{LC with ALC module
∴ Pascal
T-A2 gate arrays

M E M O R A N D U M
September 23, 1982

1) T-June?
LC-Fall
A2-May/July

2) T-June
LC-June
A2-Sept

TO: Herb Shanzer

COPY TO: Tom Ferrio
C. B. Wilson
Mark Waldin

FROM: Douglas Dobbs

SUBJECT: 1983 Plans, Schedule, and Rationale

* Introduction

This paper summarizes our proposed plans for 1983. It contains our impression of major trends, several specific obstacles to our long-term success, a summary of the strategic requirements given our market environment, and detailed product plans with rationalization to the strategic thrusts.

The background information for our strategic position is stated in your TI-88 white paper. That document, on the whole, reflects our view quite accurately. The rapid acceptance of BASIC calculators, increasingly at the expense of keystroke products, has been readily discernible in our market surveys. The decision to concentrate on the growth segment of portable computer products as an alternative to continued investment in the declining keystroke market is a rational one for price points which we can penetrate effectively with computer-like products.

* IC Strategy - Reduction of non-TI IC Content

The current trends are expected to continue into the future making the contemporary "BASIC calculator" as much an anachronism several years from now as keystroke calculators are today in the $150 and over price range. Computer features as exemplified by programming languages and powerful broad-based application packages will rapidly migrate from microcomputers to the portable hand-held products. We have drawn an essential set of technologies together on the current PDS-4000 product to act as a springboard toward development along these trends. A major challenge is to reduce the non-TI content of our products through aggressive lobbying for CMOS products and large-pin-count packages within TI. This must be accompanied by simultaneous reductions in the cost of our semiconductor content and reduction in cycle time from ROM code release to production part availability. Six catagories of chips require attention in the near-term:

1. TMS7000 family members with increased capability in CMOS and large-pin-count packages.

2. CMOS ROMs in ranges from 8K bytes to 128K bytes.

3. CMOS RAMs of 8K bytes and larger.

4. CMOS gate array technology with large-pin-count packages.

5. CMOS custom chip capability to replace gate arrays after initial production.

6. CMOS Liquid Crystal Display (LCD) drivers.

All of these components except the first are now being purchased outside of TI, many from Japanese vendors. We must be capable of acquiring many of these components internally to stay competitive in the long run.

* Overview of Product Strategy

Our project planning for 1983 assumes the following priorities:

I. Computer languages thrust. This involves the introduction of several popular computer languages on our portable products and includes the development of other necessary computer features to support and complement these. The different needs of end-users and software authors must be provided for.

II. ALC-T/C products to address the highly mobile professional in need of computer power and provide an attractive alternative to products such as the Osborne in certain applications.

III. Rapid introduction of broad-based problem solutions through application software. This includes products such as spreadsheets, data base managers, and emerging equation-set solvers.

IV. Applications specifically targeted to problems. Examples are aviation, surveying, and programs of interest to government agencies.

V. ALC-LC as a tactical product to complete our product line at $100 street price.

VI. Development of low-cost peripheral accessories to

strengthen the pull of our product line and demonstrate our committment to the ALC bus.

Excluding the Osborne Killer, TV Interface, and High-perpormance modem our plan requires an increase of three exempts: one EE for C. B. Wilson, one software engineer for Tom Ferrio, and one mechanical or test equipment engineer for Jim Neimeyer. The additional projects would require further staffing.

I. Language Thrust and Integrated Plan

The language thrust involves a numbers game of language availability but also a quality requirement of development capability for third party software authors. The needs of end users and software authors require us to develop both interpretive and compiler languages. A third approach combines a compiler and an interpreter to partially achieve some benefits of each. The UCSD p-System is the primary example of this. These three approaches may be compared as follows:

Attribute	Interpretive	Compiled	UCSD p-System
execution speed	very slow	fast	moderate
time from program entry to execution	very short	very long	long
mass storage required?	no	yes*	yes
final program size	very small	large	small
possible market for applications	only units with language	all units	only units with p-System
system overhead to run applications	large	small	very large
human factors	good	poor	poor

* for compiler languages to work without mass storage the RAM memory requirement is very high to hold both source code and machine code.

These attributes show why interpretive languges epitomized by BASIC are good for end users who develop programs frequently which execute from RAM and who desire to do that development on a minumum system at the expense of program execution speed. On the other hand software authors desire to write programs which have competitive performance and are salable to the largest installed base possible. The UCSD p-System can provide easier portability of applications than either interpretive or compiled languages since the program execution environment is closely defined and consistent from one product to another. Unfortunately, providing this system environment requires 50K bytes of software overhead

in each product compared to about 4K bytes in our current PDS-4000 and is prohibitively expensive at this time. One alternative is to develop a post-processor to the compilers which run on the p-System to convert the intermediate p-codes into machine language. The approach allows the software developer to program in high level languages while still obtaining most of the benefits of assembly language programming. As shown below this is a major effort in our language thrust.

Product plans to support the language thrust are:

1. Development of interpretive language alternatives to BASIC for end users. This will principally be Pascal and FORTRAN. These will be done in-house to capitalize on our software developed for the PDS-4000 BASIC interpreter. We will also investigate other languages for future development where the addition would broaden our product acceptance.

2. Compiled language capability will be developed centered around the UCSD p-System. A code generator will be developed to convert standard p-codes into 7000 machine language code. This capability would initially be limited to desk-top use with an ALC and Microdisk peripheral which is acceptable for software authors. The resulting applications would be assembly language code which could reside in ROM modules or on mass storage such as the Wafertape.

3. Peripheral product development to support the compiler capability. This specifically includes a video interface capabilty and random access mass storage which are both required for the p-System. Home Computer is actively pursuing the video interface through an 80 column monitor with direct ALC bus connection. We will support them aggressively in that effort. We propose doing the mass storage by implementing a 3.5 inch Microdisk peripheral for the ALC bus. Both of these products would be at or over $200 SRP to achieve the required performance.

4. Console product development to better support alternate languages through enhanced RAM capacity and a Language Module Port. This consists of development of the ALC-A2 which has RAM and port capability equivalent to the planned ALC-T.

The proposed schedule to begin this thrust includes:

1. April 1983: Interpretive Pascal ROM module available for the current PDS-4000 product. This would plug into the applicaton port.

2. July 1983: ALC-A2 with plug-in BASIC and Pascal language modules available.

3. August 1983: Interpretive FORTRAN plug-in module available for PDS-4000 and ALC-A2. ALC bus Microdisk drive and 80 column monitor available.

4. September 1983: ALC-Lowcost available.

5. October 1983: ALC-Telecom product available.

6. December 1983: UCSD p-System run-time operational on PDS-4000 and ALC-A2.

7. April 1984: Code generation phase from p-codes to 7000 machine code complete.

The software schedules are based on the risky assumption that ROM turn time can be reduced to 4 weeks either through our current vendors or by acquiring in-house CMOS ROM capability.

II. ALC-Telecom Product

The ALC-Telecom product differs from the PDS-4000 in the following ways to appeal to professionals who require a more complete portable system.

6-line by 40-character display (LCD).
Fully-spaced travel keyboard.
Built-in mass storage with a Wafertape drive.
Built-in telecommunications access with a modem.
Expanded RAM capability (34K internally, 50K maximum).
Language port for maximum software flexibility.
Increased case size to support these features.

This product will be developed in parallel with the ALC-A2, however, due to its complexity and devere resource limitations it will not be complete until October 1983. This product is intended to be completely software compatible with the ALC-A2 and BASIC program compatible with the PDS-4000.

III. Broad-based Software Solutions

Computer products are increasingly being sold for the availability of broad-based applications which are available. This trend will soon become prevalent in hand-held computers. We

intend to concentrate on the following:

Spreadsheets (e.g. Visicalc)
Personal word processing (e.g. Wordstar)
Data base management (e.g. DB Master)
Telecommunications (e.g. 99/4A TE-II)
Equation set solvers (e.g. TK! Solver)
Programming tutorial (e.g. Handholding BASIC)

The development plan is to work closely with outside authors on these projects to offset our limited resources. We will strive to maintain close control over the final products. For instance standard file formats will be required and all data processing packages should be able to interface with the telecommunications package. In certain cases (e.g. TK! Solver) a reasonable business arrangement may prove impossible. In these cases we will defer the project until another author can be located or implement the software in-house. Our goal pending contract negotiation is to have these packages in prototype form (EPROM) in May 1983 with production in August. Again this assumes a ROM turn of 4 weeks.

IV. Specifically Targeted Applications

We will aggressively persue this thrust through software authors. Our concentration will be to encourage these applications without up-front monetary investment by TI.

V. ALC-Lowcost

VI. Low Cost Peripherals

* Budgetary Requirements

The following is our current complete OST ranked list with dollar amounts excluding tooling.

	Cost (K$)	Cum	EXP TLS
ALC-A System Completion	171	171	176
Interpretive Pascal, FORTRAN	403	574	150
ALC-Telecom	875	1449	510
ALC-A2	306	1755	100
Third Party - Part I	465	2220	50
Broad-based Applications	487	2707	210
ALC-A, A2 Cost Reduction	153	2860	100
Low Cost Peripherals	1026	3886	650
ALC-Lowcost	380	4266	445
Compiler Languages	520	4786	80

Microdisk Peripheral	207~	4993	245
Internal Applications	761~	5754	210
Third Party - Part II	400—	6454	50
Osborne Killer	~~815~~ 770-	6969	475
ALC Bus High Perf. Modem	204~	7173	90
Black & White TV Interface	237~	7410	105

ask to high

		2860
LC	380	3240
Comp	520	3760
DISK	207	3967
INIT APP	761	4728
3P (2)	400	5128
OK	770	5898
ALC Modem	204	6102
B&W TV	237	6339