Robots in 2300 AD

Robots have characteristics similar to humans. However, unlike humans, robots do not generate these characteristics by rolling 4d6-4. Instead, each score is calculated by totalling a number of other factors. The following table indicates which factors effect each attribute and shows the minimum and maximum scores a robot can have in each characteristic.

Category	**Factors**	**Base Score**	**Min.**	**Max.**
Size	Size	1	4	24
Strength	Shape, Size, Material	4	4	24
Dexterity	Shape, Size, Limbs	6	0	20
Endurance	Shape, Size, Material	5	3	28
Determination	Programming	15	10	20
Intelligence	Computer Brain	0	3	25
Eloquence	Programming	10	4	16
Education	Programming	0	0	30

TABLE 1: ROBOT CHARACTERISTICS

Other characteristics are explained in the following tables, along with costs, and effects on characteristics. The system will become clear as one progresses through the various tables and reads the checklist at the end of the charts.

SHAPE

Shape	Base Cost	Shape %	Str	Dex	End	Size
Box/Tank	300	150%	+1	-3	+3	+2
Cylinder/Bullet	320	150%	+1	—	+1	+2
Cone	320	100%	+1	-3	+3	+1
Sphere	340	125%	+1	—	+1	+1
Plane/Disc	300	80%	-1	+1	+1	—
Human top, Box bottom	560	140%	+1	+1	+1	+1
Humanoid	450	100%	—	+3	—	—
Human (Android)	750	100%	—	+4	-1	—

Note: Androids may be constructed to look exactly like a certain person; however, this will drastically increase the cost of the robot, usually at least 200%.

SIZE

Size	**Size (meters/feet**	**Cost Modifier**	**Str**	**Dex**	**End**
3	less than 0.3 m	1.0	+5	+4	-5
4	0.3 m / 1'	0.8	+6	+3	-5
5	0.45 m	0.7	+7	+1	-4
6	0.6 m / 2'	0.6	+7	+1	-3
7	0.75 m	0.5	+7	+1	-2
8	0.9 m / 3'	0.6	+7	+1	-1
9	1.05 m	0.7	+8	—	—
10	1.2 m / 4'	0.8	+9	—	—
11	1.35 m	0.9	+9	—	—
12	1.5 m / 5'	1.0	+9	—	—
13	1.65 m	1.1	+10	—	—
14	1.8 m / 6'	1.2	+10	—	—
15	1.95 m	1.4	+11	—	—
16	2.1 m / 7'	1.5	+11	-1	+1
17	2.25 m	1.7	+12	-1	+2
18	2.4 m / 8'	1.8	+13	-1	+3
19	2.55 m	1.9	+13	-2	+3
20	2.7 m / 9'	2.0	+14	-3	+4
21	more than 2.7 m	2.5	+15	-4	+5

Note: Cost and attribute effects may vary in extreme cases.

MATERIAL

Material Code	Armor Equivalent	Cost Modifier	Str	End
0	None (AV=0)	0.25	-4	+4
1	Chainmail (AV=0.1)	0.4	-3	+5
2	Steel (AV=0.2)	0.6	-1	+6
3	Nonrigid Armor (AV=0.6)	0.8	-1	+8
4	Inertial Armor (AV=0.8)	1.0	—	+9
5	Rigid Armor (AV=1)	1.2	—	+9
6	Cuirasse de Combat (AV=1.2)	1.4	—	+10
7	High Threat Combat Helmet (AV=2)	1.6	+1	+11
8	BH-21 Combat Walker (AV=8)	4.0	+3	+13
9	Kz-7 Combat Walker (AV=10)	5.0	+4	+15

WEIGHT

Weight (in kg) = $[(\text{Size Code}/2) \times 11]^3 \times (\text{AV}+2) \times \text{Shape\%} \times 0.000048$

BASIC COST

Once the robot's Shape, Size, and Material have been determined, its basic cost can be calculated by multiplying the Base Cost (for Shape) by the cost modifiers for Size and Material. This basic cost will be further modified by limbs, programming, and other attributes explained hereafter.

LIMBS

Limb Type	Number	Dex	Cost
None	none	+1	none
Interface	1 or 2	+4	Lv190/attachment
Interface	3 or 4	+4	Lv190/attachment
Interface	5+	+4	Lv190/attachment
Tentacle	1	+5	Lv280
Tentacles	2	+6	Lv280/tentacle
Tentacles	3 or 4	+9	Lv280/tentacle
Tentacles	5 or 6	+11	Lv280/tentacle
Tentacles	7+	+11	Lv280/tentacle
Arm/Leg	1	+6	Lv375/limb
Arms/Legs	2	+9	Lv375/limb
Arms/Legs	3 or 4	+11	Lv375/limb
Arms/Legs	5+	+13	Lv375/limb
Wheels	1 or 2	+5	Lv20/wheel
Wheels	3 or 4	+8	Lv20/wheel
Wheels	5+	+9	Lv20/wheel
Combination	———— see below ————		

Note: Interfaces are used to plug into other robots, computers, etc. A tentacle is considered to be about two-thirds of the robot's total height in length, and this length can be increased for Lv60 per foot per tentacle. Treads can be added to wheels at a cost of Lv75 per tread (this facilitates all-terain travel). Combinations of limbs use the dexterity bonus of the best limb type, +1 for each additional limb of another type included (excluding interface limbs), up to a maximum additional bonus of +5. The cost of a limb combination is equal to the combined cost of all limb types plus an additional 20%.

COMPUTER BRAIN

Program Capacity	Intelligence	Cost (Lv)	Minimum Size Code
0	3	95	3
1	4	190	3
2	5	375	3
3	6	750	4
5	8	1125	4
7	9	1875	4
10	10	2815	5
12	11	3750	5
15	13	5625	6

18	14	7500	6
20	15	11250	7
22	16	15000	7
24	18	18750	8
26	19	22500	8
28	20	30000	8
30	21	37500	9
32	22	46875	9
35	23	56250	10
40	24	75000	10
Artificial Intell.	25	500000	12

Note: Robots with a program capacity of 0 will have only automatic, pre-programmed functions; it can open cans, toast bread, or something similar, but not much more. Artificial intelligence is included here only for possible use by the referee as true artificial intelligence has not yet been achieved, even in the year 2300. Robots with artificial intelligence are not programmed; instead, they learn skills just as a character would and has a virtually unlimited programming capacity. It is considered to have a normal Education score (see below), but when it has attained 61 or more points of programming, its Education score remains at 30.

EDUCATION

A robot's Education score is equal to one-half the number of programming points presently stored in the computer brain. However, the score cannot exceed 30, even if programming points exceed 60.

PROGRAMMING

Basic Command & Vocabulary Programs

Basic Vocabulary: Allows the robot to speak and understand one langauge for each "loading" of the program. The language must, of course, be specified for each application of the program. Audio sensors are required for the robot to hear the language, and a speaker/voder is required for it to be able to emit sounds in that language. *Program Capacity Point Cost:* 1 per application. *Cost:* Lv1875 per application.

Basic Command: Allows the robot to understand and obey simple, one-word commands - "Come," "Go," "Bring," and so on - in as many as three different languages for each application of the program. It does not require Basic Vocabulary (in fact, the loading of that program makes this one obsolete), but does require audio sensors. *Program Capacity Point Cost:* 1 per application. *Cost:* Lv1125 per application.

Advanced Command: Allows the robot to understand and obey complicated instructions such as "Call me if another ship appears or if we get too close to a planet." Requires the Basic Vocabulary program and audio sensors. *Program Capacity Point Cost:* 1. *Cost:* Lv1500.

Advanced Reasoning & Ego: Allows the robot to do things independently and act on its own initiative (though it usually obey its master), and gives it a self-preservation instinct. It takes the place of Basic Command or Advanced Command, and does not require Basic Vocabulary (although the robot will doubtless have this program as well so that it can communicate verbally). It is the closest thing to artificial intelligence a robot can have. All robots with artificial intelligence are considered to have this program naturally. *Program Capacity Point Cost:* 2. *Cost:* Lv7500.

Attribute Control Programs

These programs can be used to increase some of the robot's basic characteristics (all of them except for Size, Intelligence, and Education, and the latter two are based on programming anyway). Specifications for each of the four types of programs in this group are as follows:

Strength can be increased a maximum of 2 points, with a Program Capacity Point Cost of 1 for each point of extra Strength desired and a Cost of Lv300 per point of increase.

Dexterity can be increased a maximum of 4 points, with a Program Capacity Point Cost of 1 per point and a Cost of Lv280 per point.

Endurance can be increased a maximum of 3 points, with a Program Capacity Point Cost of 1 per point and a Cost of Lv375 per point.

Determination can be increased a maximum of 5 points, with a Program Capacity Point Cost of 1 per point and a Cost of Lv375 per point. Determination can also be decreased by a maximum of 5 points, freeing 1 Program Capacity Point per point of Determination decreased.

Eloquence can be increased a maximum of 6 points, with a Program Capacity Point Cost of 0.5 per point and a Cost of Lv190 per point. Eloquence can also be decreased by a maximum of 6 points, freeing 1 Program Capacity Point per point of Eloquence decreased.

Skill Programming

These programs enable a robot to perform skills at various levels, just like a human character; a robot can have Pilot-2, Combat Rifleman-1, and Medical-3. The Program Capacity Cost will always be 1 point per level of skill in each skill.

The cost of each program increases by an increment of 25% plus the base cost for each level of skill beyond the first. Thus, a skill which costs Lv375 for level 1 would cost Lv844 for level 2 (375+469), Lv1407 for level 3 (375+469+563), and so on.

The base costs of skills are as follows:

COMBAT SKILLS: Archaic Weapons Lv280, Combat Engineering Lv375, Combat Rifleman Lv280, Combat Walker Pilot Lv375, Demolitions Lv320, Forward Observer Lv300, Heavy Weapons Lv300, Indirect Fire Lv300, Leader Lv1000, Melee Lv300, Reconnaissance Lv340, Ship Tactics Lv560, Sidearm Lv280, Tactics Lv450, Thrown Weapon Lv280.

VEHICLE SKILLS: Aircraft Pilot Lv340, Ground Vehicle Lv300, Hover Vehicle Lv300, LTA Vehicle Lv300, Sea Vehicle Lv300.

INTELLECTUAL SKILLS: Bureaucracy Lv470, Computer Lv375, Information Gathering Lv300, Law Lv470, Robotics Lv375.

JOURNALISTIC SKILLS: Imaging Lv375, Interviewing Lv450, Writing Lv450.

UNDERWORLD SKILLS: Disguise Lv560, Forgery Lv280, Gambling Lv280, Security Systems Lv300, Stealth Lv450, Streetwise Lv375.

SPACE CREW SKILLS: Communications Lv375, Gunner Lv300, Navigator Lv470, Pilot Lv375, Remote Pilot Lv340, Sensors Lv375, Ship Drive Engineering Lv450.

ACADEMIC SKILLS: Anthropology Lv375, Astronomy Lv375, Biology Lv375, Chemistry Lv375, Engineering Lv375, Genetics Lv375, Geology Lv375, History Lv375, Linguistics Lv375, Medical Lv450, Physics Lv375, Psychology Lv450, Religion Lv375, Theoretical Sciences Lv450.

GENERAL SKILLS: Animal Handling Lv450, Electronic Lv340, First Aid Lv400, Heavy Equipment Operator Lv280, Hunting Lv320, Mechanical Lv340, Mountain Climbing Lv340, Prospecting Lv280, Riding Lv450, Scrounge Lv450, Survival Lv340, Swim Lv280, Tracking Lv320, P-Suit Lv190, Wilderness Craft Lv450.

MERCANTILE SKILLS: Appraisal Lv300, Bargain Lv375, Trader Lv375.

EXTRA FEATURES

Some basic extra features and their costs are listed below.

Feature	**Cost (Lv)**
Audio sensors (ears)	95/ear
Increased-sensitivity ears	+75/ear
Subsonic audio	+75/ear
Ultrasonic audio	+75/ear
Built-in armor	armor cost+10%
Built-in camera	360
Built-in large lifeform detector	120
Built-in lights	10/light
Visual sensors (eyes)	190/eye
Telescopic eyes (about 20x)	+375/eye
IR eyes (active)	+110/eye
IR eyes (passive)	+75/eye
LI eyes	+95/eye
UV eyes (active)	+110/eye
UV eyes (passive)	+75/eye
Built-in weaponry	weapon cost+20%
ECCM package	110
Electrical protection circuit	75
Hover vents	1875
Olfactory sensors (nose)	560
Radio (standard frequency, range 20km)	60
Radio (multiple frequencies, range 200km)	120
Taste sensors	660
Tight beam up-link communicator	650
Touch sensors	560+75/size code

Note: All costs include costs for necessary circuitry. Note that audio sensors and voder require the appropriate Basic Command and/or Basic Vocabulary programs to be of much use. Passive IR units permits the robot to see by detecting naturally present IR radiation. Active IR emits IR radiation like a searchlight. This unit has a greater range, but can be detected by other IR sensors very easily. Passive and active UV units act as the IR units mentioned above but using ultraviolet rather than infrared radiation. Subsonic or ultasonic ears detect sounds too low or too high for human hearing, respectively.

POWER SOURCE

The power source of a robot is very important, since it limits the number of things a robot can do at a given time. There are three basic power source types:

Low: Must be recharged or refueled at 24-hour intervals.

Medium: Must be recharged at 72-hour intervals or be exposed to a suitable power source (solar energy, heat, etc.) at all times so that it does not have to use its own power supply.

High: This source has a semi-regenerative power supply, and it will function for at least a month before requiring recharging (a bit of power is lost in each regenerative cycle).

Each type of power source has a rating of 1 to 5, which indicates how many functions the power source can handle at one time. The various functions and features a robot has are defined on the foloowing table as to how much power they use. These figures are totalled, and the robot's Power Rating Code (see the following text for how to determine this rating) must be at least equal to this amount for it to use all of the available features at one time.

Function/Feature	**Power Required**
Per limb (excluding wheels)	0.2
Motor for movement	0.8+0.1/Size Code over 6 (Motor cost is 0.3+0.15/Size Code over 4 for hover vents)
Hover vents	0.6 (while functioning)
Computer brain	0.2+0.1/Int point over 10
Per program stored	0.01
Per sensory unit	0.1 (plus an extra 0.1 for coordination if 3 or more senses are possessed)
Electrical protection circuit	0.4 (while functioning)
Built-in energy weapons	0.05/0.2 mJ of weapon
Communications equipment	0.1

Once a figure for the power needed to operate a robot's features and functions has been totalled, subtract it from the robot's Power Rating Code. The remainder is applied to determine the robot's effective Strength, at a rate of 0.025 power units per point of Strength. Thus, if a robot could normally have a Strength score of 10, but had only 0.2 power units left over for Strength, its effective Strength score would only be 8 instead of 10. (It could be increased to, but not past, the maximum normal score of 10 if the robot took power from some other purpose - movement, for example - and applied it to its Strength.) A robot will always have a minimum effective Strength of 1, regardless of its available power, as long as every other characteristic of the robot (size, shape, etc.) permits this.

Example: A robot with four arms, normal mode of movement (no hover vents), a computer brain with an Intelligence of 12, 7 programs stored, plus 2 eyes, 2 ears, and taste sensors, and a built-in SVB laser rifle would require 2.87 units of power, calculated as follows:

0.8 (limbs) + 0.8 (motor) + 0.4 (brain) + 0.07 (programs) + 0.6 (senses) + 0.2 (laser) = 2.87

Such a robot would require a minimum Power Rating Code of 3. If it had a rating of 4, for example, it would have 1.13 power units left over, which would easily cover its Strength requirements (since this would be enough power to supply a Strength of 22).

Recharging: Robots can be recharged at proper terminals set up for this purpose, or at any ship or similar power source if the robot has at least one interface limb. Recharging, regardless of the Power Code Rating of the robot or the amount of power being charged into it, usually costs about Lv95. (A robot - or its owner - can, of course, try to steal power, especially with an interface limb.)

POWER RATING CODE

Power Code	Power Source Type	Cost (Lv)	Minimum Size
0	None	0	0
1	Low Power - 1	200	0
2	Low Power - 2	400	1
3	Low Power - 3	800	2
4	Low Power - 4	1200	3
5	Low Power - 5	2000	5
6	Medium Power - 1	400	1
7	Medium Power - 2	800	1
8	Medium Power - 3	1200	2
9	Medium Power - 4	1800	3
10	Medium Power - 5	2400	5
11	High Power - 1	800	1
12	High Power - 2	1200	2
13	High Power - 3	2000	3
14	High Power - 4	3000	4
15	High Power - 5	4000	6

Note: Robots without a power source must be hooked into an outside power source to function. A robot can have more than one power source if desired. In this case, Minimum Size is determined by totalling the Minimum Size Code needed for each source. Cost is equal to the combined Cost of all power sources, plus 5% of that figure.

Construction time: If all materials required are on hand, a robot will usually take a number of days to build equal to its Size Code (0 and 1 count as 2) plus 0.15% of its cost. This duration is increased by 1 day for each Material Code point higher than 7 and for each 4 programs beyond the first 8 (round fractions up).

Construction time can be reduced by spending more money. For every additional 1% of the robot's cost which is spent to speed things up, the time required is reduced by 1%, with a maximum decrease of 25% possible by this means.

Repairs and overhauls: Occasionally a robot will need a complete overhaul in addition to minor repairs. "Overhaul time," the number of years between each major repair job, is calculated using this formula:

Overhaul time (in years) = 0.5 x ((Endurance/2) + Material - Power Rating Code - 4)

Treat Power Rating Codes of 0-2 as 3, and Power Rating Codes of 13-15 as 12.

The minimum overhaul time for any robot is half a year. Thus, a robot with Endurance 12, Material Code 5, and Power Rating Code 7 would need maintenance once every half a year. One with Endurance 24, Material Code 8, and Power Rating Code 10 would need maintenance once every three years.

An overhaul costs 0.5% of the robot's initial cost. If it is not performed within the required time, the robot may malfunction. The intitial chance of a malfunction due to lack of maintenance is a roll of 12+ (2d6). This roll is made at the deadline time, if an overhaul is not immediately forthcoming, and other "malfunction rolls" are made every two months thereafter, with +1 added to the roll each time it is taken until the maintenance is done.

Longevity: A robot will typically last 80 to 100 years before being beyond repair - and even in such a case, its memory circuits (the computer brain) can be installed in a new body so that it does not actually "die." To find the maximum "lifetime" of a robot in years, compute its Endurance Factor and Material Factor (defined below) and use this formula:

Maximum lifetime = 100 + Endurance Factor + Material Factor - Power Rating Code

A robot's Endurance Factor = 25 x (Endurance - 8). Can be negative.
A robot's Material Factor = 10 x (Material Code -5). Can also be negative.