MIMIC™

SPARTAN
USER'S
MANUAL

SPARTAN™

USER'S GUIDE

Mimic Systems

Rewritten by Michael Adams
Drawings by Ken Danner

Dedicated to the inumerable people involved directly,
and indirectly in this project, and to the memory of
George Young.
Technical Staff (see &Credit).

Acknowledgement to our heroes and antagonists,
for we are now wiser.

Reorder Mimic Product #M1001

**Limited
Warranty**

Warranty

Mimic warrants that the Spartan is free from defects in
materials and workmanship under normal use. Mimic
warrants that the Spartan will perform substantially in
accordance with the user guide included in this package.
This warranty is made for ninety (90) days after the date
of original delivery to you or your company as the first
user.

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Meet the Spartan

The Spartan is a new breed of computer which gives your Commodore 64 the world of the Apple][. Spartan I (the 'Hacker Version') is the first Apple][+ emulator for the C64.

The *Spartan I* package is made up of three basic components:

the *Spartan I* BUS Card

Gives your C64 complete Apple][+ hardware and software compatibility while retaining and enhancing your existing Commodore system. This version of the Spartan BUS includes:

    8 decoded Apple compatible slots,
    a high speed 8 bit communication link between
        the Commodore and the Spartan CPU,
    a full set of hardware jumpers which allow you
        to easily modify your system configuration,
    switchable audio and video,
    4 Commodore cartridge slots,
     and a Commodore to Apple joystick converter.

the CPU Card

Is the heart of the Spartan system. This Card emulates an Apple][+. It has it's own 6502 processor and 64K RAM. This lets you run two applications simultaneously.

the DOS Card

Mounts inside your 1541 Disk Drive, letting it read and write both Commodore and Apple][media. When using the drive in 'Apple mode' it will read media at a much faster rate than it normally does reading Commodore software.

About this Guide

This manual shows you how to install and use the Spartan with your C64.

The guide is divided into 4 main sections:

Chapter 1: Tells you how to install the Spartan system.

Chapter 2: Shows you how to use the Spartan, and its built in keyboard functions.

Chapter 3: Briefly explains the internals of the Spartan, so you can get the most out of your system.

Chapter 4: Explains the Spartan's theory of operation, and provides an indepth reference of its internals.

Finally, the guide provides appendicies on troubleshooting the Spartan, and aligning your 1541 disk drive for improved operation.

This guide is only intended as an introduction to the Spartan system. Also included in this package, is a copy of *The Elementary Apple* by William B. Saunders, a sound introduction to using the Apple][+.

There are many excellent books written for the Apple][series of computers. Further reading is suggested at the the end of this manual.

Welcome. . .

**This
Chapter
Covers. . .**

This chapter tells you how to install the Spartan system.

The first section explains what you will need to get your Spartan going; it then takes you through the various pieces of the Spartan system.

The second section shows you how to set up the Spartan.

The third section shows you how to turn your 1541 disk drive into an Apple compatible drive.

If you have any problem getting your system to work, consult the appendix called *Troubleshooting the Spartan*, at the end of this guide.

Contents

To get the Spartan system going you will need to provide a few things:

A Commodore 64.

A C64 power supply.

A monitor capable of using an NTSC composite video signal *or* a TV set and an Apple][compatible RF modulator.

A Commodore 1541 Disk Drive *or* an Apple][compatible disk drive, if you want a disk based system.

A Commodore Datassette if you want a cassette based system.

Cables associated with all of the above.

A Number 2 Phillips head screwdriver.
(To install the DOS Card)

Your Spartan is packed with care, but there is always a chance that something is missing, or has been damaged in shipping.

**Check what
you've
received**

Check to make sure your system is complete.

There are many static senstive devices in the Spartan. Remember to discharge yourself against any grounded surface before handling any part of your Spartan.

The packing box should contain the following items:
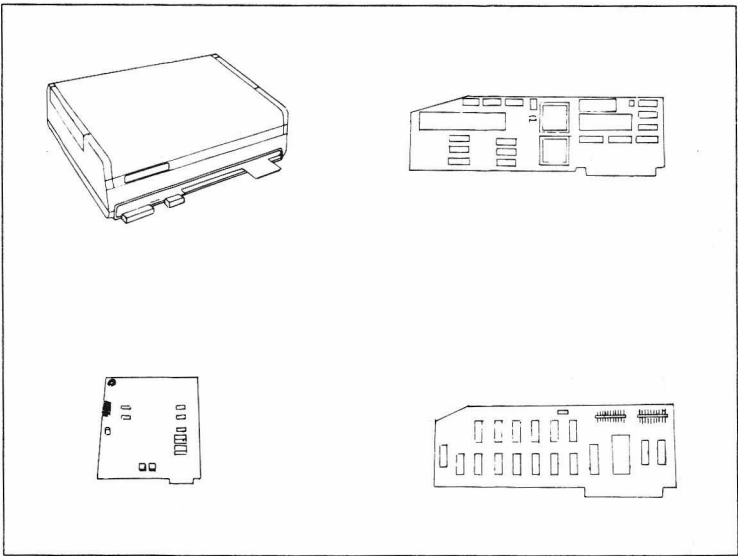
the Spartan BUSS   **the CPU Card**
the DOS Card   **the C2 Drive Controller**

*Note that the CPU Card may already be installed in the Spartan BUSS.
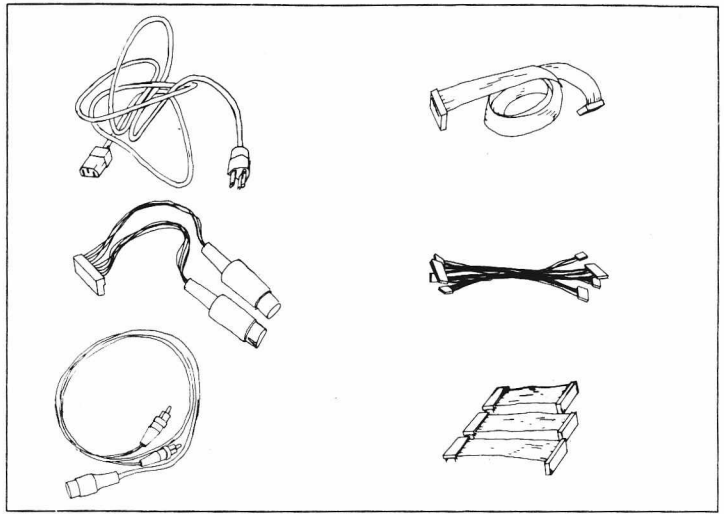
one Power Cord   one DOS Cable
one Duo-Din Cable   one DOS Cable Cluster
one Video Cable   one CPU Cable Cluster

one Filer diskette
This Manual
a Warranty form
Foam tape
The Elementary Apple

**If something
is missing. . .**

If you find something missing from your Spartan package, or if anything appears to have been damaged, contact your Spartan representative for a replacement.

**The Warranty
Form**

Take the time to fill out and return the Warranty form that comes with your Spartan.

Remember to put your receipt away, in a safe place, in case your Spartan ever needs repair.

Your Spartan is warrantted free from defects in materials and workmanship for a period of 90 days from the date of original delivery.

Carefully read the warranty agreement found on the end papers of this manual; these are your only remedies for any breach of warranty.

Installation

The Spartan requires a small amount of assembly.
Some of the installation may already have been done for
you. If so, just skip over the sections that do not apply.

**Test your
C64**

**Before attempting to install your Spartan,
test your C64 to ensure it is working properly.**

Once you are satisfied that your C64 is functioning
properly, begin the installation.

**Installing
the CPU
Card**

Remember to discharge yourself of static charge before
handling the CPU Card.

To install *the CPU Card* you will need the following:
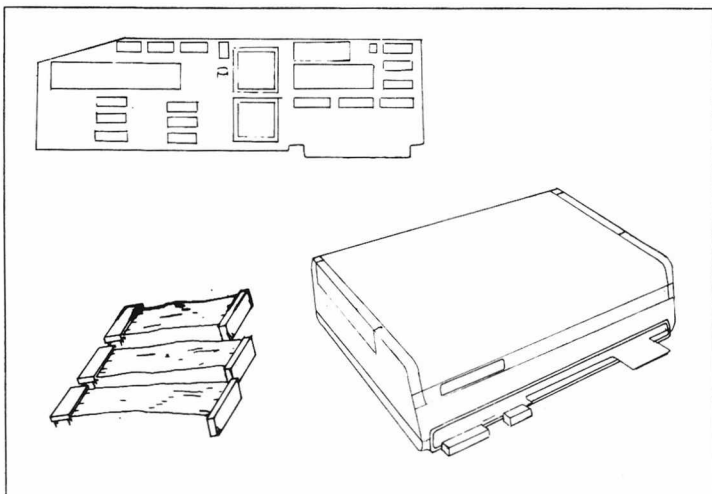
the CPU Card   **the Spartan**
CPU Cable cluster

[A] | **Installing the CPU cable cluster:**

Place the CPU Card and its three cables in front of you.

Ensure that all of the pins on each cable are standing straight up. If any of the pins are bent, they must be carefully straightened using a small pair of needlenose pliers.
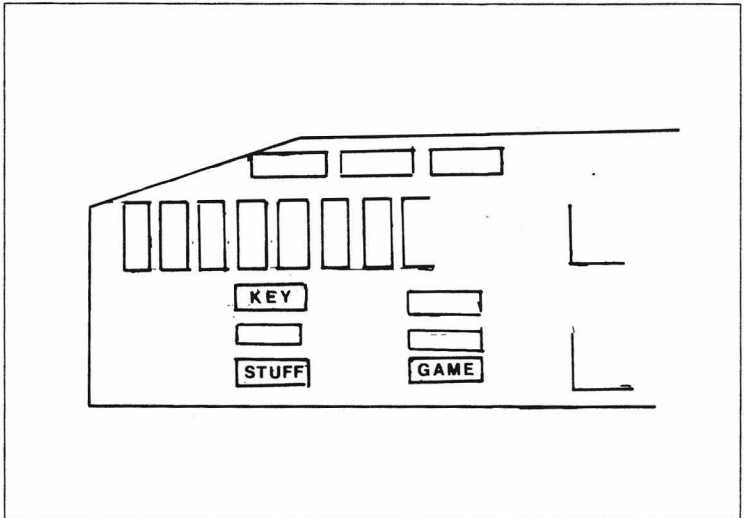
Align the pins of the **shortest** cable atop the **Game** socket, with the cable trailing away from the CPU Card.

Gently push the cable connector into the socket.

Using the same procedure, insert the **medium** length cable into the **Stuff** socket, and the longest cable into the **Key** socket.

Make sure that none of the pins have been bent.

If they are:

Remove the offending cable by placing your index finger under the cable and your thumb on top of the connector.
Gently rock it back and forth until it comes out.
Straighten the pins, then reinsert the cable connector.

The CPU Card should now look like this:
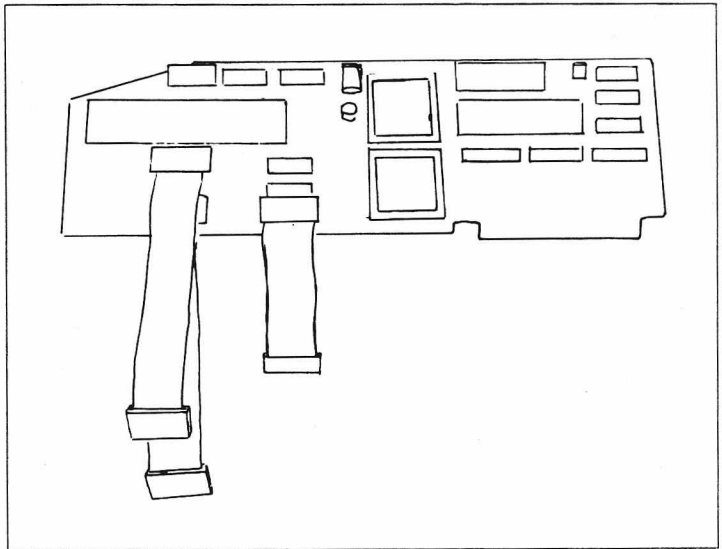
the CPU with Ribbon cables installed

[B] | **Connecting the CPU:**

To open the lid of your Spartan; slide the two latches at the back of the Spartan toward the center; then lift.

Set the lid aside.

Discharge yourself again by touching the case of the Spartan power supply.

Carefully bend the ribbon cables away from the CPU so they <u>will not</u> tuck under the card when you insert it.

Pick up the CPU card and align its fingers with those of **SA** on the Spartan Buss Card.

Press down firmly, with the palm of your hand, until the CPU Card is fully inserted.
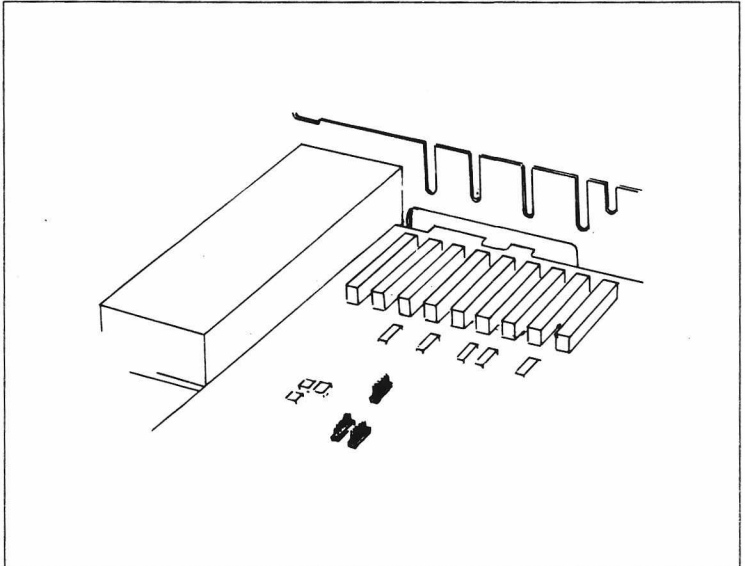
Spartan Buss Card

Examine **J10, J11,** and **J12** on the Buss Card.
Make sure all of the pins are straight.

Align the unattached end of the **short** cable to the pins
of **J10.** Push down on the cable end until it is firmly
seated.

Connect the **medium** length cable to **J11,**
    and the **long** cable to **J12.**

Reexamine **J10, J11,** and **J12.**

If any of the pins are showing (misaligned),
  remove the cable by grasping opposite ends of the
  connector, and rocking gently back and forth.

  Reinsert the cable so that none of the pins are showing.

Press down on the CPU Card to ensure that the card is
fully seated.

The CPU Card should now look like this:
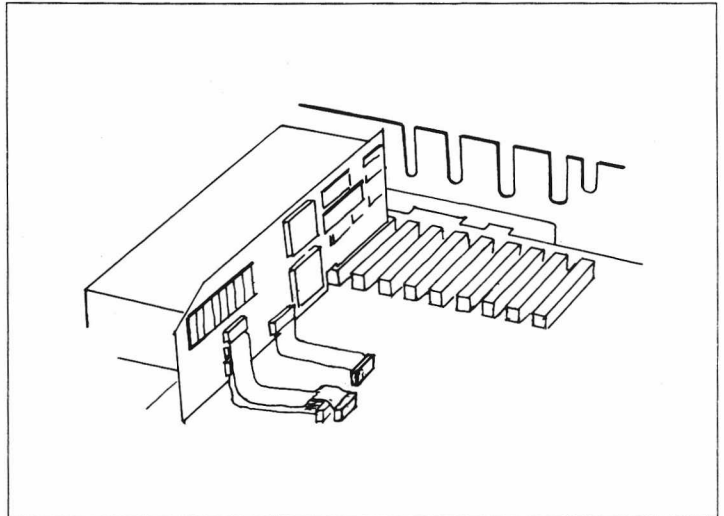
the CPU installed

To mate the Spartan to the C64 you will need the following:
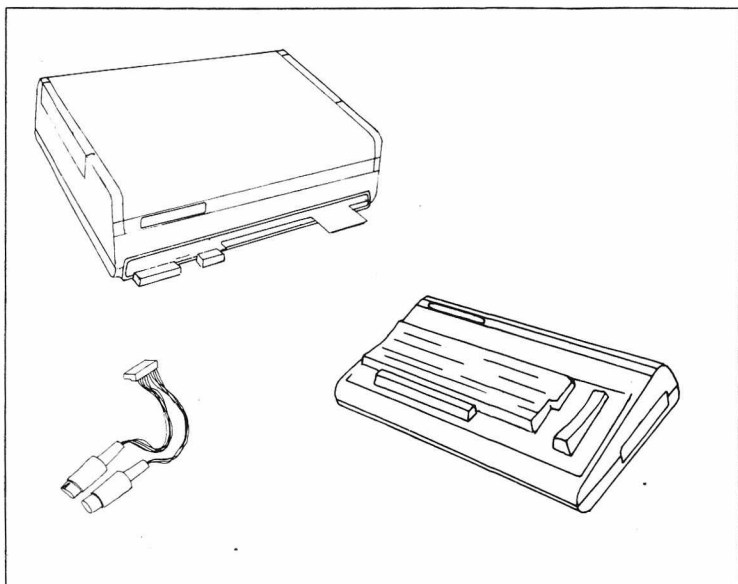
the Spartan   **the C64**
the Duo-Din Cable

[C]

Installing the Duo-Din Cable:

Connect the **single end** of the Duo-Din cable to **J13**
on the Buss Card, so the cable feeds away from the
power supply.

Feed the Din plugs through the slot at the front of the
Spartan.

The Duo-Din should look like this:
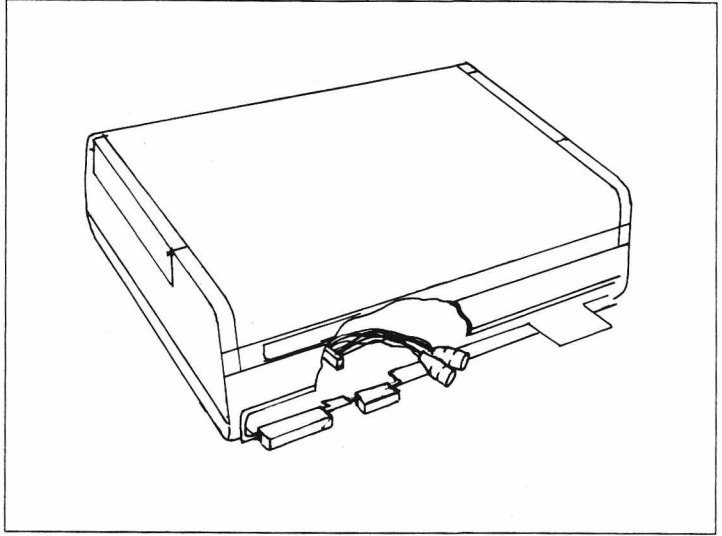
the Duo-Din connected to Spartan

Place the Spartan and the C64 together so that the back of the C64 is close to the front of the Spartan.

Plug the two DIN plugs into the mating connectors on the back of the Commodore. (They only fit one way)

[D] **Mate the Spartan and the C64:**

Make sure that all Spartan and Commodore connectors are aligned, then firmly press (do not force) the two units together.

If the two units do not mate together easily, check the alignment and try again.

NEVER PICK UP THE SPARTAN WITH THE C64 ATTACHED; to do so may permanently damage both machines.

The next step in installing the Spartan is to connect all of the external cables.

To complete the installation you will need the following:

**Mated C64/Spartan
the Spartan power cord
a C64 power supply
the Video Cable
a Video monitor   or   a TV and RF modulator**

Look at the array of connectors on the back of your Spartan.

[E]

The Power Supply:

Find the AC Voltage Range switch on the power supply.

Make sure it is set to 115V (North America).
It may cause serious damage to both machines
if set improperly. Mimic will not be held responsible
for damage caused by improper setting of this switch.

Find the AC Power switch.
Make sure it is in the OFF position.

Find the AC Input.
Plug the female end of the Spartan power cord into it.
Plug the male end into a 115v outlet.
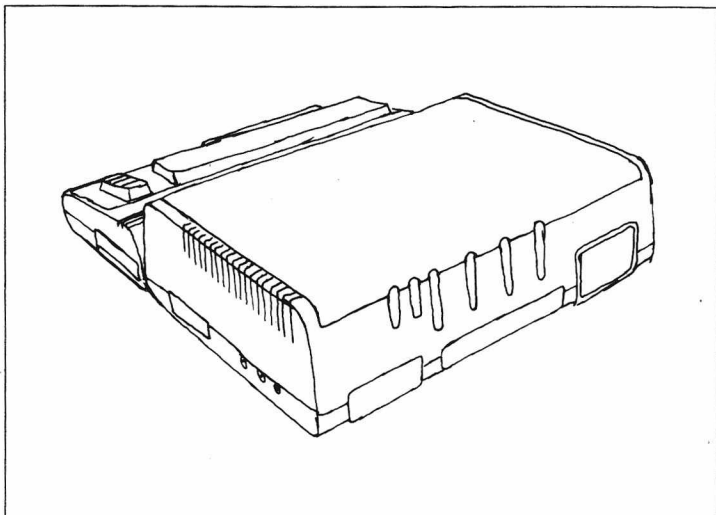
Back of the Spartan

If you have a TV and an Apple compatible RF modulator
go to step **[G]**.

[F]   **Connect the Monitor:**

Plug the Monitor's power cord in.

Take the Video Cable provided, and plug the single end
into **J1(Switched Video)** on the Spartan.

Plug the **Yellow** connector into the **Video Input** on your
monitor.

Plug the **White** connector into the **Audio Input** on your
monitor (If one is provided).

[G] | **Connecting a TV and RF Modulator:**

Plug in your TV.

Plug the strip connector from your RF modulator onto **J6** on the Spartan Buss.

If the connector on your RF Modulator will only accept four pins, plug it onto the lower four pins of **J6.**

Attach the other end of your RF Modulator onto the Antenna terminals on the back of your TV.


```
●   Audio
●   12V
●   -5 V
●   Video
●   Ground
J6
```
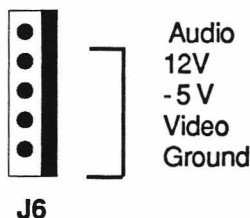
the RF Strip connector and J6

[H] | **Connect the C64 Power Supply:**

The C64 power DIN now connects to **J2** on the back of the Spartan. Note: This disables the C64 power switch.

NEVER PLUG THE C64 POWER DIN INTO THE C64 POWER CONNECTOR WITH THE SPARTAN CONNECTED; to do so may permanently damage both machines.

Plug the other end into an outlet.

Turn on your Spartan. . . Does it work?

You are now ready to test your Spartan.

[I] **Recheck the installation of your Spartan:**

Please recheck the steps you went through to install your Spartan. Care at this stage will eliminate most of the problems that may appear.

[J] **Power Up:**

Turn on your TV or monitor.

Flip the power switch at the back of your Spartan to the ON position.

After your monitor warms up you should see one of the following messages:

(C) 1985 Mimic Systems Inc.

Spartan

****

Spartan
(C) 1986 Mimic Systems

****

Followed by a] and a flashing cursor.

Press the **Return** key a few times; you should see the cursor advance down the screen.

If you get this far; the Spartan's CPU Card is functioning.

Press a few keys to satisfy yourself that you have full keyboard control.

If you have any problem getting to this point,
recheck the steps you've done so far.

If you have no message displayed on the screen,
adjust the brightness control on your TV/monitor.
If this does not help then turn off the Spartan power
supply and recheck the CPU and TV/monitor installation.
Try the power up sequence again.

If you have the power up message but no keyboard
control, check to make sure you've plugged the C64
power supply in properly; also make sure the Spartan
and C64 are mated properly.

If you are still having difficulty, see
Troubleshooting the Spartan, at the end of this guide.

Next, press the **<shift>** and **F2** keys.
You should now see the familiar, blue Commodore 64
screen.

If the screen goes blank instead of showing you the
blue Commodore screen, check the Duo-Din Cable
to ensure it is connected properly. Also make sure the
C64 and Spartan are mated properly.

Press a few keys to ensure you have full keyboard control
on the Commodore side.

Next, press the **<shift>** and **F4** keys.
You should now see the Spartan screen again.

You should be able to toggle between the Spartan and
Commodore screen any number of times by simply
pressing **F2** and **F4**.

If you get this far, your Spartan is functioning properly.

Turn off the Spartan and proceed to the next section.

Now that your Spartan is functioning, you will want to
use Apple][software. Normally, this would require an
Apple][compatible disk drive, but with the Spartan 's
DOS Card you can run both Apple][+ and Commodore
compatible software.

If you intend to use an Apple compatible drive instead
of a converted 1541 Drive, skip to section **[T]** on
Installing the Drive Controller.

[K]   **Testing your 1541 Disk Drive:**

**Before attempting to install the DOS Card in your
1541 Disk Drive, test your drive to ensure it is
working properly.**

To test your 1541 Drive you will need the following:

**A Functioning Spartan System
A 1541 Disk Drive
A Commodore 1541 Test Disk
A Power Cord
A Serial Cable**

Set your 1541 Disk Drive next to your Spartan.

Make sure the drive power switch is in the OFF position.

Plug the Drive power cord into the drive, and a nearby outlet.

Take your serial cable, and connect one end to the 1541 Disk Drive.

Connect the other end to **J3** on the back of the Spartan.

Your setup should now look like this:
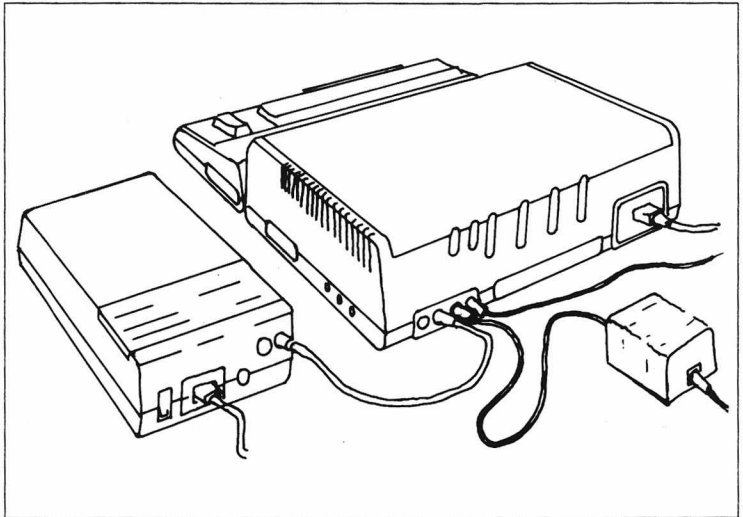
A C64/Spartan System with 1541 Drive Connected

Turn on your 1541 Drive.

Turn on your Spartan system, and TV/monitor.

When you have the prompt and flashing cursor in Spartan mode, press **F2** to go to Commodore mode.

Once in Commodore mode:

Insert a Commodore 1541 Test Disk
  (It came with your 1541 drive, if you don't have one, use any standard utility disk).

Press **\<Return\>** a few times, then type: **Load "$",8**

If you get a 'device not present' error;
  check the serial cable and the Duo-Din Cable.

Once the Disk directory is loaded, list it and run the
  Read/Write and Speed test.

When you are satisfised that your drive is functioning
properly; turn off the system, and disconnect the serial
and power cables from the 1541.

If your drive does not function properly with the Spartan,
but does work with your C64 alone, then recheck
the installation to this point and see *Troubleshooting the
Spartan* at the end of this guide.

If your drive doesn't function at all, have it repaired by a
qualified service technician.

**Installing the
DOS Card**

To install the DOS Card you will need the following:
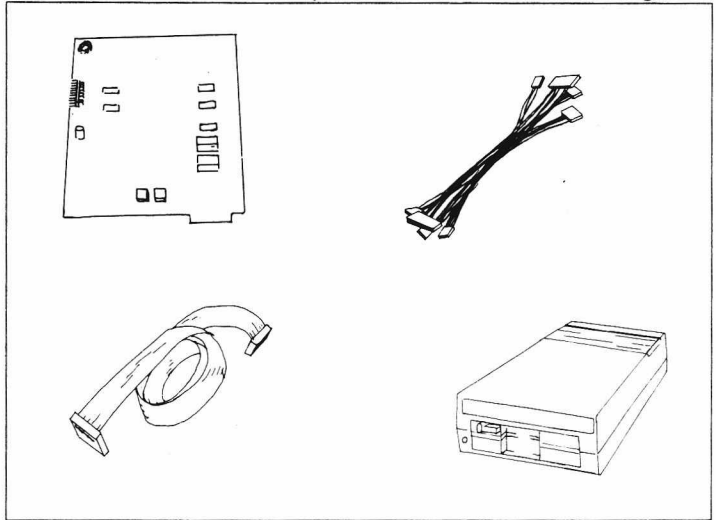
A DOS Card   **A DOS Cable Cluster**
A DOS Cable   **A 1541 Disk Drive**

A Phillips Screwdriver
4 Squares of Foam Tape

The notion of working on your drive may disturb you,
but if you follow these instructions carefully, it will be easy.

[L]   **Remove the lid of your 1541 Disk Drive:**

Remember to discharge yourself of static charge before
handling the DOS Card or your disk drive.

Ensure your drive is unplugged.

Turn the disk drive over and remove the four screws
from the recessed holes in the bottom.
Put them somewhere safe.
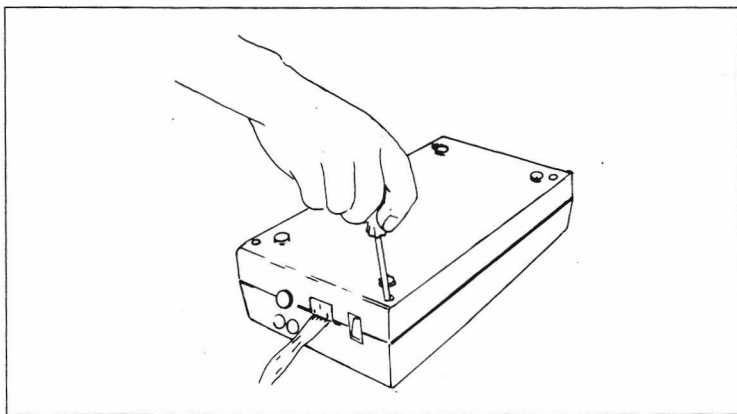
Turn the disk drive back over. Remove the lid and place it
beside the unit.

Some disk drives have a metal cover over the 1541 drive
controller card. Remove this cover and put it and its
screws in a safe place.
This cover is not used when the DOS Card is installed.

Identify the Commodore Controller Card:

Commodore has produced many versions of the 1541 drive controller card. There are 3 styles that the DOS Card will work with.

Examine your disk drive unit.

The controller card in your 1541 should look like one of the following:
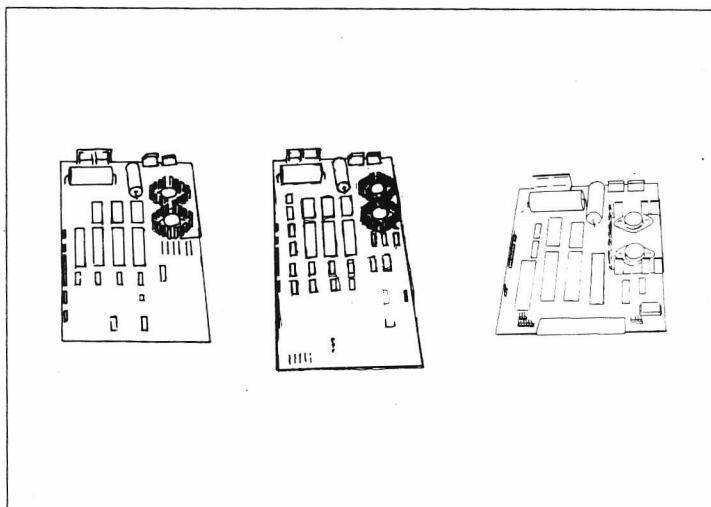
Type A   Type B   Type C
1541 Drive Controller Cards

Type A Controller Cards are 2/3 the length of the drive unit, and have 5 connectors (labeled P4 to P8) in a row on the lower left side of the card.

If you have a Type A Controller Card go to step **[NA]**.

Type B Controller Cards are longer than Type A cards, they extend to within 2 inches of the front of the drive.

If you have a Type B Controller Card go to step **[NB]**.

Type C Controller Cards are shorter than Type A and B, and have their connectors located along the side and front edges of the card.

If you have a Type C Controller Card go to step [NC].

[NA] **Connecting the DOS Card to a Type A Controller:**

Some Type A Controllers have two metal boxes on the lower right side of the card. These may interfere with the DOS Card when you re-seat the lid on your drive. If you find that they are in the way you should have them removed by a qualified service technician.

[OA] **Connect the DOS Cable to the DOS Card:**

Insert one end of the DOS Cable into the connector marked **J1** on the DOS Card, so the cable trails away from the <u>back</u> of the card (Side with no components).

DOS Card with DOS Cable Installed

Mount the DOS Card:

Stick one square of double sided foam tape in each corner, on the back of the DOS Card.

The DOS Card with Foam Tape

Peel the backing off of each of the foam pads.

Fold the DOS Cable across the back of the card.

Stick the card into the lower right corner of the drive lid, so the mounting post in the lid is in the notch formed by **P1** and the lower right corner of the the card.

The DOS Card attached to the Drive Lid

Attach the Drive Cables to the DOS Card:

Locate the connectors **P5** through **P8** on the 1541 drive controller card.

Note how the ridges on each of the connectors face toward inside of the drive controller card.
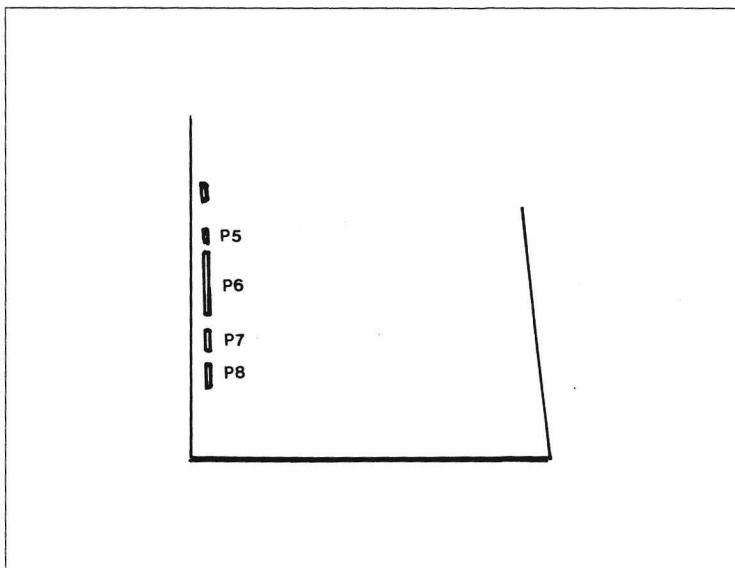
P5, P6, P7, and P8 Marked Clearly

Place the drive lid (with DOS Card mounted) next to the left side of the drive unit.

Unplug the three pin connector labeled **P5** on the 1541 Drive Controller Card.

Carefully bend the cable over and plug it into **DP5** on the DOS Card, so the ridge on the connector faces toward the outside of the DOS Card.

Connect **P6** to **DP6, P7** to **DP7,** and **P8** to **DP8** the
same way. (**P8** is keyed. Make sure the empty hole
on the connector matches the missing pin on **DP8**.)

**Recheck the connections you have made.
The drive mechanism can be damaged if
these connections are wrong .**

[RA] | **Attach the DOS Cable Cluster:**

Attach the DOS Cable Cluster to the four connectors marked CP5 through CP8 on the DOS Card. (This may already have been done for you)

The **first** cable has 3 wires. Plug it into **CP5.**

The **second** cable has six wires on a large connector. Plug it into **CP6** on the DOS Card, so the outside pair of wires are next to **CP5.**

The **third** cable has six wires on a large connector. Plug it into **CP7.**

The **fourth** cable has four wires on a keyed connector. Plug it into **CP8** so the empty hole on the connector matches the missing pin.

Connect the **first** cable to **P5** on the drive controller.
(Make sure the wires go straight from one connector to
the other. Do not cross the wires by twisting the
connector.)

Connect the **second** cable to **P6**, the **third** to **P7**,
and the **fourth** to **P8**; the same way.
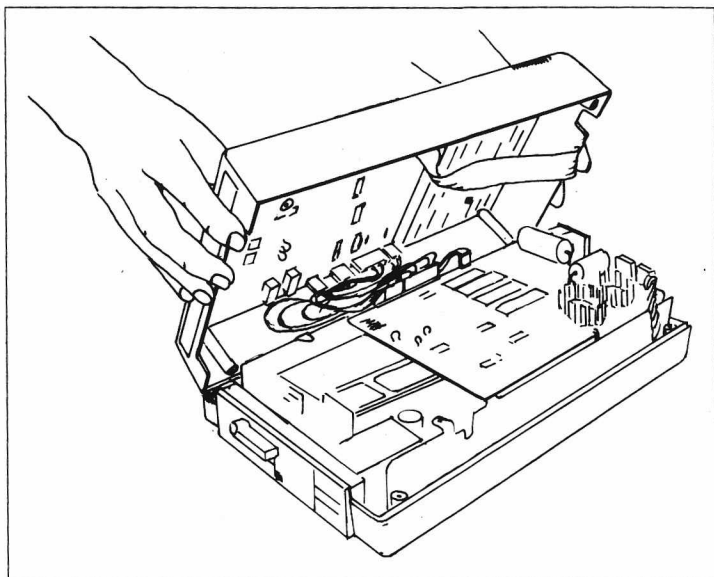
The DOS Cable Cluster Installed

[SA]   **Check the Connectors:**

Check all of the connectors to make sure they have been
seated properly.

You are now ready to test the drive.
Go to step **[T]**.

[NB] | **Connecting the DOS Card to a Type B Controller:**

Type B Controller Cards were installed in early versions of the 1541 drive; if your drive has intermittent success trying to read Apple software, have the drive alignment checked by a qualified service technician.

[OB] | **Connect the DOS Cable to the DOS Card:**

Insert one end of the DOS Cable into the connector marked **J1** on the DOS Card, so the cable trails away from the <u>back</u> of the card (Side with no components).
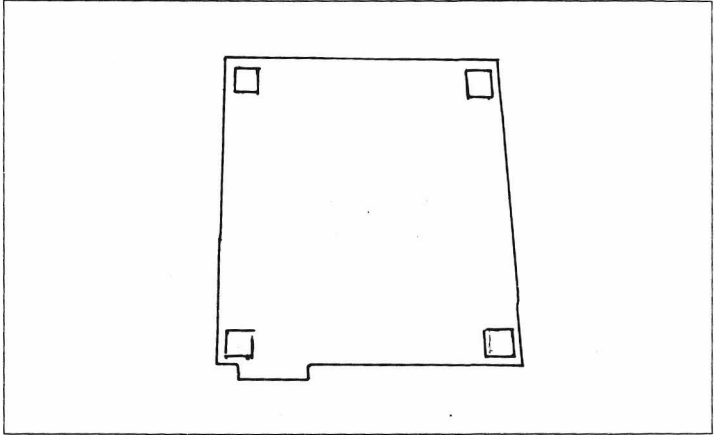

DOS Card with DOS Cable Installed

Chapter 1: Installing the Spartan

Mount the DOS Card:

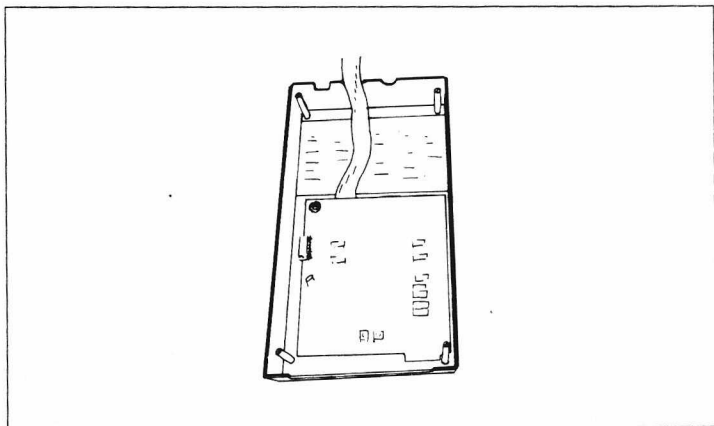Stick one square of double sided foam tape in each corner, on the back of the DOS Card.

The DOS Card with Foam Tape

Peel the backing off of each of the foam pads.

Fold the DOS Cable across the back of the card.

Stick the card into the lower right corner of the drive lid, so the mounting post in the lid is in the notch formed by **P1** and the lower right corner of the the card.

**The DOS Card attached to the Drive Lid**

Attach the Drive Cables to the DOS Card:

Locate the connectors **P2**, and **P5** through **P7** on the 1541 drive controller card.

Note how the ridges on each of the connectors face toward inside of the drive controller card.
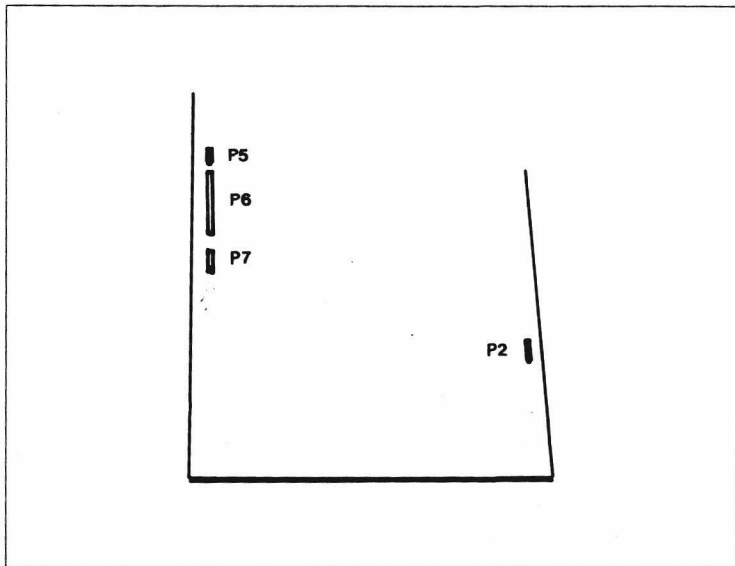
P2, P5, P6, and P7 Marked Clearly

Place the drive lid (with DOS Card mounted) next to the left side of the drive unit.

Unplug the three pin connector labeled **P5** on the 1541 Drive Controller Card.

Carefully bend the cable over and plug it into **DP5** on the DOS Card,so the ridge on the connector faces toward the outside of the DOS Card.

Connect **P6** to **DP6,** and **P7** to **DP7** the same way.

P2 will be connected later.

Attach the DOS Cable Cluster:

Attach the DOS Cable Cluster to the four connectors
marked CP2, and CP5 through CP7 on the DOS Card.
(These cables may have come pre-connected for a
TYPE A controller; make sure you connect the cables
as shown below.)

The **first** cable has 3 wires. Plug it into **CP5.**

The **second** cable has six wires on a large connector.
Plug it into **CP6** on the DOS Card, so the outside pair
of wires are next to **CP5.**

The **third** cable has six wires on a large connector.
Plug it into **CP7.**

The **fourth** cable has four wires on a keyed connector.
Plug it into **CP2** so the empty hole on the connector
matches the missing pin.

Connect the **first** cable to **P5** on the drive controller.
(Make sure the wires go straight from one connector to
the other. Do not cross the wires by twisting the
connector.)

Connect the **second** cable to **P6**, and the **third** to **P7**
the same way.

Next, carefully tip up the drive lid so you can unplug
the connector **P2**, and plug it onto **DP2** on the DOS Card.
(**P2** is a keyed connector. Make sure the empty hole
matches the missing pin on **DP2**.)

Plug the **fourth** cable, of the DOS Cable Cluster, onto **P2**
on the drive controller. Ensure the keyed pin and hole are
matched.

Carefully tuck the cables into the gap on the left side of the
drive mechanism, and carefully reseat the lid.
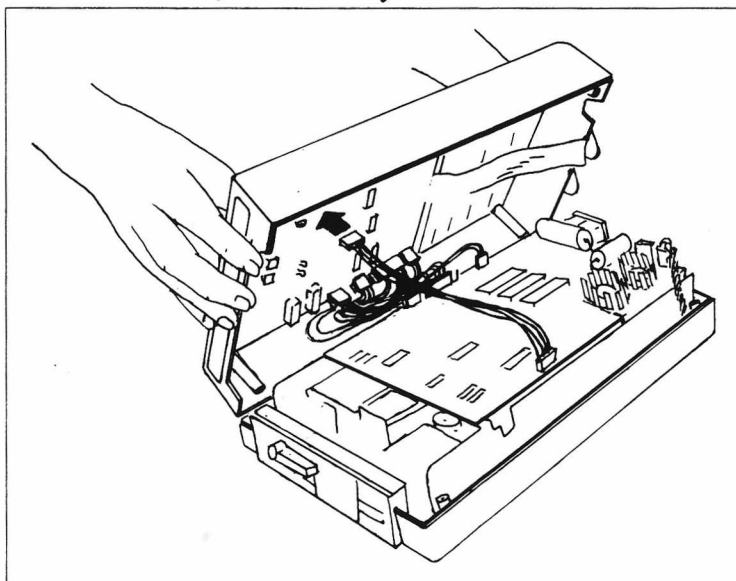
The DOS Cables Installed

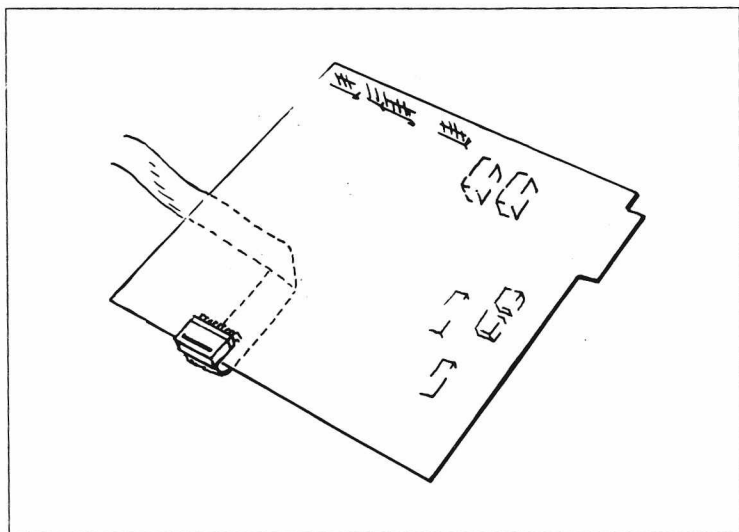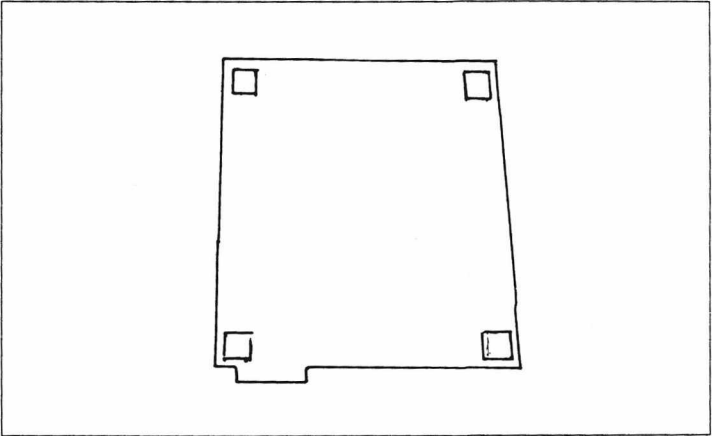|	
[SB]	**Check the Connectors:**
	Check the connectors to make sure they have all been seated properly.
	The drive mechanism can be hurt if these connections are wrong.
	You are now ready to test the drive. Go to step **[T]**.
[NC]	**Connecting the DOS Card to a Type C Controller:**
	Type C Controller Cards are installed in newer versions of the 1541 drive; if your drive has any difficulty reading or writing Apple software, have the drive alignment checked by a qualified service technician.
[OC]	**Connect the DOS Cable to the DOS Card:**
	Insert one end of the DOS Cable into the connector marked **J1** on the DOS Card, so the cable trails away from the <u>back</u> of the card. (Side with no components).
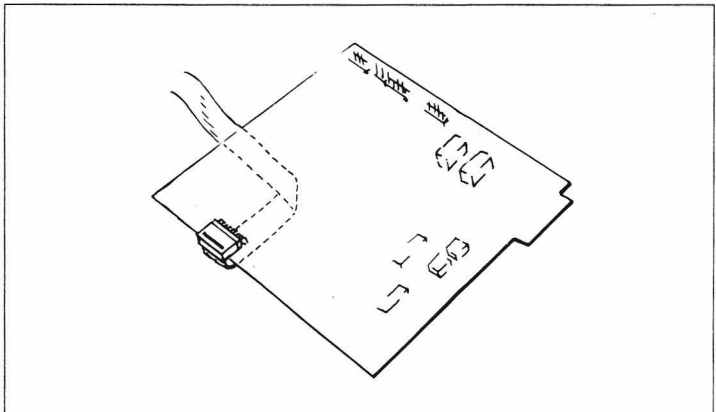
DOS Card with DOS Cable Installed

Mount the DOS Card:

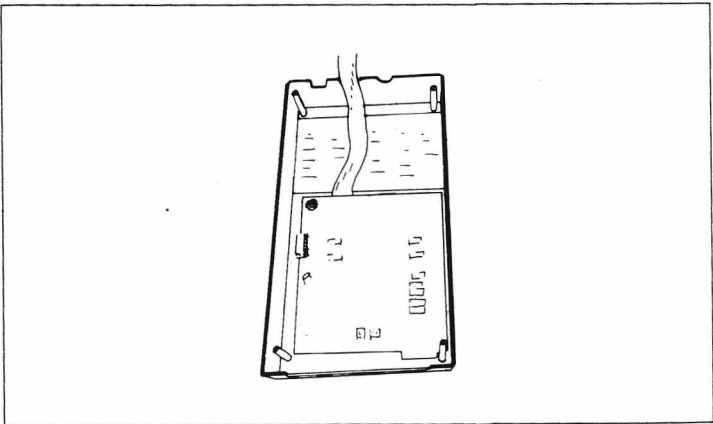Stick one square of double-sided foam tape in each corner, on the back of the DOS Card.
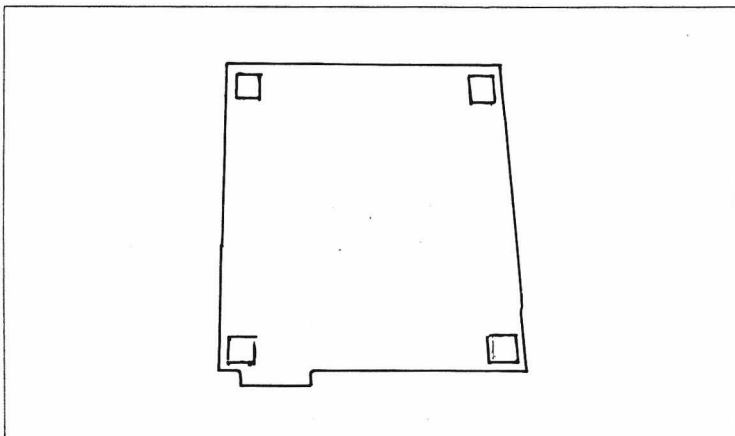
The DOS Card with Foam Tape

Peel the backing off of each of the foam pads.

Fold the DOS Cable across the back of the card.

Stick the card onto the drive lid, so the top of the card is just below the air vents in the lid.
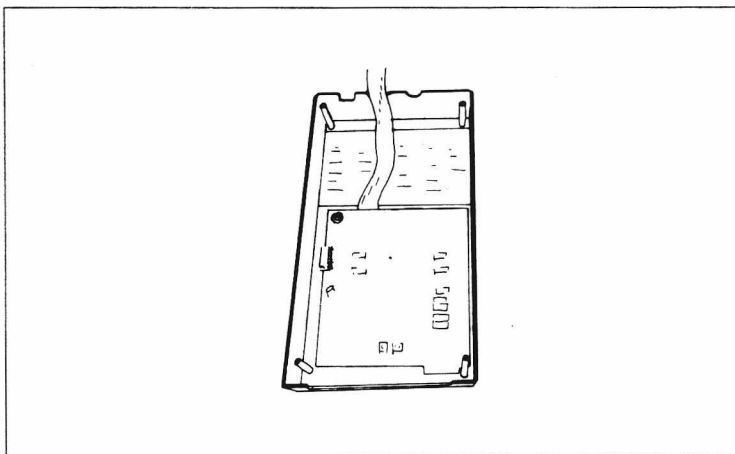
**The DOS Card attached to the Drive Lid**

Attach the Drive Cables to the DOS Card:

Locate the connectors **P2** through **P5** on the
1541 drive controller. (Along the left and front sides
of the card.)

Note how the ridges on the connectors face toward the
inside of the drive controller card.
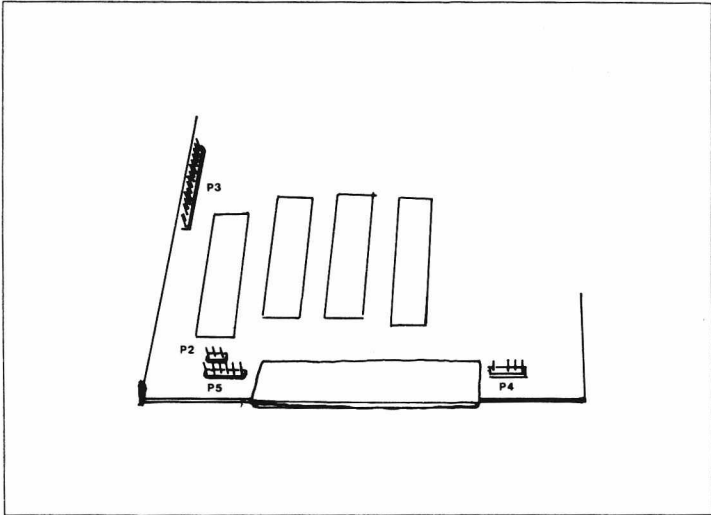
P2, P3, P4 and P5 Marked Clearly

Place the drive lid (with the DOS Card mounted) next to
the left side of the drive unit.

Unplug the three pin connector labeled **P2** on the 1541
Drive Controller Card.

Carefully bend the cable over and plug it into **DP5** on
the DOS Card, so the ridge on the connector faces toward
the outside of the DOS Card.

Connect **P3** to **DP6,** and **P5** to **DP7** the same way.

P4 will be connected later.

Attach the DOS Cable Cluster:

Attach the DOS Cable Cluster to the four connectors marked CP5 through CP8 on the DOS Card. (This may already have been done for you.)

The **first** cable has 3 wires. Plug it into **CP5.**

The **second** cable has six wires on a large connector. Plug it into **CP6** on the DOS Card, so the outside pair of the wires are next to **CP5.**

The **third** cable has six wires on a large connector. Plug it into **CP7.**

The **fourth** cable has four wires on a keyed connector. Plug it into **CP8** so the empty hole on the connector matches the missing pin.

Connect the **first** cable to **P2** on the drive controller. (Make sure the wires go straight from one connector to the other. <u>Do not</u> cross the wires by twisting the connector.)

Connect the **second** cable to **P3**, and the **third** to **P5** the same way.

Next, carefully tip up the drive lid so you can unplug the connector **P4**, and plug it onto **DP8** on the DOS Card. (**P4** is a keyed connector. Make sure the empty hole matches the missing pin on **DP8**.)

Plug the **fourth** cable, of the DOS Cable Cluster, onto **P4** on the drive controller. Ensure the keyed pin and hole are matched.

Carefully tuck the cables into the gap on the left side of the drive mechanism, and carefully reseat the lid.
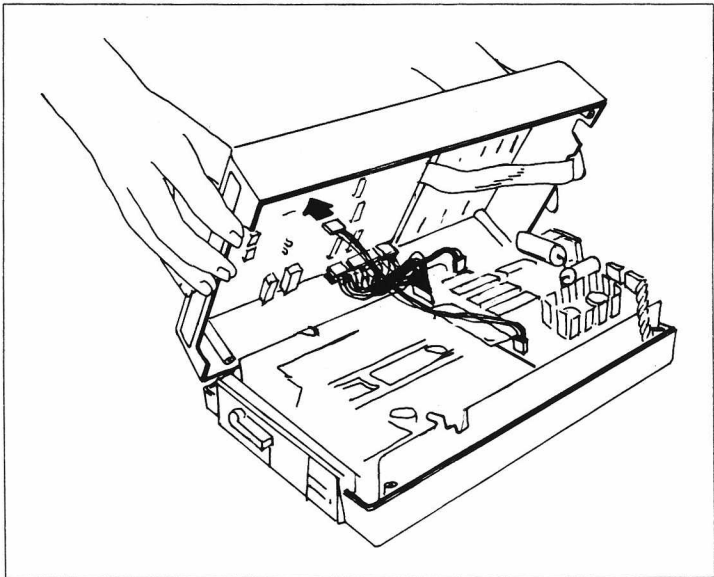
The DOS Cables Installed

Check the Connectors:

Check the connectors to make sure they have all been seated properly.

The drive mechanism can be hurt if these connections are wrong.

You are now ready to test the drive.

Connecting your drive to the Spartan

Once you are satisfied that the DOS Card is attached properly, the next step is to connect the drive to the Spartan.   To read and write Apple software the drive needs to be interfaced to the Spartan Buss. This is done with the C2 Drive controller.

[T]   **Installing the Drive Controller:**

To interface the drive you will need the following:
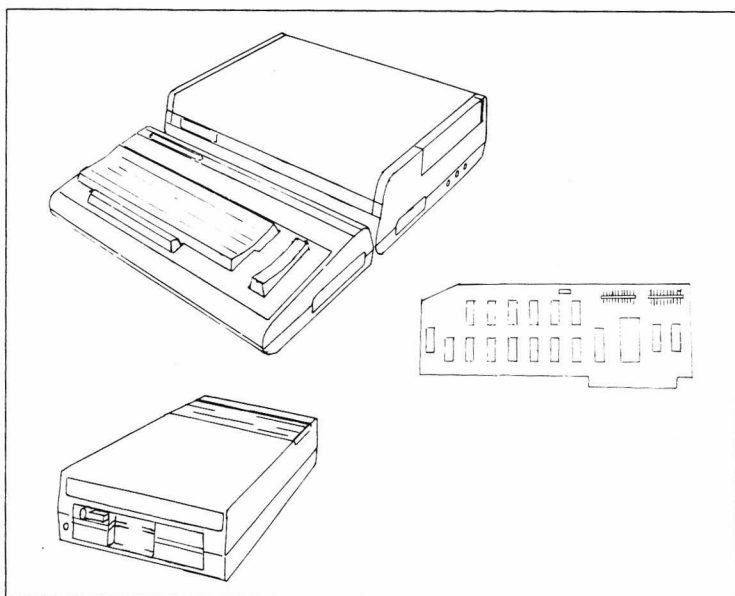
**A Working Spartan System   A C2 Drive Controller
A Converted 1541 Drive
    or An Apple Compatible Drive**

Remember to discharge yourself of static electricity before handling the Drive Controller Card.

Take your drive unit and place it next to the Spartan.

Insert the loose end of the DOS Cable into the connector marked **Drive 1** on the C2 Controller Card, so the cable trails away from the face of the card.

Align the fingers of the C2 Card with those of **S6** on the Spartan Buss. Press down firmly, with the palm of your hand, until the C2 Card clips into place.

The Drive Controller should now look like this:
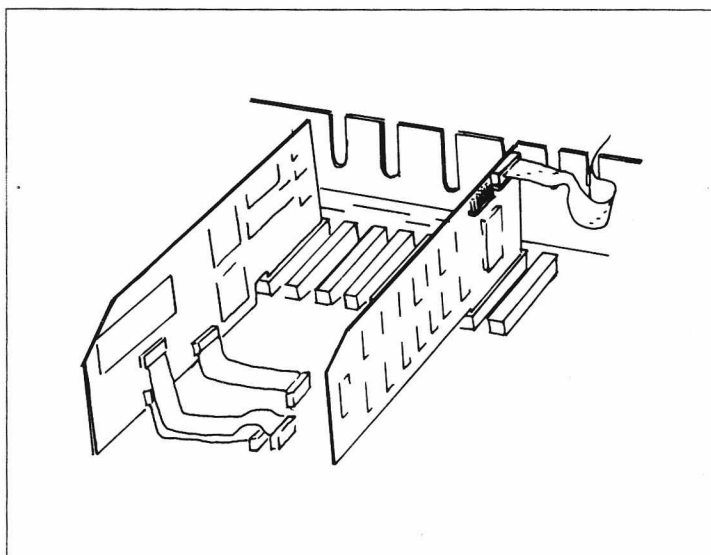
The Spartan with a Drive Controller Installed

Make sure the Card and Cable connector are seated properly.

You are now ready to test your drive.

[U]   **Power Up:**

Turn on your TV or monitor.

Make sure there are no disks in the drive.

Flip the power switch at the back of your Spartan to the
ON position.

You should see the power up message at the top of the
screen.

The drive should immediately make a buzzing sound
know as 'head clatter' (Head resetting inself to Track 0)
the drive should then continue to spin.
If this does not happen, TURN THE SYSTEM OFF!!!

If you do not get 'head clatter' and a continuously
spinning drive there is something wrong.
Carefuly recheck the DOS Card and C2 installation;
then try the power up sequence again.

Once you have 'head clatter' and a continuously spinning
drive, insert the **Filer Diskette** and close the latch.

After a short time the screen should display a menu:

The Filer Utility Disk
(C)1982 Central Point Software
1. The Filer
2. Fast Copy
3. Disk Test

If you get to this point, your drive is functioning properly.

Turn the system off.

If you are using an Apple compatible drive, reseat the Spartan's lid and start Chapter 2.

[V]   **Reseat the Drive Lid:**

Now that the drive reads Apple disks it can be reassembled.

With the power off, feed the DOS Cable out of the back of the drive lid as shown.

Carefully reseat the lid of the drive, maiking sure you neatly tuck the Drive cables inside.

Turn the drive unit over and replace the four screws in the base of the drive.
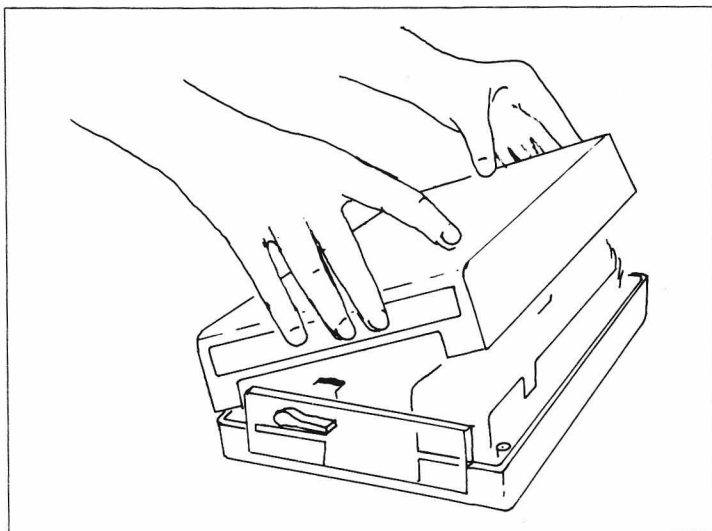
The Drive with DOS Card Installed

Your 1541 can now be used to read and write both
Apple II and C64 software.

Connect the Serial cable and power cord to your drive
as you did before.

Finally, reseat the lid of your Spartan.

The complete Spartan system should now look like this:
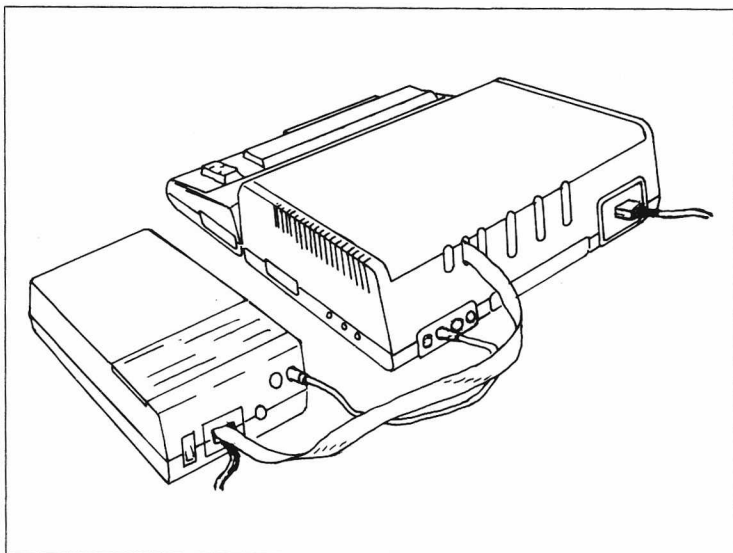
The Completed Spartan

This completes the installation.

The Spartan is now ready for use.

**If you have
any problems**

If you have any difficulty getting your Spartan to function please recheck the installation steps. Also see, *Troubleshooting the Spartan* at the end of this guide.

If you are still having problems, call your Spartan representative for assistance.
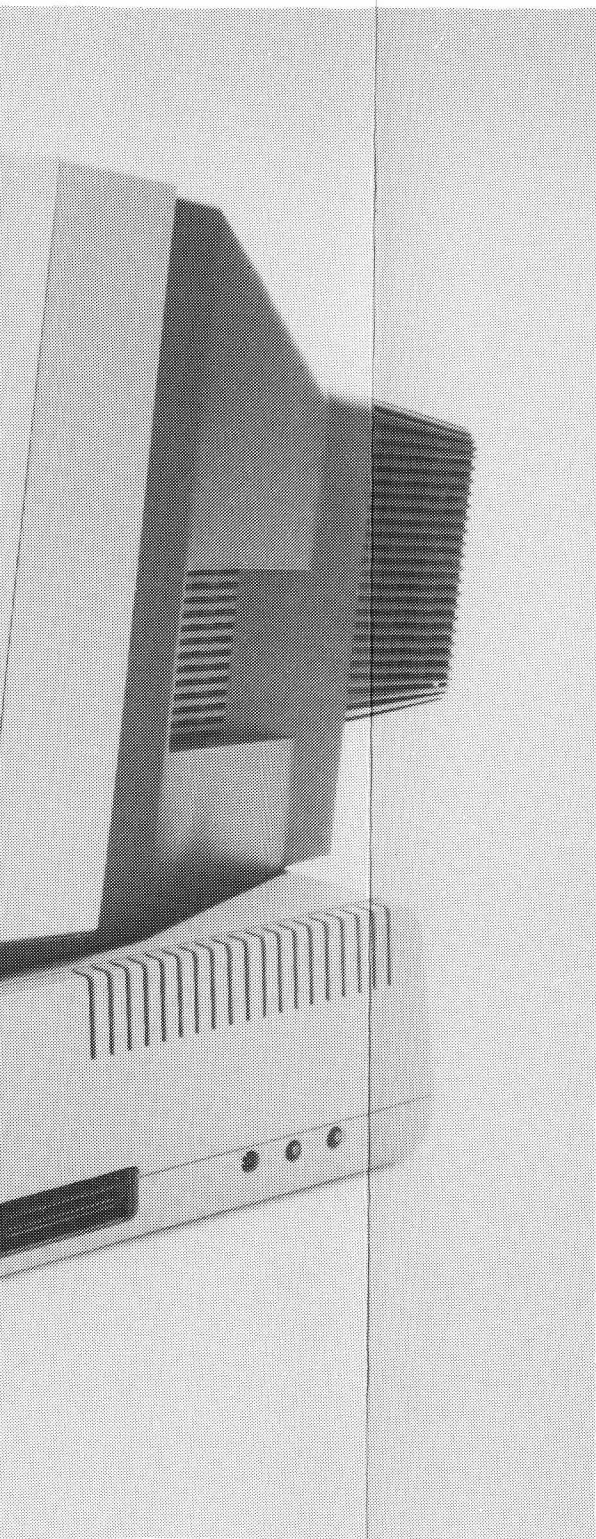
Chapter 2:

Using the Spartan

This Chapter Covers. . .

This chapter introduces you to the basic functions of the Spartan system.

The first section explains what the Spartan does.

The second section introduces the unique keyboard functions of the Spartan. (If you want to start 'hands on', go to this section)

Contents

The Spartan is really two computers in one, since you
can run it like a C64, or an Apple][+.

As it comes from the factory, the Spartan powers up as
an Apple][+. When the Spartan is in Apple mode, you
can run any Apple][+ software you choose.

When an Apple compatible drive is connected to the
Spartan, the first thing it does on power up is to
load Apple DOS (Disk Operating System) from disk.
Unlike the C64, an Apple needs to load its operating
system before it can talk to its disk drive fully.

When the Spartan is in C64 mode, it operates as if your
C64 was running on its own. In other words, with the
Spartan in C64 mode, you can run all C64 software.

Which mode you choose depends on the program you
wish to run.

If you prefer, the Spartan can power up in C64 mode.
This is achieved by moving one of the numerous
jumpers on the Spartan Buss. (See Chapter 3: *Inside
the Spartan*)

Those readers who wish to run C64 and Apple][+
software at the same time should refer to Chapter 3.

Readers interested in using C64 and Apple][+
accessories, such as printers should also refer to
Chapter 3.

You can think of the Spartan System as two independent computers connected to each other by a few common memory locations.

On the Commodore side you have 64K of memory, various I/O ports, and a cartridge slot.

On the Spartan side you also have 64K of memory, and various I/O ports.

Linking the two computers is a custom IC which looks like four memory locations to either computer. These locations are in fact a set of I/O ports through which the two computers can talk to each other.

The basic difference between the two computers is that the Spartan was designed to have an 'open architecture'. This means the Spartan has an accessible bus which makes it very flexible.

In addition to adding an Apple bus, the Spartan enhances your existing C64 system. This is done by adding 4 cartridge slots where there was only one, by giving you a C64 to Apple joystick converter so you can use your existing joystick with most Apple games, and by enhancing the Commodore's keyboard functions.

The key to the Spartan System is its 'Phantom ROMs' (so called, becausr they are not always present).

The Commodore Phantom ROM is like a cartridge for your C64, except that it is 'mapped in' by the Spartan. That is, the C64 only sees it when the Spartan wants it to.

The software contained in the Commodore Phantom ROM tells the Commodore how to talk to the Spartan. As well, it provides many enhanced functions to the keyboard.

The Spartan Phantom ROM tells the Spartan how to communicate to the C64, and the rest of its system.

When in Spartan mode the Commodore acts as the Spartan's keyboard. This is achieved through the Commodore User's Port.

At the machine language level, the possibilities are wide open, since the Spartan provides a machine level monitor for both computers.

The Phantom ROMs provide a set of commands for direct memory transfer from one computer to the other. This means you can send data back and forth between the two computers at processor speeds.
With the appropriate software you could use the Spartan's CPU and memory as a RAM disk to the C64 or vice versa.

Inside, on the Spartan Buss Card, are a large number of 'shorting blocks'. These are hardware jumpers which offer you a large number of ways to configure your system. These are fully explained in Chapter 3.

The system was designed for extreme flexibility in both hardware and software. The programming possibilities are immense.

If cared for properly, the Spartan should provide many years of service.

Now that you have successfully hooked up your
Spartan system, it is time to become familiar with it.

The purpose of this section is to get you familiar with
the Spartan-specific commands that are available to you.
We will leave the details of AppleSoft BASIC to
The Elementary Apple which comes with the Spartan.

We will assume you have some knowledge of the
BASIC programming language.

The Reset Buttons

The first, and probably most functional part of the Spartan
system is its reset buttons.

These are located on the right hand side of the Spartan
enclosure.

The Spartan Reset Buttons	
Position	*Function*
Front	**Commodore Reset**
Middle	**Cartridge Restart**
Back	**Spartan Reset**

Pressing the **Front** button will reset the C64 with the
Commodore Phantom ROM 'mapped in'.

This means that the C64 will clear its memory (this
includes any programs in its RAM), and will be ready
to run BASIC and communicate with the Spartan.

Pressing the **middle** button will reset the Commodore and restart whichever cartridge has already been selected. This will be explained further under the '&START' command, later in this chapter.

Pressing the **back** button will reset the Spartan. This <u>will not</u>, in most instances, clear the program in memory. The Spartan will reset back into basic, with its BASIC program intact, and be ready to run Apple-Soft BASIC and communicate with the C64.

Turn on the Spartan system, and press the Spartan reset button.

The disk drive should spin briefly and stop. You should then have keyboard control.

Press <Return> a few times.

The Function Keys

The next thing to note are the Function Keys. With the Spartan hooked up, they have been assigned specific functions:

The Function Keys	
Key	**Function**
F1	No Function
F2	Switch to Commodore Mode
F3	No Function
F4	Switch to Spartan Mode
F5	No Function
F6	Commodore Reset
F7	No Function
F8	Straight Commodore Reset

Note that the odd numbered function keys are not used.

If you press **<shift> F2** you will toggle into C64 mode.

If you press **<shift> F4** you will toggle into Spartan mode.

If you press **<shift> F6** you will reset the C64.

If you press **<shift> F8** you will 'map out' the Commodore Phantom ROM. This makes the C64 totally independent of the Spartan. (More on this later)

Try toggling back and forth from Spartan mode to C64 mode.

The C= Functions

As a Commodore User, you are probably familiar with the C= functions. C= means the 'Commodore Key' (C= resembles the Commodore logo), which is found at the lower left of the keyboard.

By holding down the C= key and another key you activate a special function.

While in Spartan mode the C= functions have been reassigned.

They have been reassigned to speed the entry of AppleSoft BASIC programs. Notice some of the familiar commands. Simply by pressing C= and another key the selected word will appear.

C= Functions in Spartan Mode	
Key	**Function**
C= A	PR#6 <CR> (Boot an Apple Disk)
C= B	BRUN
C= C	CATALOG <CR>
C= D	DATA
C= E	No Function
C= F	FLASH
C= G	GOSUB
C= H	HOME
C= I	INPUT
C= J	No Function
C= K	LEFT$(
C= L	LIST <CR>
C= M	--------------------------------------
C= N	NEW
C= O	ONERR
C= P	POKE
C= Q	PEEK(
C= R	RUN

C= Functions in Spartan Mode	
Key	**Function**
C= S	STR$(
C= T	TEXT
C= U	No Function
C= V	VTAB
C= W	No Function
C= X	CHR$(
C= Y	No Function
C= Z	No Function
C= @	No Function
C= *	CALL -151 <CR> (Enter Monitor)

Try a few of them.

Notice that some of the commands are followed by a <Return>. These are immediate commands.

If you try C= A or C=* you can always get back to BASIC by pressing the Spartan reset key.

The & Commands

The next set of commands that are available to you are the '&' Commands.

These are immediately available in Commodore mode, but must be loaded from disk in Spartan mode. Note that the Spartan must be in 48K mode to use the & Commands. Ensure that **JC1** on the CPU Card is in position **1/2**.(See Chapter 3 for an explanation of jumpers)

Insert the Filer Diskette, that came with the Spartan, into the drive and close the latch.

Then, type **PR#6** this will boot the disk drive (loading in Apple DOS 3.3 and the first program on the diskette).

The program that appears is a useful set of utilities for the Apple. To leave the menu, press any key but 1,2, or 3.

You should now have the] prompt.

Type **C= C** or **CATALOG <CR>** and the Disk's directory should show on the screen.

To load the & Commands type **BRUN COMMANDS <CR>**.

In a few seconds, you should have the] prompt again.

Now you are ready to use the & Commands.

Toggle to C64 mode. (**<shift> F2**)

The first & Command available is **& HELP <CR>**.

Typing this should fill the screen with a long list of & Commands that are available to you.

Press **<Return>** to continue.

You should see the following list of commands:

The & Commands

Keys	Function
&ML	Enter the Monitor ('X' Returns)
&AUDIO	Change Audio mode to O)ff C)ommodore S)partan or M)ixed
&VIDEO	Change Video Mode Parameters same as &AUDIO with the exception of O)ff
&KBD	Change keyboard mode Parameters same as &VIDEO
&CASS	Change Cassette mode S)traight or C)rossed
&SETUP	Display current setup of Audio, Video, Keyboard, and Cassette, as well as the ComPort's status and the settings of the startup jumpers
&SLAVE	Cause the other machine to become a slave
&UNSLAVE	Releases the other machine from slave mode

The & Commands

Keys	Function
&PUT	Send bytes to slave [Eg. &PUT 1024,10,5000 sends 10 bytes starting at address 1024 to the slave's memory at address 5000]
&TAKE	Take bytes from slave memory, parameters same as & PUT
&EXEC	Executes code in slave memory [Eg. '&EXEC 4096' starts running a machine language program at address 4096 in the slave's RAM]
&SELECT	Select specified slot's RAM and deselect the Phantom ROM, thenexit to BASIC [Eg. '&SELECT 2']
&START	Begin execution of a cartridge in slot specified, may require the use of the cartridge restart button [Eg. '&START 2']
&EXIT	Return C64 to 'native mode'
&HELP	Display this command summary

Many of these commands are for the advanced user,
and will be understood fully after reading later chapters.

These can be used as direct commands from BASIC,
or can be imbedded in BASIC programs.

&ML :   Enters a machine language monitor from
        Commodore BASIC. This will let you directly
        manipulate bytes of memory and run machine
        language routines in the Commodore 64.
        'X <CR>' returns from the monitor back into
        Commodore BASIC.

        This command is not available on the Spartan side.
        Instead you enter C= * or **CALL -151** to enter
        a similar monitor.

        The specifics of this monitor will be explained
        more fully in Chapter 4.

&AUDIO : Selects the Audio signals to be
         present at the Audio Output RCA Jack.
         (The **White** RCA jack on the Video Cable)

         The options available are:
         O)ff   No audio out
         C)ommodore   Commodore Audio only
         S)partan   Spartan Audio only
         M)ixed   Both C64 and Spartan Audio

         The format of the command is:

         '&Audio M'   Switch on Both C64 and Spartan
                          audio.

&VIDEO : Selects the Video signal to be present at the
         Video Output RCA Jack.
         (The **Yellow** RCA jack on the Video Cable)

         The options and format are the same as &AUDIO,
         except there is no O)ff option in & VIDEO.

&SLAVE : Causes the machine which is not being used, to become a slave. For example, if you were in C64 mode and you typed &SLAVE, the Spartan would become a slave of the C64.

This is used before &PUT, &TAKE, or &EXEC.

&UNSLAVE : Releases the other machine from slave mode.

This is used after &PUT, &TAKE, or &EXEC.

&PUT : Sends Bytes to Slave.

The format of this command is:
'&PUT <Source>, <Length>, <Destination>'

[Eg. '&PUT 1024,10,5000' sends 10 bytes starting at address 1024 to the slave's memory starting at address 5000]

&TAKE : Take bytes from slave memory.

The format of &TAKE is the same as &PUT.

&EXEC : Executes code is slave memory.

The format for this command is:
'&EXEC <Start Addr.>'

[Eg. '&EXEC 4096' starts running a machine language routine at address 4096 in the slave's RAM]

&SELECT : Selects one of the cartridge slots on the
Spartan Buss. (C64 MODE ONLY)

The format for this command is:
'& SELECT n'

Where 'n' is:
0   Front-most Cartridge Slot
1   Middle Cartridge Slot
2   Back Cartridge Slot
3   Side Cartridge Slot

4   The AUX ROM
5   Deselect C64 Phantom ROM if
already selected

[Eg. '&SELECT 0' would select the front-
most cartridge slot, you would then activate
the cartridge by pressing the Cartridge reset
button] See Chapter 3 for further details.

&START : Begin execution of a cartridge in slot
specified.

Same format as the &SELECT command.

[Eg. '&START 0' would select and activate
the cartridge selected]

&EXIT : Return to C64 'native mode'.

This command resets the C64, 'mapping out'
the C64 Phantom ROM. This makes the C64
totally independent of the Spartan and has the
same action as typing **F8**.

This must be done when running certain C64
Programs which use the same memory loca-
tions as the COMPORT. (See Chapter 4).

Note that when you are using the C64 in native
mode, you must plug the Video cable into J4
on the back of the Spartan, and then the functions
of the RCA plugs are reversed.

Yellow becomes Audio
White   becomes Video

&HELP : Displays the & Command summary.

One Difference

Before you start using your Spartan, there is one
keyboard diference to point out.

The <ESC> or ESCAPE key.
The Commodore doesn't have one.

Since it is very useful in the Apple world, the upper-left
arrow key has been reassigned to act as one while in Spartan
mode.

Now that you know the unique commands available to the Spartan, you are ready to learn about the Apple.

Turn to *POWER ON !*
(Page 24 in *The Elementary Apple*).

This will provide a sound introduction to the Apple and its operating system.

Later Chapters in this manual provide more indepth information about the Spartan. Refer to them as they are needed.
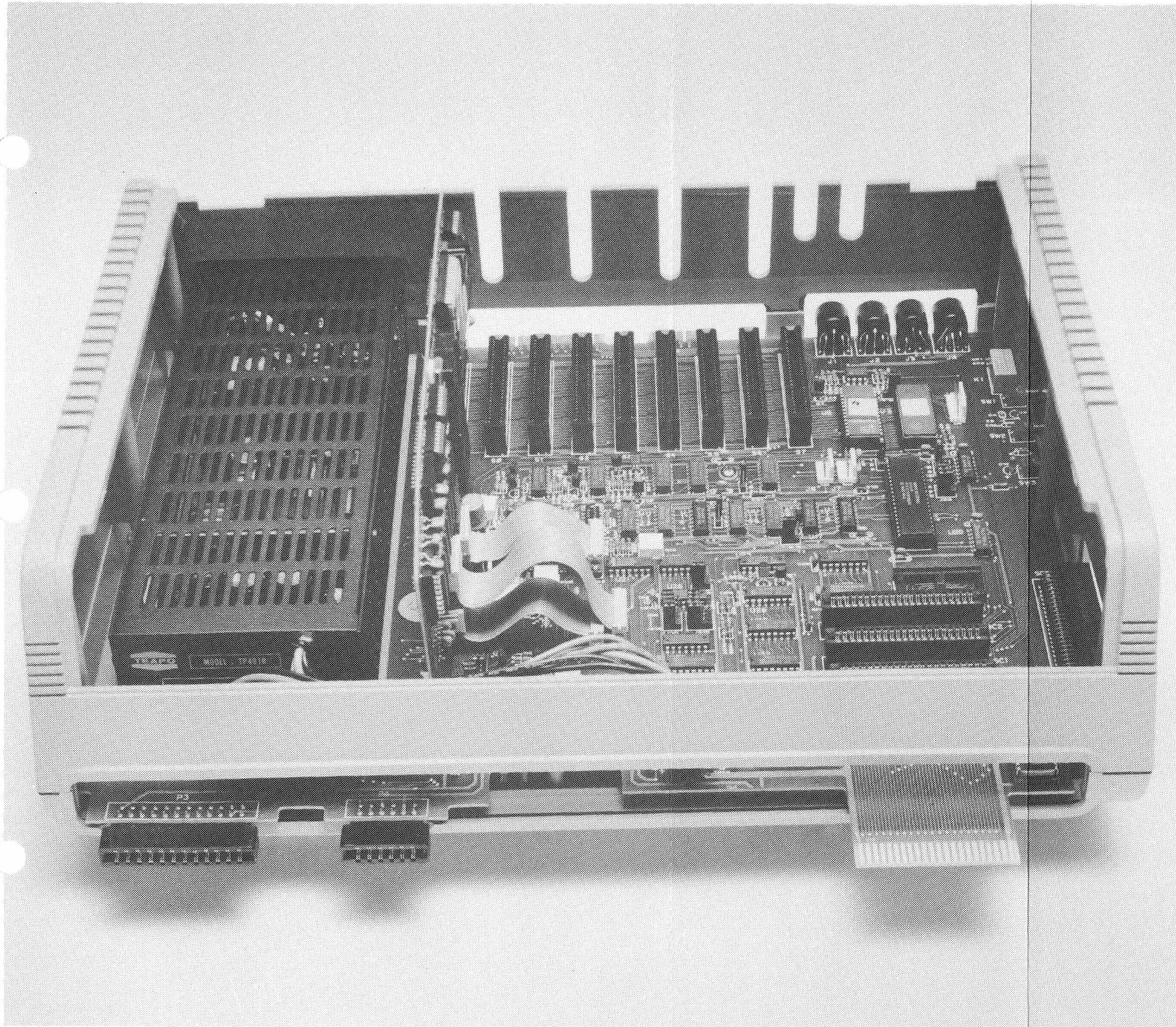
This
Chapter
Covers. . .

This chapter explains the various connectors and adjustments on the Spartan Buss Card.

The first section explains the function of each of the connectors on the Spartan Buss Card.

The second section explains the function of each of the connectors on the CPU Card.

The third section explains the function of each of the jumpers in the Spartan.

The last section explains the adjustments on the Spartan Buss Card.

Contents

**Connecting
Apple
Peripherals**

Inside the Spartan, there are 9 Apple compatible slots.

The first slot (**SA**) contains the Spartan CPU Card.
This leaves 8 slots for your use. (**S0** through **S7**)

There are literally hundreds of different Apple compatible
peripheral cards available. Some of them expect to
work in a particular slot, while some are adaptable to
any slot.

There is no assigned use for any particular slot,
but traditionally the slots have been used this way:

Slot 0: Additional Memory
Slot 1: Parallel Interface (Printer Port)
Slot 2: Serial Interface and/or MODEM
Slot 3: 80 Column Card
Slot 4: Z80 CP/M Card
Slot 5: Disk Drive Interface #2
Slot 6: Disk Drive Interface #1
Slot 7: RGB Video or PAL Video Cards

Carefully read the literature that comes with the cards
you buy.

When inserting or removing any peripheral card, always
remember to turn the power off and discharge yourself
of any static electricity before handling them.

**Connecting
Commodore
Peripherals**

Connecting peripherals to your Spartan system is just the same as on the C64, since all of the C64 ports are duplicated on the Spartan Buss. The Spartan, however, gives you 4 Cartridge Slots so you can software select one of four applications without turning the power off to swap cartridges.

The only restriction you have is that the user port is only available when you are operating in 'native mode'. This is because the C64's User Port is used as the keyboard input to the Spartan.

For specific information about connecting Commodore compatible peripherals, see your C64 User's Guide.

For information on the Cartridge slots, see Page 85.

Connectors

The Spartan has a large array of connectors, this section explains the function of each.

Spartan's Connectors

J1 Spartan Video/Audio DIN
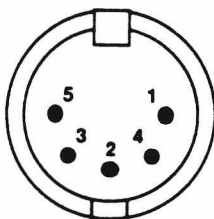
1 : Spartan Audio
2 : Ground
3 : Switchable Video
4 : Spartan Video
5 : Switchable Audio

J1 provides a standard NTSC Video output for both Straight Spartan Video, and the Switchable C64/Spartan mix. It also provides an Audio output for both Straight and Switched outputs.

J2   C64 Serial Output DIN
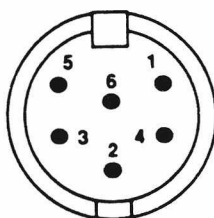
1 : Serial SRQIN
2 : Ground
3 : Serial ATN IN/OUT
4 : Serial CLK IN/OUT
5 : Serial DATA IN/OUT
6 : Reset

J2 is a straight extension from the Serial connector on the back of the C64.

J3 C64 Power DIN
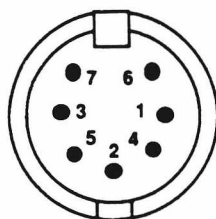
1 : Ground
2 : Ground
3 : Ground
4 : N/C
5 : +5 VDC
6 : 9 VAC
7 : 9 VAC

J3 is the switched power input for the C64 power supply. The Spartan only uses 9 VAC from the C64 power supply, all other power is derived from the Spartan's internal supply.

Never plug the C64 Power DIN into the connector on the side of the C64 with the Spartan attached, to do so may cause permanent damage to both machines.

J4 C64 Video DIN
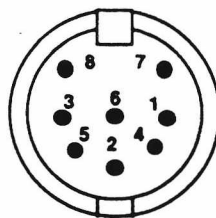
1 : LUM/SYNC
2 : Ground
3 : Audio Out
4 : Composite Video Out
5 : Audio In
6 : Color Out
7 : N/C
8 : N/C

J4 is a straight extension from the Video Connector on the back of the Commodore.

```
┌─────────────────────────────────────────────┐
│  J5  Spartan Cassette Connector             │
│                                             │
│         ┌───┐    1 : Ground                 │
│         │ ● │    2 : Cassette Data In       │
│         │ ● │    3 : N/C                    │
│         │ ● │    4 : Ground                 │
│         │ ● │    5 : Cassette Data Out      │
│         │ ● │    6 : Remote (GND)           │
│         │ ● │    7 : Remote                 │
│         └───┘                               │
└─────────────────────────────────────────────┘
```

J5 provides a set of connections for interfacing the Spartan to a normal cassette recorder. A special set of cables are needed to connect the Spartan and tape recorder together.
These can be easily made from a few easy to get parts. You will need:

1 : 7 Pin SIP Strip Connector
2 : 1/8 Inch Phono-Plugs
1 : 1/32 Inch Sub-Miniature Phono-Plug
   A 6 Foot length of thin, shielded cable

Cut the cable into 3 even lenghts.

Take one piece of cable and connect the shield to Ground (Pin 1) on the SIP Connector. Connect the inner wire to Pin 2 on the SIP Connector. Connect the other end to one of the 1/8 Inch Plugs (Shield to Ring, Inner wire to Tip).

Repeat this with the other two pieces of cable.
(Pin 4 to Shield to Ring on 1/8 Inch Plug)
(Pin 5 to Inner wire to Tip on 1/8 Inch Plug)
(Pin 6 to Shield to Ring on 1/32 Inch Plug)
(Pin 7 to Inner wire to Tip on 1/32 Inch Plug)

The First cable becomes the 'EAR' Plug for the tape recorder.

The Second cable becomes the 'MIC' Plug for the tape recorder.

The Third cable becomes the 'REM' Plug for the tape recorder.

```
J6   Switched Video Aux Connector

        ┌─────┐
        │  ●  │        1 : Audio
        │  ●  │        2 : 12V
        │  ●  │        3 : -5V
        │  ●  │        4 : Video
        │  ●  │        5 : Ground
        └─────┘
```

J6 is the Auxillary Video Connection for the Switched
Video signal which appears at **J1**. This is used to
connect an Apple compatible RF Modulator to the Spartan.

```
J7   Spartan Video Aux Connector

        ┌─────┐
        │  ●  │        1 : Audio
        │  ●  │        2 : 12V
        │  ●  │        3 : -5V
        │  ●  │        4 : Video
        │  ●  │        5 : Ground
        └─────┘
```

J7 is the Auxillary Video Connection for the Spartan
Video signal which appears at **J1**. This is also used to
connect an Apple compatible RF Modulator to the Spartan.
(Note: This is Only Spartan Video, not Switched Video)

J8   Spartan Audio Aux Connector

▮   1 : Audio
     2 : 12V

J8 is the Auxillary connector for the Spartan's Audio Signal.

J9   Switchable Audio Aux Connector

▮   1 : Audio
     2 : 12V

J9 is the Auxillary connector for the Spartan's Switched Audio signal.

J10   Game Plug

▮   1 : +5V
     2 : PB0 Push Button Inputs
     3 : PB1
     4 : PB2
     6 : GC1 Joystick Axis Inputs
     7 : GC3
     8 : GND
    10 : GC2
    11 : GC0
 5,9,12-16 : N/C

J10 connects the Commodore-to-Apple Joystick Converter to the CPU Card.

Connect your Commodore Joystick to **J16**.

You can easily connect an Apple Joystick to the Spartan. Simply remove the ribbon cable which goes from **J10** to the CPU Card, and plug the Joystick connector directly into the GAME connector on the CPU Card.

J11   Stuff Plug

```
    ┌─────────┐
    │  • •    │        2 : LDPS N/C
    │  • •    │        3 : Video Data
    │  • •    │        4 : Color Burst
    │  • •    │        5 : Text Mode
    │  • •    │        7 : SPKR Out
    │  • •    │        9 : Preset
    │  • •    │       10 : Cass In
    └─────────┘       11 : Cass Out
            1,6,8,12-16 : N/C
```

J11 connects the Video, Audio, and Cassette signals
(produced by the CPU Card) to the Spartan BUSS Card.

J12   Keyboard Plug

```
    ┌─────────┐
    │  • •    │        1 : +5V
    │  • •    │        2 : Keyboard Strobe
    │  • •    │       12 : D0
    │  • •    │       13 : D1
    │  • •    │       10 : D2
    │  • •    │       11 : D3
    │  • •    │        6 : D4
    │  • •    │        5 : D5
    └─────────┘        7 : D6
                       8 : GND
            3,4,9,14-16 : N/C
```

J12 provides keyboard input to the CPU Card.

```
J13   Duo-DIN Input

         1 : C64 Luma
         2 : C64 Audio Out
         3 : C64 Comp. Video
         4 : C64 Audio In
         5 : GND
         6 : Serial SRQIN*
         7 : Serial ATN In/Out
         8 : Serial CLK In/Out
         9 : Serial Data In/Out
        10 : CReset*
        11 : GND
```

J13 connects the C64 Video/Audio and Serial Outputs to the Spartan.

```
J14  Current Mode LED

         1 : C64 Mode (Green)
         2 : GND
         3 : Spartan Mode (Red)
```

J14 shows the current mode the Spartan system is in.

If you wish, you can connect the Tri-State LED, that came with your Spartan System, to this connector to view the mode.

Ideally, this LED can replace the Red LED in the C64, but opening the C64 may void its warranty.

J15 Spartan Power Connector
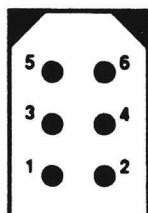
1 : Ground
2 : Ground
3 : +5VDC
4 : +12VDC
5 : - 12VDC
6 : - 5VDC

J15 is the power input to the Spartan.

J16 Commodore Joystick Input
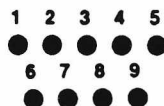
1 : Joy 0
2 : Joy 1
3 : Joy 2
4 : Joy 3
5 : Pot Y
6 : Button LP
7 : +5VDC
8 : Ground
9 : Pot X

J16 is the input to the Commodore-to-Apple Joystick converter.

Connect your Commodore Joystick here for Apple Games.

Connect your Commodore Joystick on Port 1 or 2 on the C64 for Commodore games.

```
┌─────────────────────────────────────────────────┐
│  SC0-SC3   C64 Cartridge Slots                  │
│                                                  │
│       1 ──────────────────────────── 22         │
│     ┌────────────────────────────────┐          │
│     │ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ │          │
│     │ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ │          │
│     └────────────────────────────────┘          │
│       Z Y X W V U T S R P N M L K J H F E D C B A│
│                                                  │
│   1 : GROUND        A : GROUND                  │
│   2 : + 5 VDC       B : ROMH                    │
│   3 : + 5 VDC       C : RESET                   │
│   4 : IRQ           D : NMI                      │
│   5 : R/W           E : S 02                     │
│   6 : DOT CLOCK     F : A15                      │
│   7 : I/O 1           |   |                      │
│   8 : GAME          Y : A0                       │
│   9 : EXROM         Z : GROUND                   │
│  10 : I/O 2                                      │
│  11 : ROML                                       │
│  12 : BA                                         │
│  13 : DMA                                        │
│  14 : D7                                         │
│   |   |                                          │
│  21 : D0                                         │
│  22 : GROUND                                     │
└─────────────────────────────────────────────────┘
```

SC0-SC3 are four software selectable cartridge slots. You can plug your often used cartridges into the inside slots, and you need never power down to change your application program.

These slots are selected by way of the &Select and &Start Commands. (See Page 69)

Never insert or remove a cartridge while the power in switched on, to do so may permanently damage both machines.

The CPU Card's Connectors

RAM EXP.
KEY
STUFF   GAME
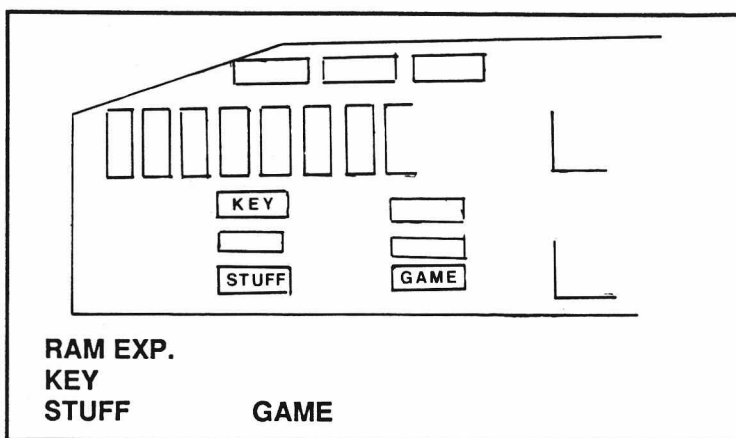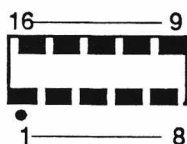
RAM EXP.

1 : N/C	9 : N/C
2 : N/C	10 : RAD 5
3 : N/C	11 : RAD 4
4 : RAS*	12 : RAD 3
5 : RAD 0	13 : RAD 6
6 : RAD 2	14 : N/C
7 : RAD 1	15 : CAS*
8 : N/C	16 : N/C

RAM EXP. provides the signals for future RAM expansion.

```
KEY

16─────────9        1 : +5VDC      9 : N/C
■■■■■■■■            2 : STROBE    10 : DATA 2
■■■■■■■■            3 : RESET     11 : DATA 3
•                    4 : N/C       12 : DATA 0
1─────────8        5 : DATA 5    13 : DATA 1
                     6 : DATA 4    14 : N/C
                     7 : DATA 6    15 : -12 VDC
                     8 : GND       16 : N/C
```

The **KEY** connector is the keyboard input to the
CPU Card.

```
STUFF

16─────────9        1 : 64 SYNC     9 : PRESET
■■■■■■■■            2 : N/C        10 : CASS IN
■■■■■■■■            3 : VID OUT    11 : CASS OUT
•                    4 : COL BUR    12 : SYNC
1─────────8        5 : TXT MODE   13 : N/C
                     6 : N/C        14 : N/C
                     7 : SPKR OUT   15 : N/C
                     8 : N/C        16 : N/C
```

The **STUFF** connector serves as the output for the
Video, Audio, and Cassette signals produced by the
CPU Card.
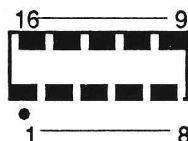
```
GAME

16─────────9        1 : +5 VDC      9 : N/C
■■■■■■■■            2 : PB0        10 : GC1
■■■■■■■■            3 : PB1        11 : GC3
•                    4 : PB2        12 : AN3
1─────────8        5 : STROBE*    13 : AN2
                     6 : GC0        14 : AN1
                     7 : GC2        15 : AN0
                     8 : GND        16 : N/C
```

The **GAME** socket is the CPU Card's Apple compatible
Joystick Input.

The Spartan has a large number of jumper blocks which let you easily customize your Spartan.

Depending on how you set them, certain features on the Spartan perform differently.

The jumpers are preset to the following configuration:

Jumper Configuration (Factory Setting)	
JB1	2/3
JB2	1/2
JB3	1/2
JB4	1/2
JB5a	1/2
JB5b	1/2
JB5c	1/2
JB6	1/2
JB7	1/2
JB8	1/2
JB9	1/2
JB10	1/2
JB11	1/2
JB12	1/2
JB13	1/2
JB14	1/2
JB15	1/2
JB16	1/2
JB17a	2/3
JB17b	1/2
JB17c	1/2
JB18	1/2
JB19	2/3

If you have any difficulty using your Spartan after adjusting these jumpers, reset them to the original factory setting.

The function of each of the Jumpers is as follows:

Spartan's Jumpers

JB1 (1/2) Disabled
(2/3) NMI Spartan from C64

When this jumper is in the 2/3 position, the C64 can send an NMI to the Spartan. When it is in the 1/2 position it cannot.

JB2 (1/2) User 1 Function
(2/3) Disabled

When this jumper is in the 1/2 position, the User 1 signal is present on Pin 39 of the Spartan Buss. (See Apple reference books)

JB3 (1/2) Enable Spartan Phantom ROM
(2/3) Disabled

When this jumper is in the 1/2 position, the Spartan Phantom ROM is enabled. When it is in the 2/3 position it is 'mapped' out.

JB4 (1/2) Enable System (Basic) ROM
(2/3) Disabled

When this jumper is in the 1/2 position, the System ROM is enabled. When it is in the 2/3 position it is 'mapped' out.

JB5a **(1/2)** **Spartan on Power Up**
(2/3) **C64 on Power Up**
JB5b **(1/2)** **Drive Timeout**
(2/3) **No Timeout**
JB5c **(1/2)** **RAM test on Power Up**
(2/3) **No Test**

This set of jumpers determines what the Spartan does on Power Up. **JB5a** determines which mode the Spartan System will power up in. **JB5b** determines whether or not the drive will stop looking for a disk after a certain time. **JB5c** determines whether or not the Spartan preforms a RAM test on power up.
(Note that **JB5b** and **JB5c** are only active when the System (Basic) ROM is disabled).

JB6 **(1/2)** **Map in Spartan Phantom ROM when Spartan is NMIed by C64**
(2/3) **Disabled**

This jumper determines whether or not the Spartan Phantom ROM is mapped in after it is interrupted by the C64.

JB7 **(1/2)** **Spartan can Reset the C64 By $C013**
(2/3) **Disabled**

This jumper determines whether or not the Spartan can Reset the C64 by accessing location $C013 on the Spartan side.

JB8 **(1/2)** **ComPort mapped at $D03X**
(2/3) **OR $D13X on the C64 side**

This jumper sets the range of memory locations that the C64 communicates to the ComPort with.
(Useful when a program in the C64's memory uses one of the two ranges of memory).

Chapter 3: Inside the Spartan

JB9 (1/2) Enable software selection of C64
             Phantom ROM on Power Up
      (2/3) Disabled

This jumper determines whether or not the C64
Phantom ROM is software selectable on power up.

JB10 (1/2) Software select C64 Phantom ROM
             (Enable JB9)
      (2/3) Hardwire select C64 Phantom ROM

This jumper determines whether the C64 Phantom ROM
is software selectable or is permanently enabled.

JB11 (1/2) Disable software selection of AUX
             ROM on Power Up
      (2/3) Enabled

This jumper determines whether or not the Aux
ROM is software selectable on power up.

JB12 (1/2) Software select AUX ROM
             (Enable JB11)
      (2/3) Hardwire select AUX ROM

This jumper determines whether the Aux ROM
is software selectable or is permanently enabled.

JB13 (1/2) Enable select on SC0
      (2/3) Hardware select SC0
      (3/4) Disable Slot
JB14 (1/2) Enable select on SC1
      (2/3) Hardware select SC1
      (3/4) Disable Slot
JB15 (1/2) Enable select on SC2
      (2/3) Hardware select SC2
      (3/4) Disable Slot
JB16 (1/2) Enable select on SC3
      (2/3) Hardware select SC3
      (3/4) Disable Slot

JB13-JB16 determine which cartridge slots are selected and whether or not they are software selectable or not.

```
JB17a   (1/2)   Disabled
        (2/3)   PB0 Enabled
JB17b   (1/2)   Disabled
        (2/3)   PB1 Enabled
JB17c   (1/2)   Disabled
        (2/3)   PB2 Enabled
```

This set of jumpers determine which Pushbutton input is connected to the Commodore Joystick when using the Joystick Converter.

```
JB18   (1/2)   Joystick X to GC1
       (2/3)   Joystick X to GC3
JB19   (1/2)   Joystick Y to GC0
       (2/3)   Joystick Y to GC2
```

This set of jumpers determine which axis input is connected to the Joystick converter, since the Spartan has two joystick inputs.

The CPU Card's Jumpers

JC1 Device Alternate
     (1/2) Softswitches at $C02X
     (2/3) Softswitches at $C08X

When this jumper is set to **(1/2)**, the Spartan's
softswitches for the top 16K of RAM are at $C024-$C027
and $C02C-$C02F.
When this jumper is set to **(2/3)**, the Spartan's
softswiches are in the normal RAM Card locations
between $C080-$C08F.
(See the Spartan Memory Map. Page 97)

JC2a&b Character Sets

These two jumpers select which one of four character
sets are displayed when in Spartan mode.

JC3 RAM Banks

This jumper was provided to allow for future memory
expansion on the CPU Card.

JC4 50/60 Hz
     (1/2) 60Hz
     (2/3) 50Hz

This jumper selects for North American or European
Power standards. (North America 60Hz)
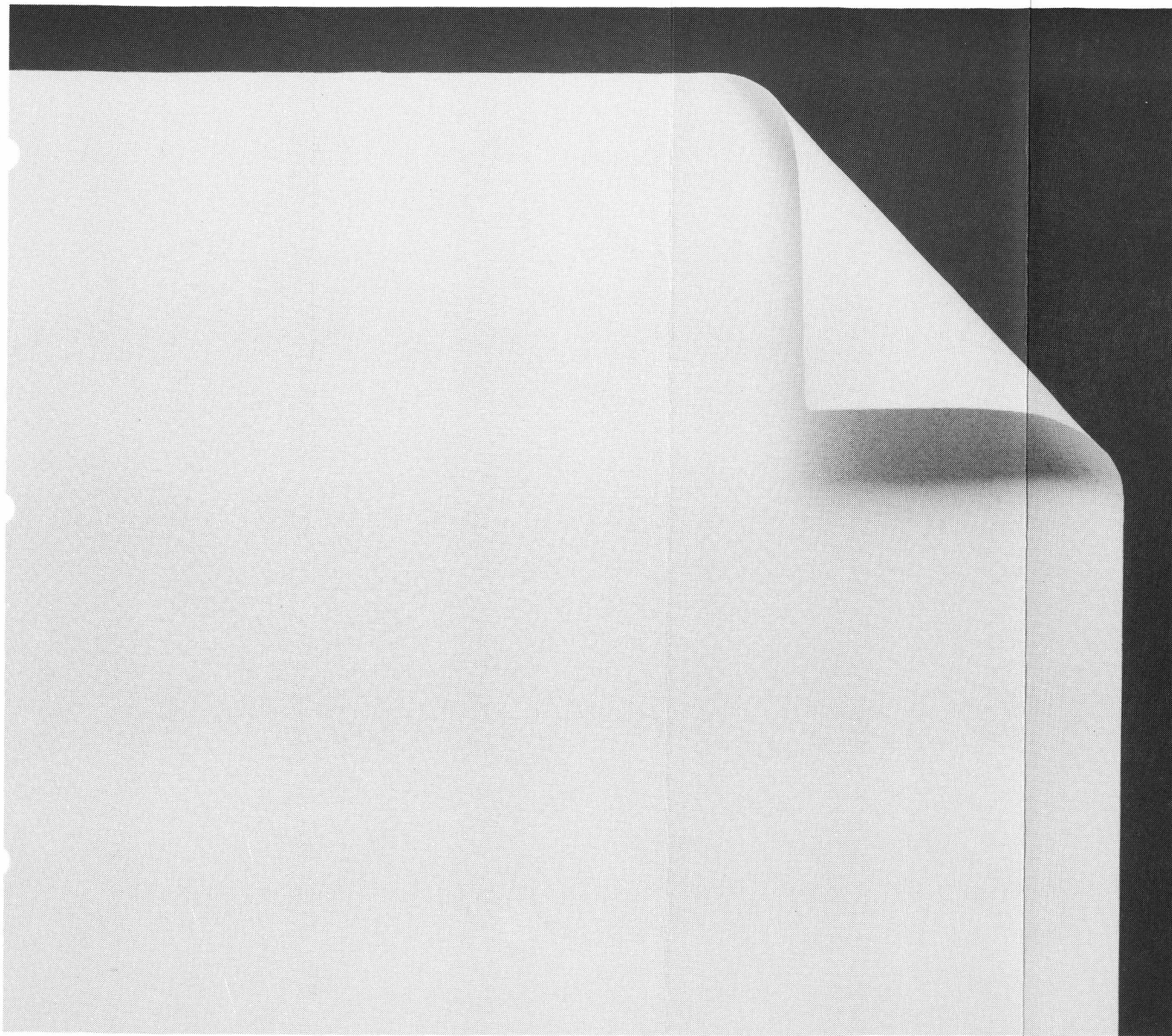

JC5 -12VDC to Keyboard Socket
     (1/2) N/C
     (2/3) -12VDC to PIN 15 of KEY Socket

This jumper selects for keyboard type.
Old Apple Keyboards needed +5 and -12VDC.

This
Chapter
Covers. . .

This Chapter explain the Spartan's memory configuration and how to access it.

The first section explains the Spartan's Memory Map

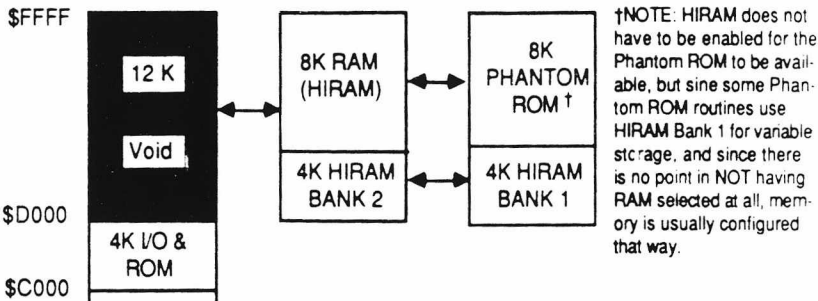The second section explains the ComPort

The third section explains how to use the built in machine language monitor.

Contents

The Spartan's memory map is almost identical to the Apple][+. The main difference is the Phantom ROM at the top of memory.

†NOTE: HIRAM does not have to be enabled for the Phantom ROM to be available, but sine some Phantom ROM routines use HIRAM Bank 1 for variable storage, and since there is no point in NOT having RAM selected at all, memory is usually configured that way.

Soft Switches for Controlling HIRAM

The HIRAM memory is controlled in much the same way as a normal Apple RAMcard, with one exception. The soft switches for controlling HIRAM are normally located in the range $C024-$C027 and $C02C-$C02F. However, there is a hardware jumper on the CPU Card (JC-1) which moves the soft switches for HIRAM up to the $C080-$C08F range, which makes HIRAM act in exactly the same manner as a normal RAMcard. The only real use for this jumper is in a situation where the user has licenced a set of Applesoft ROMs and placed them in the Spartan. At this point, this jumper can be set high and the system will operate as a fairly normal 64K Apple II+, although many Spartan ROM features are lost.

	Write RAM	Read RAM	Disable RAM	Bank 1	Bank 2
$C080/$C024		√			√
$C081/$C025	√		√		√
$C082/$C026			√		√
$C083/$C027*	√	√			√
$C088/$C02C		√		√	
$C089/$C02D	√		√	√	
$C08A/$C02E			√	√	
$C08B/$C02F*	√	√		√	

*Two succesive reads to these locations enable RAM for reading and writing.

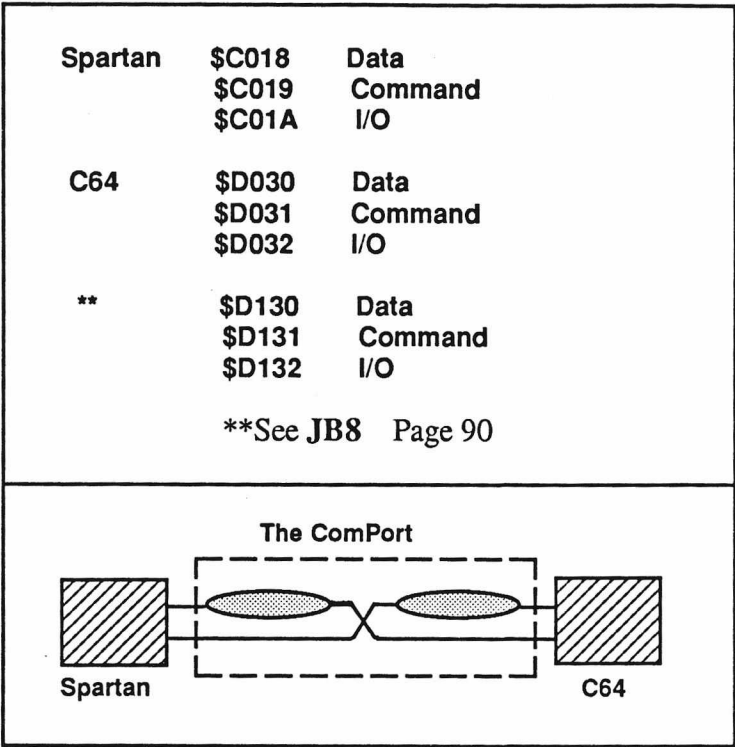See Apple reference material for indepth information on the Apple's softswitches.

The ComPort is a unique custom IC which looks like a few memory locations in both the C64 and Spartan memory maps.

This is the link through which the C64 and Spartan talk to each other.

There are 3 addressable locations on each side:

Spartan	**$C018**	**Data**
	$C019	**Command**
	$C01A	**I/O**
C64	**$D030**	**Data**
	$D031	**Command**
	$D032	**I/O**
**	**$D130**	**Data**
	$D131	**Command**
	$D132	**I/O**

See JB8 Page 90

The ComPort

Spartan   C64

The Data and Command Ports act identically, except the Data Port has flags to tell when the port is ready to be used. (These flags are read from the Input Port.)

The Data and Command Ports are simply 8 bit latches. If, for example, the Spartan writes to the Data Port ($C018) the data is latched into an 8 bit latch where the C64 can read it ($D030). Conversely if the C64 writes to the Data Port ($D030) the data is latched into an 8 bit latch where the Spartan can read it ($C018).

Chapter 4: The Spartan Indepth

Since there are two 8 bit latches per port, you do not
have to read the port (to clear it) before you write.

With the Command Port that is all there is to it.
With the Data Port, there are flags to tell you when
there is Data waiting and when you are allowed to send
more data.

There are two flags to use with the Data Port;
CTS Clear to Send and DAV Data Available.

When you write to the Data Port the CTS flag goes
low and the DAV goes high on the other side.
When you read the Data Port the DAV goes low and
the CTS flag goes high on the other side.

So you can see that using these flags would prevent you
from over-writing Data that has already been sent.

The flag status can read read from the I/O Port
When you read and write to the I/O Port, you can
see the following:

Reading the I/O Port			
BIT #	**FUNCTION**		
0	**Boot Status**		
1	**(See JB5a,b,c)**		
2			
3	**N/F**		
4	**Cassette Mode**	**1=SP/0=C64**	
5	**CTS**	**1=Clear/0=Wait**	
6	**DAV**	**1=Data/0=No Data**	
7	**N/F**		
Writing to the I/O Port			
		BIT 1	BIT 0	VIDEO
BIT #	**FUNCTION**	0	0	Spartan
0	**Video Control**	0	1	Mixed
1		1	0	Spartan
2	**Audio Control**	1	1	C64
3				
4	**N/F**	BIT 3	BIT 2	AUDIO
5	**N/F**	0	0	Spartan
6	**N/F**	0	1	Mixed
7	**N/F**	1	0	C64
		1	1	OFF

The C64 and Spartan Phantom ROMs contain a very
useful machine language monitor.

This monitor allows you to directly manipulate individual
Bytes of memory.

You can enter the monitor by typing **&ML** on the C64
side or **CALL-151** on the Spartan side.

Once you have entered the monitor program, you will
have a * prompt.

The following commands are available:

MONITOR COMMANDS

Move Memory	cccc<bbbb.aaaaM
Compare Memory Ranges	cccc<bbbb.aaaaV
List Instructions	aaaaL
Examine Byte	aaaa
Examine Range	bbbb.aaaa
Change Bytes	bbbb:aa aa aa aa. . .
Add Hex (16 Bit)	bbbb+aaaa
Subtract Hex (16 Bit)	bbbb-aaaa
Convert Hex to Bin & Dec	aaaa=
Execute Code at 'aaaa'	aaaaG
View Registers	Z
Return to BASIC	X
Send Data to Slave	cccc<bbbb.aaaaS
Take Data from Slave	cccc<bbbb.aaaaT
Multiple Cmd. Seperator	/
Become a Slave (Obey)	O
Send a Command	aa]
Make Other Machine a Slave	!
Release Other Machine	@

aaaa<bbbb.cccc

aaaa = Destination Address
bbbb =Source Address
cccc = Length

Any of the monitor commands that are of the format;
aaaa<bbbb.cccc, are easy to use.

The first four characters are the Destination address,
the second group is the Source address,
and the third group is the Length in Bytes.

For example, if you wanted to move 256 bytes
from $5000 to $1000, you would simply type:

1000<5000.0100M

Many of the commands are self explanitory.

Another useful one is **aaaaG** this runs the machine
language routine at the specified address.

A little time spent experimenting with the commands
is well worth it.

For a detailed explanation on their use, consult
one of the many excellent reference books available
on machine language programming with the Apple.

**Appendixes
Index**

Symptom	Remedy
Blank Screen	Ensure the monitor is turned on, and adjusted properly.
	Make sure the power cords for the Spartan, C64, and TV/Monitor are connected properly.
	Check the Duo-DIN and Video Cable connections. Make sure the strip connector on the Duo-DIN cable is seated properly on **J13**, and that all of the wires are in good condition. Make sure that the video cable we supplied is plugged into **J1** on the back of the Spartan, and the Yellow RCA connector is attached to the Video Input on your monitor.
	If you are using a TV and RF Modulator, make sure the Strip connector is seated properly (Page 22). Also refer to information recieved with your RF Modulator.
	Ensure that the C64 and Spartan are mated properly.
	Check to ensure the CPU Card is seated properly.
	Make sure the **shortest** ribbon cable is properly inserted in the **Stuff** socket on the CPU Card, and the other end is properly seated on **J11**. (Page 14)
	Find and adjust **RV4** (Spartan Video Intensity) on the Spartan Buss.

Symptom	Remedy
Garbage on Screen	Press the Spartan reset button. (Right side of Spartan, furthest back) Recheck the CPU Cable connections. Ensure the CPU Card is seated properly. Turn the power off, and remove the CPU Card and its cables. Using a plastic eraser, gently clean the gold fingers on both sides of the card. Lightly press the Two Large Square ICs into their sockets. Then reinstall the CPU Card (Page 13), and power up the system. Recheck the cable connections. (See Symptom: *Blank Screen*)
No Keyboard Control	Make sure the Commodore Power Supply is plugged into an outlet, and to J2 on the back of the Spartan. Check to ensure that the C64 and Spartan have beed mated properly. Turn off the power, and disconnect the Duo-DIN Cable. Then disconnect the C64 from the Spartan. Using a plastic eraser, clean the gold fingers on the Spartan which mate with the C64 cartridge slot. Reconnect the system (Page 18), and power up the system.
Spartan Video, but no C64 Video (Have KBD control)	Check to make sure the Duo-DIN cable has been connected properly. Make sure the strip connector on the Duo-DIN Cable is seated properly on J13, and that all of the wires are in good condition.

Symptom	Remedy
	Make sure the DIN plugs are inserted properly. If this doesn't help, try adjusting **RV5** on the Spartan Buss Card.
Disk Drive Spins on power up (No Cursor)	Apple computers try to boot a disk on power up, unlike the C64. Insert a disk in the drive.
Disk Drive Spins Endlessly on Power up. (With Disk)	Make sure you are using a good disk. Recheck the drive controller installation. Make sure the card is seated properly in **S6**. Also check the DOS Cable. Carefully recheck the DOS Card installation. (Page 27)
Disk Drive Does nothing on power up	Make sure the drive controller is seated properly in **S6**. Also check the DOS Cable. If these seem to be connected properly, turn off the Spartan and recheck the DOS Card installation. (Page 27) The 'Buzzing' sound is the drive searching for Track 0. If it is 'buzzing' continually, it means it cannot find Track 0.
Disk Drive 'Buzzes' endlessly on power up, or any time when accessing the disk drive while in Spartan mode.	Make sure the disk you are using is good. If this does not cure the problem, your disk drive may be out of alignment. Have your drive checked by a qualified service technician, or read the Appendix: *1541 Disk Drive Alignment Procedure.*

Symptom	Remedy
'64K Required' Error Message	Move JC4 on the CPU Card, to position 2/3.
Commodore Program crashes Video Signal from **J1**	Some programs on the Commodore use the same memory locations as the COMPORT. This has the effect of toggling the video modes. Try moving **JB8** on the Spartan Buss Card to position 2/3. Then power up again. If this does not help, move the jumper back to its original position. You will have to use the C64 in 'native mode' when running this program. Move the Video Cable from **J1** on the back of the Spartan, to **J4**. Note that the function of the two RCA jacks are now reversed. **Yellow** is **Audio** **White** is **Video**
**Commodore Program switches Video signal to Spartan Video	Reset both systems, switch to C64 mode. Move **JB5** to position B/C, then press **F8** and load the program as normal. N.B: Remember to move **JB5** back to the A/B position when finished. ** This applies only to the new system ROM (SW SYST V2).

As delivered by Commodore, the 1541 Disk Drive may not be accurate enough to meet the read and write conditions of the Spartan.

If you are having difficulty reading your Spartan or Apple disks, an alignment of the Disk Drive head stepper motor may be needed.

It is our recommendation that you have this alignment done by a professional service center. However, some of the more adventuresome of you may like to try it yourselves.

Mimic Systems accepts no responsibility for damage that may happen to anything or anyone in performing this procedure.

[1] | **Test the System**

First ensure that you **need** to align your drive.

Make sure your problems are not caused by the C64, Spartan, 1541 Disk Drive electronics or the disk you are using.

Be sure that the Spartan is properly connected to the 1541 Disk Drive.

If you are certain that these are not the causes, then continue. . .

[2] | **Remove the Power Cord**

Disconnect the power cord from the 1541 Disk Drive. This cord is not needed in the alignment procedure.

There are **Lethal Voltages** present within the 1541 if this cord is not disconnected.

[3] | **Remove the Drive Lid**

Remove the cover of the 1541, if it is not already off.

[4] | **Remove the Drive Chassis**

The disk drive chassis is held onto the bottom plastic shell by six screws, (three on either side) located in the space left between the shell and the metal chassis.

Remove them, and set them aside.

[5] | **Locate the Head Stepper Motor and Mark It**

Locate the Head Stepper Motor on the bottom of the chassis. This is a flat, metal cylinder about 2 1/2 inches in diameter, located just left of center, toward the front of the drive.

Note that the motor can has two metal tabs with screws. These are used to hold the stepper motor in alignment.

Take a sharp point and mark the position of the stepper motor with reference to the chassis.
this gives you a starting point to come back to when aligning the motor.
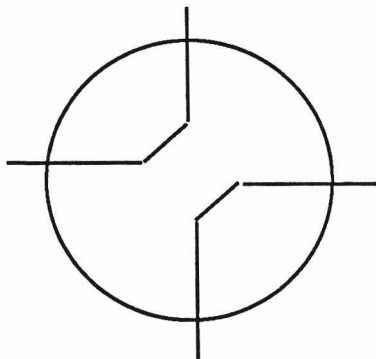
READ THROUGH THE REST OF THE ALIGNMENT
PROCEDURE BEFORE ATTEMPTING IT.

Align the Motor

Turn on your Spartan system and press the Spartan
reset button (Furthest back of the three)

Once you have clearly marked the motor, loosen the
screws on it just enough so you can move the motor
housing.

The stepper motor will only be out of alignment by a
tiny amount. The amount you will have to turn the motor
should be no more than a degree of two in either direction
from your reference point.

Place an Apple format disk in the drive and close the
drive door.

With one hand, hold the stepper motor in position,
(use the chassis as a brace). With the other hand, type
PR#6 <Return> on the keyboard.

The drive motor will start and the stepper motor will
move the drive's head to the 'track zero' position.
You will feel the motor moving as it does this.

If the heads start to sound as if they are finding data,
you have already found a somewhat acceptable alignment.

If not, move the motor a fraction and see if you get any
response.

Continue your search in first one direction and then the
other until the system loads the DOS (Disk Operating
System).

Tighten up the screws enough to keep the motor from moving around.

Type CATALOG <Return> on the keyboard. The system should display the disk directory on the screen. If the drive has difficulty in the search, then loosen the screws off again and carefully give the stepper motor a bit of a turn.

Follow this process until the drive loads properly. Then tighten the screws, (do not over do it, as you may strip their threads).

[7]   **Reseat the Drive Chassis**

Once you are satisfied with the alignment, replace the drive chassis in the bottom shell, fasten it down again and close up the unit.

The above procedure (if followed correctly) should allow you to read both Apple and Commodore disks.

If you attempt this procedure and the drive turns out the same or worse than before, then your nearest dealer will be able to assist you in drive alignment.

The information that comes with your Spartan is only
intended as an introduction to its features. It is only
a small fraction of the information available to the
Apple User.

There are thousands of sources of information for the
Apple][. Here are some suggested sources:

Books

Apple][User's Guide For Apple][Plus and Apple][e
Poole, Lon & McNiff, Martin & Cook, Steven
Osbourn/McGraw-Hill
2600 Tenth Street
Berkeley, CA
94710

The Apple][BASIC Handbook
Hergert, Douglas
Sybex
2344 Sixth Street
Berkeley, CA

The Apple Personal Computer For Beginners
Dunn, Seamus & Morgan, Valarie
Prentice-Hall
Englewood Cliffs, NJ

Games Apples Play
Capella, Mark J. & Weinstock, Michael D.
Datamost
20660 Nordboff St.
Chatsworth, CA

How To Use The Apple][&][e
Price, Robert & Willis, Jerry
Dilithium Press
8285 S.W. Nimbus, Suite 151
Beaverton, Oregon
97005

Kids and The Apple
Carlson, Edward H.
Datamost
20660 Nordboff St.
Chatsworth, OH

Mastering Your Computer The Apple][Plus Edition
Atlantis Publishing Company
5432 Hallandale Beach Blvd.
Hollywood, FL

User's Guide To The Apple][
Antonovich, Michael P.
Weber Systems, Inc.
8437 Mayfield Road
Cleveland, Ohio
44026

What's Where In The Apple:
    A Complete Guide to the Apple Computer
Micro Ink, Inc.
Ten Northern Blvd.
Amherst, NH

Magazines

Nibble
Box 325
Lincoln, MA

inCider
Box 911
Farmingdale, NY
11737

BYTE
Box 590
Martinville, NJ

Apple Orchard
908 George St.
Santa Clara, CA