DOWNLOAD PDF TI EXTENDED BASIC FOR THE TI-99/4 HOME COMPUTER

Chapter 1 : TI/4 Home Computer Timeline

Texas Instruments Extended BASIC is a powerful computer programming language for use with the Texas Instruments TI /4 Home Computer. It has the features expected from a.

Both models include support for sprites and multi-channel sound, some of the first home computers to include such custom hardware, alongside the Atari 8-bit family also introduced in The power regulator board is housed below and in front of the cartridge slot under the sloped area to the right of the keyboard. This area gets very hot so users commonly refer to it as the " coffee cup warmer". The external power supply, which was different according to the country of sale, is a step-down transformer. Federal Communications Commission in time. Speech synthesizers were offered free with the purchase of a number of cartridges and were used by many TI-written video games notable titles offered with speech during this promotion were Alpiner and Parsec. The synthesizer uses a variant of linear predictive coding and has a small in-built vocabulary. However, the success of software text-to-speech in the Terminal Emulator II cartridge cancelled that plan. In many games mostly those produced by TI , the speech synthesizer has relatively realistic voices. The "sidecar" expansion units can be connected together in a continuing chain, but can rapidly occupy an entire desktop and cause crashes and lockups due to the large numbers of connectors on the system bus. This original idea was soon replaced by a system based on expansion cards. As on the earlier S bus , the section of the power supply that power the card slots is unregulated. Each card has on-board regulators for its own requirements, thus reducing power consumption on a partially loaded PEB and allowing for future expansion cards which might have unusual voltage requirements. The PEB also carries an analog sound input on the expansion bus. No "official" cards from Texas Instruments ever made use of this line. The system has a joystick port that supports two digital joysticks, which TI referred to as "wired remote controllers". The two joysticks are connected through a single nine pin DE-9 port which is identical with those used for Atari joysticks but with incompatible pins. Aftermarket adapters were available which allow the use of two Atari-compatible joysticks. Composite video and audio are output through another port on NTSC -based machines, and combine through an external RF modulator for use with a television. This memory is placed directly on the bit bus with zero wait states, making it much faster than any other memory available to the system. All other memory and peripherals are connected to the CPU through a tobit multiplexer , requiring twice the cycles for any access and introducing an additional 4-cycle wait state. This is reportedly due to the failure of a new 8-bit processor being designed by TI for this system, while the processor was already in production and proven. Applications previously running entirely in 8-bit RAM both code and registers can speed up by a factor of two. Most hardware is based on the system clock, not the program execution speed, and the hardware access still runs through the 8-bit bus with the wait states intact, so this particular modification does not affect any peripherals. By doing so the console ROM can be copied into RAM, and thus things like interrupt vectors and such could be modified. However, such modifications are not frequent enough to make anyone but the particular modifier himself write any software to use it. A unique feature of these VDP chips is that they contained hardware support for superimposing on-screen graphics over other video signals. All accesses to the VDP system are executed 8 bits at a time. Although this affects performance, it made it easier to upgrade the VDP when newer, relatively compatible chips were released by Yamaha. This also increases the VDP memory from 16K to a maximum of K, although only software explicitly written for the take advantage of it. Device drivers called "Device Service Routines", or DSRs are built into ROMs in the hardware; when a new card was inserted, it is immediately available for any software which needed or wanted to use it. The Communications Register Unit CRU can address devices; however, each TI card runs at a hard-wired address on the CRU bus, and so multiple cards of the same type cannot be supported without modification. The only official card known to be modifiable is the RS card, which supports two different base addresses. This allows the system to support four RS ports and two parallel printer ports. The HexBus

Interface was designed in and intended for commercial release in late It connects the console to peripherals via a high-speed serial link. Several HexBus peripherals were planned or produced. A WaferTape drive never made it past the prototype stage due to reliability issues with the tapes. Because static RAM was also very expensive in the early 80s, TI only gave the machines bytes of fast "scratch pad" RAM where register workspaces could be stored. The original design for the intended CPU had this bytes internal to the CPU itself, but the requires registers to be in external memory. Placing this small amount of memory on the bit bus nevertheless helps the performance of the machine as compared to having registers in 8-bit RAM with a 4-cycle penalty for every access. Some programs, such as Parsec, copied short loops of code to this memory to take advantage of the performance. Third parties provided replacement memory cards for the PEB. For example, Myarc produced kB and kB cards. This uses the cartridge ROM space. This is expandable to kB with the use of a Yamaha V as a user-designed modification not a standard upgrade option. The GPL interpreter resides in the ROMs and takes control of the machine at power-up, and was very close to the native machine code, adding instructions to transparently access the different types of memory in the machine and perform higher level functions such as memory copy and formatted display. In addition, although the chips were largely software-compatible, certain bugs in the ROMs cause compatibility issues with the new chips. Graphics Read-Only Memory Graphics Read-Only Memory is another set of memory accessed a single byte at a time through a dedicated memory port, and were auto-incrementing read-only devices. Since the standard machine does not allow third party machine language support, programmers found their markets decidedly limited to those users who actually added more RAM to their systems. This limitation was alleviated as the price of 32 kB expansion card and a 4 kB "Mini Memory" module eventually came down, but by then the market had moved over to other computers. None of this memory is available to the user. Tigervision developed a unique solution to the memory limitation of the standard cartridge slot; a 24kB cartridge that attached to the side expansion interface, emulating an expansion device. This allowed the company to implement a larger game completely in machine code. Tigervision cartridges using the expansion port include Espial and Miner er. A third cartridge, Sprinter, is listed in its catalog but was not released. Exceltec also released two similar side cartridges, Arcturus[11] and Killer Caterpillar. Because of the speed bottlenecks tobit bus multiplexer and the doubly interpreted BASIC, the TI series gained a reputation for being quirky and eccentric, which endeared it to some and maddened others. Many people who had only experienced TI BASIC also considered it very slow, although assembly programs actually manage fairly good speed despite the hardware issues to overcome. Many TI-developed video games, especially those developed by John Phillips, may be forced into " cheat mode " by holding the shift key and pressing Terse messages often appear, which may allow the user to move to a different round of the game. In Munch Man, the top screen and top round includes invisible Hoonos "ghosts" in this Pac-Man derivative which travel several times faster than Munch Man. In Alpiner, the player can select which mountain to climb. But as the Apple II already had a major foothold in schools, in USA, and was an open architecture that anyone could easily develop for, TI failed to make an impact there. In groups within Texas Instruments were designing a video game console , a home computer to compete against the TRS and Apple II, and a high-end business personal computer with a hard drive. Ahl stated that it was "vastly overpriced, particularly considering its strange keyboard, non-standard Basic, and lack of software". Although TI and Commodore each owned their own IC fabrication facilities, Commodore created custom ICs to reduce the cost of its computers, while TI continued to use off-the-shelf components and make only relatively small revisions to their motherboards. Commodore also made other cost-cutting changes including using aluminized cardboard to build RF shields for some of their systems. In early TI stopped sales for a month to correct a defect, butâ€”predicting in April that the home-computer market that year would be much larger than most industry analysts expectedâ€”continued production at an annual rate of three million, increasing inventory. Rothschild estimated that the company would only sell two million computers. A total of 2. However, a number of elements of its design attracted criticism. All peripherals plug directly into the right-hand side of the unit unless the user purchased the expensive and heavy

Peripheral Expansion Box , which causes the computer to not fit well on top of a desk if a user adds many peripherals besides a tape drive and a printer. In addition, the key keyboard layout does not match that of a typewriter very closely, and there was at the time no option for an column display. The keyboard and display limitations made it unpopular for word processing. Because such a razor and blades business model requires that such products be its own ,[13] TI kept strict control over development for the machine, discouraging hobbyists and third-party developers. He believed that TI recognized its mistake and would change. It eventually came to achieve a cult following among retro-computer hobbyists. Third-party devices such as expanded memory cards, improved floppy controllers, and hardware ramdisks are very stable and popular additions to the machine, although there are no current known sources for these devices. Also, a number of emulators for the TI exist today for PC-based systems. In , the "Turbo XT" was introduced by Triton. The University of Southwestern Louisiana developed system software. Designed by Texas Instruments, but abandoned in the prototype stage. Some prototypes are known to exist. A toggle switch was mounted to the side of the PEB to allow insertion of wait states to bring the computer down to the same speed as the original console, allowing compatibility for games and other timing-critical software. This machine uses two FPGAs to emulate the entire architecture of the Myarc Geneve and the TMS microprocessor, thus eliminating reliance on obsolete silicon devices. TI TMS , 3. Distinct in being the only chip on the TI motherboard with a heat sink on all models. Early models also have a heat sink on the clock generator, the TMS A single bit is available in hardware for coincidence collision detection , and the console supports automatic movement via an interrupt routine in the ROM. There can be no more than 4 visible sprites per horizontal scanline. This feature was demonstrated in October at an international TI meeting near Stuttgart, Germany. This requires a hardware modification to the console itself, as the video input line is not routed on the motherboard. Bitmap mode can be arranged in such a way as to use less memory but still provide improved color or improved pattern layout, leading to the popularity of so-called "half-bitmap" modes. In fact these modes are not undocumented modes of the VDP which fully documented this masking but simply clever layout of Bitmap mode. A higher layer obscures a lower layer in hardware, unless that higher layer is transparent. Console ROM includes interrupt-driven music list playback. Modern hardware developments There has been a resurgence in new hardware projects in recent years. Recently, a range of plug in cartridge boards have been developed, allowing enthusiasts to distribute their software projects on cartridge for the first time in many years.

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It would have saved the cost of the multiplexor, and made the computer a good deal faster too. Presumably it would have simplified the routing of the circuit board also. Yes it would - if the computer had been intended to be built with a in the first place. Why not put everything on a single databus. The CPU operates a 16 bit bus, and the core components are on this bus. Think of this like Local Bus vs. ISA on a For a thorough explanation this calls for a differentiated answer about a design and what happened. Similarly, ROMs must also offer 16 bit data, and so on. A machine like that would have been extremely expensive, and definitely not able to compete against other home computers - and consoles - at the same time. But there was also an 8 bit version, the TMS The same CPU, just with an external 8 bit bus and a memory interface splitting each word access into two byte wide accesses. On the downside, it would almost halve the CPU speed. Not really what engineers like to design. Without a closer look, this only leaves the choice between a great but expensive machine and a cheap er but quite slow one. Now, looking at the most common job for a home computer, running BASIC programs, reveals that most of the memory, where the BASIC code resides, is only accessed in 8 bit portions anyway. The story could end here, but the TI engineers even went a step further and designed the whole machine around a streaming based access concept. External units that offered more than just a few port registers were supposed to offer a streaming access to their content. This means that after a start address within the device was set, each consecutive access should deliver the next byte - or take one when writing. Each of these streams were to be accessed by some hard or dynamic designated port, mapped into CPU address space, effectively enabling an almost unlimited amount of RAM or ROM. The latter being most important for game cartridges, as it was already obvious that limitation to 4 KiB as on the is a serious issue. Instead of just mapping 16KiB plain into the main address space and having that shared with some CRT controller, the was designed to manage all RAM and offer streaming access to the host system. It could have been great What Happened When the basic design was done, three somewhat custom chips where needed. The multiplex logic was straightforward, turning each access into two 8 bit ones. This was different from the planned which would have made only a single 8 bit access if it was for a byte instead of a word. A useless full memory cycle for each and every byte accessed on screen was a real stopper for program development, in particular games. So the VDP got moved to the 16 bit side of the development setup, despite being an 8 bit device. So a decision was made to integrate the replacement circuit into the mainboard, use the full CPU plus the additional circuitry for a first batch, hoping that a few months later the would be ready. The Chips a full figured 16 bit CPU with plain 16 bit wide data bus. But it was considered a serious competition for 68k and Not just because of similar performance and being available very early - , but more importantly due to the huge software library available, including mature operating systems. Not to mention the fully symmetric and straightforward instruction set. After all, the was the single chip implementation of the successful series minis. It was used in several workstations and low end minis. But at least, GROMs could be combined if not occupying the same base address. Effectively a way to turn certain library functions like floating point or such into single virtual machine operations.

Chapter 3 : DAVES OLD COMPUTERS - Calculators and Slide Rules

Abstract. A powerful, high-level programming language that expands the capability of your TI/4 Home Computer. Includes these features: More than 40 new or expanded commands, statements, functions, and subprograms.

And it was big and strong and mighty in the ways of digitals. But other companies not as big and strong had home computers and were selling them like twinkies. TI looked in its parts drawer and saw a wondrous bit microprocessor that it was most pround of. For the home computer was not a hit and sold like cold cakes, even when the price dropped from Apple Sky to Cheap City. But under the funny keyboard was a mighty machine with dazzling color graphics and the bit soul. TI looked at the sales figures and said to the engineers: Fix the fool thing and make it live up to the genius inside. And so they did. And so it does. And look out, others. It was much too expensive, it had a calculator style keyboard, it could run only Basic or plug-in modules, and had no expansion capability. These were not oversights, and TI had reasons. The cost was high because it was a new generation of machine and a color monitor came as part of the package. The keyboard came from the TI calculator heritage and allowed the use of slip-on overlays to redefine the keys for special modules. The machine was designed as a home appliance and the home user was not seen as being interested in fancy assemblers or exotic languages. Finally, to keep it compact and easy for the home user to use, there was no provision for slots or expansion board space; instead, peripherals and expansions were designed into silver boxes to be plugged into the side of the computer. The Basic on board was a good one, full of error-checking and editing capabilities, and considerable graphics capabilities. But the graphics capabilities were slow, too slow to allow anything exciting. True to their promise, TI did bring out expansion modules in silver boxes to plug into an ever-expanding daisy chain at the right side of the computer. The result was predictable: While creative souls at TI were working hard on modules and peripherals, there were thousands of creative souls among the Great Unwashed who were writing Adventures and Starfights and making superboards and widget controllers for Apples, Pets, and TRSs. Of course, there is the new keyboard, a sturdy professional one that looks like a computer keyboard. It has a bunch of new keys, offers braces, square brackets, and lower case. It allows any key to be repeated at will, and allows keys to be used in three ways: Add to this the retained capability to redefine all of the keys through software and the ability of programs to search the keyboard during a run, and you have a most impressive input capability. But there are other changes, deep in the chips and ROMs. To go with it is a revised operating system in ROM that opens up some of the advanced capabilities of both it and the microprocessor itself, as well as allowing the use of the expanded keyboard. The TMS is worth a side trip by itself. More than that, embedded in the chip is the ability to display and move graphics characters called sprites, which can move smoothly across the screen and which, once set in motion by the calling program, continue to move at the specified speed and direction without CPU attention until changed by the program. By changing data, the sprites can be made to change course, shape, speed, color, vanish, or appear. This module, adding some 36K of ROM to the on-board Basic, corrects many of the annoying limitations of the original Basic and opens up a wide range of additional capabilities to the machine. With Extended Basic, the programmer can create sprites in two sizes, set their initial shape, location, velocity, direction, and color; change any of these at will; detect coincidences of sprites with each other or with specified points; change their size and make them vanish or become invisible--all with a simple call to one or more predefined subprograms. Because the VDP does the work, the main processor is involved only with initiating the action, and the sprites will move as set while the processor is busy computing other things. Since up to 28 individual sprites can be defined and set in motion, the capability for dazzling color animation and games is almost unmatched in the home computer field. This highresolution mode is attributable to the A VDP, and provides the capability to do bit-mapped color graphics on a by grid. Now the TI has highresolution graphics in addition to the sprite capability. Unfortunately, the bit-map mode does not allow the automatic movement feature of the sprites to exist along with the high resolution capability, as the VDP gets a bit

overworked. Even with this limitation, the capabilities are astounding. We should see some amazing game and graphics programs soon. This is the ability to define up to 16 operations at the assembly level that can be used just as if they were added opcodes for the processor. From a review of the manual I can report that this module plus disk set is an extremely powerful software tool--in reality a minicomputer assembler in microcomputer form. This was made possible by the fact that the and instruction sets are virtually the same. Writing of relocatable, linkable code. The programmer does not need to worry about absolute addresses and can write his programs as independent subprograms to be linked together later by the loader. By defining certain labels as external references, the loader can match them up and link the programs together, filling in the addresses at load time. This also allows the loader to put the programs into memory wherever they fit best and not be constrained by the present configuration. The computer begins to look more like a minicomputer here. The great advantage for the programmer is the ability to write a library of subrountines, keep them on disk, and bring them into his programs as they are needed without worrying about the addresses or linkages. The Editor is very complete and offers a wide variety of conveniences for the programmer. Some of these are: The system looks rather like a word processor for assembler code. It makes coding a great deal easier by removing much of the nuisance work. Links to Utility Routines. Access to these routines makes it much easier to do the complicated graphics, sound, and speech routines. The programmer need only load certain parameters in the registers and then call on the utility routine to do the work. This capability is particularly needed with the graphics routines, as this area is rather inscrutable anyway. The utilities give the programmer the ease of programming exhibited by the Extended Basic while allowing the speed of machine-assembled code. With new software and hardware improvements, the TI Home Computer is finally a powerful force in the microcomputer field and should not be counted out. Texas Instruments A computer.

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Chapter 4 : The TI/4 Home Computer

TI Extended BASIC is a discontinued implementation of the BASIC programming language interpreter for the Texas Instruments TI/4A home computer.

Many TI-developed video games, especially those developed by John Phillips, may be forced into " cheat mode " by holding the shift key and pressing Terse messages often appear, which may allow the user to move to a different round of the game. In Munch Man, the top screen and top round includes invisible Hoonos "ghosts" in this Pac-Man derivative which travel several times faster than Munch Man. In Alpiner, the player can select which mountain to climb. But as the Apple II already had a major foothold in schools, in USA, and was an open architecture that anyone could easily develop for, TI failed to make an impact there. In groups within Texas Instruments were designing a video game console , a home computer to compete against the TRS and Apple II, and a high-end business personal computer with a hard drive. Ahl stated that it was "vastly overpriced, particularly considering its strange keyboard, non-standard Basic, and lack of software". Although TI and Commodore each owned their own IC fabrication facilities, Commodore created custom ICs to reduce the cost of its computers, while TI continued to use off-the-shelf components and make only relatively small revisions to their motherboards. Commodore also made other cost-cutting changes including using aluminized cardboard to build RF shields for some of their systems. In early TI stopped sales for a month to correct a defect, butâ€”predicting in April that the home-computer market that year would be much larger than most industry analysts expectedâ€”continued production at an annual rate of three million, increasing inventory. Rothschild estimated that the company would only sell two million computers. A total of 2. However, a number of elements of its design attracted criticism. All peripherals plug directly into the right-hand side of the unit unless the user purchased the expensive and heavy Peripheral Expansion Box , which causes the computer to not fit well on top of a desk if a user adds many peripherals besides a tape drive and a printer. In addition, the key keyboard layout does not match that of a typewriter very closely, and there was at the time no option for an column display. The keyboard and display limitations made it unpopular for word processing. Because such a razor and blades business model requires that such products be its own , [13] TI kept strict control over development for the machine, discouraging hobbyists and third-party developers. He believed that TI recognized its mistake and would change. It eventually came to achieve a cult following among retro-computer hobbyists. Third-party devices such as expanded memory cards, improved floppy controllers, and hardware ramdisks are very stable and popular additions to the machine, although there are no current known sources for these devices. Also, a number of emulators for the TI exist today for PC-based systems. In , the "Turbo XT" was introduced by Triton. Successors and clones[edit] See also: The University of Southwestern Louisiana developed system software. Designed by Texas Instruments, but abandoned in the prototype stage. Some prototypes are known to exist. A toggle switch was mounted to the side of the PEB to allow insertion of wait states to bring the computer down to the same speed as the original console, allowing compatibility for games and other timing-critical software. This machine uses two FPGAs to emulate the entire architecture of the Myarc Geneve and the TMS microprocessor, thus eliminating reliance on obsolete silicon devices. TI TMS , 3. Distinct in being the only chip on the TI motherboard with a heat sink on all models. Early models also have a heat sink on the clock generator, the TMS A single bit is available in hardware for coincidence collision detection , and the console supports automatic movement via an interrupt routine in the ROM. There can be no more than 4 visible sprites per horizontal scanline. This feature was demonstrated in October at an international TI meeting near Stuttgart, Germany. This requires a hardware modification to the console itself, as the video input line is not routed on the motherboard. Bitmap mode can be arranged in such a way as to use less memory but still provide improved color or improved pattern layout, leading to the popularity of so-called "half-bitmap" modes. In fact these modes are not undocumented modes of the VDP which fully documented this masking but simply clever layout of Bitmap mode. A higher layer

obscures a lower layer in hardware, unless that higher layer is transparent. Console ROM includes interrupt-driven music list playback. Modern hardware developments[edit] There has been a resurgence in new hardware projects in recent years. Recently, a range of plug in cartridge boards have been developed, allowing enthusiasts to distribute their software projects on cartridge for the first time in many years.

Chapter 5 : The TI/4A Home Computer Page

Estimated delivery dates - opens in a new window or tab include seller's handling time, origin ZIP Code, destination ZIP Code and time of acceptance and will depend on shipping service selected and receipt of cleared payment - opens in a new window or tab.

This Hughes Owens Co. Donated by Bob Sinclair. The Geotec Versalog II engineering slide rule. Manufactured by Sun Hemmi in Japan, this is a well crafted bamboo rule with a quality leather case and very comprehensive book. A pair of slightly different Sterling Acumath Slide Rules. These boards and manual are all that remains of an Olivetti Programma desktop programmable calculator , which I am told was disassembled many years ago. This machine did not use Integrated Circuits, but instead had resistor-transistor logic modules. This machine does not use a microprocessor, but instead has several boards full of custom LSI logic. It is suprisingly capable considering the technology. Advanced features such as trignometric function, factorial, full conditional branching and subroutines are available. Programs can range up to steps, depending on installed memory this machine supports steps - the base model is steps. This machine also incorporates an internal printer and tape drive for program storage. Here is a view of the back. This is the oldest functioning electronic computer currently in the collection. This Sperry-Remington GT is an example of an early battery powered handheld calculator using vacume fluorescent displays. Donated by Bill VanDijk. The Sinclair Scientific is one of the earliest affordable scientific calculators. It operates in reverse polish notation, with only a scientific format display of 5 mantissa and 2 exponent digits. The scientific functions are implemented without a special processor, which reduced cost, however the results have been described as "at best an approximation". Donated by Richard Parsons. The Lloyds Accumatic and Accumatc 20 are typical of the early large 4-function handheld calculators with green florecent display. The Casio "Memory A1" and "Personal M1" calculators are examples of typical 4-function green florecent display calculators by Casio in the mid 70s. The "Memory A1" operates all functions, including the display from a single 1. Donated by Markus Wandel. This Unitrex UC is an early scientific calculator with florecent display. If you have information about this calculator, please contact me. Donated by Markus Wandel The Unitrex Micro-6 and the Intertronic Mini-8 are examples of generic 4 function LED calculators manufactured by Eiko Business Machines in the mid 70s - as you can see, these two machines were built in the same plastic mold. Here is a closeup of the SRA. Here is a simulator for the original SR This is a lower-cost design, and has all of the electronics in a single module attached directly to the LED stick. Possibly the most popular TI calculator ever, the TI was a cost reduced version of the SR, the main differences being the lack of a rechargable battery pack available as an option , and a cheaper front panel. Donated by Ralph Curtis. This is a typical L. This Commodore D is a good example of a basic 4-function calculater made by the Commodore Calculator company in the early 70s before they switched their focus to the Personal Electronic Transactor PET computer. Donated by Stephane Elias. The Commodore PR is a good example of a lower-end programmable scientific calculator. This model features up to 72 programmable "steps" for automating repetative calculations. Donated by Doug Terry. This Underwood PD is a generic large format desktop printing calculator. I have been unable to establish a date or obtain other information on it. Please contact me if you can help. Donated by Tom Wilson. It features a very rudimentary programming ability - it can store up to 32 keystrokes, with no branching, looping or decision making. It features 50 user programmable steps, and an enhancement such that program labels, goto statements and other inline "data" elements only occupied a single step location. I used a TI57 during most of my years at university. The "Making Tracks Into Programming" manual is an excellent introduction to programming. Here is the reference card k PDF. Donated by "der Mouse". The TI58 and TI59 below are based on the same design, and are almost identical In fact, they came with the same manual. Here are manuals for: The National Semiconductor "International Computer" is a standard calculator with the addition of many conversion operations between various international standards. Here is the manual k PDF. The HP33C is a scientific

programmable introduced in One of the Hewlett Packards last LED display models, early models of the 33C featured a unique construction - the chips were NOT soldered to the board, but help in place with a foam insert. This proved problematic and later editions used more conventional construction. Donated by Bill Durrel. Unfortunately the keyboard was noteably horrible, with many people suggesting that the "-II" was an indicator of how many digits were entered with one keypress. This edge-on view shows from left to right: A quarter coin , the SL, and two "button" batteries of the type often used in other "thin" calculators. I found this little guy at the bottom of a box of cables I purchased at a flea market - The paper cover is missing, however it appears to work perfectly. Here is a view of the circuit board. Manuals are available on my Texas Instruments page. Casio created the first Graphing calculator with the FX in This FXG is perhaps the most interesting of that early line, because of the unique folding design, which makes it the smallest graphing calculator of the time. Later model Texas Instruments printing calculators:

Chapter 6 : TI Extended BASIC - Wikipedia

Extended BASIC Review TI 99er, June Gary Kaplan Nothing has caused as much excitement and anticipation in the Ti/4 community as the announcement (what now seems like an eternity ago) that an Extended BASIC would be forthcoming.

The speech synthesizer occasionally generates some weird noise instead of the expected phonemes. Incidentally, I have tried to hack the tms emulator to sound more like a tms, but it is just a hack, I have not reverse-engineered the tms These disk controllers have different abilities: Four floppy disk drives are emulated, though the TI controller only supports three of them the fourth disk drive will be ignored by the TI if the TI controller is selected, but it will work fine with other controllers. Floppy disk images are in V9T9 format. If you want to use these hard disks, you must use HFDC as the floppy disk controller. Note that the disk image does not work very well with the BwG disk controller, though I cannot figure out why it works fine with both the TI controller and the HFDC controller. You must use the DSR version for the prototype with a rtc clock chip. On the one hand, nothing useful can be done with the RS interface, but, on the other hand, the PIO interface enables you to redirect PIO output to a file and save listings to this file by "printing" them to PIO. Note that Supercart and MBX paging are not emulated correctly, and there must be other issues. The format of the hsgpl. The palette chip is not emulated. The computer may crash on soft reset, though I have no idea why. Tapes are stored as sampled wave files. You may find that the emulated tape interface is a relatively simple way to exchange files with real-world TIs. Cartridges Loading a cartridge: The layout file declares the type of the cartridge and the allocation of dumps to memory regions. The details of the creation of cartridge image files is elaborated on ninerpedia -- http: You MUST load all individual files. Loading a single zip archive containing all the cartridge files will NOT work, you must uncompress the archive and select every file instead. These files can be loaded in any order, as long as all necessary files are loaded. The following file name extensions are recognized for cartridges dumps: Configurations Setting up the system configuration: A few dip switches enable or disable computer extensions. These switches are only read at reset. Therefore, if you edit them, you must reset the emulator press F3 in partial keyboard emulation mode for the changes to be taken into account. Keyboard These systems require full keyboard emulation to work correctly. At startup, full keyboard emulation mode is enabled by default. The keyboard emulation mode is toggled using the "Scroll Lock" key by default. It was officially introduced in June , and was retired in late Also, only specially designed programs can take advantage of the improved graphic modes. Only two bytes were modified to derive file "agr This fix was contributed by Tony Knerr, but I have no idea who invented it first.

Chapter 7 : Texas Instruments TI/4A - Wikipedia

Publisher: Texas Instruments, pages. Used - Acceptable, Usually dispatched within business days, From the first page: 'TI Extended BASIC FOR THE T / 4 HOME COMPUTER: A powerful, high-level programming language that expands the capability of your /4 Home Computer.

Regena We are happy to welcome C. She has extensive experience in personal and educational computing and has written numerous articles on TI computers. To start things off, here is an overview of hardware, software, and miscellaneous resources for the TI. Extraordinary Graphics And Sound Graphics. You may easily define your own high-resolution detailed graphics characters. There are 16 colors, and you may use all 16 on the screen at the same time in high-resolution graphics unlike other computers. You may also use text anywhere on the screen at the same time you use high resolution graphics. Most other microcomputers are limited when combining text with graphics. You may play up to three notes and one noise for a specified time using one statement. The music is specified by a number which represents a frequency of Hz to Hz, tones from low A on the bass clef up to out of human hearing range. The tone may be between regular musical notes. An example which plays a three-note, C-major chord for three seconds is: The next numbers are frequency and loudness for each note. You may also add a "frequency" of -1 through -8 and a loudness for the noise generator. You may combine tones and noises for all kinds of sounds â€" everything from classical music to sound effects from outer space. Combining music and graphics. You may illustrate a song, for example. Or if you have a game program, you may make calculations while you are making a noise. Here is a sample using just one tone: Using negative durations and combinations of music and noise numbers for frequency, you can make all sorts of synthesized noises. The TI BASIC language is an excellent language for learning how to program, yet it is powerful enough for an experienced mathematician because of the built-in functions. String non-number manipulations are also very powerful. String variable names must always end with a dollar sign. In this case we are starting at the left side and taking one letter at a time. No Variable Name Worries Variable naming. You also do not have to worry about embedded reserved words in variable names. Two excellent manuals are included with the computer. The manual is very easy to understand, and a person with no previous computer experience can learn to program with this book. The reference manual, which is in loose-leaf form, includes all the commands along with explanations and sample programs. Modules are available for a variety of applications. The variation in price is largely dependent on the amount of memory built into the module. The modules actually add memory to the computer while they are being used. The speech synthesizer is a small box that attaches to the side of your console. Command modules are available for you to program your own speech. You can get higher numeric precision and simplified memory addressing. Programmers will enjoy the easy line editing features. Various function keys allow you to insert or delete characters or to erase or clear a line. Another feature programmers like is the built-in automatic numbering. The line numbers start with and automatically increment by You may specify any starting number and increment. NUM 5,2 will start with line 5 then increment by 2. Future columns will go into more detail, and I hope to be able to answer your questions and present programs and ideas to help you really enjoy your computer. You may have noticed that buying a computer is much like buying a house â€" you can buy the basic house computer , but then you need to add furniture programs or software to make it livable usable , and soon you want to make major improvements add peripherals. Using The Cassette Recorder Cassette. In general, a battery-operated recorder does not work well enough for accurate data retrieval. Also, your recorder should have a tone control and a volume control. I have had the greatest success using the Panasonic RQA cassette recorder. Page II shows an example of how to load a program that you have saved or purchased. Some other hints for using the cassette recorder are: Turn the tone control to the highest setting. Start with the volume about mid-range. Sometimes a fraction of a change in volume can make all the difference in your success in reading a program. Once in a while, if I alternate between the two error messages at a volume setting near 2 or 3, I turn the volume to about 8 or 9 and the

program will load. The smallest jack of the cassette cable goes into the remote switch of the cassette recorder so the computer can turn the recorder on and off automatically. If the recorder does not turn on and off properly, simply remove the remote jack from the plug. You can operate the cassette recorder manually to save and load programs. For programs using the cassette recorder for data entry, you will need the remote capability. An adapter is available for the remote switch. You can save and retrieve data or programs on a diskette much more quickly than by using a cassette system. To connect a disk drive, you also need a disk controller. One disk controller can handle up to three disk drives. Many business applications require two disk drives. The "old" method had each peripheral in a separate "box" connected to the computer or the previous peripheral; each had its own power cord. The "new" system is the peripheral box, which has its own power supply and slots for cards for the RS interface, memory expansion, disk controller, P-code, one disk drive, and possible future cards. Making The Computer Speak Speech. The TI Speech Synthesizer allows you to hear the computer speak to you. You will need a command module with built-in speech to hear the computer speak. To program your own speech or to use any cassette or disk programs that use speech, you will need a module. Terminal Emulator II allows unlimited speech; the accompanying documentation gives you ideas for programming speech using this module. You may vary the pitch and slope and inflections. You may use allophones to create words, or you may have the computer speak words which you spell phonetically. Telecommunications And Languages Terminal. You may use a number of different brands of printers with your microcomputer. The RS Interface has two ports so you may be connected to a modem and a printer at the same time. TI Logo is a fascinating programming language designed especially for young children. TI Logo is contained in a module, and the 32K memory expansion is required. Logo I can print using the TI thermal printer only. Logo II has music and also RS capability so you can print listings on a regular printer. For machine language programmers, it requires the memory expansion, disk controller, and one disk drive. This language requires the memory expansion, P-code peripheral card, disk controller, and at least one disk drive. Software is what you need to use your computer. Software is available on command modules, cassettes, and diskettes, and in a variety of subjects. Scott, Foresman educational courseware is available for grade levels kindergarten through eighth grade, Texas Instruments has several educational modules, and other educational and publishing companies are also developing modules for all grade levels. In addition, there are modules for all types of home use budget, finances, decision making, record keeping and, of course, games from chess to soccer, from Hunt the Wumpus to TI Invaders. Cassette and diskette programs are available for many applications, including programs for two-year-olds learning colors to sophisticated business programs. Texas Instruments sends an informative newsletter to all owners be sure to send in your registration card. Many user groups have formed which have their own newsletters and catalogs.

Chapter 8 : TI extended BASIC for the TI home computer ()

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It pretty much became a standard, and many commercial software products required extended basic. Extended Basic actually had two releases, the first being version 1. If you only owned one "Special Cartridge" then this was probably the one For an Extended Basic programming reference go here. More than 40 new or expanded commands, statements, functions, and subprograms. Multiple-statement lines for speed and efficiency. Sprite moving graphics capability. Subprogram capability that lets you store commonly used subprograms on diskette for use as needed. The ability to load and run one program from another. Comprehensive program control of errors, warnings, and breakpoints. Direct screen control of input and output. Support for loading and running TMS Assembly Language programs if the optional Memory Expansion unit sold separately is attached to the computer. And this bag of tricks includes some mighty impressive feats of computing magic. And, in fact, as little as bytes is frequently the critical amount of extra memory needed. These custom characters are no longer available to programmers since the memory area is needed to keep track of sprites. Nine new subprograms plus 2 redesigned ones provide the ability to create and thoroughly control the shape, color, and motion of smoothly moving, high-resolution graphics. Sprites can be set in motion with simple X and Y velocity components, and will continue their motion without further program control; they can grow and shrink at will, be relocated or "hidden", and even pass over and blot out fixed objects and other sprites to give the illusion of depth and 3-D animation. First on the list is the impressive subprogram capability. Several options exist for communicating values and entire arrays between main and subprograms. This will allow programmers to build up an library of "universal" subprograms that can be called upon to supply the appropriate modules for new programming tasks-without time-consuming re-coding and debugging. If this new subprogram flexibility is not enough for your most demanding tasks, how about "program chaining" -where one program can load and RUN another program from a disk. And at any point in this chain, a "menu" may be inserted, allowing the user to choose with a single keystroke the particular program to be RUN. Those of you with a speech synthesizer, or thinking of purchasing one, will be happy to learn that Extended BASIC includes a speech editor. And if TI ever supplies users with their master file of coded speech patterns and rules for combining them, it would be possible to create your own new words. As of now, they only provide the cryptic, "Because making new words is a complex process, it is not discussed in this manual. Besides the obvious use of an assembler-being able to write programs or subroutines in assembly language--it does, in fact open up other exciting possibilities: The bottom line is more software tools for developers, and more economic incentive for them to produce valuable programs that can be protected against most piracy.

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Texas Instruments begins programming the Early Learning Fun, Beginning Grammar, Physical Fitness, and Home Financial Decisions cartridges for the TI/4 computer. Also, Microsoft is contracted to program TI Basic for the 99/4, which will come built into the system.