DPS-470

Digital Component AV Synchronizer

Operator's Manual

rev. 1.41

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Copyright

The printed version of this document is DPS Part Number 707-470 and the version number is 1.41.

Caveats

Information in this document is subject to change without notice and does not represent a commitment on the part of Digital Processing Systems Inc.

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

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INTRODUCTION

The Digital Processing Systems DPS-470 Digital Component AV Synchronizer is a 10-bit video synchronizer, or audio/video synchronizer, featuring serial digital and analog component, composite and Y/C input and outputs. It is available in both video-only and audio/video configurations. In either configuration, the DPS-470 provides an ideal bridge between analog video signals, such as satellite and microwave feeds, and a digital production facility.

Four different input and output formats are provided:

- Serial Component Digital Video (SDI)
- Component Analog Video (Betacam / MII)
- S-Video (S-VHS / Hi8)
- Composite Video

An adaptive comb filter decoder and 10-bit ITU-R-BT.601 component processing provide maximum signal transparency. A built-in auto-sense TBC circuit provides seamless mode switching between direct color and heterodyne sources such as camcorders and VCRs.

The DPS-470 is also a transcoder and a digital test signal generator. In Test Signal Generator (TSG) mode, any one of 33 different NTSC (29 PAL) 10-bit test patterns can be selected to appear at all four outputs. The operator can specify which test signals are used by the built-in Vertical Interval Test Signal (VITS) inserter.

With the addition of a DPS AS-470 four-channel audio synchronizer module, the DPS-470 can provide dual stereo audio and video synchronization in a single rack unit high package. The internal audio synchronizer option supports balanced analog, AES/EBU digital and embedded SDI audio I/O. All outputs are simultaneously active, which enables both analog and digital audio devices to be connected at the same time. Incoming stereo audio pairs can be selected from the analog, digital or embedded SDI inputs. All four audio channels dynamically track the internal delay of the video

synchronizer whenever auto-track mode is enabled. Up to 20 NTSC (12 PAL) fields of fixed delay can also be specified, ensuring proper lip sync regardless of the program source. All audio parameters are controlled from an easy-to-use front panel menu. A variety of DPS multi-channel remote controls are also available.

The DPS-470 serial digital component synchronizer represents the ideal choice for broadcasters beginning their transition to DTV. When interfacing analog audio and video sources to serial digital equipment, nothing offers flexibility, performance, reliability or economy of the DPS-470.

This manual represents operating instructions for both the NTSC and PAL versions of the DPS-470. Please pay special attention to the differences in these two standards which are noted in parenthesis.

CHAPTER 1: INSTALLATION AND CONFIGURATION

Installation

Unpacking and Inspection

This unit has been thoroughly calibrated and inspected, both electronically and mechanically, to ensure that it meets the published specifications. The following items are included with each DPS-470:

Description	Quantity
DPS-470 Digital Component AV Synchronizer	1
Operations Manual	1
AC Power Cord	1
Video Breakout Cable (Part # 774-565)	1
Audio Breakout Cable (Part # 774-470) (available only with the DPS-470AV)	1

Mounting

The size of the DPS-470 allows it to fit into most standard consoles or 19-inch 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. Also, leave sufficient clearance from the unit's rear panel to allow for proper air circulation.

After unpacking the unit and before installing it in a console or rack, allow at least 30 minutes for temperatures to equalize and to eliminate any condensation that may have developed.

Configuration

DIP Switches

There are eight DIP switches located near the front edge of the DPS-470 board. DIP switches 1 and 2 can adjusted. DIP switches 3-8 are reserved for factory use and should not be changed.

Closed Caption Processing (DIP Switch 1)

Change this DIP switch of the closed caption lines 21 and 22 of fields 1 and 2 are to be processed through the COMB filter or to be bypassed.

- UP COMB Filter Active during closed caption lines
- DOWN Closed Caption Bypass COMB Filter

Vertical Interval Processing (DIP Switch 2)

Selects the function of the COMB filter during the vertical interval synchronizer mode.

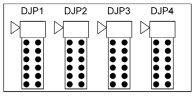
- UP Band-Pass mode
- DOWN Bypass mode

LCD Intensity

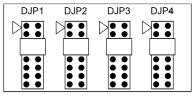
To change the LCD intensity, the top cover must be removed. Remove the screws that secure the top cover to the chassis and lift off the cover. The LCD intensity adjustment will be visible behind the front panel near the front left corner of the board (see diagram, next page). Use a small flat-head screwdriver to set the desired intensity.

Jumper Settings

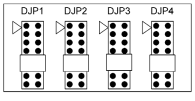
AES/EBU is comprised of 2 channels each transmitting (output) and receiving (input) audio. The channels are independent and can be set to transmit XLR balanced (110 ohms) audio or BNC unbalanced (75 ohms) audio. You could also configure the input as XLR and the output as BNC, or vice-versa. Do not use the XLR and BNC connections for the same input or output channel at the same time. In order to select the right impedance on each channel, you must configure the jumper settings on the audio board's PCB. The headers are labeled DJP1, DJP2, DJP3 and DJP4. An arrow points to pin 1 on each header. Use the following diagrams to configure the jumpers to the desired settings. Please note that the BNC unbalanced (75 ohms) audio is the factory default. Also, depending on how the jumpers are set on the board determines which of the cables are active on the breakout cable.



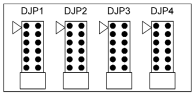
Channel 1:
Receive - 110 Ω
Transmit - 110 Ω



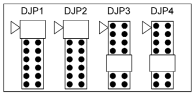
Channel 2:
Receive - 110 Ω
Transmit - 110 Ω



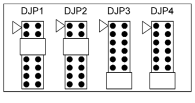
Channel 1:
Receive - 75 Ω
Transmit - 75 Ω



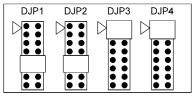
Channel 2:
Receive - 75 Ω
Transmit - 75 Ω



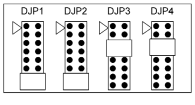
Channel 1:
Receive - 110 Ω
Transmit -75 Ω



Channel 2:
Receive - 110 Ω
Transmit -75 Ω

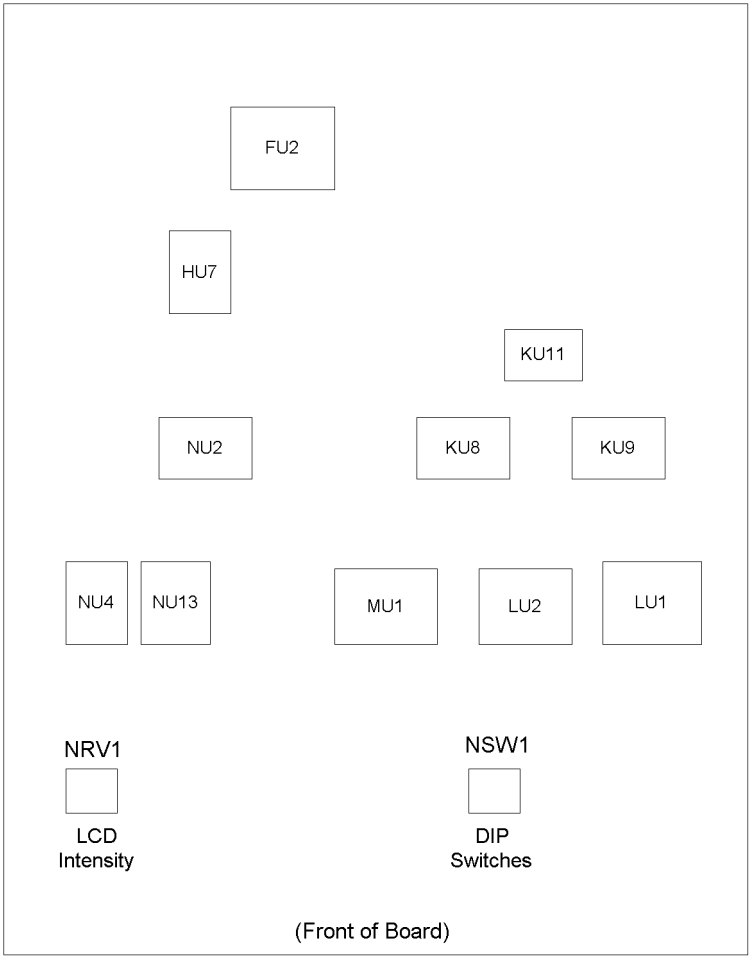


Channel 1:
Receive - 75 Ω
Transmit - 110 Ω



Channel 2:
Receive - 75 Ω
Transmit - 110 Ω

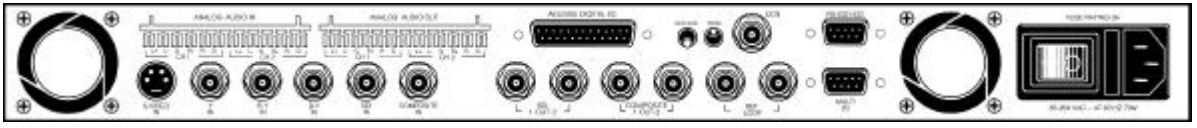
DPS-470: Simplified Video Board Layout



CHAPTER 2: CONNECTIONS

This chapter describes how to interface the DPS-470 with other video and audio equipment in your system.

DPS-470: Back Panel



Video Inputs

S-Video Input

This 4-pin connector, labeled S-*VIDEO IN*, is used for S-Video signals, like S-VHS or Hi8. 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 from the manufacturer of the VCR.

Component Analog Video Input

These BNC connectors, labeled *Y-IN*, *R-Y IN*, and *B-Y IN*, are used to input the signals from analog component devices, such as Betacam cameras or VTRs.

Serial Digital D1 Input

This BNC connector, labeled *SDI IN*, accepts serial digital ITU-R BT.601 video and embedded audio data at a rate of 270 megabits per second.

Composite Video Input

This BNC connector, labeled *COMPOSITE IN*, is used to feed composite 1 Vp-p video to the DPS-470. In Synchronizer Mode, the input video signal can be direct color or monochrome; in Timebase Corrector Mode, the input signal can be connected to the video output of a VCR.

Video Outputs

Serial Digital D1 Outputs

These BNC connectors, labeled *SDI OUT*, provide the synchronized/timebase-corrected serial digital ITU-r-BT.601, 270 megabits-per-second output.

Composite Video Output

These BNC connectors, labeled *COMP-1 OUT* and *COMP-2 OUT*, provide synchronized/timebase-corrected versions of any of the input signals, except when the DPS-470 is in either Bypass or TSG mode (for a discussion of the output in these modes, see the "Synchronizer Mode" section in Chapter 3). The *COMP-1* output can be bypassed from the front panel or will automatically do so when the DPS-470 is turned off.

S-Video Output

The synchronized /timebase-corrected S-Video version of the video input signal is part of the Multi I/O connector (see below).

Component Analog Video Output

The synchronized /timebase-corrected analog component video output is part of the Multi I/O connector (see below).

Multi I/O Breakout Cable (Component, S-Video, GPI)

A DB-15F high-density connector, labeled *MULTI I/O* is located on the right-hand side of the rear of the DPS-470. This connection and breakout cable contains the connections for Component Out, S-Video Out and GPI.

Genlock Reference

These BNC connectors, labeled *REF LOOP*, are used to loop a genlock signal through the DPS-470 to establish the timing for its video output signal. The signal for this input must always be stable, such as the output from a black-burst or color-bar generator. Do not attempt to use a signal that has not been timebase-corrected. When a valid signal is connected to the *REF LOOP* input, the video output of the DPS-470 will be genlocked to this signal. When no external reference is supplied to the genlock input, the DPS-470 will operate using its own internal sync generator. If the second *REF LOOP* is unused, terminate it with a 75-ohm terminator.

Audio Inputs

The DPS-470 can process 2 stereo pairs of analog audio, 2 stereo pairs of AES/EBU audio, or Serial Digital (SDI) audio. You can select which 2 stereo channels to be processed. The audio inputs can be selected from the front panel. Since all of the outputs are active simultaneously, inputs can be mixed from any of the analog audio SDI audio or AES/EBU audio.

Analog Audio Inputs (Terminal Strip)

The analog audio input accepts 2 stereo pairs. The first pair is considered channel 1 and the second channel 2. Channel 1 and 2 are comprised of two components each, left and right. Please see the diagram of the Back Panel.

The analog audio inputs can be configured to 600 Ω balanced/unbalanced or high impedance balanced/unbalanced audio.

AES/EBU Audio (Breakout Cable)

The following is a description of the breakout cable accompanied with the DPS-470.

Audio Inputs

XLR CH-1

The XLR CH-1 connector is used for AES/EBU balanced audio input on channel 1.

XLR CH-2

The XLR CH-2 connector is used for AES/EBU balanced audio input on channel 2.

BNC CH-1

The BNC CH-1 is used for unbalanced AES/EBU audio input on channel 1.

BNC CH-2

The BNC CH-2 is used for unbalanced AES/EBU audio input on channel 2.

NOTE: Any combination of two connectors above can be used, providing that they are on a separate channel.

Serial Digital Embedded Audio Input (SDI)

The DPS-470 accepts four channels of audio on the SDI input port. The four channels can be selected from any group on the SDI input.

Audio Outputs

Analog Audio Outputs (Terminal Strip)

The analog audio output accepts 2 stereo pairs. The first pair is considered channel 1 and the second channel 2. Channel 1 and 2 are comprised of two components each, left and right. Please see the diagram of the Back Panel.

The analog audio outputs can be configured to 600 Ω balanced/unbalanced or high impedance balanced/unbalanced audio.

XLR CH-1

The XLR CH-1 connector is used for AES/EBU balanced audio output on channel 1.

XLR CH-2

The XLR CH-2 connector is used for AES/EBU balanced audio output on channel 2.

BNC CH-1

The BNC CH-1 is used for unbalanced AES/EBU audio output on channel 1.

BNC CH-2

The BNC CH-2 is used for unbalanced AES/EBU audio output on channel 2.

Serial Digital Embedded Audio Output (SDI)

Any of the selected audio inputs can be embedded into the output of the SDI stream.

Remote Control Ports

In addition to remote triggering of the Freeze function via the GPI interface, all functions of the DPS-470 can be remotely controlled by devices capable of either RS-232 or RS-422. The DPS-470 is the first DPS studio product to also feature a *DPS Coaxial Network* (DCN) port. The type of control is selected in the Configuration Menu, under the Remote Control sub-menu (see Chapter 3, “Operation”).

RS-232 and RS-422

This DB-9F connector is used to remote control the DPS-470 via either RS-232 or RS-422. When this port is in use, a Unit Address must be set to an appropriate value in the range of 1-127. This allows the DPS-470 to be used in a multi-drop configuration where only the unit addressed will respond to remote commands.

DCN Port

This BNC connector is used to provide a DCN (DPS Coaxial Network) interface for remote control and status monitoring. DCN is a simple proprietary network in which 75-ohm coax is used as a multi-drop, bi-directional network. Using a BNC T connector on the DPS-470, loop coax between each DPS-470 and RC-4000. At each end of the chain, install a 75-ohm terminator. Every DPS-470 is assigned a unique DCN address at the factory, so there is no software configuration required. Maximum cable length (total) in a DCN configuration should be limited to 2000 feet. Remember to enable DCN at the DPS-470 front panel when using the RC-4000.

Use with RC-4000

To control the DPS-470 from a RC-4000 remote control panel, any of the above ports may be used. However, for new installations, the DCN port is recommended. If using the DCN port, then you may use the "Search for devices" menu option on the RC-4000. The RC-4000 will find all DPS-470s attached to it's DCN port and configure itself to control them. This may be done for any number of units at one time. DCN also allows multiple RC-4000s to control a single DPS-470.

To use RS-232 or RS-422 for control, the normal installation procedures should be followed on the RC-4000. The DPS-470 uses MIDI for its control protocol and must, therefore, be connected to a port configured for MIDI devices. Similarly, the baud rate and line type (RS-232 or RS-422) must match between the RC-4000 and the DPS-470. The cables required are straight connections (e.g., pin 1 to pin 1), but custom cables will be required to operate in multi-drop mode where multiple DPS-470s reside on a single RC-4000 serial port (see the RC-4000 manual for examples).

It is possible to remotely disable and enable the front panel of the DPS-470 from the RC-4000 using the "KeyLock" option. If neither this option nor the rear-panel KEYLOCK switch is activated, then it is possible for a local user to modify the remote-user's settings from the front panel. However, the RC-4000 will periodically poll the device and show the new parameters if the local user changes them. If remote control is the usual case, then it is probably best to disable front-panel access once the device has been installed.

Switches

There are two toggle switches on the back panel, labeled *KEYLOCK* and *TERM*.

Keylock

When this switch is down, or in lock position, none of the front panel keys will function.

Term

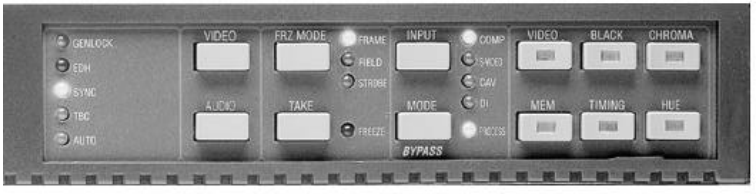
This switch terminates the RS-422 receive signal. Engage it when more than one unit is connected to the DPS-470 via RS-422.

CHAPTER 3: OPERATION

DPS-470: Front Panel

The operation of the DPS-470 is organized into six main functional areas:

- Proc Amps
- Input Selection
- Synchronizer Mode
- Freeze Menu
- Video Configuration Menu
- Audio Configuration Menu



DPS-470: Front Panel Control Area

Proc Amps

Luma

Pressing this button enables the luminance amplitude to be changed by rotating the control knob. The range is approximately +/– 30 percent.

Black

Pressing this button enables the black level to be changed by rotating the control knob. The range is approximately +/– 143 mV.

Chroma

Pressing this button enables the chrominance amplitude to be changed by rotating the control knob. The range is approximately +/– 50 percent.

Hue (Button appears on the NTSC front panel only)

Pressing this button enables the output phase to be changed by rotating the control knob. The range is approximately +/– 45 degrees. Hue cannot be adjusted in D1 or CAV modes.

Subcarrier (Button appears on the PAL front panel only)

Pressing this button enables adjustments of the subcarrier genlock timing. Adjustments are:

- Subcarrier Fine: increments of 0.156 degrees
- Subcarrier Coarse: increments of 1.406 degrees
- Range: 0-360 degrees

Timing (Button appears on the NTSC front panel only)

Pressing this button enables adjustments of the horizontal position and genlock timing. Adjustments are:

- Horizontal Fine: increments of 2.314 ns
- Horizontal Coarse: increments of 74.074 ns

- Range: +/– 9.5 µs
- Subcarrier Fine: increments of 0.156 degrees
- Subcarrier Coarse: increments of 1.406 degrees
- Range: 0 - 360 degrees

By pressing the *TIMING* button multiple times, the DPS-470 cycles through the above selections. Use the control knob to set the exact timing.

Horizontal (Button appears on the PAL front panel only)

Adjusts the horizontal genlock timing. Adjustments are:

- Horizontal Fine: increments of 2.314 ns
- Horizontal Coarse: increments of 74.074 ns
- Range: +/- 9.5 µs

Mem

The Memory button accesses the Store and Recall functions.

Store

Allows the current Proc Amp settings to be stored in the memory location selected using the control knob. Up to 10 settings can be stored, containing information on Video, Black, Chroma and Hue. Valid Store locations are numbered 001 - 010; location 000 is reserved for factory preset unity. To store a Proc Amp setting:

1 Press the *MEM* button

2. Use the control knob to select Store and press the *MEM* button again

3. Use the knob to select a memory location and press *MEM* again

Recall

Allows previously stored Proc Amp settings to be recalled. To recall:

1. Press the *MEM* button

2. Use the control knob to select Recall and press *MEM* again

3. Use the knob to select the desired memory location and press *MEM* again

(To abort, press any other Proc Amp control button before completing step 3.)

To recall factory preset unity, press the *MEM* button three times in succession. (Recalls location 000)

(**NOTE:** The *MEM* button cannot be used while in the Configuration Menu.)

Input Selection

The current (active) input selection is shown by the LED indicators, not on the LCD panel. Inputs are selected by pressing the *INPUT* button until the desired input LED becomes active.

Possible inputs are:

- COMP (Composite)
- SVID (S-Video)
- CAV (Component Analog Video)
- SDI (Serial Digital)

A flashing LED indicates that video is not present at the selected video input.

Synchronizer Modes

In Synchronizer Mode, there are three choices of operation:

- PROCESS
- BYPASS
- TSG (Test Signal Generator)

Process

Process is the normal mode of operation. The *PROCESS/BYPASS* LED will stay lit when the synchronizer is active.

Bypass

In Bypass Mode the *COMPOSITE IN* video signal is bypassed to the *COMP-1 OUT*. To enter this mode:

1. Press the *MODE* button. The *PROCESS/BYPASS* LED will flash to indicate that the composite input is being bypassed to the composite output. No other signal will be bypassed.

2. To exit Bypass, press the *MODE* button again.

TSG

The DPS-470 has a selection of 33 test patterns that will appear on all video outputs. To use the 10-bit TSG Mode:

1. Press and hold the *MODE* button. The PROCESS LED will go out, TSG is enabled, and the LCD shows the active test signal name along with another test signal to select.

2. Rotate the control knob to select a test signal.

3. Press the *VIDEO* button to activate the selection.

4. To exit the TSG Mode, press the *MODE* button again.

NOTE: While in TSG Mode only the *MODE* and *VIDEO* buttons are active.

Freeze Menu

Pressing the *FRZ MODE* button multiple times will cycle through the different freeze modes with an LED indicating one of the following modes:

- FRAME
- FIELD

- STROBE

Press the *TAKE* button to actually freeze the video.

- if FIELD mode is selected, the LCD indicates the current field (1, 2, 3 or 4) and the control knob selects which field to be displayed;

- if STROBE mode is selected, the LCD indicates the current strobe rate (number of frames per update, 000 to 127) and the control knob allows the rate to be changed.

Configuration Menu

The Configuration Menu contains the video and audio options or sub-menus. The procedure to select and use any one of the sub-menus is the same:

1. To enter the Video Configuration Menu, press the *VIDEO* button. The LCD panel will display the beginning of the video menu. Press the *AUDIO* button to enter the audio configuration menu. What follows in steps 2-5 describes how to use the *VIDEO* menu; the procedure for the *AUDIO* menu is identical.

2. Use the control knob to select one of the sub-menus listed below, i.e., scroll through until the arrow (>) is pointing to the desired sub-menu. Press the *VIDEO* button again to enter the menu.

3. Use the control knob to choose and activate the option you want.

4. Press the *VIDEO* button to go to further sub-menus, if they are available, or to return to the beginning of the Configuration Menu, or,

5. Press any other button to exit the Configuration Menu (except *MEM*, and *AUDIO*).

Video Configuration

Sync Mode

- Synchronizer: for this mode the input must be a stable, RS-170A signal

(used for most satellite and camera feeds).

- TBC: used for heterodyned signals (i.e., from a VTR).
- Auto-Switch: will sense the incoming composite video signal and select Synchronizer or TBC setting automatically.

Genlock Mode

- Auto (default): with an external genlock source, the front panel GENLOCK LED will be lit. If the genlock source disappears, the DPS-470 will automatically switch to Internal mode and the GENLOCK LED will flash.
- Internal: the unit will operate on its own internal crystal and the GENLOCK LED will be off.

Blanking Width

Sets the number of video lines blanked by the DPS-470 during the vertical interval.

- Narrow (default): vertical blanking ends at line 10 of field 1, and line 9 of field 2.
- Wide: vertical blanking ends at line 21 of field 1, and line 20 of field 2.
- Superwide: vertical blanking ends at line 23 of field 1, and line 22 of field 2.

Hot Switch

- Off (default): automatic freeze is disabled.
- On: automatically goes into freeze mode whenever the input video signal is lost.
- Drop to Black: automatically goes into black output mode whenever the input video is lost.

Color / Monochrome

- Color Mode (default)
- Monochrome Mode

- For all outputs, selecting Monochrome places the DPS-470 into 'Forced Monochrome' mode where the chrominance picture detail is suppressed, and a black-and-white image is created. The color burst is still present.

Video Out

- Normal (default)
- Force Black Out: all outputs are forced to super-black.

Clamp Speed

Applicable to the COMPOSITE Synchronizer and the CAV input modes.

- Normal (default): the input video clamp is set to a '30-line' time constant.
- Fast: the input video clamp is set to a '3-line' time constant. This mode is used when hum is present on the input video signal.

Y/C Horiz Delay

The control range is from -518 ns to +592 ns, in 74 ns increments. The factory default setting is 0 ns delay. (Does not affect D1 input.)

Y/C Vert Delay

The control range is from –2 lines to +1 line. The factory default is 0 lines. (Does not affect D1 input.)

CAV In

Selects component analog input format.

- Beta In (default)
- MII In (NTSC only)

CAV Out

Selects component analog output format.

- Beta Out (default)

- MII Out (NTSC only)

D1 Clip Mode

This feature applies only to serial digital outputs, and enables (or disables) black clip level.

- Enabled (default): all levels below black — digital level 64 — are clipped.
- Disabled: digital levels below 64 are allowed.

EDH Mode

Error Detection Handling (EDH):

- Poll Off (default): disables EDH. Errors are not detected nor reported. The EDH LED is not lit.
- Poll: enables EDH and lights the EDH LED. Input errors are detected and reported in the "EDH RX ERROR COUNT" menu (see below). When errors are detected the EDH LED flashes.

EDH RX Error Count

A flashing EDH LED indicates that errors have been detected and not cleared. Actual error counts will be displayed as:

- AP: for the active picture.
- FF: for a full field.

To clear the error count, press the *VIDEO* button twice. The counter will be reset and the LED will stop flashing until the next error is detected.

Remote Control

Selects the remote control interface.

- RS-232 IN
- RS-422 IN
- DCN

RS-232 and RS-422 share the same DB-9. DCN uses the connector labeled "DCN" on the rear panel. See the INPUT section for more information about DCN. Whichever input type is selected, a valid controller must be connected to

the correct connector on the back of the DPS-470.

Baud Rate

Allows you to change the remote port data rate:

- 9,600 BPS
- 38,400 BPS

Unit Address

Selects the DPS-470's unit address for remote control purposes. The DPS-470 can be controlled remotely by the RC-4000 2RU high super remote, the RC-2001 universal studio remote, the RC-2000 desktop remote, or PC-based custom remote software.

When using the RS-232 or RS-422 method, the user must select a unit address. Allowable address selections are from 1 to 127. Each installed DPS-470 must have a unique address setting. The setting for the first is unit 1, for the second (if installed) unit 2, and so on. However, addresses don't have to be sequential.

When using the DCN method, there is no need to set the unit address. Each unit has a unique address that is set at the factory and the RC-4000 will seek, find and control all of the DPS-470s that are connected to it through the DCN coaxial cable.

Genlock Adjust

This menu item allows you to disable the genlock adjustment. It locks in the current setting, so that it cannot be changed inadvertently.

- Enabled (default): genlock adjustment is allowed.
- Disabled: genlock adjustment is not allowed.

GPI Function

- Disabled (default): no effect on the Freeze function.
- Enabled: Freeze function is controllable by GPI (i.e., Freeze/Live).

D1 Edge Insertion

When the DPS-470 is in SDI input mode, this control allows you to add a soft transition from super-black to setup on the analog outputs.

NOTE: Setup is always added to the analog outputs in D1 input mode.

- Enabled
- Disabled

VITS Field 1

The Vertical Interval Test Signals (VITS) menu has two areas in which to make selections:

- LN#: specifies the number of the line in field 1 for the insertion of the test signal. The choices available for LN# are OFF, 16, 17, 18, 19.
- PAT#: specifies one of the nine test signals for insertion. The choices available for PAT# are 01 to 09.

One test signal can be inserted into one of the four lines; a field can contain only one test signal. (See Appendix B for the test signals available.)

VITS Field 2

Same as above for field 2.

TBC Mode

Enables adjustment to the VCR circuit time constant.

- Normal (Default): used for high-end broadcast VCRs.
- Head Switch used for home type or extreme head switch VCRs.

Transcoder Function

Normally the video delay through the DPS-470 varies over time from one line to two fields. In transcoder mode, the DPS-470 will have a fixed minimum delay of three lines.

- Normal Operation (Default): normal synchronizer mode.

- Min Dly D1 Transcoder: the DPS-470 will have a fixed video delay of three video lines.

NOTE: In the Min Dly D1 Transcoder Mode, only the D1 output is valid. All analog outputs are offset by three lines and should be used for monitor purposes only.

DPS Software Version

This menu item displays the current software version.

Audio Configuration

Analog Audio Mode

The user can choose to process or bypass the analog input audio. The audio is bypassed when the power is off.

CH1:	PRCS	CH2:	PRCS
	BYPS		BYPS

AES/EBU Audio Mode

The user can choose to process or bypass the AES/EBU input audio. The audio is bypassed when the power is off.

CH1:	PRCS	CH2:	PRCS
	BYPS		BYPS

Audio Input Source

This menu is used to select the audio source to be processed. The input audio choices are Analog, SDI and AES/EBU.

CH1:	ANLG	CH2:	ANLG
	SDI		SDI
	AES		AES
	AFV*		AFV*

* Another mode, “Audio Follow Video”, is available but not shown in this menu unless it is enabled. If a video input with AFV enabled is selected, this menu will show “AFV” under the appropriate channel. It cannot be changed from within this menu. Under the AFV menus, the user can select any combination of audio inputs to be linked to a particular video input so that when that video input is selected, the desired audio input will also be selected. AFV can be enabled for channel 1, channel 2 or both channels. More information is provided in the “AFV” menu description.

Input Level CH1

Selects the input operating level for the analog audio data of channel 1. R and L input levels are locked together. Output levels are independent (not locked).

R:	L:
+8 dBm	+8 dBm
+4 dBm	+4 dBm
0 dBm	0 dBm
–4 dBm	–4 dBm
–10 dBm	–10 dBm

Input Level CH2

Selects the input operating level for the analog audio data of channel 2. R and L input levels are locked together. Output levels are independent (not locked).

R:	L:
+8 dBm	+8 dBm
+4 dBm	+4 dBm
0 dBm	0 dB
–4 dBm	–4 dBm
–10 dBm	–10 dBm

O/P Gain CH1

Adjusts the output audio gain for channel 1.

R: –20 dB - +20 dB L: –20 dB - +20 dB

(0 dB is the default value)

O/P Gain CH2

Adjusts the output audio gain for channel 2.

R: –20 dB - +20 dB L: –20 dB - +20 dB

Auto Track

Disables or enables the auto track. When enabled the unit will automatically delay the audio data to match the delay of the video data through the synchronizer (up to 4 fields).

NOTE: The audio will be further delayed by the amount specified in the "Fixed Delay" menu.

- ENABLED
- DISABLED

Fixed Delay

Specify, in 4ms increments, how much fixed delay to add to the audio path. This delays the audio data according to the selection below. When *AUTO TRACK* is enabled, the total delay will be the sum of the fixed delay and the amount of auto track delay (see above). The maximum fixed delay is equivalent to about 16 fields of video.

CH1: 000 to 260 ms CH2: 000 to 260 ms (in 4 ms increments)

Analog O/P CH1 Adjust

This function is used to attenuate the analog audio output for channel 1 as indicated by the LCD.

R: 00.0 to –50.0 dB L: 00.0 to –50.0 dB (in –0.5 dB divisions)

Analog O/P CH2 Adjust CH2

This function is used to attenuate the analog audio output for channel 2 as indicated by the LCD.

R: 00.0 to –50.0 dB L: 00.0 to –50.0 dB (in –0.5 dB divisions)

Analog I/P Termination

Terminates the analog input with a 600-ohm load or sets as high impedance input.

CH1: 600R CH2: 600R
HIGHZ HIGHZ

Analog Input Type

This selects whether the analog audio inputs are balanced or unbalanced.

CH1: BAL CH2: BAL
UNBAL UNBAL

Stereo Mode CH1

Swaps the left and right outputs of channel 1. The last mode in this menu is the sum of the left and right channel divided by two. For example (L+R)/2..

- Stereo (Default)
- Mono Left
- Mono Right
- Mono Sum
- Stereo Reverse

Stereo Mode CH2

Swaps the left and right outputs of channel 2. The last mode in this menu is the sum of the left and right channel divided by two. For example (L+R)/2.

- Stereo (Default)
- Mono Left
- Mono Right
- Mono Sum
- Stereo Reverse

AES/EBU Grade

Select the AES/EBU grade as either professional or consumer.

CH1:	PRO	CH2:	PRO
	CONS		CONS

1 kHz Sinewave Tone

When "ON", the DPS-470 produces a 1 kHz sinusoidal wave on all of the audio outputs. The signal level can be adjusted in 1dBFS increments.

SN:	OFF	GN:	–24 dBFS
	ON		–23 dBFS
			–22 dBFS
			.....
			0 dBFS

SDI I/P Channel Sel

The DPS-470 is capable of processing four channels of audio (2 stereo pairs). This menu specifies which group of four channels from the incoming SDI input data the DPS-470 will process.

- CH01, CH02, CH03, CH04
- CH05, CH06, CH07, CH08
- CH09, CH10, CH11, CH12
- CH13, CH14, CH15, CH16

SDI O/P Channel Sel

Select which audio group you would like the DPS-470 to insert its SDI audio data into.

- CH01, CH02, CH03, CH04
- CH05, CH06, CH07, CH08
- CH09, CH10, CH11, CH12
- CH13, CH14, CH15, CH16

Route O/P Channels

Connects the input channels to one of the output channels according to the selection below. You can swap the output channels or have one input channel go to both output channels.

	Input	Output	Input	Output
•	CH1—>	CH1	CH2—>	CH2
•	CH1—>	CH1	CH1—>	CH2
•	CH2—>	CH1	CH2—>	CH2
•	CH1 —>	CH2	CH2—>	CH1

Audio Follow Video

This control enables or disables all of the AFV selections. When AFV is enabled, the audio input selection is based on the setting in the “AFV” menu for each video input.

NOTE: When AFV is “ON”, the “Audio Input Source” menu changes to “AFV” for any channel that has it enabled for the currently selected video input.

- OFF
- ON

AFV Composite

Specifies which audio input to automatically use when the Composite Video input is selected.

NOTE: When this menu is not in the “OFF” position and the “Audio Follow Video” control is “ON”, this menu selection will override the “Audio Input Source” menu when the Composite video input is selected. When any other video input is selected that does not have AFV enabled, then the “Audio Input Source” menu takes precedence.

CH1:	OFF	CH2:	OFF
	ANLG		ANLG
	SDI		SDI
	AES		AES
	MUTE		MUTE

AFV SVHS

Specifies which audio input to automatically use when the SVHS is selected.

NOTE: When this menu is not in the "OFF" position and the "Audio Follow Video" control is "ON", this menu selection will override the "Audio Input Source" menu when the S-Video input is selected. When any other video input is selected that does not have AFV enabled, then the "Audio Input Source" menu takes precedence.

CH1:	OFF	CH2:	OFF
	ANLG		ANLG
	SDI		SDI
	AES		AES
	MUTE		MUTE

AFV Component

Specifies which audio input to automatically use when the Component Video input is selected.

NOTE: When this menu is not in the "OFF" position and the "Audio Follow Video" control is "ON", this menu selection will override the "Audio Input Source" menu when the Component video input is selected. When any other video input is selected that does not have AFV enabled, then the "Audio Input Source" menu takes precedence.

CH1:	OFF	CH2:	OFF
	ANLG		ANLG
	SDI		SDI
	AES		AES
	MUTE		MUTE

AFV SDI

Specifies which audio input to automatically use when the SDI Video input is selected.

NOTE: When this menu is not in the “OFF” position and the “Audio Follow Video” control is “ON”, this menu selection will override the “Audio Input Source” menu when the SDI video input is selected. When any other video input is selected that does not have AFV enabled, then the “Audio Input Source” menu takes precedence.

CH1:	OFF	CH2:	OFF
	ANLG		ANLG
	SDI		SDI
	AES		AES
	MUTE		MUTE

SDI Audio Embedder

Embedding of digital audio into the AD1 data stream can be disabled.

- OFF (default)
- ON

AES/EBU Sampling Rate

Adjusts the sampling rate of the input audio. The default rate is 48kHz whenever the SDI input is selected. When the AES/EBU is selected, the sampling rate can be set as below:

- 48 kHz (default)
- 44.1 kHz
- 32 kHz

Master Mute Control

Mutes all of the output audio channels.

- OFF
- MUTE

APPENDIX A: SPECIFICATIONS

Video Specifications

Signal Processing	Component, 10-bit, ITU-R 601 (13.5 MHz)
Synchronizing Range	Infinite
Frequency Response:	
Synchronizer mode	+/–0.5 dB (0 - 4.5 MHz) –1 dB (4.5 - 5.5 MHz)
TBC mode	–3 dB (0 - 4.2 MHz NTSC notch at 3.58 MHZ))
Signal to Noise:	
Serial D1 (SDI) I/O Mode	>70 dB Luminance Weighted
Component Analog In Mode	>66 dB Luminance Weighted
S-Video In Mode	>62 dB Luminance Weighted
Composite Video In Mode	>60 dB Luminance Weighted
Differential Phase	<1% @ 1 Vp-p Modulated Ramp
K-Factor (2T)	<0.5%
Luminance Jitter (TBC Mode)	<15 ns
Inputs:	
Composite Video (BNC)	1 Vp-p, 75 Ω
Serial Digital SDI (BNC)	75 Ω Auto EQ to 300 M
Component Analog Video (BNC):	
Y	1 Vp-p, 75 Ω
R-Y, B-Y	0.7 Vp-p (Betacam) 486 mVp-p (MII NTSC only), 75 Ω
S-Video (4P Mini-DIN):	
Y	1 Vp-p, 75 Ω
C (Burst Level)	300 mV (NTSC), 75 Ω
Genlock Reference (BNC Loop)	1 Vp-p, 75 Ω

Outputs:	
Composite Video (BNC x2)	1 Vp-p, 75 Ω
Serial Digital SDI (BNC x2)	75 Ω
Component Analog Video (BNC*):	
Y	1 Vp-p, 75 Ω
R-Y, B-Y	0.7 Vp-p (Betacam) 486 mVp-p (MII NTSC only), 75 Ω
S-Video (4P Mini-DIN*):	
Y	1 Vp-p, 75 Ω
C (Burst Level)	300 mV, 75 Ω
Processor Controls:	
Video Level	+/- 3 dB
Setup Level	+/- 20 IRE
Chroma Level	+/- 6 dB
Hue Phase	+/- 45 degrees
Horizontal Genlock Timing	+/- 6 µs
Subcarrier Genlock Timing	360 degrees
Y/C Horizontal Delay Adjustment	–592 ns / +518 ns
Y/C Vertical Delay Adjustment	+1 / –2 Lines
Test Signal Generator Mode (Available at all outputs)	Select from 33 NTSC (29 PAL) 10-bit Test Patterns
VITS / VIRS Inserter	Select any two line repetitive test patterns to display on alternate fields of lines 16 – 19
Remote Control:	
Serial Remote Port (DB-9F)	RS-232/RS-422 Levels at 9,600/38,400 BPS
GPI Freeze Trigger (RCA*)	TTL or Contact Closure
Serial Remote (BNC)	DCN

* S-Video and CAV output connectors located on supplied breakout cable.

Audio Specifications

Analog Inputs:	
Number of Inputs	2 Stereo Channels (Balanced or Unbalanced)
Operating Levels	+8, +4, 0, -4 or -10 dBm
Input Impedance	600 or 20 kΩ
Maximum Input Level	+24 dBm

Connection	Removable Barrier Strip
AES / EBU Inputs:	
Number of Inputs	2 Stereo AES/EBU Channels
Input Type (Jumper Select)	Balanced (AES3-1992) or Unbalanced (AES Data on Coax SMPTE 276)
Impedance	75 or 110 Ω (110 Ω transformer isolated)
Connection	XLR or BNC Connectors on Supplied Breakout Cable
SDI Embedded Inputs:	
Number of Inputs	2 Stereo AES/EBU Channels
Channel Status Format	AES3-1992 (Professional Mode)
Connection	BNC (via SDI Video Input)
Analog Outputs:	
Number of Outputs	2 Stereo Channels (Balanced or Unbalanced)
Maximum Output Level	+23 dBm
Connection	Removable Barrier Strip
AES/EBU Outputs:	
Number of Outputs	2 Stereo AES/EBU Channels
Output Type	Balanced (AES3-1992) or Unbalanced (AES Data on Coax SMPTE 276)
Impedance	75 or 110 Ω (Transformer Isolated)
Connection	XLR or BNC Connectors on Supplied Breakout Cable
SDI Outputs:	
Number of Outputs	2 Stereo Channels of Embedded Audio
Channel Status Format	AES3-1992 (Professional Mode)
Connection	BNC (via SDI Video Output)
Processing	20 bits (for all inputs)
Sampling Frequencies	48 kHz, 44.1 kHz, 33 kHz
Maximum Total Delay	333.40 ms (20 NTSC Video Fields) 240.72 ms (16 PAL Video Fields)
Maximum Fixed Delay	266.72 ms (16 NTSC Video Fields) 240.72 ms (12 PAL Video Fields)
Delay Resolution	4 ms increments

Frequency Response	50 Hz to 15 kHz, +/- 0.1 dB 20 Hz to 50 Hz, +/- 0.2 dB 15 kHz to 20 kHz, +/- 0.2 dB
THD+N (non-weighted)	<0.01% at +20 dBm
THD+N (A-weighted)	<0.01% at +20 dBm
Total Dynamic Range	>90 dB
Signal-to-Noise Ratio	>70 dB (Full-Scale Output)
Channel Separation	>80 dB

General Specifications

Size (W x H x D)	17" x 1-3/4" x 20" (43.2cm x 4.4cm x 50.8cm)
Power Requirements	70 Watts, 100-240 VAC, 50/60 Hz

APPENDIX B: TEST SIGNALS

Following are the test signals available with the DPS-470:

NTSC	PAL
1. SMPTE Bars	1. Bars 100
2. EIA Bars	2. Bars / Red 100
3. FF Bars	3. EBU Bars
4. Bars / Luma	4. EBU Bars / Red
5. Bars / Reverse	5. Pulse & Bar
6. Bars / Red	6. Luma Ramp
7. Bars 100 %	7. Mod Ramp
8. Super Black	8. Luma 5 Step
9. Black	9. Mod 5 Step
10. Gray	10. Timing Bowtie
11. White	11. Mod Pulses
12. Luma Ramp	12. Pluge
13. Mod Ramp	13. Shallow Ramps
14. Luma 5-Step	14. Luma Sweep
15. Mod 5-Step	15. Chroma Sweep
16. Y-Shallow Ramp	16. Vits Line 17
17. Shallow Ramp	17. Vits Line 18
18. Multiburst-60	18. Vits Line 19

19. Luma Sweep
20. Chroma Sweep
21. Pulse & Bar
22. NTC7 Composite
23. NTC7 Combination
24. FCC Composite
25. VIRS
26. Cross Hatch
27. SIN (X) / X
28. Red Field
29. Timing Bowtie
30. Matrix-1
31. Matrix-2
32. FF Bounce
33. 90% Bounce

19. Vits Line 20
20. Vits Line 330
21. Vits Line 331
22. Black
23. Gray
24. White
25. Cross Hatch
26. Red Field
27. Matrix-1
28. FF Bounce
29. 90% Bounce

Vertical Interval Test Signals (VITS)

1. Full Field Bars
2. Multiburst-60
3. Luma Sweep
4. Chroma Sweep
5. Pulse & Bar
6. NTC7 Composite
7. NTC7 Combination
8. FCC Composite
9. VIRS

APPENDIX C: INSTALLING THE AUDIO BOARD

If you purchased the Audio Option board separately from the DPS-470, you will need to install it. Please use the following instructions on installing your audio card safely and correctly.

Precautions

WARNING: Static Electricity!

Static electricity from your body can damage your Audio Card or the DPS-470. Even though you may not notice it, static electricity is being generated every time you move. Usually, it is too small to cause a spark, but it can still cause damage to sensitive electronic components.

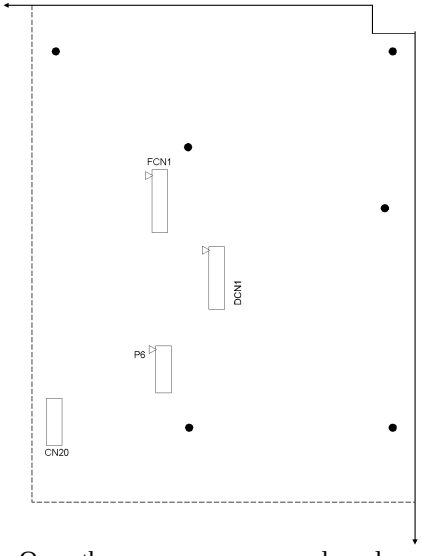
- To prevent this damage, you should handle the Audio board carefully.
- Do not take it out of its conductive bag until you are ready to install it.
- Do not carry the board around the room unless it is in its conductive bag.
- Avoid wearing wool or polyester clothing while installing the Audio board. These fabrics generate more static electricity than cotton garments.
- Before touching the Audio board, you should discharge any static electricity from your body by first touching the ground metal chassis of the DPS-470.

Installing the Audio Board

1. Confirm that the DPS-470 is shut off and that the power cord is disconnected from the rear panel.

2. Remove the top cover from the DPS-470. Use a Phillips screwdriver to remove the fifteen retaining screws and lift off the top cover. Please retain the screws, as they will be used to secure the top cover. Please note that the five front panel screws are different that the other ten screws.

3. There are six screws that must be removed from the main board of the DPS-470 and replaced with the supplied six standoffs. Use the following diagram to determine which screws are to be removed.



4. Once the screws are removed, replace them with the supplied standoffs.

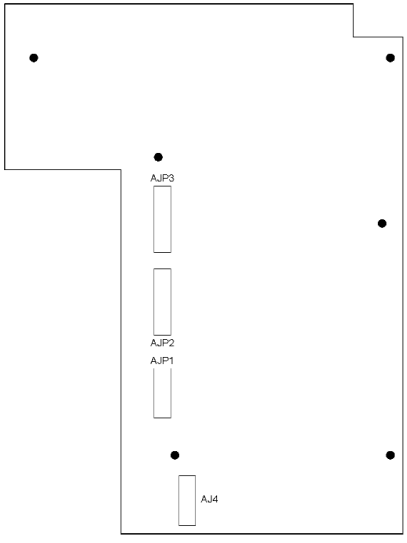
5. Three ribbon cables and a power cable are supplied with the Audio board. These cables are attached from the main board to the Audio board. There are two 34-pin cables and one 20-pin cable. To attach these cables to the main board, make sure that the red line on the ribbon cable is aligned with the arrow on the silkscreen next to the header pins on the board. The power cable is connected from the main board labeled CN20 to the Audio board. (See the above diagram)

6. Remove the Audio board and the metal shield from their conductive bag.

7. Using a hex driver, remove the two hex nuts on the DB25 on the back of the board.

8. Affix the metal shield and the Audio board over the standoffs.

9. Use the supplied screws to secure the Audio board and the metal board to the Main board.



10. Connect the ribbon cables and the power cable to the Audio board.

11. Replace the hex nuts on the DB25 to secure the connector to the chassis of the DPS-470.

12. Replace the top cover and the fifteen screws to secure the top cover. Be sure to replace the five different screws to the front panel.

13. Plug the power cord back in.

APPENDIX D: REMOTE CONTROL

This appendix describes the serial data interface to the DPS-470. This information is intended for users and programmers who want to develop their own custom control (driver) software.

Electrical Interface

The electrical interface for the DPS-470 is RS-232, RS-422 and DCN. The bit rate is set to 9600 bps, with 8 data bits, 1 stop bit and no parity. For DCN the bit rate is always 38,400 bps.

Protocol

The software protocol is a MIDI compatible format, using the system exclusive feature of the MIDI interface. Communication with the DPS-470 is initiated when the system exclusive command byte (F0 hex) is received, followed by the ID code (67 hex).

The next byte sent is the address byte, which determines which unit is being addressed by the command. This is followed by a unit 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)
Unit ID Byte (= 67 hex)
Unit 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)

Unit Response:

ACK Byte (= 06h) or NACK Byte (= 15h)

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.

Unit ID Byte

This byte is the unique code that identifies the exclusive data for the particular unit.

Unit Address Byte

This byte determines to which DPS-470 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:

DPS-470 Unit Address	Corresponding HEX Value
Unit 1	01h
Unit 2	02h
Unit 3	03h
Unit 4	04h
Unit 5	05h
.....	.....
Unit 126	7Eh
Unit 127	7Fh

Unit Function Select Byte/Data Byte(s)

The Function byte determines which function on the addressed 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.

NOTE: Parameters for functions are sent in ASCII, i.e.,'00' => 30h + 30h, '01' => 30h + 31h, etc. ...

Video Remote Commands

Function Byte	#ASCII Data Bytes (Range)	Description
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 (0, 0-F, F)	Set chroma level command 00 = Minimum chroma level FF = Maximum chroma level
04h	2 (0, 0-F, F)	Set hue command 00 = –45 degrees FF = +45 degrees
08h	1 (0-3)	Input mode select 0 = Composite input mode 1 = S-Video input mode 2 = Component input mode 3 = D1 input mode
0Ch	1 (0-1)	Freeze/Live Mode select 0 = Live mode 1 = Freeze mode
0Dh	0	Request brief status info.
0Eh	0	Request full status info
12h	2 (0, 0-7, F)	Strobe Rate 00 = Full Motion 7F = 127 Frames
13h	1 (0-2)	Select Freeze Mode 0 = Frame mode 1 = Field mode 2 = Strobe mode

Function Byte	#ASCII Data Bytes (Range)	Description
14h	1 (0-3)	Freeze Field Select 0 = Select field 0 1 = Select field 1 2 = Select field 2 3 = Select field 3
16h	1 (0-F)	Y/C Delay horizontal 0 = +518 ns 8 = 0 F = –592 ns
19h	2 (0, 0-2, 0)	Select TSG Pattern
20h	2 (0, 0-0, 8)	Subcarrier Timing Fine Each Increment = 0.175 degree
21h	2 (0, 0-F, F)	Subcarrier Timing Coarse Each Increment = 1.406 degree
22h	2 (0, 0-7, F)	Horizontal Timing Fine Each Increment = 2.314 ns
23h	2 (0, 0-7, F)	Horizontal Timing Coarse Each Increment = 74.074 µs
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
28h	1 (0-2)	Set CAV Input Mode 0 = Beta In 1 = MII In
2Fh	1 (0-1)	Set CAV Output Mode 0 = Beta Out 1 = MII Out

Function Byte	#ASCII Data Bytes (Range)	Description
37h	0,1	Function 00 = Process 01 = TSG One 02 = Bypass Mode 03 = Not Allowed
2, 3	Sync Mode	00 = Synchronize 01 = TBC 02 = Auto Switch 03 = Not Allowed
4, 5	Hot Switch	00 = Off 01 = On 02 = Drop To Black
6	Genlock Mode	0 = Auto Genlock 1 = Internal
7	Blanking Width	0 = Narrow 1 = Wide
39h	0	Video Out 0 = Normal 1 = Force All Outputs to Black
	1	Clamp Speed 0 = Normal 1 = Fast
	2	GPI Freeze 0 = Not Enabled 1 = GPI Enabled
	3, 4, 5, 6, 7	Not Used

Audio Remote Commands

Function Byte	Data Bytes	Description
5D	2	1 kHz Sinewave
	00h	Off
	18h	On
5E	2	CH2 O/P Gain Right
	80h	00 dB
	58h	–20 dB
	A8	+20 dB
5F	2	CH2 O/P Gain Left
	80h	00 dB
	58h	–20 dB
	A8	+20 dB
60h	2	Analog Audio Mode
		Lower Nibble (CH1):
	00	Process
	01	Bypass
		Upper Nibble (CH2):
	00	Process
	01	Bypass
61h	2	AES/EBU Audio Mode
		Lower Nibble (CH1):
	00	Process
	01	Bypass
		Upper Nibble (CH2):
	00	Process
	01	Bypass
62h	2	Audio Input Source
		Lower Nibble (CH1):
	00	Analog In
	01	SDI In
	02	AES/EBU In
		Upper Nibble (CH2):
	00	Analog In
	01	SDI In
	02	AES/EBU In

Function Byte	Data Bytes	Description
63h	2	Lower Nibble (Right);
	00	+8 dBM
	01	+4 dBM
	02	0 dBM
	03	–4 dBM
	04	–10 dBM
		Upper Nibble (Left):
	00	+8 dBM
	01	+4 dBM
	02	0 dBM
	03	–4 dBM
	04	–10 dBM
64h	2	Lower Nibble (Right);
	00	+8 dBM
	01	+4 dBM
	02	0 dBM
	03	–4 dBM
	04	–10 dBM
		Upper Nibble (Left):
	00	+8 dBM
	01	+4 dBM
	02	0 dBM
	03	–4 dBM
	04	–10 dBM
65h	1	Auto Track
	00	Off
	01	On
66h	1	Tone Oscillator
	00	Off
	01	1 kHz Sine Wave

Function Byte	Data Bytes	Description
67h	2	Fixed Delay CH1
	00	0 Field
	01	0.25 Field
	02	0.50 Field
	...	.....
	64h	16 Fields
68h	2	Volume Control CH1 Right
	00	00.0 dB
	01	–0.5 dB
	02	–1.0 dB
	....	.....
	74h	–60 dB
69h	2	Volume Control CH1 Left
	00	00.0 dB
	01	–0.5 dB
	02	–1.0 dB
	....	.....
	74h	–60 dB
6Ah	1	Master Mute Control
	00	Off
	01	On
6Bh	2	Analog Input Type
		Lower Nibble (CH1):
	00	Balanced
	01	Unbalanced
		Upper Nibble (CH2):
	00	CH2 Balanced
	01	CH2 Unbalanced
6Ch	2	AES/EBU Grade
		Lower Nibble (CH1):
	00	Professional
	01	Consumer
		Upper Nibble (CH2):
	00	Professional
	01	Consumer

Function Byte	Data Byte	Description
6Dh	2	Analog Input Termination
		Lower Nibble (CH1):
	00	600R
	01	High Z
		Upper Nibble (CH2):
	00	600R
	01	High Z
6Eh	2	Output Swap CH1
		Lower Nibble:
		RIGHT *LEFT*
	00 (Stereo)	Right Left
	01 (Mono Left)	Right Right
	02 (Mono Right)	Left Left
	03 (Mono Left + Right)	(R+L)/2 (R+L)/2
	2	Output Swap CH2
		Upper Nibble:
		RIGHT *LEFT*
	00 (Stereo)	Right Left
	01 (Mono Left)	Right Right
	02 (Mono Right)	Left Left
	03 (Mono Left + Right)	(R+L)/2 (R+L)/2
6Fh	2	Fixed Delay CH2
	00	0 Field
	01	0.25 Field
	02	0.50 Field
	...	.....
	64h	16 Fields
70h	2	SDI Input
	00	CH01,CH02,CH03,CH04
	01	CH05,CH06,CH07,CH08
	02	CH09,CH10,CH11,CH12
	03	CH13,CH14,CH15,CH16
71h	2	SDI Output Position
	00	CH01,CH02,CH03,CH04
	01	CH05,CH06,CH07,CH08
	02	CH09,CH10,CH11,CH12
	03	CH13,CH14,CH15,CH16

Function Byte	Data Byte	Description	
72h	2	Swap Output Channels (Stereo Pairs)	
		CHANNEL 1	*CHANNEL 2*
	00	CH1	CH2
	01	CH1	CH1
	02	CH2	CH2
	03	CH1	CH2
73h	1	Audio Follow Video	
	00	Off	
	01	On	
74h	2	AFV Preset Composite	
		Lower Nibble (CH1):	
	00	Off	
	01	Analog	
	02	SDI	
	03	AES/EBU	
	04	Mute Output	
		Upper Nibble (CH2):	
	00	Off	
	01	Analog	
	02	SDI	
	03	AES/EBU	
	04	Mute Output	
75h	2	AFV S-VIDEO	
		Lower Nibble (CH1):	
	00	Off	
	01	Analog	
	02	SDI	
	03	AES/EBU	
	04	Mute Output	
		Upper Nibble (CH2):	
	00	Off	
	01	Analog	
	02	SDI	
	03	AES/EBU	
	04	Mute Output	

Function Byte	Data Byte	Description
76h	2	AFV CAV
		Lower Nibble (CH1):
	00	Off
	01	Analog
	02	SDI
	03	AES/EBU
	04	Mute Output
		Upper Nibble (CH2):
	00	Off
	01	Analog
	02	SDI
	03	AES/EBU
	04	Mute Output
77h	2	AFV SDI
		Lower Nibble (CH1):
	00	Off
	01	Analog
	02	SDI
	03	AES/EBU
	04	Mute Control
		Upper Nibble (CH2):
	00	Off
	01	Analog
	02	SDI
	03	AES/EBU
	04	Mute Control
78h	2	Volume Control CH2 Right
	00	00.0 bD
	01	–0.5 dB
	02	–1.0 dB
	....	.....
	74h	60 dB
79h	2	Volume Control CH2 Left
	00	00.0 dB
	01	–0.5 dB
	02	–1.0 dB
	....	.....
	74h	–60 dB

Function Byte	Data Byte	Description
	1	Sampling Rate
	00	48 kHz
	01	44.1 kHz
	02	32 kHz
	03	
7B	1	D1 Embed
	00	Embed Off
	01	Embed On
	02	
7C	1	CH1 O/P Gain Control
	00	+20 dB
	01	0 dB
	02	–20 dB
7D	2	CH2 O/P Gain Control
	00	+20 dB
	01	0 dB
	02	–20 dB
	03	

Read/Write Memory Commands. The following commands allow you to directly read/write from/to the DPS-470 memory and registers (reg). For details of register location and function contact DPS.

30h	2 reg address bytes + 2 reg value bytes	Write register file
31h	2 reg address bytes + 2 reg value bytes	Read register file DPS-470 will send reg contents in binary + ACK (06hex)
1E	4 reg address bytes	Read non-volatile memory DPS-470 will send reg contents in binary + ACK (06hex)
1F	4 reg address bytes + 2 reg value bytes	Write non-volatile memory

NOTE: All register address and value bytes are in ASCII.

Brief Unit Status

Command 0D is used to request status information from the DPS-470. The DPS-470 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
Bit 5	(Input Video Pres)	1 = Input present 0 = No Input present
Bit 4	(Freeze/Live Mode)	1 = Freeze mode 0 = Live mode

Full DPS-470 Status

Command 0Eh requests a complete status dump from the addressed DPS-470. Please contact DPS for more information.

Programming Example

Some confusion has resulted from the fact that actual data bytes sent to the DPS-470 must be in ASCII. The following is an example of the actual data that would be sent to the DPS-470 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 = Unit Address
0x25	Forced Monochrome Function Select
0x31	= ASCII for “1”
0xF7	MIDI End of Exclusive

NOTE: Upon power-down, all settings are maintained in non-volatile RAM on the DPS-470.

APPENDIX E: CABLE PINOUTS

Video Cable

The following is the cable pinouts for the Multi I/O Connector (DB-15M) video cable (Part # 774-565).

Pin Number on the DB-15M	Connection Type	Description
1	BNC	R-Y
2	RCA	GPI Freeze
3	BNC	Video Delay Phase
4	NC	
5	S-Video	Y
6	Gnd	
7	Gnd	
8	Gnd	
9	Gnd	
10	Gnd	
11	Blue	CAV B-Y
12	Gnd	
13	BNC	CAV Y
14	Gnd	
15	S-Video	C

Audio Cable

The following is the cable pinouts for the AES/EBU (DB-25M) audio cable (Part # 774-470).

Pin Number on the DB-25M	Connection Type	Description
1	NC	
2	XLR – 1	Shield
3	XLR – 3	AES2 Out (–)
4	XLR – 2	AES2 Out (+)
5	XLR – 1	Shield
6	XLR – 3	AES2 In (–)
7	XLR – 2	AES2 In (+)
8	XLR – 1	Shield
9	XLR – 3	AES1 Out (–)
10	XLR – 2	AES1 Out (+)
11	XLR – 1	Shield
12	XLR – 3	AES1 In (–)
13	XLR – 2	AES1 In (+)
14	NC	
15	BNC – Shield	AES2 Out (–)
16	BNC – Center	AES2 Out (+)
17	NC	
18	BNC – Shield	AES2 In (–)
19	BNC – Center	AES2 In (+)
20	NC	
21	BNC – Shield	AES1 Out (–)
22	BNC – Center	AES1 Out (+)
23	NC	
24	BNC – Shield	AES1 In (–)
25	BNC – Center	AES1 In (+)

APPENDIX F: IMPORTANT ADDRESSES AND PHONE NUMBERS

Internet

ftp://ftp.dps.com
http://www.dps.com
Support E-mail:

Canada/International	support@dps.com
U.S.	support.us@dps.com
Europe	support.europe@dps.com
Asia-Pacific	support.au@dps.com
Suggestions:	suggestionbox@dps.com

Canada

Digital Processing Systems Inc.
70 Valleywood Drive
Markham, Ontario L3R 4T5

Toll-free:	800-775-3314
Voice:	905-944-4000
Fax:	905-944-4200
Customer Service Voice Mail:	905-944-4100

USA & Latin America

Digital Processing Systems, Inc.
11 Spiral Drive, Suite 10
Florence, KY 41042

Toll-free:	800-775-3314
Voice:	859-371-5533
Fax:	859-371-3729

Europe

Digital Processing Systems, Ltd.
Romans Business Park, Unit 9
East Street, Farnham
Surrey, GU9 7SX
U.K.

Phone numbers are preceded by +44 1252 if calling from outside the U.K., and by 01252 if calling from inside the:

Voice: 718300
Fax: 718400
BBS: 723790

Asia and the Pacific Rim

DPS Asia Pacific
858 King Georges Road
South Hurstville, Sydney
NSW 2221
Australia

Voice: 61-2-9547-0088
Fax: 61-2-9547-0988

APPENDIX G: A BRIEF HISTORY OF DPS

We were originally founded in 1975 as Digital Video Systems. We were pioneers in the development of time base correctors (TBCs) and synchronizers. Digital Video Systems was acquired by Scientific Atlanta in 1982 and the focus of the division shifted to satellite encryption technologies. In 1988, the studio video product line was spun off into a new employee-owned company called Digital Processing Systems (DPS). In 1996 DPS went public, with a very successful initial public offering (IPO) of over three million shares.

Today, while DPS continues to innovate on and expand its line of traditional broadcast products, the company experiences significant growth in the computer video marketplace. Digital Processing Systems entered the computer video field in 1991 with the introduction of the DPS Personal TBC, the first infinite window TBC on a PC card. The DPS Personal TBC's combination of features, performance and price was unique, and competed with units selling for three times its cost. After the success of this TBC card, DPS followed with the Personal TBC II, III and IV, each of which provided increased features and performance. Another innovation was the DPS Personal VScope, the world's first combination waveform monitor/vectorscope on a PC card.

The DPS Personal Animation Recorder (PAR), a plug-in card which functions as a single-frame recording deck, was introduced soon after the first Personal TBC and quickly became one of our most popular products. Still selling in both PC and Amiga versions - a testament to how far ahead of the rest of the industry it was - the PAR provides component analog video (Betacam, MII), composite and S-Video (Hi8/SVHS) outputs.

The DPS Perception Video Recorder (PVR) is a significant advancement beyond the PAR. First shipped in 1995, the multiple-award-winning PVR is a PCI-bus digital video disk recorder which features 10-bit video encoding with 2X oversampling, ITU-R BT.601 4:2:2 processing and an integrated SCSI-2 hard drive controller. The PVR is also designed to integrate with third-party non-linear editing software.

Fulfilling the promise of the PVR to be "the heart of an advanced digital video workstation," DPS has built a family of products that work with the PVR to create a complete video-audio editing solution. These products include: the AD-2500/3500 Component Video Capture daughtercard; the SD-2500/3500 Serial Digital Video I/O card; the Perception F/X transition effects accelerator card; and the Perception Audio for Video (A4V) board.

Digital Processing Systems 1997 desktop video offerings also became award winners. The DPS Hollywood, an uncompressed digital (D1) video disk recorder, won the "Pick Hit" award at its release during the National Association of Broadcasters (NAB) convention in 1997. The superb resolution-independent compositing and special effects software program, Digital Fusion, brought to market in a strategic partnership between DPS and the creators, eyeon Software, Inc., won the same award at NAB '97.

At NAB '98 we introduced a major new product: the DPS Perception RT, a dual-stream real-time disk recording and editing system. It won an "NAB Prime Time Product" award, and three of our other products also won awards.

In addition to an expanding line of video products that "push the envelope" of price and performance, DPS continues to extend its capabilities in other ways. In the summer of 1997 we purchased the award-winning software company Star Media, creators of the Video Action line of video editing software. They are now "DPS Software." The integration of our traditional hardware strengths with some of the industry's best software should help us maintain our position as a leader in desktop video solutions.

A key contributor to the quality and remarkable capabilities of DPS's computer video products has been our lengthy experience in the broadcast studio field, and our traditional broadcast product line is still going strong. In 1998 we introduced an innovative product, the DPS Whiplash. This is a powerful disk-based slow motion and instant replay system, which uses a proprietary software algorithm to dynamically optimize field and frame data to provide ultra-smooth slow motion playback. Also new for 1998 was the DPS-470 Serial Digital Component Audio-Video Synchronizer, equally suited for work in analog, digital or hybrid broadcast studios (and it won a "Pick Hit" award at NAB '98).

In 1998 DPS combined its proven digital-disk recording technology with sophisticated software tools and networking capability to create Digital Detective, a digital video recorder which marks the company's entry into the security market.

Digital Processing Systems' corporate headquarters and manufacturing facilities are in Markham, Ontario, Canada, just north of Toronto. Sales, service and distribution facilities for the United States are located in Florence, KY, adjacent to the Greater Cincinnati/Northern Kentucky Airport. A United Kingdom office oversees European operations from London, and Asia and Pacific Rim countries are serviced by our office in Sydney, Australia.

APPENDIX H: WARRANTY

Warranty Statement

Unless specifically stated otherwise in writing, Digital Processing Systems Incorporated (DPS) warrants the original purchaser that DPS manufactured products will be will be free from defects in material and workmanship for a period of two years from the date of purchase. Should a product, in DPS' opinion, malfunction within the warranty period, Digital Processing Systems will repair or replace the product without charge for parts or labor. Repaired items may incorporate new or reconditioned replacement parts, at the sole discretion of DPS. All defective parts become the property of DPS. This warranty does not apply to products that have been damaged due to misuse, accident, unauthorized alterations, unauthorized repairs or modifications.

Warranty Limitations

This warranty covers only equipment and software manufactured by Digital Processing Systems, Inc. Certain DPS system products contain vendor items, such as hard disk drives and computer motherboards, which are separately warranted by the original equipment manufacturer.

All warranties, expressed or implied, for DPS Products 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 shall not be liable for any loss of use, revenue or profit.

Digital Processing Systems makes no other representations of warranty as to fitness for purpose of merchantability or otherwise in respect to any of the products sold to the distributor pursuant to this agreement. The liability of Digital Processing Systems in respect of any defective products will be limited to the repair or replacement of such products.

In no event shall Digital Processing Systems 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. To obtain service under this warranty, the purchaser must first contact the DPS customer service department in order to receive a return for repair authorization number. Purchasers should contact the appropriate repair location from those listed below:

- **Canada** (Country code) 905-944-4000
- **USA & Latin America** (Country code) 859-371-5533
- **Europe** +44 1252 (outside the UK) or 01252 (inside the UK) followed by 718300
- **Asia - Pacific Rim** 61-2-9547-0088

Units returned for repair must display the return authorization number clearly on the packaging. Units shipped without an RMA number will not be accepted. Proof of purchase (including the date of purchase) and a detailed note describing the nature of the problem must be included.

IMPORTANT: When shipping your unit, pack it securely and ship it prepaid and insured. Digital Processing Systems will not be held liable for damage or loss to the product in shipment. Within the continental United States, repaired items will returned to the purchaser prepaid via a surface freight carrier of DPS' choice. 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. Outside the U.S., return freight charges for repaired items will be the responsibility of the purchaser.

APPENDIX I: COMPLIANCE

FCC Compliance Statement

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

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules provided that the ferrite beads accompanying this product are installed on the analog input and output audio connections. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, 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 or her own expense.

NOTE: In order for this equipment to comply with FCC regulations, the ferrite beads provided with this unit must be installed on the analog input and output audio connections.