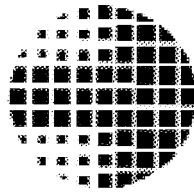


# DPS-290

# Operations Manual



# **DPS**

DIGITAL PROCESSING SYSTEMS



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## Caveats

Information in this document is subject to change without notice.

This product requires technical and mechanical ability and requires precautions against electrostatic discharge. The user assumes all risks when this product is assembled by anyone other than an authorized Digital Processing Systems dealer.

DPS Part No. 707-290  
Release Version 1.31  
April 2000

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# INTRODUCTION

The DPS-290 component transcoding TBC/Synchronizer is a broadcast quality rackmount single or dual channel time base corrector. The DPS-290 may be used with Umatic, Umatic-SP, VHS, SVHS, and Hi-8 machines.

Ideal for inter-format editing and duplication, the DPS-290 provides standard composite, Y/C and component analog video (Betacam/MII) inputs and outputs. All outputs are available simultaneously, enabling true transcoding between Y/C and CAV formats.

A newly developed adaptive comb filter Y/C separator circuit makes the DPS-290 equally adept at decoding NTSC composite video into Betacam, MII or Y/C format signals. The comb filter also enables the DPS-290 to be used as a frame synchronizer. True luminance bandwidth in excess of 5.5 MHz is maintained, even with composite signals. Unlike many infinite window TBCs, the DPS-290 can synchronize camera and satellite feeds without loss of high frequency picture detail.

Standard DPS-290 special effects include freeze frame, freeze field (1-3), variable strobe, film mode strobe and color balance. Film mode strobe provides an ersatz film look by simulating 3:2 shutter pull down. Red and Blue color balance controls, another DPS exclusive feature, provide a convenient means for correcting white balance errors.

The DPS-290 component TBC/Synchronizer is available in both single (DPS-290) and dual channel (DPS-290D) configurations. The DPS-290 features component, composite and S-Video inputs and outputs and incorporates a sophisticated Digital Recursive Noise Reduction(DNR) circuit and a three dimensional Drop Out Compensator(DOC). The DPS-291 is identical to the DPS-290 except it does not include the DNR/DOC features. An optional DNR/DOC-290 module can be added to the DPS-291 in the field to add these features, if desired.

Front panel controls provide easy access to all proc amp and configuration functions including Betacam/MII output levels, wide/narrow vertical blanking, Y/C vertical delay, Y/C horizontal delay and DNR mode. The large back-lit LCD status panel provides intuitive control over all functions. A 10-event scene memory permits all front panel settings to instantly be stored or recalled.





# CHAPTER 2

## Installation

### Unpacking and Inspection

This unit has been thoroughly calibrated and inspected, both electrically and mechanically, to ensure that it meets the published specifications. The following items are included with each DPS-290

<u>Description</u>	<u>Quantity</u>
DPS-290 Component TBC/Synchronizer	1
Operations Manual	1
AC Line Cord	1
CAV Breakout Cable	1

We suggest that you retain all original packing materials. This will facilitate reshipment should it ever become necessary.

### Mounting

The DPS-290 is 1.75"H X 17"W X 20"D allowing it to fit into most standard consoles or 19" racks. If the unit is to be mounted in a rack, then rack slides, or trays must be used for support. Care must be taken to select a dry, well ventilated location with a minimum of dust and vibration to install the unit. Also leave sufficient clearance between the units rear panel and any obstacle or wall to allow proper air circulation in and around the unit.

Allow at least 30 minutes after the unit is removed from the packing material before installing in a rack or console and applying power, to eliminate unwanted condensation due to a sudden change in temperature.

# Upgrading

Before servicing your DPS-290, turn the power off and disconnect the AC line cord. The DPS-290 contains static sensitive parts so please make sure you are grounded before removing the parts from their package. Refer service to qualified personnel

## Installing the RGB option

- Remove the top cover on the DPS-290.
- Remove the jumpers installed at CN-11 and CN-12.
- Plug the RGB board into jumpers CN-10, CN-11 and CN-12.
- Use the supplied 440 screw and standoff to secure the RGB board in place.

Note: RGB Sync Input Jumper:    BHE ON            4V  
    BHE OFF            .286V

## Installing a second TBC

- If a second TBC is installed in your DPS-290, skip this section.
- Remove the top cover on your DPS-290.
- Place the second TBC in position and install the provided hardware to secure the board. The standoffs are used to mount the RF/DOC board. Refer to figure 2-1 for placement details.
- Connect the micro, genlock and power cables. Be certain that the cables snap into their adjacent connectors.
- Using the TBC in channel 1 as a reference, install the RF/DOC board on the TBC in channel 2 in an identical manner. Connect the RF/DOC cables into the locking connector.
- On the first TBC, place DIP switch 1 in the down position.
- Replace the top cover on your DPS-290.

## Installing a Firmware Update.

Should it become necessary to update the microprocessor and ROM chips, follow the procedure outlined below. The microprocessor code is in location FU3 and the ROM chips are located at BU10, BU12 and BU11. See figure 2-1

The microprocessor EPROM is static sensitive so please make sure you are grounded before removing the parts from their package.

- Remove the top cover on the DPS-290.
- Remove the RF/DOC board.
- Remove or ROM chip from the TBC card. If a PLCC extraction tool is not available, you can remove the chip by using a flat head “precision” type screw driver. Insert the screw driver in the top right hand side of the socket and gently pull out one side of the IC until it falls out. care must be taken not to damage the socket.
- Install the new IC in place while observing **correct polarity**. Note that the IC is “Keyed” (clipped corner) Insert the “keyed” side into the socket according to the silkscreen printed around the IC socket. See figure 2-1.

# Configuration

## Jumpers

The jumpers on the board are factory configured. However, if an RGB board is to be installed then jumpers CN-11 and CN-12 must be removed. Should the RGB board be removed then these jumpers must be re-installed.

## DIP Switches

The bank of 8 DIP switches at location CSW1 may be accessed by removing the front panel if required. Remove the four screws on the top and four screws on the bottom of the front panel. Pull the front panel out gently about 3 inches. The DIP Switches will be visible behind the front panel.

### Switch 1

- UP Channel 2 TBC not present. (Factory default)
- DOWN Channel 2 TBC present.

### Switch 2

- UP Genlock Adjust Enabled. (Factory Default)
- DOWN Genlock Adjust Disabled.

### Switch 3

- UP Channel 1 DOC/DNR Card Installed (DPS-290 Default)
- DOWN Channel 1 DOC/DNR Card Not Installed (DPS-291 Default)

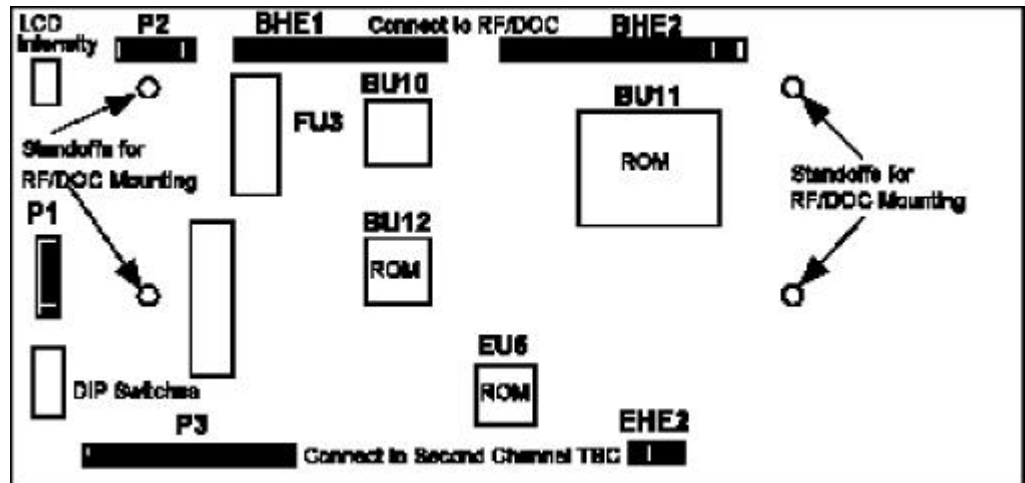
### Switch 4

- UP Channel 2 DOC/DNR Card Installed (DPS-290 Default)
- DOWN Channel 2 DOC/DNR Card Not Installed (DPS-291 Default)

### Switches 5 and 6 Not Used

Figure 2-1

DPS-290  
Main Board  
Top View



#### Switch 7

- UP Normal (Factory Default)
- DOWN Reset Memory

The memory settings on the DPS-290 can be returned to factory defaults. Set DIP Switch 8 in the down position and turn the power on / off. Then, return DIP switch 8 to the UP position.

Note: Switch 7 must be in the UP position for proper operation.

#### LCD Intensity

To change the LCD intensity, remove the eight screws that secure the front panel to the chassis. (four on top and four on the bottom) Pull the front panel out gently about 3 inches. The LCD intensity adjustment will be visible behind the front panel. (See figure 2-1) Use a small precision type, slot head screwdriver to change the LCD intensity.

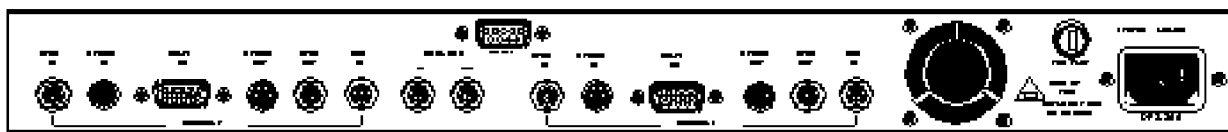


# CHAPTER 3

## Video Connections

This section describes how to interface the DPS-290 with other video equipment in your system.

### The DPS-290 Back Panel



### NTSC Video Input

This BNC connector is used to feed composite NTSC video to the DPS-290. It is normally connected to the video output of a playback VCR. It can also be connected to any composite NTSC source such as a TV tuner, laser disc player, camera, etc.

### S-Video Input

This 4-pin connector is used to input S-Video (S-VHS or Hi8) to the TBC card. It is normally connected to the S-Video output of a playback VCR using a standard 4-pin to 4-pin S-Video cable. Some JVC industrial type S-VHS players use a 7-pin connector for their S-Video output. To interface with such machines, a 7-pin to 4-pin adapter cable is required.

## Multi Function I/O (DB-15-HD)

The DB-15 high density connector is used for the component analog video/RGB I/O, advanced sync and GPI freeze. The inputs and outputs are distinguished by the length of the wires on the provided breakout cable.

### Signal Connections:

Pin 1	B-Y Output	Long Blue BNC
Pin 5	R-Y Input	Short Red BNC
Pin 6	R-Y Output	Long Red BNC
Pin 9	RGB Sync Input	Short Grey BNC
Pin 10	B-Y Input	Short Blue BNC
Pin 11	Y Output	Long Green BNC
Pin 12	ASync Output	Long White BNC
Pin 14	GPI	Short Black RCA
Pin 15	Y Input	Short Green BNC

### Ground Connections:

Pin 2	R-Y/B-Y Output
Pin 3	RGB Sync Input
Pin 4	R-Y/B-Y Input
Pin 7	Y Output
Pin 8	ASync Output
Pin 13	Y Input/GPI Input

## NTSC Video Output

This BNC connector provides a timebase corrected version of the video input signal.

## S-Video Output

This 4-pin connector provides the time base corrected S-Video (S-VHS or Hi8) version of the video input signal.

## DOC Pulse Input

Selection of the RF or TTL for the DOC input is controlled by jumpers AHE1 and AHE2 on the RF/DNR



board. The correct orientation for each mode is illustrated on the PCB. When RF mode is selected, DOC sensitivity is adjusted using ARV2.

## Genlock Video

The genlock video loop through is used by the DPS-290 to establish the timing for its video output signal. The signal applied to this input is used to reference **both** TBC channels in the DPS-290 and must always be STABLE, such as the output from a black burst or color bar generator. DO NOT attempt to use a non-time base corrected VCR for your genlock reference. When a valid signal is connected to this input, the video output of the DPS-290 will be co-timed (genlocked) to this signal. When no external reference is supplied to the genlock input, the DPS-290 will operate using its internal sync generator.

The second TBC channel is the same inputs and outputs as the channel one TBC except for the genlock BNCs. When a second TBC is installed in the DPS-290 it is always genlocked to the main TBC. Separate subcarrier timing adjustment is provided for the second TBC with a usable range of  $\pm 60^\circ$ .

## Remote

The remote DB-9 connector is used to connect the DPS-290 to a remote unit such as the RC-2001 or PC. This is standard RS-232 levels with the following connections.

- Pin 2 . . . . . Transmit
- Pin 3 . . . . . Receive
- Pin 5 . . . . . Ground



# CHAPTER 4

## Operation



### The DPS-290 Front Panel

#### UNIT SELECT (TBC 1/TBC 2)

This button is used to select which TBC channel is to be controlled.

#### INPUT SELECT (NTSC/S-Video/CAV)

This button is used to select the desired input. Use the menu section to select between Betacam and MII formats. The default factory setting is Betacam format. (For more information, see the MENU section later in this chapter.)

A flashing LED indicates that the selected video input is missing at the BNC connector.

#### FREEZE MODE

This button determines the desired freeze format "FRAME, FIELD, STROBE and FILM MODE" when the "TAKE" button is pressed.

#### FREEZE TAKE

This button enables/disables the selected freeze mode.

If frame mode is selected, the display indicates the current frame.

If field mode is selected the display indicates the current field (1,2 or 3) and the control wheel selects which field to display.

If strobe mode is selected the display indicates the the current strobe rate and the control wheel allows the rate to be changed. The number displayed indicates the number of frames per update.

When film mode is selected, this feature simulates the 3-2 pull down conversion technique from a 24 frame per second film standard, to a 30 frame per second video standard.

## Proc Amps

### **Video**

This control enables the luminance amplitude to be changed by rotation of the control wheel. The usable range is approximately  $\pm 30\%$

### **Black**

This control enables the black level to be changed by rotation of the control wheel. The usable range is approximately  $\pm 125\text{mV}$

### **Chroma**

This control enables the chrominance amplitude to be changed by rotation of the control wheel. The usable range is approximately  $\pm 30\%$

### **Hue**

This control enables the decode phase to be changed by rotation of the control wheel. The usable range is approximately  $\pm 30^\circ$

### **Color Balance (Red/Blue)**

This controls may be used when a white area of a particular scene do not appear white (for instance, have a “blue” or “red” tint), The color balance controls may be used to eliminate this problem. The usable range is  $\pm 10\%$

### **Timing**

This button is used to adjust the horizontal position and genlock timing.

### **Menu**

This button is used to enter the configuration menu.

- Press “ENTER” to select the configuration menu.
- Use the control wheel to scroll through the selections. When the desired selection is displayed, select the “ENTER” button again. The “>” will move down to the second row of the LCD display.
- Use the control wheel to select the desired value.
- Use the exit button to move the “>” back to the top row of the LCD display.

### **Store**

This feature allows the current proc amp settings to be stored in the memory location selected using the control wheel. Valid store locations are 1-9. (location 0 is reserved for factory presets.) To store a proc amp setting, press the store button. Select the desired memory location using the control wheel and press the store button again.

### **Recall**

This feature allows the previously stored proc. amp. settings to be recalled. To recall a proc amp setting, press the recall button. Select the desired memory location using the control wheel and press the recall button again. Pressing any other proc amp control button will abort the recall operation before completion.

To recall factory presets, press RECALL RECALL.

**Table 4-1**

**Menu  
Settings**

**1. Video Mode**

Video Mode is the first choice available upon pressing the front panel “Menu” button and controls the operation of the composite video bypass relay. Bypass mode connects the composite video connector input directly to the output, bypassing the DPS-290 electronics. The unit will also automatically bypass upon loss of AC power.

- A      PROCESS      (Default mode)
- B      BYPASS

**2. Y/C Horizontal Control**

This control will adjust the Y/C Horizontal Delay. The control Range is -420nS to +620nS, in 70nS increments. (Factory Default = 0nS)

**3. Hot Switch**

When the hot switch feature is enabled, the DPS-290 will automatically go into freeze mode whenever the input video signal is lost. If the feature is disabled, the automatic freeze will be disabled.

- A      DISABLED
- B      ENABLED

**4. Color/Monochrome**

This control places the DPS-290 into “Forced Monochrome” mode. Whenever “Monochrome” is selected, the chrominance picture detail is suppressed creating a black and white image. (The color burst is still present.)

- A      COLOR MODE
- B      MONOCHROME MODE

**5. Vertical Blanking**

This feature sets the number of video lines blanked by the DPS-290 during the vertical interval. When the “wide” mode is selected, the DPS-290 will blank the first 21 lines of each field. When the “narrow” mode is selected, only the first 9 lines of each field will be blanked.

- A      NARROW
- B      WIDE

**6. Video Out**

When “normal” is selected, the DPS-290 is in the normal operating mode. Selecting the “forced black out” button will cause the video output of the DPS-290 to drop to black level.

- A      NORMAL

Table 4-1

B      FORCE BLACK OUT

**Menu  
Settings  
Continued**

### 7. Burst Status

Placing the Burst status in the disabled mode turns the burst on the output video off

A      ENABLED  
B      DISABLED      (Burst off)

### 8. Noise Reduction

This feature controls the noise reduction circuit. Separate luminance and chrominance noise reduction options are available. (This feature is only available with the DPS-290/290D.)

A      LUMA OFF      CHROMA OFF (Factory Default)  
B      LUMA ON      CHROMA ON  
C      LUMA ON      CHROMA OFF  
D      LUMA OFF      CHROMA ON

### 9. Unit Genlock Mode

In the internal mode , the DPS-290 will operate on its internal crystal and the front panel GENLOCK LED will be off. In the auto mode, the DPS-290 is genlocked to a stable reference video signal that is applied to the rear panel genlock input. When the DPS-290 is externally genlocked, the front panel GENLOCK LED will be on. If the genlock source disappears, the DPS-290 will switch to internal mode and the GENLOCK LED will flash.

A      INTERNAL  
B      AUTO

**Table 4-1**  
**Menu**  
**Settings**  
**Continued**

**10. Comb Filter**

In the “on” mode, the NTSC comb filter is enabled, allowing full luminance bandwidth processing, (see specifications). In the “off” mode, the separated Y/C output is filtered by a band-pass filter.

- A     ON     (Factory Default)
- B     OFF

**11. Select CAV Output**

This menu is used to select component output formats, (Betacam, MII or RGB). RGB out may only be selected if an RGB option board is present.

- A     BETA OUT     (Factory Default)
- B     MII OUT
- C     RGB OUT     (If RGB Board is installed)

**12. Select CAV Input**

This input is used to select the desired component input . The RGB input may only be selected if an RGB option board is installed.

- A     BETA IN     (Factory Default)
- B     MII IN
- C     RGB IN (If RGB Board is installed)

**13. DOC Status**

This feature is used to enable the DPS-290 Drop out Compensator. A BNC connector is available on the back of the DPS-290, to connect directly to the RF/TTL output of a VTR. If the VTR output is TTL and not RF, then two jumpers on the DOC board must be moved to the “TTL” position. The jumpers are factory installed in the “RF” position. (This feature is only available with the DPS-290/290D.)

- A     DISABLED (DOC OFF) (Factory Default)
- B     ENABLED (DOC ON)



**Table 4-1**

**Menu  
Settings  
Continued**

**14. DOC Delay**

The RF output on some VTRs is 1 video line late. If this is true for your VTR you can set the DOC delay to one line. (This feature is only available with the DPS-290/290D.)

- A NO DELAY
- B ONE LINE

**15. GPI Mode**

This enables or disables the remote GPI freeze feature

- A ENABLED
- B DISABLED

**16. Echo Mode**

This enables or disables the DPS-290 RS-232 acknowledge commands

- A DISABLED
- B ENABLED

**17. Advanced Sync**

Normally, advanced sync is 32 lines earlier than the video. It may user selected to zero lines delay

- A - 32 lines
- B - Zero lines

**18. Unit Address (Unit 1 to 32)**

This control is used to select the DPS-290 unit address. Each installed TBC has a separate unit address selection. The factory default setting for the first TBC is Unit 1 and for the second (if installed) Unit 2. The user can select any desired address for both units. Do not select the same address for both. The unit address is used only for remote control purposes.

The DPS-290 can be remote controlled using the RC-2001 universal studio remote or the RC-2000 desktop remote. Also, the DPS 290 can be controlled using PC based custom remote software.

**Table 4-1**

**Menu  
Settings  
Continued**

**19. Y/C Vertical Delay**

This control will adjust the Y/C Horizontal Delay. The control range is -2 lines to +1 line

- A +1 LINES
- B 0 LINES(Factory Default)
- C -1 LINES
- D -2 LINES

**20. VITS Comb Control**

The “VITS Comb Control” menu determines the action of the adaptive comb filter decoder during the Vertical Blanking Interval. This control does not affect the active picture area.

- A BYPASS MODE (DPS-291 Default)
- B BANDPASS MODE (DPS-290 Default)

Adaptive comb filter decoders, such as the one used in the DPS-290, provide the best possible video performance during normal program content. Unfortunately, the averaging actions of comb decoders can create undesirable results with single line vertical interval test signals. The default "VITS Comb Bypass" mode eliminates VITS line averaging at the expense of luminance frequency response. The new "VITS Comb Bypass" mode bypasses the comb filter entirely during vertical blanking period, which increases the luminance frequency response of VITS data while avoiding any line averaging artifacts. Because Y/C separation does not occur, however, chrominance information on these lines can be affected.

**21. DPS-290 Software**

This menu item displays the current software revision.

# APPENDIX A

## DPS-290 Specifications

Video Input (NTSC mode) .....1V p-p

S-Video mode:

Y Input .....1V p-p

C Input .....286mV p-p burst level

Component Analog Video Inputs

Betacam Mode

Y Signal .....714mV p-p 75ž

R-Y Signal .....700mV p-p 75ž

B-Y Signal .....700mV p-p 75ž

MII Mode

Y Signal .....714mV p-p 75ž

R-Y Signal .....486mV p-p 75ž

B-Y Signal .....486mV p-p 75ž

Reference Video Input (Loop or 75ž).....1V p-p

D.O.C. Input .....RF/TTL

GPI Freeze Trigger .....TTL or Contact Closure

Video Output (NTSC mode)..... 1V p-p

S-Video mode:

Y Output .....1V p-p

C Output .....286mV p-p burst level

Component Analog Video Outputs

Betacam Mode

Y Signal .....714mV p-p 75ž

R-Y Signal .....700mV p-p 75ž

B-Y Signal .....700mV p-p 75ž

MII Mode	
Y Signal .....	714mV p-p 75ž
R-Y Signal .....	486mV p-p 75ž
B-Y Signal .....	486mV p-p 75ž
Advanced Sync Output .....	4V p-p 32 Lines Adv. (Selectable 0 Lines)
Bandwidth All modes .....	0-5.5 MHz (+0.5/-3dB)
Signal-to-Noise .....	>58dB
Differential Phase (Composite Mode) .....	<2P
Differential Gain (Composite Mode).....	<3%
Differential Phase (S-Video/CAV Mode) .....	<1P
Differential Gain (S-Video/CAV Mode).....	<1%
K Factor:	
Y/C Input .....	1%
NTSC Input .....	1%
CAV input .....	1%
Residual Time Base Error.....	<15nS
Serial Data Input .....	RS-232 Levels @ 9.6 kB/s
Proc Amp Controls:	
Video Level .....	+/- 3dB
Black Level.....	+/- 20 IRE
Chroma Level .....	+/- 3dB
Chroma Phase (Hue).....	+/- 30P
Horizontal Pos .....	+/- 1μs
Color Balance:	
R-Y Shift .....	+/- 10%
B-Y Shift .....	+/- 10%
Y/C Delay:	
Horizontal .....	-620nS to +420nS
Vertical .....	-2 lines to +1 line

Genlock Timing: (Main TBC)

Horizontal ..... +/- 4 $\mu$ s

Subcarrier ..... +/- 360p

Genlock Timing: (Second TBC)

Subcarrier ..... +/- 60p

Power Requirements .....85 -132 VAC

Input Power .....70 Watts

Operating Environment .....0 -40p C

Spec. Temperature .....10 -40 p C

Storage Temperature .....-40 - 75p C

Dimensions.....17in. X 1.75 in. X 20 in. (43.2 cm X 4.4 cm X 50.8cm )

Weight .....13.25lbs (6kg)



# APPENDIX B

## Using The Advanced Sync Output

The DPS-290 generates an advanced sync signal which can be used by connecting the supplied breakout cable assembly to the DB-15 High density connector. Use the long wire marked in white with the BNC connector. The advanced sync signal can be connected to the EXT SYNC input of a playback VCR. The external sync connection will force the playback VCR to maintain a speed which, on average, is correct for the TBC.

Without an external sync connection, the TBC will occasionally have to either repeat or delete frames of video in order to maintain genlock with the reference video input. This normally is not a problem, as the “frame stuffing” occurs so infrequently (perhaps every thirty minutes or so) that it is not noticeable. The advanced sync connection is normally used when precise “time-code” editing is being performed.

If you want to use the advanced sync output, be sure to select the external sync mode on your playback VCR. Refer to your VCR operating instructions if necessary.

## GPI Freeze (General Purpose Input)

The DPS-290 is equipped with a GPI freeze input. The purpose of this input is to provide a remote freeze switch that will toggle the TBC between live and freeze modes whenever the switch is pressed. In order to use the GPI freeze, you must connect the supplied custom cable assembly to the DB-15 High density connector. Use the short wire marked in black with the RCA connector. Then connect an appropriate switch to the female RCA type jack. Then select the desired freeze type from the DPS-290 front panel. (Field/Frame/Strobe and Film Mode).





# APPENDIX C

## DPS 290 Serial Protocol

This appendix describes the serial data interface to the DPS-290. This information is intended for users and programmers who want to develop their own custom control (driver) software for the card. An example of a custom application would be a special driver for a computer-based editing controller which could poll and manipulate TBC proc amp parameters in order to store these values as part of an edit decision list.

### Electrical Interface

The electrical interface for the DPS-290 is RS-232 using a computer's built in RS-232 port or any other RS-232 port which may reside on an expansion card. The bit rate is set to 9600 BPS, with 8 data bits, 1 stop bit and no parity.

### Protocol

The software protocol is a MIDI compatible format, using the system exclusive feature of the MIDI interface. Communication with the DPS-290 is initiated when the system exclusive command byte (F0 hex) is received, followed by the TBC ID code (67 hex).

The next byte sent is the TBC address byte, which determines which TBC is being addressed by the command. This is followed by a TBC function select byte and one or more data bytes. The communication is completed when the MIDI end system exclusive byte is sent (F7 hex).

The following table summarizes the protocol:

## Host:

System Exclusive Byte (= F0 hex)  
TBC ID Byte (= 67 hex)  
TBC Address Byte (= 00-7F hex)  
Function Select Byte (= 00-7F hex)  
Data Byte 1  
Data Byte 2  
...  
Data Byte N  
End System Exclusive (= F7 hex)

## TBC Response:

ACK Byte (= 40h) or NACK Byte (= 45h)

## System Exclusive Byte

This byte is used in the MIDI protocol to allow manufacturers of MIDI equipment to define messages specific to their own equipment. The system exclusive mode remains in effect until the end system exclusive command is sent.

## TBC ID Byte

This byte is the unique code which identifies the exclusive data for the particular personal TBC.

## TBC Address Byte

This byte determines to which DPS-290 the following command is directed. The address of each unit can be set using the front panel menu commands. Unit addresses correspond to hex codes as specified in the following table.

<u>DPS-290 Unit Address</u>	<u>Corresponding HEX Value</u>
Unit 1	40 HEX
Unit 2	00 HEX
Unit 3	01 HEX
Unit 4	02 HEX
Unit 5	03 HEX
Unit 6	04 HEX
Unit 7	05 HEX
Unit 8	06 HEX
Unit 9	07 HEX
Unit 10	08 HEX
Unit 11	09 HEX
Unit 12	0A HEX
Unit 13	0B HEX
Unit 14	0C HEX
Unit 15	0D HEX
Unit 16	0E HEX
Unit 17	0F HEX
Unit 18	10 HEX
Unit 19	11 HEX
Unit 20	12 HEX
Unit 21	13 HEX
Unit 22	14 HEX
Unit 23	15 HEX

<u>DPS-290 Unit Address</u>	<u>Corresponding HEX Value</u>
Unit 24	16 HEX
Unit 25	17 HEX
Unit 26	18 HEX
Unit 27	19 HEX
Unit 28	1A HEX
Unit 29	1B HEX
Unit 30	1C HEX
Unit 31	1D HEX
Unit 32	1E HEX

The Address of each DPS-290 channel can be set as desired by the user. Make certain that no two DPS-290s have the same address or that any two channels of a DPS-290 have the same address.

## TBC Function Select Byte/Data Byte(s)

The Function byte determines which function on the addressed TBC card will be affected by the command. Most commands follow this byte with two characters that represent the new hex value for the selected function. The following table lists each function with the associated data bytes.

## TBC Function Select Byte/Data Byte(s)

<u>Function Byte</u>	<u>Data Byte(s)</u>	<u>Description</u>
01h	2 (0,0-F,F)	Set luminance level command 00 = Minimum luminance level FF = Maximum luminance level
02h	2 (0,0- F,F)	Set black level command 00 = Minimum black level FF = Maximum black level
03h	2 (3,2-A,D)	Set chroma level command 32 = Minimum chroma level AD = Maximum chroma level

<b><u>Function Byte</u></b>	<b><u>Data Byte(s)</u></b>	<b><u>Description</u></b>
04h	2 (0,0-F,F)	Set hue command 00 = Max counter clockwise FF = Max clockwise
05h	2 (0,0-F,F)	Set genlock timing fine 00 = Most retarded setting FF = Most advanced setting (0.55 ns/increment)
06h	2 (0,0-3,F)	Set genlock timing horizontal 01 = Most retarded setting 3E = Most advanced setting (140 ns/increment)
07h	2 (0,0-F,F)	Set Horizontal position 00 = Most retarded setting FF = Most advanced setting
08h	1 (0-1)	Input mode select 0 = NTSC input mode 1 = S-Video input mode 2 = Component
09h	8	Set all proc amps
0Ch	1 (0-1)	Freeze/Live mode select 0 = Live mode 1 = Freeze mode
0Dh	0	Request TBC brief status info.
0Eh	0	Request TBC full status info
10h	2 (3,0-A,F)	Set Blue color balance 30 = Most neg blue 80 = No blue AF = Most pos blue
11h	2 (3,0-A,F)	Set Red color balance 30 = Most neg red 80 = No red AF = Most pos red

<b><u>Function Byte</u></b>	<b><u>Data Byte(s)</u></b>	<b><u>Description</u></b>
12h	2 (0,0-7,F)	Strobe Rate 00 = Full Motion 7F = 127 Frames
13h	1 (0-4)	Select Freeze Mode 0 = Frame mode 1 = Field mode 2 = Strobe mode 3 = 4 Field mode 4 = Film mode
14h	1 (0-2)	Freeze Field Select 0 = Select field 0 1 = Select field 1 2 = Select field 2
15h	1(0-1)	Process/Bypass Control 0 = Process 1 = Bypass
16h	1 (0-F)	Y/C Delay horizontal 0 = +420nS 8 = 0 F = -620nS
17h	1 (0-1)	VITS Comb Control 0 = Bypass 1 = Bandpass
24h	1 (0-3)	Y/C Delay vertical 0 = +1 line 1 = 0 2 = -1 line 3 = -2 lines
25h	1 (0-1)	Monochrome Mode 0 = Normal 1 = Chroma Off

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<u>Function Byte</u>	<u>Data Byte(s)</u>	<u>Description</u>
26h	2	Set control flags - 1
		Bit 0 Mono/Color mode 0 = color 1 = mono
		Bit 1 Vertical Blanking 0 = narrow 1 = wide
		Bit 2 Hot Switch 0 = disable 1 = enable
		Bit 3 Output Burst enable 0 = on 1 = off
		Bit 4 Force Black 0 = Process 1 = Black
		Bit 5/6 CAV Output Control 00 = Beta Out 01 = MII Out 10 = RGB Out 11 = Not Used
		Bit 7 Comb Filter 0 = Comb ON 1 = Comb OFF

<u>Function Byte</u>	<u>Data Byte(s)</u>	<u>Description</u>
27h	2	Set control flags - 2 Bit 0 Echo Mode 0 = Disable 1 = Enable Bit 1/2 Noise Reduction 00 = Noise Reduction OFF 01 = Luma OFF Chroma ON 10 = Luma ON Chroma OFF 11 = Luma ON Chroma ON Bit 3 DOC Control 0 = DOC Off 1 = DOC On Bit 4 DOC Delay 0 = No Delay 1 = 1 Line Delay Bit 5 Genlock Control 0 = Internal 1 = External Bit 6 GPI Control 0 = Enabled 1 = Disabled Bit 7 Not Used
28h	0 (0-2)	Set CAV Input Mode 00 = Beta In 01 = MII In 10 = RGB In

## Proc Amp Control

The first four commands will be used most often. They allow each of the TBC proc amp functions to be individually manipulated.



## Genlock Timing

Commands 05 and 06 are used to adjust the genlock timing of the DPS-290. When the genlock timing subcarrier control is incremented from FFh - 00h, the horizontal control should be incremented to maintain a continuous control effect. Similarly, when the subcarrier setting is decremented from 00h - FFh, the horizontal control should be decremented. Whenever the genlock timing is to be adjusted, the TBC status should be read (see command 0Ah) to ensure that the addressed TBC is in genlock mode. The system phase is not significant when the TBC is in free-running mode.

The genlock timing control on the DPS-290 adjusts BOTH horizontal (i.e. sync timing) and subcarrier phase simultaneously in such a manner as to ALWAYS maintain a zero SCH relationship at the TBC video output. This is unlike some equipment which permits separate sync and subcarrier adjustments. The correct adjustment procedure is to first obtain the closest possible horizontal phasing. (Typically a waveform monitor or DPS Personal V-Scope would be used. Lacking a calibrated waveform monitor, the adjustment can be performed using a split monitor.)

Horizontal phasing should be done by incrementing/decrementing the genlock timing horizontal setting in steps of 2 ( $2 \times 140 \text{ ns} = 1 \text{ subcarrier cycle}$ ) which will move the picture without changing the color phasing.

The subcarrier setting and the LSB of the horizontal setting can now be adjusted for correct color phase. If this adjustment is performed without a vectorscope (i.e. by observing the color phase on a picture monitor), it is important that the TBC hue setting first be centered (Set to 80h) so that correct system timing is achieved.

Genlock timing adjustment for the second TBC channel is limited to subcarrier adjustment with range a range of 00 to 6F ( $\pm 60^\circ$ )

## Horizontal Position

The horizontal position control moves the active video portion of the picture without affecting the output sync and burst. When proper genlock timing is set, this control can be used to move the active video portion of the signal as may be required for certain editing situations. This control should be set to unity (80 hex) when the system phase is manipulated.

## Brief TBC Status

Command 0D is used to request status information from the TBC. The TBC responds with the following status byte (followed by the normal ACK byte).

	Bit 7	Always 0	
	Bit 6	(Genlock Status)	1 = Genlocked 0 = Free-running
DPS-290 TBC 1	Bit 5	(Input Video Pres)	1 = Input present 0 = No Input present
DPS-290 TBC 1	Bit 4	(Freeze/Live Mode)	1 = Freeze mode 0 = Live mode
DPS-290 TBC 2	Bit 1	(Input Video Pres)	1 = Input present 0 = No Input present
DPS-290 TBC 2	Bit 0	(Freeze/Live Mode)	1 = Freeze mode 0 = Live mode

## Full TBC Status

Command 0Eh requests a complete status dump from the addressed TBC. The status information consists of the brief status byte (see command 0Dh), followed by two ASCII characters for each of the proc amp and system phase settings. These represent the hex value of their current setting as indicated.

<u>Byte</u>	<u>Description</u>
1	Brief status byte (see command 0Dh)
2	MSN of Video Level
3	LSN of Video Level
4	MSN of Black Level
5	LSN of Black Level
6	MSN of Chroma Level
7	LSN of Chroma Level
8	MSN of Hue Level
9	LSN of Hue Level
10	MSN of Red Level
11	LSN of Red Level
12	MSN of Blue Level
13	LSN of Blue Level
12	MSN of Blue Level
14	MSN of Horizontal Position
15	LSN of Horizontal Position
16	MSN of Subcarrier System Phase
17	LSN of Subcarrier System Phase
18	MSN of Horizontal System Phase
19	LSN of Horizontal System Phase
20	MSN of Strobe Rate
21	LSN of Strobe Rate
22	MSN of Freeze Field
23	LSN of Freeze Field
24	MSN of 290 Flags 1
25	LSN of 290 Flags 1
26	MSN of 290 Flags 2
27	LSN of 290 Flags 2
28	MSN of Y/C Horizontal Delay
29	LSN of Y/C Horizontal Delay
30	MSN of Y/C Vertical Delay
31	LSN of Y/C Vertical Delay

**Note:** MSN = Most Significant Nibble (ASCII 0 - 9 or A - F)  
LSN = Least Significant Nibble

## Programming Example

Some confusion has resulted from the fact that actual data bytes sent to the TBC card must be in ASCII. The following is an example of the actual data that would be sent to the DPS-290 to force it into monochrome mode. Please note that the data bytes are always transmitted in ASCII.

0xF0	MIDI Start of Exclusive
0x67	DPS ID
0xAA	AA = TBC Address
0x37	Forced Monochrome Function Select
0x31	= ASCII for "1"
0xF7	MIDI End of Exclusive

**Note:** All TBC settings are maintained upon power down in non-volatile RAM on the DPS-290.

# APPENDIX D

## FCC Compliance Statement

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

### Notes:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

### Warning:

**Changes or modifications to this unit not expressly approved by Digital Processing Systems, Incorporated could void the user's authority to operate the equipment.**



# APPENDIX E

## Warranty

Digital Processing Systems Inc. warrants the original purchaser that this product is in good working condition for a period of two years from the date of purchase. Should this product, in Digital Processing System's opinion, malfunction within the warranty period, Digital Processing Systems Inc. will repair or replace this product without charge. This warranty does not apply to those products which have been damaged due to accident, unauthorized alterations, repairs or modifications.

## Limitations

All warranties for this product, expressed or implied, are limited to two years from the date of purchase and no warranties, expressed or implied, will apply after that period.

The distributor, its dealers and customers agree that Digital Processing Systems Inc. shall not be liable for any loss of use, revenue or profit.

Digital Processing Systems Inc. makes no other representations of warranty as to fitness for purpose of merchantability of otherwise in respect to any of the products sold to the distributor pursuant to this agreement.

The liability of Digital Processing Systems Inc. in respect of any defective products will be limited to the repair or replacement of such products.

In no event shall Digital Processing Systems Inc. be responsible or liable for any damages arising from the use of such defective products whether such damages be direct, indirect, consequential or otherwise and whether such damages are incurred by the distributor or third party.

## Warranty Service

Units requiring repair under warranty may be sent directly to Digital Processing Systems Inc. To obtain service under this warranty, first contact the Digital Processing Systems Customer Service Department to request a Return Material Authorization Number (RMA).

Canada and International	(905) 944-4000
U.S.A.	(859) 371-5533
Europe	(01232) 718300
Asia and the Pacific Rim	(612) 9547-0088

This number must be clearly displayed on the units external packaging. Units shipped without an RMA number will not be accepted. Include proof of purchase (including date of purchase), a note outlining the problem and the RMA number.

**IMPORTANT:** When shipping your unit, pack it securely and ship prepaid and insured. Digital Processing Systems Inc. will not be held liable for damage or loss to the product in shipment. Repaired items will returned to the purchaser prepaid via a surface freight carrier of DPS' choice within the continental United States. If another method of shipping is desired, it must be clearly specified in writing and all priority return freight charges are the responsibility of the purchaser.