Book 8
Robots

TRAVELLER®

Science-Fiction Adventure
In the Far Future

Game Designers' Workshop

Some of the material in this book originally appeared (in a more abbreviated form) in the *Travellers' Digest,* issue numbers 1 through 3.

Travellers' Digest is a quarterly magazine chronicling the exploits (in **Traveller** adventure form) of a band of four Imperial citizens as they journey from Deneb sector to Terra and back, visiting along the way the fabled worlds of Vland, Capital, Terra, Kuzu, and more. Rules, discussion, and background for Traveller are also included. For more information, write:

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This booklet is an additional volume in the rules to **Traveller,** GDW's science fiction role-playing game set in the far future.

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Introduction

As technology increases, more and more work can be done by machines, giving intelligent creatures cheaper goods and more leisure time. But machines reach their highest potential only when they are finally able to think for themselves, as well as move about and manipulate their environment.

Robots are the machines with these capabilities.

Traveller Book 8, *Robots,* enables referees and players to confidently integrate robots into **Traveller** campaigns. Articles about the role of robots in the **Traveller** universe, types and uses of robots, robot brains. Imperial and alien robot manufacturers, and how to play robots as player characters supplement a complete design system and a robot generation/encounter system,

ROBOT DESIGN SYSTEM

The robot design system in this book serves both referees and players. Referees can design robots in detail for their campaigns. Players can create player character robots for themselves. The robot design system is compatible with *Striker,* so miniatures campaigns can also include robots.

ROBOT GENERATION AND ENCOUNTER TABLES

Referees can not only design robots for specific purposes in an adventure, but by using the deluxe Robot Encounter Tables they can also instantly generate detailed robots for random encounters during a gaming session,

REQUIRED MATERIALS

Much of the material in *Robots* refers to rules and equipment found In **Traveller.** In addition to this book, the basic **Traveller** rules are essential, as are at least two six-sided dice, paper, and pencil.

DIE ROLLING CONVENTIONS

The same die rolling conventions used in previous volumes of **Traveller** are in force in *Robots.* To briefly recapitulate:

Throw: That dice roll required to achieve a stated effect. If only a number is stated, it must be rolled exactly. A number followed by a plus (such as 7 + 1 indicates that number or greater must be rolled. Similarly, a number followed by a minus (such) as 3-) indicates that number or less must be rolled.

Number of Dice: Generally, a dice throw requires two six-sided dice. Throws requiring more (or fewer) dice are clearly stated. For example, a throw calling for one die would be stated 1D.

Die Modifiers: Die roll modifiers (abbreviated PM) are always preceded by either a plus or a minus. Thus, the notation DM + 3 indicates that three is added to the die roll before it is used.

Robots in Future Society

Most worlds of tech level 12 or greater use robots to augment or even replace biological beings in uncreative, menial, or hazardous tasks that require little intelligence. The technological challenge is to build a cheap, reliable robot able to completely replace a being with intelligence. Relatively mindless robotic machines and appliances appear about tech level 8, and reliable speech recognition occurs at tech level 10. The reliability of primitive (non-creative) artificial intelligence often follows at tech 11, making the way for widespread introduction of primitive artificially intelligent robots at tech 12.

One factor of overriding concern governs all robots in the Imperium: economics. Robots are possible at lower tech levels, but they are not generally practical until tech level 12. (A few industrial, high-population worlds have expensive yet primitive robots as low as tech level 10.)

At the higher tech levels, robots are a cheap and reliable alternative to human labor, particularly in dull or dangerous jobs. Consider the typical tech 15 starport. Ships arrive and depart sporadically around the clock, so staff levels must be kept high enough to service any vessel at anytime, even though there may be long intervals during which no ships need to be loaded or unloaded. Robots are an efficient solution to this problem.

A standard cargo robot costs 75000Cr, and can be financed over 40 years for 4500Cr per year. If maintained regularly (at an additional cost of 750Cr per year), the robot should last as long as 85 years. Obviously, using robots in this situation can cut costs significantly.

Pseudo-biological robots are rare in the Third Imperium. Tech level 15 is the first tech level at which a convincing pseudo-biological robot can be constructed. The majority of the worlds in the Imperium are below tech 15 in local manufacturing capability. Besides this, pseudo-biological robots are not particularly cost effective in design (the experimental robot described later would cost 12 million credits to construct). Pseudo-bio robots also tend to be more fragile and less reliable than traditional robots.

Another reason that pseudo-biological robots have been slow to catch on is the bias some sophonts have against them. Many people, even from high-tech worlds, are unsure of how to react to a human that turns out to be a machine. Some hurnan-populated worlds harbor a general anti-robotic bias, even though robots are technologically feasible there. On such worlds, items advertised as "Human-Made" often bring a premium price. A famous example of this philosophy is the popular quasi-religious Society for the Sovereignty of Man over Machine (SSMM) in the Solomani Confederation.

For these reasons, few researchers spend their time trying to re-invent man in machine form. Much more energy is spent on related pursuits that obviously help humaniti, such as prosthetics.

A HISTORY OF ROBOTS IN IMPERIAL SPACE

The age of modern robots was thrust upon the First Imperium by the events of the First Interstellar War. In -2389, the Terran Confederation Navy commissioned a line of mass-produced tech level 12 robots as support staff for military personnel. These were not warbots as we know them today. A few of the robots were expert medical robots or served as administrative support, but most were heavy-duty, hard-working construction robots, used to build temporary installations for advanced bases.

Beginning in -2204, the ambitious Solomani carried their higher technology with them as they established the Rule of Man over the dominions of the defeated Vilani Empire. The Vilani, still at tech level 11, had not yet developed true robots.

Less than two hundred years later, Naasirka introduced the first line of robots for private, non-military use. Dubbed "Rashush", these housekeeping and valet robots spread rapidly, thanks to a powerful, high-prestige advertising campaign. Although expensive, ownership of these useful robots was within the reach of many rich citizens of the Second Imperium. The Rashush line is still marketed today.

At the time, the future of robots and robotic appliances looked promising. But in -1776, the Rule of Man crumbled, and the Long Night began. During these seventeen centuries of regression and decay, interstellar communication and trade slowed to a standstill. Progress in robotic science screeched to a halt as many worlds dropped to lower tech levels.

In - 650, the Sylean Federation began to reestablish trade between certain worlds. As the Federation grew, technology saw a rebirth, and robots became practical again. In -143, Dover-Gabe, a Sylean manufacturing and mining concern, was awarded a large contract for courier robots. These robots provided an efficient and secure means of transporting secret military communications from place to place. No one at the time realized the critical historic effect one of these devices would play in the future of robots.

THE SHUDUSHAM CONCORDS

A tragic attack against the Sylean Federation, which occurred in -112 in Core sector, helped shape the Third Imperium's current attitudes about robots. A terrorist group rigged one of the Dover-Gabe courier robots to self-destruct, and managed to sneak it aboard a 90,000-ton Sylean battleship. The Empire's Banner was on a goodwill mission in orbit around the world Fornol (Core 1715) when the robot's hydrogen/oxygen fuel-cell exploded. Fornol's premier, two ambassadors, and the Sylean vice-minister were killed, along with a host of ship's officers and crewmen. The repercussions from this event were so far reaching that the Sylean Federation was nearly thrown into a civil war.

This disaster prompted twelve worlds of the Sylean Federation to meet on the neutral world of Shudusham to draft an agreement dealing with the issue of weaponry carried by robots. After much deliberation, all twelve worlds finally signed the completed Shudusham Concords in -110. A hardcopy is on display in the Museum of Sylean History on Capital.

The Concords have no legal force in the Third Imperium, but they have served as a model for many high-tech worlds' documents governing the manufacture and use of robots.

The Concords contain seven articles:

Article 1: Gives a general explanation of the document, overall guidelines for robot construction, locations and occasions for robot use, and the rights of robot owners. The robot's owner is responsible for all actions the robot may perform, whether direct or indirect. Reliability is thus identified as a key issue, as is motivation for a robot equipped with a weapon or used as a weapon.

Article 2: Describes detailed programming guidelines for general functions.

Article 3: Covers detailed manufacturing standards to insure reliability and provide for the safety of owners and the general public.

Article 4: Gives guidelines for when and where weapons are allowed or prohibited.

Article 5: Describes specific programming logic for weapon control and usage. Most strongly worded of all the articles.

Article 6: Describes detailed manufacturing standards to insure weapon reliability, when weapon installation is allowed.

Article 7: Provides for a new agency whose sole responsibility is to enforce the articles of the Concords.

Forty-three amendments were added over the active life of the Concords, dealing with technological changes, minor logic enhancements, and additional enforcement procedures. The 37th amendment is well-known; it states that no pseudo-biological robot may attempt to pass itself off as a living being.

The Shudusham Concords proved to be effective. An entire interstellar industry grew out of the need for sensory devices to aid in enforcement of the Concords on the original twelve member worlds and later signatories. The Concords lost their legal force when Cleon declared himself emperor of the Third Imperium in Year 0,

Many worlds still use parts of the pre-Imperial Shudusham Concords as a model for their own laws to keep abuses with robots in check. Most worlds declare an owner to be responsible for the actions of his robot, even if the owner did not directly order the action. For example, if an owner orders his robot to protect his home, and in so doing the robot kills someone approaching the home, the owner can be charged with accidental murder.

ROBOTS IN THE THIRD IMPERIUM

In 298, Makhidkarun marketed the first line of robots with tech level 13 brains. These robots, using "high autonomous" software, were more intelligent than earlier robots, so they could be operated by ordinary individuals without special skills or training. By making robots usable by every citizen, Makhidkarun revolutionized the popularity of robots within the Third Imperium.

About one hundred years later, in 404, a group of roboticists met at Shudusham to share their latest technological breakthroughs. Shudusham was chosen as the site because of its historical significance and central location. The conference was a success; so much so, in fact, that the Shudusham Robotics Conference has continued to meet every ten years. Roboticists, manufacturers, heavy robot users, journalists, and other interested parties are drawn from all over explored space to attend a portion of the one-year conference,

Makhidkarun announced another breakthrough in 711: roboticists working in cooperation with the Imperial Navy Research Lab produced a reliable robot brain with twenty-five percent synaptic processing. Robots with more synaptic units are more intelligent, so these machines were capable of more powerful programming

Expect robots with higher skill levels appeared more often in the marketplace.

A few years ago, SURD received the Shudusham Conference Medal of Merit for the first convincing "human" pseudo-biological robot. The robot, nicknamed Telku, was the main attraction of the meeting. Pseudo-bios are not mass-produced yet by any Imperial manufacturer, but technology has reached the stage at which such robots can fool real humans.

Types of Robots and Their Uses

A wide variety of configurations of robots can be found in explored space. Below is a sampling of robot types; this list is not meant to be comprehensive. Certain types do not occur in certain cultures, of course, but all of those discussed here occur in more than one race.

Pseudo-biological Robots: In fact, pseudo-bios are the least common configuration of robot, because of their high cost, but they continue to be the dream of scientists and technicians, particularly among some of the human races. A pseudo-biological robot is designed to mimic a member of its race in every apparent feature. The perfect pseudo-bio would be externally indistinguishable from the actual sophont it represents. At tech level 15, a pseudo-bio robot can pass as a member of its race in a casual encounter. Pseudo-biological robots of lower tech levels are not as convincing.

Warbots: Warbots are the tactician's dream: an intelligent, effective battlefield force that follows orders, has no fear, and costs no friendly lives if it is overcome by the enemy. For the most part, this degree of perfection in warbots is still an elusive dream, but warbots are used by several cultures (particularly the Zhodani and Hivers) with varying amounts of success. Most warbots can be classified as local protection warbots, tactical warbots, or drone warbots.

On a few worlds, warbots handle all local protection duties, protecting the populace from crime, or even fending off incursions by other governments on balkanized worlds. Local protection robots do not need weapons or armor as powerful and protective as other warbot configurations. But local protection robots do need a fair amount of brains, depending, of course, on the degree of sophont intervention in their operation.

Tactical warbots need good brains and armor, and some access to weapons, whether self-mounted or driven through slave robots by means of a communication link. Because of the expense and unreliability of battlefield expert systems, tactical warbots are practical only at higher tech levels.

Drone warbots have good armor and weapons, but little independent computational power. These warbots are guided by master units or sophonts at the scene using remote control.

Dumbots: Dumbots are the most common type of robot used anywhere. These robots are built for a special purpose, with a single application program of skill level 1 to 3. The dumbot's intelligence is commonly 4 or less, which limits it when it is asked to perform a task unrelated to its programmed skill.

Typical dumbots can be found in almost every high-tech assembly line, performing tasks which are too dangerous or too tedious for sophonts to safely or efficiently perform. Some of these dumbots, especially at tower tech levels, barely qualify for the appellation of "robot".

Couriers: Courier robots are specially configured to perform communications tasks. Some of these robots physically deliver messages to their recipients; others collect messages, then travel to a safe place from which the messages can be transmitted by conventional means. Many courier robots are armored; some are also armed. A few are designed to self-destruct if tampered with. Recently, the Imperium has started to experiment with combination courier-pilot robots as xboat pilots, but this is not common knowledge.

Administration Robots: By tech level 7, some societies begin to experiment with crude optical character recognition (OCR) devices, which can be used to enter printed or written data directly into a computer. At higher tech levels, admin robots are the ultimate in OCR technology. Bureaucratic robots, specializing in clerical tasks, can be found in millions of offices in explored space, handling data entry and light office duties at a cost much less than using living help. A few admin robots have some expert programming, so they are able to function as higher-level civil servants.

Expert Robots: These robots are basically computers programmed to function as "expert" systems, with the addition of sophisticated peripherals to achieve the desired results. Expert robots are often used to replace expensive sentient professionals, particularly in the medical field. These robots are sometimes found in a contoured or pseudo-biological configuration. An expert robot has a skill level of 4 in its primary ability.

Servant: In the Imperium, servant robots are popular on very high tech worlds. For example, Naasirka retails a standard model tech level 15 servant robot with an intelligence of 5 and education of 1 for Cr77,500, The robot has a humanoid contoured chassis, understands basic commands, and has the equivalent of Steward-1, Valet-1, Vehicle-1, and Emotion Simulation. Over three-quarters of the cost is for brain and software.

This cost is admittedly high, but consider that such an appliance has a useful life of 85 years at tech level 15. Purchasing such a robot using a 40 year loan and paying for regular maintenance works out to about Cr10 per day. Once the robot is paid off, maintenance costs about Cr1 per day.

Non-mobile Robots: In the strictest sense of the term, these devices are not truly robots, because they cannot move from place to place. But by restricting the mobility of a robot, designing it as a room or series of rooms, a tremendous amount of space is available for power plant, brain, and peripheral devices. Such a robot can be particularly effective for tasks such as medical and surgical functions. One large non-mobile robot "hospital" admits patients at one door, ferries them from room to room while examining, diagnosing, and treating illnesses, and then discharges the treated patients through a door at the other end of the building,

Research & Development Robots: This special category of robots (such as the pseudo-biological AB-101) allows many features not commonly found, with certain components actually performing at the next higher tech level. In terms of cost, these robots are the most expensive, because they are "hand-made" one at a time.

Master-Slave Worker Robots: This robot configuration is particularly efficient in its use of computer power. The "master" robot has most of the brains, and may be non-mobile. The master robot also contains some type of communication linkup to the "slave" worker robots, which have only a minimum amount of dedicated computational power themselves, but contain efficient movement and other peripheral devices. By definition, the master-slave configuration needs at least one master and at least two slave robots.

Robots outside the Imperium

Beyond the borders of the Imperium, the other technological races also create their own styles of robots. These are modeled after the physical and psychological nature of their masters, and are quite different from their Imperial counterparts. Use the following as a guide to refereeing robots within these other cultures.

Robots In the Zhodani Consulate: The Zhodani use robots more than any other major race in explored space, but their reliance on psionics has hindered the development of high-intelligence robots. By "flicking" electronic switches psionically, it is a simple task for any noble to give instructions to a robot. Because of this, Zhodani robots do not need high intelligence, and Zhodani research into artificial intelligence is slow. Zhodani robots deal only with things, rather than with Zhodani; this again is a result of the efficiency of psionics in dealing with humans. The Zhodani nobles do not allow much independence to robots, because they cannot be controlled as easily as citizens can using psionics.

TL: 14, some 15. Highest tech level robots are warbots.

Intelligence: Low.

Warbots: Sophisticated semi-independent robots armed with powerful weapons participate in every Zhodani military action. Additional information on Zhodani warbots can be found later in this book and in Alien Module 4, *Zhodani.*

Experts: None.

Pseudo-biological Robots: None.

Psionic: Zhodani robots can be commanded by "flicking", but otherwise cannot actively respond to psionic activity. Starting at TL14, trained Zhodani nobles can enter data into a computer by flicking, at a psionic point cost of 1 point per hour plus range. All Zhodani devices that can respond to flicking are illegal in the Imperium.

Master-Slave Robots: Not used, except in the special (and common) case of a Zhodani "master" flicking a robot "slave".

Quality: Good.

Price: Average.

Robots in the Aslan Hierate: The Aslan culture precludes any use of robots to perform male tasks; some robots are used for female tasks.

TL: 14.

Intelligence: Average.

Warbots: Aslan prefer warbot dumbots, which are totally remote-controlled, with no brains at all. These warbots are used only when the other side also has such devices, so that the fight is fair and honorable. The Aslan do not use warbots against "defenseless" Aslan.

Experts: For their tech level, the quality of Aslan expert robots is second only to that of Hiver robots. Unarmed medical robots are common in dangerous battle situations.

Pseudo-biological Robots: At the Aslan tech level, some early experimental pseudo-bios are just starting to appear. Such robot designs are generally built by female researchers and are used in female-oriented applications.

Psionic: None.

Master-Slave Robots: Most races use master-slave configurations to save on the cost of robot brains, but the Aslan use this technique less than other races do.

Quality: Average.

Price: Average.

Robots in the Vargr Extents: To a Vargr, it is better to boss around another Vargr than to boss around a robot, other considerations being equal. A chaotic variety of configurations and tech levels is found, including inconsistent tech-level mixes among the components in a single robot.

Vargr robots can be found occupied as factory and heavy construction workers, in space and hazardous atmosphere operations (with no vacc suit required), as ship's boat pilots, air/raft pilots, and ATV drivers.

TL: 13.

Intelligence: Average. Vargr robots capable of understanding full commands are very expensive.

Warbots: Vargr do not use armed robots: such a use of robots would portray a great weakness of character.

Experts: Vargr make some use of expert robots, but their development is still at a primitive level. The Vargr charisma precludes any public use of these robots to make decisions.

Pseudo-biological Robots: Vargr do not construct pseudo-biological robots,

Psionic: None.

Master-Slave Robots: Few,

Quality: Vargr robots are generally not well cared for, and often wear out prematurely. When this happens "twine and baling wire" are used more often than the proper maintenance, Vargr robots seldom use electronic circuit protection.

Price: High, considering what the buyer gets.

Robots in the Two Thousand Worlds: The K'kree use robots only for menial tasks rather than as decision makers.

TL: 13.

Intelligence: Low. K'kree robots must be instructed with limited basic commands.

Warbots: K'kree do not use armed robots per se, but they do have some sophisticated remote-control weapon systems. They have a general distrust against allowing any non-K'kree to control weapons.

Experts: K'kree make all important decisions themselves; they do not use expert robots.

Pseudo-biologicalRobots: The large size of the K'kree would make their pseudo-biological robots easier to make, but K'kree show little interest in creating robots that look like K'kree.

Psionic: None.

Master-Slave Robots: Most robot systems in K'kree space reflect the herd structure of K'kree society. It is common for robots to function in groups, under a hierarchy of more intelligent directors. Many slave robots are miniaturized, built to perform tasks that would be too confining to the claustrophobic K'kree.

Quality: Average.

Price: Average.

Robots in the Hive Federation: The Hivers build some of the finest robots in explored space. Hiver robots, like robots of other races, reflect certain societal traits, but Hiver robots are also designed to appeal to a growing export market.

Hivers use robots themselves for a wide variety of applications, including designing and building large underground cities, Hivers do not use robots to clean their dwellings, but instead use the non-intelligent burrowing animals with which they live,

Hiver robots often use a modified tentacle-like leg design for propulsion and as manipulative members. Hiver robots have the best sense of touch and dexterity of any robots in explored space. They also have excellent speech recognition and voder systems, despite the fact that Hivers are mute.

Hiver translator robots are popular with merchants, both Hiver and human.

TL: 15, with some16. Hiver robot brains are always TL 16.

Intelligence: High. Hiver robots are sophisticated and robust, able to "handle themselves" in a variety of environments.

Warbots: Hivers do not like close combat, and their excellent warbots have relieved them from this unpleasant duty. Some Hiver armies have consisted entirely of warbots, with no living members. Hiver warbots are of such quality that their import into the Imperium is illegal.

Experts: The high intelligence of Hiver robots is reflected in the wide variety of expert robots they build and construct. Hiver robots diagnose and treat illnesses, advise on legal matters, negotiate treaty terms with member races, and perform many other tasks which would require years of training for a living creature.

Pseudo-biological Robots: Hivers do not construct Hiver pseudo-biological robots, but robots contoured as humans are popular trade items. True pseudo-biological robots are too expensive to be practical as a mass-market item.

Psionic: None.

Master-Slave Robots: Hivers are experts at communications, and master-slave configurations are common, reliable, and powerful.

Quality: Excellent. Hiver robots are reliable over long periods of use. Hiver robots are superior to Imperial robots, generally massing only 80% of the Imperial equivalent.

Price: Premium robots at a premium price. In Hive space, robots can be purchased at a price of only 60% of what the equivalent robot produced in Imperial space would cost. Every sector of distance from the Hive Federation adds 20% to this multiplier; thus, a Hive robot purchased at Terra (two sectors away) would cost 100% of the robot's standard price. A Hive robot at Capital (five sectors away) would cost 160% of the standard price. In the Spinward Marches (ten sectors away). Hive robots cost 260% of the standard price, if they are even available.

Robots in the Solomani Confederation: The most diverse use of robots is found in the Solomani Confederation; the original humans and their descendants have a love-hate relationship with robots. On some worlds, robots perform every task of which they are capable. On other worlds, robots are outlawed. Several organizations and "religions" have promulgated various views on the proper place of robots. Perhaps the best known among these (although not the largest, by any means) is the Society for the Sovereignty of Man over Machine (SSMM) headquartered at

Thetls/Kukulkan.

Solomani grav technology is often poor for its tech level, and in some locations may lag one or even two tech levels behind other technology. Because of this, Solomani grav modules use 30% more power and only produce 80% as much thrust as normal. Solomani robots use grav locomotion less than any of the other major races.

Solomani have many conflicting viewpoints on the proper extent of robot independence.

TL: 14.

Intelligence: High for their tech level, but lower than typical Imperial robot intelligence.

Warbots: Solomani seldom use warbots.

Experts: Like the Hivers at their borders, many Solomani exploit the high intelligence of their robots to produce expert machines. Solomani robots are not as advanced as those of the Hivers, but their expert robots do perform many of the same tasks.

Pseudo-biological Robots: The tech level of Solomani robots is not high enough to make pseudo-biological robots practical. Some initial progress toward pseudo-bios has been made.

Psionic: None.

Master-Slave Robots: Some master-slave configurations are found, especially in mass-production manufacturing systems.

Quality: The quality of Solomani robots fluctuates from world to world. A few high-tech facilities are known for their robot's quality; other robots ore little better than most Vargr robots.

Price: The price range of Solomani robots is also quite variable. Some worlds with low import and export duties have excellent bargains.

Robots In Droyne (and the Ancients') Society: There are no modern Droyne robots, but Ancient robots were astonishing in their complexity and abilities. This section refers only to Ancient robots.

The Ancients had the most diverse configurations of robots, ranging from ultraminiaturized robots to a few that were the size of small planets.

The Ancients can also claim the most diverse use of robots, ranging from menial tasks to the origination (the robot actually came up with the idea) and full supervision of some research projects.

Some Ancient "societies" did not use robots at all, while others used them exclusively (no work done by living creatures).

Additional information on Ancient robots can be found in *Secret of the Ancients* and Alien Module 5, *Droyne.*

TL: 17+.

Intelligence: Superior. Ancient robots had true artificial intelligence, and were capable of independent creative thought.

Warbots: Ancient warbots were an awesome fighting force that had no equal anywhere in explored space.

Experts: At the height of Ancient civilization, vast research missions were conceived of and carried out entirely by robots.

Pseudo-biological Robots: The Ancients not only constructed pseudo-biological robots, which cleverly mimicked the appearance of some species (Including themselves, humans, and Vargr), but also constructed self-healing, self-reproducing robots capable of growth. These "biological" robots were not necessarily patterned after any known race.

Psionic: Some Ancient robots were truly psionic in every sense of the word, able to read minds, teleport, and use other psionic abilities.

Master-Slave Robots: Ancient robot configurations were as sophisticated as other Ancient endeavors.

Quality: Superior.

Price: Ancient robots are no longer available in explored space. No functioning Ancient robots are known to have survived the Final War.

Robots Among Other Races: The Ahetaowa (on Ealiyasivw 2604) is a race of intelligent animated plants. Members of the race are immobile, but they have evolved simple manipulative members. The world's jungle environment kept individual plants close enough to each other that they could cooperate with these single "limbs".

Over time, the plants developed a technology; now at tech level 12, they have developed simple robots that can carry out tasks such as exploring and transplanting.

There are occasional planets in explored space on which robots are worshipped. Among these is Juess (Spica 0917). After a disastrous internecine struggle for power, when the world suffered from a balkanized government, knowledge of the advanced technologies of the inhabitants was lost. Since Juess is a desert world, the remaining robots were revered as "Providers" and "Life-givers". They are carefully tended by a priestly class which has no real understanding of the technology driving the robots. On the occasions when one of these robots ceases to function, the "death" of the god is mourned, and citizens may be offered as sacrifices to appease the other gods,

A sudden plague on Sabmiqys (Antares 2117) wiped out its sentient Inhabitants. The world is now inhabited by a "race" of tech-level 17 self-repairing robots, which have produced an interesting body of literature. The Scout Service has interdicted this world; no other world in the Imperium has such a high tech level (this level is not the current manufacturing level, but the level of the existing technological artifacts).

Robot Builders

Many corporations, Imperial and otherwise, are reknowned for their construction of robots and robot components. The major robot manufacturers are listed below, organized according to race.

Aslan

Tlektaowa: Headquartered on Kusyu, Tlektaowa was originally designated as the "official" robot builder for the 29 ruling clans. The old firm received this plum as a political appointment for services rendered during the Aslan Border Wars. The position does not reflect any particular technical prowess.

Droyne

None.

Hiver

Star Patterns Trading: Robots carrying the Star Patterns trademark command a premium price in the Imperium, which is why counterfeit models are so often encountered. Particularly near Vargr space, let the buyer beware.

Six Eyes Nest: Warbots produced at Six Eyes installations are deadly. Import of these warbots into the Imperium is a high justice crime.

Imperium

Several of the Imperium's corporations and megacorporations produce robots.

Naasirka: Naasirka is the largest manufacturer of robots in the Imperium. Naasirka's robots rarely use innovative technology, but their aggressive marketing staff has placed more robots than either Makhidkarun or LSP, Naasirka's two largest competitors.

Makhidkarun: This old Vilani corporation is not the largest manufacturer of robots, but it is the most innovative. The company's research staff is responsible for many of the Imperium's significant breakthroughs in synaptic processing.

Ling Standard Products (LSP): Ling Standard Products' expert med-robots are used in a variety of medical applications throughout the Imperium.

Other prominent manufacturers include:

SURD: One,of the principal robot manufacturers in Core sector Is SURD, the Shinku University Research Directorate. SURD was founded about four hundred years ago by a group of academic roboticists who agreed to pool their patents together, to make robots and to make money at the same time.

Today, the marketing and fiscal management are left in the hands of corporate officers trained in business matters. No research is actually conducted by SURD itself. Many university robotics departments, however, are patron members of SURD, which provides generous research grants in exchange for the right to commercially exploit useful discoveries.

Spinward Specialties: In the past two centuries a number of firms have sprung up In Deneb and the Spinward Marches. Spinward Specialties, only six years old, is one of the newest. It specializes in contoured chassis courier robots, unarmed but heavily armored against attack.

K'kree

Kllkoog'x': Located in the Raakaan subsector, Kllkoog'x' is a group of eight K'kree families, cooperating to manufacture a popular line of cleaning robots.

Solomani

Panstellar: Specializing in high technology, Panstellar sells expert robots capable of designing and safely erecting a building in any environment. Panstellar, founded on old Terra, also markets spaceships throughout the Solomani Rim.

Vargr

Eksaekfoer: Eksaekfoer sells robots under a variety of different brand names, including those of several competing Vargr firms, and occasionally even Ling Standard Products and Star Patterns Trading. These shoddy counterfeits are not worth their freight charges.

Ungzoenogzkha: This corsair band, headquartered in Meshan sector, has recently diversified its product line to include bargain-priced heavy construction robots. The low price and high quality of these robots is easy to explain: they are stolen.

Zhodani

Manufacture of robots above TL 13 is tightly monitored, and new consular licenses are hard to come by. Warbots are made by a number of different contractors. Among the most important are: Chiadle, IAD, and Tliazhashal. Tliazhashai is the largest Zhodani defense contractor, and is also the largest provider of equipment and civilian personnel for the Zhodani Core Expeditions.

The Robot Brain

It is impossible to discuss robots without also discussing the computer hardware and software that make the robot brain and artificial intelligence (AI) possible. As technology advances, the breakthroughs that finally make robots an economic reality can be seen,

Tech Level 4: Primitive "computational machines" first appear. These crude devices can perform arithmetic calculations and simple sorting operations by mechanical means. From these early devices, the idea of instructing a machine to follow a given course of action, or "programming", is born.

Tech Level 5: Slow and bulky mechanical calculating engines give way to slow and bulky electric calculating engines. The machines are still used strictly for numerical processing, with no real idea of symbolic manipulation until late in TL 5.

Tech Level 6: The advent of electronics makes a new generation of computers possible. Miniaturization and reduced cost make computers more common, and result in a mushrooming of their applications, "High-level" programming languages make symbolic (i.e., non-numeric) manipulation easy, and give birth to the dream of a practical artificial intelligence.

Tech Level 7: Computers that once filled entire rooms are reduced to desktop size, thanks to electronic miniaturization. Processing speeds and offline data storage capacity increases. Research in artificial intelligence produces the first computers that can consistently beat sophonts in complicated games. Some primitive language translators appear, and expert systems in law, medicine, geology, and other professions pique the public interest. While some great strides have been made in AI research, it is conceded that truly inductive, self-learning, self-aware machine artificial intelligence is still but a dream.

Tech Level 8: Prior to this tech level, most commercially available computers execute one instruction on one data item at one time. At TL 8, however, "massively parallel" computer architectures become common. Processing power leaps as computers are able to perform hundreds, or even thousands, of operations simultaneously. The benefits to language understanding, expert systems, visual recognition systems, and other aspects of artificial intelligence are immediate, as machines can finally consider hundreds of facts at once to make their decisions. TL 8 data storage capacity increases by an order of magnitude with the introduction of optical storage devices.

Also at TL 8, computers in most societies reach the "low data" stage—i.e., they are capable of storing a variety of data using a variety of means. But computers are still rather rudimentary appliances, severely limited by the capabilities of their hardware and software. "Low data" computers cannot learn by themselves,

Tech Level 9: Non-volatile computer memories become common, so that no power supply is needed to preserve data when the computer is shut off. Computers can now be stored powerless for years, and yet pick up where they left off as soon as power is resumed.

Using new software techniques, along with increased use of parallel processing, advanced AI research computers at TL 9 reach the "high data" stage, Such computers are programmed so they can "learn" to some degree from their mistakes, as well as from their successes. Thus, by programming the computer with a basic knowledge of a particular skill, it can improve its knowledge of that skill through "experience" over time.

Computers at this tech level can also be programmed to understand limited basic commands when given vocally. These consist of one-word commands from a vocabulary of a few hundred words. No pre-training is required, but careful enunciation is necessary. Speech synthesizers are perfected at this tech level,

"High" data computers remain largely in the realm of AI research, since they are outrageously expensive and subject to strange "quirks".

Tech Level 10: Voice transcription devices become widespread, allowing computers to produce written text directly from spoken words. The "domain of discourse" is carefully circumscribed, so lawyers must buy different modules than doctors use, and doctors must use different modules than businessmen. The use of voders (speech synthesizers) to produce "spoken" computer output becomes common in most societies at this tech level.

While the transcribers at TL 10 do not need to "understand" what is being said (they can be made less expensively if they do not understand), computers at this level can be made to understand and respond to basic commands, consisting of simple sentences. Serious AI experiments with synaptic processing begin,

Tech Level 11: Primitive experiments in synaptic processing at TL 10 lead to its limited commercial use at TL 11. Prior to this tech level, computers are strictly deterministic; that is, given a certain set of data as input, a computer will always produce the same output. Synaptic processing, an attempt to model computer operation after sophont brains, is found to introduce a measure of non-determinism into the computer CPU.

The synaptic processors at this level are bulky, slow, unreliable, and expensive, but they do have advantages over traditional deterministic processors for certain artificial intelligence applications. Configuring the computer to use a deterministic master coupled with a small percentage of synaptic enhancement, pattern recognition and language understanding systems can be made faster and more robust. A purely synaptic computer is not functional at all, because of the unreliability caused by the overloaded synaptic circuits. A large percentage of traditional deterministic processors in the machine can be used to reduce the number of false matches picked up by the minute synaptic percentage.

Tech Level 12: More reliable synaptic processors allow true self-programming (heuristic or self-teaching) AI software to be developed, but cost and size continue to be limiting factors. "Low autonomous" computer brains appear, making possible the first self-actuating, learning machine with a reasonable intelligence.

At TL 12 then, the self-mobile computer brain with developed manipulative appendages (i.e., a robot) finally becomes an economic and commercial reality.

Computers at TL 12 can be made to understand virtually any spoken command, including complex sentences spoken by someone with an accent or speech impediment.

Tech Level 13: The first "high autonomous" software appears. At last, robot brains possess a crude form of artificial intelligence: these machines are not only self-actuating and self-teaching, but they are able to make better use of these capabilities with their moderate intelligence.

Holographic crystal data storage, first widely available at TL 13, increases the capacity of computer memory banks by another factor of 10 over optical storage. Processing rates also continue to increase with each tech level, keeping pace with the growing storage capacity.

Both "low autonomous" and "high autonomous" software require the use of synaptic processors, as well as heavy parallelism.

Tech Level 14: Sophonts take matters into their own hands, or rather into their own brains. Experiments with lesser animals make a direct implant possible, allowing a computer to exchange massive amounts of data at microsecond rates with a living brain. Initial use of such devices is typically restricted to correcting certain neurological disorders, rather than to enhance intelligence.

Linear CPU "clock speeds" reach their upper electronic limits at tech level 14. The only way to make computers faster now is to increase the degree of parallelism or to increase the use of synaptic processing, which is becoming more reliable with each increase in tech level.

While robot brains can now include up to 25% synaptic processing, the most reliable traditional computers (such as starship computers) still rely on deterministic massively parallel processing.

Tech Level 15: Computers become "alive", thanks to sophisticated programming and remarkable visual imaging devices. "Pseudo-reality" machines can artificially produce the illusion of existence of whatever they are programmed to produce, with the help of holographic (3-D) displays. For example, the personality of a dead individual can be programmed into a computer, allowing one to "converse" with the dead individual (via the computer) as if that individual were still alive.

Above the Imperium's highest tech level:

Tech Level 16: Computers become still faster, cheaper, smaller, and more reliable, in no small part, thanks to the increased capabilities of synaptic processing. Reliable synaptic processing crosses the 50% boundary and makes "low artificial intelligence" software a reality. True creativity and unprogrammed inspiration spring from these fantastic machines.

Tech Level 17: Computers with synaptic "brains" can program themselves through their hardware, with no outside software influence. It is literally possible to setup one of these computers, with the proper sensory peripherals and an almost empty memory bank, and after a few years of "eavesdropping" it can understand simple commands. Computers at this level are "self-aware".

Tech 17 computers are possessed of exceptional intelligence, guided by what is, in every sense of the word, an artificial mind. This "high artificial intelligence" programming, as well as the earlier "low artificial intelligence" programming, is possible only by using massively synaptic processors.

AN EXAMPLE OF SYNAPTIC PROCESSING

One way to understand the distinction between earlier deterministic processing and the more advanced synaptic processing is to see the difference between deductive and inductive learning.

Consider, for example, two Vilani gentlemen who wish to learn Gvegh, the most common Vargr language, Mr. D, the deductive learner, purchases a holo book of Gvegh grammar, or perhaps he attends classes at a local school. He spends much of his spare time scrutinizing charts and tables, carefully memorizing the intricacies of Gvegh grammar and vocabulary.

Mr. I, on the other hand, chooses the inductive approach. He travels to Lair and spends all of his time among speakers of Gvegh. Eventually, the goings-on around him start to sink in, and little by little, he learns the language. This method is quite natural: it is the method used by all Gvegh pups, and, in fact, it is the very method by which Mr. I learned Vilani as he grew up.

The inductive and deductive methods both reach the same goal: a knowledge of Gvegh, The deductive method is faster, but more difficult. The inductive method takes longer, but is a more natural method of learning and requires no "studying".

Relating these two techniques to computer hardware and software, the early deterministic machines were strictly deductive. These devices were programmed with certain information, and by following a fixed series of steps, the computers could manipulate their input to produce a desired output.

Synaptic hardware, modeled after sophont brain processes, is non-deterministic, and operates by a method more akin to inductive learning. There is not so much a fixed series of steps, as there is a general pattern to compare to. Input is taken in by sensors and other devices, and by comparing these data sets to patterns already known, the computer can reach its conclusions with (preferably) a high degree of certainty.

Because of the way this process works, some matches will be "false" or incorrect: the computer will mistakenly think that two dissimilar things are related. At lower tech levels, the inherent unreliability of synaptic processors is so great that a large degree of linear or parallel processing is needed to "check" the results of the synaptic processing. At higher tech levels, synaptics are better able to stand on their own.

As a synaptic processor makes more decisions, it inductively "learns" and revises the patterns to which it compares the outside world.

Robot Construction

Travellers can find a wide variety of robots throughout known space. Not only does each alien race use *a* different philosophy of design for robots, but within any single race one encounters many different sizes, configurations, and purposes of robots. The design rules as given here are primarily for robots in the Imperium. The needed modifications for the other major races can be determined from the section at the end of this chapter Non-Imperial Robots.

The design tables use kilowatts as the unit of power, and liters as the unit of volume. To convert to *Striker* units

1 megawatt = 1000 kilowatts

1 $meter^3$ = 1000 liters

PRE-CONSTRUCTION CONSIDERATIONS

Before designing a robot, certain items must be considered. What is the tech level of the robot? What is its purpose? Is there a price limit? Are there specific attributes that must be incorporated into the robot design? (Also see the chapter Robots as Characters.)

SUMMARY OF ROBOT DESIGN

The robot design process consists of several steps, beginning with the choice of a bare chassis and ending with the selection of program software and brain. A robot's components consist of:

1. Chassis (attributes of size, configuration, and armor)
2. Power plant (choose from fuel cell, fusion, or batteries)
3. Method of locomotion (choose grav, air cushion, legs, tracks, or wheels)
4. Appendages (choose head(s), arms, tentacles)
5. Equipment to install (sensors, devices, weapons)
6. Software (fundamental logic, command, applications)
7. Brain (choose CPU size and type, storage size and type)

The design process is detailed in the text that follows, A design checklist and a convenient Robot Design Form (which may be photocopied) are provided in this book as an aid to robot design.

The Chassis

This is the bare framework onto or into which all other components are placed. The three attributes to be determined are size, configuration, and extra armor, if any.

Select the desired chassis size from the Chassis Size Table. Generally, ail installed components must fit within the volume of the chosen chassis.

Next, select the chassis configuration from the Chassis Configuration Table. The configuration types are:

Open Frame: An open skeletal frame with no exterior covering,

Box/Wedge: A square-edged exterior with few rounded edges.

Cylinder/Cone: An oblong rounded exterior with few square edges.

Sphere: A ball-shaped exterior.

Dome/Disk: A half-sphere or flattened-sphere exterior.

Contoured: Hard-skinned with a shape usually patterned after some biological creature, often the creating race (e.g., humanoid, hiver, or whatever).

Pseudo-biological: Soft-skinned biological look-alike, often of the creating race. At tech 15 and above, pseudo-biological robots may pass for members of their "race".

Notice that the configuration modifies the basic weight and price of the chassis as given on the Size Table. The configuration also gives a basic armor level to the robot.

It is possible to increase a robot's armor beyond the basic value given on the Configuration Table, at an additional increase in the chassis weight and price.

To increase the armor when using basic **Traveller:**

for Configurations 1, 2, 3, 4, or 5

from mesh to cloth: chassis weight and price x 2.5

from mesh to combat armor: chassis weight and price x 10.

To polish any armor type to reflec standards: chassis price x 2.

for Configuration 6

TL 13: from jack to mesh: total robot weight and price x 2.

TL 15: from jack to cloth: total robot weight and price x 5.

To increase the armor when using *Striker,* use the following formula:

$$F = A/a$$

Where *F* is the factor we are determining, *A* is *Striker* equivalent cm thickness for new armor value, and *a* is *Striker* equivalent cm thickness for configuration basic armor value.

Use this factor as an additional multiplier on the chassis weight and price. Configurations 1 through 5 are limited to a maximum armor value of 18 (TL 14 battle dress). To polish any armor to reflec standards, multiply the chassis price by 2 (same as for basic **Traveller).**

The armor value for a pseudo-biological configuration can be raised 1 per tech level over 12.

Configuration 0 {open frame) cannot have armor.

Note: Be sensible when adding armor to a robot. At tech 15 the maximum basic **Traveller** armor limit for a pseudo-biological chassis (configuration 6) is cloth. Using the multiplier of 5 above, we get a total weight multiplier of 7.5 (5 x 1.5) and a total cost multiplier of 40 (5 x 8) for a pseudo-biological robot. A pseudo-biological warbot is extravagantly wasteful, but if a pseudo-biological robot must go into battle, an armor suit used by the race they are modeled after is just as good and much cheaper.

Power Plant

The power plant, installed in the chassis, provides the power to move the robot and operate its many components. Types of power plants include:

Fuel Cell: Advanced hydrogen/oxygen fuel cells are powerful and efficient. The fuel consumption listed on the table assumes a closed hydrogen/open oxygen design. Such a fuel cell carries its own supply of hydrogen, but draws its supply of oxygen from the air. If the robot must operate in a hostile or vacuum atmosphere, oxygen must be provided as well. Multiply the fuel consumption rate in this case by 9 to account for the relative mass of oxygen molecules to hydrogen molecules.

Fuel cells produce pure water as a waste by-product. The amount of water produced is 9 times the fuel consumption rate on the table. High tech fuel cell technology typically eliminates the waste water through an evaporation process, so the problem of what to do with the waste water can easily be ignored if desired.

Fusion: By its very nature, a fusion reactor can only be made so small, even at higher tech levels. Fusion reactors smaller than 1000 liters (1 cubic meter) are less efficient, and the efficiency declines as the size decreases. The 250 liter size listed on the table is generally conceded to be the lower size limit. Below this limit, fuel cells are the preferred choice.

Batteries: Battery technology makes great strides at higher tech levels, with sustained power output for a given volume and weight increasing dramatically. These "super batteries" are, however, quite expensive.

From these types, choose the desired power plant. The output from the power plant must be sufficient to provide all the energy needed for the robot's locomotion, brain, appendages, sensors and devices. Moreover, the power plant volume must be small enough to leave room in the chassis for power plant fuel and other necessary components. Note that at higher tech levels, power output increases, while weight decreases.

Power plant output is measured in kilowatt-hours. These kilowatt-hours are assigned as points to those components which require energy. Kilowatt-hours may be distributed as needed—one kilowatt-hour will supply an item requiring one energy point for one hour, or it can supply an item requiring half an energy point for two hours, etc.

Batteries can be used either as the primary power source (at a greater cost and weight than fuel cells or fusion), or to supplement the normal power plant by allowing the robot to continue to function even though the regular power plant is not operating. To determine how long {in hours) the robot can function on batteries, divide the total power requirement of all components into the total battery storage. Robots with an intelligence of 4 or more can voluntarily shut down certain systems to conserve their supply of energy.

Both fuel cells and fusion power plants require fuel to operate. The Power Plant Table lists the fuel consumption of each power plant. The fuel tanks are installed in the leftover space in the chassis after the robot is designed. The space used for this purpose should be large enough to provide fuel for several days of operation, with a 30 day supply considered ideal. For game purposes, robot fuel is considered to be the same as that used in starships.

The exact fuel requirements are listed on the Power Plant Table.

Locomotion

If the robot needs to move from place to place, locomotion units must be installed (some robots may be intentionally designed without any locomotion and are thus non-mobile). The types of locomotion available include:

Anti-gravity modules: The robot uses anti-gravity modules (or more simply, "grav modules") to move about. Three types of grav modules are available: Ultra Heavy Duty (relatively cheap, with adequate power to thrust ratio); Heavy Duty (moderately priced, with good power to thrust ratio); and Light Duty [expensive, with excellent power to thrust ratio}. Anti-grav is expensive, but provides the best mobility of any locomotion method; a robot with anti-grav can fly like any grav vehicle.

Air cushion: Air Cushion locomotion (also termed "AC") allows a robot to hover about 1 meter off the ground on a cushion of compressed air created by ducted fans. Unlike grav locomotion, AC locomotion cannot function in a vacuum. AC locomotion is second only to anti-grav in mobility. A robot with AC locomotion can cross bodies of water with ease, but it cannot fly like a grav vehicle.

Legs: The robot uses flexible-limb legs to move about. Most leg-based robot designs use 2 to 8 legs, with 2 legs by far the most common. Occasionally designs use more than 8 legs, or even a single leg. Hiver leg-based designs typically use 6 tentacle-like legs (treat like regular legs for design purposes). Legs are ideal in rough terrain.

Wheels: The robot uses wheeled locomotion to move about. Wheels are most common in robot designs limited to urban areas or used indoors. Wheels do poorly in rough terrain (See Robots in a **Traveller** Game).

Tracks: The robot moves about using tracked locomotion. Tracks provide the robot with a slightly better dexterity than do wheels. Tracks are better than wheels in rough terrain.

Grav and AC require only a suspension, which is installed in the chassis. Legs, tracks, and wheels each require both a suspension and a transmission. The type of locomotion chosen determines the robot's base dexterity, from which the final URP [Universal Robot Profile) code for dexterity is derived. In all cases, the power draw must not exceed the power plant output.

Grav Locomotion

Grav robots must have a suspension, but no transmission is required. The thrust must exceed the weight of the robot.

Maneuver Gs: A grav robot has Gs of acceleration equal to its thrust in kilograms divided by its weight, also in kilograms. One G is needed to keep the robot in the air (and if its thrust is less than one G, the robot cannot move); thrust in excess of one G is used for maneuver. Thus, to find maneuver Gs, subtract one from the total G value.

For example, a robot has a power plant that outputs 10 points and weighs 200 kg. The robot could use one HV grav module to produce 400 kg of thrust at a cost of 8 energy points and Cr 10,000.

AC Locomotion

AC robots must have a suspension, but no transmission is required, AC suspension must occupy at least 10% of chassis volume. The thrust must exceed the weight of the robot.

For example, a robot has a 100 liter chassis and weighs 200 kg. One AC unit occupies 10 liters (which is the required 10% of the chassis) but only produces 50 kg of thrust. Five AC units are adequate since they produce 250 kg of thrust. Five AC units take up 50 liters of space, use 25 kw, and cost Cr7500.

Legs

Suspension: Each leg requires 5% of chassis volume; 8 or more legs always require 40% of the chassis volume.

Transmission: One unit of transmission is required for each kilowatt of power plant output.

The transmission volume is external to the chassis volume; divide the transmission volume by the number of legs, to determine the transmission volume for each individual leg.

For a contoured configuration or a pseudo-biological configuration, legs have a volume twice that of other configurations. However, the transmission does not require any extra volume, so add one half of the final leg volume (that is the original volume before it was doubled) to the chassis volume.

For a contoured configuration, multiply the weight and price of legs by the configuration modifiers (1.2 for weight, 2.0 for price).

For example, a 150 liter pseudo-biological robot has a power plant that outputs 60 kilowatts. Two legs require a suspension volume of 15 liters, which weighs 15 kg and costs Cr525. The 15 liters is subtracted from the chassis volume, giving a remaining chassis volume of 135 liters. The 60 units of transmission require 30 kw of power, have a volume of 30 liters, weigh 60 kg, and cost Cr900. Since this is a pseudo-bio configuration, the actual volume of the legs is twice the transmission volume, or 60 liters. Since the transmission only takes 30 liters of that volume, the other 30 liters of the leg volume is added back to the chassis, making a final remaining volume for the robot of 165 liters.

Wheels

Suspension: Wheels require at least 15% of chassis volume.

Transmission: One unit of transmission is required for each kilowatt of power plant output. The total transmission volume must fit within the chassis volume.

For example, a robot has a 300 liter chassis and a power plant output of 90 kw. The wheel suspension takes a minimum of 45 liters, which weighs 45 kg and costs Cr540. The 90 units of wheel transmission take 27 liters, use 27 kw, weigh 45 kg, and cost Cr1350.

Tracks

Suspension: Tracks require at least 20% of chassis volume.

Transmission; One unit of transmission is required for each kilowatt of power plant output. The total transmission volume must fit within the chassis volume.

For example, a robot has a 300 liter chassis and a power plant output of 90 kw. The track suspension takes a minimum of 60 liters, which weighs 45 kg and costs Cr1500, The 90 units of track transmission take 54 liters, use 36 kw, weigh 135 kg, and cost Cr1350.

Exceptions

Some robots have none of the standard locomotion systems, but are mobile in certain environments by virtue of software and use of appendages or devices. For example, a robot designed for underwater use would need only an aqua maneuver package; a robot for space use would need only a zero-G maneuver package (see Sensors, Devices, and Weapons, below).

Also, certain robots do not require locomotion systems at all. Non-mobile robots can be used as integral portions of various structures, such as office buildings and starships, allowing them to use their entire energy output for things other than locomotion. Such robots are most common on board starships, indeed built into

CHASSIS SIZE TABLE

URP	*V(liters)*	*Wt(kg)*	*Price(CR)*	*Notes*
0	5	0.5	1500	Chassis type a
1	10	1.0	2500	Chassis type b; infant human torso size
2	20	2.0	4000	Chassis type c
3	50	5.0	7500	Chassis type I
4	80	8.0	9500	Chassis type II
5	100	10.0	1000	Chassis type III; adult human torso size
6	150	15.0	1500	Chassis type IIIb; large torso size
7	200	20,0	2000	Chassis type IV
8	350	35.0	2500	Chassis type IVb
9	500	50.0	3000	Chassis type V
A	750	75.0	3500	Chassis type Vb
B	1000	100.0	4000	Chassis type VI
C	2000	200.0	5000	Chassis type VII
D	3000	300.0	6000	Chassis type VIIb

CHASSIS CONFIGURATION TABLE

URP	*Configuration*	*Wt Mod*	*Price Mod*	*Armor*
0	Open Frame	0.5	0.5	none
1	Box/Wedge	—	—	mesh
2	Cylinder/Cone	—	1.1	mesh
3	Sphere	0.8	1.5	mesh
4	Dome/Disk	0.9	1.2	mesh
5	Contoured	1.2	2,0	mesh
6	Pseudo-biological*	1.5	8.0	jack

Modifiers affect only the chassis weight and price.
*Pseudo-biological modifiers affect the total weight and price of the robot, not just the chassis.

LOCOMOTION: SUSPENSIONS (GRAV, AIR CUSHION)

URP	*Type*	*Power*	*V(liters)*	*Wt(kg)*	*Thrust(kg)*	*Price(CR)*
C	Air Cushion	5	10	15	50	1500
D	UH Grav Mod	100	20	40	1000	2000
E	HV Grav Mod	8	20	12	400	10000
F	LT Grav Mod	1	3	2	100	30000

LOCOMOTION: TRANSMISSIONS (LEGS, TRACKS, WHEELS)

URP	*Type*	*Power*	*V(liters)*	*Wt(kg)*	*Price(CR)*	*Base Dex*
0-9*	Legs	0.5	0.5	1.0	15	TL-8
A	Wheels	0.3	0.3	0,5	15	2
B	Tracks	0.4	0.6	1.5	15	3

These values are for one unit of transmission (see text).
*The URP value for legs is the number of legs,

LOCOMOTION: SUSPENSIONS (LEGS, TRACKS, WHEELS)

Type	*V(liters)*	*Wt(kg)*	*Price(CR)*
Each Leg	1	1.0	35
Tracks	1	1.0	25
Wheels	1	1.0	12

BRAIN COMPONENTS

Type	*V(liters)*	*Wt(kg)*	*Price(CR)*	*TL*
CPU, linear	0.2	0.1	500	8
CPU, parallel	0.5	0.1	10000	9
CPU, synaptic	0.1	0.1	50000	11
Storage, standard	0.5	0.1	250	8
Storage, synaptic	0,1	0.05	25000	11

These values are for one unit (see text).
The power requirement for any size brain is 1 kilowatt per hour.

POWER PLANT TABLE

URP	*Type*	*Output*	*V(liters)*	*Wt(kg)*	*Price(CR)*	*Fuel*	*Notes*
0	Fuel Cell	10	20	20	600	0.10	Type A
1	Fuel Cell	20	30	35	800	0.15	Type B
2	Fuel Cell	30	40	55	1000	0.20	Type C
3	Fuel Cell	40	50	75	1200	0.25	Type D
4	Fuel Cell	50	60	95	1400	0.30	Type E
5	Fuel Cell	70	80	130	1500	0.35	Type F
6	Fuel Cell	90	100	165	2000	0.40	Type G
7	Fusion	245	250	1000	300000	0.75	
8	Fusion	500	500	2000	250000	1.00	
9	Fusion	1000	750	3000	225000	1.20	
A	Fusion	2000	1000	4000	200000	1 .5	

Output: in kilowatt-hours. TL 13 + multiply by 1.5, TL 15 multiply by 3, TL 16 + multiply by 3.5.
Wt: in kilograms. TL 13+ multiply by 0.75, TL 15 multiply by 0.5, TL 16+ multiply by 0.4.
Fuel: liters consumed per hour. Each liter weighs 0.07 kg.

BATTERY TABLE

URP	*TL*	*Storage*	*Price(CR)*
0	12	1	850
1	13	3	3000
2	14	4	5000
3	15	7	10000
4	16	11	15000
5	17	18	20000

Storage: amount of energy stored per kg of battery. The figure shown is in kilowatt-hours.
Price: Cr per kg of battery.
Volume: 1 liter per kg.

APPENDAGE TABLE

Type	*Power*	*Wt(kg)*	*Price(CR)*	*Dex+*	*Str+*
Arm, very light	1	1	750	+3	
Arm, light	2	5	500	+2	+5
Arm, medium	5	20	700	+1	+20
Arm, heavy	10	50	1000	+0	+50
Tentacle, very light	3	5	1000	+5	+0
Tentacle, light	5	10	750	+4	+3
Tentacle, medium	10	20	1200	+3	+7
Tentacle, heavy	15	30	1500	+2	+ 10
Head (see text)	varies	varies	varies	—	—

FUNDAMENTAL LOGIC PROGRAMS

URP	*Description*	*TL*	*CPU*	*Parallel*	*Synap*	*Storage*	*Price(CR)*	*Dex*
0	Low Data	8	*2*	0	0	10	400	+0
1	High Data	9	*3*	5	0	10	3000	+1
2	Low Autonomous	12	15	10	1	25	7000	+2
3	High Autonomous	13	20	12	3	25	10000	+2
4	Low Artificial Intel	17	25	4	21	25	20000	+3
5	High Artificial Intel	18+	30	2	28	25	50000	+3

CPU: Total number of CPU units required,
Parallel: Minimum number of CPU units that must be parallel.
Synaptic: Minimum number of CPU units that must be synaptic.
Storage: Total number of storage units required.

FUNDAMENTAL COMMAND PROGRAMS

URP	*Description*	*CPU*	*Storage*	*Price(CR)*	*Fund Logic Reg.*	*Int*
0	Limited Basic Command	1	1	500	Low Data	0
1	Basic Command	2	2	1000	High Data	+1
2	Full Command	3	5	5000	Low Autonomous	+2

SENSORS

Type	*Power*	*Wt(kg)*	*Price(CR)*
Visual Sensor	0.5	0,5	100
+ telescopic	1.0	2.0	200
+ light intensifying	1.0	1.0	200
+ passive infrared	1,0	1.0	200
+ active infrared	2.0	2.0	300
Audio Sensor	1.0	0.5	50
+ extra sensitivity	1,0	1.0	200
Olfactory Sensor	2.0	1,5	1500
+ extra sensitivity	2,0	1.0	2000
Basic Sensor Package	4.0	3.0	1700
Voder	2.0	3.0	1200
Touch Sensor*	1.0	0.5	150
+ extra sensitivity*	0.5	0.5	200
Taste Sensor	1.0	1.0	1750
Magnetic Sensor	1.0	0.5	1000
Radiation Sensor	1.0	0.5	1200
Mass Sensor	2.0	1.0	1000
Neutrino Sensor	5.0	4.0	1200

*Multiply this value by the chassis size URP (treating 0 as 1). Add this value to the base cost for Touch Sensors of Cr1000 to determine the total cost for the sensor.

DEVICES

Type	*Power*	*Wt(kg)*	*Price(CR)*
Electronic Circuit Protection	—	x1.5	x1.5
Spotlight (visual spectrum)	1.0	1.0	50
Acoustical Speaker	1.5	1.0	200
Power Interface	1.0	0.5	100
Brain Interface	1.0	1.0	1200
Program Interface	1.0	1.5	1000
Zero-G Maneuver Package	1.0	4.0	2000
Aqua Maneuver Package	5.0	10.0	1100
Master Unit	3.0	2.0	400
Slave Unit	2.0	2.0	200
Radio, Distant Range (5km)	0.5	0.1	75
Radio, Very Distant Range (50km)	1.0	0.4	250
Radio, Regional Range (500km)	1.5	1.0	500
Radio, Continental Range (5000km)	2.0	5.0	5000
ECM	2,0	2.0	5000
Extensive ECM	8.0	6.0	20000
Obscuration Device	1.0	5.0	150
Odor Emitter	1.5	2.0	500
Video Recorder (2D)	3.0	4.0	600
Flat Video Display (2D)	5.0	2.0	500
TL13 Holo Recorder (3D)	10.0	15.0	2000
TL14 Holo Recorder (3D)	8.0	6.0	4000
TL15 Holo Recorder (3D)	5.0	3.0	5000
Holodisplay (3D), TL13+	8.5	10.0	15000
Laser Welder, Light	5,0	10.0	5000
Laser Welder	15.0	25.0	8000
Janitorial Tool Package	4.5	18.0	3500
Mechanical Tool Package	5.0	25,0	2500
Electronic Tool Package	3.5	8.0	5000
Metalwork Tool Package	10.0	60.0	4000
Carpentry Tool Package	10.0	30.0	500
Medical Instrument Package	1.5	15.0	6000

SYNAPTIC LIMITS

TL	*Reliable Synaptic %*
12	10%
13	15%
14	25%
15	40%
16	60%
17	85%
18	95%

ROBOT ECONOMICS

TL	*Life in Years*	*Max. Bank Loan Term*
10	10	5
11	25	12
12	40	20
13	55	27
14	70	35
15	85	40
16+	100+	40

APPLICATION PROGRAMS

Description	*Space*	*Price(CR)*
Pilot	4	500
Navigator	4	500
Steward	2	300
Medical	4	500
Vacc Suit	1	200
Survival	1	300
Survey	4	600
Grav Vehicle	2	400
Ship's Boat	2	400
ATV	1	300
Gunnery	2	400
Electronic	2	400
Mechanical	2	400
Engineering	4	400
Gravities	4	400
Communications	2	400
Naval Architect	4	600
Forward Observer	2	400
Demolition	2	400
Prospecting	4	500
Another Language	5	600
Tactics	8	800
Ship Tactics	8	800

Description	*Space*	*Price(CR)*
Fleet Tactics	8	800
Recon	2	400
Hunting	2	400
Forgery	1	300
Interrogation*	3	500
Bribery*	6	700
Recruiting*	5	600
Gambling*	4	400
Instruction*	10	700
Administration*	4	400
Legal*	8	700
Trader*	6	400
Valet*	2	300
Linguistics	10	800
Vehicle	4	400
Close Combat	3	400
Weapon Handling	2	300
Security	2	200
Infantry Ground Cbt	5	400
Armor Ground Cbt	6	500
Rescue	4	200
Cargo Handling	2	200
Emotion Simulation	2	400

*Requires Emotion Simulation,

Note: If less than tech level 12, all space requirements and prices for application programs are doubted.

WEAPONS PACKAGES

Type	*Power*	*Wt(kg)*	*Price(CR)*
Body/Snub Pistol	1.0	1.0	700
Automatic Pistol	1.0	2.0	700
SMG	1.0	5.0	800
Auto Rifle	2.0	5.0	1500
Gauss Rifle	3.5	6.0	2000
Laser Pistol	4.5	5.0	2500
Laser Carbine	5.0	8.0	3000
Laser Rifle	15.0	14.0	5000
PGMP-12*	10.0	17.0	11000
PGMP-13*	11.0	12.0	70000
PGMP-14*	15.0	20.0	325000
FGMP-14*	12.0	15.0	125000
FGMP-15*	16.0	6.0	450000
LAG	3.0	5.0	900
LMG	2.0	10.0	1800
Auto Grenade Launcher	2.0	7.0	1000
RAM Grenade Launcher	2.0	7.0	4000
RAM Auto Grenade Launcher	2,5	21.0	7500

*These weapons require a chassis URP of 6 + .

them with the sole purpose of being the ship's navigator, communications specialist, or whatever is required.

Appendages

The appendages allow the robot to manipulate and interact with the outside world. The appendage chosen affects the robot's final strength and dexterity. There are three types of appendages—arms, tentacles, and heads.

For a contoured configuration, multiply the weight and price of the appendage by the configuration modifiers,

A head is a special rotating appendage, almost an extension of the chassis, and as such adds its volume to that of the chassis. If a head is desired, the minimum size for it is 5% of the chassis volume; the maximum size is 40% of the chassis volume. Multiple heads are possible as long as their total combined volume does not exceed 40% of the chassis volume. Multiply the chassis weight and price by the head's volume percentage to determine its weight and price. The power requirement in kilowatts to provide the head with the ability to move is .2 times its volume in liters. The volume of the head is added to the chassis volume.

Any appendage may carry up to 2 times its weight in installed sensors, devices, or weapons.

Sensors, Devices, and Weapons

The Sensors Table, Devices Table, and Weapons Table all list components that can be mounted in or on the chassis, head, or any other appendage. All items installed must be able to draw power at the rate shown on the table to be functional. The items listed in the tables are described below.

Visual Sensor: Gives the robot the ability to see. At least two are suggested. Other features can be added to the basic sensor at the listed increase in power requirement, weight, and price.

Audio Sensor: Gives the robot the ability to hear. As with the visual sensors, at least two audio sensors are suggested. Increased sensitivity is possible at the listed increase in power requirement, weight, and price,

Olfactory Sensor: Gives the robot the ability to smell. Increased sensitivity is possible at the listed increase in power requirement, weight, and price.

Basic Sensor Package: Includes 2 visual sensors, 2 audio sensors, and 1 olfactory sensor. This combined sensor package is optimized in size, weight and price. Pseudo-biological robots cannot use this package.

Speech Synthesizer (Voder): Allows the robot to speak.

Touch Sensor: Provides the robot with the ability to sense through contact and touch. The values listed are for a robot with a chassis size URP code of 1. Larger chassis sizes require more sensors; multiply the chassis URP by the values in the table for power, weight and price to arrive at the actual values for any given robot,

Taste Sensor: Provides the robot with the ability to taste,

Magnetic Sensor: Allows the robot to detect the presence of magnetic fields and ferrous metals out to very distant range (5-50 kilometers) on a world's surface, or to planetary range (5,000-50,000 kilometers) in space.

Radiation Sensor: Detects excess radiation levels or dangerous radiation sources out to very distant range (5-50 kilometers) on a world's surface, or to planetary range (5,000-50,000 kilometers) in space.

Mass Sensor: Enables the robot to detect and locate objects of a specific mass out to very distant range (5-50 kilometers) on a world's surface, or to planetary range (5,000-50,000 kilometers) in space,

Neutrino Sensor: Allows the robot to detect and locate neutrino emissions from high energy sources (such as a fusion power plant) out to very distant range (5-50 kilometers) on a world's surface or to planetary, range (5,000-50,000 kilometers) in space.

Electronic Circuit Protection: Provides the circuits of the robot with radiation and harsh environment protection through the use of heavier circuit components, backup circuits, and shielding of critical circuits. Including this multiplies the robot's final weight and price by 1.5.

Spotlight, Visual Spectrum: This is a bright spotlight that illuminates out to 100 meters with visible light.

Acoustical Speaker: Allows the robot to reproduce simple sounds and music,

Power Interface: This allows a robot with batteries to have its batteries recharged by connecting to a suitable power source. A robot without batteries could also use a power interface to connect to a power source and thereby continue to operate without a functioning power plant (i.e., one that is damaged or out of fuel).

Brain interface; Gives the robot the ability to connect to other robots or computers and rapidly transfer data and programs.

Program interface: Permits the owner of the robot to physically exchange the programs that the robot has in storage currently with other available programs. This allows a robot with a minimum of storage to still be multi-purpose.

Zero-G Maneuver Package: Enables the robot to maneuver in a zero-G environment. Includes thrusters linked to a gyroscope to provide maximum stability and maneuvering ability. For game purposes, the thrusters are considered to use power plant fuel directly. Each combat round of thrusting uses .01 liters of fuel. In other words, 100 combat rounds (25 minutes) would use 1 liter of the available power plant fuel.

Aqua Maneuver Package: Enables the robot to maneuver in a water environment. The robot must have a configuration of 2-5 to use this package. Top speed is 25 meters per combat round (about 6 kph).

Master Unit: A control center needed for a robot to have remote control capability over slave units that do not have brains installed. The master unit must be installed in the robot with the brain. A radio is needed to communicate with the slave unit(s).

Slave Unit: Permits a brainless slave robot to be controlled remotely by a robot with a brain and a master unit. A radio is needed to communicate with the master unit.

Radio (various ranges): Allows the robot to communicate over long distances with another robot or being.

ECM: This is a device to counter low power radio jamming and radio homing devices. In combat situations, robots fall under attack by a variety of sophisticated weapons using several detection and location techniques. Counter ECM lessens the effectiveness of these enemy techniques,

Extensive ECM: This device counters most high power radio jamming and sophisticated radio homing devices.

Obscuration Device: Provides the robot with the ability to create a sight-blocking and laser-blocking smoke screen.

Odor Emitter: Permits the robot to emit specific odors, either pleasant or unpleasant. Used extensively by the K'kree in their robots. Also used by the Hiver in their warbots on the Hiver-K'kree border.

Video Recorder: Provides video recording equipment so that the robot may record all it sees and hears. This is somewhat more archaic than a holographer, as it provides only 2 dimensional images.

Flat Video Display: Provides the robot with a flat screen that displays 2 dimensional video images. When combined with the video recorder, the robot can instantly play back its video recordings.

Holo Recorder (various tech levels}: Like the Video Recorder, provides recording equipment so that the robot may record all it sees and hears. Provides much more realistic and informative 3 dimensional images.

Holodisplay: Provides the robot with the ability to display three dimensional holographic images. When combined with the holo recorder, the robot can instantly play back its holo recordings.

Laser Welder: Used to repair hulls and other major work. Similar to a laser rifle in combat, but its maximum range is 5 meters. Local law level does not restrict laser welders,

Laser Welder, light: Lighter version of the laser welder; treat as a laser carbine in combat, again with a maximum range of 5 meters.

Janitorial Tool Package: A collection of tools for sweeping, dusting, polishing, and vacuuming. Includes static charge dissipators and assorted mechanical cleaning aids.

Mechanical Tool Package: Identical to the mechanical tool set in basic **Traveller.**

Electronic Tool Package: Identical to the electronic tool set in basic **Traveller.**

Metalwork Tool Package: Identical to the metalwork tool set in basic **Traveller.**

Carpentry Tool Package: Identical to the carpentry tool set in basic **Traveller.**

Medical Instrument Package: Identical to the medical kit in basic **Traveller.**

All weapons are modified versions of their regular **Traveller** counterparts. Laser and energy weapons have as many shots as there is power available. Automatic weapons (including auto grenade launchers) have 100 shots, and all other weapons have 50 shots before reloading is required. Storage space on the robot may be allocated for extra ammunition magazine capacity, if desired.

Programming

Programs give a robot its intelligence and abilities. There are three program tables: fundamental logic, fundamental command, and applications.

Every robot requires the selection of a fundamental logic and a fundamental command program. These programs must be resident in the robot's CPU; they also need a specific amount of dedicated brain storage. These are listed on the Fundamental Logic Programs Table.

The Fundamental Logic Programs Table also indicates the amount of Parallel and Synaptic CPU units required for that type of logic.

The logic programs heavily influence the robot's basic intelligence. Choose from the following:

Low Data: The robot remembers all data taken in by its sensors. It cannot analyze or learn anything from the data. Commands must be explicit.

High Data: The robot remembers all data taken in by its sensors and can use the data to learn and gain "experience". The robot can improve the skill level of its application programs on its own. Commands must be explicit.

Low Autonomous: The robot can take independent action without direct commands and is able to understand simple inferences. Commands no longer need to be as explicit and the robot may be able to "figure out what you meant". It can analyze data and arrive at some very simple obvious conclusions. However, robots with this program are not truly creative they cannot originate ideas on their own. This is not yet artificial intelligence. The robot remembers all data taken in by its sensors and can use the data to learn and gain "experience". The robot can improve the skill level of its application programs on its own. Requires at least the "Basic Command" command program.

High Autonomous: The robot has the abilities conferred by Low Autonomous and is able to understand most inferences. Commands can be vague and the robot can still "figure out what you meant". Requires at least the "Basic Command" command program.

Low AI: The robot can reason and draw conclusions or originate ideas whose origins totally mystify the players. The robot has true artificial intelligence and may be mistaken for a sentient. The robot does not like being shut down. All the abilities of information, learning, and self-actuation are present. This level is beyond Imperial technology; the robot can exhibit true creativity and unprogrammed inspiration apparently through reasoning. Requires the "Full Command" command program.

High AI: The robot has an artificial mind in every sense of the word. Requires the "Full Command" command program.

The command programs provide the robot with its ability to decode and analyze the meaning of commands given to it. Select from:

Limited Basic Command: Provides the robot with a limited vocabulary of about 100 words. The speaker must enunciate words carefully or they may be misinterpreted or ignored. Foreign accents often cause difficulty.

Basic Command: Allows the robot to interpret simple, verb-object commands, like "get the red book" or "show the starport data". Complicated sentence structures like "I'm going to my cabin, so call me if anything appears on the sensors or an alarm sounds" cannot be used. Words must be enunciated carefully or they may become garbled. Foreign accents can cause garbling.

Full Command: Allows the robot to interpret all natural language commands without restriction. Poor enunciation and foreign accents are rarely a problem.

Application programs give the robot its skills. At least one application program must be designated as the robot's primary skill and reside in the CPU. All other applications can reside in storage, if desired. Programs put in the CPU will tend to increase the robot's intelligence, while programs put in storage tend to increase the robot's education.

The application programs listed are for skill level 1. To increase the skill level of a given application, multiply the space and price of the program by the desired skill level. The initial skill limit is 4, Robots may possess skill levels higher than 4 only by learning (see the Universal Robot Profile chapter). A robot with a skill level of 4 or more is known as an expert.

The sum of all the robot's skill levels may never exceed the sum of its intelligence and education. A robot with synaptic storage may increase its education to allow further improvement in its skill levels (see the Universal Robot Profile chapter).

Most of the listed skills are identical to their regular Traveller counterparts. The new application program skills are:

Another Language: The robot automatically has skill in one language when the fundamental command program is installed. If another language is desired, this application provides it. You must specify which language this application is for.

Linguistics: Gives the robot the ability to quickly learn and understand an unknown language, based on language structure laws.

Vehicle: This application program is a cascade skill. The specific vehicle skill must be selected. A robot with anti-grav must select grav vehicle skill, and it must be CPU resident.

Close Combat: Allows the robot to use its appendages and mass to fight and maneuver at close range; this allows a robot to have brawling skill.

Weapon Handling: This application is a cascade skill; *a* specific weapon must be chosen. An application program for each of the robot's installed weapons must be specified.

Emotion Simulation: Allows the robot to appear to have emotions, to seem frustrated, happy, angry, and so on. Certain other applications require this program. This program requires at least the Low Autonomous logic program and must be CPU resident. Note that this is the only application with no skill level associated with it.

Note: For all robots designed at tech level 11 or less, double both the storage size and the cost of all application programs.

Brain

A brain is required so that programs can be used to control the robot's functions. The brain is a sophisticated computer consisting of two basic parts; CPU (central processing unit) and storage.

A program must be in the CPU to be active and have its functions be part of the current "consciousness" of the brain. A non-essential program can be in storage until it is needed again. Storage is also used to remember data for future recall.

There are three possible types of CPU processors:

Linear: A traditional single-process CPU unit. This type of CPU processor is inexpensive, but is very limited in artificial intelligence. Twenty or more linear CPU units provide a +1 to the robot's intelligence.

Parallel: A simultaneous multiple-process CPU unit. Parallel CPU processors are very expensive compared to linear processors, but they are much better for artificial intelligence. For every five parallel CPU units, add +1 to the robot's intelligence, to a limit of +10.

Synaptic: An inductive processing CPU unit. Synaptic CPU processors are excellent at artificial intelligence applications. For every two synaptic CPU units, add +1 to the robot's intelligence. There is no limit to the effect of synaptic processing on intelligence.

There are two types of storage:

Standard: A traditional storage unit. Standard storage is cheap, but it takes a lot of it to give a robot a well-rounded knowledge base. For every ten units add a +1 to the robot's education.

Synaptic: A naturally learning storage unit. Synaptic storage is expensive, but allows the robot's education to improve beyond its original level. Initially, synaptic storage works exactly like standard storage. For a description on how a robot with synaptic storage can improve its education, see the Universal Robot Profile chapter.

Select the desired number of "units" of CPU and storage to accommodate the necessary programs. The brain must fit within the available chassis volume.

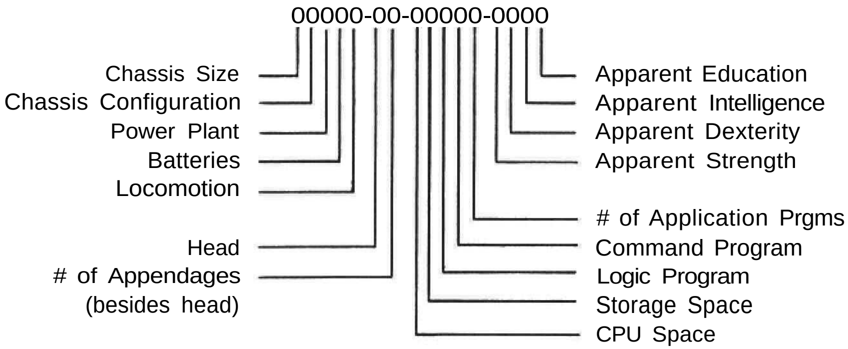
Synaptic units are limited by tech level, as shown on the Synaptic Limits Table. The table shows the maximum percentage of the CPU or storage that may be devoted to synaptic units. For example, a tech level 15 robot with a CPU size of 10 units can have a maximum of 4 synaptic CPU units. The same robot, with a storage size of 20 units, could have 8 synaptic storage units.

The only exception to this is a research and development robot; it may have synaptic units beyond its current tech level limit, but the synaptic percentage must still be below the limit of the next higher tech level. For example, a tech level 15 research and development robot with a CPU size of 10 could have 5 synaptic units, but it could not have 6 synaptic units.

The Universal Robot Profile

The Universal Robot Profile (URP) is used to quickly and concisely describe *a* robot's primary attributes. The format of the URP is:

Universal Robot Profile



The codes used for the URP digit positions describing chassis size, chassis configuration, power plant, batteries, locomotion, logic program, and command program come directly from the design tables.

The one-digit codes used for the URP digit positions describing the head, number of appendages, CPU space, storage space, number of applications, apparent strength, apparent dexterity, apparent intelligence, and apparent education are determined from this table of codes:

URP CODES

no.	*code*	*no.*	*code*	*no.*	*code*	*no.*	*code*
0	0	9	9	18	J	150	T
1	1	10	A	19	K	175	U
2	2	11	B	20	L	200	V
3	3	12	C	30	M	300	W
4	4	13	D	40	N	400	X
5	5	14	E	50	P	500	Y
6	6	15	F	75	Q	1000	Z
7	7	16	G	100	R		
8	8	17	H	125	S		

The four apparent characteristics represent rough equivalents to the standard UPP stats for characters, and are determined as follows:

Apparent Strength: Divide the chassis volume in liters by 20, and add the strength modifier from the Appendage Table for each appendage the robot has. For example, a robot with a chassis URP of 6 (150 liters/20 = 7) and four medium arms (+ 20 each) has a strength of 87 (URP code Q). For robots with grav or AC locomotion, always make sure that the weight of the robot plus the weight of its load never exceeds the total grav module thrust.

Apparent Dexterity; Take the base dexterity from the Locomotion Table and add the dexterity modifier from both the Appendage Table and the Fundamental Logic Program Table. For example, a TL13 robot with a locomotion of 2 legs (base dexterity for legs is 5 (13-8)), 4 medium arms (+ 1 each), and a "High Autonomous" logic program (+ 2) has a dexterity of 11 (URP code B). Dexterity can never exceed 15 (F). Robots with grav locomotion always have an apparent dexterity of 15; those with AC locomotion always have an apparent dexterity of 10.

Apparent Intelligence: Compute the following:

L + **P** + **S** + **C** + **T**

Where:
L = linear CPU units/20 (maximum of + 1)
P = parallel CPU units/5 (maximum of +10)
S = synaptic CPU units/2 (no maximum)
C = fundamental command modifier
T = tech level-12

For example, a TL 15 robot (T = 3) using full command (C = 2) using a brain with 30 linear (L=1), 12 parallel (P= 2), and 9 synaptic units (S = 4) has an intelligence of 12 (URP code of C). The absolute limit of robot brain intelligence is the robot's tech level minus 3. Thus 12 is the absolute robot brain intelligence limit at tech level 15.

Apparent Education: Divide the robot's total storage units by 10. For example, a robot with a total storage of 30 units has an education of 3, Robots with synaptic storage can improve their education to a limit of the total storage divided by 10 plus 1 for each unit of synaptic storage. Thus if the robot above had 15 units of synaptic storage out of the total of 30, the possible education limit is 18 (URP code of J). The maximum potential education is listed in parenthesis following the regular education digit,

A robot with synaptic storage and in active use can improve its education by the following method. Roll 11 + to improve education 1 level. Apply the following DMs.

+ 1 if INT is 5 +
+ 2 if INT is 10 +
+ 3 if INT is 15 +

Roll 6D to determine how many months have elapsed.

A summary of other pertinent data should be listed along with the URP:

Robot type URP price weight(loaded)
fuel = liters duration = 24 hour days tech level = ? speed = kph
chassis damage points (chassis armor type]
list appendages
list sensors

list devices
list weapons
list application programs

Chassis Damage Points: To determine the number of damage points a robot chassis can take before the robot is rendered non-functional, divide its volume in liters by 5. To determine the number of damage points the chassis can take before it is destroyed, divide the chassis volume by 2. For example, a robot with a chassis type III with a volume of 100 liters has chassis damage points of 20/50. The first number is what it takes to render the robot inoperable (in chassis hits), the other number is what it takes to destroy the robot (in chassis hits).

Sample URP's:

AB-101 56102-A2-PM327-FDC3(J) Cr11,970,600 319 kg
Fuel = 78.1 Duration = 21.7 days TL = 15
20/50 (jack)
2 light arms
2 eyes (+ 1 light intens), 2 ears, voder, touch sensors
Power interface, brain interface, TL15 holo recorder, elec circuit protect
Light laser welder (right arm)
Medical-1
Linguistics-1
Vehicle-1
Valet-1
Laser welder-1
Rescue-1
Emotion simulation

Zhodani Warbot 6230E-02-CK004-NF31 Cr158,550 280 kg
Fuel = 78.6 Duration= 13.1 days TL=14 Thrust = 400kg
30/75 (cloth)
2 Med arms
Basic sensor pkg, voder
Radio (50km), extensive ECM, elec circuit protect
Laser rifle
Grav vehicle-1
Tactics-1
Laser rifle-1
Inf ground cbt-1

Cargo Robot 7160B-N2-GC111-R421 Cr75,150 482kg
Fuel = 75.3 Duration = 7.8 days TL= 12
50/100 (mesh)
1 Head(40%)
2 Hvy arms
Basic sensor pkg, voder
Cargo handling-3

Robot Encounters

RANDOM ENCOUNTERS

On worlds of tech level 12 or greater (and on rare occasions, on worlds of tech level 10 or 11), characters may expect to encounter robots in the course of their activities. However, robots are not terribly uncommon in the everyday life of most player characters. Robots can be commonly found in and around the facilities that make up a starport or handle any and all ship related functions.

If the player characters are making a special effort to locate a robot as opposed to making some other type of encounter, this should be allowed. Roll 8 + once per day, provided the players are on a world of tech level 12 or greater, and apply the following modifiers.

+ 2 if industrial world
+ 1 if asteroid belt
+ 1 if desert world
+ 1 if ice-capped world
+ 1 if low population world
+ 1 if rich world
+ 1 if vacuum world
- 1 per tech level below 15
- 1 if non-industrial world
- 2 if poor world

When an encounter is rolled, use the following steps to determine the nature of the encounter,

First: Select which robot list (local robots or transit robots) will be used to determine the specific robot encountered. Local robots are encountered where they typically work. Transit robots are encountered between job sites and may not necessarily be of the same tech level as the local world (depends on the world's starport type; see Robot Generation for details).

Second: Roll 2D, then consult the appropriate table (local or transit) to determine the robot type. The type indicates the basic function for that particular robot in order to belter set the scene for the characters making the encounter. The referee should keep this in mind when generating the robot, if such generation is called for.

Third: Roll 1D on the appropriate modifier table (local or transit) 1D-4 times. This better defines the robot for purposes of the encounter. For example, a transit robot could also be more clearly defined as being of alien origin and malfunctioning.

Fourth: The robot is alone, that is, not with an owner or supervisor, on a roll of 12 + ; DM of +1 per tech level over 12.

Fifth; If the robot is with an owner/supervisor, roll the reaction of the owner as normal. Otherwise roll on the Robot Reactions Table.

LOCAL ROBOTS

Die	*Result*
11	Guard/Security
12	Medic
13	Guide
14	Prospecting
15	Survey
16	Lab Assistant
21	Agricultural
22	Cargo
23	Admin
24	Servant
25	Housekeeping
26	Janitorial
31	Doctor
32	Mechanic
33	Electronic
34	Technician
35	Librarian
36	Clerk
41	Law Enforcement
42	Construction/Fabrication
43	Traffic Control
44	Bus Boy/Waiter
45	Teacher
46	Entertainment
51	Information
52	Driver
53	Valet
54	Housekeeping
55	Janitorial
56	Steward
61	
62	
63	
64	
65	
66	

TRANSIT ROBOTS

Die	*Result*
11	Warbot
12	Rescue
13	Medic
14	Guide
15	Prospecting
16	Agricultural
21	Admin
22	Valet
23	Janitorial
24	Law Enforcement
25	Construction/Fabrication
26	Traffic Control
31	Hunting
32	Information
33	Courier
34	Pet
35	Construction/Fabrication
36	Courier
41	Law Enforcement
42	Guide
43	Ships Boat
44	Construction/Fabrication
45	Janitorial
46	Driver
51	Military
52	Driver
53	Gunner
54	Navigation
55	Engineering
56	Pilot
61	
62	
63	
64	
65	
66	

LOCAL ROBOT MODIFIERS

Die	*Result*
1	High Intelligence
2	Expert
3	Master-Slave
4	Counterfeit
5	Malfunctioning
6	Research and Development

TRANSIT ROBOT MODIFIERS

Die	*Result*
1	High Intelligence
2	Alien
3	Master-Slave
4	Counterfeit
5	Malfunctioning
6	Research and Development

ROBOT REACTION TABLE

Die	*Result*
1	Totally oblivious.
2	Oblivious unless interfered with. Roll 11+ for robot to respond.
3	Oblivious unless interfered with. Roll 7+ for robot to respond.
4	Oblivious unless interfered with. Roll 3+ for robot to respond.
5	Oblivious unless detects unusual situation. Roll 11 + for robot to respond.
6	Oblivious unless detects unusual situation. Roll 7+ for robot to respond.
7	Oblivious unless detects unusual situation. Roll 3 + for robot to respond.
8	Responds if an unusual situation occurs.
9	Aware of situation. Roll normal reaction on 11+.
10	Aware of situation. Roll normal reaction on 7 + .
11	Aware of situation. Roll normal reaction on 3 + .
12	Roll normal reaction.

DMs:
+ 1 per tech level over 12
+ 1 if expert system
+ 6 if high intelligence
DM + actual INT of the robot, if known.

Aware of the Situation: The robot should be treated as an uncreative, emotionless sophont.

Notes: The players should be aware of these basic rules when dealing with robots.

Speaking to a robot is considered interfering with it, as is touching it or hitting it with weapon fire. An unusual situation is always detected by the robot if it is interfered with; it will always respond.

Normal reactions are rolled on the Standard Reaction Table for the appropriate race. The robot is seemingly sophont in its thinking, minus any real creativity until tech level 16.

ROBOTS AS PATRONS

A robot may be the initial contact for a patron on a high tech world. The referee should decide if a patron encounter is actually a robot, and should create a frequency of robot patron encounters which best fits with his own campaign. A robot is almost never a patron until tech level 16. Situations where a robot is the actual patron at tech 15 and below are very rare and should be limited to a special referee-imposed event.

Robots in a Traveller Game

When incorporating robots into a **Traveller** game, several new adventuring possibilities open up for the player characters. The referee should be familiar with this section before extensive robot involvement is created.

NEW CHARACTER SKILLS

Two new skills for characters are introduced in this book. These skills are Robotics and Robot Operation.

Robotics: The individual is trained in designing, building, and repairing robots of his tech level and culture. At higher tech levels, robots play critical roles in the function of society. Individuals with good robotics skill levels will find that their skill is Just as Important.

Referee: Specific throws for specific situations must be generated. Applicable DMs for a situation might include intelligence, dexterity, and available tools.

Robotics skill may be used as the next lower level of Computer skill, where needed; thus Robotics-2 equals Computer-1. Robotics skill may be used as the same level of Robot Operation skill.

Robotics skill may also be used as the next lower level of mechanical, electronics, or gravities when dealing with robots only.

If a player wishes to generate a character with robotics skill, use the scientist character generation system from *Citizens of the Imperium,* and replace Computer skill with Robotics skill on the Advanced Education (education 8+) Table.

Robot Operation: The individual is trained in overseeing robots, and in instructing them in their specific duties.

A robot will not always understand the commands given to it. Robot Operation and the robot's intelligence and skill level are the three factors which increase the chance that a command will be correctly interpreted and carried out. Players and referees should keep these conditions in mind when playing robots.

Referee: Under ordinary operations, a person with any level of robot operation skill automatically succeeds in instructing the robot. (It is assumed that most tasks are simple for the robot, as long as it has been programmed to be able to perform them.) For more complicated tasks, a basic throw of 7+ to avoid a misunderstanding should be used. Apply these DMs: per character's level of Robot Operation, +1; per robot's level of applicable skill, +1.

A robot with intelligence 0 will not perform properly unless it is instructed by someone with Robot Operation skill.

Any robot with an intelligence of 4- (a dumbot) requires supervision of its work at occasional intervals. This can be accomplished by a sophont or by another robot with higher intelligence. As a rule of thumb, a robot with an intelligence of 4- will be unable to perform a task for which it has no skill.

Computer skill may be used as the next lower level of Robot Operation skill, where needed; thus Computer-2 equals Robot Operation-1. Robotics skill may be used as the same level of Robot Operation skill.

ROBOT INTELLIGENCE

A dumb robot is not a versatile robot: it can capably execute its specific programming, and that's all. The higher the intelligence, the more versatile the robot becomes in applying any skill to a task that may not be directly related to the skill. For example, a large cargo robot could be used as an attack robot, by having it chase after menacing thieves in the warehouse. It would not be very successful at this, unless specifically ordered by someone with a good level of robot operation skill.

Referee: To perform any task outside its skill set, a basic roll of 11 + should be used. Apply the following DMs: + 1 per level of Robot Operation; + 1 for robot intelligence of 5 + ; + 2 for robot intelligence of 10+ ; + 3 for robot intelligence of 15 + . AI robots are not subject to this limitation.

Any robot with an "AI" fundamental logic program can pick up new skills on its own.

Interestingly enough, the Shudusham Concords encouraged low intelligence in robots, to prevent them from being versatile enough to be used as attack robots unless specifically programmed to do so. This programming was closely regulated by the commission overseeing the Concords' enforcement, so armed robots were more easily kept in check as society first came to grips with the robots' potential for misuse.

Excess thrift when designing a robot's brain can severely limit its skill list. A robot may have no more skills (or total of levels of skills) than the sum of its intelligence and education, just as any **Traveller** character is limited.

COMBAT SITUATIONS INVOLVING ROBOTS

The chapter on the Universal Robot Profile describes how to determine the number of damage points a robot's chassis can take before the robot is rendered inoperative, and the number of damage points the chassis can take before the robot is destroyed. The two numbers are expressed similar to the notation used for animals; for example, 20/50.

Movement: To determine a robot's movement speed in basic **Traveller:**

If the robot's DEX is 1-4: maximum speed of 1.

5-9: maximum speed of 2.

10-14: maximum speed of 3.

15: maximum speed of 4.

However, in rough terrain, robots with wheels have a top speed of 1/2, those with tracks have a top speed of 1.

Fire Combat: Very small robots are harder to hit; very large robots are easier to hit. Apply the following DM to the hit roll depending on the size of the robot target:

Effects of size:

DM - 1 if 10 liters or less

DM + 1 if 500 liters or more

Once it has been determined that the robot has indeed been hit, roll on the Hit Location Table and apply the results.

Hit Location		Subtable 1		Subtable 2		Subtable 3	
1	Chassis	1	Power Plant	1	Sensor	1	Locomotion
2	Chassis	2	Power Plant	2	Sensor	2	Locomotion
3	Chassis	3	Power Plant	3	Device	3	Locomotion
4	Subtable 1	4	Power Plant	4	Device	4	Locomotion
5	Subtable 2	5	Power Plant	5	Weapon	5	Appendage
6	Subtable 3	6	Brain	6	Weapon	6	Appendage

Hit effects:

Chassis: Roll for damage to the robot's chassis.

Power Plant: If the power plant is a fuel cell, roll tech level or less on 3D to avoid a catastrophic explosion. Roll the power plant URP or less on 2D to avoid *a* serious power loss. If the power loss is avoided, roll for chassis hit damage. If a power loss occurs, the robot speed/action points drop by 1/2. A second power loss renders the robot inoperative.

Brain: If the brain is hit, the robot ceases to function.

Locomotion: The robot speed/action points drop by 1/2. A second hit means the robot is unable to move.

Sensor: Randomly select one sensor to render inoperative.

Device: Randomly select one device to render inoperative.

Weapon: Randomly select one weapon to render inoperative.

Appendage: Randomly select one appendage to render inoperative.

Damage and Repair: Once a robot has been damaged, the specific level of damage needs to be determined.

If the robot was still operating (including locomotion), and no sensors, devices or weapons were rendered inoperative, the damage is automatically Superficial. Otherwise, roll 2D; on 11 + the damage is Major; otherwise the damage is Minor. Add a + 1 DM to the roll for every sensor, device, weapon, and appendage that was rendered inoperative.

A destroyed robot is just that: destroyed; there is a slim chance the robot can be totally rebuilt. A robot destroyed by a catastrophic explosion is permanently destroyed with no chance of being rebuilt.

Damage in Non-Combat Situations: In the absence of a specific system for determining damage from a mishap or accident, roll 2D on the following table to determine the level of damage. If the situation was a hazardous one, roll 3D on the table.

Mishap Damage Table

Die	*Damage Level*
2 +	Superficial
7 +	Minor
11 +	Major
15 +	Destroyed

Repairs

The damage levels effects are defined as:

Superficial: The robot still functions; damage to the robot is largely cosmetic.

Minor: Some portion of the robot does not function; the damage is slight, however; repair is routine.

Major: Either some portion or all of the robot does not function; the damage is heavy; repair is difficult.

Destroyed: No portion of the robot functions; the damage is extreme; repair is formidable.

Before you can perform repairs, you must first diagnose the damage. For this, roll 7 + , with appropriate DMs:

For appendages, legs, wheels, tracks, AC,chassis, non-laser and energy weapons use the greater of:
+ 1 per level of mechanical skill
+ 1 per level of robotics skill over skill level 1

For sensors, devices, laser and energy weapons use the greater of:
+ 1 per level of electronic skill
+ 1 per level of robotics skill over skill level 1

For anti-grav locomotion use the greater of:
+ 1 per level of gravitic
+ 1 per level of robotics skill over skill level 1

For the brain use:
+ 1 per level of robotics skill

Duration of the diagnosis task: A diagnosis task takes 3D time increments. Appropriate time increments are chosen by the referee, with 10 time increments assumed to be the average.

Number of attempts: The number of attempts that may be made for one task is equal to the sum of the character's endurance + intelligence / 5 (drop fractions) + JOT skill.

Once diagnosis has succeeded, to perform repairs, cross-index the level of damage with the appropriate roll from the table below:

Damage Repair

Damage	*Repair Cost*
Superficial	3 + 1D % of new price
Minor	7 + 1D x 1D % of new price
Major	11 + 2D x 5 % of new price
Destroyed	15 + 2D x 2D % of new price

DMs:
-4 if in the "field" (away from facilities of an adequate tech level)
-4 if inadequate supply of spare parts
-4 if inadequate tools
+ appropriate skill level

Duration of the repair task: A repair task takes 3D time increments. Appropriate time increments are chosen by the referee, with 10 time increments assumed to be the average.

Number of attempts: The number of attempts that may be made for one task is equal to the sum of the character's endurance + intelligence / 5 (drop fractions) + JOT skill.

Repairs can be made without successful diagnosis at an additional cost multiplier of 1D (just replace the entire assembly if the diagnosis isn't successful).

If the party performs the repairs themselves, the cost of labor is saved. Labor is 50% of the repair cost.

For repairs in the field, the cost of repairs is payed once the party returns to "civilization".

Routine Maintenance: All robots require routine annual maintenance equal to 1 % of their original cost. If this maintenance is not performed, roll 11 + each month for a breakdown to occur. When a breakdown occurs, roll on the Mishap Damage Table.

Robots as Characters

Robot NPCs and player characters can add a new level of excitement to a **Traveller** game. This chapter covers how to use robots as detailed NPCs and as full-fledged player characters.

ROBOTS AS NON-PLAYER CHARACTERS

The chapter on encounters contains all the detail players generally need for occasional random encounters with robots. If a more detailed treatment of an encountered NPC robot is desired, the robot generation system in this chapter is recommended.

ROBOTS AS PLAYER CHARACTERS

With the rules in this book, it is now possible for a **Traveller** player to be a robot. Not every player should choose to be a robot character, but with dedication and imagination on the part of the player, a player character robot can do much to liven up a **Traveller** adventure.

If a player wants to be a robot, first, determine the tech level; either pick a specific tech level, or create it using the robot generation Tech Level Table.

If the Tech Level is 16 or less:

Use the robot generation Age Table to determine the robot's age. Next, either select the type of robot desired from the Transit Encounter List in the chapter on robot encounters, or randomly roll the robot type from the list. Once the robot type is known, determine an appropriate owner for such a robot, either a player character, or an NPC. Roll the robot's owner using regular character generation.

The amount of cash the robot's owner receives represents the budget available for the player's robot.

At this point, either proceed directly to robot design, or use the robot generation tables to first generate specific details of the player's robot character first.

Based on the age of the robot's owner and the age of the robot, it can be determined if the current owner is likely to be the original owner of the robot.

If the owner of the robot is designated an" NPC", the player's primary character is assumed to be the robot, and the robot's owner is a secondary character, also played by the robot player,

If the Tech Level is 17 or more:

Use the robot generation Age Table to determine the robot's age. Determine the initial characteristics as normal, except: Strength, Dexterity, and Endurance are all 15; Intelligence is 1D + 6. Roll the character using normal character generation for as many terms as indicated by the character's age. Ignore aging rolls. Once the character is finished, go back and design the robot using the robot design system. The brain design must have the proper intelligence and education. Ignore the application programs; the robot already has its skills. Recompute the strength and dexterity from the final design. Tech level 17 robots are almost never found in the Imperium, and the referee should exercise great caution in allowing a player to be a tech level 17 robot.

ROLE PLAYING A ROBOT

The greatest difficulty in playing a player character or NPC robot in a **Traveller** campaign is coincidentally one of the greatest difficulties in playing any sophont. The tendency for a character to know everything that the player knows should be avoided. Characters do not have access to the **Traveller** rule book, or extensive maps and library data. They do not know anything about dice rolls or percentages. A character may properly have gut feelings about how good he is and how difficult some task is, but he should have no idea like "I need a 10 +, so that gives me a 17% chance of success".

For the most part, robots are not creative, and it is neither as enjoyable nor as proper to play a robot as such. However, robots are expert at creating "decision trees" in their memories by quickly generating a complete list of alternatives to a situation. Sometimes this ordinary feat can seem like creativity, but looking inside the robot's brain reveals how this actually works. It is just thoroughness, combined with the ability to weigh alternatives and then choose the best one, that yields "creative" thinking in robots.

For example, a robot in a dangerous situation might start off its decision tree with "fight or flight"; two alternatives. Under the alternative of "fight", the robot might enumerate choices of weapons, or consider hand-to-hand combat. Under weapons, alternative strategies of firing could be considered: shoot low, fire a warning shot first, aim for the heart, fire a burst, fire one shot at a time. Under "flight", the robot might consider different routes and means of escape. There may be other alternatives to "fight" and "flight", such as "appease" or "call for help" or "ignore situation and hope it goes away".

The character successfully playing an uncreative robot will find that considering nonsensical alternatives may lead to interesting play. The robot's brain, after all, considers "everything" (or at least the alternatives that it generates), then prunes its choices by some algorithm that clips branches from the decision tree until only one "best" choice is left.

The player handling a PC robot needs an active imagination to generate these alternatives. Just make sure that "true creativity" on the part of the robot doesn't slip into this process.

Referee: When in doubt, make the player roll his robot character's intelligence or less to go ahead with his chosen course of action.

Robot Generation

Whenever extra detail about a robot is needed, the robot generation system in this section can be used. This system allows the quick generation of important details concerning the robot in question. From these details it is possible to go even further and construct a full-blown detailed robot design.

Robot Tech Level: Roll 2D on the Robot Tech Level Table.

Robot Age: Based on the tech level of the robot, determine its age from this table.

Volume: Roll 2D on the Volume Table.

Locomotion: Roll 1D on the Locomotion Table.

Outstanding Attribute: Roll 1D. If the number is odd, roll 2D once on the Outstanding Attribute Table. If the number is even, roll 2D twice on the Outstanding Attribute Table.

Dumbot: If the robot is not an expert, the robot is a dumbot on a roll of 4+ on 1D.

Intelligence: Depending on whether or not the robot is a dumbot, roll on the appropriate column of the Intelligence Table.

Fundamental Command: Depending on whether or not the robot is a dumbot, roll 1D on the appropriate column of the Fundamental Command Table.

Other Attributes: If more detail for the robot is needed, use the information already generated as the basis for a robot designed using the robot design system.

TECH LEVEL OF ROBOT

Die	*Tech Level*
2	same as world tech level
3	same as world tech level
4	same as world tech level
5	tech level 12
6	tech level 12
7	tech level 12
8	tech level 12
9	tech level 13
10	tech level 13
11	tech level 14
12	tech level 15
13	tech level 15
14	tech level 16 (brain only)

DMs:
+2 if starport A or B
+1 if starport C
-1 if starport E

ROBOT AGE IN YEARS

TL	*Age*
10	3D -3 years
11	(3D-3) x 2 years
12	(3D-3) x 4 years
13	(3D-3) x 5 years
14	(3D-3) x 7 years
15	(3D-3) x 8 years
16+	(3D-3) x 10 years

VOLUME

Die	*Volume*
2	50-
3	80
4	100
5	100
6	150
7	150
8	200
9	350
10	500
11	750
12	1000+

LOCOMOTION

Die	*Locomotion*
1	Wheels
2	Wheels
3	Tracks
4	Legs
5	Legs
6	Grav/AC

FUNDAMENTAL COMMAND

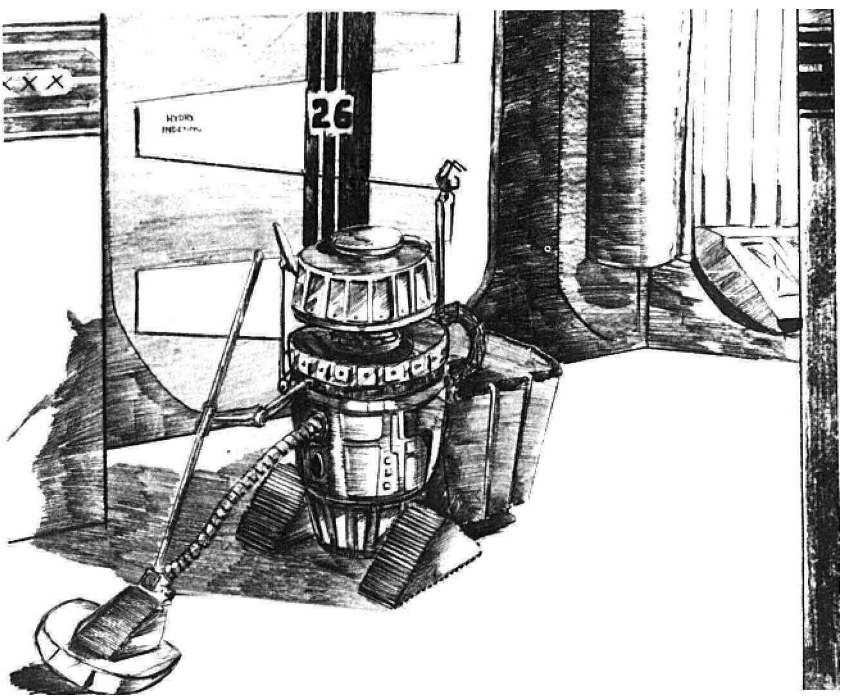
Die	*Intel 4 -*	*Intel 5 +*
1	Limited Basic	Basic
2	Limited Basic	Basic
3	Limited Basic	Basic
4	Limited Basic	Full Command
5	Limited Basic	Full Command
6	Basic	Full Command

OUTSTANDING ATTRIBUTE

Die	*Attribute*
2	High intelligence, roll 2D; limit TL-3
3	Multiple legs
4	None
5	Contoured
6	No head
7	None
8	Many appendages
9	Large head
10	Tentacles
11	Armored
12	Open frame

INTELLIGENCE

Dumbot	*Other*
1D-2	2D-3



ROBOT DESIGN CHECKLIST

1. Determine tech level and purpose of robot.
2. Determine chassis attributes.
   A. Choose size.
   B. Choose configuration.
   C. Consider adding armor.
3. Select power supply.
4. Select method of locomotion.
   A. Determine suspension units.
   B. If legs, wheels, or tracks, determine transmission units.
   C. If legs and chassis configuration 5+, add excess transmission volume to chassis volume.
5. Select appendages.
   A. Consider a head.
   B. Choose arms and/or tentacles.
6. Select equipment to install.
   A, Choose sensors (minimum of Basic Sensor Package).
   B. Choose devices.
   C. Choose weapons (subject to law level).
7. Select software.
   A. Choose fundamental logic program,
   B. Choose fundamental command program.
   C. Choose applications.
8. Design brain.
   A. Determine CPU size.
   B. Determine storage size.
   C. Determine required parallel CPU units.
   D. Determine required synaptic CPU units.
   E. Consider additional parallel CPU units,
   F, Consider additional synaptic CPU units.
   G. Consider additional synaptic storage units.
9. Finalize robot design.
   A. Insure power draw does not exceed power supply output.
   B. Insure all installed items do not exceed chassis volume.
   C, If applicable, apply electronic circuit protection modifiers.
   D. If applicable, apply pseudo-bio configuration modifiers.
   E. Determine volume available for fuel; find duration of operation,
   F. Determine loaded weight of robot; insure weight does not exceed thrust for robots with anti-grav or AC locomotion.
   G. Determine price of robot; cannot exceed budget.
10. Determine apparent attributes.
   A. Determine strength.
   B. Determine dexterity,
   C. Determine intelligence.
   D. Determine education.
   E. Insure skill level total does not exceed sum of intelligence and education.

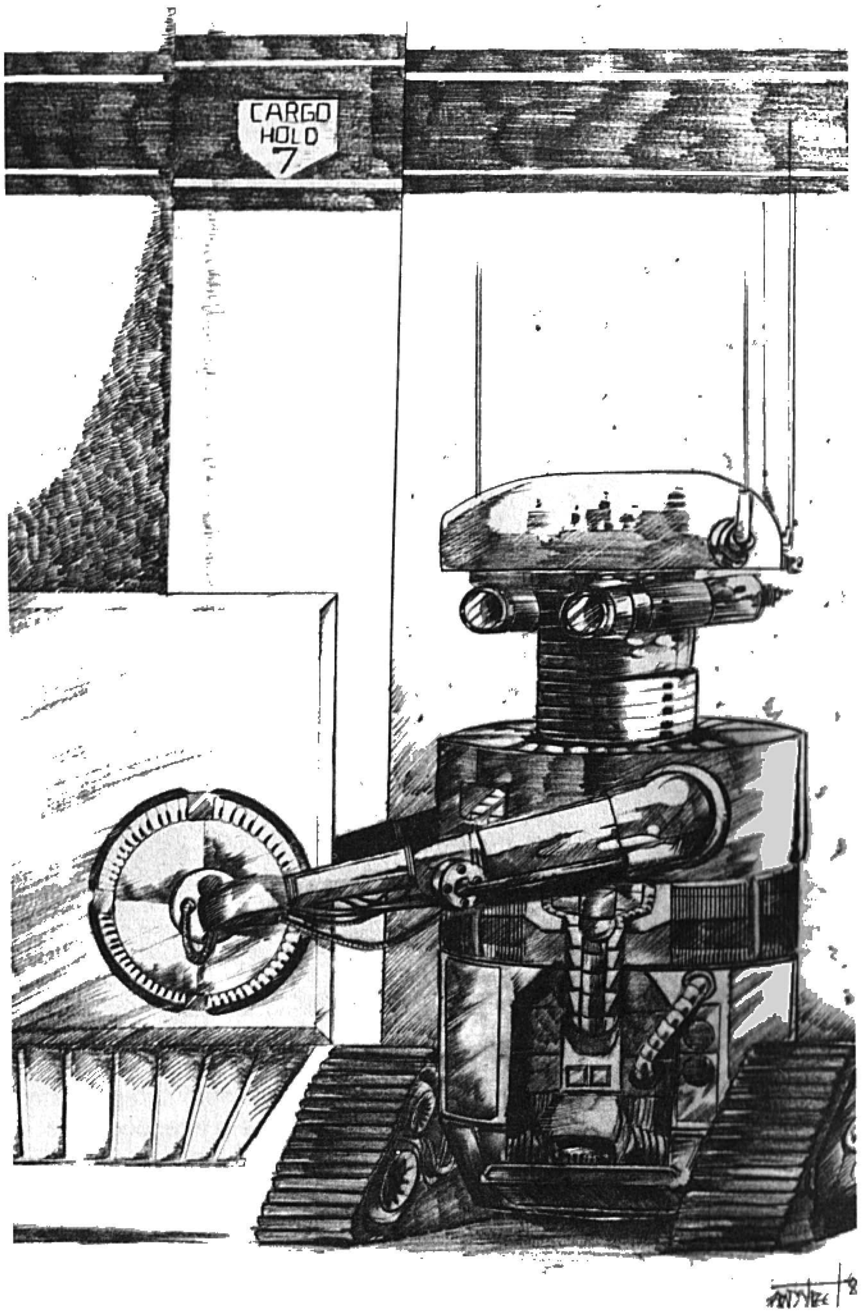
ROBOT DESIGN FORM		Creating Race VILANI		Tech Level 12
Description CARGO ROBOT	Power (kw)	Volume (liters)	Mass (kg)	Price (Cr)
Chassis: Size 7		200.0	20.0	2000
Chassis: Configuration 1				
Chassis: Armor —				
Power Plant 6	90.0	−100.0	165.0	2000
Batteries —				
Locomotion: Transmission 90 UNITS	−36.0	−54.0	135.0	1350
Locomotion: Suspension 40 UNITS		−40.0	40.0	1000
Locomotion: TRACKS				
Appendages: Head 40%	−16.0	80.0	8.0	800
Appendages: 2 HVY ARMS	−20.0		100.0	2000
Appendages:				
Appendages:				
Appendages:				
Sensors, Devices, Weapons: BASIC SENSOR PKG	−4.0		3.0	1700
Sensors, Devices, Weapons: VODER	−2.0		3.0	1200
Sensors, Devices, Weapons:				
Sensors, Devices, Weapons:				
Sensors, Devices, Weapons:				
Sensors, Devices, Weapons:				
Sensors, Devices, Weapons:				
Sensors, Devices, Weapons:				
Sensors, Devices, Weapons:				
Sensors, Devices, Weapons:				

Software		CPU	Storage				Price (Cr)
Logic	1	8	10				3000
Command	1	2	2				1000
Applications							
CARGO-3		6					600
Brain		16	12	−1.0	−10.7	2.8	58,500
Subtotal				11.0	75.3	476.8	75,150
Electronic Circuit Protection				NA			
Pseudo-biological Configuration				NA			
Total				11.0	75.3	476.8	75,150

ROBOT DESIGN FORM

Creating Race	Tech Level

Description		CPU	Storage	Power (kw)	Volume (liters)	Mass (kg)	Price (Cr)
Chassis	Size						
Chassis	Configuration						
Chassis	Armor						
Power Plant							
Batteries							
Locomotion	Transmission						
Locomotion	Suspension						
Locomotion							
Appendages	Head						
Appendages							
Appendages							
Appendages							
Appendages							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Sensors, Devices, Weapons							
Software	Logic	CPU	Storage				
Software	Command						
Software	Applications						
Software							
Software							
Software							
Software							
Software							
Software							
Brain							
Subtotal							
Electronic Circuit Protection							
Pseudo-biological Configuration							
Total							


CARGO
HOLD
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