



BCD VC-16a

DVD/Multimedia Controller

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Manual Revision 1.3 3 March 2004
Machine Addenda Revised 30 September 2003
Photos rearranged 14 December 2004

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BCD VC-16a Controller

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BCD VC-16a Controller

Introduction

Welcome to the VC-16a Controller!

This document will show you how to connect, configure, operate, and if required, reprogram the VC-16a. We will refer to the VC-16a as either the “VC-16a” or the “Controller” because parts of this manual come from other BCD products.

About BCD Associates, Inc.

BCD has manufactured controller systems for video since 1980. BCD is known for *frame-accurate* time code control of video tape machines for computer-controlled interactive applications. In fact the first two interactive videodiscs produced by Sony were developed using BCD interactive systems. (Remember the big, 12” Videodiscs? Also called Laserdiscs?)

What is a VC-16a?

The VC-16a is the first in a line of controller products designed originally to operate DVD players for exhibits and displays by means of push-button or RS-232 control. (You add the pushbuttons and the VC-16a does the controlling.) This is a perfect application when you want to limit the viewer choices and a touch screen is not required. You connect buttons to the VC-16a and designate what each button is to do. As it happens, the VC-16a can do a lot more than that, but we’ll discuss some of the other applications later.

Each of the 16 inputs is configurable to send a specific command (Infrared or RS-232 Serial), or a *series of commands* to the controlled device. Frequently, the VC-16a is set up to emulate the buttons found on the machine’s hand-held IR (InfraRed) remote control.

For RS-232 Serial control by your computer, the VC-16a offers multiple Baud rates, and BCD’s standard 4-character command set: PLAY, STOP, REWD, etc.

New for firmware version VA40303 and above is an *optional* Alternate Parser or command language. (Switch #6 Up at power on activates the Alternate Parser.) The first non-BCD command set to be implemented is that of the Panasonic AG-5700/5710 RS-232 controlled VCR. This machine is often used for recording Ultrasound scans, and many of our clients asked if our controllers could operate a DVD recorder while emulating a VCR. Yes!

Typical DVD Examples

For example, for DVD control, you may want Button #1 to be the “Up Arrow”, #2 to be the “Down Arrow”, #3 to be the “Left Arrow”, #4 to be the “Right Arrow”, and #5 to be the “Enter” button. This lets your viewer navigate the DVD from your exhibit display just like a “regular” DVD.

In another instance, your DVD may have 5 video segments. You can assign one button to each of the segments. This, of course, requires that you create/author your DVD disc so that it responds to numeric commands from the IR remote. Pressing the “3” key plays video segment #3. If you can make the DVD player do what you want by using the IR remote, it’s very likely that you can do the same with the VC-16a

Let’s begin with what’s included...

Components

- 1 VC-16a Controller
- 1 9 Volt Power Supply
- 1 IR Emitter Cable for machine control
or Machine Control RS-232 Serial Cable
- 3 Ribbon Cables
- 1 Serial Cable (9-pin to RJ-11 modular plug)
- 1 3.5” Floppy Disc

Hookup

There are four types of connections to be made:

Button Connections (Ribbon Cables)

Control Cable: (IR Emitter or RS-232 Serial)

Power

Host Computer Cable (for Button Programming & Flash ROM update and/or computer control.)

Ribbon Cables (for Buttons)

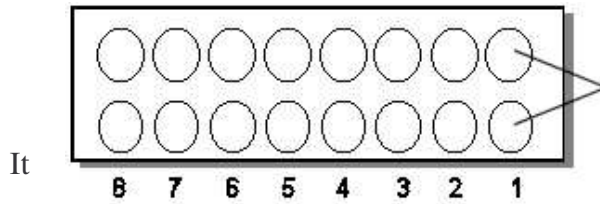
Connect the ribbon cable marked “Button In 8-1” to the corresponding pin header on the rear of the VC-16a. NOTE that the cable exits its connector from the bottom, and the cable’s colored stripe is on the right. Each pair will connect to one of your 8 pushbuttons on this header.



If you need more than 8 buttons, connect the second “Button In” cable to the header labeled “Button In 9-16”. If your application requires *GPI Triggers*¹, connect the third ribbon cable to “Trig Out 8-1”.

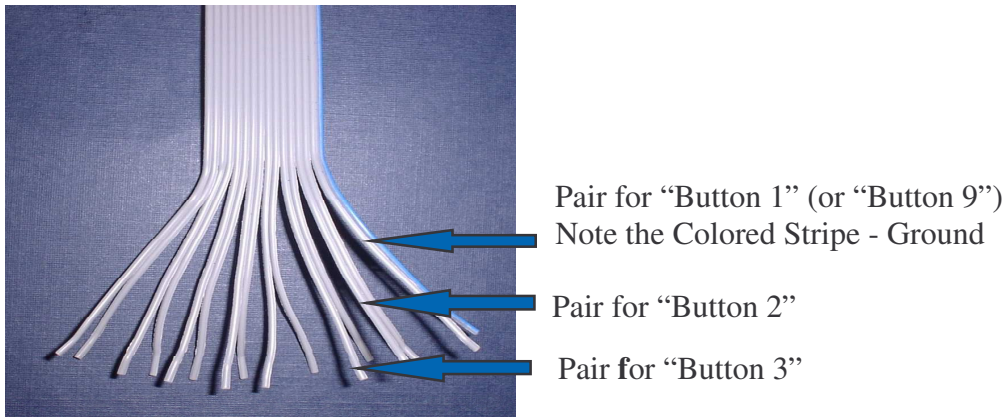
¹ GPI means “General Purpose Interface”. The 8 GPI outputs are similar to electronically controlled switches.

The “Button” pin contacts on each header on the rear of the VC-16a are assigned in vertical pairs going from Right to Left.



This diagram depicts the headers on the rear of the VC-16a. This is “Button #1” for the header called “Button In 8-1”. is the same configuration for the header called “Button In 9-16”.

The upper row is Ground and the lower row is Active.
 On each of the Ribbon Cables, the Colored Stripe (Pin 1) goes on the Right as you face the rear of the VC-16a, so the “Button” numbering for the ribbon cable goes from **Right to Left**, just like on the headers.



The “Button” contacts for the VC-16a are grouped in 3 sets of 8: Two sets for Button Input, one set for Output. The inputs are designed to use momentary contact pushbuttons, similar to doorbell buttons. Each of the 8 outputs can drive an LED².

Depending on how many buttons you plan to use, connect one or both of the “Button In” ribbon cables to their headers on the back of the VC-16a.

Note: for testing purposes, you can touch two of the wires together (like the Pair for “Button 1”) to simulate a button press.

Button Assignments

Even though all buttons are programmable, the VC-16a is usually shipped with a default set of button function assignments. Below are designations of the Button Number, the BCD Command (in ALL CAPS), and a description.

² LED means Light Emitting Diode – The three small lights on the front of the VC-16a are LEDs.

**Default "Button" Assignments
"Button In 8-1"**

1. STUP Up (DVD Control Arrows)
2. STDN Down
3. STLF Left
4. STRT Right
5. ENTR Enter/Ok
6. RETN Return
7. PREV Previous
8. NEXT Next

**Default "Button" Assignments
"Button In 16-9"**

In the default configuration, these are Numeric values from 1 to 8.

9. NUMB 1 (The number 1)
10. NUMB 2
11. NUMB 3
12. NUMB 4
13. NUMB 5
14. NUMB 6
15. NUMB 7
16. NUMB 8

IR Emitter

The IR Emitter assembly consists of a small-diameter cable with a sub-mini plug on one end and a black shell on the other end which contains the actual emitter.

Plug the IR Emitter sub-mini plug into the jack marked "IR".

We have equipped the emitter with an adhesive black Velcro® disc.

FIRST - Experiment with the placement of the emitter to locate the IR receiver on the front of the player. (Sony marks their players with the symbol "IR" which is just above the actual IR receiver. The Pioneer DVD-7400 has the symbol "SR" just above the IR receiver.)

Attaching the IR Emitter to the player is one of the **last steps** in the hookup procedure. (Bookmark this section and come back to it when you are REALLY READY to attach the Velcro® because it is very sticky and difficult to reposition!) Remove the adhesive-sided Velcro disc and adhere it to the front of the player DIRECTLY ON the IR receiver of the deck. (Infrared light can penetrate the Velcro® just fine.) Attach the Velcro of the Emitter to the Velcro on the player.

RS-232 Machine Control Cable

The Device Control RS-232 Serial Cable has a telephone-type RJ-11 connector on one end, and a 9-pin (or sometimes 25-pin) connector on the other end. Connect the 9-pin to the remote control connector on your DVD player, and plug the RJ-11 connector into the VC-16a jack marked "Device Remote".

RS-232 Computer Communications Cable

Like the Device Control cable, the Communications Cable has 9-pin and an RJ-11 connectors. The 9-pin goes to your computer Serial Comm Port (Com1 or Com2), and the RJ-11 goes to the rightmost jack marked "Host RS-232 Looping".

EMULATION NOTE:

If you purchased a version with the optional Alternate Parser, you also received a special RS-232 cable with a connector that looks like the one on the back of the emulated machine. This connects between YOUR controlling device and the VC-16a Host RS-232 instead of BCD's standard Communications Cable.

Initial Testing

Do you feel lucky?

Try this test to determine if your VC-16a was configured just the way you want when you ordered it from the factory:

- Connect your DVD player to a TV monitor and verify that your disc plays.
- Plug in the power to the VC-16a. (The two lights on the front of the box should blink a couple of times.)
- Tape the IR Emitter to the machine where you think it ought to go. (Just use some kind of sticky tape for now until you are certain that everything is working properly.)
- Put a DVD disc (one that has a menu) into the DVD player.
- On the "Button In 8-1" cable, touch the first conductor (colored blue or red) on the ribbon cable to the second conductor (gray). **If** the VC-16a is set to your machine type, and **if** the default programming is in effect, the highlight on the DVD menu screen should move UP. If it works, do it again. It's fun! Go crazy and use the second pair of conductors to make the highlight move DOWN.

If this is all you need the VC-16a to do, connect your buttons to the proper connector pairs and install the system in you exhibit or display. You will probably need to add some extra wire to extend the distance to your buttons. BCD can sell you custom ribbon cables made to your lengths, or just buy some (with connectors) at an electronics supplier, (The ribbon cable is 16-conductor, and the connector is a "16 position Insulation Displacement Ribbon Cable connector.)

If this works the way you want, forget the rest of this manual and go build your exhibit!

Computer Communication Setup

The VC-16a communication configuration process is not difficult, but it is a bit of a hassle. Fortunately, you only have to do it once...unless you change to a different Make/Model DVD machine or you wish to re-assign the functions of the buttons.

You should know how to:

- Operate a computer
- Find the computer's RS-232 Serial Port (9-Pin)
- Operate a "Terminal Communications Program" like Windows *HyperTerm*, *Telix*, *Procomm*, or BCD's *BCDComm*.

If you ever need to install completely new firmware, you must also know how to get into “MS-DOS Mode” and how to change directories.

Computer Communication

The *Host Serial Cable* has 9-pin (DB-9) female connector on one end and an RJ-11 modular telephone plug on the other end. Plug the 9-Pin end into your RS-232 Serial Port (Com1 or Com2), and plug the RJ-11 connector into *either* of the *Host Serial Looping* connectors.

Communications Parameters

The *Switches* on the rear of the VC-16a control how the VC-16a communicates with your computer. The *Setup* or *Properties* of your terminal program control how your computer communicates with the VC-16a. BOTH the switches and the terminal program must have the same values.

Usual Switch Settings

For 9600 Baud, all switches are Off.



This picture shows the VC-16a settings for:
Baud Rate: 9600 (9600 bits per second)
Parity: None
Data Bits: 8
Start Bits: 1
Stop Bits: 1

For 38,400 Baud, switch # 7 is On, all other switches are Off.

At BCD, we usually operate with **Switch 7 On** and **All Other Switches Off** because it permits faster downloading. For normal operation, it doesn't matter.

Note: **Parity, Data Bits, Start Bits, and Stop Bits are always the same.** The only parameter controlled by the switches is the Baud Rate. Be certain that the parameters of your terminal program agree with the switches.

HyperTerm Settings

Cancel the *New Connection Window*.

Click on the *File* menu and choose *Properties*.

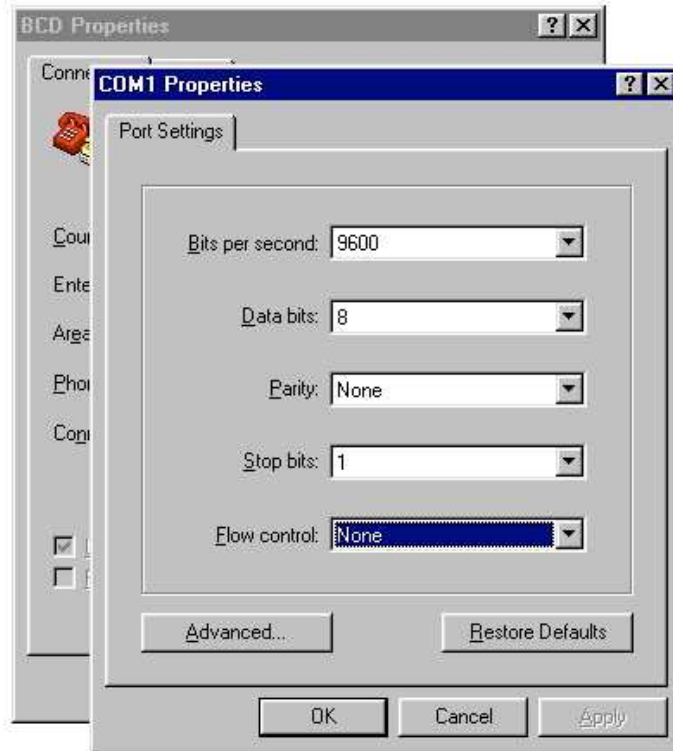
Choose *Direct to Com1* or *Direct to Com2*.

Click *Configure*.

Set the “Bits per second” window to be the same as your setting for Switch 7 (9600 or 38400). **Be certain that “Flow Control” is set to None.**

Alternate Parser Switch

To activate the Alternate Parser, put Switch #6 Up/On before applying power.



BCDComm Settings

BCDComm is an MS-DOS program that we use all the time because it provides very fast, direct communication with BCD controllers. It is configured with a text file called BCD.PRM.

For 38.4K Baud, the BCD.PRM file should be

mode = com1:38400,n,8,1

For 9600 Baud, the BCD.PRM file should be

mode = com1:9600,n,8,1

Note that the line is lower case and there are *spaces* on both sides of the “=” equal sign.

Change “com1” to be “com2” if your are using Serial Comm Port #2.

Talking to the Box

Be certain that you are hooked up, Switch 7 is set the way you like it, and your communications parameters are correct. On your computer keyboard hit the ENTER key several times. You should see a series of BCD Prompt Characters (>) like this:

```
>
>
>
```

If you do not see this, something is wrong: Switch #7, terminal program parameters, the cable, the computer, or the Controller (unlikely).

BCD Command Syntax

All BCD Commands are 4-characters long, terminated by a Carriage Return/Linefeed. In a terminal program, the Carriage Return/Linefeed is the same as the Enter key.

The first command you should type is `VERS`. This is short for `VERSion`, and it will display the version of the firmware that is in your controller. Something like:

```
BCD VC-16a Control System Copyright 1986-2002
V20331 Sunday March 31 2002 10:56am
```

The important part is the Version Number – in this case `V20331`. Write this down, and it's also a good idea to tape it on the Controller.

When you see the `VERSion`, you know that the Controller is working and that communications are ok.

In this manual, when we issue a command like `PLAY`, it is assumed that we mean `PLAY<CR>`, or `PLAY` followed by the Enter key.

Commands are **not** `cAsE-sEnsitive`. Spaces do not matter.

You can issue several commands on the same line, with commands separated by a semicolon (;) like this:

```
PLAY ; TIME 100 ; STOP
```

This causes the unit to play for about 10 seconds, then stop. (Each unit of `TIME` is about 0.1 second.)

The `TYPE` command

`TYPE` is very important, because it tells the controller the make and model of your machine. Issue the `TYPE` Command and you should see a number like

```
15
>
```

Issue `DEBG 1` and type `TYPE` again. You should see something like:

```
15 Panasonic DVD General IR (Type 15)
```

The `DEBG` command (that's the word debug without the "U") is helpful to let you see in human terms what is happening with the Controller. Now, with "`DEBG 1`" in effect, type `VERS`. The Controller will display the current firmware version AND will display all of the machine types available in this firmware version.

If your machine is listed as a supported machine at the BCD Website www.bcdusa.com/vc16, but it is not listed in these displayed machines, call BCD and we will email the proper file to you for Flash update.

Note the last two lines of this VERSion display:

```
Default machine type: 15
Current machine type: 15
```

The Save Command

If you issue the TYPE command to change a machine type, that change will disappear when you disconnect the power. To save the TYPE and make it permanent (more or less) type the SAVE command. This will save the machine TYPE as well as all of the current button values.

Button Assignments

First, see how the buttons are currently assigned. Type BUTS for BUTtonS. You should see something like this, but without the comments

```
:
      BT01 STUP      DVD Arrow Up (STep UP)
      BT02 STDN      DVD Arrow Down (STep Down)
      BT03 STLF      DVD Arrow Left (STep LeFt)
      BT04 STRT      DVD Arrow Right (STep Right)
      BT05 ENTR      DVD Enter Key (ENTeR)
      BT06 RETN      DVD Return Key (RETurN)
      BT07 PREV      DVD Previous Key (PREVious)
      BT08 NEXT      DVD Next Key (PREVious)
      BT09 NUMB 1    DVD Number Keys (1 to 8)
      ...
      BT16 NUMB 8
>
```

The diagram above shows the button command (BT01, etc.) followed by the BCD command associated with that button. If you like these command associations, if they work for your application, you don't have to do anything more.

If, by chance, you see garbage characters after the BTxx command, you MUST reprogram the buttons. Just to be neat about it, you should reprogram ALL the button values that show garbage. If you don't plan to use a particular button, you should assign it the NULL command, which when activated will do nothing.

Like this: BT12 NULL

Programming the Buttons

It's really simple. The first button command is BT01 (that's BT zero one) for Button #1. The last button command is BT16 for Button #16.

To assign the PLAY command to Button #1, type

BT01 PLAY

If you want the change to be permanent, type SAVE.

If you want Button 3 to make the machine play for 10 seconds, then stop, just type:

BT03 PLAY; TIME 100; STOP

Then type

SAVE

Now, whenever someone presses Button #3, the machine will Play for 10 seconds, then Stop.

Other Parameters You Can SAVE

RL16 - The "RL16" command is special. It is active when Button 16 is ReLeased.

Unless you require this function, RL16 should be NULL.

GDLY – This determines how long a button must be pressed before the VC-16a considers it to be really pressed. Electronically, this is called *debounce*. Each unit of GDLY is about 3 milliseconds, and the default is GDLY 3 or about 9 milliseconds.

MUTM – Mute Timer. One customer wanted a mute button (and the IR remote on his player had one) so we implemented the MUTE command for that player. He also needed a timer to UN-mute after some time period. The default is 0, and you need not worry about it if your DVD player does not have a MUTE button.

The HELP Command

If you forget the BCD commands, the HELP will give a complete listing of all commands available in that version of the firmware. There are no definitions shown, just a list of the commands as a reminder.

Mode Definitions (MODF command)

There are many commands we could include in the FlashROM firmware, but each command takes a certain amount of space. To increase flexibility we use the MODF command which invokes various MODe DeFinitions. The MODF command is always followed by a number. For example, to issue the "NEXT" command you could say "MODF 22" (without the quotes, of course).

Please note: only a few of these values are valid for many machines, namely the Arrows (STUP, etc.), NEXT, PREVIOUS, RETURN, and ENTER. Others may be specific to only one machine.

If you use the "MODF x" command, please use the associated Number. We use the words in the left column internally within our program as mnemonics. Some of the words may actually be commands, but most are not.

NEXT '22' Next Key
PREV '23' Previous Key
STUP '24' Step Up (Arrow Up) to next box
STDN '25' Step Down (Arrow Down) to next box
STLF '26' Step Left (Arrow Left) to next box
STRT '27' Step Right (Arrow Right) to next box
OKOK '28' OK or ENTER or Select
ENTR '28' OK or ENTER or Select
CLOS '30' Close
TSEL '31' Philips DVD-170 T-C Select
ANGL '32' Angle
AUDI '33' Audio track sel
CMEN '34' Chapter Menu (Philips)
TITL '35' Title Menu (or TMEN, Top Menu)
MENU '36' Menu Key
RETN '37' Return Key
STAT '38' Status request
CHPS '50' Chapter Status
CHPP '51' Chapter Play
TMEN '52' Top Menu (See also TITL)
DTYP '53' What disc type-Philips
TITS '54' TitleStatus

Sony DVD

FL_A '56' Sony Changer Folder A cmd
FL_B '57' Sony Changer Folder B cmd
FL_C '58' Sony Changer Folder C cmd
FL_D '59' Sony Changer Folder D cmd
FLAL '60' Sony Changer Folder ALL cmd
FLDV '61' Sony Changer Folder DVD cmd
FLCD '62' Sony Changer Folder CD cmd

Panasonic DVD

DISC1 '63' Pan Changer direct DISC Select
DISC2 '64' Pan Changer direct DISC Select
DISC3 '65' Pan Changer direct DISC Select
DISC4 '66' Pan Changer direct DISC Select
DISC5 '67' Pan Changer direct DISC Select
SLOAD '68' Sony Load (Disc Explorer) check for all discs

Pioneer DVD-7400

GT10 '69' Pioneer 7400 Greater than 10 for Chapters * VideoCD
FRMS '70' Pioneer 7400 Frame Search Button
TSCH '71' Pioneer 7400 Title-Chap. Srch button

Myron & Davis (MD) Mobile

RSUM '73' M&D Resume
MUTE '74' M&D Mute

DISP '83' Display
SUBT '84' Subtitle

More Pioneer DVD-7400
DSON '86' Display ON
DSOF '87' Display Off
CHAP '88' Chapter

Pioneer DVD-7400 RS-232 status requests for MODEDEF
(Several of these queries are not included in the firmware, to save space in the firmware.
Let us know if there are any that you particularly need and we can prepare a firmware file
for you.)

ADDR '89' ?A Current Address ?A
TNUM '90' ?R Title-Track Num
CNUM '91' ?C Chap num request
TCOD '92' ?T Time Code Request
INUM '93' ?I Index Number Request
FRAM '94' ?F Frame Number Request
BLOK '95' ?B Block Number Request
TFRM '96' ?Y Total Frame Number Request
TOCQ '97' ?Q TOC Info Request
REGD '98' ?G DISC Region Code Request
STAD '99' ?V DVD Disc Status Request
STAL '100' ?D Laser Disc Status Request
STAC '101' ?K CD Disc Status Request
STAP '102' ?P Player Active Mode Request
STAM '103' ?X Player Model Name Request
CCRM '104' ?W CCR Mode Request
RTIM '105' ?H Real Time Mode Request
REGP '106' ?M PLAYER Region Code Request
INPQ '107' ?N Input Number Request
ERRQ '108' ?E Error Code Request
TITP '110' IR Title Play (like CHPP)

Machine Notes

These are observations and hints concerning various machines that we control.

Pioneer DVD-V7400 RS-232 (Type 14)

RS-232 Serial Connection

Connect the 15-pin connector of the control cable to the jack on the rear of the deck. Connect the RJ-11 connector of the control cable to the “Device Remote” jack on the rear of the VC-16aa controller.

Communication Parameters

Communication between the BCD Controller and the Player is 9600 bits per second. As usual, we recommend the PC <==> BCD communication be set to 38,400 (Switch 7 Up/On)

Command Set

The Pioneer DVD-V7400 uses essentially the same command set as their previous LaserDisc players with a few additions. This is nice because you can go to specific frame numbers and play until specific frame numbers. The disadvantage is that many DVD navigation commands are not present: Not present are STUP, STDN, STRT, STLF, ENTR, NEXT, PREV, RETN.

FIND xxx (Goto Frame #)

FIND xxx takes you to frame # xxx and still-frames on that frame. It can take as long as 4 seconds to go from one frame to another.

PLAY yyy (play until frame #)

PLAY yyy plays from current position until frame # yyy. If yyy is equal to or less than frame xxx used by FIND, an error is reported.

Because it takes some time for the player to go to a frame, we suggest the following command string to play from xxx to yyy:

```
FIND xxx; TIME 40; PLAY yyy
```

Differences in DVD authoring systems and techniques can impact the FIND time, so you should experiment with TIME values for your system.

Consider this set of commands:

COMMAND	COMMENT
>FRAM	Request current frame number
>5000	the current frame number

>FIND 2000; PLAY 3000

An error will occur because the player still reports 5000 as the current frame number until some period of time *after* frame 2000 has been found.

OFST the PLAY Target

Sometimes a disc will be a frame late with the Play Target as in

>PLAY 1000

>FRAM

>1001

The OFST is preset for 1 frame so that the controller issues STOP or PAUS to the player at frame 999. If the PLAY command is consistently 1 frame late, issue OFST 2 which will automatically subtract 2 frames from the Play Target instead of the usual 1 frame.

CHAP xx (Go to Chapter #)

CHAP 3 goes to the first frame in Chapter # 3 and still-frames.

If Chapter #3 does not exist, there is an error.

CHAP, by itself, with no number, returns the current chapter number.

CHPP yy (Play until Chapter #)

CHPP 4 plays from the current position until Chapter #4 is reached. The controller switches from polling the deck for frame numbers and begins polling the deck for current chapter numbers. The controller issues pause/still when the deck reaches the target chapter. Typically, the deck will play into the next chapter for a couple of frames. NOTE: If you specify the final chapter of a title, the deck will continue to play into the next title (because Chapter 1 of the next title is less than the target chapter.) If you will need to play the last chapter in a title, you should create an additional dummy chapter at the end of the title.

TITL xx (Go to Title #)

Same syntax and operation as CHAP.

TITL, by itself, with no number, returns the current title number.

TITP yy (Play until Chapter #)

Same syntax and operation as CHPP.

Example: Attract Loop with One Video

An “Attract Loop” is designed to attract people to your display, and to encourage them to push a button to see a video. Secondly, it acts as a screen saver to prevent burn-in of images on your TV monitor.

Make your disc like this:

Video #1 (Attract Loop)

This is the First Play Item and it loops forever. (For versatility, we suggest that the Attract Loop also be a 1-item menu which branches to the main video content.)

Video #2 (Main Content)

This is a standard VOB video which goes back to the Attract Loop when it is finished.

Programming Button #1

With Infrared, it's really easy. Design your Attract Loop as a Menu and program button #1 to be the Enter Key like this

>BT01 ENTR

>SAVE

That's it.

With RS-232 it is somewhat more complex. You need to know about the geography of your disc. Let's assume that Video #2 begins at frame 5000.

>BT01 FIND 5000; TIME 20; PLAY

>SAVE

When button #1 is pressed, the player goes to frame 5000.

TIME 20 allows 2 seconds for the player to find the frame.

PLAY makes the content video (Video #2) play.

Your disc is programmed to go back to the Attract Loop at the end of Video #2.

Be certain to issue the SAVE command so the VC-16aa will remember it.

Alternately, you could use the CHAP command. Assume that your content video is Chapter 2:

>BT01 CHAP 2; TIME 20; PLAY

This works if your disc can branch back to the Attract Loop at the end of the chapter.

And one more option using CHPP

>BT01 CHAP 2; TIME 20; CHPP 3

CHPP causes the deck to play from the current position until the beginning of the designated chapter. Be certain that there is a Chapter 3, even if it's a dummy chapter.

Emulation: Panasonic AG-5700 Alternate Parser

Switch #6 controls the Emulation Mode.

SW #6 Down/OFF = BCD 4-character commands

SW #6 Up/On = Panasonic AG-5700 Command Emulation

NOTE: ONLY Switch #6 should be on.

ALL OTHER SWITCHES SHOULD BE OFF/DOWN.

The Communication settings for the AG-5700 are

9600 Baud, 7 Data Bits, Odd Parity (Panasonic Defaults)

Contact BCD if you need another Machine setting.

