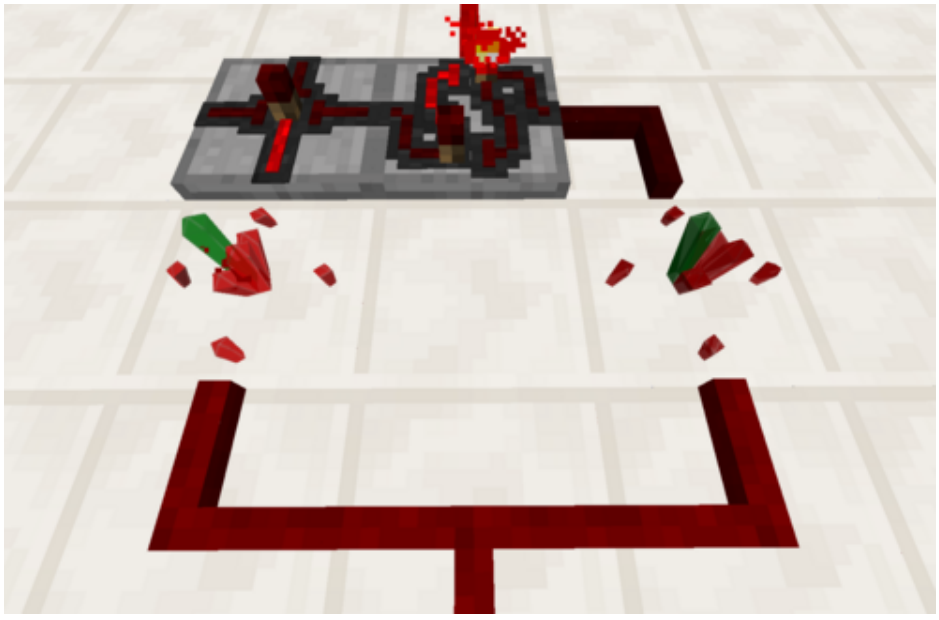
This will output a redstone signal with a strength proportional to the used capacity. Red alloy wire is used to carry the redstone signal.

STEP 2

Connect the red alloy wire from the LSC to this RS latch circuit at the bottom. The red alloy wire at the top is the output that connects to the generators.

The top left component is a NOT gate, the top middle component is an RS latch, and the other two components are Dense Red Crystals from TC.

Sneak right-click the RS latch with a screwdriver (twice) to change its configuration. Right click the Dense Red Crystals with a wand to change their signal strength



Set the left crystal to a low value (ie. 4) and the right crystal to a high value (ie. 12).

STEP 3

Place a machine controller cover on the side of any generators and keep the settings to ENABLE WITH REDSTONE. Also set the tick rate to 5 seconds.

This will enable the generator(s) when the left crystal is activated, or when power is less than ~20%, and disable the generator(s) when the right crystal is activated, or when power is greater than ~80%.

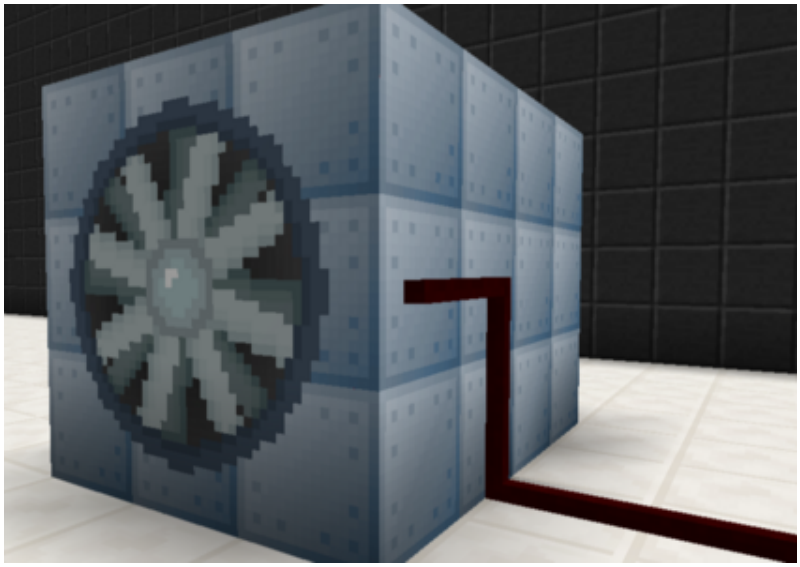
Change the strength of the Dense Red Crystals to change these percentages.

STEP 4

Place the remaining block to complete the structure and run the red alloy wire over the side to reach the machine controller cover.

Parallelizing this approach is as simple as extending the same red alloy wire to other generators.

Note that there are also framed red alloy wires that can carry redstone signals without being attached to the side of any blocks.



Retrieved from "https://wiki.gtnewhorizons.com/wiki/Lapotronic_Supercapacitor?oldid=12403"