April 10, 1978

Steve Jobs
APPLE COMPUTER INC.
10260 Bandley Drive
Cupertino, CA 95014

Dear Steve:

Per our discussions of the last 2 weeks we are developing the following components of an APPLE II operating system:

1. File manager

2. Basic interface for your integer BASIC and Applesoft BASIC.

3. Utilities for:

    a) backing up a disc

    b) disc recovery

    c) file copy

Not included are SYSGEN nor any other utilities. SYSGEN will be required as another component prior to your shipping DOS to customers. Apple to provide us with the disc driver software.

Price is $13,000. Payable as follows:

1. $5200. Now

2. $7800. Upon delivery.

In addition Apple is to give us two controllers with three drives.
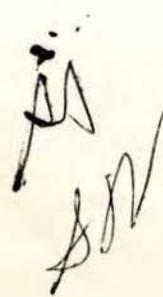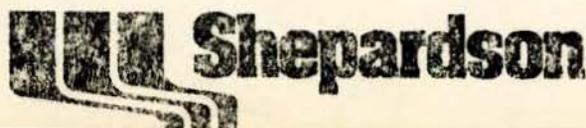
Delivery will be May 15.

Sincerely yours,

Robert C. Shepardson
SHEPARDSON MICROSYSTEMS, INC.

RCS/ks

Shepardson

May 10, 1978

Steve Jobs
APPLE COMPUTER
10260 Bandley Dr.
Cupertino, CA   95014

Dear Steve:

APPLE II SYSTEM CONTRACT

Technical Summary

1. Utility Disk Control Program

    An Integer Basic Program (with machine subroutines) which is the
    INIT Program on the Utility Disk that relocates the booted DOS to
    the highest available RAM in the user system.

2. Operating System

    The user will have a DOS FORMAT Command that will format a new
    diskette and write an operating system boot record. This command
    will consume yet another 512 bytes of DOS.

REQUIRED FROM APPLE (By May 22, 1978)

1. Source code listing of disk format subroutine.

2. Source listing of disk I/O routines.

DELIVERY

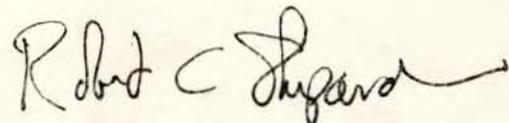May 26, 1978

PRICE

$4,000.00 + sales tax payable on project completion.

Agreed,   Sincerely yours,

Steve Jobs   Robert C. Shepardson
APPLE COMPUTER   SHEPARDSON MICROSYSTEMS, INC
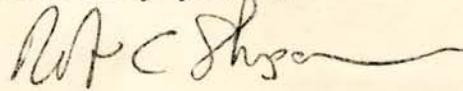
Shepardson

June 16, 1978

Steve Jobs
Apple Computer Company
10260 Bandley Dr.
Cupertino, CA 95014

Dear Steve:

Per our discussion Shepardson Microsystems, Inc. will implement the attached changes to DOS.

Total price is $3500. plus tax to be invoiced when the changes are completed.

Sincerely yours,

Robert C. Shepardson
Shepardson Microsystems, Inc.

RCS:ks
Enclosures

Shepardson

Shepardson Microsystems, Inc.
20823 Stevens Creek Blvd.
Building C4-H
Cupertino, CA 95014
(408) 257-9900

June 26, 1978
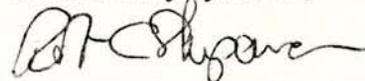
Steve Wozniak
Apple Computer
10260 Bandley Dr.
Cupertino, CA 95014

Dear Steve:

Per your request Paul is going to make the changes agreed upon by
you and Paul today. Estimated effort is 1 man day and will be de-
livered tomorrow if possible. Price $500. as agreed by you and I.

Sincerely yours,

Robert C. Shepardson
Shepardson Microsystems, Inc.

RCS/ks
cc: Steve Jobs

Shepardson

October 5, 1978

Steve Jobs
Apple Computers, Inc.
10260 Bandley Dr.
Cupertino, CA 95014

Reference: Dick Huston 10-4-78 DOS Bugs Memo

Items 1 thru 6 will be repaired by October 20. We will supply you
with the changes to your source (marked up listing).

Sincerely yours,

Robert C. Shepardson
Shepardson Microsystems, Inc.

RCS:ks

cc: Paul Laughton
       Dick Huston
       Bill Thomas

Shepardson

Apple DOS Modification

By 6/20

$1500

* 1. Do not automatically create a "Not Basic Program" on LOAD

* 2. Switch between RAM Applesoft and Integer Basic ~~based~~ based on program type being LOADED ~~loaded~~ and/or RUN + ROM applesoft

3. Eliminate Volume Match requirement on CATALOG

4. At Boot time, set Vol = 0

* 5. Catalog Print out to include Volume No and no free sectors on disk.

Time: 3½ man days
Size: 512 bytes
Available: 6/20/78

Apple DOS Modification

By 6/23

w 1. Allow Hex Notation for Address and length on BLOAD, BSAVE, BRUN

2. Add ~~BLOAD~~ BRUN command

w 3. Include all Parms on catalog
    (Does _not_ include individual file sizes)

w 4. Use INT & FP rather than Applesoft flip flop

5. Add write protection error message

w 6. VERIFY filename

7. Use "Applesoft" as Ram Applesoft filename and recognize LOAD or RUN Applesoft as "FP" command

Time: 4 man days
Size: ~~~~ 650 bytes
Available: 6/23

APPLE-II
ADVANCE ORDER INFORMATION

Apple Computer, Inc. 770 Welch Road, Palo Alto, CA 94304 (415) 326-4248

APPLE-II

Apple Computer shipped its first computer in March 1976. Since that time we have grown to become a major supplier of personal computing systems.

APPLE-II is our newest product. It represents several advancements in the personal computing state-of-the-art: the incorporation of color graphics onto a single-board system along with color graphic commands in a BASIC; a ROM BASIC and monitor; and the use of the new 16k × 1 RAM chips to achieve 48k bytes on-board memory space.

Because of the advanced design, APPLE-II uses 1/3 to 1/4 the number of components previously used in 1st generation personal computing products. This has a significant effect on reliability and enables APPLE-II to be priced below competitive systems of inferior capability. As all APPLE products, APPLE-II is delivered **fully assembled & tested,** making it a truly off-the-shelf computer system, priced below the cost of many kits.

THE PRODUCT

Apple-II consists of a 6502 microprocessor, powerful video display electronics including color graphics, from 4k to 48k bytes on-board RAM, up to 12k bytes ROM (8k supplied—6k BASIC, 2k monitor), a cassette interface, an ASCII keyboard port and the APPLE GAME I/O connector for paddles and other game controls, **all on a 8½ × 11 (legal size) PC Board!** Listed below is a brief overview of the product.

VIDEO DISPLAY

The Apple-II includes a versatile video display section which displays memory as **text, color graphics,** or **hi-resolution graphics** (completely transparent memory access). Both graphics modes can be optionally selected to include 4 lines of text at the bottom of the display area. **All display modes are software selectable.** In addition, the user can select under software one of two memory blocks to be displayed.

Text
- 40 characters/line, 24 lines.
- 5 × 7 upper case characters.
- Normal or inverse video.
- Extensive display control software in ROM.
- Full cursor control.
- Fast display.
- Dual page mode.

Color Graphics
- 40h × 48v resolution.
  (40h × 40v with 4 lines text).
- 16 colors.
- BASIC commands to use easily: COLOR=, PLOT, HLIN, VLIN, SCRN.
- Color generation done digitally.
- Dual page mode.

Hi Resolution Graphics
- 280h × 192v dots.
  (280h × 160v with 4 lines text).
- 4 colors—black, white, blue, green.
- Displays 8k bytes (requires 12k minimum system).
- Dual page mode.

MEMORY

APPLE-II uses **both** the 4k and the new 16k dynamic RAMS. By using 3 rows of the 16k chips (24 chips) the incredible density of **48k bytes on-board RAM** is achieved. APPLE first delivered a microcomputer using 16k RAMS in December, 1976. Apple is, at this time (1st quarter 77), the only personal computer manufacturer using these advanced chips. Since these 16k chips reduce the memory chip count by a factor of 16 (compared to 2102's), the reliability is far superior and the power requirements are reduced enormously. The 16k RAM will be the chip used in future microcomputers, available now, **only** from APPLE.

APPLE-II also includes 8k bytes of ROM memory which contains BASIC (6k) and a powerful system monitor (2k). This makes loading BASIC from tape unnecessary and assures that BASIC is just a few keystrokes away. Two extra ROM sockets are included for future APPLE software.

- **Up to 48K bytes on-board RAM—no external RAM boards needed!**
- The only personal computer system to use 16k RAMs.
- 24 chips = 48k bytes, the equivalent of 384 2102's at 1/20 the power!
- Unique automatic dynamic RAM refresh system (completely transparent).
- **BASIC and MONITOR on ROM.**

I/O

APPLE-II contains a fast cassette interface (1500 bps) which can be called from the monitor or from BASIC (SAVE, LOAD). It is extremely reliable and can be used with **any** home cassette recorder.

APPLE-II has 8 connectors which serve as a peripheral card motherboard. The connectors contain the address, data, control & timing busses, all fully buffered.

Each peripheral slot is numbered (0-7). Many APPLE-II peripherals will contain on-card ROM-based driver software, enabling the BASIC to call the peripheral by simply specifying a slot number (i.e. PR #4, IN #5).

Also included are an ASCII keyboard port, speaker, apple game i-o connector. The APPLE GAME I/O connector greatly simplifies interfacing game controls. It has inputs for 4 pots (paddles, joysticks, etc.), 3 TTL inputs and 4 TTL outputs.

- **Fast cassette interface:** 1500 bps
- **8-slot motherboard**
  - Fully buffered busses & timing.
  - Daisy-chained interrupt priority structure.
  - Daisy-chained DMA priority structure for burst-mode or cycle-steal DMA.
- ASCII keyboard input port.
  - Supplies all power.
  - 7 bits ASCII and positive strobe inputs.
- GAME I/O Connector. Inputs for Paddles, joysticks, buttons, etc.
- **PERIPHERAL BOARDS**
  - Parallel Interface Board—April 77.
  - Serial Interface Board—April 77.
  - A/D, D/A Board—April 77.
  - EROM Board with 2708 programmer—May 77.
  - Music Synthesis Package—June 77.
  - Mini Floppy Controller—July 77.

SOFTWARE

Basic

APPLE BASIC is an integer BASIC supplied in 6k bytes of ROM and includes the following features (ih addition to normal basic features):

- APPLE BASIC is a **fast** translated BASIC.
- Any length variable names (ALPHA, BETA$).
- Syntax and range errors indicated **immediately** when line is entered.
- Multiple statements on one line.
- Integers from −32767 to +32767.
- String arrays to 255 characters.
- Single dimension integer arrays.
- GRAPHICS COMMANDS: COLOR=expr, PLOT, HLIN (draw horizontal line), VLIN, SCRN (x, y) (reads the screen color).
- Paddle read function: PDL (0-3).
- TEXT and GRaphics commands set display mode from BASIC.
- Immediate execution of most statements.
- Memory boundary adjust commands (does not destroy current program).
- Break and Continue program execution.
- Debug commands: line number trace and variable trace (DSP APPLE).
- Switchable I/O device assignments using APPLE ROM-based peripherals.
- Direct memory access: PEEK, POKE, CALL commands.
- Cassette SAVE & LOAD commands.
- Auto line number mode.
- RND, SGN, ASC, LEN and ABS functions.
- POP instruction pops the return stack one level.
- GOTO expr, GOSUB expr allowed.

Monitor

The system monitor is supplied in ROM and enables the user to enter, examine, debug and run assembly language programs. It also contains very useful screen control routines, the cassette routines, a dis-assembler and other debug aids. Since it is supplied in ROM, it is immediately available when the computer is turned on and cannot be inadvertently clobbered.

- 2k byte ROM monitor.
- Screen control (intelligent display routines).
- Full cursor control.
- Scrolling window adjustable (protected screen feature).
- Inverse/Normal video selection.
- Versatile memory store/examine commands.
- Read/Write cassette routines.
- Dis-assembler.
- Mini-assembler.
- Software simulated single-step and trace modes.
- Breakpoint handling.
- Register examine/modify.
- Input/Output device assignment.
- Hex add/subtract for relative branch calculations.
- Editing on keyboard entry.
- Direct calls to BASIC.
- Floating point package.
- Software simulated 16-bit processor.

THE OFFER

We expect a sizable backlog of orders almost immediately after APPLE-I' is nationally announced in April. This advance offer is extended to allow you to order an Apple-II from the first production run, thus be guaranteed delivery by April 30, 1977. The terms of the advance order are as follows:

1. All orders will be processed on a first-come, first-served basis regardless of quantity.
2. A deposit of one-third (1/3) of the total dollar amount ordered will be required and must accompany the order, the balance due on delivery.
3. All California residents must add 6½% sales tax on retail orders.
4. Apple will pay all shipping (UPS) and order handling charges.
5. Delivery is guaranteed on or before April 30, 1977.

The only other items required to start using your APPLE-II are:

- An ASCII encoded keyboard.
- A video monitor (or home TV with RF modulator).
- A power supply:
    - 5v @ 2A
    - 12v @ 1.5A
    - −5v @ .5A
    - −12v @ .5A

    (These current requirements will supply a totally loaded Apple-II with 8 peripheral boards!)
- Case (optional).

All four items above will be available from Apple in April. Check with us for prices.

PRICES

APPLE-II board, completely assembled & tested with 4k bytes RAM	$600.00
Additional RAM: each 4k bytes	$125.00
each 16k bytes	$600.00

APPLE-II prices with all memory options are:

Bytes RAM	Column A Price	Column B Price including 6½% sales tax California residents only
4k	$ 600.00	$ 639.00
8k	725.00	772.12
12k	850.00	905.25
16k	1,075.00	1,144.87
20k	1,200.00	1,278.00
24k	1,325.00	1,411.12
32k	1,675.00	1,783.87
36k	1,800.00	1,917.00
48k	2,275.00	2,422.87

Get on the List

Quantity	Memory	Price each*	Price × Quantity
1. _____	Apple-II(s) with _____ k RAM at $ _____	each. Total = $ _____
2. _____	Apple-II(s) with _____ k RAM at $ _____	each. Total = $ _____
3. _____	Apple-II(s) with _____ k RAM at $ _____	each. Total = $ _____

4. **SUBTOTAL** $ _____

5. **1/3 advance payment** $ _____

6. **BALANCE DUE** $ _____

(subtract item 5 from item 4)

*California residents must include 6½% sales tax on retail sales and should use prices from column B in the price list (which already include 6½% sales tax).

Orders from all other states should use prices from column A.

Name _____

Street _____

City _____ State _____ Zip _____

Date _____ Amount enclosed $_____

Signed _____