UNIVERSE: ELECTROCELLS

A guide to power in the 24th Century

INDEX

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[1] INTRODUCTION

[1.1] The following rules are designed to serve as guidelines for adding electrical power to SPI's Universe RPG. In addition to covering details on electrocells and other new equipment, these rules provide both a simple and advanced method of determining equipment power consumption. Many examples and information boxes facilitate the simple integration of these guidelines into the existing Universe game system. Power consumption data for all of the equipment in the original game are provided in convenient tables in appendix I. Optional Power Rules for spacecraft power are given in appendix II.

[1.2] The Federation has established a standard for supplying electrical power to equipment. This is part of the same standard that establishes the power unit for use in spacecraft. The Standard is based on CIV 7 technology, and covers power available at power outlets via power grids, and portable electrocells. The Resources utilized in electrocell production varies on different worlds, and include Nickel, Iron, processed radioactives, and a few other resources.

[1.3] This Federal Standard establishes seven power output levels. The power level of each cell type is 10 times greater than the proceeding type. Power values (units) for each Electrocell are given in Table [1.3] – Electrocells along with their standardized size, weight, and characteristics. The Power level available at Power Grid outlets is 03. Power level 07 is equivalent to one unit of power for use on spacecraft.

Table [1.3] – Electrocells – All CIV 7

Equipment	Code	POW	Wgt Kg	Price	Recharge	Dimensions	TNU	BRT
Power Grid Node	07	1,000,000	245	1 Tran	300 Mill	1m L x 1m Diam	n/a	n/a
Industrial Power	06	100,000	100	830 Mill	230 Mill	1m L x .5m Diam	n/a	n/a
Vehicular Power	05	10,000	40	665 Mill	165 Mill	1m L x .1m Diam	n/a	n/a
High Power	04	1,000	10	500 Mill	100 Mill	.5m L x 5cm Diam	n/a	n/a
Standard Power	03	100	1	335 Mill	35 Mill	.25m L x 2.5cm Diam	n/a	n/a
Small Power	02	10	0.25	170 Mill	15 Mill	10cm L x 1 cm Diam	n/a	n/a
Mini Power	01	1	0.01	50 Mill	5 Mill	1cm L x .1cm Diam	n/a	n/a

POW = Power Units, TNU = Time Needed for Use, BRT = Base Repair Time

[1.4] The Federal Standard also addresses performance criterion for electrocells. Some of the criteria are addressed in the list below:

- **must be re-chargeable a minimum of 50 times**
- **must display current charge (size 02 and larger cells)**
- **automatically cease charging when fully charged**
- **have an unused shelf life of 3 years**
- **withstand prolonged exposure to vacuum**
- **withstand prolonged periods of acceleration to 5 g.**
- **withstand short periods of acceleration to 9 g.**
- **be tolerant of normal impact and vibration**
- **resist corrosion in all "earthlike" atmospheres**
- **withstand prolonged periods at -100º F.**
- **withstand prolonged periods at +100º F.**
- **not explode upon casing breech**
- **have a power node end (tapered)**
- **have a power connector end (flanged)**
- **communicate current power to smart equipment**

[1.5] Electrocells contain a power node end (tapered), where electrical power is passed to equipment, and a power connector end (flanged), which may accept another electrocell connector, or a power coupler. Three different connector end sizes are listed in Table [1.5]. When two electrocells are attached directly to each other's connector (flanged) ends, it is referred to as **cell stacking**. Cell stacking is only permitted by electrocells that share the same connector size. Specific cell behavior when cell stacking is covered in section [2.1].

Table [1.5] Connector Size

Cell Type	Connector Size
01 to 02	Light
03 to 05	Standard
06 to 07	Heavy

[1.6] A Power Coupler can be used to connect an electrocell to a power grid outlet or to another electrocell when cell stacking is impractical. The power coupler is a flexible, insulated cord with a quick connect device at either end that is designed to interface with electrocell power connectors and power outlets. Three different coupler sizes exist, and these match the connector end sizes listed above. Couplers also come in normal and Super Conductor versions, with different physical qualities, and power transfer rates.

Table [1.5] – Electrocell Couplers

Equipment	Codes	CIV	Wgt Kg	Price	Equipment Notes	TNU	BRT
Light Coupler	01 to 02	7	.5/M	5 Mill per M	Connects light connector sizes	1 Rd	10 Min
Standard Coupler	03 to 05	7	.7/M	10 Mill per M	Connects standard connector sizes	1 Rd	10 Min
Heavy Coupler	06 to 07	7	.9/M	25 Mill per M	Connects heavey connector sizes	1 Rd	10 Min
SC Light Coupler	01 to 02	7	.5/M	15 Mill per M	Connects light connector sizes	1 Rd	10 Min
SC Standard Coupler	03 to 05	7	.7/M	20 Mill per M	Connects standard connector sizes	1 Rd	10 Min
SC Heavy Coupler	06 to 07	7	.9/M	50 Mill per M	Connects heavey connector sizes	1 Rd	10 Min

Universal Power Couplers may also be used for power transfer, power sharing, or power draining. The resource for a typical Power coupler is Copper. Super Conductor Power Couplers and transmission lines are available for fast power transfers and long range power distribution. The basic resource for a super conducting cord is Germanium. Many electronic equipment items come with a 1 meter long **standard** power coupler of the appropriate rating.

[2] RECHARGING AND CONFIGURING CELLS

[2.1] Electrocells of size 04 or less may use cell stacking for recharging a cell. The rate of power flow for cell stacking uses the super conductor rates given in Table [2.3]. Cells of size 05 or greater may also utilize cell stacking, but their size and mass often make this impractical, as at gravities greater than .5, the connector end can no longer support the mass of the cells involved. The following conventions are followed when cell stacking is used.

- Power will always move from a free cell to a connected cell
- Two free cells will always recharge the cell with the lowest charge

Example: A character wants to recharge a drained 02 electrocell on his Energy Scanner. He takes the 03 cell from his Chem Synthesizer, and stacks it (connects it to) the drained 02 cell. The 02 cell is fully recharged in 6 seconds (0.1 minutes), and the 03 cell has lost 1/10th of it's charge.

Cell Stacking uses the super conductor recharge rates (table [2.3]) when recharging a cell.

[2.2] At the GM's discretion, electrocells for some items may use cell stacking while the item is in operation. Items that support this option will leave the flange end of the powercell exposed. Cell stacking effectively doubles the duration or uses an item has available. See section [6.3] for special notes on double stacking beam weapon electrocells.

[2.3] Electrocells recharge at a rate contingent upon the rating of the power source, the rating of the cell being recharged, and the type of coupler being used. Recharging rates listed on table [2.3] are given in minutes for a full recharge. Cross reference the Power Source value with the value of the Recharging Cell. The number before the slash is the number of minutes to recharge using a standard coupler. The number after the slash is the number of minutes to recharge using a super conductor coupler, direct cell to outlet connection, or recharging via cell stacking.

Example: An 03 electrocell (100 power units) connected to an 03 power outlet with a standard coupler, will take 10 minutes to fully recharge. However, at 04 electrocell, being recharged at an 03 outlet via a standard coupler, would take 100 minutes to fully recharge.

Table [2.3] Connector and Coupler Recharge Rates

	Power Source						
Recharging	1	2	3	4	5	6	7
1	10 / .1	10 / .1					
2	100 / 1	10 / .1					
3			10 / .1	10 / .1	10 / .1		
4			100 / 1	10 / .1	10 / .1		
5			1000 / 10	100 / 1	10 / .1		
6						10 / .1	10 / .1
7						100 / .1	10 / .1
	Light Connector		Standard Connector			Heavy Connector	

.1 min = 6 sec 100 min = 1hr, 40min 1000 min = 16 hrs, 40 min

[2.4] Various power converters are available that allow interface to other power sources. These converters are listed along with other power specific equipment in table [9.0] New Power Related Equipment. When calculating recharge rates with power converters in place, items still recharge at rate based on the recharging cell and the highest cell rating for the compatible connector type.

Example: When using a standard to light converter in order to recharge an 01 cell from an 03 source, the source is treated as an 02 source for determining recharge rates. However, the amount of charge lost by the source is still based on the number of units drained in the recharging. In this example, 1/100th of the sources available power.

[2.5] Power generation systems are available to generate power, or re-charge electrocells. These power related include solar panels, all fuel generators, and portable fusion plants. These items are listed in table [9.0] New Power Related Equipment, with additional details in section 9.1.

[2.6] When using a technical skill for electrocell related tasks, the Electric Tech Skill is used for power levels of 01 to 04, and the Energy Tech Skill is used for power levels of 04 to 07. Both skills may be used for the 04 power level. Also, GM's may allow other tech skills (Vehicle, Weapon) to attempt electrocell tasks that relate to their specific skill.

[2.7] Electro and Energy technicians are capable of creating complex power configurations. At the GM's discretion, a technician with an electro kit may link multiple electrocells and sources in a series (summing power), in parallel (sharing power), or use splitters and other devices to further manipulate power flows. See section [8.0] New Skill Tasks for a technicians chance of succeeding at such tasks.

[2.8] Electro and Energy technicians may use electrocells and power sources to rig electric hazards. A technician with an electro kit, a power source, and optionally some conducting medium, may rig a power hazard. See section [8.0] New Skill Tasks for details on which skill is appropriate and for the chance of success. See section [10.0] Electrical Hazards for a description of the effects of an electrical hazard. CIV level 8 equipment is not subject to this kind of modification.

[3] POWER CONSUMPTION

[**3.1] Simple Method Power Consumption – A electrocell should provide 10 *uses* of equipment with heavy power requirements, 10 *hours* of operation for short duration equipment, 10 *days* of operation for long duration equipment.** Civ Level 6 equipment will require a electrocell with one rating higher than equivalent Civ level 7 equipment. Civ Level 8 equipment may require a electrocell one rating lower than the equivalent Civ Level 7 equipment. Robots can operate for 14 days on a single charge. Vehicles can operate to the full extent of their range on a single charge. Weapons requiring electrocells use their ROF as the number of uses per electrocell.

[3.2] Advanced Method Power Consumption - Use table [3.1] Base Power Usage to establish basic power requirements. Robots, Vehicles, and Powered Weapons use the special formulas listed in 4.0 through 6.0 for determining power consumption.

Table [3.2] – Base Power Usage

Equipment Type	Wgt (Kg)	Size Class	Base Power Usage
Miniature Device	<1 Kg	Miniscule	0.1
Hand Held Device	1-5 Kg	Very Small	1.0
Portable Device	6-15 Kg	Small	10.0
Movable Device	16-100 Kg	Human Sized	100.0
Heavy Equipment	101+ Kg	Large	1000.0

[3.3] Modify the Base Power Usage by all equipment aspects shown on Table [3.2] Usage Multiplier Matrix. All multipliers are cumulative.

Table [3.2] – Usage Multiplier Matrix

Equipment Type Vs. CIV Level	CIV 5	CIV 6	CIV 7	CIV 8
Emits Ray, Beam, or Long Range Radio Waves	X 20	X 10	X 5	X 2.5
Emits Fied, Scan, or Medium Range Radio Waves	X 8	X 4	X 2	X .5
Contact Scan, or emits Low Range Radio Waves	X .8	X .4	X .2	X .1
Records/Computes Data	X 2	X 1	X .5	X .25
Long Duration Item (Micro-electronics)	X .4	X .2	X .1	X .05

[3.4] After determining the base power usage multiplier, determine the number and type of electrocells required to operate the equipment, and whether the units will be *uses, hours*, or *days*. The number of electrocells required can be altered in order to get close to the 10 *uses*, 10 *hours*, or 10 *days*.

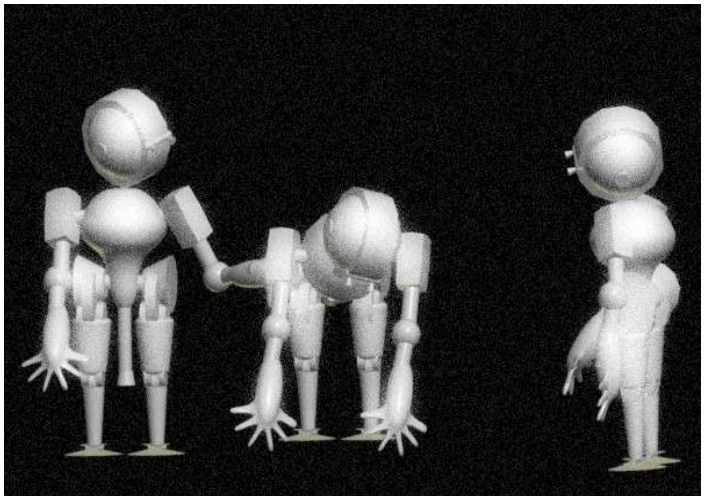
Example: The geoscanner-I weighs 25 kg, yielding a base power usage of 100. Cross referencing its CIV level of 6 with the best description to the right (emits scan), yields a consumption multiplier of x4, for a power requirement of 400 units. As the geoscanner-1 is designed to perform a number of scans, rather than for short or long term operation, the units are determined to be *uses*, rather than *hours* or *days*. Since a single 04 cell, would only power the cell for 2.5 uses, an 05 cell, allowing 25 uses is chosen. The GM determines that the 05 cell is carried in a back-pack, and attached to the Geoscanner-I via a 2 meter standard coupler.

[4] ROBOTS

[4.1] Power Usage for Robots (Advanced system) uses the following formula.

Base Robotic Power Usage

Multiply Agility x Unloaded Mass (kg)
Add +10 per point of strength
Add +10 per point of dexterity
Add +10 per point of projectile Armor
Add +10 per point of beam Armor
Add +10 per Hardware Point
Add +1 per Software Point



Once the base power consumption has been determined, use the following steps to calculate the days of operation before recharging is necessary.

- If the Robot is CIV 8, multiply the Base Power Consumption by .5
- Divide the adjusted Power Consumption by 1000 (the Power available in a 04 electrocell). This yields duration in weeks.
- Multiply duration in weeks by 7 to get duration in days.

Use the following formula for determining hour power consumption:

Hourly Power Consumption = 1000 (04 cell) / (Duration in Days X 24)

Example: A Brummagen I robot has an agility of 1 and a base wt of 180 kg's empty, yielding a base power requirement of 180. Adding 10 for every point of Strength, Dexterity, projectile armor, beam armor and the 2 hard point's yields an additional requirement of 270. The 2 Software points add another 2 for a grand total of 180+270+2 or 452. Since this is a CIV 7 robot, there is no Civ Modifier. Dividing the Power usage into the 1000 power rating of the 04 robotic electrocell yields 2.21 weeks of operation on 1 electrocell. Multiplying this by 7 yields 15.5 days of operation before recharging is necessary. The hourly power consumption would be 2.69 units per hour.

[4.2] Power consumption for robots may be reduced by shutting down all non essential systems. This is a "sleep" mode for robots, during which power consumption is multiplied by .1. A robot in "sleep" mode will re-activate upon hearing the voice of a designated controller speak its name. It can also be reactivated via the remote, or via physical contact.

[4.3] Power consumption for a robot is not effected by terrain. The adjustment to robot speed incorporates power consumption. When traveling in difficult terrain, the robot consumes the same amount of power to traverse less ground.

[4.4] Optionally, a GM may calculate differences in power consumption for Robots carrying cargo. Use the unloaded mass (in Kg) for the robot, plus the weight (in Kg) of all Cargo carried, before calculating the robots energy consumption. Durations for robots listed in appendix-I are for robots carrying no significant cargo. Encumbrance for equipment not stored in Cargo Areas is covered under section [26.5] of the main rules.

[4.5] Optionally, a GM may further modify robotic power consumption by the gravity of the world on which the robot is being operated. To modify for local gravity, divide the listed duration for the robot by the local gravity value in G's. For Near Weightless gravity, use .1 for calculating the gravity related power consumption.

Example: A Frazette Blue, with a standard duration of 5 hours, may operate for 7.14 hours on world with .7 g gravity (5 hrs / .7 g).

[4.6] Optionally, a GM may further modify robotic power consumption by the way in which the robot is operated. Robotic durations are based on human 16 hour days. If the robot is performing tasks 24 hours a day, or is performing particularly strenuous activities, the GM may further increase the rate of power consumption, thereby further reducing the robots duration per charge.

[4.7] New Robotic Systems – A robot may mount an additional (back-up) 04 electrocell to one hardware point. A robot may substitute an 05 electrocell at the cost of 2 – hardware points. These new Robotic Systems are listed in Table [9.0] New Power Related Equipment. Cell stacking of robotic electrocells is not permitted due to space limitations, but additional cells may be placed in robotic cargo areas (if of sufficient proportions), and attached via power couplers.

[4.8] The Robot/Equipment Pod has 04 outlets, in addition to the standard 03 outlets for general equipment.

[5] VEHICLES

[5.1] Power consumption for vehicles is incorporated into the values given for range. Most vehicles (but not all) use the 05 electrocell with 10,000 power units. Power consumption per Km is determined by the formula:

Power Consumption by Distance = Cell Rating (10000 for 05 cells) / Range in Km

Example: A Rover, using an 05 cell, with a range of 300 (30,000 km), consumes .333 units of power per Km.

[5.2] Power consumption for vehicles is reduced when not traveling. Multiply Power Consumption per Km by .5 if significant vehicle systems are being used or the vehicle is idling for prolonged periods, but not traveling. Note that this computation is per **minute**, rather than per kilometer.

Example: A Rover with a .333 units per Km Power consumption rate, will consume (.5 x .333) .1666 units of power per minute.

[5.3] Power consumption for vehicles can be further reduced by shutting down all non essential systems. A vehicle using only minimal systems consumes power at .1 its normal power consumption. Vehicles with environmental controls may not use this option, and must consume power as in section [5.2] above. This is also a computation per **minute**, rather than per kilometer.

[5.4] Optionally, Power consumption for a vehicle is effected by cargo carried. Use the following table to determine the effect of being loaded on vehicle range and power consumption. These effects only apply when cargo capacity is 1000 kg or more, or passenger capacity is 10 or more.

Table [5.4] – Loaded Vehicles/Robots

Vehicle Load	Duration/Range	Consumptioin
<25%	X .75	X 1.5
26% to 75%	X .5	X 2
>76%	X .25	X 4

Example: A mobile lab (cargo capacity of 25 or 2,500 kgs), is loaded with 1000 kgs of additional laboratory gear. As 1000 kg load / 2500 kgs capacity is 40%, the normal range of 100 is reduced to 50 while under this load.

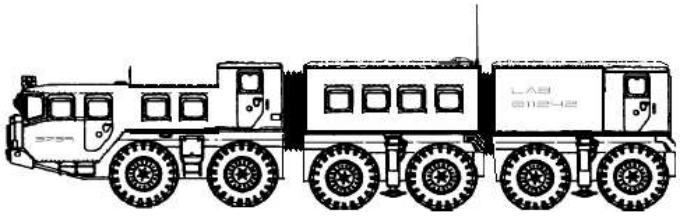
[5.5] Power consumption for Anti-Gravity Vehicles covers only non drive use of power. The ranges listed for Skimmers, Floaters, and Levitators only cover the non drive power requirements of these anti-grav vehicles. Monopolar drives do not require power to operate, and these vehicles can continue to function as vehicles without environmental and other power systems (lights, etc) being used.

[5.6] Cell stacking of electrocells is not normally an option for vehicular (05) electrocells. Connecting via coupler to a back-up or larger electrocell on board the vehicle remains an option.

[5.7] Optionally, a GM may further modify vehicular power consumption by the gravity of the world on which the vehicle is being operated. To modify for local gravity, divide the listed range for the vehicle by the local gravity value in G's. This optional modifier does not apply to anti-grav vehicles.

Example: A mobile Lab, with a standard duration of 100 (10,000 km), operated on a world with .7g gravity, will have a duration of (100/.7) 142 (14,200 km) on this world.

[5.8] Optionally, a GM may further modify vehicular power consumption by the way in which the vehicle is operated. Aggressive or high speed operation will consume twice as much power as normal. Cautious and slow vehicle operation may reduce power consumption by as much as half.



[5.9] The Original Universe Game lists on board power generators (fusion and petroleum) for many vehicles. The GM may use the portable fusion generator and all fuel generator for calculating power related issues with these on board generators.

Recharging the standard 05 vehicular electrocell from a standard 03 outlet and coupler, will take 1000 minutes (16 hour, 40 minutes). Recharging the same 05 vehicular electrocell from ships power (07), will take 10 minutes.

[6] BEAM WEAPONS

[6.1] Power Consumption for Beam weapons is incorporated into the weapons ROF. When calculating Power consumption per shot, use the following formula:

Power = electrocell Units / ROF

Example: A CIV 8 Arc Gun, with a ROF of 4, drains 25 power points per shot of the 100 power points available in its standard electrocell.

[6.2] Beam weapon consumption of power is handled differently depending on the method a GM has players keeping track of ammunition. The pertinent sections discussing ammunition expenditure are repeated below.

- **From Section [19.0]**
  No cost or availability is given for ammunition used in these weapons. Aside from the time required to reload during Action Rounds (see 29.5), it is assumed that a character with a weapon has plenty of ammunition. If the GM wishes to keep track of ammunition, he should have the players note the expenditure of one clip each time they fire a number of shots equal to the weapon's *Fire Rate* (cumulative from Action Round to Action Round). The GM is responsible for determining the price, weight, and availability of each type of clip if he is keeping track of ammunition.

- **From Section [29.5]**
  He [a character] may fire the weapon up to a number of times equal to the weapon's *Fire Rate* (listed on the Weapon Chart). However, if he fires a number of times *greater than half the* weapon's Fire Rate, the weapon becomes *unloaded* and may not be fired again until loaded (an action listed in 29.3). Thus, a weapon with a Fire Rate of 1 must be reloaded after each fire. As long as a weapon is fired a number of times equal to or less than half its Fire Rate, the character need not pause to reload.

[6.3] At the GM's discretion, military beam weapons may permit cell stacking of electrocells, doubling the amount of shots available to a weapon. This should not allow increases in beam weapon ROF. Weapons may also be attached to larger electrocells via power couplers, again increasing the shots available, but not the ROF. Pushing the ROF higher via a tech skill, or other means should be treated as a rare avoidable accident every time the weapon is operated, with the following result:

- The beam producing element of the weapon melts (sparks, smokes) and the beam weapon is rendered destroyed.

[7] PROPREITY POWER AND SUSTAINED POWER

[7.1] Some Equipment will use propriety power supplies that do not comply with the standard. Also, some equipment may use propriety power, but still be capable of being powered by standardized electrocells as an alternative. Use the following guidelines for propriety power sources. Also note that for many electronic items, the size of the electrocell is the primary factor in determining the size (and mass) of the item.

Civ Level 5 and lower equipment can not, based on their own technology, provide power that matches the standard. Unless this equipment has been specifically designed for export, and therefore meets the standard via imported electrocells, it must come with propriety power supplies. In general the size, weight and capacity of the power source should exceed the standard by a factor of at least 2 (x2), and the power consumption for these items will be higher as well (x4). Furthermore, they may not meet the safety and durability standards covered in section [1.2].

CIV Level 6 equipment can come close to the standard, with difficulty. Propriety electrocells of Civ 6 should be 1.5 times the size, weight, and cost of the standard. Power usage should be about twice (x2). Safety and Durability may be compromised.

CIV Level 7 propriety equipment may vary slightly from the standard, but as this is the same CIV Level, and therefore technological sophistication upon which the standard was based, it typically matches the standard. Extreme miniaturization of some electronic devices, although expensive, permits very efficient power usage. This technology is most evident in Robots.

CIV Level 8 propriety equipment can exceed the standard in compactness, and available power. Propriety Power sources can be as little as half the size and weight of the standard, and produce twice as much power, while power consumption for this equipment is one half (.5). Propriety equipment should cost double that listed for equipment geared toward the standard. Note that some propriety equipment may still meet the "standard" through redundant Power supplies, but the cost increase remains in place. In addition to the extreme miniaturization of electronic components first noted at CIV 7, at Civ 8 these electronics are often embedded within equipment structure. It is for this reason that the electro technician suffers a loss of 2 skill levels when working on CIV 8 electronic equipment, as separate electronic components are less accessible.

[7.2] Some micro and nano sized propriety items will incorporate sustained propriety power systems that due not require recharging. Systems that contain such power sources are designed to last for extended period of times (see table [7.2]). These tiny power sources have not been standardized. When such devices are designed to be powered by standardized 01 electrocells, the duration is comparable to those listed for propriety power sources at CIV Level 7. Note that the 01 Cell may be much larger than the device being powered.

Table [7.1] - Micro Powered Durations

CIV	Days	Months
6	100	3
7	1000	30
8	5000	165

[8] NEW SKILL TASKS

[8.1] The introduction of electrocells bring several new skill tasks to the electro tech and energy tech skills. Information regarding these skills are repeated in their entirety.

- **ELECTRO TECH**
  8 Levels/Limit: Dexterity
  The character may repair all types of handheld, non-weapon devices, including scanners, portable labs, cameras, Holographers, radios, and all other types of small electronic equipment. The Electro tech skill may not be used to repair interstellar commlinks, psionic equipment, and computer systems. A character's Electro Tech Skill Level is reduced by **2** (to a minimum of **1**) when repairing or inspecting any Civ Level 8 device. An Electrokit is required to repair any of these items that has incurred more than light damage. Electro Tech also allows a character to operate a two-way radio skillfully.

- **ENERGY TECH**
  6 Levels/Limit: Dexterity
  The character is familiar with all types of power systems. He may repair heating and cooling systems, electrical systems, air systems, and all non-combustion drive systems (including spaceship engines). The kit required for repair depends on the type of system undergoing repair. An Electrokit would be used for most portable systems, a vehicle kit for damage to a vehicle climate-control system or engine, and a spaceship kit would be used for a spaceship engine or other

spaceship system. A basic repair kit may not be used to repair power systems at all. The character may also attempt to repair a damaged force field. When doing so he uses the lower of the *Energy Tech* and *Physics* Skill Levels. If he does not possess both of these skills, he may not attempt repair. An Electrokit is required to repair a personal force field. A vehicle or spaceship kit (as appropriate) is required to repair a larger force field.

Electrocell tasks on power levels between 01 and 04 use the Electro Tech Skill. Electrocell tasks on power levels between 04 and 07 use the Energy Tech Skill. Both Skills may conduct tasks at 04 levels.

Electro Tech/Energy Tech Tasks:
T⇨ Temporarily rig an item to use a power source without the appropriate power coupler.
BC 50% Time: 1 Min

T⇨ Temporarily rig an item to operate off a propriety power source:
BC 30% Time: 5 Min

T⇨ Access a power supply or power grid at a point other than the standard Universal Power Jack.
BC 10% Time: 5 Min

T⇨ Create a complex power configuration to manipulate the flow of power.
BC 10% Time: 10 Min

T⇨ Rig a power hazard.
BC 0% Time: 10 Min

[9] EQUIPMENT TABLES

[9.1] Table [9.1] New Power Related Equipment lists new equipment that is specific to the use of electrocells. Included in this list are Solar Panels that Match Standardized Outputs. Items that are included in the electro tech kit are indicated.

Table [9.1] New Power Related Equipment

Equipment	Codes	CIV	Wgt Kg	Price	Description	TNU	BRT
Lt Power Converter	Lt to Std	7	1	25 Mill	Connects 01 through 05	1 Rd	10 Min
Hvy Power Converter	Std to Hvy	7	2	35 Mill	Connects 03 through 07	1 Rd	10 Min
Universal Concerter	All	7	2.5	50 Mill	Connects 01 through 07	1 Rd	10 Min
Power Tap	All	7	0.5	50 Mill	Allows coupler to tap into power line	1 Min	10 Min
1m Solar Panel	03	7	10	500 Mill	Solid 1m square panel	n/a	10 Min
.1m Solar Panel	02	7	1	350 Mill	Solid .1m square panel	n/a	10 Min
1cm Solar Panel	01	7	2 g	150 Mill	Solid 1cm square panel	n/a	10 Min
1m Flexipanel	03	7	2 kg/m	750 Mill	Rolls of flexible 1m Square panels	n/a	10 Min
Std All Fuel Gen	03	7	10	500 Mill	Generator that burns any organic material	1 Min	1 Hr
Hvy All Fuel Gen	04	7	50	900 Mill	Generator that burns any organic material	1 Min	1 Hr
Portable Fusion Gen	04	7	500	18 Tran	Portable Fusion Plant with 04 output	n/a	20 Min
Portable Fusion Gen	05	8	425	20 Tran	Portable Fusion Plant with 05 output	n/a	20 Min
Robotic Extra Power	04	7	10	1 Tran	Backup or Auxilley power for robots	n/a	20 Min
Robotic Hvy Power	05	7	40	12 Tran	Heavy Duty power for robots	n/a	20 Min

[9.2] Equipment Notes:

Solar Panels – Energy output for Solar panels are based on Earthlike Conditions. Variations in Stellar Luminosity and distance can greatly affect Solar Panel Output. Use the following table to determine Solar Panel Output for orbits and planets with no atmosphere. The number listed on the matrix is multiplied by the standard output of the panel. Solar Panels may be coupled with electrocells to create power systems.

Table [9.1a] – Solar Panel Stellar Luminosity Matrix

Orbit vs. Stellar Type	0.5	1.0	1.5	2.0	2.5	3.5	5.0	7.0	10.0	15.0	25.0	40.0
A	8.800	2.200	0.970	0.550	0.350	0.180	0.090	0.040	0.020	0.010	0.004	0.001
F	5.200	1.300	0.570	0.320	0.210	0.110	0.050	0.030	0.010	0.006	0.002	0.001
G	4.000	1.000	0.440	0.250	0.160	0.080	0.040	0.020	0.010	0.004	0.002	0.001
K	3.600	0.900	0.400	0.220	0.140	0.070	0.040	0.020	0.009	0.004	0.001	0.001
M	0.800	0.200	0.090	0.050	0.030	0.020	0.008	0.004	0.002	0.001	0.001	0.001

Numerous other factors, such as atmospheric composition, cloud cover, and day light cycles due to axial tilt and planet rotation, will all affect solar panel output. Calculate full daylight exposure, and multiply by 75% to adjust for periods of dawn and dusk. Details on the various types and sizes of solar panels are listed in table [9.1] New Power Related Equipment.

All Fuel Generators – All Fuel generators can burn any organic material. On worlds with little or no oxygen present in the atmosphere, an oxygen tank will be required. Ten minutes of oxygen is consumed per KG of material consumed. In addition to providing energy, an All Fuel Generator can be used as an incinerator to destroy hazardous materials. All Fuel Generators can be coupled with electrocells to create power systems. Details on All Fuel Generators are listed in table [9.1] New Power Related Equipment.

Portable Fusion Generators – At CIV level 7, portable Fusion Generators become available. Portable Fusion Generators use raw radioactives as a power source, and can operate for years on a single kg of fuel. Portable Fusion Generators can be coupled with electrocells to create power systems. Details on Portable Fusion Generators are listed in table [9.1] New Power Related Equipment.

[9.3] Appendix 1 Lists electrocell requirements and power durations for all the equipment listed in the original game.

[10] ELECTROCELL ELECTRICAL HAZARDS

[10.1] Faulty equipment and the inappropriate handling of electrocells may result in electrical shock. A electrocell operating outside of the performance criterion listed in section [1.4] may become an electrical hazard at the GM's discretion. The chance that a electrocell will become an electrical hazard from taking damage is listed on below. Damage is determined by rolling 1d10, adding the appropriate modifiers on tables [10.1] and [10.2], and checking the results on table [30.9] Hit Table of the main Universe Rules. At high power ratings (05 thru 07), electrical damage may be delivered over a range, or via any conducting surface in contact with the electrocell. Note that electrical traps and accidents may also result in electrocells becoming electrical hazards.

- A electrocell with light damage has a 10% chance of becoming an electrical hazard
- A electrocell with heavy damage has a 50% chance of becoming an electrical hazard.
- A electrocell with destructive damage (partial or total) will automatically become an electrical hazard and immediately discharge all remaining power.

Once a electrocell becomes an electrical hazard, it will no longer perform it function as a source of power.

[**10.2] Damage from electrical shock is further modified by the composition of the entity taking damages.** See Table [10.2] for specific effects.

Table [10.1] Electric Shock Damage

Electro Cell	Effect Range	Damage Mod	Possible Additional Effects
1	Contact	-10	None
2	Contact	5	None
3	Contact	0	Unable to loose Grip
4	Contact	10	Burn & Recoil
5	1 m	20	Heart Filbrillation
6	5 m (Same Hex)	30	Cardiac Arrest
7	7.5 m (1 hex)	40	Deep Burn Damage

Table [10.2] Composition Modifiers

Composition	Damage Mod
Human/Humanoid	0
Mammalian	0
Terran Like	-5
Protein	-10
Carbon	-15
Non-Carbon	-20
Equipment (CIV 5 or 6)	20
Equipment (CIV 7)	5
Equipment (CIV 8)	-10

[10.3] A character with Energy Tech Skill may mitigate the amount of damage taken from electric shock under certain circumstances. Electric Shock is much more damaging when the path of electricity travels through the chest or head. An energy technician can, by intentionally or instinctively limiting the electric flow to a single limb, may treat any electric shock as if it were 1 level lower than the actual electric source, when determining damage modifiers.

[11] CREATURE POWERS

[11.1] Some creature powers listed in the Adventures Guide may be further supplemented by the electrocell rules. The Energy Drain power specifically discusses draining electrical equipment. A GM may wish to assign an electrical capacity, and drain rate based on the electrocell scale, in order to determine partial drains. Energy Blast, Energy Absorption, and Energy Ingestion Powers have no direct effect from the electrocell rules, but may be further refined using these rules at the GM's discretion.

Energy Drain Example: The GM assigns an 03 electrical capacity and a 1 – combat round drain rate to a creature with the Energy drain Power. When the creature makes a successful attack on the party's robot, it drains 03 worth of electrical energy from the robot, which is 1/10th of its 04 battery, before dropping off robot, fully satiated.

Energy Absorption Example: The GM decides to use the electrocell rules to further enhance the Energy Absorption power of his creature. Where normally the power allows the creature to absorb all stun and beam weapon energy, the GM further stipulates that once the creature has absorbed the equivalent of 05 power absorption, it will deliver an electrical Energy Blast.

[12] POWER RELATED ACCIDENTS

[12.1] GM's may wish to incorporate some of the power related accidents listed below.

COMMON
- A equipment items electrocell power level display goes blank, or begins to give false reports.
- Upon trying to use equipment, an electric arc is emitted from the electrocell – the electrocell works fine on any subsequent attempts to use the item.
- An electrocell connected via cell stacking becomes disconnected and falls from the item.
- The power node of an electrocell is defective, and the cell will not provide power.
- A vehicular electrocell connector works free, interrupting power. It may be reconnected.
- An Electrocell begins to make a loud crackling noise, but with no other effect.

RARE
- Upon use, an electrocell becomes an electrical hazard to any attached equipment item.
- In a non "Earthlike" atmosphere, corrosion causes the electrocell to become an electrical hazard.
- Upon use, an electrocell becomes an electrical hazard to anyone holding or carrying an equipment item.
- Upon trying to use equipment, an electric arc is emitted from the electrocell – the electrocell becomes an electrical hazard upon any subsequent attempts to use the item.

- An electrocell arc welds the power node to the equipment interface – the cell works, but can not be removed from the equipment.
- An electrocell attached to another via cell stacking, recharges in the wrong direction.
- A faulty power connection causes stored equipment to activate, possibly without characters realizing it.

UNIQUE
- An electrocell arc welds the power node to the equipment interface, rendering the equipment unusable.
- A faulty power connection causes a stored beam weapon to fire.
- A vehicular electrocell malfunctions, with total and immediate electrical discharge – see electric hazards.
- A faulty power connection totally destroys attached equipment.
- A suit electrocell malfunctions, with total and immediate electrical discharge – see electric hazards.

Appendix I – Adding Electrocells and Power Usage to Listed Equipment

Table [19.0] Weapon Chart Expansion

Equipment	E-Cell	Duration	Unit
Pain Gun (CIV 6)	03	2	U
Paint Gun (CIV 7)	03	6	U
Arc Gun	03	4	U
Laser Pistol (CIV 6)	03	1	U
Laser Pistol (CIV 8)	03	3	U
Stun Pistol (CIV 7)	03	1	U
Stun Pistol (CIV 8)	03	2	U

Table [20.0] Protective Attire Chart Expansion

Equipment	E-Cell	Duration	Unit
Battle Sleeve	03 ea	50	H
Respirator	01	50	H
Respirator Helmet (CIV 7)	02 – 03	20	H
Respirator Helmet (CIV 8)	02	20	H
Powered Impact Armor	02 – 03	5	H
Powered Reflect/Impact (CIV 7)	02 – 03	5	H
Powered Reflect/Impact (CIV 8)	03	5	H
Expedition Suit (CIV 6)	02 – 03	10	H
Expedition Suit (CIV 7)	03	10	H
Expedition Suit (CIV 8)	03	20	H

Table [21.1] Land Vehicle Chart Expansion

Equipment	E-Cell	Duration	Unit
Scout Car	04	12.5	R
Crawler – Wheeled	05	200	R
Crawler – Legs	05	100	R
Rover	05	300	R
Mobile Lab	05	100	R
Amphibian	05	20	R
Van Rig	05	100	R
Car	05	200	R
Tractor	05	5	R
Half-Track	05	50	R
Loricate	05	50	R
APC/Tank	05	50	R
Self Propelled Artillery	05	10	R

Table [21.3] Land Vehicle Chart Expansion

Equipment	E-Cell	Duration	Unit
Dragonfly	05	1	R
Ornithopter	05	200	R
Propeller Plane	05	40	R
Jet Plant	06	600	R
Air Car	05	10	R
Levitator	05	1000	R
Skimmer	05	1000	R
Helicopter	05	2000	R
Shuttle	07	640	R

Table [21.2.0] Marine Vehicle Chart Expansion

Equipment	E-Cell	Duration	Unit
Mine Submarine	04	15	R
Flexicraft	05	150	R
Reef Walker	03	4	U
Water Scooter	03	1	U
Amphibian	04	3	U

Table [22.1] Protective Attire Chart Expansion

Equipment	E-Cell	Duration	Unit
Geo Lab	03	50	U
Geoscanner I	04	25	U
Geoscanner II	02	10	U
Mediscanner I	04	25	U
Mediscanner II	02	10	U
Bioscanner I	03	50	U
Bioscanner II	02	10	U
Neuroscanner	02	10	U
Chem Lab I	03	5	U
Chem Lab II	03	10	U
Chem Synthesizer I	03	10	U
Chem Synthesizer II	03	40	U
Energy Scanner	02	5	U

Table [22.2] Repair Equipment Expansion

Equipment	E-Cell	Duration	Unit
Basic Repair Kit	02	5	U
Suit Kit	02	20	U
Armor Kit I	03	20	U
Armor Kit II	03	40	U
Weapon Kit I	02	10	U
Weapon Kit II	02	40	U
Electro Kit I	02	20	U
Electro Kit II	02	40	U
Robot Kit	03	40	U
Vehicle Kit I	03	10	U
Vehicle Kit II	03	40	U
Spacecraft Kit I	04	10	U
Spacecraft Kit II	04	20	U
Spacecraft Kit III	04	40	U

Table [21.3] Communications Expansion

Equipment	E-Cell	Duration	Unit
Headset Radio	1	12.5	H
Planetary Shortwave	2	12.5	H
Interplanetary Radio	2	50	H
Planetary Headset	1	100	H
Translator (CIV 7)	2	20	U
Translator (CIV 8)	2	40	U

U = Uses H = Hours D = Days W = Weeks

R = Range (100 Km)

Appendix I – Adding Electrocells and Power Usage to Listed Equipment (Continued)

Table [21.3] Misc. Equipment Expansion

Equipment	E-Cell	Duration	Unit
Still Camera	03	25	U
Superoid Camera	03	50	H
Holographer	03	10	H
Night Glasses	01	20	H
Audio Recorder	02	5	H
Force Cage	03	100	H
Rock Blaster	04	12.5	U

U = Uses H = Hours D = Days W = Weeks
R = Range (100 Km)

Notes for Appendix I:

•At the GM's discretion, military beam weapons may allow Cell Stacking.
•Proctective Equipment ecells are for maintaining temperature controls, and monitoring occupant.
•Repair Equipment ecells are for powered tools and diagnostic equipment.

Table [21.3] Robot Chassis Expansion (CIV 7)

Equipment	E-Cell	Duration	Unit
Brummagen I	04	15.5	D
Brummagen II	04	14.6	D
Manner 31b	04	4.4	D
Manner 36sd	04	4.4	D
Manner 38sdf	04	4.3	D
Frazette Blue	04	5	D

Table [21.3] Robot Chassis Expansion (CIV 8)

Equipment	E-Cell	Duration	Unit
Brummagen II	04	13.4	D
Manner 44	04	9.5	D
Manner 50sd	04	11.6	D
Manner 51sdf	04	8.8	D
Frazette Green	04	6.8	D
Frazette Amber	04	6.3	D
Soidistant RAR	04	5.3	D
Soidistant V-201	04	7.6	D
Soidistant V-202	04	3.3	D

All Robot Durations based on single 04 Cell.

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This supplement was created in the Universe Development Group at Universe_RPGDevelopment@yahoogroups.com
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Information on the Supply Transfer Pod was drawn from "The Federation Strikes Back" by Marvant Duhon, first published in Ares Magazine, Nr 17, 1984, pages 47-52.

This and many other Ares Articles related to Universe are also available in Adobe Acrobat® (.pdf) format from Ian Taylor. For queries, please see his website: http://members.iinet.net.au/~avalon1/IMPRINT/IMPRINT.htm

Ian Taylor is also the founder of the Universe Development Group that made this project possible.

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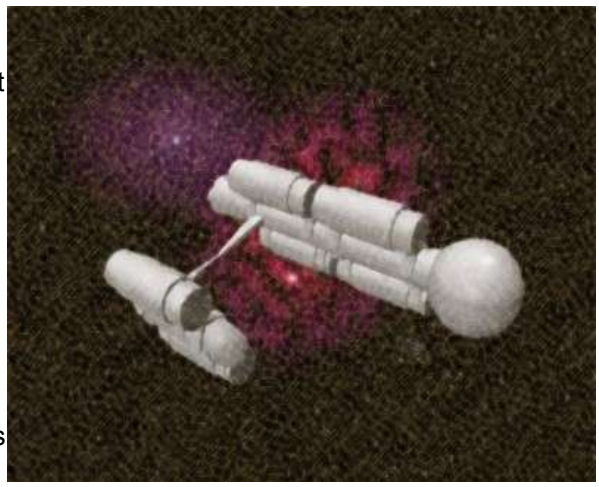
APPENDIX 2: OPTIONAL SPACECRAFT POWER RULES

[13.0] Optional rules for spacecraft power are based on the following changes and assumptions that attempt to reconcile discrepancies in how STL Travel is conducted in the Universe Setting. The primary concern addressed in these optional rules, is that the depletion of reaction mass or other form of propellant is not tracked over the course of interplanetary travel. Another aspect addressed is that spacecraft drives, shields, and tractor systems (as well as various weapons) all draw power for operation from the same reserve of "energy." Finally, use of the tractor beam to issue maneuver commands to a target ship is not met with an equal and opposite force affecting the issuing ship. These optional rules attempt to explain and expand upon spacecraft systems in a manner that removes these discrepancies.



- Reactionless drives function via virtual mass field generators, and utilize the same technology as tractor field generators (projected mass fields) and spacecraft shields, with all having similar power requirements. Virtual mass fields may be generated with a velocity component (virtual momentum generation) as in spacecraft drives and tractor beams, or without a velocity component, as in shield generation. Via virtual mass field generation, a type of energy with many of the qualities of mass is produced, and can be used as a type of reaction mass.

- Reactionless drives require immense electrical power to operate. Electric consumption is dependent upon the mass being moved, as reflected in the spacecraft's energy burn rate.

- Spacecraft electricity is stored in high capacity 07 Electrocells. Re-energizing spacecraft energy reserves can be conducted either via the physical exchange of discharged cells for fully charged ones, or via a high capacity energy transfer pylon.

- On board power generation systems capable of providing the energy required for mass field generation in a volume practical for spacecraft operations remain highly complex, require highly specialized technicians and systems to service and maintain correctly, and are prone to disastrous volatility when something goes wrong. The 07 Electrocell standards were enacted in order to provide the immense power requirements of ship's drive systems, without requiring all the contingencies normally associated with power generation at required levels, in the limited and vulnerable volume of spacecraft.

[13.1] The following changes effect all spacecraft using these optional rules. Spacecraft on board energy consists of 07 Electrocells stored in a buffered containment chamber, usually adjacent to on board power generation systems. Additional features of the spacecraft power system include:

- High Capacity Electric Cables permit 07 power levels to be transferred from and to all Pod Interfaces.
- An additional High Capacity Electric Cable is routed to a steerable re-charging pylon that permits re-charging on board cells without EVA.
- High Capacity cables route power to the ships burster, blaster, particle accelerator, shields, tractor field generator, and all other systems requiring power.
- Standard 03 electrical power is also routed from the buffered chamber to all points on the spacecraft, including standardized open outlets.
- The power storage chamber has an electricity routing computer responsible for routing, monitoring, and logging power usage at all times. A back-up means of manual switching is also available, and may be performed by an energy-tech or spacecraft-tech.

- A 1m diameter aperture permits the movement of 07 electrocells directly into the chamber from outside the ship. The buffered chamber may be depressurized, and often acts as a limited access emergency air lock. This aperture is often located on the underside of the ship to permit easy access when exchanging 07 electrocells on a planet's surface.
- Unmanned spacecraft often rely solely on on board power generation.
- Spacecraft and podular tractor beams may also be used as backup drive engines.

[13.2] The following changes effect all pods using these optional rules.

Energy Pod – An energy pod is a buffered containment chamber for storing 144 – 07 Electrocells. The spacecraft electricity routing system will by default draw electricity from energy pod Electrocells prior to using on board Electrocells. In addition to Electrocell storage and interconnectivity, Energy Pods also contain an overhead lift for easily moving 07 Electrocells. Energy Pods hulls contain a egress aperture (non airlock) that may be used to interface with another Energy Pod, Resource Transfer Pod, or other pod. An after market Airlock may also be affixed to this aperture.

Lander Pod – In addition to many other systems designed for ship to lander interaction and interface, the Lander Pod includes an interface with ship's power that allows transfer of power to the landers on board power supply. A Lander must be docked or stowed for this power transfer to take place.

Battlecraft Pod – In addition to many other systems designed for ship to battlecraft interaction and interface, the Battlecraft Pod includes an interface with ship's power that allows transfer of power to the Battlecraft's on board power supply. Battlecraft must be docked or stowed for this power transfer to take place.

Supply Transfer Pod – Created as a means of re-supplying warships during an engagement, the Supply Transfer Pod has been continuously updated in order to utilize the newest technology available, and is encountered in its many forms throughout the Federation. The Supply Transfer Pod used specially designed arms to quickly transfer missiles or energy to docked (but not stowed) spacecraft. Each arm is capable of transferring missiles directly into launch tubes and wracks or transferring energy directly to the power transfer pylon of another craft, but can not perform both functions simultaneously. The Supply Transfer Pod can also be used to transfer 07 electrical cells between two craft. It does so at the same rate that missiles are exchanged.

The details covering the energy transfer features of this pod are repeated here in their entirety.

- A supply transfer pod has a number of ports, each capable of providing missiles or energy (but not both from one port on the same turn). Number of ports and rate of transfer per port varies with civilization levels. On a single "Provide Supply" Battle Command, which may be issued by a recipient or provider ship, one ship may supply one other ship (using as many ports as desired). Additional "Provide Supply" commands allow other ships to be served, although each port may only be used once per turn. A damaged supply transfer pod functions at one level lower than its original level; a destroyed pod does not function.

Level	Missiles/Port	Energy/Port	Ports
5	1	1 unit	1
6	Enough to fill 1 pod	12 units	2
7	Enough to fill 2 pods	144 units	3
8	Enough to fill a ship	Enough to fill a ship	4

Level 8 pods (only) may service fighters [battlecraft], but if the pod is damaged, destroyed, or made vulnerable, any fighters docked for such servicing are destroyed.

[13.3] Spacecraft include on board energy generation systems. In addition to storing the large amounts of energy required for interplanetary travel via 07 electrocells, spacecraft house on board power generation systems. On board power plants vary by manufacture, CIV Level, and projected spacecraft operations profiles, but always provide enough power to run ship's systems, and most pod power needs. Spacecraft power generation utilize systems that do not require frequent replenishing of resources, and can operate for years with on board resource supplies. On board power generation is not sufficient for prolonged use of ships drives, shields, tractor beams, bursters, blasters, and particle accelerators.

On board power systems can be used to recharge 07 electrocells. Details of this process are covered under Spacecraft Energy Recharging below.

Orbital spacecraft sufficiently close to the star will often use Solar Panels for power generation. A 1 square meter panel produces the equivalent of an 03 electrocell, modified by the conditions described in section 9.1.

[13.4] The following procedures are used for calculating recharge rates for various forms of recharging.

Star port recharging: Spacecraft may recharging either via recharging on board 07 cells, or by exchanging depleted 07 cells for fully charged ones. The rates at which a spacecraft recharges is contingent upon the CIV level of the recharging facility, and are similar to the rates for recharging via a Supply Transfer Pod. The large increase in power transfer rates at CIV 7 is a product of the electrocell standards enacted by the Federation.

REENERGIZING FACILITY RECHARGE RATES

CIV Level	Rate per Minute	Rate per Delta Vee Turn	Time for 1 – 07 unit of power
5	0.07	1 Energy Unit	15 min
6	0.8	12 Energy Units	48 sec
7	9.6	144 Energy Units	6.25 sec
8	15	225 Energy Units	4 sec

Example: A Dagger, with an energy capacity of 48, would take 12 hours to fully reenergize at a CIV 5 Star Port. The same ship reenergizing at a CIV 7 facility, would be fully recharged in 5 minutes.

Inter-craft recharging: Inter-craft recharging via the steerable power transfer pylon or used for recharging stowed craft, take place at the same CIV Level based rates as re-energizing at a Star Port Facility, described above. The power transfer rate is based on the CIV level of the ship providing power.

Example: A CIV Level 8 Spear, using Spacecraft Power to reenergize a battlecraft via the steerable power transfer pylon, could fully recharge a terwillicker 5000 (energy capacity 15) in 1 minute.

On board recharging: Ships may also use on board power generation systems to recharge depleted 07 cells. The recharge rate for spaceship power generation systems are also contingent upon CIV Level, and are listed below.

ON BOARD POWER GENERATOR RECHARGE RATES

CIV Level	Rate per Minute	Rate per Delta Vee Turn	Time for 1 - 07 unit of power	Equivalent Electrocell
5	0	.001 Energy Unit	250 Hrs	4
6	0	.01 Energy Units	25 Hrs	5
7	0.01	.1 Energy Units	2.5 Hrs	6
8	0.07	1 Energy Units	15 Min	7

Example: A CIV Level 7 Corco Mu, using on board power to reenergize its depleted energy capacity of 176, would require 440 hours to do so. A harmonics Clarinet (CIV 8), performing reenergizing to its energy capacity of 104, could do so in 26 hours.

[13.5] Spacecraft Energy Consumption and Backup Power Systems

Standard Consumption
All spacecraft are designed so that all non power intensive spacecraft systems may operate using power provided by the spacecraft's on board power generation system. Power intensive operations are consumed by the procedures outlined in rules governing interplanetary travel and Delta Vee.

Backup Power
Many key systems will also have an independent backup electrocell for operation in a power emergency. The following guidelines may be used for determining the number of back-up electrocells available, but as always the actual number should be determined by the GM.

- 1 – 05 Cell per Spacecraft
- 1 – 05 Cell per Passenger Pod (all types), or Living Cargo Pod
- 1 – 04 Cell per 10 passenger or crew on board
- 1 – 04 Cell per Pod
- 1 – 03 Cell per Crew Member
- Electrocells required for Enviro suits, vehicles, and other standard equipment.

Minimum Consumption
In the event that a power emergency occurs on board a spacecraft, the following minimum consumption information may prove useful.

- An 03 power source can provide comfortable life support for 1 person for 12 hours.
- An 03 power source can provide minimum life support for 1 person for 24 hours.
- An 03 power source can also power for individual cryogenic units in the following manner.

Cryogenic Life Support Units

CIV Level	Power Consumption	Duration
6	4/Hour	25 hours
7	2/Hour	50 hours
8	1/Hour	100 hours

Note that environmental suits, additional craft, and on board vehicles may also provide additional life support options, or emergency electrocells. See new pods and new equipment in these rules for details on cryogenic stasis units.

[13.6] Use the following guidelines for addressing damage to power systems. Spacecraft power generation and storage systems are of a robust design, and the buffered containment chamber is specifically designed to protect the ship and ship systems in the event of a power emergency. Power leaks and overloads due to malfunctioning power systems are channeled to a conductor node on the steerable power transfer pylon, where excess power is distributed over the outer hull, and the hulls of any docked spacecraft. A power leak due to power system **damage** will result in a noticeable arc from the conductor node to the ships hull. A total discharge due to power system **destruction** will result in a massive network of arcs encompassing the entire spacecraft. Note that in the vacuum of space, with no other debris present, and electrical arc will form a linear beam of electrons rather than the familiar forked or zigzag arc.

No power system damage is represented in Universe space combat via Delta Vee, but a GM may incorporate such damage upon a hit to the crafts drive system (Engine), or other component associated with 07 power levels. Alternatively, the GM may use Spacecraft Power related accidents to represent damage to power systems from space combat.

All pods associated with power generation and storage will also have an emergency conductor node, and the power routing computer will automatically take any malfunctioning power component off line at the first

sign of malfunction. Podular emergency power discharge is identical to spacecraft emergency power discharge.

Details on Delta Vee ramifications of damage and destruction to an energy pod are repeated in there entirety.

- **Energy Pod**. ***Damaged***: Ten Energy Units must be expended each friendly Command Phase (in addition to any other expenditures of energy) until a total of 144 Energy Units have been expended (including previously expended energy). ***Destroyed:*** The total expenditure of energy for the spaceship must be immediately brought up to 144 Energy Units; the pod is considered empty.

Although spacecraft are designed to keep power system damage and destruction from resulting in total ship failure, the possibility of high capacity power line exposure due to internal spacecraft damage remain a potential hazard, and pose a serious threat to personnel and spacecraft systems until the power system computer takes the exposed cable off line.

Spacecraft power systems may be maintained or repaired by both spacecraft technicians or energy technicians.

[13.7] New Pods and Equipment

Power Generation Pod

The power generation pod houses a power generation system for adding auxiliary power to spacecraft, or supplying power to orbital facilities. The power generation pod varies in output over CIV Level in the following manner. This pod requires an Energy Technician.

Availability: Open. Crew Required: 1. Passenger Capacity: 0. Cargo: 0. Cost: Varies. CIV Level: Varies.

PODULAR POWER GENERATOR RECHARGE RATES

CIV Level	Rate per Minute & Time for 1 – 07 Cell	Rate per Delta Vee Turn	Equivalent Electrocell	Cost (Trans)
6	.0066 / 25hrs	.01 Energy Units	5	850
7	.066 / 2.5hrs	.1 Energy Units	6	800
8	.66 / 15min	1 Energy Units	7	750

Cryogenic Passenger Pod

The Cryogenic Passenger Pod was designed to allow the transport of passengers on ships that do not have the facilities to support, sustain, or entertain passengers over the long interplanetary travel times. Since its deployment, this pod has been pressed into many other uses, including the transportation of prisoners, contagious patients, and colonists. Individual cryogenic units have onboard back-up power, and can be removed from support wracks, for transport without interrupting the cryogenic stasis. The crew member required is typically someone with both medical and technical experience.

Availability: Open. Crew Required: 1. Passenger Capacity: 60. Cargo: 0. Cost: 850. CIV Level: 8.

Cryogenic Stasis Unit

A chamber for storing and transporting an individual in a state of suspended animation where no life functions need be maintained. The chamber is a self contained unit, capable of inducing sleep, conducting the cryogenic process, and reversing this process without the aid of a technician. Individuals undergoing cryogenic stasis are completely unaware of any experiences while in stasis, and are for all purposes, functionally dead while in stasis. This deathlike state applies to all life, including any micro organism that is inside the chamber when the stasis begins. Although designed for the stasis and transport of humans, the technology used in the cryogenic process, has proven to work well on Earth animals, and other carbon-water based life forms. Cryogenic chambers are robust, and each unit contains an 03 backup electrocell on board in the event that power is otherwise interrupted. Chambers are also designed to be easily transported on gurneys. Premature interruption of cryogenic stasis will result in the unconscious death of any life forms inside the chamber. At the GM's discretion, Crew Cryogenic stasis units may already be in

place on existing ships. Pods dedicated to passenger transport via cryogenic stasis (covered above), are only available at CIV 8.

Cryogenic Stasis Units

Equipment	CIV	Wgt (Kg)	Price	Dimensions	BRT (hrs)	TNU
Cryogenic Stasis Unit	6	100	17 T	2.5mL x 1mW x .5mH	2	30 min
Cryogenic Stasis Unit II	7	50	15 T	2.5mL x .75mW x .4mH	2	20 min
Cryogenic Stasis Unit III	8	35	12 T	2.5mL x .75mW x .35mH	2	10 min

[13.8] Tractor Systems may be used as auxiliary or back up drives systems. The virtual mass field generation process used by Tractor Pods is very similar to the reactionless drive systems used by interplanetary capable spacecraft. Energy cost for using the Tractor system in this fashion is the same as the rates listed for issuing maneuver commands to target spacecraft – twice the energy burn rate of the spacecraft being issued a command.

[13.9] Spacecraft Power Accidents

COMMON
- The power routing computer misinterprets information on power consumption coming from the bridge, and takes the bridge power offline as a precautionary measure. Direct interface with the routing computer is required to fix this problem.
- An unexplained flicker develops in the drive engines, but the engines resume normal operation after a few minutes.

RARE
- The spacecraft power transfer pylon maneuvering system fails. EVA will be required to fix the pylon.
- Spacecraft drive systems flicker during interplanetary travel – if maintenance (Superficial Damage) is not performed prior to the next engine shutoff, the engines will fail to restart.
- The power routing computer misinterprets information of power consumption coming from a pod, and takes the pod off line as a precautionary measure. Direct interface with the routing computer is required to fix this problem.

UNIQUE
- The power routing computer misinterprets information on power consumption coming from a pod, and takes the pod off line. A computer error keeps this shutdown from being reported or logged.
- Upon restarting spacecraft drive systems, a polarity reversal error occurs, causing heavy damage to the drive system.
- Upon restarting spacecraft drive systems, a polarity flux causes a power leak from on board power systems. The drive system takes light damage, and the on board power system is partially destroyed.
- An unexplained flicker develops in the drive engines. If maintenance (Superficial Damage) is not performed in the next hour, the power storage system will suffer total destruction.

Chart Summary

Table [1.3] – Electrocells – All CIV 7

Equipment	Code	POW	Wgt Kg	Price	Recharge	Dimensions	TNU	BRT
Power Grid Node	07	1,000,000	245	1 Tran	300 Mill	1m L x 1m Diam	n/a	n/a
Industrial Power	06	100,000	100	830 Mill	230 Mill	1m L x .5m Diam	n/a	n/a
Vehicular Power	05	10,000	40	665 Mill	165 Mill	1m L x .1m Diam	n/a	n/a
High Power	04	1,000	10	500 Mill	100 Mill	.5m L x 5cm Diam	n/a	n/a
Standard Power	03	100	1	335 Mill	35 Mill	.25m L x 2.5cm Diam	n/a	n/a
Small Power	02	10	0.25	170 Mill	15 Mill	10cm L x 1 cm Diam	n/a	n/a
Mini Power	01	1	0.01	50 Mill	5 Mill	1cm L x .1cm Diam	n/a	n/a

POW = Power Units, TNU = Time Needed for Use, BRT = Base Repair Time

Table [1.5] Connector Size

Cell Type	Connector Size
01 to 02	Light
03 to 05	Standard
06 to 07	Heavy

Table [7.1] - Micro Powered Durations

CIV	Days	Months
6	100	3
7	1000	30
8	5000	165

Table [2.3] Connector and Coupler Recharge Rates

	Power Source						
Recharging	1	2	3	4	5	6	7
1	10 / .1	10 / .1					
2	100 / 1	10 / .1					
3			10 / .1	10 / .1	10 / .1		
4			100 / 1	10 / .1	10 / .1		
5			1000 / 10	100 / 1	10 / .1		
6						10 / .1	10 / .1
7						100 / .1	10 / .1
	Light Connector		Standard Connector			Heavy Connector	

.1 min = 6 sec 100 min = 1hr, 40min 1000 min = 16 hrs, 40 min

From Section [8.1]

Electrocell tasks on power levels between 01 and 04 use the Electro Tech Skill. Electrocell tasks on power levels between 04 and 07 use the Energy Tech Skill. Both Skills may conduct tasks at 04 levels.

Table [10.1] Electric Shock Damage

Electro Cell	Effect Range	Damage Mod	Possible Additional Effects
1	Contact	-10	None
2	Contact	5	None
3	Contact	0	Unable to loose Grip
4	Contact	10	Burn & Recoil
5	1 m	20	Heart Filbrillation
6	5 m (Same Hex)	30	Cardiac Arrest
7	7.5 m (1 hex)	40	Deep Burn Damage

Table [10.2] Composition Modifiers

Composition	Damage Mod
Human/Humanoid	0
Mammalian	0
Terran Like	-5
Protein	-10
Carbon	-15
Non-Carbon	-20
Equipment (CIV 5 or 6)	20
Equipment (CIV 7)	5
Equipment (CIV 8)	-10