



BCD SB-100

Time Code Video Controller

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BCD SB-100

Introduction

BCD's SB-100 is a combination RS-232 controller and SMPTE VITC/LTC Time Code Generator/Reader. Whew!

The controller part of the SB-100 enables it to control VCRs and other devices via RS-232. It also emulates RS-422 signals for control of professional BetaCam™ and similar machines.

The Time Code part of the SB-100 generates and reads two types of time code: LTC (Longitudinal Time Code) and VITC (Vertical Interval Time Code). LTC is recorded as an audio signal on an audio track, and VITC is inserted into the Vertical Blanking Interval (frame line) of the actual video. VITC is the most popular with our customers because it does not require an audio track. VITC is also good because it can be read in many slow and fast tape speeds.

Together, RS-232 control and Time Code can make an ordinary industrial VCR into one capable of *frame accurate precision!*

How it Works

Your computer sends command to the SB-100 using BCD's standard 4-character commands like PLAY and STOP. The SB-100 translates these commands into the serial protocol (or language) that is used by the machine. This way, your computer program has to know only one language, BCD's, to control machines from Sony, Panasonic, and JVC. This feature is called a *protocol translator*. That might be enough, but it does not solve the problem of making the machine frame-accurate.

By design, the SB-100 must control a machine that is already controllable via RS-232 serial commands. The problem is that most of the VHS/SVHS models do not use SMPTE Time Code...they use *frame counters just like home VCRs!* They lose track of their position easily....especially when they shuttle and change direction. If you insert a new tape, you must rewind the tape to its beginning

and set its frame counter to zero. That sort of works, but it is never *frame accurate*. That's the magic of time code.

Time Code

The use of SMPTE (Society of Motion Picture and Television Engineers) time code is that it applies a unique number to *each frame* of video. With LTC, the time code is on an audio track, theoretically in sync with the video. With VITC, the time code is married to the video, *in the video*. This means that the time code will stay in sync with the picture even if you copy the tape.

Recording

During RECORD, the video from the camera goes through the SB-100 on its way to the VCR. The SB-100 inserts the VITC into each frame of the video, and simultaneously generates LTC which may be recorded on an audio channel.

Playback

During play, the Video with VITC and/or the LTC go from the VCR to the SB-100. The SB-100 reads the time code so it knows the exact tape position.

It does not matter if the tape is rewound to the beginning or is in the middle of the tape. The time code provides an exact indication of tape position, even if the tape is a copy or one made on a different machine.

VCRs with Time Code

Some machines like BetaCam have built-in time code systems, so the SB-100 just acts like a protocol translator. There are other machines, however, that use a special proprietary time code, often in the CTL or Control Track. These are fine **if** you play the tape on the same type of machine that recorded it. Also, some of these machines reset their time code numbers to zero if you stop the tape during record and then resume recording. The time code can restart at 00:00:00:00 in the middle of the tape each time you stop. That's why we like the *international standard* SMPTE!

Connections



Signal Cable Set (SCS) is a 15-pin cable consisting of two bundles and one long single cable. The larger bundle has connectors that go to the VCR. The smaller bundle goes to the TV Monitor. The single coax cable can go to an auxiliary video source.

S-Video In is In TO the SB-100. This is where you connect your camera or other video source that you want recorded with VITC.

S-Video Out is Out FROM the SB-100 to your VCR. This connection goes to your VCR's S-Video In jack. VITC will be added to this video.

Vid. In. is the normal composite video in jack from your camera TO the SB-100. VITC will be added to this video.

Vid. Out is Out FROM the SB-100 to your VCR. This connection goes to your VCR's Video In jack. VITC has been added to this video.

LTC In is from an LTC source. The SB-100 will read the LTC from this source. Typically, this is connected to the VCR's audio out jack which has the LTC.

LTC Out is FROM the SB-100 to the VCR's audio channel that will be recording LTC.

Device Remote is a 6-position RJ-11 jack that connects to your VCR (or other device's) serial remote jack.

Host RS-232 Looping connects to your computer's RS-232 connector. Both connectors are alike so you may use either one. The other one is for connecting to a second (third, fourth...) SB-100.

Switch controls various Power-on parameters.

Signal Cable Set

The SCS-IR Signal Cable Set has a 15pin connector which pigtails to several RCA and BNC connectors. One cable bundle goes to the tape machine. The smaller bundle goes to the TV monitor.

SCS-IR Label ----- connects to:

Large VCR Bundle

VTR Vid Out	VCR Video Out
VTR Add Code Out	VCR LTC Time Code Channel Audio Out
VTR Add Code In	VCR LTC Time Code Channel Audio In
VTR Ch. 1 Out	VCR Audio Ch. 1 Out (if used)
VTR Ch. 2 Out	VCR Audio Ch. 2 Out (if used)

Small Monitor Bundle

Mon. Vid. In	TV Monitor Video In
Mon Aud. 1 In	TV Monitor Audio 1 In
Mon Aud. 2 In	TV Monitor Audio 2 In

RCA Connectors

Vid In	from TV Camera to be recorded
VID Out	to VCR "Video In" - has VITC added

LTC In	Same as SCS "VTR Add Code Out"
LTC Out	LTC to VCR Audio chan. In for LTC record.

To be redundant, here are diagrams for recording and playing using VITC Time Code. The arrows show the video signal direction.

Composite Video VITC Hookup

VCR or Other Device		SB-100
Camera Video Out	—————→	Video In (RCA)
VCR Video In	—————→	Video Out (RCA)
VCR Video Out	—————→	VTR Vid. Out (Sig. Cable)

Monitor Video In ————— Mon. Vid. In (Sig. Cable)

S-Video VITC Hookup

VCR or Other Device	SB-100
----------------------------	---------------

Camera S-Video Out	—————	S-Video In (4-pin)
VCR S-Video In	—————	S-Video Out (4-pin)
VCR Video Out	—————	VTR Vid. Out (Sig. Cable)
Monitor Video In	—————	Mon. Vid. In (Sig. Cable)

Note: VCR Video through the Signal Cable Set "Mon. Vid. In" will show as monochrome. The VCR S-Video Out connector will show color.

SB-100 Switch Settings

BCD's Default: Switch 7 ONLY On. All others OFF.

Baud Rate: We always use 38,400 (Switch 7 UP/ON).

Sw. 7 Down/OFF and Sw.8 Up/ON is AutoBaud.

For autobaud detection, your software must issue several Carriage Return/Line Feeds(CRLF) to permit the SB-100 to determine your program's Baud rate.

The Baud Rate switches pertain ONLY to the host communications with your computer. The Baud rate for communication with the machine is determined with the TYPE command issued by you.

- sw.1-4 = box number/deck type in binary, on=0 off=1
- sw.5 = flash bank override, on=stay in bank 1, off=normal
- sw.6 = parser during development on=ALTERNATE, off=BCD)
- sw.7 = fixed baudrate, on=38400, off=9600
- sw.8 = autobaud, on=autobaud, off=fixed baudrate

Examples:

ALL OFF = 9600,n,8,1 fixed baud rate

7 On Only = 38,400,n,8,1 fixed baud rate

8 On Only = Autobaud

Switch 5 is special, used only if normal flash programming fails.

Getting Started

Using a Terminal Program

We use the *BCDComm.exe* program for DOS as well as *HyperTerm* supplied with Windows. At BCD we normally use 38.400 baud: that is only Switch #7 should be ON.

For ***BCDComm***, the text file *bcd.prm* sets up the program. If your SB-100 is connected to Com2: the *bcd.prm* file should read as follows:

```
mode = com2:38400,n,8,1
```

Note the spaces on each side of the “=”. They are important.

comm port #2, 38,400 Baud, no parity, 8 data bits, and 1 stop bit”.

Run the *BCDComm* program by typing its name at the DOS prompt. After pressing the Enter key again you should see the BCD “Prompt Character” which is a “>” greater than symbol. Now you can issue BCD Commands to the SB-100. You may exit or quit the *BCDComm* program by pressing the ESCape key on your keyboard. (This does *not* send an ESCape character to the SB-100, it only exits the program.)

You find Windows ***HyperTerm*** in the Accessories folder. The communications parameters are set in the “File | Properties” window. **Be certain** that “Flow Control” is set to “None”.

Now, with either program, hit the Enter key a couple of times. You should see several “>” characters going down the screen. This is the prompt character generated by the SB-100.

Determining Machine Types Available

Type the following commands, pressing the Enter key after each one:

```
DEBUG 10  
VERS  
DEBUG 1
```

DEBUG 10 is a special command combination that is used only to determine the machine type control codes that are available in the Flash ROM. You should see something *similar* to the following:

>VERS

```
BCD SB-100 Video Control System: Copyright 1986-99 BCD Assoc.,  
Inc. NTSC-30 S90412 Firmware Version Mon Apr 12 16:42:25 1999  
02 Sony BVU/BVW etc. 422 deck (TYPE 2)  
04 Panasonic AG-5700 VCR protocol (TYPE 4)  
08 Panasonic AG-5710 VCR protocol (TYPE 8)  
Factory Reset or Low Battery  
>
```

This gives you a lot of information:

- The firmware VERSION number is "S90412"
- This SB-100 can control Sony RS-422 machines, Panasonic AG-5700 machines and Panasonic AG-5710 machines.
- (The box automatically resets after this special combination of commands.

The list of TYPES is important, because the Flash ROM can't hold all of the machine types available.

Machine Types Available for Machine Control:

```
TYPE 1 BCD 4-Character Commands RS-232  
TYPE 2 Sony BVU/BVW, etc. RS-422 Commands  
TYPE 3 RESERVED  
TYPE 4 Panasonic AG-5700 RS-232  
TYPE 5 Panasonic AG-MD830 RS-232  
TYPE 6 JVC BR-S365 RS-232  
TYPE 7 Sony RS-232  
TYPE 8 Panasonic AG-5710 RS-232  
TYPES 9, 10, and 12 are RESERVED
```

Operation Connections

1. Connect your computer's serial port to one of the "Host RS-232" connectors on the SB-100
2. Connect the "Device Remote" to your VCRs Serial Port
3. Connect video from your camera to the "Vid. In" RCA jack on the SB-100
4. Connect the SB-100 "Vid. Out." To the VCR Video In jack.
5. Connect the Signal Cable "VTR Vid Out" cable to the VCRs Video Out jack
6. Connect the Signal Cable "Mon. Vid. In" to your TV monitor's Video In jack
7. The Signal Cable "VTR Add. Code IN" connects to the VTRs Audio Out jack providing the LTC Time Code (if used).
8. The Signal Cable "VTR Add. Code IN" connects to the VTRs Audio In jack for recording LTC Time Code (if used).

Operating the Machine

Get a ">" prompt by pressing the Enter key
For a Panasonic AG-5710, type the command TYPE 8.
Type PLAY and the machine should play.
Type STOP and the machine should stop.
Type FRAM and the SB-100 will return the current frame number (in integer frames).
Type FRAM: (note the colon) and the SB-100 will return the current frame number in SMPTE Time Code format (HH:MM:SS:FF).
Congratulations! You're controlling the machine!
Please note that the commands are NOT case sensitive, and that the SB-100 ignores any spaces that you type.

SB-100 Comands

This command table undergoes frequent revision. Please check the BCD website <http://www.bcdusa.com/sb100> for the most recent version.

Syntax:

```
cmmd [modifier] [parameter] CRLF [;] ...
```

cmmd is the 4-character command

modifier is a colon (:) or other modifier

parameter is a number

CRLF is Carriage Return + Line Feed

';' is a semicolon. Multiple commands may be delimited by a semicolon.

Example: PLAY;FRAM:STOP plays, returns current frame #, stops.

In the following table, if a parameter is allowed, it is shown with its minimum, maximum, and default values.

Example: FRAM 0, 2.59M, 0

The mininum value is 0.

The maximum is 2.592 million (24hrs of frames).

Zero (0) is the default power-on value.

NOTES:

Some modes of some machines may not permit negative (-) parameters.

Commands marked with * are new to the SB-100.

'AUD0', none

Turns off audio channels. Mute

'AUD1', none

Turns on only Audio Channel 1

'AUD2', none

Turns on only Audio Channel 2

'AUDB', none

Turns on both Audio Channels 1 & 2

'AUDX', 0, 3, 0,

'AVID', none

Send Aux Vid Input video to VCR Video Out. Aux. Video In signal is not recorded.

'BANK', 0, 1, 0,

'BOOT', none

Causes a cold boot of the controller system. Mainly used by BCD in testing.

'BAUD', none, 0, 0, 0,

Returns current communications Baud Rate
2400, 4800, 9600, 19200, 38400

'BURN', allowed, 0, 1, 0,

Turns on/off Time Code Overlay
BURN 1 = ON, BURN 0 = OFF (Default)

'DEBG', allowed, 0, 9, 0,

Sets or displays verbose error code reporting for debugging
0 = none (zero, default)
1 = Error numbers and messages
9 = Time Code evaluation

"DEBG 9" issued during PLAY will return

O+O+O+... for VITC

o+o+o+... for LTC

The 'O' (letter oh) means that good VITC was read. There are 2 'O's, one for each video field. A bad VITC read returns a ';' semicolon. VITC writes the frame number on two NON-ADJACENT lines on each video field. The code is considered 'good' only if the code in each of the two lines is identical.

NOTE: ALWAYS issue DEBG 0 (zero) before running a program or else the returned error codes may cause unexpected results in your program. The usual programming technique is to issue ERR? after each command to insure that the returned code is 00000.

'ECHO', 0, 1, 0,

'ECOF', none, 0, 0, 0,

Turns off communications character echo. Default is ECON so humans can see the command characters echoed back. Usually a program will issue ECOF as one of its first commands.

'ECON', none, 0, 0, 0,

Permits command characters to be echoed back (full duplex) to the host computer.

'ERR?', allowed, 0, 255, 0,

Displays the number of the most recent error. ERR? also clears the current error after displaying it. DEBG 1 will cause the full text of the error message to be displayed along with the error number.

NOTE: Some of the error codes below apply to other BCD control systems and will not appear using the AG-2540C.
See also STAT and ERR?.

001	'Unknown command '
002	'Argument Required '
003	'Bad hex argument '
004	'Argument range error'
005	'Unknown Disc value '
006	'Send to Disc error '
007	'Disc lid open. '
008	'Preroll too small '
009	'Argument not allowed'
010	'Unexpected motion. '
011	'NAK from Disc. '
012	'Unknown Disc error '
013	'Frame not found. '
014	'Frame does not exist'
015	'PLR Type not avail. '
016	'Retry limit exceeded.'
017	'Function. Not Avail. '
018	'Unexpected Motion '
019	'Frame Prev. Recorded '
020	'Bad Video or Sync. '
021	'Missed Cut Out Adrssl.'
022	'Missed Stop Address. '
025	'Switcher Non-Sync Err'
026	'Function Not Allowed '
027	'Play to Frame Error '
029	'No Tape in VCR '
030	'Power is Off '
246	'Bad ACK value. '
247	'No Address Code. '
248	'Serial timeout. '
249	'Disc Auto Play error.'
250	'Disc Search Error. '
251	'Bad SMPTE Code. '
252	'No frame motion. '
253	'Bad Time Code '

'ERRF', allowed, 0, 255, 0,
Same as ERR?, but for some commands, also returns the frame number at which the error happened.

'ETRY', 0, FFh, 0,

'FACT', none 0, 0, 1,
Resets variables to factory settings.

'FFWD', 0, 2.59M, 2.59M,
Makes the VCR Fast Forward. Actually it is a SEEK to a very big frame.

'FIND', 0, 2.59M, 2.59M,
FIND subtracts the PROL value from the given frame number and causes a SEEK to that frame while showing AUX Video. If it overshoots in a forward direction, FIND will cause the tape to REWIND until the tape is at least PROL frames before the target frame. FIND is NOT an exact positioning command (See STIL). (* Not frame-accurate with AG-2550CL)

FIND usually precedes PLYB.

Example: 'FIND 1800; PLYB 1830' causes a SEEK to frame (1800 - PROL). PLYB plays forward with Aux Video(AVID), turns on Tape Video(TVID) at exactly frame 1800, stops the VCR and switches back to AVID at frame 1830.

'FRAM', allowed, 0, 2.59M, 0,
Sets or Returns the current frame number in the format specified. Default format is integer format. 'FRAM:' causes frame number to be returned in SMPTE format HH:MM:SS:FF. 'FRAM : 01234511' sets the current frame to 01:23:45:11 in preparation for the RECS command. Useful to synchronize the time code generator to the current time of day. (* AG-2550CL reports BCD's internal counter or front-panel display numbers.)

'GPIO', 0, 1, 0,
Activates GPI Output. GPIO 0 is default (off). GPIO 1 is active.

'HELP', none
Lists currently implemented commands.
Note: Some commands reported in HELP are not documented here.

'INIT', none, 0, 0, 0,
Plays the tape (with AVID) for 2 seconds and attempts to read VITC time codes. If no valid code is found, error 253 is posted and may be retrieved with the ERR? or STAT commands.

The typical initialization process is like this:

Command	Comment
INIT	you wait for the prompt
>ERR?	you ask if there are any errors
00000	deck reports no errors

The INIT command also searches the Vertical Blanking Interval for VITC. If VITC is found, it sets the VITC reader to that video line and to that video line + 2. To see the first line where the VITC was found, issue RLIN. The RLIN response of E10 means that VITC read is enabled and that the first VITC code was found on line 10.
See also RLIN, RLN2, WLIN, WLN2

'LAST', none
Displays the previous 127 characters in the deck's input buffer, most recent at the bottom (last). Useful in determining what your program actually sent to the deck.

'LEND', none
Terminates a LOOP command.

'LOOP', allowed, 0, 2.59M, 1,
Performs a command or a series of commands several times. Terminated by LEND command.
 LOOP 10000; FIND :1800; WAIT; PLYB 3600; LEND
will play from frame 1800 to frame 3600 ten thousand times. See also WAIT and PLYB

'MOD0', allowed, 0, 4x10⁶, 0,
(MOD zero) Adds the parameter to Register 0 (REG0). See also REG0

'MOD1', allowed, 0, 4x10⁶, 0,
Adds the parameter to Register 1 (REG1) See also REG0

MODE, none

Returns the current transport mode number, depending on the deck TYPE

For the BCD AG-2550C

0	STOP	7	PWR OFF
2	REWD	8	PLAY
3	FFWD	9	STILL (PAUSE)
4	REV SRCH	A	RECORD
5	FWD SRCH	B	RECORD + PAUSE
6	SLOW		

For the Panasonic AG-5700/5710

0	STOP	stop
1	STPF	step forward
2	FFWD	fast forward
3	REWD	rewind
5	PAUS	play-pause
7	RECP	record-pause
8	SCHF	shuttle fwd
9	SCHR	shuttle rev
10	PLAY	same as last_move f
11	STPR	step reverse
16	RECS	recs

'MOVE', none, 0, 0, 0,

Returns ,MOVE. if the tape is moving. Returns ,STOP. if the tape is not moving (STOP or PAUSE).

'OFST', allowed, -2.59M, 2.59M, 0,

Time Code Offset to accomodate tapes whose LTC was written on a different machine. Default is 00.

'PAUS', allowed, 0, 2.59M, 0,

Causes the tape to Pause. If the tape is playing and currently at frame 1000, the command PAUS 2000 will cause the tape to pause at frame 2000. PAUS 900 will cause Error Code 4, Argument Range error because it can't pause in front of where it is.

'PLAY', allowed, 0, -2.59M, 2.59M,

Makes the tape play. If the tape is at frame 1000, PLAY 2000 will cause the tape to play until frame 2000 and then stop.

* 'PLYB', required, 0, 4x10⁶, 4x10⁶,

Plays Both video and audio from the frame designated by FIND until the end frame specified.

FIND 1000; PLYB 2000 plays video & audio from frame 1000 to frame 2000.

In the case above, the prompt (>) will return at the FIND frame (1000). If you want the prompt to return at the end of the segment, modify PLYB with the WAIT command.

FIND 1000; WAIT; PLYB 2000 will not return the prompt until the tape reaches frame 2000. This is the usual method so that your program can tell when the scene has finished.

'PLYB', 120, 2.59M, 2.59M

Must always be preceded by FIND xxx. Plays from Preroll point with muted video/audio, turns on the video/audio at the FIND location, and plays to the end target. The ">" prompt is returned at the FIND point.

FIND 1000; PLYB 2000
plays from frame 1000 to frame 2000. The prompt returns at frame 1000.

FIND 1000; WAIT; PLYB 2000
plays from frame 1000 to frame 2000. The prompt returns at frame 2000.

'POWR', 0, 1, 0,
Turns machine power on/off, where permitted by the machine.

'PRMT', [], [], >
Permits user-defined prompt character.
Example: PRMT + now gives you the '+' plus sign as a prompt character.

'PROG', none
Special command for 'manual' reprogramming of the flash rom.
Do Not Use without consultation with BCD.

'PROL', allowed, 0, 2.59M, 120
This the preroll number of frames used by FIND. Default is 4 seconds or 120 frames.

'PVID', none
Synonym for TVID

'RECS', 0, 2.59M, 2.59M
Puts the deck in Record. RECS 2000 will record until frame 2000 and then stop.

'REG0' 0, 2.59M, 0,
(REG zero) A utility register useful for storing numeric values.
May be modified by the MOD0 command.
Example: You want to STIL for 1 second on all frames from 1000 to 2000.
>REG0 1000
>LOOP 1000; STIL REG0; TIME 10; MOD0 1; LEND
Here is what that means:
REG 0 1000 assigns 1000 to Register 0.
LOOP 1000 do the following 1000 times.
STIL REG0 STIL exactly at the frame number in REG0.
TIME 10 Wait for approx. 1 second.
MOD0 1 Add 1 to Register 0.
LEND Repeat the loop until 1000 iterations are complete.

'REG1', 0, 2.59M, 0,
See REG0

'REJE', none, 0, 0, 0,
Causes the tape to Eject on those machine that can.

'REWD', allowed, 0, 2.59M, 0,
Causes the tape to rewind. See also FFWD.

'RLIN', allowed, 0, 20, 0,
Sets or displays the first VITC Time Code Read Line.
The command "RLIN 10 sets the read lines to 10 and 12 as per SMPTE specifications. The SB-100 will NOT read VITC on 2 adjacent lines.
RLIN \$FF or RLIN 255 sets the reader to hunt for VITC.
If hunt is enabled, RLIN will return "EHUNT".

'RLN2', 20, 0

Sets or displays the second VITC read line.
The command "RLN2 15 sets the second read line to 15, REGARDLESS of what the first RLIN line was. Always be certain that the RLN2 number is set at least 2 greater than the RLIN number!

'RLSE', none
Forces UnPause if the machine is paused. Unpredicable if machine is not paused.

'SADD', none, 0, 0, 0,
Displays the Stop Address used by FIND.

'SEEK', -2.59M, 2.59M, 0,
Causes FFWD or REWD to the specified frame number. Stops the tape when that frame is reached. Tape will overshoot forward or backward depending on the direction. SEEK does NOT subtract PROL as does FIND. One advantage to SEEK in a program is that the prompt returns immediately; therefore FRAM can be issued by your program during SEEK, but you the programmer, are responsible for any overshoot. This is NOT a frame-accurate command.

'SRCH', allowed, 0, 10, 0,
Causes variable speed search, forward or backwards.
SRCH - 10 is max search reverse. (Search minus 10)
SRCH -5 is approx. PLAY reverse.
SRCH 0 is similar to pause.
SRCH 5 is PLAY
SRCH 10 is max search forward.

'SROL', allowed, 0, 2.59M, 3-15 depending on machine TYPE.
Used by STIL. Designates how many frames before the target shall the VCR go into slow/step mode before pausing.

'STA2', none
Used to check several variables with one command.
Returns frame, move, mode, vbit, error.
The responses are all on one line, separated by commas, and terminated by CR LF.

'STAT', none, 0, 0, 0,
Used to check several variables with one command.
CMMD,00000,MOVE.
123456, 65535
CMMD = the last command issued
00000=error code
,MOVE.(,STOP.)=tape moving or not moving
12345=current frame number(FRAM)
65535=current Tape ID number(TPID, not used)
NOTE: STAT: (with colon) will return the numbers in SMPTE format

'STEP', allowed, 0, 2.59M, 1,
Cause the tape to single-step (frame advance/frame reverse) one or more frame numbers. STEP-10 will step backwards 10 frames. Not available with all machine TYPES.

'STIL', required, 0, 2.59M, 0,
Causes the tape to pause/still on exactly the frame specified.

'STOP', allowed, 0, 2.59M, 0,
Causes the tape to stop immediately or on the frame specified.

'TALK', allowed, 0, 2, 1,
 Controls whether the machine returns messages or not. Default is TALK 1.
 TALK 0 causes NO RESPONSE to be sent from the deck unless that deck is
 specifically addressed with the DECK command.. TALK 2 will send NO
 CHARACTERS AT ALL.

'THRD', allowed, 0, 1, 0,
 Keeps the tape threaded during FIND. Causes the deck to use
 search/shuttle instead of FFWD/REWD. Causes pause with visible picture at
 end of FINDxxx ; PLYByyy instead of STOP.

'TIME', required, 0, 65535, 0,
 TIME is a useful time delay. Each unit of TIME is approx. 0.1 seconds. TIME
 10 is about 1
 second.

'TRGI', 0, 2.59M, 0,
 Sets the GPI Output Trigger to activate at a certain frame.

'TRGO', 0, 2.59M, 0,
 Sets the GPI Output Trigger to DEactivate at a certain frame.

'TROL', 0, 2.59M, 1800,
 When searching, how far away must the target be to engage FFWD/REWD
 instead of SRCH.
 The default is 1 minute (1800 NTSC frames).

'TVID', none
 Switches the Video Out to display off-tape video or loop-through video
 from the input source. See also AVID, PVID.

'TYPE', 0, 23, 0,
 Designates Machine Type.
 Current Types available are:
 0 No Valid Type
 1 BCD RS-232 machines
 2 Sony RS-422 generic protocol
 3 Sanyo/Fisher consumer IR VCRs
 4 Panasonic RS-232 protocol (AG-5700/5710, etc.)
 Other TYPEs pending.

'UNIT', 0, FFh, 0,
 Directs the commands following the UNIT command to a certain machine.
 DECK 7 ; PLAY causes only deck #7 to play.
 Deck TYPEs are set with DIP switches 1-4.
 UNIT 0 (default) is switches 1-4 off.

'USER', -----, PENDING, NOT IMPLEMENTED
 Permits user-defined 4-character commands.

'VERS', none, 0, 0, 0,
 Displays the Control ROM version and copyright information.

'VITC', none
 Displays BCD's internal time code register information.

'WAIT', none, 0, 0, 0,
 Modifies PLYB so the prompt (>) does not return until the end
 of the video segment.

'WLIN', 0, 20, 0, PENDING, NOT IMPLEMENTED

Displays the first VITC write line or sets the 2 VITC write lines.
VITC is written on lines 10 and 12 by default.

Example: WLIN 13 will set lines 13 and 15 as the write lines.
SMPTE requires that the 2 VITC lines be non-adjacent.

'WLN2', 0, 20, 0, PENDING, NOT IMPLEMENTED

Sets only the second VITC write line. The WLN2 value should always be at least 2 greater than the WLIN value. Always set WLIN before setting WLN2. If you set WLIN to 15 and you set WLN2 to 16, the unit will NOT WRITE. SMPTE requires that the 2 VITC lines be non-adjacent.

'WRIT', none, 0, 0, 0,

Prepares to write Time Code. Rewinds the tape to its beginning, sets BCD's counters and the VCR's counter to zero.

'ZERO', none, 0, 0, 0,

Sets BCD's counters and the VCR's counter to zero.

Note: The VCR counter usually CANNOT be set by BCD and does NOT reflect actual tape

Time Code frame numbers!

Time Code Commands

=====

'BURN', allowed, 0, 255, 0,

Turns on/off Time Code Overlay

BURN 1 = ON, BURN 0 = OFF (Default), 2-255=Vertical Position

'CODE', .code_cmd_bcd, 0, 8, 0,

'CODE', allowed, 0, 8, 0,

Sets or displays time code type to be used.

0 = None

2 = LTC Non Drop Frame

3 = LTC Drop Frame

7 = VITC Non-Drop Frame SMPTE

8 = VITC Non-Drop Frame SMPTE

'CTRK', 0, 3, 0,

0 = Internal Time Code as in RS-422 Betacam

1 = Audio Track 1

2 = Audio Track 2

3 = Audio 3/Code Track for units with time code

tracks, but no internal time code reader.

'CODW', .codw_cmd_bcd, 0, 3, 0,

The code type that is to be written

'DBAK', allowed, 0, 3, 0,

Sets or displays TC overlay style

0 = White characters on Black Box

1 = Black characters on White Box (default)

2 = White characters on background video

3 = Black characters on background video

'DPOS', allowed, 0, 255, 0,

Sets or displays TC Overlay (BURN) position. DBAK 60 is approximately the center of the screen. DPOS is a vertical position variable only.

Horizontal position is fixed.

'DSIZ', allowed, 0, 1, 0,
TC Overlay (BURN) size.
0 = small
1 = large (default)

'LBIT', 0, 2, 0,
LBIT with no parameter returns User Bits from the LTC code.
LBIT 2 displays LTC User Bits in the overlay.
(Only digits 0-9 can be displayed.)

'TCRF', 0, 2.59M, 0,
Sets or displays the frame value of the Time Code system, REGARDLESS
of the frame number of the video machine. Part of the process to
permit the SB-100 to be a separate, stand-alone TC device.

'UBIT', allowed, 0, 8 hex digits, 0,
Sets the SMPTE user bits to be recorded in the Time Code.
Syntax: UBIT HHHHHHHHHH where H is a hex digit from 0 to F. All 8
places must be used.

Example: UBIT 1F2A3B4C

Note: UBIT displays what is being written. To read user bits, see
VBIT and LBIT.

VBIT 0,1,0

VBIT is normally a read only command.

VBIT with no parameter returns the User Bits to the computer as
8 digits. VBIT 1 causes the userbits to be displayed in the video
overlay if the overlay is turned on. Use VBIT 0 to return the overlay
to time code display.

'VFST', allowed, 0, 2.59M, 0,
VITC Offset. See also OFST.

'VINI', none, 0, 0, 0,
Reads all possible VITC lines (10 - 20) and returns the numbers of those
lines where VITC-like data was found. Tape must be in PLAY for VINI to work.

'VSTD', 25, 30, 30,
Displays or set the Video Standard (NTSC/PAL) to be used by the time
code system.

Editing Commands (available only on some machines)

=====

'APND', 0, 2.59M, 1,
Appends one or more frames to the previous edit.
This is a combination of CUTA x and EDIT.

'CUTA', 0, 2.59M, 0,
 Automatically increments both IN and OUT edit points and performs an edit when those points are reached.
 Machine must be in play in front of the points or the system will hang. The prompt is returned after the cut out.

'CUTI', 0, 2.59M, 0,
 Causes an immediate Cut In or at the specified frame.

'CUTO', 0, 2.59M, 0,
 Causes an immediate Cut Out or at the specified frame.

'DLYI', 0, 2.59M, 0,
 Causes Cut In happen x frames BEFORE the target to allow for machine Cut In Delay

'DLYO', 0, 2.59M, 0,
 Causes Cut Out happen x frames BEFORE the target to allow for machine Cut Out Delay

'EDIN', 0, 2.59M, 0,
 Sets or displays the Edit In point

'EDIO', 0, 2.59M, 0,
 Increments bot EDIN and EDOT points.

'EDIT', none
 Causes an edit to be performed. Search to preroll, play, cut in, cut out, stop

'EDOT', 0, 2.59M, 0,
 Sets or displays the Edit Out point

'EDTP', 0, 11, 0,
 Edit Type. EDTP 5 is Video Insert.

'ENTRY', 0, FFh, 3,
 How many times should the system try to perform the edit?
 Also used as a default variable for STIL.

'PREV', none
 Preview (fake record) of the edit.

'REVI', none
 Review (play back) the most recent edit, beginning at PROL before EDIN

Flash Programming

The SB-100 does not require a chip or EPROM change to update its internal firmware program. Updates are accomplished by downloading the new operating system from your computer to the SB-100. The flash ROM in the SB-100 contains TWO sets of programs, located in BANK 0 and BANK 1. BANK 0 is the normal operating bank.

Most probably, the firmware furnished with your SB-100 is exactly what you need and no updates will be required. You do, however, need to know the version of the firmware you are using, just in case you need technical support from BCD, our Dealers or OEM clients.

Use a terminal program like HyperTerm for Windows or BCDComm.exe for DOS. Issue the VERS command and the VERSion will be displayed.

Flashing

The program to use is FLASHBCD.EXE

The syntax is

FLASHBCD [options] filename.HEX

Options for FLASHBCD:

- c Bios comm port
- s Serial Baud Rate

Selection of hardware port (-p) and hardware address (-h) are optional and rarely used.

Sample:

FLASHBCD -c2 SB100.HEX

This uses comm2 at the program's default 38,400 Baud.

Also available are 9600 and 56K.

Type FLASHBCD by itself to see the help.

This is the content of FLASH.BAT for BCD's default:

```
flashbcd -c2 %1.hex
```

Using the FLASH.BAT file, we type FLASH <filename>
(without the HEX extension).

How to reprogram the flash with FLASHBCD.EXE

(Note: We use 38,400 Baud because it's faster - about 90 seconds.)

1. Get a '>' prompt using some terminal program.
2. Issue the FACT command. This resets the unit to FACTory defaults.
3. Exit the terminal program
4. Run FLASH.BAT modified to your parameters or use FLASHBCD.EXE using appropriate command line parameters.
5. When the update is complete, you should see

'Restart Complete. NVRAM values have changed'
followed by the current VERSion of the new file.