Makes your Atari 520/1040 ST™ outrun a Mega ST™

Based on actual run times of many programs (see back cover)

TURBO ST

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SOFTREK

TURBO ST™

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TURBO ST
USER'S MANUAL

WHAT TURBO ST DOES FOR YOU

TURBO ST speeds up most Atari ST programs that write text to your screen. For example, Data Manager ST displays new pages 81% faster, GFA BASIC 69% faster, and ST Writer 116% faster, when these programs are run with Turbo ST. Turbo ST even quadruples the paging speeds of some programs, such as ST BASIC. In addition many features of your Desktop will operate faster. With few exceptions, TURBO ST does for programs running on your Atari 520 or 1040 what Atari's "blitter chip" does for programs running on a Mega ST -- but it usually does so even faster.

HOW TO INSTALL TURBO ST

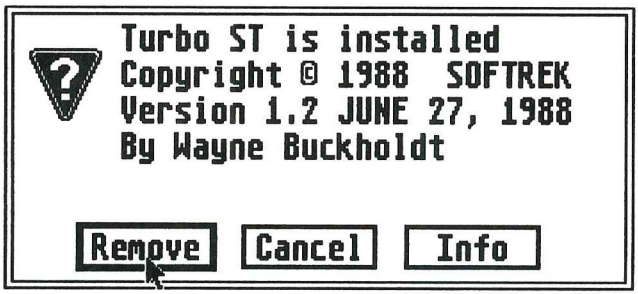
Simply copy TURBOST.ACC from the disk in this package to any disk that you will initially use in Drive A (or, if you boot from your hard disk, copy TURBOST.ACC to partition C.) Then press the Reset button on the back of your ST. That's all!

From now on, whenever you turn on your ST with TURBOST.ACC on the disk in Drive A (or on partition C of your hard drive), TURBO ST will be up and running. You can then run your favorite programs just the way you always have -- there are no special instructions and no complications. All you'll ever notice is that response and text displays are typically faster, operation is therefore easier, and that your work gets finished that much sooner.

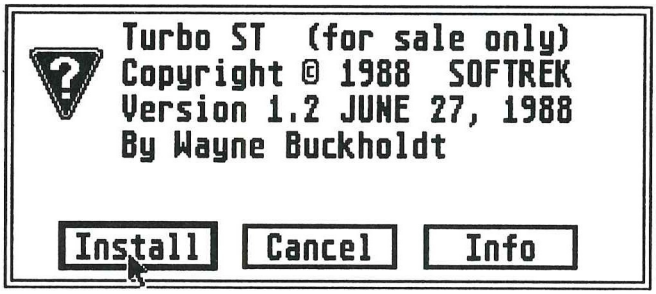
HOW TO TURN TURBO ST ON AND OFF

Once installed, should you ever wish to turn Turbo ST off, simply pull down the desk accessory menu on your Desktop, like this:

Click on "Turbo ST." Then click on "Remove" in the dialog box that appears, like this:



To turn Turbo ST on again, just repeat the process, but click on "Install" in the dialog box, like this:



You have now read all you'll ever have to read in order to take full advantage of TURBO ST's features. If you like, you can ignore the rest of this material and start using TURBO ST immediately. But . . .

Before you put your original Turbo ST disk away, please be sure to read its README file. You'll find interesting information about such things as improvements, disk updates, and incompatibilities. And be sure to mail us your registration card, so that you'll be eligible for those benefits!

WHY TURBO ST WORKS

The GEM operating system that comes with your Atari ST is one of the finest available for any computer -- and if you've used the mouse and Desktop for more than five minutes, you know exactly why: GEM is intuitive, powerful, and easy to use. GEM is one of the principal reasons most users decide to buy an Atari ST.

GEM's only real deficiency lies in its speed -- it isn't as fast as it could and should be. There are two ways to overcome this limitation. You can (1) add a special piece of hardware that takes over part of GEM's job, or (2) you can rewrite the slower parts of GEM with more efficient code. Atari's blitter chip represents Method #1. Turbo ST represents Method #2.

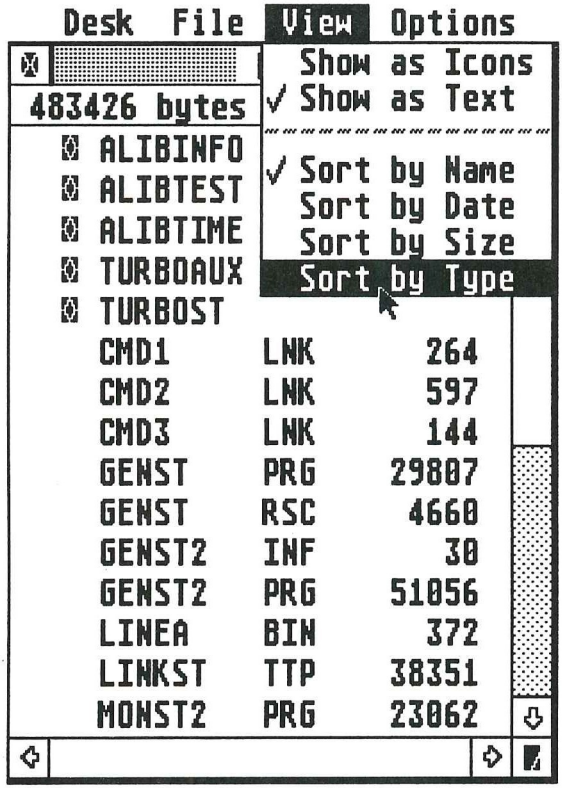
The routines in GEM that write characters to your screen, clear it, and scroll it, do not fully exploit the speed of the 68000 CPU. Turbo ST simply intercepts "calls" to those routines, performs their jobs in more effective fashion, and then gets out of the way. Since so much of a typical computer program's operation consists of writing something to your screen, blanking that screen, and then writing something else, the performance of the entire program accelerates dramatically.

TESTING TURBO ST

The quickest and simplest way to test Turbo ST is to compare the speeds at which a text file is displayed when you SHOW it to the screen, first with Turbo ST turned off, then with Turbo ST turned on. The speed difference should be especially noticeable

with a hard disk or a RAM disk. Or, you can do the following:

1. On the Desktop, set the view window option to "Show as Text."
2. Set the width of a GEM window so that only the filenames, types, and sizes are visible.
3. Now switch between "Sort by Name" and "Sort by Type" with Turbo ST switched OFF.
4. Repeat step 3 with Turbo ST switched ON. The increase in speed using Turbo ST is striking and obvious, especially when the list of files is long.



That's GEM's performance, turbocharged by Turbo ST! While it convincingly demonstrates the acceleration achieved by Turbo ST, the experiment is too short to permit exact measurements by folks who are interested in rigorous, stopwatch-in-hand time trials. If you are interested in more precise measurements of Turbo ST's speed enhancement, please be sure to read the Technical Notes by Wayne Buckholdt, author of Turbo ST, beginning on Page 8. In that section, Wayne presents methods and tables.

PROGRAMS THAT TURBO ST DOES NOT ACCELERATE

It should be recognized that Turbo ST achieves its increase in speed by enhancing the performance of GEM and TOS. Therefore, it cannot accelerate programs which, like pc-ditto, replace GEM with their own operating systems. Neither can it speed up programs which bypass GEM and TOS in favor of custom routines. Nor can it substantially speed up programs which spend a great deal of time on operations other than text display, such as those which perform intensive math operations. Similar limitations, of course, apply to Atari's hardware blitter as well!

Since Turbo ST operates by speeding up the display of the system fonts in the Atari ST ROMs; custom fonts which are loaded from disk and are used by GDOS are not affected. In addition, Turbo ST is not presently designed to speed up graphic operations, such as the drawing of lines (which the blitter chip does not accelerate either, except for horizontals and verticals). Turbo ST does not speed up most games, which typically bypass GEM and access the 68000 chip directly via assembly language, nor would we expect there to be much demand for a game-accelerator; most game authors consider the precisely selected speed of each game to be critical to that games's success.

TROUBLESHOOTING

If Turbo ST ever seems inoperative, or if another program seems to be interfering with its operation, check the following:

1. Is Turbo ST on the desk accessory menu? If not, copy TURBOST.ACC from your original disk to your boot disk (Drive A or C), but not into a folder. Then press the Reset button.

2. If Turbo ST is, in fact, listed on the desk accessory menu, click the mouse on it, to make sure it is turned on. If the dialog box that appears includes the "Install" option, click on that word. If it includes the "Remove" option, then click, "Cancel."

3. If the operation of your program is still not satisfactory, check for a list of incompatible or partially compatible programs in the README file on your original disk. If you find your program listed there, simply turn off Turbo ST when using that program. Otherwise, continue on to step 4.

4. If none of the above steps solves the difficulty, you can write us at P.O. Box 5257, Winter Park, FL 32793, or call us at (405) 657-4611 between the hours of 9:00 A.M. to 9:00 P.M. Eastern Time. (If we're out, and you're calling from the U.S. or Canada, please leave your number with our answering machine, so we can call you back. Otherwise, leave your address.) When calling, be ready to give us the issue date and version number of your copy, both of which appear when you click on "Turbo ST" on the desk accessory menu. If possible, have your Atari ST running, with Turbo ST and the program that is not operating properly both installed, so that we can do some real-time analysis if necessary.

A WORD OF THANKS

Thank you for purchasing Turbo ST. Your support helps to insure that Softrek will continue to offer innovative software for the Atari ST.

If you enjoy using this version of Turbo ST, please give credit to the registered users who have recommended the refinements that have made the program more effective and easier to use. We do read every comment on every registration card we receive, and we encourage further suggestions.

dBMan is a trademark of VersaSoft Corp.; Data Manager ST and Word Writer ST are trademarks of TimeWorks; Devpac ST is a trademark or registered trademark of HiSoft; FinalWord is a trademark or registered trademark of Mark of the Unicorn, Inc.; Interlink is a trademark of Intersect Software Corp.; pc-ditto is a trademark of Avant-Garde Systems; Mega ST, 520 ST, 1040 ST, ST BASIC, ST Writer and TOS are trademarks or registered trademarks of Atari Corporation; GEM is a trademark or registered trademark of Digital Research Inc.

TECHNICAL NOTES

by Wayne Buckholdt

HOW TURBO ST ACHIEVES ITS SPEED

Many of you may be curious as to how Turbo ST achieves its speed. For competitive reasons, we can not reveal everything right now, but we can give you some clues.

First, many long hours were spent thinking about the best possible algorithms. An algorithm, by the way, is a step by step procedure that solves a specific type of problem. Although, the techniques used are our own, a lot of ideas came from published books. The books span many different computers and fields of computer science and are too numerous to mention. But as an example, one book used was Microcomputer Displays, Graphics, and Animation by Bruce Artwick, the author of Flight Simulator. Other ideas came from technical journals such as Byte, Hewlett Packard Journal, Computer Language, etc. And yes, we even got ideas from other commercial programs; however, to avoid any possible legal complications, they were never disassembled.

Next, Turbo ST was written in 100 percent 68000 assembly language using the HiSoft Devpac ST Assembler. Code written in assembly language is almost always faster than the code produced by the best optimizing compilers (an optimizing compiler attempts to translate a programming language such as C, Fortran, or BASIC into the fastest sequence of machine instructions). But we didn't stop there. After you have done something once, you can almost always do it better the second time. Having done it twice, you can almost always do it better the third time. Having done it three times ... I think you get the idea. Of course, the law of diminishing returns sets in after awhile and the percentage improvement over the last revision becomes very small.

BENCHMARKING TURBO ST

There are basically two ways to benchmark Turbo ST. One way is to time how long an application program takes to do a particular text operation with and without Turbo ST. For instance, one could use a stop watch to time how long it takes to scroll or page through a document (when scrolling, the screen shifts up one line at a time and when paging, the screen shifts up one page at a time). Another way is to run a set of routines that precisely time the execution of TOS and GEM calls with and without Turbo ST.

The first method of timing applications programs was used for the back cover of our manual. In the graph, a stop watch was used to time how long it took to page from the top to the bottom of a data file that was appropriate for that application. To page through the document, the "shift down arrow" key combination was used where possible. If that key combination was unavailable, then the mouse was used to click on the scroll bar underneath the slider box. In general, the results show Turbo ST, version 1.2, to be about the same speed as the blitter in GEM applications, and very much faster in TOS applications (those that do not use windows).

Right now, some of you may be considering getting out your stop watch to duplicate our test results. Although we have tried to be conservative, keep in mind that test results will vary depending on your program's environment. In our tests, a 1040 ST with version 1.0 ROMs was run with Turbo ST, version 1.2, against a blitter-equipped Mega ST with version 1.2 ROMs. The application programs that we ran with Turbo ST had the following version numbers: dBMAN 2.02, Data Manager ST 1.1, Final Word 1.17, GFA BASIC 2.02, Interlink 1.8, and Word Writer ST 2.00. When we ran the tests, no other desk accessories or auto folder programs were loaded, as this could have affected test results. Even with this precaution test results may vary by a few percent depending on the data files used.

If you attempt to time scrolling with Turbo ST, you may need to set the key repeat rate higher on the control panel. (A document will normally scroll when you use the up and down arrow keys or when you click on the arrows on the vertical scroll bar with the mouse.) In our original tests with ST Writer, it was necessary to set the key repeat rate higher in order to see the full effect of Turbo ST. At the normal key repeat rate, the bottleneck was how fast the keys repeated, not how fast Turbo ST could shift the screen up or down by one line.

An alternative to the stop watch method is to simply use Turbo ST for several hours or days with your favorite word processor, programming editor, etc. and then turn Turbo ST off. Based on the experience of many people who use Turbo ST, the computer system will now seem sluggish, almost as if you were waiting on the computer instead of it waiting on you. In reality, this is the only test that really matters for a particular individual.

The second method mentioned, that of running a set of routines to time TOS and GEM calls, was used to test the raw speed of Turbo ST. In general, most application programs do not exploit the full speed-up that Turbo ST offers. This happens for a couple of reasons. For one, most application programs are written in a high level language such as C, and for that reason alone can not match the speed of our efficient assembly-level test programs. For another, our assembly-level test programs run with almost no overhead, which is not true for most application programs. Imagine that an application program spends 50 percent of its time writing text to the screen; then no matter how fast the Turbo ST routines are (even if they take zero time!), the best improvement you could get with Turbo ST would be a doubling in speed. This explains why most program editors speed up more than word processors, they simply spend a greater proportion of their time displaying text.

The following table should help clarify what we have said. It

lists the percentage speed up you can expect in any application program, given the percentage of time it spends updating the screen and the number of times the new screen driver is faster.

Expected Speed-Up In Application Program In Percent

Percent of Time Originally Spent Calling Screen Driver	Number of Times New Screen Driver is Faster								
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
10%	5	7	8	8	9	9	9	9	9
20%	11	15	17	19	20	20	21	21	21
30%	17	25	29	31	33	34	35	36	36
40%	25	36	42	47	50	52	53	55	56
50%	33	50	60	66	71	75	77	80	81
60%	42	66	81	92	100	105	110	114	117
70%	53	87	110	127	140	150	158	164	170
80%	66	114	150	177	200	218	233	246	257
90%	81	150	207	257	300	337	370	400	426
100%	100	200	300	400	500	600	700	800	900

For the mathematically inclined, the expected percentage speed up in the table above was based on the following formula:

$$\text{Percent Speedup} = 100 \left(\frac{100}{100 - p + p/n} - 1 \right)$$

where

p = % of time originally spent updating the screen

and

n = number of times new screen driver is faster

As you can see, the speed-up in an application program can often be much less than the raw speed-up in the screen driver. With that in mind, the following sample benchmarks illustrate how fast Turbo ST does its work. They consist of paging and scrolling through 100,000 characters, using black text on a white background and the normal system font for that screen resolution. Based on these benchmarks, we found that Turbo ST can run up to 607% as fast as the ST operating system when paging through text, and up to 285% as fast when scrolling through text! (As a side note, the highest reported speed-up for a program was in GEM, in which version 1.22 of the Devpac ST editor by Hisoft, paged 450% faster in monochrome and 524% faster in color.)

	Time in Seconds			
Monochrome Test Results	**BIOS Function 3**		**GEMDOS Function 9**	
High Resolution	page	scroll	page	scroll
520/1040 ST (1.0 ROMs)	27.785	68.155	47.680	88.585
520/1040 ST (1.2 ROMs)	26.405	55.890	46.350	76.345
Mega ST with Blitter	22.995	44.865	43.010	65.310
Turbo ST with any ST	**10.595**	**33.680**	**7.745**	**31.060**

All unmodified 520/1040 STs prior to 1988 should have the old 1.0 ROMs which are dated 11/20/1985. The 1.2 ROMs which are dated 04/22/1987 are those that are used with the Mega ST. The times for a Mega ST with the blitter off should be the same as a 520/1040 ST with the 1.2 ROMs.

	Time in Seconds			
Color Test Results	**BIOS Function 3**		**GEMDOS Function 9**	
Medium Resolution	page	scroll	page	scroll
520/1040 ST (1.0 ROMs)	28.645	68.070	48.475	88.455
520/1040 ST (1.2 ROMs)	27.595	56.215	47.470	76.615
Mega ST with Blitter	24.875	46.675	44.805	67.075
Turbo ST with any ST	**10.845**	**33.910**	**7.990**	**31.295**

These benchmarks do not document everything that is speeded up as there are literally thousands of ways of displaying text on an Atari ST. It would take several months and numerous tables to document the speed-up with Turbo ST using different text routines, colors, styles, modes, rotations, etc., so we leave this as an exercise to the reader (as they say in the textbooks).

INTERNAL WORKINGS OF TURBO ST

When you select "Remove" in the Turbo ST dialog box, Turbo ST version 1.2, does a check to make sure it is safe to remove itself. If another program has stolen the 68000 trap vectors after Turbo ST has stolen them, you are informed you that Turbo ST can not be removed right now. There is, however, an override button which, in the right hands, can sometimes be useful. When you select "Override", the program will ask you if you want to logically or physically remove Turbo ST.

If you select, "physically remove", Turbo ST removes itself completely from the system by restoring the original trap vectors that were in place when Turbo ST was installed. This has the side effect of of partially or totally removing any program that stole the 68000 trap vectors after Turbo ST. This will often result in a crash depending on how the programs above Turbo ST behave.

If you select, "logically remove", Turbo ST clears a flag to indicate that it is no longer installed. This can be useful in situations similar to the following: When Laser C starts, it apparently steals one of the 68000 trap vectors. If you then install Turbo ST, and then quit Laser C, the system will now run as if Turbo ST is not installed. This is because Turbo ST was removed without its knowledge, when Laser C terminated. What happened was that Laser C restored the original trap vectors that were in place when it started. In this case, you can logically remove Turbo ST, so that you can reinstall it without rebooting your computer.

SOFTWARE DEVELOPMENT COPIES

It is our goal to be 100% compatible with all commercial software. To help ensure this, we offer an exchange policy to commercial software developers, in which finished goods can be swapped. This allows both parties the opportunity to test for complete compatibility without relying exclusively on outside beta testers.

REVISION HISTORY

The following improvements have been made to Turbo ST since version 1.0:

1. It now comes up automatically installed.
2. A fast VDI fill rectangle routine is included, which helps speed up window redraw time.
3. The transparent text mode is supported, which helps speed up a few more programs, such as Word Writer ST and A-Calc. The drop-down menus and dialog boxes are also faster.
4. The compatibility problems with Flash, Interlink, VIP Professional, Zoomracks II, Beckmeyer MT C-Shell and a few others were resolved.

Because we stand by our products, we are offering a very liberal upgrade policy for registered users of version 1.0 until January 1, 1989. Dealers in North America can receive a 1.2 update disk at no charge, provided that we have proof of purchase of version 1.0 and provided that they do not charge their customers for the upgrade. Simply call us at (407) 657-4611.

Individuals can obtain the version 1.2 upgrade by bringing their original disks to participating Atari ST dealers, or by returning the original disk along with a small amount to help defray postage and handling costs. Persons with U.S. addresses should enclose

$1 for a disk update and $5 for a disk and manual update. Persons with Canadian addresses can enclose an equivalent amount of Canadian postage stamps (we are looking for 43 cent Canadian stamps so that we can pre-stamp the registration cards of packages sold in Canada). Persons with overseas addresses should enclose $5 for a disk update and $10 for a disk and manual update, in U.S. funds either by cash, check, VISA, or Mastercard number (expiration date must be included). All mail sent overseas will be sent by airmail.

After January 1, 1989 updates of version 1.0 disks will cost $10 to North America addresses and $15 to overseas addresses. In addition, we reserve the right to change our upgrade policy for any upgrades that we might offer beyond version 1.2.

TURBO ST LICENSE AGREEMENT

READ BEFORE BREAKING THE SEAL ON THE DISK ENVELOPE

This package contains computer software (referred to as "Turbo ST"). The terms of this agreement and the information in this manual are made readily available to you so that you may make an informed decision prior to breaking the seal on the envelope that contains the software disk. Breaking the seal indicates your acceptance of the terms and conditions of this agreement.

In return for acquiring a license to use Turbo ST , you agree to the following terms and conditions.

1.Copyright - You acknowledge that Turbo ST and the documentation are copyrighted and all rights are reserved by Softrek. Further, you acknowledge that Softrek retains ownership of Turbo ST, including any portion or derivative work thereof.

2.Usage - You may use Turbo ST in its present form on a single computer to be designated by you. You may copy Turbo ST for backup purposes and for applications on the single designated computer; however you may not translate, disassemble, decompile, or modify in any way Turbo ST or any copy in whole or in part. Rental of Turbo ST is expressly prohibited by this agreement.

3.Limited Warranty and Disclaimer - Turbo ST and the documentation are provided "AS IS". All warranties, either expressed or implied, are disclaimed, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Softrek warranties the disk media only to be free from defects in materials and workmanship for a period of 90 days. Defective merchandise returned during this period will be replaced without charge. After 90 days and for up to one year, registered owners will be permitted, on a one time only basis, to purchase a replacement copy of Turbo ST for $10.00. Turbo ST is not guaranteed to work with all application programs, and Softrek specifically disclaims any implied warranty with respect to fitness for any particular purpose or merchantability.

4.Term - The license to use Turbo ST shall be effective until terminated. You may only terminate this agreement by destroying Turbo ST and its documentation together with all copies or modifications in any form. Softrek reserves the right to terminate this license immediately should you fail to comply fully with all terms and conditions. Upon such termination you agree to destroy Turbo ST and its documentation together with all copies or modifications in any form.

5.Transfer - You may transfer Turbo ST and the license to another party if the party accepts the terms and conditions of this agreement. At that time, you must either transfer all copies of Turbo ST or destroy any copies of Turbo ST not transferred.

6.Limited Liability - By the terms of this agreement you expressly waive any right to INCIDENTAL or CONSEQUENTIAL damages caused by the use of Turbo ST. In no event shall Softrek be liable for more than the purchase price of Turbo ST.

7.Acknowledgement - You acknowledge that you have read this agreement, understand it and that, by opening the seal on the envelope, you agree to be bound by its terms and conditions. You acknowledge that this is the exclusive statement of the agreement between Softrek and you, which supersedes any prior agreement, oral or written between Softrek and you concerning the subject matter of this agreement.

Opening this envelope indicates your acceptance of the terms and conditions of the Turbo ST license agreement on the facing page.

TURBO ST™

$49.95

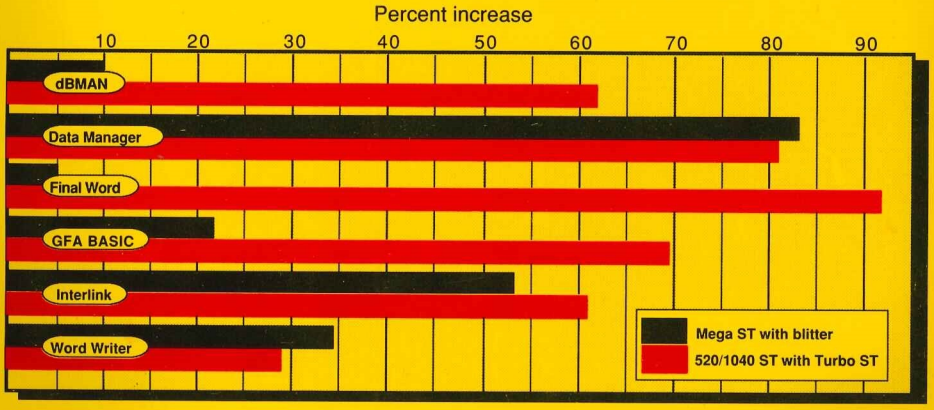
The ***"Software Blitter"***

- **Speeds computer response; saves time, reduces fatigue**
- **Easy to use desk accessory, automatically installs**
- **Low price; less than 1/3 the cost of the blitter upgrade**
- **Not copy protected; install on all of your favorite disks**
- **Works on any 520, 1040, or Mega ST™ with TOS™ in ROM**

Unlock the power of your computer. Just copy Turbo ST to any disk that you start your computer with—it's that simple. By unleashing the power of the 68000 microprocessor, Turbo ST out-races the "hardware blitter" in most text-based applications. As a "software blitter," Turbo ST saves time and eliminates frustration by speeding the computer's response. Quick response means you don't wait for the computer, it waits for you.

How do we do it? Once installed, Turbo ST works by intercepting calls to GEM DOS routines and replacing them with optimized assembly language equivalents. Turbo ST concentrates on the most frequently used and most time consuming DOS routines to speed up character graphics. The results speak for themselves.

Speed improvements for some popular programs



Results obtained while paging through an appropriate data file from top to bottom. Using Turbo ST on a Mega ST may result in speed improvements even better than those shown. Programs that bypass the operating system or that use GDOS fonts are not affected by Turbo ST.

Turbocharge Your ST Computer Today!