VIRTUAL REALITIES 3.0

FIFTH WAVE

A TECHNOLOGICAL PRIMER: 2062 EDITION

KENNETH PETERS

CREDITS

WRITING:
Kenneth L. Peters

PROJECT DEVELOPMENT:
Kenneth L. Peters
Allen Landsidel

COPY EDITING
Ryan MacClanathan

PROJECT MANAGEMENT:
A_ Engine
Allen Landsidel
Ryan MacClanathan

SPECIAL THANKS TO:
Peter Ramos, Paul Hume, Keith Henry, Alex Yang, Ryan MacClanathan (Seattle Baby!), Michael Papas, Ray Macey, Lester Ward, Grzegorz Ruminski (BATOR!), Jeremy Sheese (Study! Study! Study!)

NO THANKS TO:
You know who you are...

FOR MORE INFORMATION, CONTACT:
Kenneth Peters
Email Address: tzeentch666@earthlink.net

INTRODUCTION

"Little ones and zeroes that make the world go 'round..."
-Anonymous

Virtual Realities 3.0: The Matrix is a sourcebook and resource detailing the computer-generated reality of the Matrix in 2062. It expands and updates the material presented in **Shadowrun, Third Edition (SR3)**, as well as incorporates material from both **Virtual Realities 1.0** and **2.0**. In the process of developing these rules some necessary contradictions with the basic rules laid down in the **SR3** book were necessary. Thus, the rules in this book take precedence over any previous Matrix-related material.

As always, the gamemaster and players are encouraged to read through this supplement and decide for themselves if the rules and concepts are appropriate for their game. If an earlier version of these rules better fits the needs and desires of your group, feel free to use them. No jackbooted thugs from WizKids will break down your door in the middle of the night to steal your copies of the older books or house rules.

Those players who are intimately familiar with the earlier rules from **Virtual Realities 2.0** and **Matrix** are highly encouraged to carefully read through the entire book. In particular, the rules for **Programming** and **Computer Construction** are quite different from previous supplements. **Otaku** players should also consult the appropriate chapter for the new rules relating to their characters. Other changes to concepts familiar with owners of **Virtual Realities 2.0 (VR 2.0)** should also be made apparent - in particular the sections dealing with **Paydata** and **Intrusion Countermeasures**.

SOFTWARE

Samurai have their guns, riggers have their drones and mages have their spirits. Deckers have their programs. Software is a deckers stock in trade, more valuable then even his deck. For without hot warez his deck is so much dead weight.

The following rules cover all sorts of software, from simple spreadsheets to soul-destroying Intrusion Countermeasures.

COMPLEXITY

All software is given a complexity rating. This is a measure of the programs complexity and difficulty to program. It is also used as a measure for the programs final size and for purposes of calculating System Load (see **Processing Rating**, p.xx).

MULTIPLIER

All software is given a Multiplier, this is the base measure of difficulty for the program. Certain programming options alter this rating either up or down.

DETERMINING COMPLEXITY

Complexity is equal to the programs Rating multiplied by the software's Multiplier. If using the optional Programming Options rules then Complexity is broken into two ratings, each is figured in the same manner, Rating times Multiplier. Certain options affect either of the components for purposes of determining their values.

Programming Complexity

This is the measure of how difficult it is to program the software. This is the target number that the programmer must exceed in order to successfully write the program. It is also used to determine how long it takes to program.

System Complexity

This is a measure of how many resources the software consumes. Unless otherwise modified the system complexity is equal to the programs final size in megapulses. It is also the value used for determining System Load.

SYSTEM LOAD

Computers cannot run an infinite number of programs, with every advance in processor design and speed software designers have figured out ways to exploit those capabilities both to make better software and to make their jobs easier by letting the processor do all the hard work so the program is easier to make.

To represent this there is System Load.

DETERMINING SYSTEM LOAD

System Load is figured by totally the System Complexity for all programs loaded into active memory, including the OS and Persona programs. This total is then divided by 25, to give you the final System Load.

System Load = Total System Complexity of Active Programs /25

MAXIMUM SYSTEM LOAD

The systems core can only do so much, thus the System Load cannot exceed the computers Core Rating.

OPTIONAL RULE: OVERLOAD

For every point of System Load over the systems Core Rating subtract 1 from the Rating of ALL programs loaded into memory. This penalty is in place until the Load is reduced.

PROCESSING RATING

Some tasks and programs reference a systems "Processing Rating". This is the amount of Core Rating points not taken up by System Load.

Processing Rating = Core Rating – System Load

For example, if a system with a Core Rating of 8 had a current Load of 5 it would have a Processing Rating of 3.

Processing Rating is useful when programming and for mainframes (see **Mainframes**, p. xx).

SPLITTING PROGRAMS

Programs may not be run as lower-rating versions of themselves. An Attack-6M program may not be run at Attack-5L or Attack-5M for example. Programs may not be split up or "partially" loaded into memory either. An Armor-4 program cannot be split into two Armor-2 programs or have just enough of the program to equal Armor-3 loaded into memory. If the software is not completely loaded then it does not work at all.

OPERATING SYSTEMS

No computer can operate without some sort of operating system. Without an OS the system cannot load programs, manipulate data or access the Matrix. All operating system software is Legal in any rating.

There are four types of operating systems, Palm, Desktop, Cyberterminal, and Mainframe. Each operating system has a Multiplier, Maximum Rating, and Persona Multiplier.

MULTIPLIER

The operating systems Multiplier is treated just like the Multiplier on any piece of software.

MAX RATING

The Max Rating is the maximum rating that that OS can be designed at. It determines the maximum rating of utility programs that can run on the system.

PERSONA MULTIPLIER

The persona multiplier is the amount you multiply the OS Rating by to determine how many total points of persona programs you can use with the system.

PALM

Multiplier: 4
Persona Multiplier: 1

Palm operating systems are designed to be run on low-power devices such as pocket secretaries and embedded devices. Most trideo sets have a palm OS that runs the system and provides the interface for Matrix access.

Restrictions

Palm OS's are not capable of utilizing ASIST interfaces.

DESKTOP

Multiplier: 6
Persona Multiplier: 2

Desktop operating systems are designed for most personal computers and cyberterminals. They are not as capable as a cyberterminal operating system for DNI control, but are quite capable for legitimate uses.

CYBERTERMINAL
Multiplier: 8
Persona Multiplier: 3
Cyberterminal operating systems, technically referred to as Master Persona Control Programs, are specialized interfaces designed specifically for accessing and manipulating the Matrix. The first cyberterminal interfaces were developed for the Echo Mirage project and the source code for second-generation cyberterminal operating systems appeared on the shadownets shortly after Matrix Systems went out of business (under very odd circumstances).

Custom Interface
Multiplier: +2
Each type of OS except mainframes and CCSS may be designed with a custom interface that works according to the designer's wishes. A person familiar with the interface essentially gets a free level of Response Increase while the interface is active. It increases the users Reaction by 2 and adds +1D6 to Initiative. Custom interfaces on systems with ASIST interfaces are usually referred to as "reality filters". Mainframes design sculpted iconography using the Simulation rules.

However, the custom interface makes the OS much harder to program. It adds 2 to the programs base multiplier, and thus both Programming and System Complexity.

In addition, it adds +1 to the computers System Load while it is active. As a result, the custom interface includes the ability to be toggled on or off. Turning a custom interface on or off requires a Simple Action. However, until the beginning of the next Combat Turn the users current Initiative is halved and all target numbers are at +2.

PERSONA PROGRAMS
Persona programs are REQUIRED to access the Matrix. Without a persona logged onto the Matrix no data can be transmitted back to the system. Even the simplest of devices that access the Matrix must have a Bod and Sensor Rating of 1.

Evasion and Masking are both technically illegal if used. Using an Evasion program is Legality 3P-S and Masking is 2-S. Evasion has greater restrictions since it is used to defraud the legal Matrix account verification and logging procedures.

BOD
Multiplier: 3
Bod represents the personas ability to withstand attacks against its Matrix connection and data integrity. High Bod Ratings represent advanced error checking, morphing connection signatures, and redundant connection paths.

EVASION
Multiplier: 3
Evasion represents code designed to falsify the personas datatrail. Evasion subroutines automatically reroute connections, generate false log entries and create misleading trace paths.

MASKING
Multiplier: 2
Masking suppresses the decks signature, or if necessary generates false persona broadcast information that helps it blend in. Masking is often seen as the most useful illegal modification to a persona.

SENSOR
Multiplier: 2
The sensor routines of the persona translate the crushing amount of data flowing through the Matrix into a form understandable by the human operator. High sensor ratings denote advanced signal discrimination features, extensive databases of Matrix signatures, and excellent machine code translation speeds.

SIMULATIONS

Simulations are advanced virtual realities. They are used both to create VRCade games and to create sculpted systems. Simulations are usually programmed with a core Reality and then have a number of Actor modules plugged in. Users in a simulation are known as avatars, and have their actions fed through a set of "attributes" to adjust their perceived simsense input.

REALITY

This is the core "landscape" of the simulation. Whether that is a hyper-realistic city model or cartoon fantasy land.

Game Effects

The programs realism determines its Multiplier while the size of the simulation determines the Rating.

Sculpted Systems

If the simulation is going to be used as a sculpted metaphor then the simulation will have a rating equal to the OS rating.

CCSS

If designing a CCSS interface the realism must at least be 'Realistic' and the size proportionate to the compound size that will be monitored (a rating 1 simulation will not cover an entire research compound for example).

Size

As a general rule each rating point means the simulation measures about 1 square mile. This can be stretched somewhat in areas with very low complexity (i.e. a desert) and is reduced for areas of high complexity (downtown area of a city or detailed building). The gamemaster has final determination as to what the required rating for the simulation is.

REALITY

Multiplier:

Cartoon: 5
Simple: 7
Realistic: 10
Advanced: 14

Cartoon

At this level of realism everything looks like a cartoon. Objects are three-dimensional but have only the most basic shading and definition. Most small details are actually texture maps. Items will have a definite "chunky" look and have a very small number of animations. Items will have only a limited number of sounds they can produce (usually about 20 or so) and interaction is very limited. There is only very coarse simsense output, limited to broad variations such as "hot", "wet" or "sweet" with no gradation. (Nintendo 64 level of realism)

Simple

Objects start to look more realistic, with natural textures and dynamic lighting. Everything looks like an advanced 20th century videogame. When people in the simulation speak their voices are synched to lip movements, there is fogging and other atmospheric effects. Sounds are sampled from real items but are very generalized, all cars sound the same, all birds make the same noises, etc. Simsense output is very generalized; there is definition but everything feels flat and without any fine detail. (Dreamcast level of realism)

Realistic

This is the level of a low budget movie. Small items are simulated such as simple wind dynamics and sounds will all have varying levels of differentiation from each other. Simsense output is very advanced – with realtime ACT format output. The differences from real life requiring an Intelligence(4) Test. This is the level most advanced sculpted systems use.

Advanced
So close to real life that one really has to look for the differences. Dust will appear to rise and settle in the air, wind currents will carry scent and the simsense output is of Dir-X quality. It's not at the UV level of realism but it will still require an Intelligence (7) Test to notice flaws in the recreation. Obviously not all advanced simulations are set up to be totally realistic as compared to the real world. In an advanced Reality the users avatar be capable of flight or use magic. Due to the extremely high difficulty of programming these environments it is primarily used for the most advanced VRCade simulations or MMS (Massive Multiplayer Simsense) programs such as *FantasyQuest 2000*.

ACTORS
Actors are the cast of the simulation. They fill the world with common people, crowds, partygoers, street merchants, even animals. Actor programs are usually divided loosely into Extras and Principles. Extras are the common masses, and they are often cloned in the simulation, with the actor program adding subtle variations between the cloned members. In this way a single 100-actor program can simulate massive crowds. They will all tend to act and look somewhat alike but they are not intended to be subject to close scrutiny. Principles are usually important members of the simulation world; they tend to possess good interactive abilities and can even maintain a simple conversation. In most simulations there are dozens of "stock" principles that are "switched" out with extras if engaged in conversation.

Since a few actor programs can be cloned thousands of time, it is not uncommon for entire virtual cities to have a single actor module for the common citizens, another for semi-important roles like merchants, and individual programs for important leaders and contacts in the simulation.

Game Effects
Actor programs can only operate in a simulation. They cannot do anything outside of the specific simulation they were designed for (for programming purposes this counts as Platform Specialization but provides no advantages). Actors may not use the Platform Specialization, Platform Concentration, or Firmware.

The Rating of the Actor modules is equal to the number of actors divided by 25, rounded up.

Add the Reality Multiplier to the actor programs final programming complexity total.

ACTORS
Multiplier:
Dumb: 5
Interactive: 15
Smart: 20

Dumb
Dumb actors are quite common in most simulations, taking the place of background elements such as animals, crowds of people, and even simple monsters that don't need to do much other then growl and get killed. Dumb actors have an effective Intelligence of 1 if engaged in conversation, and will simply repeat canned and banal responses such as "Nice weather" and "I don't know anything about that." Dumb actors have no memory function and will not remember interactions for more then a few seconds. They are usually background elements. In some advanced simulations if an avatar starts to talk to a dumb actor they are seamlessly replaced with a smarter version.

Interactive
Interactive actors fill the role of semi-important parts in a simulation. They can be compared to the one-line walk-on jobs of a real actor. Although much smarter then dumb actors they are still not exactly 'real'. Each one may have a plausible history but it won't stand too much questioning, just what the simulation expects in the course of standard activities. Generally they can do their virtual job, interact with other actors, and chat with avatars in the simulation. Interactive actors have an effective Intelligence of 3 for simulation and

interaction purposes. They also have skills relevant to the simulation. Interactive actors may or may not have memory functions, most will pretend to know the avatars and may actually have an stored memory of previous encounters.

Smart
Smart actors are the important cast members of a simulation. In most simulations it can be exceedingly difficult to tell a smart actor (usually called a "primary") from an avatar playing in-character with the simulation. They can be quite devious and often are programmed with "shortcuts" to the simulation in order to be more capable and appear even more intelligent. Smart actors are quite resource hungry however, and typically only a few dozen will be present on all but the largest and most lavish simulations. As much as possible they are cloned throughout the simulation. They have an effective Intelligence of 4 for simulation purposes and can display specific personalities. They also are quite capable of "remembering" interactions for quite some time.

OPERATIONAL UTILITIES
All operational utilities have a Legality Rating of 5P-S with the exceptions of Browse and Read/Write (which are Legal).

OFFENSIVE UTILITIES
All offensive utilities have a Legality Rating of 4P-S with the exceptions of Black Hammer, which is 2-S and Killjoy, which is 2P-S.

POISON
Multiplier: 3
Target: Deckers
The Poison utility attacks the Bod Rating of targeted personas and behaves like Acid IC. If the program successfully attacks, the target makes a Bod (Poison Rating) Test. Reduce the target's Bod Rating by 1 for every 2 successes the attacker achieved.

REVEAL
Multiplier: 3
Target: Deckers
The Reveal program attacks the Masking Rating of targeted personas. The target makes a Masking (Reveal Rating) Test. Reduce the target's Masking Rating by 1 for every 2 net successes the attacker achieved.

SPECIAL UTILITIES
Sleaze and Black Boxes are Legality 2-S. Track is Legality 3P-S. Skillsofts and Expert Systems may be restricted depending on their skills. Patch programs are not technically illegal by themselves, but using them to pirate software is a 4-S felony. All others are legal.

APPLICATIONS
Multiplier: Special
Applications covers common end-user applications such as spreadsheet programs, word processors, and simple programs such as a trideo control program so you can turn your trid on and off and change channels through a connected PC. These programs are almost always assembled from premade "building" blocks. Any grade school student can custom build his own applications. For programs of higher complexity there is still some demand for new features and cleaning up bugs from earlier versions of the plugin code sections.

Game Effects
For determining the Multiplier and rating of the program the gamemaster should decide on the overall complexity of the program in question.

Multipliers
Multiplier 1 and 2 programs are simple programs, or those that are well understood and common source code is available. These programs may be very powerful, but everyone can grab some existing source code and tweak it to their liking and make it their own. Multiplier 3 and 4 programs are more complex, source code may be available but the character can be assumed to be working on something a bit more complex and out of the ordinary, so stock code won't completely work. These programs require a lot more grunt coding. Rating 5-7 programs usually require the code to be done by hand for large sections. Common tasks are handled automatically (like video display and ASIST processing) but the actual program must be done by hand. Multiplier 8-10 programs require extensive work, often requiring not-so-common tools and learning special tricks and tips in order to get the program working. At this level most software is done by program teams, since a decently rated program will require far too much time and effort to complete by themselves. It can also include common software that requires extensive modification to work in specific applications (notably operating systems). Above Multiplier 10 the programs get increasingly complex and unmanageable.

Ratings
As a general rule, simple, free utilities are rating 1-2; they can do common tasks but will choke if faced with complex problems. Common user applications like word processors and simple cookie-cutter games are rating 3-4, most people won't be stressing the program beyond its normal limits. More difficult programs such as homemade trid/appliance control programs and original games would be rating 5-7 since they are much more capable and complex just to have the basic functionality that they do. Advanced, or feature rich programs will have 2-4 more rating points. Extra features can include ASIST feedback compatibility, auto-updating features, special DNI control features and macros, and nifty user interfaces.

AUTOSOFTS
Multiplier
Pilot: 5
Datalink: 2
Targeting: 3
Personality: 2
Sharpshooter: 4
Clearsight: 3
Firefall: 5
Autosofts, more commonly referred to as "dronesofts" are software packages specifically designed to be used to control drone systems. Unless otherwise noted, these software packages can usually only be programmed up to Rating 5. After that it simply does not become cost effective, and agents and knowbots become reasonable alternatives.

Pilot
Pilotsofts are specialized expert systems designed to control a drone. Although the higher-rated versions are "smart" in a sense they lack adaptability and cannot be given learning pools. They are also specific for a specific drone body and cannot be reconfigured for use in anything greater then a variant of the original. Pilotsofts cannot be used together with agents or knowbots.

Datalink
This is a specialized piece of software that collates sensor information from the vehicle and then feeds it either to the drone controller (over a broadcast link) or to the pilot program. When connected to a pilot program this gives the system awareness of its surroundings as well as it's orientation in that space. This software is required if the unit is to move independently in its environment or feed sensor information to a remote location.

Targeting
The targetsoft suite provides the drone pilot program with the capability to utilize any weapons mounted on the drone. This software includes various hooks for the datalink program and the sharpshooter expert system. It cosists of both a core targeting module, threat analysis databases, weapon ballistics, and

environment analysis systems. It is required if the drone is to use any weapons (even if only through a rigger).

Personality
This is an adaptation of the artificial personality modules originally developed for knowbots. It gives the drone quirks that make it seem much more lifelike. It is not widely used in official channels, but it is very common for even military pilots and drivers to load their pilotsofts with personality modules of their liking.

Sharpshooter
The sharpshooter suite is an dedicated expert system module designed to assist the drones targeting software with target acquisition, fire control, and ballistics modeling.

Clearsight
Clearsight is an image-processing suite designed to perform advanced filtering of a drones optical sensor information in real time.

Firefall
Firefall is a software package designed to assist in directing indirect weapons.

Game Effects
Pilot - PilotPilotsofts function as described for remote Pilot Advanced Programming software, p. 126, **Rigger2**. All pilotsofts count as having "platform specialization" for one specific drone type/model. A pilotsoft written for an Doberman will not function for a Bis Snooper under any conditions. The pilotsoft must also have access to a Frame Profiling Database with a size in Mp equal to the sum of the desired drone bodies Handling (highest of any two), Body, and Sensor squared.

For example, an Pilotsoft (Doberman) pilotsoft would require a database of ((5 + 2 + 1)^2 =) 72 Mp.

Datalink - The drone must possess a datalink program of a Rating equal to the rating of the Pilotsoft and the drone bodies Sensor Rating.

For example, a drone with Sensor 2 and a Pilot-6 autosoft would require a Rating 8 datalink program.

Targeting - The drone must possess a targeting program equal to the number of firmpoints and hardpoints on the drone (hardpoints count as 2 firmpoints for this purpose) plus the drones Pilot program rating. In addition, an weapon database of a size equal to the number of weapons x 10 is also required (typically this database is loaded separately as the weapon loadout on most drones can change).

For example, an Doberman drone has a micro-turret (which takes a firmpoint) and an external firmpoint. It also has a Pilot 2 autosoft. Thus the drone will require a Rating 4 targeting program. If it had weapons in both locations it would require a 20Mp weapons database as well.

Personality - This software cannot exceed the rating of the drones Pilot program. Each rating point in this software gives the drone an effective "Charisma Rating" of 1 for interaction purposes.

Sharpshooter - If the drone is operating independently (without rigger direction) it may add its rating to the Pilot programs Rating for purposes of Gunnery Tests.

Clearsight - This software adds its rating to the drone's Pilot Rating for perception Tests made with the drone. A rigger controlling the drone can add it's rating to his Intelligence for general Perception Tests. However, in this case the bonus cannot exceed the rigger's original Intelligence. It may not be used for any combat-related success tests. However, it also functions as an electronic magnifications system equal to its rating.

Firefall - If the drone also possesses an FDDM receiver module (p. 136, **Rigger2**) then a rigger using the drone can add it's rating to his appropriate skill when making Indirect Fire Attack Tests. If the drone is equipped with target designation equipment and is ordered to designate a target then it may use it's rating in the Firefall program as an Indirect Fire Skill.

BLACK BOX
Multiplier: 4
Black Boxes are the common name given to the decrypt and verification spoofers employed by satellite constellations. Limited versions (Multiplier 2) are used to decrypt standard SBS broadcasts without legal access. Black Boxes must be burnt onto blank access cards in order to properly function of course, and have a nasty habit of becoming invalidated quite quickly.

Game Effects
Black Boxes are designed to work with only a specific satellite constellation and will have no effect at all for access attempts made against other constellations. Black Boxes may not be programmed with any options (though they are assumed to already have the Firmware option since they must be burnt onto access cards to function).

The rating of the Box determines the ability of the software and how well it adapts to changing security measures by the constellations (and they change very often). Low-rated boxes will be invalidated very quickly, while high-rated units are can handle one or two code switches by the constellation before they are no longer effective. At the end of every adventure, even if the decker and/or the program were not used it degrades by a number of points equal to 1D6/3. This loss cannot be counteracted by Karma point expenditure.

Before programming can begin the decker must make a successful Etiquette (Black Box Rating) Test in order to get the latest signal developments and hacks on the underground. This test can either be made with the Decker or Matrix specialization, although if performed with any skill other then the Decker specialization the target number is increased by 2. This test must also be made for upgrades, although the target number is reduced to (Original Rating-New Rating). Upgrades can never increase the base rating of the program.

Access cards follow the same rules as for Cardbus cards when designing the firmware.

COMPRESSOR
Multiplier: 2
The compressor utility works in a similar manner to the cyberware data compactor (p. 20, **Man and Machine**), it shrinks file sizes with the use of advanced algorithms and software tricks. It is usually used to archive data when transferring to offline storage, or for storage memory strapped systems.

Game Effects
Compressor packs files down by 10% per rating point, to a maximum amount of 60% of the original program size.

Compressing or expanding a file on the users system requires a Complex Action. The compressor program is not required to decompress a file, the archives are self-extracting. It requires a Complex Action to uncompress a file on a host; files may not be compressed on a host and then downloaded.

Compressed file sizes may not be further reduced with other compression hardware or software such as the data compactor or other compressor programs.

For example, a 63Mp file archived using a Compressor-3 program would be reduced to (63 x .7) 42Mp.

DISINFECT
Multiplier: 2
Disinfect is used to protect against, and destroy, dataworm programs (see **Dataworms**, p. xx).

EMULATOR
Multiplier: Special
Emulators are programs that simulate other operating environments, whether a computer OS or certain specialty hardware. The complexity of the hardware determines the multiplier and the maximum rating of programs that will run on the emulator determine the rating. This represents how "deep" the emulation is, whether it only can run certain common programs or even hardware that directly accesses the simulated "hardware".

Game Effects
For simple machines such as calculators or very old machines (1980s or earlier) the Multiplier will be 1. More complex emulators, such as those that emulate computers from the 1990s and early 21st century – or simple embedded systems such as those in appliances are Multiplier 2. More advanced systems use the Core Rating of the system they are attempting to emulate times two as their Multiplier. These "virtual machines" can then run software as normal. One use for this is running multiple operating systems at one time, with one or more OS's running concurrently using virtual machines.

For example, emulating a Core Rating-6 system is Multiplier-12.

The emulators rating determines the maximum ratings of any programs being ran on the emulator.

For example, a Rating 6 emulator could run any program of Rating 6 or below.

Programs may run on the emulator exactly as if they were running on a computer of that type. Running programs must still be loaded into the systems active memory along with the emulator itself.

Emulators do not add to system load in the normal manner. Instead apply their rating directly to the current System Load. Programs running on the emulator add to system load as normal.

For example, a Rating 3 emulator would add 3 points to the current system load.

EVALUATE
Multiplier: 3
Evaluate is a special utility that is used for one purpose – locate paydata on the system. It analyzes data from the Browse utility in order to find any data that is potentially valuable and then flags it for the deckers attention.

Game Effects
In order to locate any paydata on the host the decker must make a successful Index Test on the host, reduced as normal. The decker must then spend a Complex Action to run the Evaluate program and analyze the data. This is made as an Evaluate (Paydata Density) Test. Each success by the evaluate program locates 1 paydata point, up to the maximum that the host contains (see **Paydata**, p. xx).

Market demands change very quickly however. The gamemaster rolls 1D6 /2 at the end of each adventure. All evaluate programs in the deckers inventory are reduced by this rating. This loss of effectiveness occurs even if the program or decker character was not active.

If the decker has the source code for the programs he may upgrade them as normal, using their new Rating for purposes of calculating the original Programming Complexity. Alternately the decker may restore 1 rating point to all of his evaluate programs that he has the source code for by spending a point of good Karma. Each point of Karma expended restores one rating point to his evaluate programs, up to their original ratings. This represents the decker performing personal research to feed into the programs.

EXPERT SYSTEMS
Multiplier:
Base: 6
Specialization: 4
Expert systems are systems designed specifically to aid metahumans in performing their tasks with certain skills. Expert systems have large libraries of common problems and solutions, as well as additional tools and software wizards. High-end "expert systems" are usually knowbots and agents with specific skills and tasks.

Game Effects
Expert systems can be designed for any Intelligence and Charisma linked skill. The actual skill (or specialization thereof) must be determined at the time of design. And at least one person on the programming team must possess the skill in question (or have access to the relevant skillsoft).

If an Expert System can be consulted it provides a Complimentary Skill equal to its rating for the skill in question. Expert systems are capable of aiding those without any experience in the skill, but in that case they are not as effective since the user will not be asking the "right" kind of questions to the system. In this case reduce the systems effective rating by half.

ICCM FILTER
Multiplier: 4
Intrusion counter-countermeasures technology has been around since the end of the Echo Mirage project. ICCM filters are individually tailored to an individual's specific neurological profile and are of no use to anyone other then their intended user.

Game Effects
ICCM filters increase the decker's chances of jacking out successfully when under attack by black IC. Apply a -2 modifier to the target number for the Willpower (IC Rating) Test (see p.230, **SR3**). They also reduce the target number for simsense overload tests by 2 (p. 226, SR3). When facing dump shock the filter reduces the damages Power by 2 and the Damage level by 1. This dump shock bonus is cumulative with running a deck in cool mode.

The filter also allows a decker to make two separate Damage Resistance Tests against the effects of lethal and non-lethal black IC – one test with Body and the other will Willpower. The player may then choose the test with the best result to use for the characters Resistance Test. Karma Pool dice added to the test are rolled separately and augment the chosen Resistance Test. Hacking Pool dice may not be allocated for these tests.

The ICCM filter has no effect against the psychological effects of psychotropic IC.

Creation of the individual profile requires a bioscanner (5,000¥) and a successful Biotech (12-Users Willpower) Test. This test should be made in secret by the gamemaster so that the true capability of the filter is not know until it is needed.

The Rating of the filter is equal to the OS Rating of the machine it is written for. ICCM filters are assumed to have the Platform Specialization programming option (though it confers no modifications to the programs complexity calculations).

IMAGE MANIPULATION
Multiplier: 3
Image manipulation software is used for various conventional applications. It is listed here because it is the primary software component of a good tridisynth (which as every good shadowrunner knows is useful for generating fake trideo if necessary).

Game Effects
Image manipulation software uses it's rating as a Complimentary Skill for Fake Pix Tests (p. 50, **Shadowbeat**).

PATCH
Multiplier: Special
In order to break the copy protection of a program there has to be a patch written. A patch will only work with one specific program. For example, a patch program written for an Attack-6M program will not work on an Attack-6S program. Each Patch program is individual.

Game Effects
The Multiplier for a Patch to the program is equal to the copy protected programs original Multiplier plus 2. After the program is written make a Patch (Copy Protection) Test. Each additional success after the first determines how many SOTA upgrades the patched program can go through before Patch no longer defeats the copy protection.

The final size of the Patch program is added to the programs size when it is loaded or copied, if the patch is not included then the programs copy protection will operate as normal. If multiple copies of a cracked program are loaded they must each have their patch loaded.

RESTORE
Multiplier: 3
The restore utility helps repair damage to the users online persona.

Game Effects
To use the restore utility the user targets a damaged persona program and makes a Restore (Highest Rating of program that damaged program) Test. The utility restores 1 rating point for every 2 successes. However, the program cannot repair OS rating reductions and the persona reductions that it causes.

For example, if the users Bod was reduced by both an Acid-4 and Poison-6 program before applying the restore utility then the highest rated program is used, in this case the Poison-6. So the Restore Test would be versus a Target Number of 6.

SOFTMODEM
Multiplier: 1
Softmodem software consists of a Matrix interface stack, various drivers, and an emulation library to simulate the capabilities of a hardware link. They cannot match the capabilities of their hardware cousins, but for low-bandwidth applications or other low-price applications they excel. Except for the limitations noted below they otherwise operate as standard Matrix Links.

Game Effects
Softmodems primary limitation is in the total bandwidth they can handle. If using a softmodem the systems effective maximum bandwidth is equal to the programs Rating plus Processor Rating.

For example, a Softmodem-6 program running on a system with a 2 Processing Rating has an effective maximum bandwidth to the Matrix of 8MePS. This speed can be recalculated every turn of the Processor Rating varies.

STEGO
Multiplier: 2
Stego is a unique utility in that it combines with other programs to perform its job. In this case the utility is used to perform a process called "steganography", which hides data inside another file.

Stego uses various methods to hide the data, ranging from hiding the data in image files, to bogus data libraries, or just hiding it in junk data. Stego also alters the data file to make it appear as if it's infalted size is normal (for example, data hidden in a skillsoft program will cause casual observers to see the soft as a high-rated version).

Game Effects
When hiding the data both files must be loaded into active memory, stego is then run and the decker rolls a number of dice equal to the programs rating against a target number of 4. The number of successes becomes the threshhold an analysist must beat if using another stego program to analyze the data in an attempt to find hidden data. Obviously the test will automatically be successful if the analyst knows the specific passkey to unlock the data. No deice pools may be used in this test.

Note that ANY sort of data can be buried in this way, and in most cases such data is heavily encrypted before being buried in another program. The buried program cannot be used of course, but the "host" program can be used as normal (if larger then normal). The inflated file size is usually misinterpreted for bad programming, extensive use of tinker-toy programming methods, or other facts of modern software.

For example, Tamino is trying to hide some important research data in utility he is going to send to another decker (the utility is something innocuous like a Pac-Man remake). Tamino is using a Rating 5 Stego program to hide the data. He rolls 5 dice against a Target Number of 4 and scores 3 successes. Later on, a busybody security decker is checking out the data and thinks there is something odd about a 300Mp Pac-Man game. He runs his own Stego program to check it out. His Stego program is Rating 6, so he rolls 6 dice against a Target Number of 4, scoring 3 successes as well. This does not exceed the original number of successes so the security decker attributes the size to the extensive simsense samples and moves on to more exciting work.

VIDEO GAMES
Multiplier:
Flatscreen: 2
Trideo: 3
True 3D: 5

Simsense
If the video game will have the capability of generating ASIST compatible data increase the base Multiplier by 2.

Addiction Rating
Increasing the games base Addiction Rating (see below) by one point raises the base programming Multiplier by 1. The total Addiction Rating can never exceed 10.

Multi-Display
If the video game will be compatible with different display types (such as both trideo and True-3D) then add the base Multipliers together.

Multi-Player
Most modern video games are capable of playing over the Matrix with other users of the same game. As a general rule the game can support a number of active players per game equal to its Rating squared.

Everyone knows what a video game is. They come in a multitude of types and classes - ranging from those that are primarily educational to those that are essentially interactive pornographic movies. Video games

are designed for one of three display types and may not be used interchangeably normally unless specifically designed that way (see above).

Game Effects
Unlike most other software, video games are assigned an Addiction Rating to show how immersive they are, and in one sense how "fun" the game is. The base Addiction Rating of the game is equal to the highest base multiple of the display type (better-looking games are obviously more attractive). Then divide the Rating of the program by 3, rounded down, and add that to the total. Apply for any specific modifications made to make the game more addictive (usually eye candy or things like level editors). The total becomes the games Addiction Rating. All video games are mentally addicting. Video games have a "Fix Factor" of 1 day - with a "fix" being a period of time playing the video game equal to half the games Addiction Rating.

Note that video game Addiction is different from drug addiction. Unless the character has the Flaw of Addiction (Computer Games) none of the effects listed under "Addiction Effects", p. 109, **M&M** are applied. There are no withdrawal TN penalties. However, you can still apply the effects for "staying clean" if faced with a chance to play the characters favorite video game.

FRAMES

Frames are a special class of utility program that help users manage their utilities. They are fairly limited however, with even “smart” frames having only the most minimal levels of independence. No frame, however “smart”, can operate on the Matrix without an active persona. They do not have personas themselves nor can they generate one, they are always linked to the users. Thus frames are limited to operating on grids and hosts that the users persona is already logged onto. They may not “roam” the Matrix or log onto hosts independent of the user.

However, smart frames may control a persona if specifically directed to do so (usually this is done when the decker is busy with other matters and does not require the use of the persona). In this case the smart frame can log itself onto other grids if so directed.

FRAME LOADING
When a frame is loaded into memory, the decker may link other programs that are loaded into active memory to it. It requires a Complex Action to link a program to a frame. For this reason, most frames are loaded before logging on to a grid.

The total Rating of the linked programs may not exceed the frames own. In the case of smart frames, use the frames adjusted rating.

Utilities may not be run multiple times in the same initiative pass.

FRAME DAMAGE
If a frame is crashed then it must be reloaded with a Swap Memory function. Any links to other programs are lost. For smart frames that have sacrificed Rating points for extra initiative, use their unmodified Rating for purposes of damage.

SCRIPTS
Both types of frames may run scripts (see **Scripts**, p.xx). For purposes of running scripts, a dumb frame has a Computer Skill equal to it’s rating divided by 3.

DUMB FRAMES
Dumb frames are essentially glorified batch programs, possessing only the most basic levels of decision making.

Giving a command to a dumb frame is a Simple Action. This applies even if the frame is used to perform a Complex Action. For example, a frame could use a linked Analyze program to perform an Analyze Security system operation as a Simple Action.

Dumb frames cannot repeat commands; they are triggered, run the appropriate program and then wait for a new instruction. For example, a frame ordered to attack an IC program will do as ordered, but not continue to attack each turn. If the user wants it to attack the following turn it must be given a new order.

SMART FRAMES
Smart frames contain much more robust decision making capabilities, enough for the frame to perform actions with a degree of autonomity.

Giving orders to a simple order to a smart frame is a Free Action, and in this case operates exactly like a dumb frame.

However, smart frames can also be given complex orders. Giving a complex order to a smart frame requires a Complex Action, once given an order the frame will carry out its orders to the best of its ability, using its own "skill" (their Independence Rating), together with their own Response and Initiative ratings. This order is a one-sentence command that the frame will attempt to follow literally.

For example, a decker could order a smart frame linked with combat utilities to attack an IC program. The frame will use its own actions to complete the task. The frame could also be used to monitor an operation independently of the user, although in that case it can do nothing else.

In game terms, the player controls any smart frames he has running. The frames actions do not require any attention from the user and no not use any actions. However, the gamemaster has final authority in determining of the players actions with the frame are consistent with its orders.

Smart Frames as Datahounds
Users may use smart frames to perform Matrix searches in their place (see **Searching the Matrix**, p. 254, **SR3**). Smart frames used in this role use their Independence Rating in place of the deckers Etiquette (Matrix) Skill. The smart frame may also use a linked Browse program to reduce the target number of the search if using a hacked account. Smart frames may conduct a number of searches equal to their rating.

Note that if there are multiple smart frames assigned to research they must each have an individual copy of the Browse utility loaded. If using a perfectly legitimate connection then the Browse program is not needed.

FRAME
Multiplier
- **Dumb:** 2
- **Smart:** 3

The determination if the frame will be dumb or smart must be made when it is designed, it may not be changed later on though upgrades. Smart frames must have at least one point of the Independence option.

Smart Frame Attributes
Smart frames have a Reaction attribute equal to their Rating. They also have 1D6 for Initiative. During the design of the frame, the programmer may increase the number of Initiative dice by sacrificing the frames Rating for purposes of linking programs. Each point of adjusted Rating sacrificed provides and additional Initiative die. This allocation must be done during the design and cannot be changed at a later date.

AGENTS
Agents are a new technology derived from Semi-Autonomous Knowbot (SK) research. They are highly advanced pieces of software, capable of very high levels of heuristic planning and decision-making. Most are designed to operate on the Matrix, but some agents are designed to inhabit and control drone bodies.

AGENTS ON THE MATRIX

In order access the Matrix an agent requires the Computer (Decking) Skill. They also require a persona to operate. A computer can only generate one persona at a time, so if the agent is running on a system being used by a metahuman operator to access the Matrix it cannot perform any tasks independently.

Agents and Searches

Agents assigned to perform data searches on the Matrix (p. 254, **SR3**) use their Intelligence + Computer Skill in place of a deckers Etiquette (Matrix) skill. The agent may use any Browse programs loaded on the system to reduce the Success Tests target numbers in that case. Note that the agent must have its own copy of the Browse utility loaded, multiple copies of a utility cannot be used simultaneously by multiple applications.

Agents can maintain a number of searches equal to their Intelligence + Processing Rating.

Agents and Frames

Agents are not capable of giving orders to frames or directing them.

Hacking Pool

Agents do not get a Hacking Pool, though they can substitute their Learning Pool instead.

Interface

All agents can only access the Matrix in terminal mode (see **Deck Modes**, p. xx).

Agents and Cyberdecks

Agents cannot utilize ASIST interfaces except in terminal mode. All agents are assumed to be running the system in DNI-only mode even on non-DNI systems (such as those with basic interfaces).

AGENTS AND RIGGING

If controlling a vehicle an agent falls under the rules for Robots (p. 67 **Rigger 2**) with the following changes.

Remote Control

An agent may control a single vehicle through a remote control deck. An agent can only have a single drone, which is considered primary mode. While controlling the drone this way the drone is considered to be a Robot. Agents may not give orders or maintain a subscriber list beyond 1 (the unit they are controlling).

Controlling

An agent may only control a vehicle with rigger adaptation. A simple datajack link does not give the agent sufficient data to run the drone. This applies only of the agent is "plugged into" the drone. If it is built into the drone during the design it must be designed with the firmware option, which in this instance also means the agent does not require an rigger adapted frame.

Comprehension Tests

For purposes of agent comprehension tests use its Intelligence in place of the Pilot rating.

Pilot Rating

The agent's Pilot rating is equal to its skill in that particular vehicle type. An agent must have the Remote Operations specialization of the vehicle skill to control a vehicle. Even if directly controlling a vehicle through a datajack connection, the relevant specialization is Remote Operations.

Learning Pool

The agents Learning Pool is calculated normally, it is not equal to twice its calculated Pilot Rating.

PROGRAMMING AGENTS
A programmer requires a Software Suite equal to the Agents desired rating in order to begin. Agents may use any of the standard programming options, with the exceptions of Platform Specialization and Concentration

CAPABILITY POINTS
Programmers "buy" the agents attributes with Capability Points. An agent has it's Rating x 5 in Capability Points. Once spent, Capability Points may not be altered at a later date.

Upgrading
Agents that are upgraded only receive a number of new Capability Points equal to the difference between the old and new Rating.

For example, a Rating 3 Agent is upgraded to Rating 5. The programmers now have an additional 10 points to assign.

ATTRIBUTES
An Agent possesses four attributes, Intelligence, Personality, Skills, and Learning Pool. None of these separate attributes may exceed the Agents Rating.

Reaction and Initiative
Agents have a Reaction Rating of twice their Rating. They have a base Initiative Rating of 1D6, +1D6 for every two full points of Intelligence.

Agent
Multiplier: 6
None of the Agents attributes or skills can exceed its Rating. Otherwise, the programmer can then divide the agents Capability Points as he wishes.

Each point of unspent Capability reduces the final programming complexity by an equal amount.

Intelligence
The agent's intelligence measures it's adaptability, decision making capabilities, and ability to operate independently. It is treated in the same manner as a character's Intelligence Rating but does not represent actual parity or equivalence with metahuman Intelligence, just the capabilities of the agent in regards to its programming.

Each point of Intelligence Rating costs 2 Capability Points.

Personality
Personality is a rating of how well the agent interacts with people. It can be likened to the agents Charisma, and is used as a Complimentary Skill for skills that default to Charisma.

Each Personality Rating point costs 1 Capability Point.

Skills
The skills attribute works a bit differently then the others. Skills for an agent show capability to use a skill, not the presence of the actual skill software. In order to actually use the skill in question the agent must have access to a skillsoft of the appropriate rating or greater. Agents cannot use skillsofts with rating less then the required level. The skillsoft must be loaded into active memory for the agent to access it.

Agents must specialize in their chosen skills, but do not get the usual bonus for doing so. Agents cannot default skills.

An agent may possess a number of skill points equal to its Skills Rating multiplied by 3. No Skill Rating can exceed the Rating of the agent. The agent may not possess more skills then it's Intelligence.

Each Skills Rating point costs 3 Capability Points.

Learning Pool
Agents may possess a maximum Learning Pool Rating of Agent Rating/2, round down. Each rating point gives the agent +1D6 Learning Pool dice. Each Learning Pool die costs 5 Capability Points.

For example, a programmer is designing an agent he will call "Bob". Bob will be a Rating 5 Agent. Thus the programmer can allocate up to 25 Capability Points.

The programmer decides Bob will be an agent designed to teach people, especially children, how to use the Matrix. With this concept in mind he begins to purchase attributes.

The agent has to be pretty smart so the designer spends 6 Capability Points to buy an Intelligence of 3. It's about as smart as the average metahuman for it's tasks. The agent will be dealing with people a lot, and children may react badly to an agent that is cold and without any apparent emotion. Thus he spends 5 Capability Points to get a Personality of 5.

Skills are the most expensive part of the agents design so the programmer looks at his available Capability Points and gets a Skill rating of 3. This gives him 9 points to divide among up to 4 skills.

Since this is a teaching agent he gives it Computer (Decking), Instruction (Computer), and Etiquette (UCAS) at ratings 3, 4, and 2 respectively. Since a teaching agent should be adaptable he gives it a Learning Pool of 1 at a cost of 5 CPs.

The final design is below:

Bob
Rating 5 Agent
Reaction: 10
Initiative: 2D6
Intelligence: 3
Personality: 5
Skills: 3
Computer(Decking)-3
Instruction(Computer)-4
Etiquette(UCAS)-2
Learning Pool: 1
Complexity: 30

SCRIPTS

Scripts are collections of commands that can be acted upon by frames or agents. The acting agent of the script will attempt to follow the commands as directly as possible. If it is unable to complete a step in the task, whether through a fault of the scripts logic or the ability of the software running it, then the script will abort and the runner of the script will attempt a Graceful Logoff.

COMMAND COMPLEXITY
Scripts are written as a series of commands. Each command is written as a single sentence. Each command increases the Scripts rating by 1. The programmers Computer Rating does not limit the rating of a Script.

The scripts Multiplier determines the highest complexity of each command can possess. Use the Command Chart below as a guideline. Gamemasters are encouraged to be flexible, but should enforce a limit to the length of each command. As a general guideline, each command sentence cannot exceed the scripts Multiplier times 10.

COMMAND CHART	
Multiplier	**Complexity of Commands**
1	**Simple**. "Logon to LTG", "Analyze Host", "If IC present attack with Attack-6 program". Orders should be direct and specific. Failed commands will not be retried.
2	**Moderate**. "Attack IC with best program." "Log off Host if Tally Exceeds 10", "Download all files related to 'Basketball'". Orders can be subject to limited interpretation. Each order should be limited to one task, though multiple steps could be required for the task. Failed commands will be retried at least twice.
3	**Advanced**. "Logon to RTG and run Trace Commcall for 'John Doe'", "Run Tap Commcall and monitor for 15 hours", "Record only when calls active". Orders can involve additional options. If a command fails to execute the script will either try again or attempt the next command on the list.

RUNNING SCRIPTS
Scripts will attempt to perform each command in order. For convenience the programmer may reference commands out of order, it is recommended that the player number his commands in this case to reduce confusion.

If the user wishes, he may have an agent or frame run a script while he is online. In this case the frame or agent will attempt to run the script as normal, except that it may not attempt to log the persona onto any system.

Activating a script requires two Simple Actions. One to tell a frame or agent to follow its commands, and another to actually run it. A single script may be used as the source for multiple frames and agents operating at the same time.

In essence the gamemaster runs any program following a script. He has final judgment over whether the tasks confuse the program or what the program will do if faced with an situation not covered by the script.

PROGRAMMING SCRIPTS
Scripts are written just like any other program, except they may not take any programming options.

Task Time
The base task time for scripts is rated in hours.

SCRIPT
Multiplier: Special
Each command line increases the scripts rating by 1.

COMMAND SETS

Command sets are specialized scripts that are ran on hosts. They are programmed in the same way but any System Tests that the script would be required to make must be made ahead of time, while the decker is actually on the host. For example, if the decker wanted the host to record images from it's security cameras to a file he set up at a specific time then he would have to make a successful Slave Test in advance. If he wanted the office printer to start printing lewd pictures, he must make a Files Test. If he wanted the system to boot Joe User at a certain time he would make a Control Test, and so on. The gamemaster determines the script complexity multiplier and the actual subsystem tests needed for a specific task – if in doubt use a Control Test. These tests may be made before the actual script is written, but the time limit (see below) still applies. If the script is not uploaded and activated before the detection time the script will not function.

The resulting script must be uploaded to the host with a successful Control Test.

Total any successes the host scores in opposing these Subsystem Tests. Divide the resulting total into 24 to get the number of hours before the host detects and deletes the command set. If the host scores no successes then the set will remain undetected for 48 hours.

OPTIONAL RULE: PROGRAMMING OPTIONS

Programming options are ways of “personalizing” a program. Including such things as programmer tricks as optimizing the code, adding copy protection to secure their investment, and using shortcuts to make software easier to develop.

OPTIONS AND RATINGS

Options can affect three ratings in designing software, Base Multiplier, Programming Complexity, and System Complexity.

Many options that alter the base multiplier only do so for purposes of calculating the software’s complexity. Modifications of this sort do not permanently alter the programs Multiplier. Total all changes to the programs base multiplies from all of the programs options before determining Programming and System Complexity.

The Multiplier of a program may not be adjusted below 1.

BLOCKS

Maximum Rating: 6

If the software’s programming complexity exceeds 20 then it may be broken up into separate tasks. To determine the programming complexity of the “chunks” divide the programming complexity by the number of blocks it will be broken into, rounded up. These blocks may be distributed among various programmers, or worked on over a period of time by the same programmer. Each block will still take the original amount of task days to complete.

For example, A_Engine is trying his hand at crafting a Black Hammer utility. He wants to go all out and create a rating 10 version of the program and does not want to use any programming options. The base difficulty for this task is an insane 100!! Obviously there is no way this could be done outside of a miracle even with the hottest programming suites and a crack team of programmers. So A_Engine breaks the program into 6 chunks, with each block of code having a programming difficulty of (100 / 6) 17. Inside the realm of possibility. But each block of code will still require 200 task days to complete. If A_Engine wanted to write the entire program himself he would require 1,200 days to complete the task, assuming he made all the tests, that would require over three years! Obviously, the big programs are done by professional teams of software engineers with the latest cyber and mages with Enhanced Attribute(Intelligence) spells on tap…

CLIENT-SERVER

Maximum Rating: 1

A client-server program is designed to be ran on the host, with connecting clients downloading only enough of the program in order to function, but still requiring constant contact with the host. This is by far the most popular option among corporate networks, since they can then centrally administer most software and have systems that are not as powerful (and thus cheaper). A typical corporate host will have client-server versions of every program the clients use except for the absolute basic persona programs.

Only Operational, Offensive, Operating System, Applications, and Video Games may be designed with this option. These programs can only run on systems with a workstation operating system (but the host OS cannot directly access these programs). By itself the program cannot function, but a user can download a "client" version of the program, which then functions exactly as if it were a full version of the program for all purposes.

No client-server program may have its rating exceed that of the Operations environment rating. It consumes the normal amount of system resources on the host system. The client versions of the program must be downloaded before use (most coporate systems automatically download the necessary software as soon as they connect to the network). These client programs are usually referred to as "modules" and only require 25% of the original programs system requirements in both size and for system load calculations.

Thin-client Operating Systems
Although normally a computer cannot load or use persona programs without an operating system, with the client-server option that can be bypassed to a limited extent. In this case the system must have at least a Rating 1 sensor and bod persona program in firmware when the system is hooked up to the network. If authorized, the host can then download the operating system to the client, which then would start up as normal.

EFFICIENCY
Maximum Rating: 2
The efficiency option represents low-level programming to have the software operate on as little system resources as possible. Because of the difficult in making very complex programs reasonably efficient it is commonly used on simpler programs, or ones with a low rating.

Each level of Efficiency reduces the programs base Multiplier by 1 for purposes of calculating System Complexity, and increases it by 1 for when calculating Programming Complexity.

Efficiency may not be combined with the Tinker-Toy option.

OPTIMIZATION
Maximum Rating: 1
Optimization means the program has been written for a specific platform. The programmer must choose a specific Core Technology for the program. The program will then only run on systems of that type.

Round down the programs final System Complexity, increase the programs final Programming Complexity by 2.

PLATFORM CONCENTRATION
Maximum Rating: 1
The software is written to only work on a specific type of Operating System. It will not work on any other.

Reduce the base Multiplier by 1 for purposes of calculating System Complexity, increase the final Programming Complexity by 2.

PLATFORM SPECIALIZATION
Maximum Rating: 1
The software will only operate on one specific computer. This specialization includes a specific brand and name. If the system OS or Core Rating differs from the original, then the software will no longer work.

Reduce the base Multiplier by 2 for calculating System Complexity; but increase the final Programming Complexity by 3.

COPY PROTECTION
Maximum Rating: 15
Copy protection is used to protect software from illegal duplication and use. Software protected with Copy Protection cannot be copied more then once, since the original program has to reside either in storage memory or on connected offline storage. If the original program is not present, the software will not operate. Even if it was loaded into memory and the original was then removed.

The exact methods vary of course, programs originally written on OMCs, for example, tie the program to an embedded signature on the chip that conventional chipreaders and burners cannot read or write. Other methods involve encrypted software keys contained in the main program that are not passed on to copies, and so on.

Game Effects
Copy protection is divided into two types, Linked and One Use. Link protected programs must have the original media that the software was distributed on connected to the system in order to function. One Use

protected programs allow a copy to be made of the chip but that copy cannot be copied again, it will either be corrupt or simply not function due to the lack of specially hidden tags or lack of a needed software key that is included along with the program when it is copied. If it is copied again the keys flags mark it as a copy of a copy and the software refuses to work. Some One Use software requires an external key on the original media to be copies over, which makes the original worthless unless the key is transferred back.

Each Rating point of Copy Protection adds 1 to the final Programming Complexity.

TINKER-TOY
Maximum Rating: 1
Tinker-toy programming is making extensive use of pre-made libraries and object-oriented development tools. While this makes the task of development much simpler, it has the side effect of making programs much larger.

The tinker-toy option reduces the programs base Multiplier by 1 for determining final Programming Complexity, but the programs final size is figured in the same manner as for Commercial Software (square the Rating then multiply by Multiplier).

INDEPENDENCE
Maximum Rating: Frames Rating
Smart frames only. The independence option gives a smart frame a Computer Skill, equal to the options rating, for performing tasks.

If a smart frame fails a test with all 1's, the frame will crash. A new copy must be loaded and linked before it can be used again.

Independence adds it's rating to the frames for calculating final Complexity.

FIRMWARE
Maximum Rating: Special
The firmware option allows the program to be cooked into processor logic and ran independently. Programs with the firmware programming option cannot be run on normal systems.

Firmware cannot be combined with Platform Concentration or Specialization.

Firmware adds 1 to the programs Multiplier for calculating the final Programming Complexity.

PROGRAMMING

All programming jobs are tasks, with success tests, base times, and task periods needed to complete the work (see **Deckers and Tasks**, p. xx).

DIFFICULTY
Base Difficulty
The base target number for writing a piece of software is equal to its Programming Complexity. The programmer makes an Computer(Programming Complexity) Test to see if he can successfully write the program. The Software specialization may be used in place of the base Computer Skill.

For example, a programmer is attempting to write an Attack-6S program with no programming options. The Programming Complexity for this job is 24 (4 x 6). If the programmer had Computer Skill-5 and rolled 1, 3, 4, 6 and 6 then he would reroll the two sixes (Rule of Six). If those rolls turned up a 4 and another 6 then the six would be rolled again. For this example the last roll results in a 5. That gives a result of 17 (6+6+5) for the highest die. No luck, try again.

Adjusted Difficulty

Programming Suites

The base target number for designing a program is reduced by the Rating of any programming suite (see **Programming Tools**, p. xx). Thus, a program with a Programming Complexity of 16 being designed with a Rating 2 programming suite would have a final adjusted target number of 14.

TIME

Base Time

The base time to write a piece of software is it's final Programming Complexity multiplied by 2. The result is the base time, expressed in task days.

Optional Rule: Trading Time

The programmer may attempt to program otherwise impossible programs by taking more time. Each +1 to the final base time multiplier (see Base Time) reduces the final programming difficulty number by 1. The programmer may only adjust the final base time multiplier to 10 (i.e. a max reduction of 8).

Task Period

To determine the task period for the programming job, make a Computer (Program Rating) Test. The Software concentration or appropriate specialization may be substituted instead of the base Computer Skill.

Divide the base time by the number of successes scored on the test. The result is the task period, expressed in days.

MAXIMUM RATING

Programmers may not design programs with a Rating exceeding his Computer Skill, its Software concentration, or appropriate specialization.

However, they may assist in a programming team on software they themselves could not design alone.

UPGRADING PROGRAMS

If the programmer has the source then he can attempt to upgrade any piece of software he possesses. At it's simplest the programmer compares the programs new Programming Complexity with his original Programming Test roll and makes a Computer (Difference in Ratings) Test, substituting the Software specialization if available. Programming suites reduce the target number as normal.

The base time is calculated from the new Programming Complexity. The programs size is calculated from the new ratings and options, as is system complexity.

Programming Options

If the original program possessed programming options then their multiplier effects still apply when calculating the new Programming and System Complexity.

If attempting to REMOVE a programming option apply the options effects again in the new ratings.

For example, Henry is attempting to upgrade his Attack-6S program to an Attack-7 program with the programming option of Efficiency-2.

His old programming complexity was (6 x 4) 24. His new programming complexity is (6 x 7) 42. The difference is 18. The new Programming Task will have a target number of 18. The base programming time is 82 days.

PROGRAMMING TOOLS

The minimum setup for programming is a computer with Processing Rating of at least half the Rating of the software being written, an amount of free memory equal or greater to the size of the program, and a programming suite of some kind.

Programming Suites
Programming suites are Commercial Software (see **Commercial Programs**, p. xx). Program suites are rated in a special manner from most programs. First the user decides the Rating of the suite, this will be his bonus against the software's final Programming Complexity (see **Complexity**, p. xx,) and then what level of task bonus he wishes to gain. Task bonuses are handled as detailed with **Deckers and Tasks**, p. xx.

For purposes of size calculation and cost (p. 304, **SR3**) the suites Rating is the Program Rating and the Task Bonus is the multiplier. Programming suites available through standard channels are limited to Rating 6 and Task Bonus 4. Higher rated suites no doubt exist, but they are not available on the street.

The suite must be loaded into memory in order to be effective, thus it does impact on the systems Load and free memory.

BONUSES
Memory
If the programming system possesses twice as much free memory as the program requires then there is a +1 task bonus. This bonus is in addition to any gained through the programming suite or other method.

System Speed
For every multiple of the systems free Processing Rating there is an additional +1 task bonus, to a maximum of +4. Thus a system with a current Processing Rating of 13 that is used for writing a Rating 5 piece of software will provide a +2 task bonus.

CODE WIZARD
Agents and knowbots with the Software specialization of the Computer Skill may be used to program. They are not quite as adaptable as metahumans however, and gain no benefit from a programming suite (although they still require one to be available). Other then that they may attempt to write any program with a rating equal or less then their rating. Smart frames may not be used to program.

Task Bonus
Code wizards do not get task bonuses from programming suites or the system they are working on (they must be loaded into or connected to the system that is being used to program). Instead they reduce the base time of the programming they are working at by half (they work day and night).

Errors
Code wizards are not quite the smartest animals, even those based on knowbots. If they fail their programming test and realize their current task is flawed (p. xx) then they stop work and await input from another programmer to get them started again. Thus it's a good idea to keep an eye on them in case they have problems.

Teams
Code wizards cannot work in teams, even if multiple wizards are all connected there is absolutely no bonus.

SOURCE CODE SIZE
Object code is the compiled source code of a program, the actual executable program. A piece of software's source code often takes up far more space then its compiled counterpart. To represent this multiply the software's final System Complexity by 2 to get the source codes size in Mp.

PROGRAMMING TEAMS
Several people may also work together as a team to produce software. The maximum team size equals the Leadership Skill of the team leader (usually the team member with the highest Leadership Skill). No concentrations or specializations are applicable. Optionally, if no member of the team possesses Leadership then the team limit is equal to half the Computer Skill (rounded down) of the character with the highest Computer Skill.

For example, a team led by a leader with Leadership-5 could have up to 5 team members. If the most skilled character with a Computer Skill of 5 was forced to lead the team, then the maximum number of team members would be 2.

Software Development
Programming teams that are developing software can design software with a maximum rating equal to the highest Computer Skill in the group, plus 1 for every two members of the team.

For example, the programming team from the previous example could design a program with a Rating of up to 7 (Highest Computer Skill of 5 + (5 /2 =2)).

Grunt Coding
For the Computer Skill Test made to determine the task period, average the skills of the team members, rounding up.

For example, a team of three programmers with skills of 7, 6, and 4 would make the test with an effective Skill Rating of 6.

The team cannot share tools, each team member must possess at least the minimum levels of resources. Task bonuses are totaled for purposes of determining the groups total bonus. Each day of work done by the group counts as 1 day times the number of team members. The groups task bonuses is then added to the result. Each day of work reduces the task period by that amount.

For example, the team from the previous example has task bonuses of +1, +2, and +1 respectively. Each day of work by the team reduces the task period by 7 days.

FIRMWARE

Firmware is a "system on a chip" that is specifically designed to run a specific program without relying on the host resources. It is a very expensive option however, and thus only used in certain exceptional circumstances such as IC and other high-load software.

SOFTWARE REQUIREMENT
The software must be designed or purchased before it can be burned into firmware. It must possess the Firmware programming option.

HARDWARE REQUIREMENT
The firmwares Hardware Requirement rating is equal to the final programs System Complexity.

MEMORY REQUIREMENT
The firmwares memory requirement is equal to twice the programs size in Mp.

PARTS AND PROGRAMS
Firmware must be designed to match the technology of the system it will be used with. Silicon systems use silicon-base firmware for example. Hybrid systems use optical firmware. Biotek systems use optical memory chips.

The cost for the necessary processor logic and support circuitry is determined from the Firmware Parts Table. Multiply the hardware requirement rating and memory requirement by their respective cost factors to get the final hardware price for the firmware components.

FIRMWARE PARTS TABLE		
Core Type	**Technical Name**	**Cost Factor**
HARDWARE REQUIREMENT		
Silicon	Silicon Control Processor	100¥ x Rating
Optical	Optical Code Chips	250¥ x Rating
Biotek	Boptronic Logic Node	600¥ x Rating
MEMORY REQUIREMENT		
Silicon	Silicon Memory Chips	2¥ per Mp
Optical	Optical Memory Chips	5¥ per Mp

BURNING THE PROGRAM
The programmer must then make a successful Cook (Program Rating) Task. The base time is a number of days equal to the Program Rating divided by the number of successes on the Cook Task.

FIRMWARE SIZE
The size of the final firmware circuitry package is equal to the System Complexity /10. Size is measured in spaces.

Firmware cannot use space efficiency.

FINAL ASSEMBLY
If successful then the new firmware package may be used with the appropriate system after it is interfaced through a UBUS or Cardbus card.

The final assembly process requires an empty card (easily located) and a successfully completed Assembly Task. If successful, then the programmer now has a card that is the same size as the firmware size plus one.

ASSEMBLY TASK
Parts Cost: 40¥
Parts Availability: Always
Street Index: 1
Base Time: 2 days
Skill: Computer B/R
Target Number: 4
Equipment Needed: Microtronics Shop
Size:
UBUS - Firmware Size + 1
Cardbus – Firmware Size

Design Cost
If built into the system at design, calculate the firmwares DP by dividing the final total cost by 100 and rounding down.

Embedded Firmware
Firmware may also be embedded if purchased at system design. Embedded firmware may be replaced by another embedded package. The final size of the embedded firmware cannot be greater then the firmware it is replacing.

The Assembly Task is identical in this case.

EFFECTS OF FIRMWARE
System Load
Software loaded into firmware modules does not consume any active memory. They only contribute half of their System Complexity for System Load calculations.

Firmware programs are counted for determining persona bandwidth.

Program Copies
Only one copy of a firmware program can be active at a time. Users may not copy a firmware program into active memory and expect it to run. The firmware programming option modifies the software to only function in the firmware environment.

Crashing
If a firmware program is crashed it can be restarted with a Complex Action. If the OS or persona is crashed the system is immediately dumped off the Matrix however.

Upgrades
Firmware may not normally be upgraded. If the programmer wishes to update a program that resides in firmware then he must possess the source code, make the necessary upgrades and then make a completely new Cook and Assembly Task.

Flashable Firmware
Firmware that can be updated is a special case, and involves the use of special reprogrammable memory units. These OCCs are triple the normal price and can only be bought up to 25 Mp of storage, it is not possible to purchase flashable biochip units currently. Thus the absolute maximum size for reprogrammable firmware is 25Mp. Typically most flashable systems have the maximum size possible even if the software is much software, giving more room for future upgrades.

Updating flashable firmware requires the chip be removed (this is usually a simple matter) and placed in a flash-capable chipburner (costs 2x the normal price). This requires a new Cook Task as normal, but if the test fails, it can be restarted again.

COMMERCIAL SOFTWARE

Users and deckers can also attempt to purchase software on the open (or shadow) markets. For legal programs or software being purchased with a valid permit (p. 273, **SR3**) the Availability test is made with the Etiquette (Matrix) Skill. Otherwise use the Decker specialization.

COPY PROTECTION
Most commercial software is designed with a Copy Protection rating of 10. This protection is usually Linked to the OMC that most software is distributed on. Skillsofts are usually designed with the One Copy protection, but after some high-profile abuse was noted new skillsofts after 2062 will start to use the Linked protection method.

Patch Programs
Patch programs have an availability rating modifier of +2 and a Street Index modifier of +1.

SOURCE CODE
All prices given represent object code-only software. Triple the listed price if the source code is also required (the source code comes on a separate, non-copy protected OMC). Source code is NEVER publicly available for IC, agents, knowbots, skillsofts, expert systems or illegal software. The deckers who program such nasties as Black Hammer are not willing to potentially incriminate themselves unintentionally by their programming styles any more then an illegal weapon manufacturer would stamp their address on their guns.

OPEN-SOURCE PROGRAMMING
Many legal applications are available in "open-source" form. By this it means the source code for the program is publicly available for free.

The gamemaster is free to decide which applications are available in open-source form. As a general rule any legal application can be found in up to Rating 3 as open-source. Most programmers who make better versions (higher-Rating) want to be paid for their work and generally do not make it publicly available.

Operating-Systems
Of special note is that operating systems are ALL considered open-source in these rules. The Multiplier and programming task assumes the character is specifically tweaking the software to match his specifications, his hardware, and various other modifications (such as decker tweaks and exploits). To actually program an OS from scratch is more difficult by far. A character wishing to perform such a monumental task should have the base Multiplier for the OS type in question tripled or even quadrupled. Most OS development efforts are conducted by large teams of individuals, a single individual making an modern OS is almost laughable.

SOFTWARE PRICES
This chart replaces the one that appears on p.304, **SR3**. The prices below assume software that is normally legally available on the open market. Illegal software such as Black Hammer, Black IC and other software with a Legality Code will cost much more - the gamemaster is encouraged to multiply the final prices for such software by x10 or more.

Note that you use the programs base complexity (Rating x Multiplier) for calculating the price on the chart below, programming options do not apply to this.

COMMERICAL SOFTWARE PRICES TABLE

Program Rating	Price	Availability	Street Index
1-3	Complexity x 20¥	2/7 days	1
4-6	Complexity x 50¥	4/7 days	1.5
7-9	Complexity x 100¥	8/14 days	2
10	Complexity x 500¥	16/30 days	3

NASTY PRESENTS
If purchasing software on the grey or black market the program may include more then they bargained for. If the source code is not purchased, the software has a 1 in 6 chance of having a dataworm (gamemasters choice). This dataworm resides on the actual OMC and is loaded every time the program is copied. Once loaded, the dataworm can be eliminated by the Disinfect utility.

For stealthed dataworms the gamemaster should make a secret Disinfect (Dataworm Rating) Test. If the Disinfect program does not score any successes then the dataworm operates in secret and cannot be detected unless the user makes a Computer (Dataworm Rating) Test with a base time equal to the worms rating.

Commercial Software Size
All commercial software is made with the tinker-toy option unless otherwise noted, thus its final size is equal to its Rating squared times the program Multiplier.

Bundled Software
If purchasing software that will be bundled with the system divide the final adjusted price of the software by 125, rounded down, to get the bundles cost in Design Points. This bonus ONLY applies for software included with a designed system.

STATE OF THE ART

"Hardware: the parts of a computer that can be kicked."
-Jeff Pesis

Computers in 2060 are incredibly complex beasts. No person could hope to build a modern computer from scratch without extensive support personnel and facilities. This system is primarily designed to simulate mass-market computers or those custom built for their buyers. Technology is much more modular in the Sixth World, and any decent computer jock can "Frankenstein" a respectable machine in no time.

THE DESIGN PROCESS

The design process for all computer systems starts with the selection of technology base the system will be based on and it's rating. This determines the foundation of the system and is important when later determining the limitations and ultimate price of the system. It also provides the basis for the systems Design Points. The total number of Design Points in the system, including enhancements, options, and accessories add to this number. At the end of the design process, the gamemaster multiplies the total number of Design Points by the Mark-Up Factor to determine the systems final price.

The design process can be broken into the following simple steps:

1) **Select Core Technology**
2) **Add Design Options**
3) **Add Accessories**
4) **Determine Power Requirement**
5) **Determine Final System Size**
6) **Determine System Cost**

STEP 1: SELECT CORE TECHNOLOGY

The core technology of the system determines what type of processor and logic the system is built with (silicon, hybrid, optical, and biotek). The rating of this core is used to determine how much System Load the machine can handle (see **Software**, p. xx).

Besides determining the systems maximum rating, the core technology also assigns a base Power Requirement, Size and Markup. The core technology chosen may also mean certain options and accessories may not be utilized. These restrictions are noted in the specific options description.

The Core Rating is fixed and may not be modified by any options or accessories. The other base ratings may be modified from their original values. Doing so will increase the systems Design Point total, and affect its final price.

Core technologies fall into four categories, listed below.

SILICON

Silicon is the cheapest of the various technology bases. But while it is a very mature technology, it simply cannot match the capabilities of its successors. It is primarily used in low cost solutions where high power is not required. Thus, silicon systems are still very common in simple embedded computers, toys, and even low-end consumer electronics.

Despite its edge in simplicity and cost, optical systems continue to erode silicon's market share even at the low end. It will not be long before optical systems relegate silicon systems to the same dustbin as vacuum tubes.

He primary disadvantages to silicon-based systems are their comparatively high power requirements, size (silicon systems comparable to optical systems require extensive cooling and often consist of multiple processor clusters). But they are VERY cheap.

Technology Notes: Silicon systems in 2060 are quite different from their 20th century counterparts. In many cases the designs are silicon in name only, the actual construction being vapor-deposited crystal matrixes using nanites as etchants. The term "silicon" has stuck, however, even though the actual technologies used have become quite exotic.

In any case, the general principles are the same. Layers of nonconductive material are layered, with grooves being etched to allow conductive material to be laid down. Current silicon technology tends to be massively scaled, with silicon cores being three-dimensional matrixes in order to maximize transistor density.

Unfortunately, while the technology has made great strides, it still tends to have problems with heat dissipation, quantum effects that effectively limit their maximum capabilities, and a plateau of technological development with the shift to optronic systems.

HYBRID

Hybrid systems originated from early optronic technology being integrated with silicon systems. In most cases they utilize silicon logic but optical switching and data paths in order to boost efficiency and system bandwidth. They are not as capable as full optical systems, but are cheaper. They also do not possess all of the limitations of silicon systems.

Hybrid systems are rapidly losing favor in the modern world. Although superior to silicon systems, they are more expensive and in many cases full optical systems are better suited for modern applications. Their biggest niche is in consumer cyberterminals and "smart toys" marketed for the upper middle-class.

Technology Notes: Hybrid systems are usually composed of silicon processors tied to an optical data bus. Freed from the limitations of standard bus speeds, hybrid systems represented a major step forward in computer design at the time of their introduction, especially with high-end mainframes that used the optical interconnects to build massively powerful clustered systems.

OPTICAL

The vast majority of high-end computing products have moved to full electro-optical systems (or "optronic") in the last decade. In particular there has not been a supercomputer built in the last 20 years that relied on standard transistor-based processors. As the technology continues to mature, the price drops and it becomes available at lower and lower pricepoints. Although it has yet to completely destroy silicons hold on the cheapest of consumer electronics, it is generally considered only a matter of time before breakthroughs make the technology economical even at that level.

Optical systems are renowned for their low power requirements (very important on the high end) and their incredible scalability. Even low-end cyberdecks often possess multiple optronic processors working in parallel.

Technical Notes: As the name implies, optical systems are based on the manipulation of light. As simple as it may sound this can take several forms.

Optical storage systems are based around doping crystal lattices with photoreactive proteins derived from *bacteriorhodopsin*. The structure of these proteins can be altered by special laser wavelengths, and retain their structure until shifted again. Another laser can then read the structure of the protein. Simple proteins used in optical systems usually only have two states, but recent advances in molecular biochemistry have produced proteins with varying levels of wavelength discrimination. Meaning one protein 'cell' can have multiple states, depending on the wavelength of the lasers used to read and write their state.

Optical processors, on the other hand, utilize similar proteins that have varying conductive qualities depending on their current structure. Other proteins function as logic gates, passing or not passing light pulses of certain wavelengths. Thus, manipulating the protein chains into different configurations can modify the logic pathways of the chips. These structures are usually arranged in a hypercube format that provides maximum density of possible connections. Large facilities are usually required to modify optical processors because of special techniques used in their formatting, but simpler optical processors can be reformatted with commonly available optical encoders.

Research into future optical systems is primarily concentrated into researching new photoreactive proteins, in particular those that exhibit stable phase-changes from varying light wavelengths. Other avenues of research are in faster laser formatters (read and write speeds are limited by the laser aperture movement) and more efficient templates for optical processors.

BIOTEK

Biotek systems represent the cutting edge of computing technology. These systems are modeled on organic neural nets in construction and operation. The circuits are literally grown in predetermined patterns and then "imprinted" with their logic. The exact science behind this new technology has not been revealed, and so far only Renraku and Maas-Neotek are known to possess the technology.

Technical Notes: Biotek systems utilize technologies developed both for human augmentation and systems integration. Gengineered neural fibers are manipulated to create high dense processing structures with incredible self-organizing abilities and connection densities. All biochips are grown from a central "mother" mass, and then sections removed and force grown into specified patterns. The individual neural masses in the chip do not contain enough genetic information to fully clone a mother, an intentional bit of "copy protection". Each generation of mother seed has grown increasingly complex and capable, with no end in sight for future ability.

Biotek processors require a minimal level of life support, and can be damaged by intense radiation or electromagnetic fields. For this reason, biochips tend to be quite large in order to incorporate the proper nutrient feed systems and shielding. Small connectors on the chip provide feed channels for the necessary nutrients that bathe the neural structures.

CORE TECHNOLOGIES TABLE

Core	Max Rating	Base PR	Base Size	Body	Design Points
Silicon	8	5	5	2/1	2
Hybrid	15	2	3	1/1	10
Optical	25	1	1	1/2	15
Biotek	Generation x 15	.5	5	2/2	GM discretion

Core: This is the technology bases for the core of the system (processor, logic circuitry, etc).
Max Rating: This is the maximum Rating that the core can attain with current technology.
Base PR: This is the cores base Power Requirement factor. Multiply the Rating by this number to get a base PR total.
Base Size: This is the base size of a unit. Multiply the Rating of the core by this amount to get the systems base Size. Some components sizes are also multiplied by this number, representing not only the component itself, but also support logic and associated interface circuitry.
Body: This is the systems base Body for purposes of resisting damage. The first number is the systems Body for resisting physical shock, such as being dropped or hit with a hammer. The second number is the systems base Body for resisting electrical attacks such as shocks and EMP.
Design Points: The base number of Design Points for this technology. Multiply this number by the systems Rating to get a current Design Point total.

STEP 2. ADD DESIGN OPTIONS
Design options are improvements and options that are added to the core system to provide additional capabilities and options. A core is not capable of much by itself, having only rudimentary diagnostic capabilities. Most design options can come in various forms, these include:

UBUS
UBUS is the future equivalent of the high speed data busses that started to come into use in the early 21st century. Although only recently have the expansion slot I/O speeds reached the necessary speeds to directly interface with modern Cores, the development of the UBUS standard has led to both a rapid price drop in modern computer systems and an explosion in accessories designed for the new standard.

Most UBUS cards are approximately as large as an ancient 3 1/2 inch diskette. They typically are installed internally and are locked in place with small clamps. The link provides power to the card as well as a direct I/O connection to the Core and other components. There are usually panels on the back of the system that allow any connectors on the card itself to be accessed.

CARDBUS
Cardbus is the "portable" standard developed alongside UBUS. The base technologies are very similar, but Cardbus's focus is on portable computing devices where size and adaptability are very important. For this reason Carbus components are much smaller then their UBUS counterparts, as well as have the capability of "hot-swapping" (plugging and unplugging cards without restarting the system or loading new drivers).

Cardbus cards are generally the same size as an old-style credit cards, typically the connector end will come with a rubber "cap" to protect the interface logic. If there are any connectors for external devices on the card typically the card will come with the necessary cabling to provide standard jacks of the appropriate type - cardbus cards themselves are too small to mount jacks.

Some cardbus units - notably cellular links and the like - are known as "fat" cards since they typically have an thick end that extends out of the cardbus drive. Typically this section holds bits that would not fit inside or would not function properly (antennas for example).

STEP 3. ADD ACCESSORIES
These are additional pieces of gear that are added to the system after its components are selected. None are absolutely required, but many are quite useful. Common accessories include cases, stylistic enhancements, display readouts, and hitcherjack ports.

STEP 4. DETERMINE POWER REQUIREMENT
After determining the systems options and accessories the systems power requirements must be determined.

To determine the amount of Power Factor units that the system will consume in an hour, divide the Power Requirement by 10 and round down.

STEP 5. DETERMINE FINAL SYSTEM SIZE

Weight
The systems weight in kilograms is equal to the final Size of the system divided by 10. Do not round up or down.

For example, a Size 47 system would weigh 4.7 kilograms.

CF
To determine the systems size in CF (if any) divide the systems final Size by 50, rounded down. If less then 1 then the system is of negligible size in that scale.

ECU
To determine the systems size in ECU divide the systems final Size by 5.

For example, the above Size 47 unit would become (47/5) 10 ECU.

Concealability
To determine the systems concealability, take the final ECU size and subtract it from 10.

Size Comparisons

ECU TABLE	
ECU	**Description**
1-3	Microcomputer
4-8	Minicomputer
9-14	Macrocomputer
15-21	Mainframe
22+	Macroframe

Microcomputers:
These systems range in size from of a pack of cigarettes to a paperback book.

Minicomputers:
These systems are about equal in size to a Sony Discman.

Macrocomputer:
These systems are about the size of a modern console system or bulky keyboard.

Mainframe
These are as large as modern desktop systems.

Macroframes
These systems are as large as small refrigerators.

STEP 6. DETERMINE SYSTEM COST
For final system cost the systems DP total is multiplied by the Mark-Up Factor, and then multiplied again by 100 to get the final cost in nuyen.

SYSTEM MARK-UP FACTORS TABLE	
Production Type	**Mark-Up Factor**
Unique, Prototype	5
Limited Run (<50 units)	3
Short Run (<500 units)	2
Long Run (<1000 units)	1
Mass Production (>1000 units)	.8

DESIGN OPTIONS
Each entry is broken into design and customization specifications.

SPACE EFFICIENCY
Most options, unless specifically noted otherwise, can be made smaller…for a price. An option may never be reduced below 1 space in size. Space Efficiency is always calculated before other options. Space efficiency may not be combined with space inefficiency.

During Design
To determine the cost for the space efficiency use the following formula (Original Spaces-Desired Spaces)+1 = DP multiplier. This multiplier is applied to the base DP cost and results in a new base DP price.

For example, a Matrix Link is normally Size 5. If the option was reduced to Size 2 through space efficiency, then the multiplier would be (5-2)+1=4. The new base DP cost for the Matrix Link would be 5 x 4=20.

Customization
For items with space efficiency bought off-the-rack apply the DP multiplier to the items base cost in nuyen. This base price is then modified for Street Index and Form Factors (if any).

For example, a Size 2 Matrix Link (Space Efficiency: 3) bought on the open market would cost 2400¥ (600 x 4).

SPACE INEFFICIENCY
Many options can also be purchased at a discount if liberties are taken with the technologies used. Space inefficient items use older tech, cheap components, alternative systems, or combinations of all three to reduce costs at the expense of the items size. An option may never have its size increased by more then 100%. Space inefficiency may not be combined with space efficiency.

During Design
Each additional size point added to the component reduces its final DP cost by 10%, rounded down.

For example, a Matrix Link with 2 points of space inefficiency would be Size 7. It's final DP cost would be reduced 20% to (5 x.8) 4.

Customization
Each additional size point added reduces the final nuyen cost for the item by 10%, rounded up.

For example, a space inefficient-3 Matrix Link bought on the open market would be (600 x .8) 480¥.

FORM FACTORS
Most design options can be modeled in various ways. Some must be built into the system during its creation, while others can be added as expansion cards at a later date. The specific options description will provide the necessary information.

EMBEDDED
Some options are noted that they can be embedded. Embedded options are built into the system when it is constructed. They cannot usually be removed or upgraded at a later data, although they can be turned off and superceded by options placed in UBUS or Cardbus slots (if they are present).

During Design
There are no modifiers for embedded options. It's assumed to be the default, even if you can't embed the option in question it's the "baseline".

Customization
Some customization options require actual installation in the core of the system. These items may not be placed in any other form factor.

UBUS CARDS
UBUS is a fairly recent standard that provides a very high speed data connection to the core and other system components. The UBUS technologies biggest advantage lies is comparatively low cost of

implementation and ease of upgradability. Most larger systems have at least one UBUS slot for future expansion possibilities.

A UBUS card can hold 7 spaces worth of options at most.

During Design
Options mounted on UBUS cards in during system design take up an additional space, but multiply the options final DP cost by .8.

Customization
Options mounted on a UBUS card consume an extra space and multiply the base price by .9. This multiplier is taken before calculating Street Index. If there are multiple options on a single card, total their base prices before multiplying by .9. Each option on a card consumes an additional space over its original size. Use the highest Street Index of all options mounted on the card.

Example, a Rating 3 Cellular Link and Dataport are both mounted on a single UBUS card. Each option consumes an extra space so the cards final size is 7 Spaces (4+3). Their prices are then totaled and multiplied by .9, resulting in a final price of 1530¥ (1700x.9). It would have a Street Index of 2.

CARDBUS CARDS
Cardbus cards are essentially miniaturized UBUS cards, providing the same capability in a smaller package (and at much higher cost). Cardbus has become very popular with the recent introduction of portable cellular cyberterminals and Cardbus slots on new-model pocket secretaries.

Cardbus cards can hold a maximum of 4 option spaces.

During Design
Options built as Cardbus cards have a final DP cost multiplier of 1.5.

Customization
Options purchased as Cardbus cards retail have a cost multiplier of x2. This multiplier is applied before calculating Street Index.

THE OPTIONS

DESIGN SPECIFICATIONS
Design specifications apply when designing a computer. The ratings and prices of each device to not apply for individually created items. For example, if a player wanted to figure the cost of an expansion card for his existing computer he would use the Customization costs.

Design Cost: This is the option's cost in Design Points. Some items are expressed in flat costs while others are determined by their Rating.
Maximum Rating: This lists the items maximum Rating.
Power Requirement: This is the items Power Requirement (PR).
Size: This is the option's size in Spaces. Base Size refers to the Core Technologies Base Size (p. xx).
Design Options: Design options (if any) that the component can use.
Forms: This lists the various forms in which the option may be installed at design. It also restricts the forms that aftermarket modifications may take. The forms are Embedded, UBUS and Cardbus.

CUSTOMIZATION SPECIFICATIONS
These statistics refer to the options price and statistics if bought as an accessory, or if not designed as part of a system package. In many cases this refers to buying the item off-the-rack at the local computer store, while some options require the user do some hardware hacking of his own. The restrictions and Sizes are usually determined using the Design Specifications.

Type: The customization can either require total replacement of a previously existing modification of the same type or the existing option can be upgraded.
Restrictions: Any restrictions on the possible forms of the option or its purchase.
Parts Cost: This is the options retail price in nuyen.
Parts Availability: The Availability Rating of the option, or the parts required to construct the option.
Street Index: The item or parts Street Index.
Maximum Rating: The maximum Rating of the option if purchased retail.
Base Time: The base time, in hours, required to install the modification into a system.
Skill: The relevant skill used to install or upgrade the component. In most cases this is Computer B/R.
Target Number: The target number for the Installation Test.
Equipment Needed: This specifies the equipment and tools needed to complete the installation. Some items list other items as prerequisites. In this case the required item must be present to install the option.
Size: The items size in Spaces.

OPTIONAL RULE: SYSTEM BOARD REPLACEMENT
Some design options cannot be added to a system later on. At the gamemaster's discretion he may allow players to buy a new system board with the desired options and salvage as many components from the old system as possible.

Restrictions
In general, any embedded components on the old system may NOT be recovered for use on the new board. Only active memory and storage memory may be freely recovered from the old system along with the Core itself. The old system board is reduced to a Core Rating of 0, but a new core of equal or lesser rating then the original may be purchased for it (at no price discount).

Cost
Typically, many of the core components can be reused. But the user can expect to pay an additional 20% of the original Core cost for non-replacable parts that even selling the old equipment off won't cover. The new system board is a completely new unit, so there is no "discount" for items that were on the old board..

ACTIVE MEMORY
Active memory is high-speed storage space that is analogous to “RAM” from old-tech computers. This high-quality storage generally runs as fast as the systems processor can access the information, which is necessary to operate most programs without any hitches or lag. Most systems can get by with minimal levels of expensive active memory, instead relying on much-cheaper storage memory or offline methods such as MiniCDs or chipreaders.

Technical Information
Active memory comes in "sticks" approxomantely 15cm in length, with a protective cover on the optical interface plug on the bottom edge of the unit. These sticks are of uniform size, no matter how much data they can actually hold. Most sticks come in Mp size multiples of 25, although it is not uncommon to see "odd-numbered" sticks that are simply higher-rated sticks rated down in size due to manufacturing defects (although they work perfectly fine in a reduced rating).

Active memory is volatile, i.e. it will not hold data once the power is turned off. This is NOT a technical oversight but an intentional design feature to help prevent various forms of dataworm infection and security violations. This feature cannot be disabled easily. Some units that require fast boot-times do use specially modified active memory modules (do not need to load any software already stored there). These special modules are typically triple the normal price and hard to find without going to specialist retailers.

Aftermarket
Aftermarket active memory units are easily available at any reasonably modern computer dealer. However, sticks rated 200Mp or higher are typically only available through special order. Although noted as "embedded" that is something of a misnomer since they are not physically built into the core and can be removed.

Game Effects
When designed the maximum physical size of the active memory space must be determined. This will result in a limit to how much active memory the system can be upgraded to. This allocated space is added to the systems total at design and may not be change. It essentially represents how many memory “slots” are available on the cores system board and how much memory the system is designed to support. This number is set at design time and may not be changed - the amount of Active Memory actually installed can vary, but not the absolute size limit.

For example, NightRain decides his system will have 4 spaces allocated to active memory but he will only buy 200Mp of active memory (he's on a budget). If using an optical core, then the 200Mp will consume 2 spaces, leaving 2 more spaces open. Thus the system could be upgraded to a maximum of 600Mp, or less if the memory is not bought in the most "space efficient" form possible.

Design Specifications
Design Cost: Memory Size / 25
Maximum Rating: None
Power Requirement: Memory Size /200
Size: Memory Size /150 x Base Size
Design Options: None
Forms: Embedded

Customization Specifications
Type: Upgrade
Restrictions: Embedded Only
Parts Cost: Memory Size x 7.5¥
Parts Availability: Always
Street Index: .9
Maximum Rating: None
Base Time: 4 hours
Skill: Computer B/R
Target Number: 4
Equipment Needed: Microtronics Kit
Size: New Total/150 x Base Size

STORAGE MEMORY
Storage memory is fast storage space that is directly connected to the systems bus. It is not as fast or responsive as active memory, but its far cheaper since much more mature technologies can be used in its construction. Storage memory can be compared to a 20th century computers hard drive, but with far higher access speeds then anything imagined back then.

Technical Information
Storage memory modules are typically small cubes or slabs, depending on their size. They are actually built using stacked crystal matrixes with holographic data storage and compression. Oddly enough, most of the "bulk" of a storage drive is composed of the optical read and write units inside. Because the first holo-storage units were white in color and squarish they quickly acquired the nickname "sugar cubes".

Like active memory, storage memory modules can be removed and replaced quite easily. In fact, the entire drive can be swapped out as long as there is enough space inside the systems case. The connectors can be "daisy chained" to connect multiple drives - in most cases these are configured as one single logical drive, although applications such as drive-mirroring are also in use.

Drive mirroring means that another storage memory block either periodically or simultaneously makes identical copies of the files on the core drive. In many cases these mirroring drives are set for write-only and record EVERY transaction conducted - even ones later erased on the core drive. In this way it is very hard for deckers or system crashes to destroy important log files and data.

Aftermarket
Commercialy available storage memory units are typically available only in 100Mp increments. It is not cost effective to have "odd" sized drives. The actual size and format of the drives can radically differ from item to item. With the advent of UBUS and Cardbus it is not uncommon to find them in even more off configurations either alone or with other items. One popular application are storage memory cardbus cards - popularly referred to as "hardcards".

Game Effects
Storage memory is bought in “blocks”. When upgrading, the option is to either replace the old unit or add an additional block, leaving the old memory in place. For most purposes the blocks count as one contiguous unit of storage memory, though for future upgrade purposes each block should be noted separately.

For example, Bobs system starts with 500Mp of storage memory. When he later upgrades he adds another 200Mp of storage memory. He now has a total of 700Mp of storage memory but two separate actual “drives” in the system. One consuming 5 spaces and the other 2 spaces.

Design Specifications
Design Cost: Memory Size / 100
Maximum Rating: None
Power Requirement: Memory Size/ 500
Size: Memory Size /100
Design Options: Size Efficiency, Size Inefficiency
Forms: Embedded, UBUS, Cardbus

Customization Specifications
Type: Replacement or Upgrade
Restrictions: None
Parts Cost: Memory Size x .5¥
Parts Availability: Always
Street Index: .8
Maximum Rating: None
Base Time: 1 hour
Skill: Computer B/R
Target Number: 3
Equipment Needed: Microtronics Set
Size: Memory Size /100, round up

CELLULAR LINK
A cellular link provides the necessary equipment for the unit to access a local CDS. The link covers only the required hardware; the antenna is a separate component covered under the relevant section (p. xx **Cellular Links**).

The link includes a connector for attaching an external booster or antenna to the system.

Technical Information
All CDS-compatible cellular links conform to international standards and can be used anywhere in the world as long as links exist. The transceiver uses adaptive frequency hopping and data correction algorithms in order to function even in semi-hostile situations (such as nearby use of unapproved bandwidth-stealing MSS networks).

If there is a microphone and speakers the cellular link can also function as a conventional cellphone (as long as the subscriber has the appropriate services purchased).

Aftermarket
Cellular Data Services are beginning to make major inroads into the high-end market. Although common for over four decades in low-bandwidth data services only recently has the technology and frequency spectrum opened up enough for high-speed Matrix access and even broadcast/reception of live simsense and trideo signals.

CDS compatible hardware can be found in most electronics-related stores and are very popular attachments for the new generation handpads and PDS units as Cardbus attachments.

Game Effects
The Cellular Link has an effective Flux rating equal to its Device Rating (to a maximum of 3). For double the base price the Links Flux has no limit. The link has an effective ECCM rating of 1.

Design Specifications
Design Cost: Device Rating x 2
Maximum Rating: 10
Power Requirement: Device Rating
Size: Device Rating / 2
Design Options: Size Efficiency, Size Inefficiency
Forms: Embedded, UBUS, Cardbus

Customization Specifications
Type: Replacement
Restrictions: None
Parts Cost: Rating x 500¥
Parts Availability: 4/72 hours
Street Index: 2
Maximum Rating: 10
Base Time: 48 hours
Skill: Computer B/R
Target Number: Rating
Equipment Needed: Microtronics Set
Size: Device Rating

SATELLITE LINK
As for a cellular link, this piece of equipment constitutes the hardware required to translate and decode signals from satellite networks. The hardware also includes an antenna that is usually good enough to contact LEO subscription services. A connector for linking up external antenna arrays is also provided.

Technical Information
Since comsats use microwaves to send information to the planets surface line of sight is very important for proper functioning of a satlink. In particular, a satlink will not work indoors or in some areas of a city with blocked line of sight to the sky.

In some situations users of satlinks will also use broadcast gear to connect a remote site to a satlink antenna. This typically requires a free dataport for the communications gear to be hooked up and some minor tweaking of the satlink interface software (negligible game effects). Some extreme cases have even seen satlinks connected to shadowboxes for extremely paranoid levels of security.

Using a satlink is exceedingly simple, amounting to activating the hardware, waiting for a link and connecting.

Aftermarket
Most satlinks can be purchased at any of the various service providers outlets. Although many differ in minor ways this has little effect in the end, usually amounting to stylistic differences. If the buyer also purchases a subscription the service provider will usually discount the cost of the satlink by about 10% (this

assumes a minimum 6 month contract and valid SIN). An updated access card will also be provided to the user as well as instructions and even instructional aids for the truly clueless.

Game Effects
The antenna must be deployed before use, and reduces the units Concealability by its Rating. The system has an embedded access card that can be tied to legitimate service just like a cellphone ID. Most satellite links also are connected to either internal or external cardbus drives so they can accept specialized access cards if required (and they are quickly becoming standard). Even SBS broadcasts require cardbus format access cards on home receivers. These cards must be upgraded weekly either over the Matrix or though authorized service centers.

Design Specifications
Design Cost: Device Rating x 5
Maximum Rating: 4
Power Requirement: 2 x Device Rating
Size: Device Rating
Design Options: None
Forms: Embedded, UBUS, Cardbus

Customization Specifications
Type: Replacement
Restrictions: None
Parts Cost: Device Rating x 1,000¥
Parts Availability: 4/12 days
Street Index: 2
Maximum Rating: 4
Base Time: 48 hours
Skill: Computer B/R
Target Number: Rating + 1
Equipment Needed: Microtronics Shop
Size: Device Rating + 1

MATRIX LINK
The Matrix Link provides the necessary connector and interface logic so that a system can connect to the Matrix on its own and load persona programs.

Technical Information
Although called by some a "Matrix co-processor" that is not the case. It consists of fairly simple interface logic and various firmware drivers that allow the system to recognize and interact with the various Matrix-standard protocols in a realtime manner. Many Matrix Links are bundled with a dedicated dataport but that is not standard throughout, instead most are installed internally and the actual connection is from another port on the machine.

Note that there is a software-only version of the Matrix Link but is somewhat limited compared to the hardware version. Thus it is commonly used only in Matrix-aware appliances and certain budget machines. For addition information see **SoftModem** (p. xx).

Aftermarket
The market is literally swamped with different variations of Matrix Links. They are as common as modems were in 2005.

Game Effects
You still need a dataport to connect to jackpoints.

Design Specifications
Design Cost: 5
Power Requirement: 5
Size: 5
Design Options: Size Efficiency, Size Inefficiency
Forms: Embedded, UBUS, Cardbus

Customization Specifications
Type: Upgrade
Restrictions: None
Parts Cost: 600¥
Parts Availability: 3/24 hours
Street Index: .75
Base Time: 6 hours
Skill: Computer B/R
Target Number: 2
Equipment Needed: Microtronics Set
Size: 4

DATAPORT
A dataport is a universal information I/O port that can be interfaced with pretty much anything. It uses the same connectors as a datajack in fact. Dataports are used to connect to external peripherals and devices that can extend the units capabilities.

Technical Information
A dataport is the universal I/O interface of the Sixth World. The universal hardware standards of the dataport are utilized by datajacks and telecommunications jacks, in addition to various computing peripherals such as vehicle interface jacks and many external computing devices. The dataport standard itself is a development derived from earlier universal standards such as USB, the current standard was adopted in 2042.

Aftermarket
Although the actual interface is standardized, the interface hardware still requires money and time to properly install. Most dataport aftermarket mods are actually bundled with other items to reduce costs.

Game Effects
Dataports have an effective I/O rate of the systems Core Rating x 100Mp.

Design Specifications
Design Cost: 2
Power Requirement: 1
Size: 1
Design Options: None
Forms: Embedded, UBUS, Cardbus

Customization Specifications
Type: Upgrade
Restrictions: None
Parts Cost: 200¥
Parts Availability: Always
Street Index: .8
Base Time: 24 hours

Skill: Computer B/R
Target Number: 3
Equipment Needed: Microtronics Kit
Size: 2

UBUS SLOT
The UBUS slot is the actual connector that you can plug UBUS cards into. It provides a direct, high-speed connection to other system peripherals and the core. The development of UBUS has reshaped the computing market, allowing much more modular systems and diversification.

Technical Information
A UBUS slot is actually quite small, at least by late 20th century standards from such interface slots. It typically measures about 15x3x4cm with a slot for fixing the card to the system board and power connectors and optical connectors. Some options have "feeder cables" that plug into the slot but then feed the power and data to the device in another location in the system.

Aftermarket
New UBUS slots cannot be attached to a system without purchasing a completely new system board.

Game Effects
The slots power requirements only come into effect when a device is plugged into it. The slots size is actually quite small, but when purchased the designer must also note the size of the card that can be inserted into the slot. This is factored into the final design, and thus it's actual size. A card may not be inserted into a slot if the space allocated is too small. Only one card can fit into a slot.

For example, a UBUS slot that could hold a Matrix Link UBUS card (Size 6) would be noted as UBUS Slot (6) and take up seven spaces (1 + 6 = 7).

Design Specifications
Design Cost: 2
Power Requirement: 0
Size: 1 + Allocated Space
Design Options: None
Forms: Embedded

Customization Specifications
Type: Upgrade
Restrictions: Special
Parts Cost: 300¥
Parts Availability: Always
Street Index: 1
Base Time: None
Skill: None
Target Number: None
Equipment Needed: None
Size: 1 + Allocated Space

CARDBUS DRIVE
Cardbus was developed as a smaller, portable alternative to UBUS. It is a direct descendent of PCMCIA and follows many of the original conventions. Cardbus peripherals tend to be smaller and require less power then their UBUS cousins, but pay the price for this efficiency.

Technical Information
Most cardbus cards are no larger then an old style credit card, although "fat" cards that extend past the drive itself are common for certain large options that cannot be sufficiently miniaturized. The drive itself has connectors much like a UBUS slot that the card connects to (the cards slide in on grooves to prevent

misalignment). The "bay" that the cards slide into is typically sealed, and cards can be inserted or removed even underwater if the rest of the system is sealed. However, the bays are susceptible to dirt, and usually come with cleaning kits to ensure proper functionality. A bay will not function if it is dirty.

Aftermarket
Cardbus drives are the new rage in portable systems, with the cardbus standard meaning anything from storage memory hardcards to satellite link hardware can be found in the format. Even some cheap consumer systems are introducing cardbus drives that connect to UBUS slots to interface with the rest of the system. And of course there is a burgeoning market for various firmware software that can run on most (comparitively underpowered) portable systems.

Game Effects
Cardbus drives can hold any number of cards as long as the combined spaces of the cards do not exceed the rating of the drive. The drives power requirements are negligible but the cards themselves do draw power.

Design Specifications
Design Cost: Rating x 2
Maximum Rating: 10
Power Requirement: 0
Size: Rating + 1
Design Options: None
Forms: Embedded, UBUS

Customization Specifications
Type: Replacement
Restrictions: Embedded or UBUS Only
Parts Cost: Rating x 300¥
Parts Availability: 3/72 hours
Street Index: 1.5
Maximum Rating: 10
Base Time: 4 hours
Skill: Computer B/R
Target Number: 3
Equipment Needed: Microtronics Set
Size: Rating + 1

DNI ADAPTATION
The direct neural interface option allows the computer to be send and receive information via a datajack, or even via ‘trodes in some cases. In order to control a system completely through DNI the user must possess a Cyberdeck DNI.

Technical Information
First introduced with the Fuchi Prometheus 4000 cyberterminal, modern DNI systems are an technical evolution from the systems developed for the Echo Mirage project. While the original direct neural interface systems required extensive brain surgery and grafting in order to function with the first primitive datajacks, modern systems simlpy require the standard neural net implanted along will all basic headware interfaces.

Most DNI systems also have a "cyberdeck" DNI that is essentially a specialized processor dsigned to recognize and react to specific mental commands and processes, greatly speeding up the man-machine interface. External neural networks are also available but lack the fine control of the implanted net and cannot be installed with a cyberdeck control processor because of the low signal quality. These systems monitor the electrochemical reactions in the brain via incredibly precise sensors (SQUIDS). They typically look like headbands, strange headsets, or in the case of older systems, as full helmets coated with a fine network of wires. They are often refered to as 'trodes, even the systems that do not actually use electrode attachments.

Aftermarket
DNI adaptation kits are usually available from the manufacturer of the system, and most have attachments built-in for later upgrades. Usually it it a simple matter of plugging in the necessary hardware and running the training programs included (this typically takes about a week, during which time the system cannot be run through pure DNI).

Game Effects
If a system does not have DNI adaptation then the user's Reaction is reduced by half, rounded down when accessing the Matrix. In order to get the benefits of an ASIST interface the system must possess this modification.

Design Specifications
Design Cost: 25
Power Requirement: 0
Size: 1
Design Options: None
Forms: Embedded

Customization Specifications
Type: Upgrade
Restrictions: Embedded Only
Parts Cost: 5,000¥
Parts Availability: 3/72 hours
Street Index: 2
Base Time: 50 hours
Skill: Computer B/R
Target Number: 4
Equipment Needed: Microtronics Shop
Size: 2

BASIC INTERFACE
This is a very basic level of interaction with the computer. At this level only fairly simple interaction with the system is possible, usually conducted through text-based command prompts or simple icon-based menus. This includes systems such as personal organizers, pocket secretaries and many "smart" devices. In some cases, this level of interface is only available through diagnostic outputs.

Systems with basic interfaces are able to access the Matrix, though it tends to be a bit less intuitive then the more advanced interfaces. Often the user must memorize arcane command sets and perform icon manipulations in order to operate the system. The average computer user of 2060 would have little trouble figuring out what to do with the better basic interfaces but could be totally lost with the more arcane text-only systems.

Technical Information
Most basic interfaces are in actuality quite complex, the term is used to reference the level of control the user has over the system. While basic interfaces are usually quite simple to use (often being entirely voice controlled) they do not allow a deep level of control over the system in question. Basic interfaces are very varied in form and use, from text-based command prompts to icon-based virtual reality environments. Many systems use a basic interface for diagnostic purposes. It is considered to be a part of any modern computer controlled device (at least in its most basic incarnations). Even a soykaf machine will have a basic interface that will allow limited interaction (such as updating its flashable firmware).

Aftermarket
Since this is a part of every system, the aftermarket is usually limited to software and hardware that "dresses up" the interface for various effects (usually adding simple labor saving shortcuts and the like). These have little to no game effect.

All basic interfaces are assumed to include some sort of basic graphics rendering engine and a microphone for voice control, but no sound system at all. Note that even this "basic"

Game Effects
Using a computer with a basic interface always counts as if it were in terminal mode (see p. xx, **Deck Modes**) but gain no advantage at all from Response Increase. Basic interfaces may not take advantage of DNI adaptation or custom interfaces, even if it is present in the system.

Design Specifications
Design Cost: 0
Power Requirement: 0
Size: Negligible
Design Options: None
Forms: Embedded

Customization Specifications
Type: Upgrade
Restrictions: None
Parts Cost: 100¥
Parts Availability: Always
Street Index: .8
Base Time: 4 hours
Skill: Computer B/R
Target Number: 2
Equipment Needed: Microtronics Kit
Size: Negligible

ADVANCED INTERFACE
An advanced interface allows manipulation of the system via keyboard, mice, touch-sensitive screens and up to simple virtual reality setups (gloves and goggles). This is the type of interface most commonly seen on low-end terminals not capable of direct neural control. This interface does not support ASIST feedback except through simsampling playback (which is not detailed enough to count as even a cool ASIST).

Technical Information
Advanced interfaces are the type most often seen in computing devices intended to be heavily used for Matrix access and other needs. Again, the actual interface of the system various enormously, from advanced systems with hyperreal virtual-reality setups to text-based interfaces. All that matters is that the interface allows for a great deal of control and speed when using the system. Some interfaces may have more eye-candy then others but they all get the job done with more or less the same level of efficiency.

Aftermarket
An advanced interface typically includes an advanced graphics rendering engine, an ESS-capable sound processor and output, and built-in microphones for voice command.

Game Effects
Systems with an advanced interface may only function as terminals (see **Deck Modes**, p.xx).

Design Specifications
Design Cost: 2
Power Requirement: 1
Size: Negligible
Design Options: None
Forms: Embedded, UBUS, Cardbus

Customization Specifications
Type: Upgrade
Restrictions: None
Parts Cost: 250¥
Parts Availability: Always
Street Index: .8
Base Time: 4 hour
Skill: Computer B/R
Target Number: 3
Equipment Needed: Microtronics Kit
Size: Negligible

ASIST INTERFACE
In addition to the features of an advanced interface ASIST interfaces include the necessary hardware to decode information from the users persona into actual physical impressions. The quality and mechanism by which this is accomplished varies from system to system but the effect is the same. In order to get the full benefits of an ASIST interface the system must have DNI adaptation and the user must be connected via datajack. If using an ASIST through 'trodes the signal feed is so diluted it runs as a advanced interface.

Technical Information
ASIST interfaces take data given to it by the users sensor program and not only can render it as a "virtual reality" like advanced interfaces, but can also convert the data into actual sensory impressions. This is usually done either based on UMS ICS data or by parameters set up either by the operating system, user, or by "theme" packs that define how the data is to be translated. The more advanced the ASIST interface and the better the parameters the more information that the ASIST interface can "fill in". For example, if the user wanted all SANs to appear as black granite rocks it might "feel" solid if "touched" in the VR, but a more advanced ASIST could also give it a more advanced series of textures and even make sure light refracted off of it properly.

Most advanced interfaces of this type are usually referred to as "custom interfaces", or more commonly in decker circles as "reality filters". These setups can even ignore UMS or sculpted system identifier packets and use their own based on the kind of data that is attached to it. For more information on this see **Archaic Systems**, p. xx.

Aftermarket
ASIST interfaces are typically an add-on "module" that interfaces with an existing advanced interface. It consists of the RAS cutout circuitry, the ASIST processor itself, and various modules that handle the simsense output, simsense buffering, and other tasks.

ASIST interfaces cannot be found at the local electronics store, they usually must be special ordered.

Game Effects
The system can operate up to "cool" mode (see **Deck Modes**, p. xx).

Some ASIST interfaces are quite rudimentary; this is covered in the Flaws section.

RAS OVERRIDE
ASIST circuitry includes a reticular-activation system (RAS) override. The RAS override suppresses signals from the users body, enabling full concentration on the artificial sensory input from the ASIST. The RAS override has the effect of disrupting the users physical coordination while jacked in.

Game Effects
The user suffers a +8 target number modifier for all Physical Tests he must make while jacked in. Concentrating on the physical world also has the effect of disrupting the users concentration; reduce his Initiative by –1D6 for as long as direct contact takes place.

Design Specifications
Design Cost: 10
Power Requirement: 2
Size: 1 x Base Size
Design Options: None
Forms: Embedded, UBUS

Customization Specifications
Type: Replacement (Advanced Interfaces only)
Restrictions: Embedded or UBUS Only
Parts Cost: 2,000¥
Parts Availability: 3/24 hours
Street Index: 1
Base Time: 8 days
Skill: Computer B/R
Target Number: 4
Equipment Needed: Microtronics Shop
Size: 4

HOT ASIST
This is a standard ASIST interface modified to operate without any safety limits. It operates in the same manner as a sense deck modified to play BTL chips, and enables that level of simsense signal to pass to the user. Despite the danger, it is a common decker modification and is required to fully run a "hot" deck.

Technical Information
Hot ASISTs not only have their signal output tweaked ro higher levels, but also usually have heavily modified analysis parameters that convert more data into sensory stimulation then is normal. Whereas a normal ASIST might flash red lights or sound a klaxon to represent a system alert, an hot ASIST might be set up so that the decker experiences a heat-like sensation in his upper spine. Same effect, but what would you respond to faster, an annoying klaxon or a burning fire in your spine?

Aftermarket
There are no hot ASIST modifications on the open market. The user must buy the required parts and install it himself (or have someone else do it for him).

Game Effects
Hot ASISTS can be toggled back to "cool" mode (see **Deck Modes**, p. xx).

Design Specifications
Design Cost: 20
Power Requirement: 3
Size: 1 x Size Multiplier
Design Options: None
Forms: Embedded, UBUS

Customization Specifications
Type: Upgrade
Restrictions: Modification to existing ASIST Interface
Parts Cost: 1,500¥
Parts Availability: 3/24 hours
Street Index: .8
Base Time: 72 hours
Skill: Computer B/R
Target Number: 6
Equipment Needed: Microtronics Kit, ASIST Interface
Size: Original ASIST + 1

PROCESSOR STEALTHING
Processor stealthing removes the cores identification numbers and broadcast logic, erasing the decks unique identification that is used for account verification and logging. Stealthed processors are one item that makes a deckers cyberterminal illegal.

If a system starts with a normal core, the only upgrade is to by another core that is stealthed. The old core circuitry is then removed and the modified versions inserted. The new stealthed Core must be the same type and rating as the original core.

Technical Information
All cores straight from the factory have an embedded "serial number" that is used in almost all areas of system verification and accounting. The processor ID is often used for passcodes, account verification, and the all-important data logging. Each ID is unique, cannot be modified and is usually accepted as evidence in most legal jurisdictions.

The ID cannot be removed through, but requests made to the system for the ID can be blocked, forged, or otherwise misdirected. This is also the principle behind several of the Masking subprograms, either preventing the ID from being transmitted at all, or making sure that when it is used it does not leave an incriminating trail.

However, there is a small market both for illegally manufactured processor cores without IDs (typically intended for corporate use) and those modified in the shadow community (an extraordinarily difficult task). These chips are greatly prized since software alone cannot totally mask a systems signature.

Aftermarket
Stealthed cores must be purchased from specialized sources in the underground. Typically this will require an Etiquette (Decker) Test with a Target Number equal to the desired Core Rating. The process of replacing an unstealthed core is fairly trivial.

Game Effects
Without processor stealthing the Masking program is only half as effective. Processor stealthing is Legality 2-S.

Design Specifications
Design Cost: Core Rating
Power Requirement: 0
Size: Negligible
Design Options: None
Forms: Embedded

Customization Specifications
Type: Replacement
Restrictions: Removal of old Core
Parts Cost: DP of Original Core x 500¥
Parts Availability: Core Rating/2 weeks
Street Index: 2
Base Time: 24 hours
Skill: Computer B/R
Target Number: 3
Equipment Needed: Microtronics Kit
Size: Original Core

RUGGEDIZED
Ruggedized systems are built to withstand abuse, harsh weather and physical damage. This affects every component built into the system or directly connected via UBUS or Cardbus, but not external devices.

Technical Information
Ruggedized systems not only have sealed cases, but usually incorporate other modifications like shock-mounted UBUS brackets, heavy duty heat sinks, redundant power supplies, and other modifications. External connections are often grounded and sealed to maintain deck integrity. In many cases connecting devices will require special connectors to properly hook up to the modified outlets (these are trivial in cost).

Aftermarket
Since much of the effort of ruggedizing a system requires planning even before the system is built, it is not usually available as an aftermarket modification. There are "ruggedized" cases and peripherals but they do not toughen the system as a whole. The gamemaster has final say on the effectiveness of any other "ruggedized" options.

Game Effects
This option gives the deck a Body bonus equal to the options Rating for purposes of resisting damage from shock, weather, or simple mishandling (dropping). A ruggedized system is also waterproof to a depth of Rating x 50 meters. A ruggedized system requires a case to get any benefits. Multiply the base case price by the level of ruggedization to get the cases final adjusted price.

Design Specifications
Design Cost: (Rating x Core Rating) /2
Maximum Rating: 4
Power Requirement: 0
Size: Rating / 2, round up
Design Options: Size Inefficiency
Forms: Embedded

Customization Specifications
Type: Replacement
Restrictions: Embedded Only
Parts Cost: Rating + Core Rating x 200¥
Parts Availability: Always
Street Index: .8
Maximum Rating: 2
Base Time: 24 hours
Skill: Computer B/R
Target Number: 4
Equipment Needed: Microtronics Kit
Size: Rating

HARDENING
Hardening is modifications to the system to resist electromagnetic effects such as power surges or EMP effects. Most optical based systems have some level of hardening simply by virtue of their construction, but their associated logic and transport circuitry is not as resilient as the optical components themselves.

Technical Information
All modern computing devices contain some level of hardening. It's impossible not to incorporate some level of protection with the increase in both rogue signals and high-powered legal emanations.

The actual Hardening option takes this too another level however, incorporating not only various protective modifications against EMP and RF but also TEMPEST shielding and signal-damping coverings for most components.

Aftermarket
Systems cannot be upgraded to gain hardening, it involves modifications made to the systems core and associated components when it was designed. Hardening only protects the core, not associated electronics. The gamemaster is the final arbiter of the effects on peripherals if subjected to such an attack.

Game Effects
Whereas Ruggedizing the system gives a Body stat for resisting physical damage and shock, Hardening gives a Body stat for purposes of resisting electromagnetic attacks, including electrical spikes and attacks (such as from tasers), electromagnetic pulses (EMP) and radiofrequency (RF) weapons.

Design Cost: Rating x Core Rating
Maximum Rating: 5
Power Requirement: 0
Size: Rating / 3, round down
Design Options: Size Efficiency, Size Inefficiency
Forms: Embedded

RESPONSE INCREASE
Response increase is the catch-all category for modifications that increase the systems speed and responsiveness. It includes such tried and true methods as overclocking the processors, replacing the decks rendering engine with a new model, optimizing the operating system, and generally tweaking the system for maximum performance. The actual method used is irrelevant, the effects are the same in game terms.

Technical Information
Since computers were first released, people have been working on ways to squeeze the last little bit of power out of them. From replacing crystal oscillators to replacing their graphics subsystems, noone is ever happy with the base "stock" systems.

As noted above, the actual techniques used to speed up the system are not necessarily important, in game terms they all have the same effect.

Aftermarket
The sky is the limit with the kinds of response increase techniques one could conceivably use. The only constant is that they cannot be "stacked" on top of each other.

Game Effects
Each level of Response Increase increases the users persona Reaction attribute by 2 and it’s Initiative by +1D6.

Design Specifications
Design Cost: Core Rating x Response Increase Rating
Maximum Rating: 4
Power Requirement: Rating
Size: Negligible
Design Options: None
Forms: Embedded

Customization Specifications
Type: Replacement
Restrictions: Embedded Only
Parts Cost: Rating x 1,000¥
Parts Availability: 4/72 hours
Street Index: 1.5
Maximum Rating: 4
Base Time: 48 hours
Skill: Computer B/R

Target Number: 5
Equipment Needed: Microtronics Kit
Size: Negligible

SYSTEM LINKS
System Links are dedicated connections that allow systems to be connected in series and run effectively combine their power.

Technical Information
System links are the evolutionary development of ultra-high speed bus connections pioneered by SGI and Cray as far back as the 1980s. Modern system links look somewhat like large dataports, and are intentionally designed to be incompatible with conventional datalines (it could possibly damage the link). For direct connections special "high-density" cable is required, but it can also be connected to a fast leased Matrix line to connect computers that are located remotely.

Aftermarket
System links must be designed into the system in order to work properly, they cannot be "hacked" into an existing system.

Game Effects
A system may not contain more system links then it's Core Rating / 10.

Design Specifications
Design Cost: 15
Power Requirement: 1
Size: 1
Design Options: Size Inefficiency
Forms: Embedded

ACCESSORIES

AUDIO SUBSYSTEM
Depending on the interface of the system, a certain level of audio quality can be assured. Adding an audio subsystem means the user has taken extraordinary steps to improve the systems sound quality and capability.

Audio subsystems come in three grades - Cheap, Average, and Fine.

Cheap
Cheap audio subsystems consist of a small amplifier, two large speakers, and two "satellite" speakers that can be placed anywhere. For portable systems an Direct Digital Output (DDO) port is provided instead.

Average
These systems include an club amplifier and ten speakers (about the size of paperback books) that operate as Club speakers. The system also incorporates an basic mixer (4 input, 1 digital-analog output).

Fine
Fine systems include the equivalent of a Hall Amplifier and four large speakers (Hall level). It also has a DDO port and a mixer with 8 input and 2 output channels.

Game Effects
No game effects, but you like having a drek-hot audio system right? Additional information on sound systems and gear can be found on p. 92 - 96, **Shadowbeat**.

Customization Specifications
Cost:
Cheap - 250¥
Average -500¥
AFine – 1,000¥
Availability: Always
Street Index: .8

VIDSCREEN
This is a high definition trideo display unit that can be set up to display the users view of the Matrix. One popular option is to have a frame or agent 'tour' the LTG and display on the vidscreen as a form of art. Contains connectors for ESS-quality sound output.

'Flat' displays are also available at half the cost. These lack ESS sound output.

Game Effects
Smaller displays are used as output devices on handheld computers and other small electronics. In this case a vidscreen consumes 1 space per square foot. Trideo screens cannot be placed in cyberware or most portable electronics due to their size. They consume 10 spaces per cubic foot.

Customization Specifications
Cost: 50¥ per square feet
Availability: 2/24 hours
Street Index: 1

CASES
Systems do not come with cases unless otherwise specified. A standard no-nonsense case is big enough to hold the components and provide limited environmental protection but will not stand up to abuse. Other cases are designed for more active lifestyles and include features such as environmental sealing and Kevlar weaves.

Game Effects
The buyer determines how large (in Size Factors) the case is when purchased. You may not cram more items into the case then that amount. The total amount of options in the deck may not exceed the Size Factor rating.

Styling: Styling alters the cases appearance in as "fashionable" a manner as possible. All sorts of options are possible including airbrushing, sculpted curves and designs, imbedded gemstones or chemicals sealed in the case that give off strange colors or designs when exposed to variations in temperature. Each point in Styling essentially gives the system a 'Charisma' Rating. In some situations this attribute could be used as a Complimentary Skill in an Etiquette Test (gamemasters discretion).

Armor: The case may be armored and the internal components shockproofed to prevent damage. This essentially gives the decks case an armor rating. Each Rating point of armor gives the decks case an Impact Rating of 1. Every two full points of Impact Rating provides a point of Ballistic Rating. No case may have more then an Impact Rating of 4.

Customization Specifications
Cost:
Basic Case - 5¥ x Size Factor x Ruggedized Rating (if applicable)
Styling - 800¥ x Rating
Armor – 1,000¥ x Rating
Availability: 2/48 hours
Street Index: 1

DATAPORT HUB
Dataport hubs provide additional access jacks to a single port. In most cases they are simply external boxes that options can be plugged into, but they can also be built in to a system. In that case they often take the form of a "switchboard" with multiple connectors, the actual dataport being located behind the hub.

Game Effects
Dataport hubs allow as many devices as it has ports to use a single dataport. In this case they also all share the dataports bandwidth.

If built into a system every 5 jacks adds 1 Space to the dataports size.

Hitchers: Hitchers can connect to a dataport hub. Hitchers connecting through datajacks are affected by IC effects only if they would affect the user operating a "cool" interface. 'Trode users are never affected by grey or black IC.

Customization Specifications
Cost: 50¥ + 25¥ per port
Availability: 2/48 hours
Street Index: 1

SATLINK OPTIONS
Satlinks are assumed to include an internal or screw-on antenna. For additional signal quality, or to allow DBS reception larger antenna arrays are necessary. All antennas can be hooked up to the satlink with high-density fiber-optic cable. Without signal boosters the maximum cable length is 200 meters. Cable with built-in signal boosting can stretch for several kilometers before needing an external signal booster.

All antennas include signal strength indicators and small, motorized bases that allow precise control by the satlink interface. The owner simply has to place it in a location with as unobstructed a view of the sky as possible and enter his current location. The system does the rest.

A portable satellite antenna is a dish or square-shaped unit about the size of an unfolded book when deployed. They can be collapsed to the size of a paperback book when not in use. Larger mobile antennas are dish-shaped units one meter across, they fold up to the size of an umbrella when not in use. A BUD, short for 'Big Ugly Dish' is usually about 2 meters across and cannot be packed, the only way you can get it smaller is if you disassemble it.

Bigger antennas are available but are non-portable by the average person, requiring trailors to transport. As it is BUDS are usually only mounted on vehicles used for SNG (Satellite News Gathering) teams on a budget (LEO constellations are much more efficient).

Game Effects
Portable antennas reduce the TN for purposes of a Contact Test by 1. They have a **Concealability** of 3 and a **Weight** of 2.
Mobile antennas reduce the TN for a Contact Test by 2. They have a **Concealability** of 5 and a **Weight** of 4. They can pick up most DBS broadcasting if pointing at the right satellite.
BUDs reduce the Contact Test TN by 3. They are not concealable unless you put it under a tarp, and weigh about 25 kilograms when set up.

Customization Specifications
Cost:
Portable Antenna - 500¥
Mobile Antenna - 900¥
BUD – 1,200¥
Unboosted Cable - 1¥/meter
Boosted Cable - 10¥/meter
Availability: 3/48 hours

Street Index: 1

CELLULAR OPTIONS

All cellular links include an internal antenna that functions as described in **Cellular Links** (p. xx). Cellular units can also be modified with any of the options given on p. 290, **SR3**. The most common improvements is a signal amplifier for the units transmitter and ECCM.

Cellular units cannot use broadcast encryption and still access the cellular network. In most cases the user will have a signal repeater set up that will decrypt his transmissions and broadcast it to the standard cellular network (see **Shadowdecks**, p.xx).

Game Effects

Signal Amplifier – Internal amplifiers modify the transmitter antenna so that it can exceed the usual Flux limit of 4. This modification is Legality 6P-U. The unit calculates it's effective Flux as normal. If built in to the unit at its design the signal amplifier increases the Cellular Links Design Point multiplier to 3 (i.e. a signal amplifier modified Cellular Link costs Device Rating x 3).

ECCM – The Availability and Street Index modifiers only apply to cellular links installed as a modification.

Customization Specifications

Cost:

Signal Amplifier – 2,500¥

ECCM – 1,000¥ x Rating

Availability:

Signal Amplifier - 5/60 hours

ECCM – +1 x Rating

Street Index:

Signal Amplifier – 2

ECCM - +.5 x Rating

INTERFACE GEAR

All computer systems are assumed to have basic interface gear relevant to their interface type included in their base cost. This includes everything from simple keyboards and mice on the basic interface units to VR goggles and suspension harnesses for the advanced interface units. ASIST capable units are assumed to have proper gear to enable them to function in any mode they are capable of.

Note that connecting the interface gear to the system (allowing it to be used) requires connection to a dataport (even if the interface gear is built in). All interface types are assumed to posses advanced voice command systems. These typically accept commands "in plain English" and are quite adept at performing the right action even if the command is badly worded. For this reason many computer operations are done without touching the system at all. This still requires a dataport however, if just for the microphones.

Basic

A basic interface typically includes a simple sound system (ESS quality … but only barely). The graphics rendering engine is sufficient for most tasks, but it lacks the power that would give it truly lifelike capabilities. Virtual realities and other environments rendered on a basic interface will typically look somewhat flat and lack fine detail - especially scenes with many objects. The unit comes with an keyboard of some type, a 3d mouse (can track its position in 3d space) typically built as a glove and small speakers of some type (typically tinny and of low manufacturing quality). In some cases simple force-feedback technologies will also be included but these will be rare - and more on the order of simple pressure simulators. Portable systems typically have "floppable" keyboards that can be rolled up, touch sensitive screens and buttons that activate predefined scripts.

Advanced
Advanced interfaces include a quality sound system and an graphics system capable of detailing even the most complex virtual world. Advanced interfaces also include a command transducer module that allows interfacing with users who possess datajacks (although this transfer is one way with a cyberdeck DNI). It also possesses at least a rudimentary ASIST processor and library of simsense samples for more detailed feedback with properly equipped users (typically through neural nets built into helmets or headbands).

ASIST Interface
These are essentially advanced interfaces with beefed up ASIST processors and more advanced feedback systems. As a general rule an ASIST interface used without a datajack link will only function as an advanced interface. This includes users accessing the system with a neural net or remotely over the Matrix.

Customization Specifications
Cost: NA
Availability: NA
Street Index: NA

BATTERY PACKS
Batteries enable the deck to operate independent of the standard power grid. Batteries in 2060 are high-density and come in a variety of shapes and sizes, from flat panels to gel-like semi-malleable sacks. Some portable units include internal battery packs for maximum mobility.

Game Effects
Battery packs store a number of PF equal to their Rating. If hooked up to a charger or wall current (all packs contain various power adapters) they regain Rating /2 PF per hour.

If built into a system the packs consume a number of spaces equal to the Rating squared (i.e. Rating x Rating). Only battery packs of equal or lesser size may be placed in the battery storage area.

Batteries useful for computer systems are currently limited to a Rating of 12.

Customization Specifications
Cost: 50¥ x Rating
Availability: Rating/24 hours
Street Index: 1

POWER STRIPS
Power strips essentially provide Hardening versus electrical surges and power fluctuations. They provide absolutely no protection from EMP effects or direct electrical attacks on the system itself.

Game Effects
Each Rating point of the strip counts as a point of Hardening for purposes of resisting electrical damage coming through the systems power source (i.e. a wall outlet). If the system also possesses Hardening then the Ratings are combined.

Each time the strip has to protect against an attack (successful or not) the strip permanently loses a point of Rating. Power strips are limited to a Rating of 3.

Customization Specifications
Cost: 30¥ x Rating
Availability: Always
Street Index: .5

OFFLINE STORAGE
Offline storage is the generic term for any storage capability located external to the system itself. These systems are usually connected to the system via dataports. They are exceedingly useful both as backup and as cheap mass storage.

Some options for offline drives include the ubiquitous MiniCD drive, which are capable of accessing and writing to both the older high-density/double sided (DS/HD) CDs and the newer multilayer access (MLA) CDs. Both media types come in small holder cases about 5cm to a side. The cases protect the somewhat delicate discs themselves.

Perhaps the most common current device is called the chipdrive. This system contains ports that a user can plug any standard optical memory chip (OMC) into. The chipdrive itself is fairly cheap, but the OMCs themselves are still quite expensive. An OMC is usually only six square centimeters in size (2 x 3 x 1 cm to be exact). Their small size and relative durableness has made them very popular for a variety of uses. Large corporate systems often have racks of high-density OMCs mounted as mass storage on their systems.

Both types of offline storage can operate in three modes, these can only be altered manually, taking a Complex Action to switch modes. The three modes are Standard, Read-Only, and Write-Only.

Standard mode is standard, read and write, access to the system. Read-only on the other hand means the system in question can only have data copied off of it, the user cannot delete or add any additional information to the unit. Write-only is the opposite of read-only. Data can only be copied to the drive but nothing can be read from it or deleted. This is a popular option for deckers who want to have some data security, in which case they mirror all of their data onto a write-only drive in order to protect it in case of a dataworm or system crash.

Game Effects
Transfers to and from offline storage are handled by the Swap Memory operation (see p. xx).

It takes a Complex Action to manually switch offline storage modes, it cannot be handled in software.

Both MiniCDs and chips have an effective Body of 2 for resisting physical damage.

MiniCD – If built into a system the drive takes up 4 spaces and 5 PF; the drive must be connected to a dataport. A HD/DS CD can store up to 500Mp. MLA CDs can store up to 1,000Mp (a gigapulse or Gp) per disc. It takes a Simple Action to switch CDs. The drive can only hold one disc at a time. A MiniCD unit has a maximum read/write bandwidth of 10MePS per Rating point. It cannot read or write (or a combination thereof) more then that amount per second. Thus to transfer 475Mp to a MiniCD-1 drive would take 48 seconds (16 Combat Turns!). A MiniCD-5 drive would be able to record that same file in less then 9 seconds (3 Combat Turns). MiniCD drives have a maximum Rating of 10.

Chipdrives – If built into a system they take up 1 space and consume 1 PF for every 4 ports; the drive must be connected to a dataport. There is no limit to the amount of ports a chipdrive may possess (although data throughput could become a problem unless multiple dataports are hooked to the chipdrive unit). Chipdrives can read and write at the full I/O speed of the dataports connected to them.

Customization Specifications
Cost:
MiniCD Drive - 75¥ x Device Rating
Chipdrive - 50¥ + 25¥ per port
DS/HD CD - 2¥ (can store 500Mp)
MLA CD - 10¥ (can store 1,000Mp)
OMC - .5¥/Mp
Availability: Always
Street Index: 1

DECK SECURITY
Everyone wants to protect their deck from potential theft or unwarranted snooping. Thus there are three main types of security, the really paranoid have all three.

Software is the most common, in effect it is a specialized for of the Access Lock IC. If the correct passcode is not entered it either simply prevents access or can trigger an additional effect.

Encryption is another common one, this is a software module for the systems OS that encrypts and decrypts data in realtime for the system. All data in storage and offline memory is automatically encrypted. As with the software lock failed access attempts can trigger additional effects (usually deletion of the data).

Hardware is just like it says, usually taking the form of thumbprint and retinal scanners. Some hardware security systems are quite elaborate and potentially fatal. Hardware security also prevents access to internal components on the system if ruggedized. Some paranoid deckers have been known to wire the hardware security system to plastic explosives in the deck – especially on systems used for shadowdecks (p. xx).

Game Effects
The most common deck physical security measures include maglocks and identification scanners. These are covered on p. 294, **SR3**.

The passcode system is designed in the same manner as the Access Lock IC, with the rating being the target number for an intruders Computer Test. If the test fails then the deck triggers any linked security measures and locks completely up for Rating x 2 minutes. During which time nothing may be done with the system.

Encryption is designed in the same manner as Scramble IC and must be present in Storage Memory at all times. If an intruder attempts to access any data on the storage drive or offline storage treat it as being Encryption Rating equal to the program rating. If a failed attempt is made to decrypt the data (and its all or nothing)

Customization Specifications
Cost: Special
Availability: Special
Street Index: Special

SCANNERS
Scanner technology in the Sixth World is light years ahead of what was available in the early 21st century. All scanners are capable of both reproducing the flat image of objects that they are given as well as a true 3d object suitable for trideo (if there are at least two connected scanners).

The term "scanner" is somewhat misleading, since they also function as simple trideo cameras in addition to digitizing objects in 3d format. They are commonly referred to as "tridcams" in common parlance and are used in everything from tridphones to graphic artists scanning objects into a VR simulation.

Game Effects
Scanners come in various sizes and shapes. They are the Shadowrun equivalent of flatbed scanners, cheap webcams, and 3d digitizers all rolled into one. These devices are typically rated by their quality, the gamemaster is free to define the limits of the various grades - note that even the best scanner is nowhere NEAR the quality necessary for professional trid - it would be like trying to pass a webcam shot off as the real thing.

If built into a device Cheap scanners take up negligible space, Average versions take up 1 space, and Fine models take 1.5. If not built into the device they require connection to a dataport.

Customization Specifications
Cost:
Cheap - 10¥
Average - 50¥
Fine - 75¥
Availability: Always
Street Index: .5

PRINTERS
Modern printers are capable of printing photo-quality output. They come in a variety of suzes. From units that are hand fed, but the size of small sticks, to office printers that can churn out entire books in minutes.

Typically, printers are rated for size and output speed. They can all function as old-style image scanners as well. Most have controls to let them function as standalone fax machines.

Size
The sizes do not note paper capacity, that is up to the gamemaster.

Micro: Micro printers are usually no wider then the paper they print on and only a few cm's thick. Their ink reservoirs are quite limited, usually requiring replacement after 100 pages. They must be hand fed one sheet at a time so are always Very Slow.

Small: Small printers are typically the size of a textbook. They can typically print 1-2000 pages before requiring replacement of their ink reservoirs. These are the typical units that are also built into public access dataterminals, but with extended ink reservoirs.

Large: Large printers are commonly seen only in business settings. They can go for thousands of pages before needed their ink replenished. They are typically as large as a normal trideo unit.

Monster: Monster printers are rarely seen except in a printers. They are usually used to print hardcopy books, magazines, and other assorted items. Due to the low volume of such products in the modern age. These units have essentially replaced old-style printing presses. They are about as large as a refrigerator.

Speed
All speeds assume full-color glossy output. Black and white or plain output will typically be twice as fast.

Very Slow: These units are usually hand-fed or obscenely slow for some reason. They can typically only print between 10 and 20 pages a minute.

Slow: Printers running at this speed can typically print a page every second, totaling approximately 60 pages a minute.

Fast: These are the typical printer speeds of 2060-era printers. They can print a page every .5 seconds. For an output of 120 pages a minute.

Obscene: These units typically print multiple pages at a time, with output speeds ranging from 200-1000 pages a minute.

Game Effects
Shadowrun printers function as a conglomeration of 20th century printers, fax machines, and scanners. They also usually have built-in optical character recognition capabilities.

DECKS

NAMES IN THE BIZ

Electronics manufacturing is a very mature market, and one with extreme levels of competition. Unlike cybertechnology or various forms of industrial chemistry it requires very little initial capital or equipment to get started in the field - and new startup companies with new ideas and innovations can make headway even against the big boys...for a time.

TOP OF THE HEAP

The companies are the heads of the computer fields. Some are surprisingly small companies independently owned, while others are subsidiaries of the megacorps.

Novatech

Since the breakup of Fuchi, Novatech has invested heavily in the newly resurgent cyberterminal market with a vengence. Novatech has released products running the range from terminals built for children (in cooperation with Mattel/Hasbro) to the new Phoebos supercomputer that is the centerpiece of the Pentagon's new information management system. Novatech has not invested much in research and development and little that they have released can be called "revolutionary". But it is well manufactured and of equal or greater quality then Fuchi ever released.

Renraku

Once the leader in cyberterminal technology along with Fuchi, Rentaku has fallen on serious hard times. However, it still maintains a top position in the field, slipping only slightly behind Sony. Technical advances gained from the Arcology are expected to filter into other areas soon, Renraku recently completed an nanofabrication facility in Australia that is expected to begin production of a new generation of optical processors soon.

Sony

Sony has been a leader in consumer electronics for over 100 years and shows no signs of slowing. Although their CTY cyberterminal line has been quite successful Sony has yet to release a mainframe system - preferring to rely on volume sales of their products. Sony continues to innovate in the computer manufacturing field, and was the first company to market computers that met all the standards for the UBUS implementation.

Sony creates the most common consumer computing devices on the market, their products are ubiquitious in the Sixth World.

SECOND-STRINGERS

These companies do their best, and while they make a ton of nuyen they are not trendsetters or groundbreakers.

Aztechnology

Aztechnology has it's fingers in everything - and that includes the various computer markets. Aztechnology has shown comparatively little interest in cyberterminal technology except in the field of Intrusion Countermeasures. There are no cyberterminals marketed directly under the Aztechnology name, instead they rely on subsidiaries such as Allegiance Systems and SkyOrb Telecom to market their products.

Mitsuhama Computer Technologies

MCT does not directly produce consumer computer products. Instead their main focus is on drone control systems building scalable systems intended for even more advanced robotic systems. They do own several subsidiaries that are part of the consumer market, but it is not a focus of the company by any means. MCT's directors generally feel the civilian market is too unstable and risky to risk the companies' profits.

BIT PLAYERS
The following corps either operate in niche markets or are only peripherally part of the market.

Fairlight
Fairlight Labs is a very small company, having no more then 200 employees worldwide. However, for it's size it has an extraordinarily high number of big names in the fields of interface design, microelectronics, and architecture development. Fairlight makes only the best, and many of their products are as much works of art as they are powerful machines.

Fairlight does not produce products for the consumer market, nor does it sell its products in any way other then directly from the company itself. As a general rule anything produced by Fairlight will be ahead of the current State of the Art, and they have generous trade-in offers to maintain customer loyalty (typically 50% of the original price).

Pacific Cybersystems
PacCyber (as it is usually referred to) is a new corp founded in 2060 by several former engineers from Fairlight, Renraku and (it is rumored) Saeder-Krupp. They have their headquarters and a nanofab plant in Seattle, with full sale production facilities being leased. So far they have only released a very powerful cyberterminal system and a "host in a box" bundled system that is proving quite popular with smaller businesses.

Despite these somewhat low-profile efforts, it is know that many of the employees were top talents at their previous employers and the buzz in the shadows is not all of them left in the good graces of the company. They are also rumored to be developing some sort of new core architecture that will revolutionize the field.

Transys Neuronet
Transys Neuronet is perhaps more well known for it's software research and development then for hardware, but they have carved out an profitable niche market producing high-quality ASIST processors that are used in several other companies systems as well as producing several mainframe systems used for mid-level data processing. Transys has not shown a desire to compete directly with the bigger names in the business, but persistent rumors that they have developed a fourh generation bioprocessor seed continue to swirl.

Transys makes very few consumer-level systems, concentrating instead on mainframe systems that include extensive bundling of Transys Neuronet's justly famous software.

Universal Omnitech
This companies greatest claim to fame is the development of the first bioprocessor through its Maas-Neotek subsidiary. Since that time they have released their second generation of the biochips and are expected to shortly release a third generation. Other then this development they have relatively little activitiy in the market.

Yamatetsu
Yamatetsu is primarily well known for recent advances in firmware development. It does not maintain a flashy or well-known series of computing products however, instead it licenses it's technologies to other companies. Recent events may lead Yamatetsu into a more active involvement in the field however, and may even attempt to knock Sony and Renraku out of the top spots.

EXAMPLE DECKS

Allegiance Sigma
16,325¥ +1,575¥ for Decker Modification
Optical Core-6 with DNI Adapted ASIST Interface
200Mp Active Memory
500Mp Storage Memory
Dataports (4)
Case
163 Design Points
24 Spaces
2.4kg, 5 ECU
19 PR (1 PF)
Decker Modification adds Stealthed Processor and Hot ASIST. Increases PR to 20 (2PF).

Sony CTY-360-D
28,930¥ +1,970¥ for Decker Modification
Optical Core-10 with DNI Adapted ASIST Interface
Response Increase-1
Bundled Cyberdeck OS-5
Bundled Armor-3
300Mp Active Memory
600Mp Storage Memory
Dataports(4)
Case
238 Design Points
51 Design Points Bundled Software
29 Spaces
2.9kg, 6 ECU
26 PR (2 PF)
Decker Modification adds Stealthed Processor and Hot ASIST. Increases PR to 27 (2 PF).

Novatech Hyperdeck-6
28,240¥ +2,160¥ for Decker Modification
Optical Core-12 with DNI Adapted ASIST Interface
Response Increase-1
500Mp Active Memory
1,000Mp Storage Memory
Dataports(4)
Case
282 Design Points
37 Spaces
3.7kg, 8 ECU
29 PR (2 PF)
Decker Modification adds Stealthed Processor and Hot ASIST. Increases PR to 30 (3 PF).

CMT Avatar
32,650¥ +2,350¥ for Decker Modification
Optical Core-14 with DNI Adapted ASIST Interface
Response Increase-1
700Mp Active Memory
1,400Mp Storage Memory
Dataports(4)
Case
326 Design Points

46 Spaces
4.6kg, 10 ECU
35 PR (3 PF)
Decker Modification adds Stealthed Processor and Hot ASIST. Increases PR to 36 (3 PF).

Renraku Kraftwerk-8
39,255¥ +2,545¥ for Decker Modification
Optical Core-16 with DNI Adapted ASIST Interface
Response Increase-2
1,000Mp Active Memory
2,000Mp Storage Memory
Dataports(4)
Case
392 Design Points
54 Spaces
5.4kg, 11 ECU, 1 CF
38 PR (3 PF)
Decker Modification adds Stealthed Processor and Hot ASIST. Increases PR to 39 (3 PF).

Transys Highlander
45,165¥ +2,735¥ for Decker Modification
Optical Core-18 with DNI Adapted ASIST Interface
Response Increase-2
1,500Mp Active Memory
2,500Mp Storage Memory
Dataports(4)
Case
451 Design Points
64 Spaces
6.4kg, 13 ECU, 1 CF
44 PR (4 PF)
Decker Modification adds Stealthed Processor and Hot ASIST. Increases PR to 45 (4 PF).

Novatech Slimcase-10
50,590¥ +2,910¥ for Decker Modification
Optical Core-20 with DNI Adapted ASIST Interface
Response Increase-2
2,000Mp Active Memory
2,500Mp Storage Memory
Dataports(4)
Case
505 Design Points
70 Spaces
7kg, 14 ECU, 1 CF
48 PR (4 PF)
Decker Modification adds Stealthed Processor and Hot ASIST. Increases PR to 49 (4 PF).

Fairlight Excalibur
68,110¥ +3,390¥ for Decker Modification
Optical Core-25 with DNI Adapted ASIST Interface
Response Increase-3
3,000Mp Active Memory
5,000Mp Storage Memory
Dataports(4)
Case

680 Design Points
106 Spaces
10.6kg, 22 ECU, 2 CF
64 PR (6 PF)
Decker Modification adds Stealthed Processor and Hot ASIST. Increases PR to 65 (6 PF).

Pacific Cybersystems Balthasar
39,900¥ +2,500¥ for Decker Conversion
Optical Core-16 with DNI Adapted ASIST Interface
Response Increase-2
1,000Mp Active Memory
1,500Mp Storage Memory
Dataports(3)
Ruggedized-2
Ruggedized Case
398 Design Points
49 Spaces
4.9kg, 10 ECU
36 PR (3 PF)
Decker Conversion adds Stealthed Processor and Hot ASIST. Increases PR to 37 (3PF). Legality rises to 2-S.

Compmachine e300
3,040¥
Silicon Core-6 with Standard Interface
50Mp Active Memory
200Mp Storage Memory
Dataport(1)
UBUS Slots (7 Space, 7 Space)
Case
30 Design Points
29 Spaces
2.9kg, 8 ECU
15 PR (1 PF)

Legal Software Bundle
10,400¥ if bought with system, 13,050¥ retail
Cyberdeck OS-4 (Tinker-Toy, Optimization (Optical), Copy Protection-6): 128Mp
Bod-6 (No Options): 18Mp
Sensor-6 (No Options): 12Mp
Armor-5 (Efficiency-1): 20Mp
104 Design Points

Illegal Software Bundle
24,900¥ if bought with system
Cyberdeck OS-8 (Tinker-Toy): 512Mp
Bod-6 (No Options): 18Mp
Evasion-6 (No Options): 18Mp
Masking-6 (No Options): 12Mp
Sensors-6 (No Options): 12Mp
ICCM Filter (No Options): 25Mp
Armor-5 (No Options): 25Mp
249 Design Points