Using the Transputer Education Kit
and Add-On-Processor Boards

Suppose that you have just purchased the entry-level Kit. What can you do and learn?

Without even plugging in the circuit board or loading the software onto your PC, you can learn a whale-of-a-lot just by studying the documentation which comes with the Kit. You might start with the book entitled *Transputer*. It commences with a general discussion of the architecture of the Transputer, the programming model which that architecture supports, and the means provided for interprocessor communication (the so-called transputer "links"). In the course of these discussions the programming language Occam is introduced. Occam is a new notation, based on the same conceptual model as was the Transputer architecture, and designed specifically for use with it. As such, Occam is a quite useful means of expression, even when not formally writing programs.

The *Transputer* book further contains the complete set of "data sheets" for the chip, including pin assignments and functional descriptions, electrical and timing specifications, and an instruction set summary. Finally, the remainder, and in fact the bulk, of the book is a reprint of *The Transputer Instruction Set: A Compiler Writer's Guide*. This is the definitive text relative to programming the Transputer; an invaluable resource for sophisticated programmers and students of computer architecture, but is probably too detailed to make for appropriate reading this early on.

Once you have quite thoroughly acquainted yourself with at least the first part of the *Transputer* book, and lightly browsed through the remainder, you might wish to pick up the *Workbook*. This text gives you more "overview" information, and then launches into a quite complete Occam-based tutorial (with exercises) relative to the Transputer, its salient features, and how to program using multiple processes on single or multiple processors. Following this "programming" tutorial, the *Workbook* proceeds with another description of the Transputer's hardware operation, and concludes with the description of half a dozen or so possible hardware lab projects.

Of course you could continue on, digesting the contents of the *Occam* and *C 89.1* books as well; becoming a regular armchair expert. But surely by now (and most likely well before this point) you will have gotten a hankering to get your hands on the hardware itself, to try the thing out and see if it really works. This might possibly even be the very best starting point. That way you can experiment as your knowledge progresses; reinforcing and stimulating your learning, as only "doing" can.

For this approach, simply open the *User Guide*, follow the brief installation instructions, run the simple test and diagnostic program, and *voilà!*, you're ready to play with the famous Mandelbrot demo. But don't become distracted for too long with the Mandelbrot. There are many new and fascinating things to learn right now. Continuing on in the *User Guide*, you will be instructed as to how to load all the software; and then, more importantly, you'll get a "jump start" in programming by trying out one or more of the sample C programs. You'll soon know the basic mechanics of the C program development cycle, and even a bit about the C-way of multi-processing on the Transputer. You might even have dabbled with the sample assembly language programs. Then it's on to using your own creativity; using the documents provided only as reference manuals, and saving the tutorials and overviews for later when your fingertips are blistered.

Ah, but why all the earlier talk of Occam, just to start off programming in C?

Well, there's a small technicality. Occam, as CSA has carefully noted in the Kit promotional literature, requires for its use that a megabyte of DRAM be installed in the Kit circuit board; and since it is possible to order the kit without memory installed, we settled on Occam as a vehicle for discussion, and C as a notation for our initial programming experiments. Thus if you originally ordered your Kit with DRAM installed (the most likely scenario), or if you have installed some DRAM yourself, you could have started off programming Occam instead, or as well.

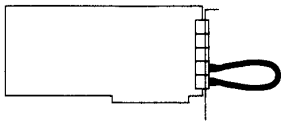
Once you've mastered the basics of programming a single Transputer, then what?

You will not have mastered the basics of programming a single transputer without having become proficient at dealing with multiple concurrent processes on the same processor. In fact, this feat is one of the first that you would have learned to accomplish if you had worked through the sample programs provided. The transputer is made for concurrency, the C libraries facilitate it, and the very most significant aspect of Occam is that it even has special syntactic support for it. And now the best news of all is that virtually every technique that applied to multi-processing on a single transputer carries over to multi-processing over an entire network of transputers.

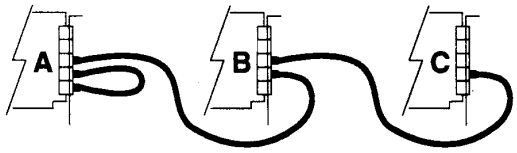
So the next step is to get together with someone else who has a Transputer Education Kit, or to purchase some additional Transputers for yourself. This will be the final proof of the pudding; to test out your newly developed concurrent algorithms on multiple transputer processors; to experience power and exhilaration (or is that "acceleration") of PARALLEL PROCESSING.

Suppose that you and several of your friends at school have each purchased a Kit?

Well, here's what you could do. Each of you could install your Kit board in one of the PC's which already exist within one of your department labs, or you could each bring your own PC (with Kit board installed) to a common location. Then each would configure his or her board so that the interconnection between the Transputer's Link-0 and the PC/link interface circuitry (the means by which the host PC communicates with the Transputer) will require an external cable, rather than being accomplished via the on-board jumpers as when delivered. The figure below depicts a board so arranged, with the PC/link interface (the bottom external connector) connected to the Transputer's Link-0 (the next connector up), so that normal program development and program downloading and interaction can occur.



Then when true parallelism is desired some of the boards (B and C in the case depicted below) can have their cables removed from their PC/link interface connectors, and reconnected to the Transputer Link-1 connectors of their intended-to-be-logically-adjacent neighbors (boards A and B, respectively).



In this configuration boards B and C have no connection to their respective PC hosts except to draw power from the slots into which they are plugged. And board A's PC host is now in control of all three boards, being able to reset them, and to download code and interact with them, all over the link cables which now chain them together. Of course you can incorporate as many boards in the chain as you wish, and can reconfigure the cabling again at any time you should desire.

But suppose that you don't have any friends, or that they're all English majors?

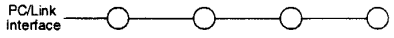
Do you have to go out and purchase more Kits; even when you obviously don't need additional copies of all that documentation and software? Furthermore, considering the figure above, why would any new boards need their PC/link interface circuitry?

Happily, the people at CSA noticed the same things, so they have provided an even lower-cost product called the Kit Add-On-Processor board. But it's actually not really a new product at all. It's just the same circuit board as comes with the Kit, but with the chips which constitute the PC/link interface logic removed. And, of course, you get just the tested and ready to use board, since they assume that you already received the documentation and software when you purchased the original Kit.

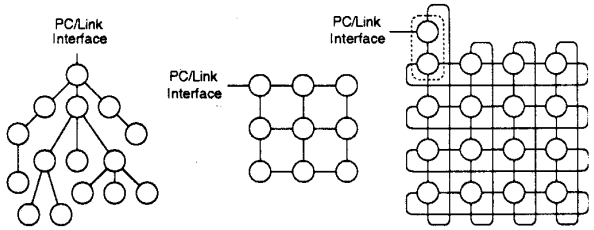
So how do you hook up your new Add-On-Processor boards to your Kit board? Just the same way as boards B and C are connected to board A in the previous figure. There's one difference, however. Should it be more convenient for you, all or any number of the boards could reside in the same PC chassis.

Finally, can you learn everything there is to learn using T400 Transputers?

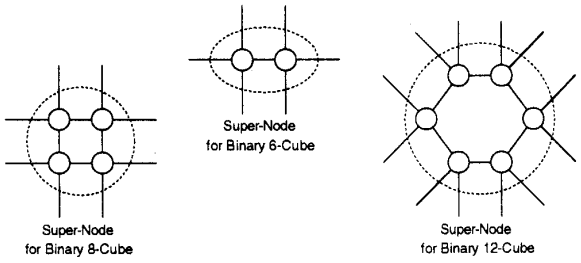
Not quite, but almost; at least if you're still thinking about parallel processing using the Transputer's distributed memory, message-passing model. But there is one additional aspect of this topic which cannot be addressed with the T400. Because the T400 has only two built-in communication links, you are limited to experimenting with only one simple interconnect topology; a linear chain.



With the T425 and the T800 you get four such links, and as a result, a much richer set of possibilities. You can create trees and two-dimensional meshes of processors. Even a hypercube (i.e. a binary 4-cube) is possible if you allow one of its nodes to be comprised of a pair of processors.



This last mentioned idea, using a pair of processors for a single node, might inspire you to push the frontier even further; using rings of processors as super-nodes which can be directly connected to other such super-nodes, say to form binary n-cubes of super-nodes.

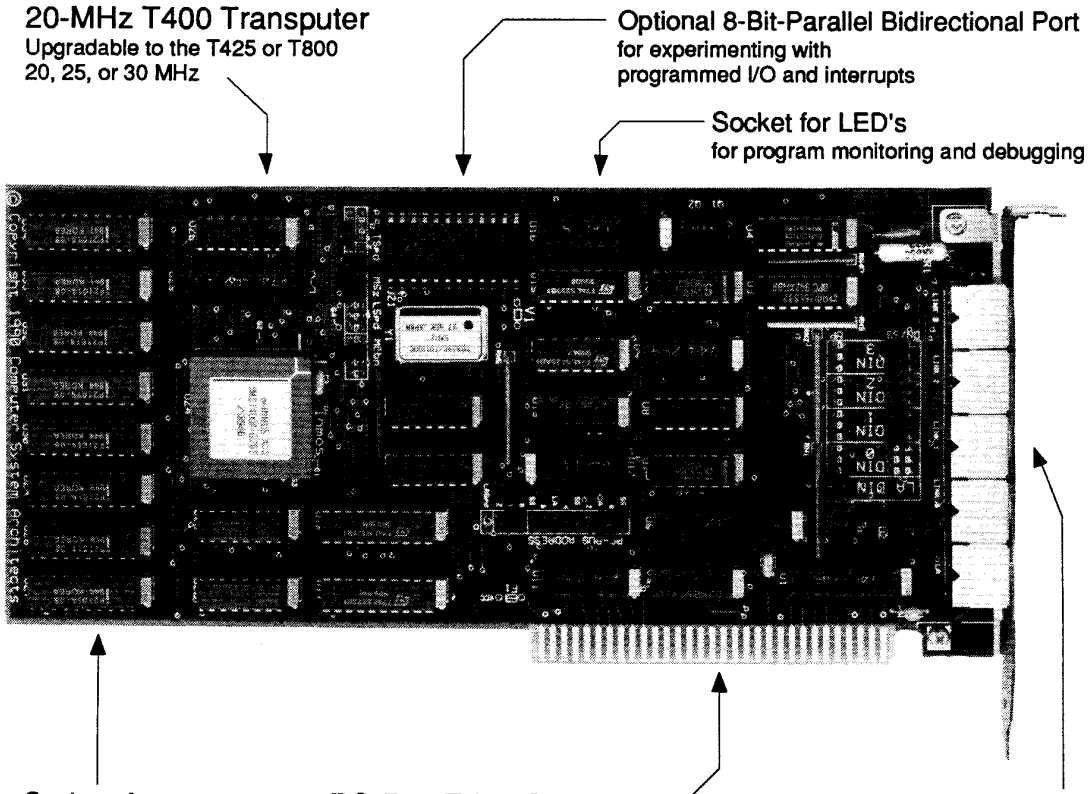


Your imagination is your only limit, so have at it. Call CSA today and order a Transputer Education Kit and your first set of Kit Add-On-Processor boards. Then tell all your friends so they'll become envious, and unwittingly fund your next round of add-on processors.

Kit Add-On-Processor Boards

Introductory Price: $150.00

Add-On-Processor Circuit Board



Add-On-Processor Board Features:

- **Incorporates the T400 Transputer (upgradable to T425 or T800)**
- **Plugs into PC along with Kit board, or into any other PC or expansion chassis**
- **Interconnects with Kits or other Add-On-Processor boards using standard cables**
- **Toll-free customer support**

Question: *Just what is a Kit Add-On-Processor Board, and how does it differ from the circuit board which is delivered with the basic Transputer Education Kit?*

Answer: The Add-On-Processor board (AOP board) is identical to the board delivered with the basic Transputer Education Kit (the TEK board), except that the PC/link interface portion of the circuit is left unpopulated for the AOP board. The customer could, in fact, order the missing chips, plug them into the appropriate sockets, and thus convert the AOP board into a full-fledged TEK board.

Question: *So why the price difference?*

Answer: Well, those chips do cost something. And there is the added cost of manufacture, test, and warranty fulfillment. But way more than that, there is the cost of the documentation, diskettes, and software. Those items need only be delivered with the original kit, thus further reducing the cost of the AOP boards.

Question: *How is the Add-On-Processor Board used?*

Answer: Just as the name implies, the AOP boards are for adding one or more additional processors to your original kit in order to increase your computational capability, or in order for you to experiment with true parallel processing. And since transputers are designed to communicate with each other over their built-in high-speed serial ports, rather than through a shared memory or over a common bus, there is no need for the AOP boards to include the PC-bus interface circuitry as does the TEK board. Thus the AOP communicates with other AOP's or the TEK board via cables plugged into the special connectors provided on the I/O bracket of each board; and the TEK board alone communicates with the host PC via the PC/link interface, which it alone has and needs.

Note that since the AOP boards have no PC/link interface circuitry, they only plug into a card slot to receive power. As such, they need not be plugged into the same chassis as is the TEK board. They need not even be plugged into a PC. In fact any expansion chassis having appropriate card-edge connectors, sufficient power and cooling, and located within 50 or so feet of the chassis housing the TEK board will do.

Question: *How many Add-On-Processor Boards can be added on?*

Answer: There is no given limit as to the number of add-on-processors, or for that matter kits themselves, that can be interconnected as part of a single system. The answer depends mostly on how good or bad the AC power distribution is at your location.

Since the transputer links on both TEK and AOP boards (and on all other CSA boards, for that matter) are outfitted with differential drivers and receivers, it is possible to interconnect devices housed in different chassis and powered by different DC power supplies which are even plugged into AC outlets on different circuit breakers. A problem could arise, however, if AC outlets stemming from different transformers are to be used, and/or an unusually wicked ground-looping problem exists within a facility. This usually only occurs in the near proximity of very power-consumptive machinery, such as is found in a heavy manufacturing environment, and if exhibited, its existence will probably already be common knowledge. In any case, any problem can probably be avoided by minimizing the number of chassis to be involved and by taking care in selecting the AC outlets into which they are plugged.

With any luck at all you should be able to plug hundreds of processors together, and thus your only real limitation will probably be money. If you should get anywhere near this aggressive, however, you might consider using processors of at least the T425 or T800 capability, as with so many nodes, the extra two links on each may prove a worthwhile advantage. Furthermore, you might consider moving up from CSA's kit products to its PARTS product line, or to its SuperSet line of preconfigured systems. The higher circuit densities and the increased integrity of their link cabling mechanisms will compensate for their somewhat higher prices.

Question: *Can more than one PC/link interface be used at the same time within a single system?*

Answer: It may be perfectly reasonable to start out using the "Hey you, are you done yet?" method of arbitration; physically unplugging and plugging in cables to claim a portion of the network and to reconfigure it into the desired topology. At some point in time, however, you may wish to have something more automatic. But, without special provision (i.e. special hardware and/or software) the way in which you physically configure and cable your system will determine which selection and number of processors can be controlled (i.e. reset, downloaded to, and debugged) by which PC host.

When this time comes, a good idea might be to contact CSA and tell the people there what you would like to accomplish, and then let them give you some suggestions. There do exist programmable transputer link switches and software to operate them, and even operating systems such as Helios and Trollius. Or part of the learning experience might be to conceive of and design your own solution. In any case, don't forget that CSA offers toll-free support to kit customers.

Kit Upgrades and Accessories

Field Upgrades

Processor: Since the Kit and Add-On-Processor boards are fully socketed, it is possible, at any time in the future, to remove the transputer chip and replace it with a different processor. Allowable models include the T400, T414, T425, T805, or T805 (at 20, 25, or 30 MHz).

Memory: Kits and Add-On-Processor boards can be purchased initially with or without factory-installed DRAM. The customer can optionally select between 1, 2, or 4 megabytes of 60 or 80 nanosecond components. 80 ns devices support zero-wait-state performance for 20-MHz processors, or one-wait-state for 25-MHz models. 60 ns DRAM yields zero-wait-states even at 25 MHz.

Memory can also be installed in the field, of course, with the same limitations; that is 1, 2, and 4 MB are the only size options. 1 MB requires installation of 8 256K x 4 IC's (in 20-pin DIP format) in the sockets provided. 4 MB requires 8 similarly packaged 1M x 4 devices, or 8 1M x 4 ZIP devices and a special memory daughterboard. A 2 MB configuration also requires a special daughterboard and 16 256K x 4 DIP's. Just about any speed chips can be accommodated.

Software: The C that is provided with the entry-level Kit comes from Logical Systems of Corvallis, Oregon, and is referred to here as "T400 Kit C." A fully-featured version of this same program development system, referred to as "TXXX Kit C," can be purchased by kit owners as an aftermarket upgrade. This version supports floating-point arithmetic, can download code to arbitrarily configured transputer networks (not just linear pipelines), and accommodates all 32-bit transputer models. It differs from the latest top-of-the-line commercial product (LS-C/PC, revision 89.1) only in that it is restricted to use with the Kit, and doesn't include sources for the PC server program and C libraries.

The Occam2 provided with the entry-level Kit comes from SGS-Thomson/Inmos, the providers of the transputer itself, and is referred to here as "T400 Kit Occam." A fully-featured version of this software, "TXXX Kit Occam," can also be purchased as an aftermarket upgrade. This version differs from the latest commercial product (IMS D705/PC) only in that it is restricted to use with the kit, doesn't include the transputer simulator, and doesn't include sources for the PC server program.

Accessories

Cables: Industry-standard (Macintosh ImageWriter™ compatible) cables for interconnecting Kits and Add-On-Processor boards can be purchased from many computer stores, through mail-order catalogs, or directly from CSA.

LED's: Kit and Add-On-Processor boards provide a socket which can accommodate up to 8 LED indicators. If installed, each indicator can be turned on or off under program control, making a convenient program diagnosis or monitoring tool. Suitable LED's can be purchased through most electronics distributors or directly from CSA.

Interfacing Kits: The Kit board design accommodates interconnection with external devices in two basic ways: 1) via one of the transputer links, or 2) through an 8-bit-parallel bidirectional port (optionally utilizing the transputer's "Event," or interrupt, signals). Of course, only the basic mechanisms are provided, with the intent that the user will create the remainder of the circuit.

The TEK.A1 Link Interfacing Kit includes a schematic and the basic components required for interfacing to a link. The TEK.A2 Parallel Interfacing Kit includes a schematic and the basic components required for a parallel interface. In either case, the user will supply the breadboard and additional components, depending on the application.

Other Boards and Software: CSA carries a complete line of transputer-based hardware and software products, all compatible with the kit. More than a dozen different board types provide a selection of up to 10 processors per board or up to 32 megabytes of DRAM per processor; with virtually any combination of processor model or memory speed. There are also peripheral and bus interface boards, link switches, chassis and cabinets, and even complete preconfigured, multi-user systems.

A number of additional program development systems and several operating systems are also available. There are a total of four C compilers, plus Pascal, Modula-2, FORTRAN, Ada and Prolog compilers. There are also a number of network debuggers, the Helios operating system, the Express operating environment, and even a transputer RAM-disk utility which you can make use of when you're not "transputing."

Data sheets and price lists for these "other" products are available from CSA upon request.

Field-Upgrade Price Tables

Table 1

Processor Upgrade Prices

Processor Model	Part Number	Price
20-MHz T425	T42520	$189.54
25-MHz T425	T42525	236.52
20-MHz T805	T80520	315.90
25-MHz T805	T80525	395.28

Table 2

Memory Upgrade Prices

DRAM Component	Part Number	Price
80ns 256Kx4 DIP	DRAM-256Kx4-80-DIP	Inquire
60ns 256Kx4 DIP	DRAM-256Kx4-60-DIP	Inquire
80ns 1Mx4 DIP	DRAM-1Mx4-80-DIP	Inquire
60ns 1Mx4 DIP	DRAM-1Mx4-60-DIP	Inquire

Table 3

Memory Daughterboard Prices

Circuit Board	Part Number	Price
For 16 256x4 DIP's (i.e. for 2 MB)	TEK.2	38.50
For 8 1Mx4 ZIP's (i.e. for 4 MB)	TEK.3	Inquire

Table 4

Software Upgrade Prices

Software	Part Number	Price
TXXX C Toolset for the Kit	TEK.C	200.00
TXXX Occam2 Toolset for the Kit	TEK.Occam	500.00
T4XX Modula-2 for the Kit	TEK.Modula-T4	100.00
TXXX Modula-2 for the Kit	TEK.Modula-TX	200.00
TXXX C for the Kit (Site License)	TEK.C-Site	1,600.00
T4 M-2 for the Kit (Site License)*	n.a.	*
TX M-2 for the Kit (Site License)*	n.a.	*

*You may use the square of the number of Modula-2 copies purchased.

Remember! Both the Transputer Education Kit and Kit Add-On-Processor boards can be initially procured with the equivalent of any of the upgrade options listed above. The prices listed above are for components or software purchased from CSA after the time of original purchase. As such, the kit owner must install any upgrade components himself (or herself), and the CSA one-year warranty must be considered void thereafter. This is not meant to discourage you, but rather reflects the only practical position possible for the company.

Upgrade components (processors and memory, in particular) need not be purchased from CSA, as other vendors may carry these same components.

Accessory Price Tables

Table 1

Cable Prices

Description	Part Number	Price
10 in. Mini-8 DIN (male/male)	CABLE-DIN8-MM-1	$8.00
20 in. Mini-8 DIN (male/male)	CABLE-DIN8-MM-2	10.00
6 ft. Mini-8 DIN (male/male)	CABLE-DIN8-MM-6	10.00
25 ft. Mini-8 DIN (male/male)	CABLE-DIN8-MM-25	25.00
25 ft. Mini-8 DIN (male/female)	CABLE-DIN8-MF-25	25.00
50 ft. Mini-8 DIN (male/male)	CABLE-DIN8-MM-50	40.00

Table 2

LED Indicator Prices

Description	Part Number	Price
Single right-angle red LED	LED-R-1	2.00
Set of 8 right-angle red LED's	LED-R-8	15.00

Table 3

Interfacing Kit Accessory Prices

Description	Part Number	Price
Serial link interfacing kit	TEK.A1	25.00
Parallel port interfacing kit	TEK.A2	20.00

Table 4

Complementary CSA Products

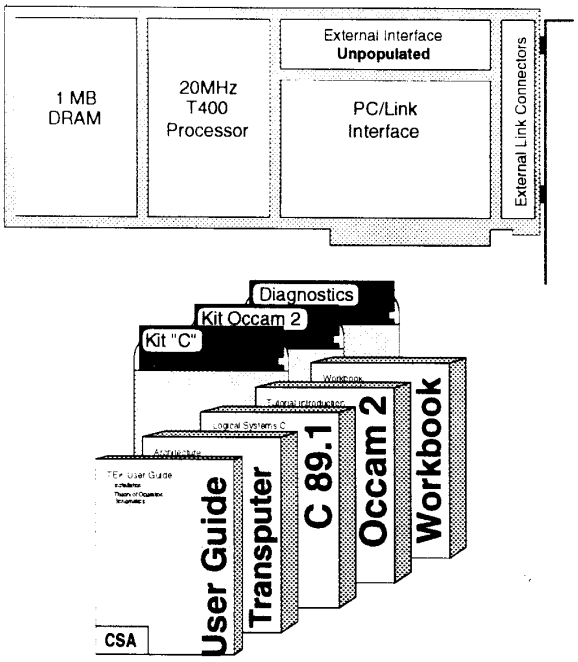
Description	Price
Standard Logical Systems C toolset	400.00
Standard Occam2 toolset	938.00
Standard Modula-2 for T4XX transputers	400.00
Standard Modula-2 for T4XX & T8XX transputers	500.00
Pascal (from 3L)	750.00
FORTRAN (from SGS-Thomson/Inmos or from 3L)	938.00
C (from SGS-Thomson/Inmos or from 3L)	938.00
ParaScope network debugger for LS C (above)	300.00
Helios Unix-like operating system (two user)	1,600.00
Express operating environment	1,500.00
Transputer Technical Notes	29.00
T425 quad-board with 256KB per transputer	2,150.00
T425 quad-board with 1MB per transputer	2,460.00
T805 quad-board with 256KB per transputer	3,040.00
T805 quad-board with 1MB per transputer	3,360.00
T805 single processor board with 8MB	2,200.00
T222 prototyping board with 64KB SRAM	610.00
Programmable 32x32 link switch board	520.00
Link/PC interface board	220.00
6-link/VME interface board	1,510.00
4-slot expansion cabinet	285.00
16 T425 4-user system with 1MB per processor	23,355.00
16 T805 4-user system with 1MB per processor	26,955.00
64 T425 4-user system with 1MB per processor	64,635.00
64 T805 4-user system with 1MB per processor	79,035.00
64 T805 16-user system with 1MB per processor	82,440.00

The table above includes just a sampling of CSA products which are compatible with the Transputer Education Kit. Feel free to contact CSA directly for a complete price list and data sheets.

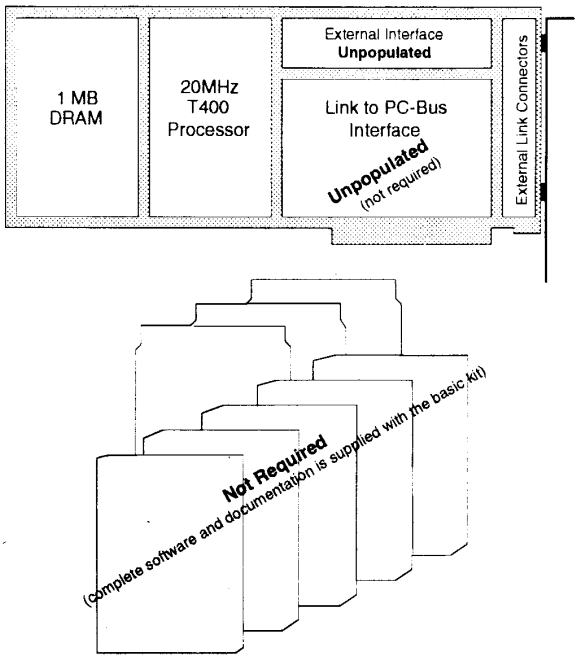
Prices are in US dollars and are subject to change without notice.

Transputer Education Kit Prices

Transputer Education Kit
$396



Add-On-Processor Board
$296



Options

Processor: You can purchase either the entry-level Kit or Add-On-Processor boards with 20-MHz T400 transputers installed (as priced above), or you may opt to have 20 or 25 MHz T425 or T805 transputers installed instead. If you choose the T425 or T805 option, however, you will need to purchase your kit with more fully-featured software as well, in order to exploit the additional capabilities of those processor models.

Memory: You can purchase either the entry-level Kit or Add-On-Processor (AOP) boards with 1 MB of 80 nanosecond DRAM installed (as priced above), or you may opt for more memory (2 or 4 MB) and/or faster (60 ns) devices. The 80 ns devices support zero-wait-state performance for 20-MHz processors, or one-wait-state for 25-MHz models. 60 ns memory yields zero-wait-states, even at 25 MHz. (By the way, it is even possible to order Kits and AOP's with no DRAM at all.)

Software: The C and Occam2 program development systems which are delivered with the entry-level kit (as priced above) have some limitations. In particular, the C does not support floating-point arithmetic, and both the C and the Occam2 are targeted only to the T400 installed in a Kit board. That is, the C and Occam2, as delivered with the entry-level Kit, do not support the T425 or the T805, nor do they support program development on other than Kit boards. But do not be misled. Both are very powerful implementations, each being capable of exploiting all of the special architectural features unique to the transputer. Both development systems have more fully-featured counterparts, however, which can be specified at the time of initial acquisition or purchased afterwards.

The following tables show limitations in the capability of the various software options relative to various processor options. The right-hand table also includes entries for a special new release of CSA's Modula-2 for the Kit, which you can arrange to receive in addition to C and Occam2 for a modest additional cost.

	Come Standard with the Kit	
	T400 Kit C	T400 Kit Occam2
T400	1,2,3	2,3
T425	1,2,3	Not Supported
T805	Not Supported	Not Supported

	Available at an Additional Cost			
	TXXX Kit C	TXXX Kit Occam2	T4XX Kit Modula-2	TXXX Kit Modula-2
T400	2,3	no limitations	2,3	2,3
T425	2,3	no limitations	2,3	2,3
T805	2,3	no limitations	Not Supported	2,3

1. No floating point arithmetic support. Also, the loader supports only a linear down-load chain (sufficient for T400's).
2. Does not include sources for the PC server program and for the library functions.
3. Limited to use with the Transputer Education Kit. (For an array of transputers, at least the root node must be a Kit board.)

Price Tables

Table 1

Entry-Level Kit Prices

Kit Model	Designator	Price
Entry-Level Transputer Education Kit	TEK.1	$396.00
Entry-Level Add-On-Processor Board	TEK.1A	296.00

Table 2

Additional Costs for Processor Upgrades

Processor	Designator	Add
20-MHz T400	-T40020	0.00
20-MHz T425	-T42520	150.00
25-MHz T425	-T42525	200.00
20-MHz T805	-T80520	300.00
25-MHz T805	-T80525	375.00

Table 3

Additional Costs for Memory Upgrades

Memory	Designator	Add
On-chip SRAM only	-X	Inquire
1MB of 80ns DRAM	-1M80	0.00
1MB of 60ns DRAM	-1M60	50.00
2MB of 80ns DRAM	-2M80	140.00
4MB of 80ns DRAM	-4M80	Inquire
4MB of 60ns DRAM	-4M60	Inquire

Table 4

Additional Costs for Software Upgrades

Software	Designator	Add
T400 C and T400 Occam2 for the Kit	<blank>	0.00
TXXX C Toolset for the Kit	-C	150.00
TXXX Occam2 Toolset for the Kit	-O	500.00
T4XX Modula-2 for the Kit	-M4	100.00
TXXX Modula-2 for the Kit	-M8	200.00

Part Numbering and Price Calculation Examples

Options	Option Designator	Price
Kit Model	TEK.1	$396.00
Processor	-T40020	0.00
Memory	-1M80	0.00
Software		0.00
	TEK.1-T40020-1M80	$396.00
	Part Number (combined designators)	**TOTAL**

Options	Option Designator	Price
Kit Model	TEK.1	$396.00
Processor	-T42520	150.00
Memory	-2M80	140.00
Software	-C	150.00
	TEK.1-T42520-2M80-C	$836.00
	Part Number (combined designators)	**TOTAL**

Options	Option Designator	Price
Kit Model	TEK.1A	$296.00
Processor	-T40020	0.00
Memory	-1M80	0.00
Software		0.00
	TEK.1A-T40020-1M80	$296.00
	Part Number (combined designators)	**TOTAL**

Options	Option Designator	Price
Kit Model	TEK.1A	$296.00
Processor	-T80020	300.00
Memory	-1M80	00.00
Software		0.00
	TEK.1A-T80020-1M80	$596.00
	Part Number (combined designators)	**TOTAL**

Prices are in US dollars and are subject to change without notice.

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Shortform Price List

1 June 1992

CSA Transputer Education Kit Products

Price	PART Number	Description
$396 546 696 821	TEK.1-T40020-1M80 TEK.1-T42520-1M80 TEK.1-T80520-1M80 TEK.1-T80525-1M60	Transputer Education Kit with single transputer & 1 Mbyte of no-wait state memory, over 1500 pages of documentation, schematics, RAM-Disk, test & demonstration programs. Kits are also available with 2 or 4 Mbytes of memory. Transputer Education Kits with T400 processors come with T400 C and Occam compilers and debuggers. Kits with T425/T805 processors require Kit or professional software packages.
296 446 596 721	TEK.1A-T40020-1M80 TEK.1A-T42520-1M80 TEK.1A-T80520-1M80 TEK.1A-T80525-1M60	Transputer Education Kit Add-On-Processor Board with single transputer & 1 MB of no-wait-state memory. Boards are also available with 2 or 4 Mbytes of memory. No PC link interface included (or required). To be used with the Transputer Education Kit or a PART.0 PC/link interface. Draws power from PC or PC/AT format card slot.
25	TEK.A1	Transputer serial link interfacing kit. Interface external devices via a transputer link.
20	TEK.A2	8-bit parallel port interfacing kit. Interface external devices via the port on the Kit board.
38.50	TEK.2	Memory daughterboard. Requires 16 256Kx4 chips. For use with Kit or AOP boards.

Software Products for use with the Transputer Education Kit

100	TEK.ParaScope	CSA ParaScope Debugger for Logical Systems C on the Transputer Education Kit board.
100 200	TEK.Modula-T4 TEK.Modula-Tx	CSA Modula-2 for the Transputer Education Kit. Includes compiler, loader, source-level debugger, IO Library, and support for mouse, menus and windows.
200	TEK.C	Txxx C Toolset for the Transputer Education Kit. Same as LS-C/PC, but without any sources.
500	TEK.Occam	Txxx Occam 2 Toolset. Same as IMS D705/PC Occam2 Toolset.
All software listed below as professional software can also be used with the Transputer Education Kit.		

Professional Software Packages

395 100 425 130 595	LS-C/PC LS-C/PCv89.1 upgrade LS-C/SUN LS-C/SUNv89.1 upgrade LS-C/Mac	Logical Systems C Transputer Toolset version 91.1. License for one PC , one SUN, or one Macintosh user.
995 1025	LS-C/PC (source) LS-C/SUN (source)	Source code to Logical Systems C Transputer Toolset version 91.1.
300 400	PART.S30/PC PART.S30/SUN	CSA's source-level debugger for use with Logical Systems C. Mouse and EGA or VGA display required for PC version. License for one PC or one SUN user.
400 500 995	PART.S12/PC PART.S11/PC PART.S10/PC	CSA's Modula-2 for transputer networks. Includes compiler, loaders, source-level debugger, run-time library, math library, I/O library, and support for mouse, menus, and windows. PART.S10 includes library sources. PART.S12 supports only T4xx transputers.
938 4130 995	IMS D7205/PC IMS D5205-1/SUN IMS D7205/Mac	SGS-Thomson/Inmos Occam2 compiler. License for one PC user, four SUN users, or one Macintosh user.
938 4130 995	IMS D7214/PC IMS D5214-1/SUN IMS D7214/Mac	SGS-Thomson/Inmos ANSI C compiler. License for one PC user, four SUN users, or one Macintosh user.
938 2584	IMS D713/PC IMS D513-1/SUN	SGS-Thomson/Inmos FORTRAN compiler. License for one PC or four SUN users.
750 2000 895	3L-C/PC 3L-C/SUN 3L-C/Mac	3L Parallel C compiler and configurer v 2.2. License for one PC , one SUN, or one Macintosh user.
475 995	3L-C++/PC 3L-C&C++/PC	3L Parallel C++ compiler v 2.1. Requires Parallel C. License for one PC user.
750	3L-F/PC	3L Parallel FORTRAN 77 compiler and configurer v 2.1. License for one PC user.
750 895	3L-P/PC 3L-P/Mac	3L Parallel Pascal compiler and configurer v 2.0. License for one PC or one Macintosh user.
330	3L-Tbug/PC	3L Tbug debugger v 1.1. License for one PC user.
350	PL-PROLOG	Paralogic's n-parallel Prolog. (Priced per node. Multi-node discounts available.)
1500	DSL H44002-1	Helios Transputer Operating System with C compiler licensed for use with up to 20 transputers.
50 50	CSA C Graphics/PC CSA Modula Graphics/PC	Graphics package for use with Logical Systems C or CSA Modula 2. EGA/VGA compatible. Mouse/Text support. License for one PC user.

CSA PART Series Professional Transputer Products

Price	PART number	Interface	Transputers ↓	RAM	Description
220	PART.0	PC-Bus	0	none	PC/Link interface. For connecting transputers to a PC. Compatible with boards from Inmos and other vendors. Supports Programmed I/O, PC interrupts and PC DMA. PC format.
1530 2200 3090	PART.1-4(T40020-256K0) PART.1-4(T42520-256K0) PART.1-4(T80520-256K0)	none	4	1MB	Four transputers on a PC format board with 256 KB of no-wait state memory per transputer.
1500 1730 1590 1870	PART.5-T42520-4M0 PART.5-T80520-4M0 PART.5-T42525-4M1 PART.5-T80525-4M1	PC-Bus	1	4MB	One transputer with 4 MB of local memory with parity and PC/Link interface for programmed I/O, DMA & PC interrupts. PC/Link interface contains switch selectable I/O address & link speeds. AT height.
2140 2360 2220 2500	PART.5-T42520-8M0 PART.5-T80520-8M0 PART.5-T42525-8M1 PART.5-T80525-8M1	PC-Bus	1	8MB	One transputer with 8 MB of local memory with parity and PC/Link interface for programmed I/O, DMA & PC interrupts. PC/Link interface contains switch selectable I/O address & link speeds. AT height.
4780 5010 4470 4750	PART.5-T42520-16M0 PART.5-T80520-16M0 PART.5-T42525-16M1 PART.5-T80525-16M1	PC-Bus	1	16MB	One transputer with 16 MB of local memory with parity and PC/Link interface for programmed I/O, DMA & PC interrupts. PC/Link interface contains switch selectable I/O address & link speeds. AT height.
8700 8920 7980 8260	PART.5-T42520-32M0 PART.5-T80520-32M0 PART.5-T42525-32M1 PART.5-T80525-32M1	PC-Bus	1	32MB	One transputer with 32 MB of local memory with parity and PC/Link interface for programmed I/O, DMA & PC interrupts. PC/Link interface contains switch selectable I/O address & link speeds. AT height.
1880 2540 3440 3070 4190	PART.6-4(T40020-1M0) PART.6-4(T42520-1M0) PART.6-4(T80520-1M0) PART.6-4(T42525-1M0) PART.5-4(T80525-1M0)	none	4	4 MB	Four transputers on a PC format board with 1 Mbyte of no-wait-state memory per transputer. Boards with fewer transputers available.
3060 3950 3780 4890	PART.6-4(T42520-2M0) PART.6-4(T80520-2M0) PART.6-4(T42525-2M0) PART.6-4(T80525-2M0)	none	4	8 MB	Four transputers on a PC format board with 2 Mbytes of no-wait-state memory per transputer. Boards with fewer transputers available.
5440 6330 5780 6890	PART.6-4(T42520-4M0) PART.6-4(T80520-4M0) PART.6-4(T42525-4M0) PART.6-4(T80525-4M0)	none	4	16 MB	Four transputers on a PC format board with 4 Mbytes of no-wait-state memory per transputer. Boards with fewer transputers available.
520 750	PART.7-1 PART.7-2	none	0	none	32 x 32 link switch. Single or dual switches with differential link drivers and receivers. PC format.
1510	PART.8	VME-bus	0	none	Quad 32-bit VME-bus link interface. 6U VME format. For use with SUN systems with VME slots.
920 1650	PART.12-1(T22220-64K0) PART.12-2(T22220-64K0)	SCSI-bus	1 2	64 KB 128 KB	T222 transputer with 64 Kbytes of SRAM and a 5 Mbyte/s SCSI interface. Independent single or dual interfaces on PC/AT format board. Optional mounting of disks available.
610	PART.13-T22220-64K0	—	---	—	Prototyping board with T222 and 64 Kbytes of SRAM mounted at the card-guide end of the board. Socketed for EPROM. PC/AT format.
795	Macintosh Interface	NuBus	0	none	Link interface for connecting transputers to a Macintosh.
Inquire	TRAMS & Motherboards	—	---	—	TRAM products available from multiple vendors. Call for pricing.

CSA Cables and PC Expansion Chassis

35 35	TEK-to-CSA Cable TEK-to-Inmos Cable	6 foot single link cable for connecting the Transputer Education Kit to CSA PART series boards. 6 foot single link cable for connecting the Education Kit to Inmos boards with 1x5 connectors.
8 10	Cable-DIN8-MM-1 Cable-DIN8-MM-6	1 foot cable for interconnecting Transputer Education Kits and/or Add-On-Processor boards. 6 foot cable for interconnecting Transputer Education Kits and/or Add-On-Processor boards.
100	PART.C2-72	6 foot four link cable for externally connecting PART series boards.
285	PART.E4T	4 slot table-top expansion chassis with passive AT-bus, 100W power supply, and fans.
1100	PART.E6T	6 slot table-top expansion chassis with passive AT-bus, 200W power supply, and fans.
2800	PART.E20R	20 slot rack-mountable expansion chassis with passive AT-bus, 400W power supply, and fans.

U.S. price list. Prices shown in U.S. dollars. Prices subject to change without notice. Firm price quotations available upon request.

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