

Crestron **C2N-DVP4DI**
Digital Video Processor
Reference Guide



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Digital Video Processor: C2N-DVP4DI

Introduction

Features and Functions

The C2N-DVP4DI Digital Video Processor can simultaneously display four windows, with any combination of high-resolution computer or video sources, on a single large high-resolution monitor, projector or plasma screen, while also operating as an integrated seamless switcher, mouse and touchpanel control.

The C2N-DVP4DI accepts both digital and analog inputs with RGB (VGA) resolutions up to 1600 x 1200, as well as NTSC/PAL composite, S-video, and component video sources. The output can be scaled from 800 x 600 to 1600 x 1200 to match the desired display resolution. Built-in flexibility provides the ability to change window sizes and aspect ratios, as well as simultaneous display of multiple input resolutions. Coupled with its seamless switching, these features make the C2N-DVP4DI ideal for information-intensive applications like command and control centers.

For flexibility in designing applications, the C2N-DVP4DI can be controlled by a variety of pointing devices, including a serial mouse or touch-sensitive screen overlay connected via RS-232. The C2N-DVP4DI also contains its own video and computer annotation (built-in telestrator).

The breakthrough 2-Series control engine is based on the 257 MIPS, 32-bit Motorola ColdFire[®] processor. The standard 68MB memory (32MB SDRAM, 4MB flash ROM, 32MB compact flash) can be enhanced by replacing the supplied compact flash with a larger flash memory, to allow an on-board storage of programs, room and equipment profiles, upgrades, databases, and schedules.

The internal 10/100 BaseT Ethernet supports static IP and dynamic addressing, TCP/IP and UDP/IP. The built-in Web Server uses memory storage on a compact flash card for remote access and control.

NOTE: The C2N-DVP4DI is a complex device containing a powerful processor, touchpanel and A/V controller. When there are conflicting commands between these functions, the C2N-DVP4DI will always allow the controller priority.

NOTE: The C2N-DVP4DI is not usable by X-Generation control systems.

Specifications

The following table provides a summary of specifications for the C2N-DVP4DI.

C2N-DVP4DI Specifications

SPECIFICATION	DETAILS
Processor	2-Series class processor with built-in compact flash (32Mb)
Memory	4MB flash (non-volatile), 32MB DRAM (volatile), and 256KB NVRAM. Ships with 32MB (FAT format) Compact Flash
Power Requirements	50 Watts ¹ (2A @ 24 VDC) Power supply not included
Default Mode	Cresnet Slave - ID 54
2-Series Control System Update File for C2N-DVP4DI	Version C2N-DVP4DI.3053.CUZ or later for Cresnet Master or Slave
Cresnet	Standard 4-pin
Ethernet	10/100BaseT RJ45 with built in Link/Activity LEDs
RGB Input Interface	4 DVI/RGB connectors, analog input support for RGBHV, RGBS and RGsB
RGB Input Horizontal Frequency	31.5 KHz to 100 KHz
RGB Input Vertical Frequency	50 Hz to 85 Hz (1600 x 1200 60 Hz only)
RGB Input Resolutions	640 x 480 to 1600 x 1200 (60 Hz limit at 1600 x 1200)
RGB Input Resolutions (Factory Auto-Calibrate Settings)	640 x 400 @ 85 Hz 640 x 480 @ 60 Hz 640 x 480 @ 73 Hz 640 x 480 @ 75 Hz 640 x 480 @ 85 Hz 720 x 480 @ 60 Hz 704 x 480 @ 60 Hz (480p) 800 x 600 @ 56 Hz 800 x 600 @ 60 Hz 800 x 600 @ 72 Hz 800 x 600 @ 75 Hz 800 x 600 @ 85 Hz 1280 x 720 @ 60 Hz (720p)* 1024 x 768 @ 60 Hz 1024 x 768 @ 70 Hz 1024 x 768 @ 75 Hz 1024 x 768 @ 85 Hz 1152 x 864 @ 70 Hz 1152 x 864 @ 75 Hz 1152 x 864 @ 85 Hz 1280 x 960 @ 60 Hz 1280 x 960 @ 85 Hz 1280 x 1024 @ 60 Hz 1280 x 1024 @ 75 Hz 1280 x 1024 @ 85 Hz 1400 x 1050 @ 60 Hz 1600 x 1200 @ 60 Hz
RGB Output Resolutions	800 x 600, 1024 x 768, 1152 x 864, 1280 x 1024, 1365 x 768 and 1600 x 1200. The 720P is HDTV with a resolution of 1280 x 720 (progressive scan) but it outputs as RGBHV and not Y-P _R P _B . Output rate selectable from 60 Hz to 85 Hz (60 Hz limit at 1600 x 1200). Console commands can be used to configure output to most non-interlaced formats from 25 MHz to 160 MHz clock up to 1600 x 1200.

*Requires conversion from Y, P_b, P_r to RGB.

C2N-DVP4DI Specifications (continued)

SPECIFICATION	DETAILS
<p>DVI Interface</p> <p>DVI Input Horizontal Frequency</p> <p>DVI Input Vertical Frequency</p> <p>DVI Input Resolutions (DVI/RGB adapters included)</p> <p>DVI Output Resolutions (DVI/RGB adapter included)</p>	<p>DVI-I connector for analog RGB and digital TMDS video² (integrated DVI connector for both RGB and DVI)</p> <p>31.5 kHz to 64 kHz</p> <p>60 Hz -75 Hz</p> <p>640 x 400 @ 85 Hz 640 x 480 @ 60 Hz 640 x 480 @ 73 Hz 640 x 480 @ 75 Hz 640 x 480 @ 85 Hz 720 x 480 @ 60 Hz 704 x 480 @ 60 Hz (480p) 800 x 600 @ 56 Hz 800 x 600 @ 60 Hz 800 x 600 @ 72 Hz 800 x 600 @ 75 Hz 800 x 600 @ 85 Hz 1280 x 720 @ 60 Hz (720p) 1024 x 768 @ 60 Hz 1024 x 768 @ 70 Hz 1024 x 768 @ 75 Hz 1024 x 768 @ 85 Hz 1152 x 864 @ 70 Hz 1152 x 864 @ 75 Hz 1280 x 960 @ 60 Hz 1280 x 1024 @ 60 Hz 1280 x 1024 @ 75 Hz</p> <p>800 x 600 to 1280 x 1024 (digital) Vertical Frequency: 60 – 75 Hz Output rate selectable (60Hz limit at 1600 x 1200) Console commands can be used to configure output to most non-interlaced formats from 25MHz to 160MHz clock up to 1600 x 1200.</p>
<p>Video Inputs</p> <p>Video Input Horizontal Frequency</p> <p>Video Input Vertical Frequency</p>	<p>Twelve BNC connectors for NTSC/PAL (Can be used as 12 composite or 4 S-video or 4 component video inputs, or in combination. Any four inputs can be displayed simultaneously) Y/C S-video, four inputs, NTSC/PAL Y-P_BP_R Component video, four inputs, NTSC. Supports 480I (480P, 720P, and 1080I must be converted to RGB)*</p> <p>NTSC 15.75 kHz (PAL 15.625 kHz)</p> <p>50 Hz -60 Hz.</p>
<p>Aspect ratio</p>	<p>4 x 3 to 16 x 9</p>
<p>Mouse input</p>	<p>Microsoft compatible serial mouse (supplied), 9-pin D connector³</p>
<p>RS-232 Ports</p>	<p>6 DB-9 connectors: 4 for PC or Control serial interfacing (DB9F-DCE) 1 for Pointing Device/touch display input (DB9M-DTE) 1 for direct Console communication (PC) input (DB9F-DCE). RS-232 only.</p>

*Use Key Digital System Model KD-CTCAL (www.keydigital.com)

C2N-DVP4DI Specifications (continued)

SPECIFICATION	DETAILS
Rack Space	2 units high, 1 unit wide
Environmental Temperature	41° to 113°F (5° to 45°C)
Environmental Humidity	10% to 90% RH (non-condensing)
Dimensions and Weight	Height: 3.47 in (8.82 cm) ⁴ Width: 17.03 in (43.25 cm) Depth: 12.10 in (30.74cm) Weight: 7.8 lb (3.5 kg)

1. Crestron recommends that the C2N-DVP4DI be the only device connected to the Crestron power supply (CNPWS-75, not included). Do not use a 2-Series system (AV2, PRO2, etc.) as a power source. Because of surge current, **do not use a power supply smaller than 75 watts.**
2. TMDS (Transmission Minimized Differential Signaling) is a transmission method for sending digital information to a flat panel display. TMDS is a variation of LVDS (Low Voltage Differential Signaling), the standard interface used for notebook PCs.
3. You can also use a Logitech MouseMan compatible 3-button serial mouse. PS2/serial (or USB) mouse is incompatible, even with a 9-pin adapter. Refer to "Connecting a Pointing Device" on page 60 for additional mouse installation information.
4. The C2N-DVP4DI occupies two rack spaces. Crestron recommends allowing ventilation above and below the unit.

NOTE: Crestron[®] software and any files on the website are for Authorized Crestron dealers only. New users may be required to register to obtain access to certain areas of the website (including the FTP site).

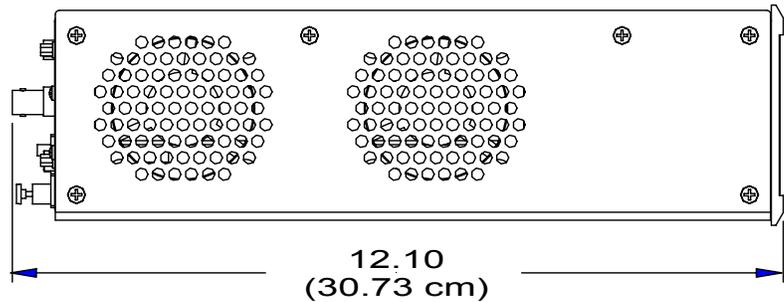
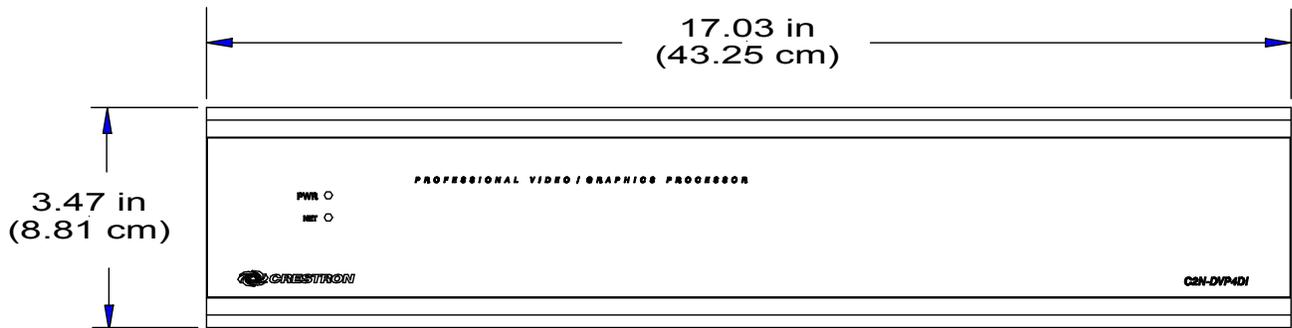
Physical Description

The C2N-DVP4DI, shown in the following illustration, is housed in a black metal enclosure. All RS-232, video, LAN, and Cresnet[®] connectors are on the back panel. The supplied racking mounting ears can be attached at the shorter sides of the unit. Two holes per ear are for inserting the rack mounting screws. The ears can be removed to reduce the size of the C2N-DVP4DI. If the ears are removed, the provided rubber feet can be mounted on the under side to stabilize the unit on a flat surface. The front panel has a PWR (green) LED and a NET (yellow) LED. The PWR LED illuminates when power is applied to the unit. When functioning in the master mode, the NET LED blinks when transmitting or receiving data from Cresnet. When functioning as a slave, this LED blinks when the unit is polled. This will generally be frequent enough to appear to be on steady.

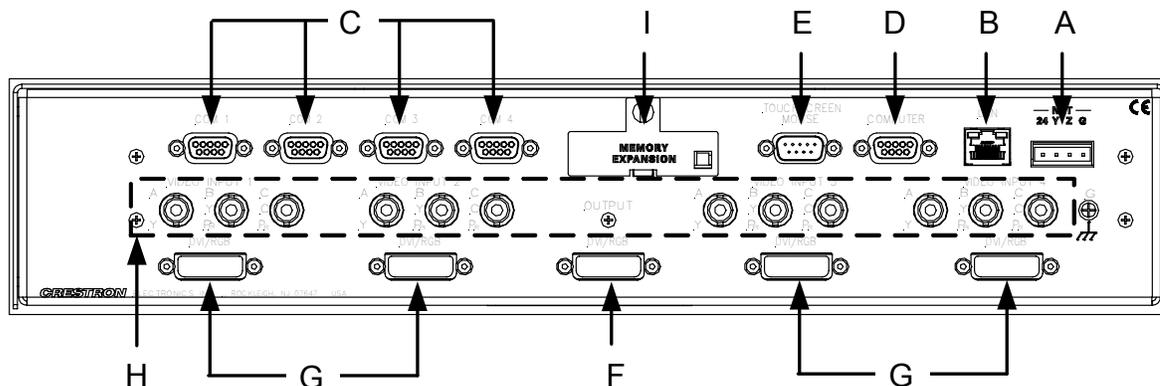
C2N-DVP4DI, Front and Back Views



Physical Views –Front and Side



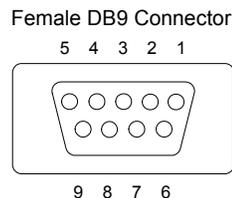
The 26 Ports on the C2N-DVP4DI Rear Panel



- A. **NET** – provides communication to other Cresnet devices and power to the C2N-DVP4DI. If making network connections to Cresnet peripherals, refer to “Network Wiring” on page 12.
- B. **LAN** – provides an Ethernet 10/100 base network connection.
- C. **COM1-4 PORTS**– provides only RS-232 communication (DB9, straight-through only for the “Touch The PC” application). For telestrator, or A/V device the pinout is device dependent (refer to the COM Port chart). DSR on pin 4 is always high or ON. Pin 6 (DTR) is +5 V.

COM Port RS-232 (DB9F - DCE) Pinouts

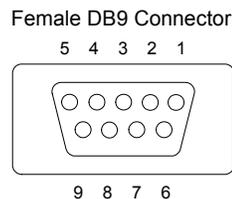
PIN	DESCRIPTION
2	TXD
3	RXD
4	DSR
5	GND
6	DTR
7	CTS
8	RTS



- D. **COMPUTER PORT**– Provides only RS-232 communication (DB9, straight-through) from a PC for programming and system setup.

RS-232 (DB9F - DCE) Pinouts

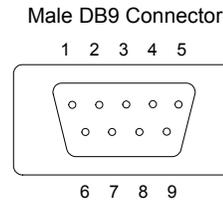
PIN	DESCRIPTION
2	TXD
3	RXD
5	GND
7	CTS
8	RTS



- E. **TOUCHSCREEN/MOUSE PORT** – Provides RS-232 communication to a touchscreen or mouse. DTR on pin 4 is always high or ON. Refer to “Connecting a Pointing Device” on page 60 for additional information.

RS-232 (DB9M - DTE) Pinouts

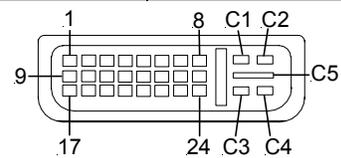
PIN	DESCRIPTION
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS



- F. **OUTPUT DVI/RGB (1)** – provides RGB or DVI video output. Output resolution from 800 x 600 to 1600 x 1200 (RGB) or 800 x 600 to 1280 x 1024 (digital). A DVI to RGB adapter for RGB output is supplied. The C2N-DVP4DI comes with five DVI/RGB input/output adapters (Crestron P/N JDCMDVI-VGAMF-1).

DVI Connector Input/Output Pinouts

PIN	DESCRIPTION	PIN	DESCRIPTION
1	SD2-	13	SD3+ (N/C)
2	SD2+	14	+5V
3	SHIELD2/4	15	DGND
4	SD4- (N/C)	16	HP_DET
5	SD4+ (N/C)	17	SDO-
6	DDC_CLK	18	SDO+
7	DDC_DATA	19	SHIELD0/5
8	VSYNC	20	SD5- (N/C)
9	SD1-	21	SD5+ (N/C)
10	SD1+	22	SHIELD_C
11	SHIELD1/3	23	SDCLK+
12	SD3- (N/C)	24	SDCLK-
C1	A_RED		
C2	A_GREEN		
C3	A_BLUE		
C4	HSYNC		
C5	AGND		



NOTE: The Digital Visual Interface (DVI) is a digital video connectivity standard. This standard offers two different connectors: one with 24 pins (DVI-D) that handles digital video signals only, and one with 29 pins (DVI-I) that handles both digital and analog video. The C2N-DVP4DI uses the 29-pin DVI-I standard.

NOTE: RGB is a computer signal that uses the standard High Density (HD-15) 15-pin connector. It is comprised of three analog video signals: red, green, blue and separate horizontal and vertical syncs. Most computer monitors use RGB (usually called VGA, SVGA, XVGA, etc.).

NOTE: The C2N-DVP4DI outputs both an RGB computer signal and a DVI (Digital Video Signal). To output RGB, use the DVI/RGB adaptor and use the standard VGA HD-15 cable (use a better quality cable for best resolution). Poor quality cables can affect the performance of the C2N-DVP4DI.

NOTE: To output DVI, connect directly from the DVI connector of the C2N-DVP4DI to the display device using a standard DVI-D cable.

NOTE: Maximum length of a DVI cable is 15.4 feet (3 meters).

- G. **INPUT DVI/RGB (4 female)** – allows RGB or DVI video input. Input resolution from 640 x 480 to 1600 x 1200 (RGB) or 640 x 480 to 1280 x 1024 (DVI) 31.5 to 64 Hz. RGB to DVI adapters (4) for RGB input are supplied.
- H. **VIDEO INPUT 1-4 (BNC)** – allows composite, component or S-video input. You may have 12 composite video inputs, four S-video inputs, four component video inputs, or some combination of the three. Each S-video input requires two BNC connectors, for example, if you are using two S-video inputs, then there are eight composite video inputs remaining.



S-video inputs must use the same pair of B (Y) and C (C) BNC connectors.

Each component video connection requires a set of three BNC connectors, Y, P_B, and P_R, and must use the same group of A, B, and C connectors. Component video can only be 480i. Component video 480p, 720p, and 1080i must be converted to RGBHV.

NOTE: Composite video is a type of video signal in which all information – the red, green, and blue (horizontal and vertical sync) signals are mixed together.

NOTE: S-video contains two separate components, luma and chroma (also known as Y and C signals respectively). The luma signal contains brightness, intensity, and signal timing information. This signal contains all picture information except for color. The chroma signal contains only the color information. You can see the complete black and white image, without the chroma, by only feeding the luma signal into a monitor.

NOTE: Component video is a method of transferring video information using multiple, individual signals: luminance (Y), luminance minus blue (PB), and luminance minus red (PR). Video information is transmitted in individual parts to prevent errors due to combining and then separating the various parts of the color video signal. The C2N-DVP4DI supports video standard 480i (480 lines, interlaced). Component video uses three coaxial video cables with BNC connectors to transfer the three signal components (refer to the “Appendix” on page 93 for additional information about component video).

NOTE: RGBS consists of red, green, blue, and a composite sync. RGBHV consists of red, green, blue, horizontal sync and vertical sync.

NOTE: HDTV and progressive scan component video must be converted to interlaced RGBHV by a third party device and then applied to the DVI/RGB connector.

Possible Video Input Combinations (fully occupied)

Composite	Component	S-Video
12	0	0
9	1	0
6	2	0
1	3	1
0	4	0
10	0	1
8	0	2
6	0	3
4	0	4
7	1	1
4	2	1
5	1	2
3	3	0
2	2	2
3	1	3

- I. **MEMORY EXPANSION** – provides for compact flash memory card. The C2N-DVP4DI comes with a 32MB compact flash memory card (Crestron P/N COMFLS-32M-1).

Memory

The C2N-DVP4DI has 36MB of built-in memory (non-volatile and volatile). A total of 36MB is broken down as follows: 4MB flash (non-volatile), 32MB DRAM (volatile), and 256KB NVRAM. The C2N-DVP4DI ships with 32MB of compact flash installed. Flash memory contains the file system inside the 2-Series control engine. Non-volatile memory contains information that is retained after loss of electrical power. Volatile memory is lost after a power failure. Refer to the following lists for a breakdown of memory usage for program-related information stored in the unit.

File System

The file system inside the 2-Series control engine can be broken down into two parts. The first part resides on the on-board flash memory and the second resides on the external compact flash/microdrive card. The following is a brief description of the file system structure.

The files that reside in the internal flash conform to a flat directory structure. The compact flash system contains a fully FAT32 compatible file system to allow the same compact flash card to be used in a Windows® environment. The following table presents the structure of the overall file system.

File System

TOP LEVEL	SECONDARY LEVEL	DESCRIPTION
\		Root of the file system
	DISPLAY	Legacy/Unused
	SYS	Contain various system configuration files
	SETUP	Directory used to hold setup files
	HTML	Web pages
	SIMPL	Control system program files
	SPLUS	SIMPL+ module files\
	USER	User defined files
	MAILBOX	User mailbox file
	CFØ	The mounting point for the compact flash files.
	\CFØ\DISPLAY	Directory used to hold display files
	\nvram	The mounting point for NVRAM disk files

Although the file system is case insensitive, the case is preserved to maintain file checksums. The compact flash directory only appears when the compact flash is inserted into the system. To reference files on the compact flash, prefix the “\CFØ” to any fully qualified path from the Windows environment. For example, if the file in Windows is “\MyDirectory\MySubdirectory\MyFile.ext”, the complete 2-Series path for a file on the first Compact Flash slot (onboard) is:

“\CFØ\MyDirectory\MySubdirectory\MyFile.ext”

You do not have to create subdirectories for general files; you can put them in the root of the Compact flash (\CFØ).

The only time subdirectories are required is when putting bootable projects on the Compact Flash (\CFØ\SIMPL, \CFØ\SPLUS), but SIMPL Windows takes care of that for you when you do the **File | Copy to CF** function. SIMPL Windows makes the appropriate subdirectories. The same is true when you put web pages on the Compact Flash. The tools create the appropriate directories.

Flash

The 4MB flash memory consists of approximately 1.5MB used for firmware, and approximately 2.5MB available for SIMPL and SIMPL+®. The files that reside in flash conform to a flat directory structure.

1. SIMPL+ Modules.
2. SIMPL Program.
3. Operating System.

Non-volatile (NVRAM)

1. SIMPL+ Variables (using "nonvolatile" qualifier or #DEFAULT_NONVOLATILE).
2. Signals explicitly written to NVRAM (by symbols such as Analog RAM, Analog RAM from database, Serial RAM, Serial RAM from database, Analog Non-volatile Ramp, Digital RAM, etc.).
3. Portions of the NVRAM may be set aside for implementing an “NVRAM Disk”. This can be used to provide file system access from SIMPL+.

NOTE: If you extract NVRAM values to a file (**Viewport, File transfer | Save NVRAM to File**), to simplify restoring them in the event of file corruption or to distribute to identical control systems, remember that NVRAM values are position sensitive in the program. When saving the NVRAM is crucial to your application, it is recommended to place all symbols and/or modules that use NVRAM at the beginning of your program. When NVRAM (.nvr file) is re-installed, all the values should line up with the program. If the program is modified, and new logic that uses NVRAM is placed before any older symbols using NVRAM, the previously stored values will not line up and your presets will have to be re-entered.

NOTE: The new NVRAMDISK command (available in CUZ files later than 3.053), will fail unless it can determine the amount of NVRAM used by the program, to ensure that the NVRAM is not overwritten. Programs compiled in SIMPL Windows version 2.04.11 or later can provide this information. In the event of a failure of the NVRAMDISK command, ensure that your program has been recompiled in an appropriate version of SIMPL Windows and reloaded.

Volatile (DRAM)

NOTE: The DRAM memory runs all bit map files. To maximize loading speed of backgrounds, keep the total page size to a maximum of 32 MB.

NOTE: To reduce the size of bit maps, make them 16 bit rather than 24 or 32 bit. This will also reduce the load time of these files.

1. Digital, analog and serial signal values (except as noted above).
2. SIMPL+ Variables (Default if no options are specified, or if "volatile" qualifier is used, or #DEFAULT_VOLATILE is used).

DRAM is used by the operating system for dynamic storage of variables, signals, loading of pages and other constructs used at runtime. The actual amount of DRAM used at any given time depends on the particular program that is running, i.e., usage is variable, or dynamic, during normal operation.

NOTE: To check the size of the memory installed in the C2N-DVP4DI, use Viewport and type the SHOWHW command.

Industry Compliance

As of the date of manufacture, the C2N-DVP4DI have been tested and found to comply with specifications for CE marking and standards per EMC and Radiocommunications Compliance Labelling (N11785).



NOTE: 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.

Setup

Refer to the C2N-DVP4DI Operation Guide (Doc. 6112) for setup procedures and configuration menus.

NOTE: Some of the following subsections use the Crestron Viewport. Refer to the latest revision of 2-Series Console Commands (Doc. 6002) for console command details.

Network Wiring

CAUTION: Crestron recommends that the C2N-DVP4DI be **the only device connected to the Crestron power supply (CNPWS-75)**. Connecting more devices may cause the system to start up or operate improperly.

CAUTION: Crestron recommends that the C2N-DVP4DI be the only device connected to the Crestron power supply (CNPWS-75, not included). Do not use a 2-Series system (AV2, PRO2, etc.) as a power source. Because of surge current, do not use a power supply smaller than 75 watts.

CAUTION: Use only Crestron power supplies for Crestron equipment. Failure to do so could cause equipment damage or void the Crestron warranty. Power Requirement is 75 Watts @ 24VDC.

NOTE: When making wire connections, refer to the latest revision of the Cresnet Network Interconnect Drawing (Doc. 5411). The document can be obtained from the Downloads | Product Manuals section of the Crestron website (www.crestron.com).

NOTE: For larger networks (i.e., greater than 28 network devices), it may be necessary to add a Cresnet Hub/Repeater (CNXHUB) to maintain signal quality throughout the network. Also, for networks with lengthy cable runs or varying types of network devices, it may be desirable to add a hub/repeater after only 20 network devices.

When calculating the wire gauge for a particular Cresnet run, the length of the run and the power factor of each network unit to be connected must be taken into consideration. If Cresnet units are to be daisy-chained on the run, the power factor of each unit to be daisy-chained must be added together to determine the power factor of the entire chain. If the unit is a home-run from a Crestron system power supply network port, the power factor of that unit is the power factor of the entire run. The length of the run in feet and the power factor of the run should be used in the following resistance equation to calculate the value on the right side of the equation.

Resistance Equation

$$R < \frac{40,000}{L \times PF}$$

<p>Where: R = Resistance (refer to table below). L = Length of run (or chain) in feet. PF = Power factor of entire run (or chain).</p>
--

The required wire gauge should be chosen such that the resistance value is less than the value calculated in the resistance equation. Refer to the following table.

Wire Gauge Values

RESISTANCE	WIRE GAUGE
4	16
6	18
10	20
15	22
13	Doubled CAT5
8.7	Tripled CAT5

Identity Code (Slave Mode on Cresnet)

All equipment and user interfaces within the network require a unique identity code (NET ID). A two-digit hexadecimal number ranging from 03 to FE designates these codes. The NET ID of each unit must match an ID code specified in the SIMPL Windows program. The NET ID of the C2N-DVP4DI has been factory set to **54**. The NET IDs of multiple C2N-DVP4DIs in the same system must be unique and changed from a PC via Viewport or from the setup menu of the C2N-DVP4DI, refer to the latest version of the C2N-DVP4DI Operation Guide (Doc. 6112). Complete the following procedure to change the NET ID. This is required if the C2N-DVP4DI is to be a Cresnet slave. If the C2N-DVP4DI is to be used as a master or as an Ethernet slave, set the Cresnet ID to 02. Refer to the setup information in the Operations Guide (Doc. 6112), or use the following instructions.

NOTE: If configured as a Cresnet slave (ID 03 – FE) and as an Ethernet slave with *Set as Master* checked in the IP Table Entry, the Ethernet slave takes priority.

NOTE: For detailed information on establishing communication between the PC and control system, refer to the network's control system Operations Guide.

1. Ensure that the C2N-DVP4DI is the only device connected (verify that the software is running) to the control system.
2. Open Viewport. From the Viewport menu, select **Functions | Set Network ID**. The software checks the baud rate and then opens the "Set Network ID" window.
3. In the "Set Network ID" window, select the C2N-DVP4DI from the *Current Network Devices* text window.
4. From the *Choose the new network ID for the selected device (Hex):* text box; select the new NET ID for the C2N-DVP4DI.
5. Click **Set ID** to initiate the change. This will display the "ID command has been sent" window.
6. In the "Command Complete" window, click **OK**.
7. In the "Current Network Devices" text window, verify the new NET ID code.
8. In the "Set Network ID" window, click **Close**.

NOTE: The new NET ID code may also be verified by selecting **Diagnostic | Report Network Devices** in Viewport (alternately, press **F4**).

NOTE: If multiple C2N-DVP4DIs are added, and one of them is to stay at ID 54, it should be added last to prevent a Cresnet ID conflict.

10. Repeat this procedure for each C2N-DVP4DI to be added to the network.

Connector Information

RS-232 Control and Computer Ports

Use a DB9 straight-through cable (do not use a null-modem cable).

Touchscreen/Mouse

This cable is supplied by the touchscreen or mouse vendor (except for a Matisse cable); refer to “Unique Viewport Commands” on page 18.

Serial Mouse

The C2N-DVP4DI is shipped with a Microsoft compatible 9-pin mouse. For installation instructions, refer to page 60.

RGB to BNC Cable

A RGB to BNC cable has an RGB DB15 connector on one end and five BNC connectors on the other end. The BNC connectors are red, blue, green, horizontal and vertical. The horizontal and vertical cables are stamped H and V, respectively. The RGB to BNC connection standards are:

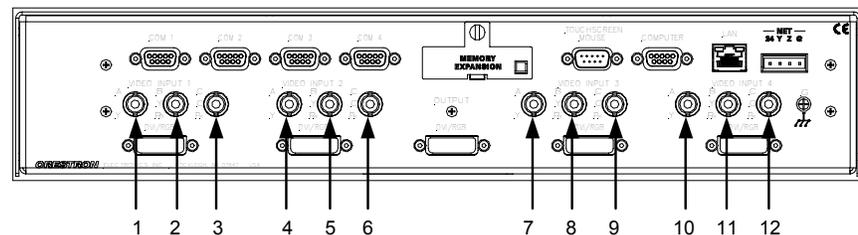
- RGB Sync on Green (red, green and blue only; horizontal and vertical not connected)
- RGB H Sync (red, green, blue and horizontal only; vertical not connected)
- RGB H Sync/V Sync (red, green, blue, horizontal and vertical connected)

NOTE: If you connect the horizontal and/or vertical cables for RGB Sync on green, no video will be displayed.

Composite Video Connections

The C2N-DVP4DI has 12 composite video inputs available. Refer to the following diagram.

Composite Video Connections



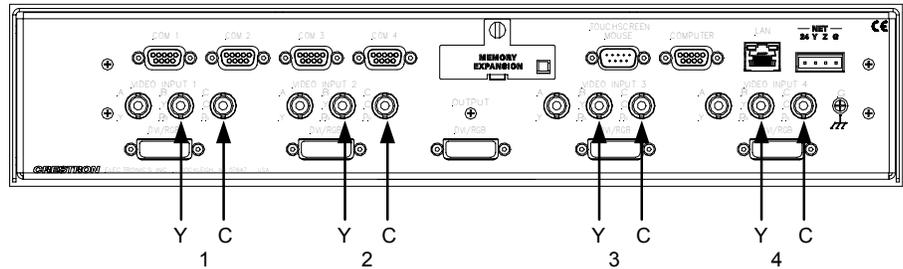
S-Video Cable Adapter

If you are using a 4-pin DIN S-video cable, you will need to use a 4-pin (female) DIN to BNC adapter (adaptor not included).

S-Video Connections

When connecting S-video cables to the C2N-DVP4DI, make sure to connect one set to one input. Connect Y to the B input and C to the C input. Refer to the following diagram.

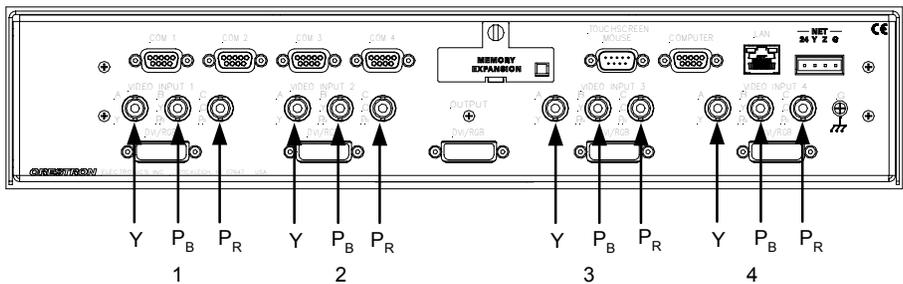
S-Video Connections



Component Video Connections

When connecting Component video, connect one set of Y, P_B, and P_R to one set of connectors. Refer to the following diagram.

Component Video Connections



NOTE: HDTV and progressive scan component video must be converted to RGBHV by a third party device and then applied to the DVI/RGB connector.

DVI/RGB Adapter

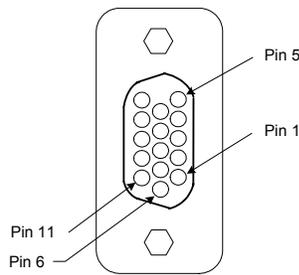
Crestron supplies five 29-pin to 15-pin adaptors for VGA analog signals (refer to page 7 for additional connector information).

Use a 29-pin DVI cable for digital video, 15.4 feet (3 meters) maximum length. Refer to the following illustration and table for adapter pinouts.

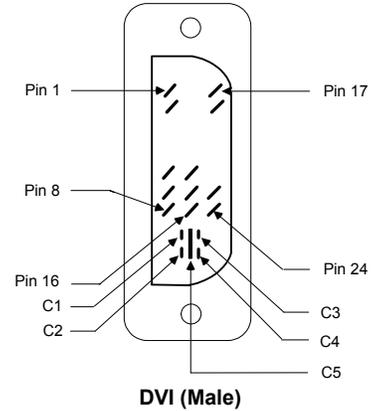
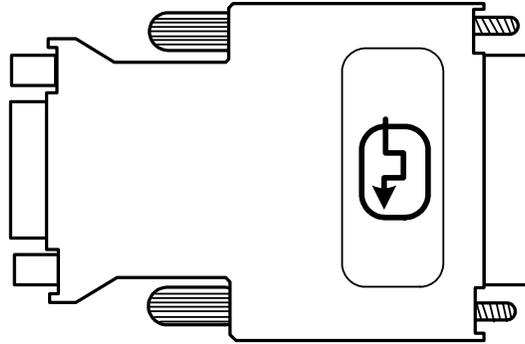
Single link DVI supports a maximum bandwidth of 108 MHz (1280 x 1024 at 60 Hz). The C2N-DVP4DI supports the single link implementation only, not the dual link implementation.

NOTE: Crestron Part Number for this connector: JDCMDVI-VGAMF-1

DVI/RGB Pinouts



VGA(Female)



DVI (Male)

DVI/RGB Connections

VGA (RGB)	DVI	CABLE FUNCTION
SHIELD	SHIELD	GROUND
PIN R6, G7, B8	C5	ANALOG GROUND
PIN 13	C4	HORIZONTAL SYNC
PIN 3	C3	ANALOG BLUE
PIN 2	C2	ANALOG GREEN
PIN 1	C1	ANALOG RED
PIN 5,10	PIN 15	GROUND (+5V & HV SYNC)
PIN 9	PIN 14, 16	POWER +5V/HDT PLUG DETECT
PIN 14	PIN 8	VERTICAL SYNC
PIN 12	PIN 7	DDC DATA
PIN 15	PIN 6	DDC CLOCK

Output DVI Video from PC to C2N-DVP4DI

To output DVI video from a Microsoft Windows-based (98/NT/2000) PC to the C2N-DVP4DI, the current DVI driver on the PC must be updated with a plug and play monitor driver. This is accomplished via the “Display Properties” window.

NOTE: The following procedure assumes that the PC has a DVI video card and driver installed. A Matrox Graphics™ DVI driver is used in the following example.

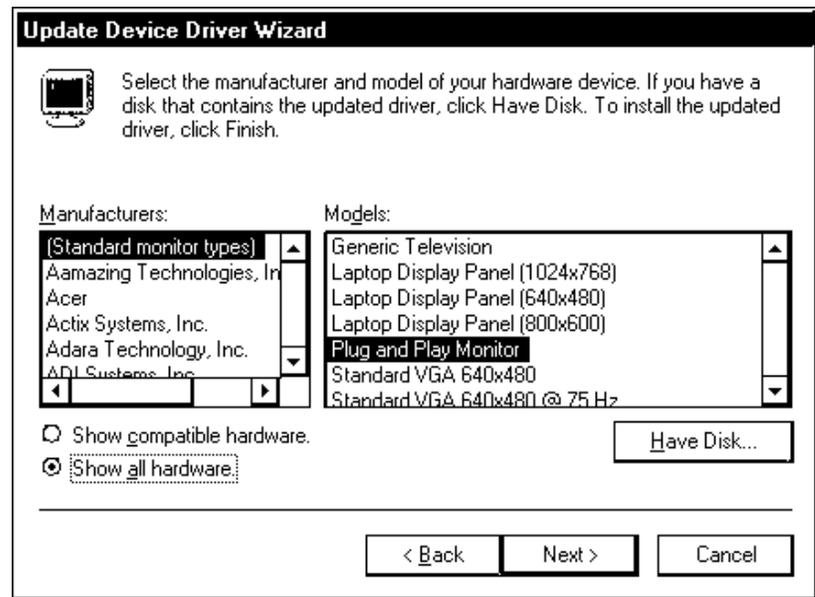
1. Right click on the desktop and click **Properties** from the pulldown menu to open the “Display Properties” window.
2. Select the *Settings* tab.
3. Select the Matrox DVI video display driver from the *Display* field.
4. Click **Advanced** to open the “Matrox DVI” driver window.
5. Select the *Monitor* tab.
6. Click **Change** to open the Update Device Driver Wizard.

NOTE: Depending on the type of driver, the **Change** button may reside on a tab other than the *Monitor* tab.

7. Click **Next**.
8. Select *Display a list of all drivers...* and click **Next**.

9. Select *Show All Hardware* to open the hardware fields.
10. Select **(Standard monitor types)** from *Manufacturers* field (refer to the following graphic).
11. Select **Plug and Play Monitor** from the *Models* field (refer to the following graphic).

Update Device Driver Wizard



12. Click **Next** three times.
13. Click **Finish** to return to the “Matrox DVI” driver window.
14. Click **OK**.

Troubleshooting Communications

NOTE: Establishing communication is covered in the C2N-DVP4DI Operations Manual (Doc. 6112).

Use the following checklist if communication cannot be established with the C2N-DVP4DI.

1. Verify that you are using the correct cables. As described previously, an RS-232 connection requires a straight-through serial cable. That is, pin 1 on one end is connected to pin 1 on the other end. Pin 2 connects to pin 2, etc. With a TCP/IP connection, you must use a CAT5 cable with 8-pin RJ45 connectors.
2. With a serial connection, verify that the correct COM port on the PC has been selected. Some computers have more than one COM port; some may be internal (e.g., for a modem). Consult the manufacturer documentation for further information about the COM ports on your PC.
3. With a serial connection, reset the control system as follows:
 - a. Open Viewport and click **Setup | Communications Settings** to display the “Port Settings” window. Choose **RS-232** as the connection type.
 - b. Set the baud rate of the PC to **115200** (use with new .cuz files, version 3.0.17 and higher) or **57600** (use with older .cuz files).

- c. Make sure that RTS/CTS is selected and click **OK**.
 - d. If communication still cannot be established, reinitialize the unit by recycling power (the unit takes approximately 25 seconds to reboot). If the connection is established, the Viewport console should display some text and the **<DVP4DI>** prompt.
 - e. If communication still cannot be established, contact Crestron customer service.
4. Verify that no other software is using the same COM port.

NOTE: If communication cannot be established, check that the correct cable is being used. Also check that the Ethernet is enabled (refer to Main Menu | Diagnostics in the Operation Guide).

Unique Viewport Commands

The following are some Viewport commands that are unique to the C2N-DVP4DI, i.e., they can be accessed only through the C2N-DVP4DI prompt in Viewport.

NOTE: The Crestron Viewport utility performs multiple system tasks, primarily via an RS-232 or TCP/IP connection between the control system and a PC. It is used to observe system processes, upload new operating systems and firmware, change system and network parameters, and communicate with network device consoles and touchpanels, among many other tasks. Viewport can also function as a terminal emulator for generic file transfer. All of these functions are accessed through the commands and options in the Viewport menus. Therefore, for its effectiveness as a support and diagnostic tool, the Crestron Viewport may be preferred over development tools when uploading programs and projects.

To run these commands, establish communications between the PC and the C2N-DVP4DI. Either launch the stand-alone version of Viewport, or start SIMPL Windows or Crestron VisionTools® Pro-e (VT Pro-e), and from the menu bar, select **Tools | Viewport**.

Input Calibration

This command determines how the video input is calibrated. To access this adjustment, at the DVP4DI prompt, type **input?**

The input calibration commands are:

- A** – Auto Calibrate (normal mode). Sources are automatically calibrated the first time only.
- D** – Default. Calibration relies on an internal predetermined set of values. This can be quite useful when manual calibration has set the parameters too far out of bounds by setting a starting point.
- N** – No calibration. No HDTV overscan, allows the full image (including the safe TV areas) to be displayed.
- L** – Lock Calibrate. This selection causes the C2N-DVP4DI to perform auto calibration every time the source is selected, even if it has done so already.

```
DVP4DI>input ?
Format is "INPUT 1 2", where Parameter 1 is 1,
2, 3, or 4 to select one of the four RGB inputs,
and Parameter 2 is the new Horizontal
Resolution, from 320 to 1920,
or "A" to Auto Calibrate this input,
or "D" for Default for this input,
or "N" for No HDTV Overscan for this input,
or "L" to Lock Auto Calibrate On for this input.
```

Cursor On/Cursor Off

Allows the user to display or not display the cursor on a display device. The commands are:

- **cursor on** - displays cursor.
- **cursor off** - does not display cursor.

NOTE: The default for a mouse connected to the C2N-DVP4DI is *cursor on*.
The default for a touchscreen connected to the C2N-DVP4DI is *cursor off*.

Output Resolution Selection

Allows the user to select the output resolution. The commands are:

- **output** – Displays the current resolution setting.
- **output ?** – Displays the resolution options.

For example, the resolution options are: 1600, 1365, 1280, 1024 or 800.

To change the resolution, type **output <resolution>** and press **Enter**. For example, type **output 1280** and press **Enter**. The system prompts you to reboot to accept the change.

Touch

Allows the user to select the touchscreen or mouse that will be used as a pointing device. The commands are:

- **Touch** - displays what is currently selected.
- **Touch ?** - displays list of available pointing devices.

```
DVP4DI>touch ?
TOUCH [input]
  where input =
    0 - Program Control
    1 - Microsoft mouse*
    2 - Smart (SC3,SC4,SC5)
    3 - Smart (SC6,SC7,..)
    4 - Microtouch
    5 - Dynapro SC3
    6 - Dynapro SC4
    7 - Elo Graphics
    8 - Crestron Tablet
    9 - Mouse Systems Mouse
    10 - Logitech MouseMan
    11 - Wacom Tablet
    12 - QTC Touch Controller
  No parameter - current input selection
```

NOTE: Refer to “Specifications” on page 2 for mouse requirements.

NOTE: Smart (Matisse) requires that the Data Terminal Ready (DTR, pin 6) and Data Set Ready (DSR, pin 4) connections be removed from the DB9 RS-232 cable for proper operation. Use Crestron part number CNSP-141 cable. For **Smart Sympodium** installation instructions, refer to page 81 and to: http://www.smarttech.com/support/pdf/plasma_install.pdf.

Pointing Device Calibration

CALTOUCH allows user to calibrate the C2N-DVP4DI to a touchscreen. Once a touchscreen is connected, typing **cal touch** and pressing **Enter** at the C2N-DVP4DI prompt puts the system in the calibration mode. You then follow the screen prompts. You must perform a new calibration for each new touchscreen connected.

NOTE: The first time any touchscreen is selected, it is not operational until it is calibrated. The calibration setting is not lost when switching between mouse and touchscreen. The current calibration setting is lost when a new calibration is performed.

NOTE: If you change the C2N-DVP4DI output resolution, you are required to perform the calibration of the pointing device again.

Updating the Operating System

As with all 2-Series control systems, operating system files for the C2N-DVP4DI have a .cuz extension. You can obtain .cuz updates (when available) from the Downloads | Software Updates section of the Crestron website (www.crestron.com). To download a firmware update, click the .cuz file and choose the **Save to Disk** option, then specify the directory where the update will be stored.

NOTE: In some cases Microsoft Internet Explorer[®] may append a .zip extension to a downloaded .cuz file. For example, a file called "C2-1008.cuz" may appear as "C2-1008.cuz.zip." If this happens, rename the file, removing the .zip extension.

NOTE: Crestron software and any files on the website are for Authorized Crestron dealers and Crestron Authorized Independent Programmers (CAIP) only. New users may be required to register to obtain access to certain areas of the site (including the FTP site).

To upload the new .cuz to the control system:

1. Open Viewport and establish communication with the C2N-DVP4DI (refer to “Establishing Communications with the Control System” in the latest version of the C2N-DVP4DI Operations Guide (Doc. 6112).
2. Select **File Transfer | Update Control System**.
3. Browse to the .cuz file and click **Open** to start the transfer.
4. After the transfer is complete, the C2N-DVP4DI will automatically reboot. To confirm the transfer, click **Diagnostics | Check Ops Version**. The Viewport console should display the new .cuz version number.

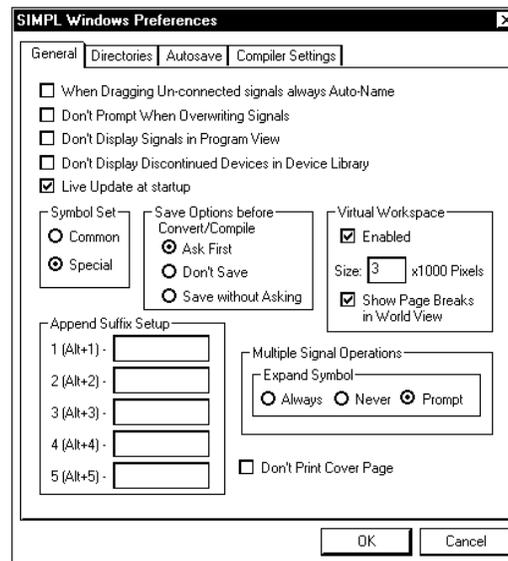
NOTE: Store all CUZ files on local hard drive. Do not perform file transfer from a local PC with the upgrade file located on network or partitioned drive.

Advanced Console Commands

The SIMPL Windows online help file provides a full listing of console commands that are valid for **2-Series** control systems. You can access the C2N-DVP4DI console in a variety of ways: via a serial connection (RS-232) with a PC, over Ethernet via the LAN port, or through Telnet. It is also possible to issue console commands through logic, by adding a Console symbol to the SIMPL Windows program.

The Console symbol is visible in the *Symbol Library* only when “Special” is selected as the Symbol Set. Click: **Edit | Preferences**. In the *Symbol Set* area of the *General* tab, select **Special** as shown in the following graphic.

"SIMPL Windows Preferences" Window



Console commands are provided for advanced programmers. However, most functions and commands can be selected from the various Viewport menus.

Ethernet Setup (Master/Slave Mode)

This section explains how to configure a C2N-DVP4DI to communicate over Ethernet using TCP/IP. These procedures assume that the C2N-DVP4DI has been powered up and connected properly. The screen prompt for Ethernet slave is ESLAVE_DVP4DI, the screen prompt for Cresnet slave is CSLAVE_DVP4DI. Use Cresnet ID 02 for a master or Ethernet slave, and Cresnet ID 03 through FE for a Cresnet slave.

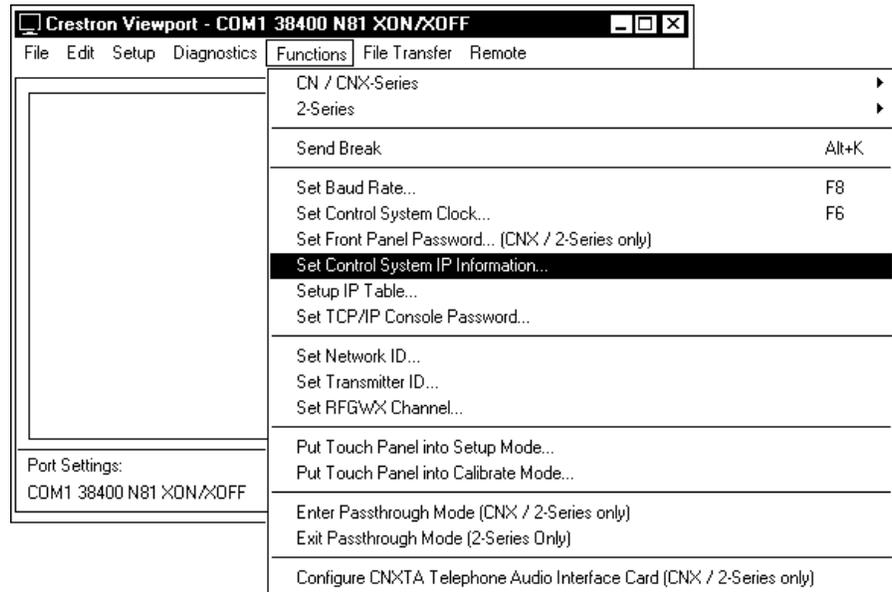
CAUTION: Do not connect a Cresnet network to the C2N-DVP4DI when in Ethernet slave mode.

Initial IP Setup

NOTE: This initial IP setup *MUST* be done via the RS-232 computer port. Before performing the procedures in this section, refer to the “Cable Connection for Programming” in the C2N-DVP4DI Operations Guide (Doc. 6112) for cabling instructions. Thereafter, communications may be established by using the Crestron Viewport to directly connect to the IP address assigned to the C2N-DVP4DI. It is assumed that the user has communications with the C2N-DVP4DI and the appropriate update file has been loaded.

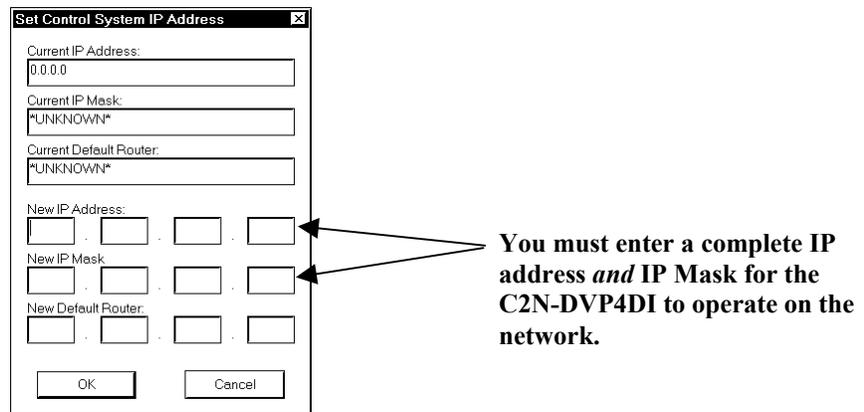
1. From the Crestron Viewport, select **Functions | Set Control System IP Information**. The “Set Control System IP Address” window opens.

Set IP Information Via Viewport



As shown in the following illustration, the C2N-DVP4DI does not have an IP address assigned to it.

IP Address Window



2. Refer to the following table and enter the network IP values.

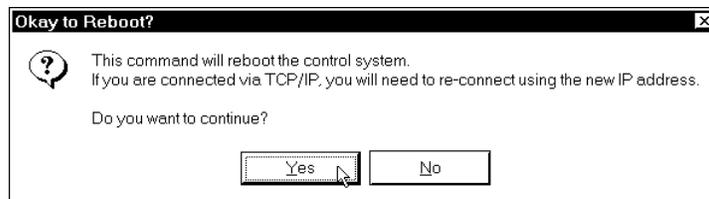
NOTE: If an invalid IP address is entered, the subnet mask may be CHANGED AUTOMATICALLY BY THE EQUIPMENT to an appropriate subnet mask.

NOTE: To *TURN OFF* the TCP/IP stack, an IP address of **0.0.0.0** can be entered; no IP Mask or Default Router would be required.

SETTINGS FOR NETWORK WITH CRESTRON® ONLY EQUIPMENT
<p>If the C2N-DVP4DI is being placed on a corporate LAN or a LAN with other equipment besides Crestron equipment, the IP address, IP Mask and Default Router (also known as the Gateway) will be provided from an MIS Department or other network administrator.</p>
<p>Other Crestron IP control devices on this network would require that their IP Address, IP Mask and Default Router also be obtained from the MIS department or other network administrator.</p> <p>If the Network consists of only Crestron equipment, the following Private Address Ranges are recommended for use.</p>
<p>Reference Guidelines</p>
<p>First Octet of Zero and 127 are reserved</p>
<p>Class A: First octet ranges from 1 to 128 Default Subnet Mask: 255.0.0.0</p>
<p>Class B: First two octet ranges from 128.1 to 191.254 Default Subnet Mask: 255.255.0.0</p>
<p>Class C: First three octet ranges from 192.0.1 to 233.255.254 Default Subnet Mask: 255.255.255.0</p>
<p>Class D: 224.0.0.0 to 239.255.255.254 (Not available for general use, reserved for multicast systems)</p>
<p>Class E: 240.0.0.0 to 255.255.255.254 (Not available for general use, reserved for multicast systems)</p>

3. On the “Set Control System IP Address” window, click **OK** to set the entered values.
4. The reboot window, as shown in the following graphic, opens. Click **Yes** to reboot the C2N-DVP4DI and continue.

Reboot Window



5. You will receive a confirmation message that the IP information has been setup. After the system reboots, select **Function | Set Control System IP Information**, to view the IP Information.

NOTE: If an error message that the Viewport could not setup the IP information appears, verify that the C2N-DVP4DI has been updated to the minimum operating system required for Ethernet functionality. If the C2N-DVP4DI still cannot set the IP information, contact Crestron customer service for assistance.

IP Table Setup

Ethernet devices that are addressed by the C2N-DVP4DI may have their IP addresses set either in the SIMPL Windows program (default IP Table) or through the Crestron Viewport using a PC. Just as each Cresnet device is assigned a Cresnet NET ID, e.g. 03 through FE, to be used when programming, an Ethernet device is assigned an IP ID that also may range from 03 through FE. Ultimately, each IP ID is converted into an actual IP address through an IP table that exists inside the C2N-DVP4DI.

Adding Devices and IP Table Setup in SIMPL Windows

To add Ethernet devices to your program, in the SIMPL Windows Configuration Manager, drag an Ethernet device into the program. Drop it on to the "Ethernet Units" arrow underneath the "Cresnet Units" arrow. (If the arrow is not visible in the *System View* window, pull the window divider down further.)

1. Double click on the icon and assign an IP ID and a corresponding IP address in the tabbed configuration window titled "IP Net Address".
2. In the SIMPL Windows Program Manager, connect signals to the "Virtual Touchpanel" symbol, exactly as you would to a regular wired Touchpanel symbol.

NOTE: For more detailed information, refer to the SIMPL Windows help file by selecting **Help | Help Topics**. Select the *Index* tab, type in **IP Table**, and then select **Adding Ethernet Devices to a SIMPL Windows Program**.

When the SIMPL Windows program is compiled; the compiler creates an IP table consisting of the IP IDs and the IP addresses for the various Ethernet devices. During upload, choose whether to load this IP table or whether to use the table that already exists in the C2N-DVP4DI.

Changing the IP Table via Viewport

You can modify the corresponding IP address for any IP ID without changing or reloading the program by changing the IP table directly. From the Crestron Viewport, select **Functions | Setup IP Table** then click the **Retrieve Current IP Table from Control System** button. This will extract the IP table from the C2N-DVP4DI and list it in the window. Modify or delete existing entries or add new ones. When all the necessary changes have been made, save the new table to disk and/or load it back into the unit. Do not overwrite the IP table in the C2N-DVP4DI the next time the program is uploaded, unless the addresses in the program supercede those in the current IP table.

NOTE: For more detailed information, refer to the SIMPL Windows help file by selecting **Help | Help Topics**. Select the *Index* tab, type in **IP table**, and then select **Changing IP Addresses without Changing the Program**.

About the IP Table

For the C2N-DVP4DI (or any Ethernet-enabled control system) to control devices via Ethernet, the IP ID of the device must be associated with an IP address, and both the IP ID and IP address must be entered into the IP table of the control system.

You can create an IP table in two ways. The first method is to double-click the device in Configuration Manager to open the "Device Settings" window. Click the *IP Net Address* tab and enter the IP address of the device in the *IP Address* field. Repeat this procedure for all Ethernet devices in your system. This creates what is referred to as a "default" IP table. When the program is compiled and ready to be uploaded to the control system, you will have the option to upload this default IP table.

The second method is to use the Crestron Viewport. This method is especially useful on site if you want to change one or more IP addresses without changing the program. Refer to "Ethernet Setup" on page 21 for more information.

1. Select **Functions | Setup IP Table**.
2. Click **Add** and select the IP ID of the device from the drop-down list, then enter the IP address.

- When all the IP IDs and associated IP addresses have been added to the IP table, click **Send IP Table to Control System**.

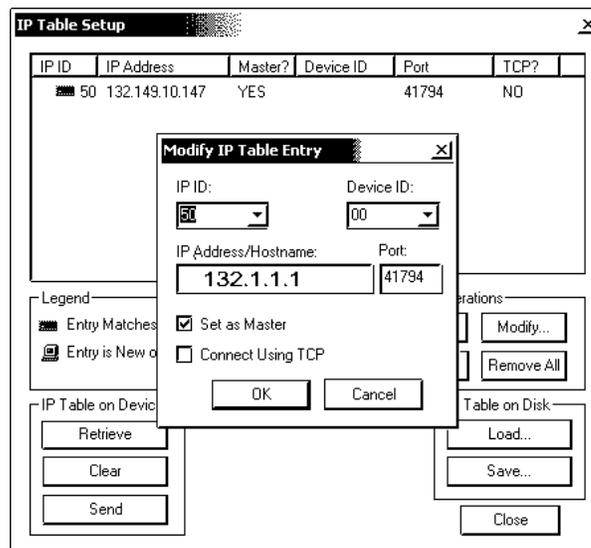
Changing the IP Table via Viewport for Ethernet Slave Mode

As with all 2-Series control systems, the C2N-DVP4DI has the capability to function as a peripheral device, or “slave”, in a master/slave arrangement with another control system. Here the IP table of the C2N-DVP4DI must contain just one entry for the master control system.

To access the IP table of a “slave” C2N-DVP4DI, use the **Setup IP Table** command on the Viewport **Functions** menu. The settings are as follows:

- Enter the IP ID of the C2N-DVP4DI itself, as specified in the program of the master control system and select **OK**. Notice that the “slave” C2N-DVP4DI is listed with TRUE in the *Master?* column.
- Enter the IP address of the master control system.
- Click the *Set as Master* check box.

IP Table Setup



When operating as a slave device, the C2N-DVP4DI can accept commands only from one control system. Therefore, there must only be one entry in the IP table.

For further information about e-Control applications, including basic concepts and terminology, refer to the Crestron e-Control Reference Guide, (Doc. 6052), available in PDF format on the Crestron website (www.crestron.com).

Crestron e-Control IP Table Information

It is extremely important that the IP ID in the SIMPL Windows program match the IP ID encoded in the Crestron e-Control Software Development Kit (SDK) object by the developer of the Web page, Visual Basic® or Crestron VT Pro-e browser program.

NOTE: If configured as a Cresnet slave (ID 03 – FE) and as an Ethernet slave with *Set as Master* checked in the IP Table Entry, the Ethernet slave takes priority.

If more than one PC uses the same IP ID for a connection (e.g., each loads the same web page), the CNX Gateway will duplicate all packets that are received from the C2N-DVP4DI to each of the identical IP IDs. This is known as touchpanel tracking.

The IP address that is typed into the virtual touchpanel devices in the SIMPL Windows program is the IP address of the CNX Gateway, not of the individual PCs (running a web browser or Active CNX application). This is because individual PCs may change, but the CNX Gateway normally does not.

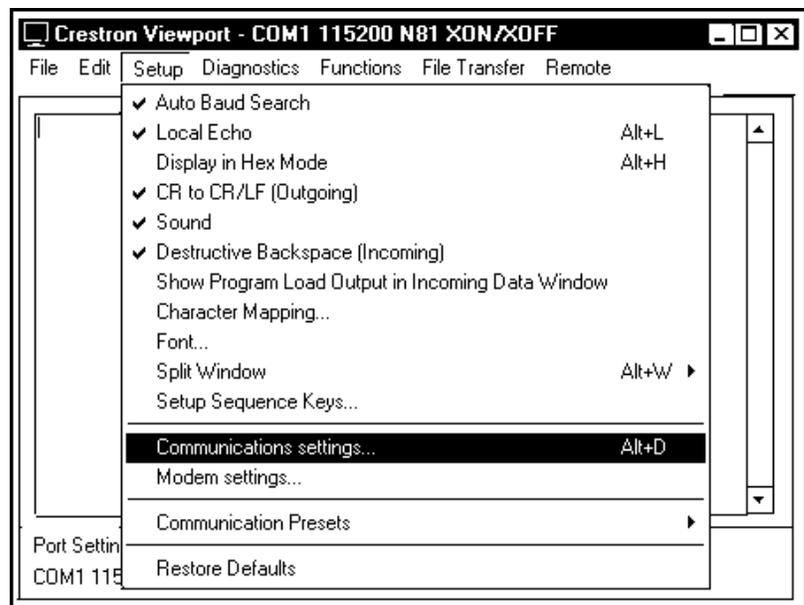
Communicating via Ethernet

NOTE: Before performing this procedure, refer to “Establishing Communication with the C2N-DVP4DI, TCP/IP Connection” in the C2N-DVP4DI Operations Guide (Doc. 6112) for cabling instructions.

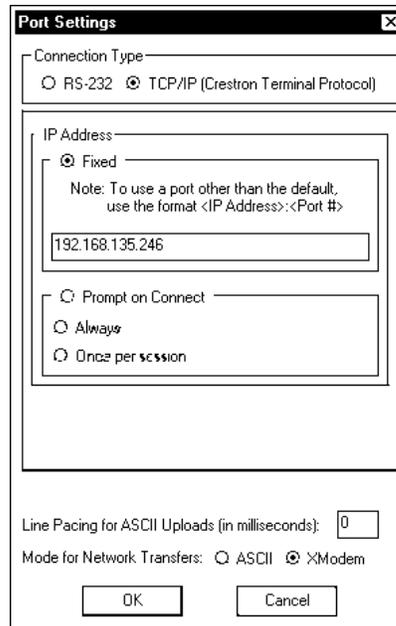
The Crestron Viewport may be used to communicate with the C2N-DVP4DI via Ethernet. To connect the Viewport to the unit, perform the following procedure.

1. In the Viewport, select **Setup | Communications Settings** as shown to open the “Port Settings” window.

Viewport Setup | Communications Settings



2. In the “Port Settings” window, select **TCP/IP** from the *Connection Type* field as shown in the following illustration and select **Fixed** from the *IP Address* field.

“Port Settings” Window, TCP/IP Selected

3. Enter the IP address of the configured C2N-DVP4DI and click **OK**. The Viewport prompt displays either DVP4DI (master) or CSLAVE_DVP4DI (slave).
4. Perform any of the diagnostics and features that Viewport provides.

Troubleshooting Communications via Ethernet

You can PING the C2N-DVP4DI from a MS-DOS® prompt (Windows 95/98/Me) or a Command Prompt (Windows NT/2000/XP). Ping means "to get the attention of" or "to check for the presence of" another online device. Ping operates by sending a packet to a designated address and waiting for a response.

The unit should reply and there should be no packet loss.

NOTE: Verify that the IP Settings of the C2N-DVP4DI are correct, and that the PC used to ping the unit can ping other devices that are on the C2N-DVP4DI subnet.

MS-DOS or Command Screen

```

MS-DOS Prompt
Auto
C:\Crestron\Simple>ping 192.168.135.246
Pinging 192.168.135.246 with 32 bytes of data:
Reply from 192.168.135.246: bytes=32 time=18ms TTL=60
Reply from 192.168.135.246: bytes=32 time=10ms TTL=60
Reply from 192.168.135.246: bytes=32 time=10ms TTL=60
Reply from 192.168.135.246: bytes=32 time=5ms TTL=60

Ping statistics for 192.168.135.246
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 5ms, Maximum = 18ms, Average = 10ms
C:\Crestron\Simple>

```

Programming Software

Have a question or comment about Crestron software?

Answers to frequently asked questions (FAQs) can be viewed in the Online Help section of the Crestron website (www.crestron.com). To post your own question or view questions you have submitted to Crestron's True Blue Support, log in at <http://support.crestron.com>. First-time users will need to establish a user account.

The following are the earliest useable software version requirements for the PC:

- SIMPL Windows version 2.04.11, or later with Library Update file 232. Requires SIMPL+ Cross Compiler version 1.1.
 - VT Pro-e version 3.1.1.7 or later.
 - Crestron Database version 15.9.9 or later.
 - (Optional) Crestron RoomView™ enterprise version 2.0.0.3.
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NOTE: Crestron recommends that you use the latest software to take advantage of the most recently released features. The latest software is available from the Downloads | Software Updates section of the Crestron website (www.crestron.com). Crestron software and any files on the website are for Authorized Crestron dealers and Crestron Authorized Independent Programmers (CAIP) only. New users may be required to register to obtain access to certain areas of the site (including the FTP site).

NOTE: This section describes basic programming using both SIMPL Windows and VT Pro-e. Additional programming examples are in “C2N-DVP4DI Master Mode Features” on page 56.

Programming with SIMPL Windows

NOTE: The following are acceptable file extensions for programs that include a C2N-DVP4DI, developed for specific control system types:

projectname.smw (source file)
projectname.spz (compiled file for 2-Series)
projectname.usp (source code module for SIMPL+)

NOTE: The following assumes that the reader has knowledge of SIMPL Windows. If not, refer to the extensive help information provided with the software.

SIMPL Windows is the Crestron software for programming Crestron control systems. It provides a well-designed graphical environment with a number of workspaces (i.e., windows) in which a programmer can select, configure, program, test, and monitor a Crestron control system. SIMPL Windows offers drag and drop functionality in a familiar Windows® environment. Digital, analog and serial join numbers are a common thread between VT Pro-e and SIMPL Windows. These numbers define how the objects on a touchpanel page of a VT Pro-e project interface to the outside world, specifically the Cresnet system as defined in the SIMPL Windows program. There are digital join numbers that carry out some predetermined function (a logical high or low); analog join numbers for displaying incremental values, sliders, gauges and bar graphs; and serial join numbers that allow for the display of variable text and transmission/reception of serial commands from other

manufacturers. Unjoined objects are not interfaced with the system and thus cannot initiate any functions.

Signal Types

Signals interconnect the various devices and logic symbols that comprise a SIMPL Windows program. Signals can be one of three types: digital, analog, or serial. For any given signal, the signal type is determined by its driving source. That is, if the symbol that drives the signal has an analog output, then, by definition, the connecting signal is analog.

In SIMPL Windows, the signal types are color-coded as follows:

Digital = Blue

Analog = Red

Serial = Black

Undefined/Other = Green

NOTE: “Other” signals are a combination of the three basic types (e.g., many symbols accept either analog or serial signals where the combination is shown as a green signal). The signal type is displayed on the Status Bar when the signal is highlighted.

For additional information, refer to Doc. 6120, Crestron SIMPL Windows Symbol Guide. It may be downloaded from the Downloads | Product Manuals | Software section of the Crestron website (www.crestron.com).

Digital Signals: A digital signal contains one bit of information and usually takes on one of two values: 1 or 0. These two digits can represent the logical values true and false, and they can be represented in an electronic device by the states of on/off, high/low, and recognized as two voltage levels (Other common descriptors are active/inactive).

Analog Signals: Unlike digital signals, analog signals can vary continuously in value, in the same manner as a parameter such as volume, temperature, or pressure. Analog signals contain 16 bits of information, which means that this type of signal can have values ranging from 0 to 65535 ($2^{16}-1$). This 16-bit property makes analog signals useful for controlling devices that do not have discrete settings, such as volume controllers, pan/tilt head controllers, and lighting dimmers.

Serial Signals: Serial signals are used to facilitate the transmission of serial data (strings of characters). These signals can be generated by incoming data on a COM port or by a symbol that has a serial output, such as a serial I/O symbol.

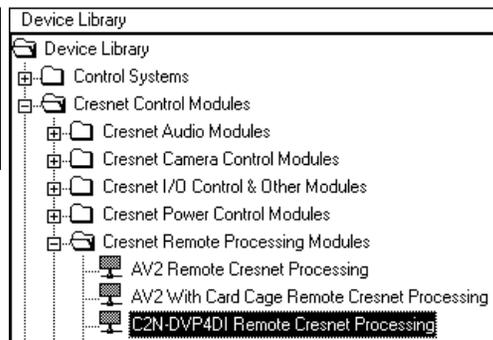
Programming Modes

The C2N-DVP4DI may be utilized two ways to perform different functions: Local Processing mode (master) or Remote Processing mode (Cresnet or Ethernet slave). As shown in the following graphic, the C2N-DVP4DI has been added to SIMPL Windows as a master or slave device.

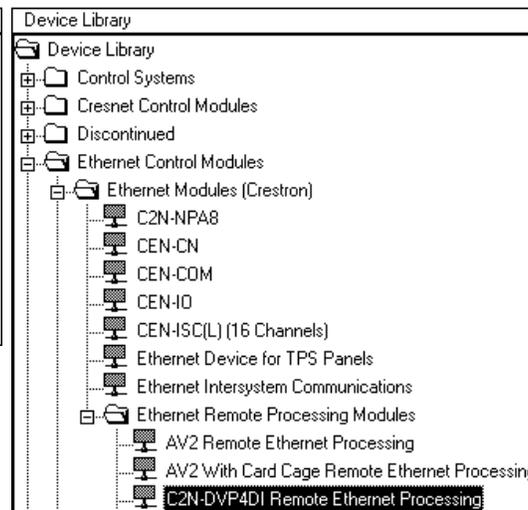
C2N-DVP4DI Master



C2N-DVP4DI Cresnet Slave



C2N-DVP4DI Ethernet Slave



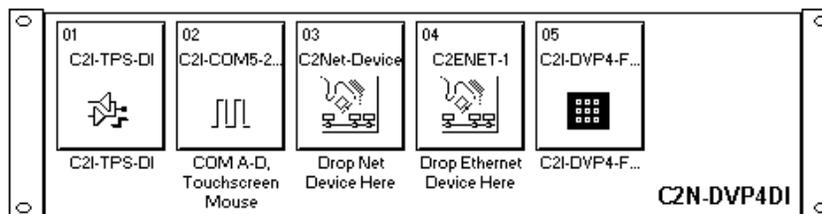
NOTE: The C2N-DVP4DI is set to Cresnet slave mode (ID 54) by default. SIMPL Windows automatically changes NET ID values of a device added to a program if a duplicate device or a device with the same NET ID already exists in the program. Always ensure that the hardware and software settings of the NET ID match. For NET ID hardware settings and details about changing the unit to master mode or Ethernet slave mode, refer to “Interface Menu” in the latest version of the C2N-DVP4DI Operations Guide (Doc. 6112).

Local Processing Mode (Master)

In the Local Processing mode, the C2N-DVP4DI is programmed to access and control its local hardware ports. Use the Configuration Manager workspace (**Project | Configure System**) in SIMPL Windows to select and configure all the devices that need to be included into the system.

Configuration Manager is where programmers “build” a Crestron control system. In Configuration Manager, drag the C2N-DVP4DI from the control systems folder of the *Device Library* and drop it in *System Views*.

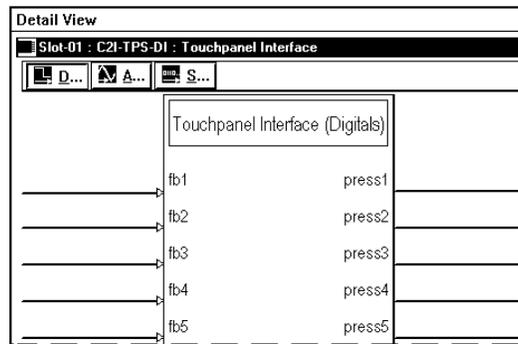
C2N-DVP4DI in SIMPL Windows’ Configuration Manager



Programming Manager is where programmers “program” a Crestron control system by assigning signals to symbols. The following shows the C2N-DVP4DI symbols in the SIMPL Windows Programming Manager.

Slot 1: C2I-TPS-DI

The C2I-TPS-DI slot allows the user to program digital, analog, and serial logic for a built-in touchpanel Interface (TPI). Touchpanel projects created in VT Pro-e are loaded into the compact flash through VT Pro-e or Viewport. Two new Device Extender symbols are available for slot 1 for mouse input and output programming (refer to page 61).

Detail View of the C2N-DVP4DI C2I TPS Symbol in SIMPL Windows' Program Manager

The TPS touchpanel symbol defines the signals for Crestron Ethernet and Cresnet TPS-series touchpanels.

- Maximum Touchpanel Digital joins: 4000
- Maximum Touchpanel Analog joins: 4000
- Maximum Touchpanel Serial joins: 999

Typically, touchscreen layouts are designed in VT Pro-e, where buttons and other objects such as sliders and gauges are assigned join numbers that correspond to their function in the application. The join numbers are equivalent to inputs and outputs, such that when a VT Pro-e project is imported into SIMPL Windows, the previously assigned join numbers appear automatically as defined signals.

Slot 2: C2I-COM5-232

The C2N-DVP4DI provides four ports that enable and configure RS-232 two-way serial communication and logic, and one port for serial mouse and RS-232 touch sensitive devices. To view the ports, expand Slot 2: C2I-COM5-232 is under the C2N-DVP4DI icon on the lower window of *System Views*.

Slot 3: C2Net-Device

The C2Net-Device slot enables the C2N-DVP4DI to control up to 252 Cresnet devices. Each Cresnet device is assigned a unique identifier called a Net ID, which is a hexadecimal value ranging from 03 to FE.

To view the list of supported devices, expand the control system in the bottom pane of *System Views* and double-click the C2Net-Device slot, or right-click and select **Add Item** from the submenu. Supported devices include network control modules and a variety of Crestron wired touchpanels.

To add a device to the system expand the C2Net-Device slot and double-click the desired Net ID, or right click and select **Add Item** from the submenu. Then select the device you want to add. Alternatively, you can drag the device from the Cresnet Modules folder onto the Net ID.

In Program Manager, the C2Net-Device symbol contains no signals; to program a controlled Cresnet device, expand the C2Net-Device symbol in *Program View*. Then drag the device to *Detail View*.

Slot 4: C2ENET-1

The C2ENET-1 port enables the C2N-DVP4DI communication through Ethernet to control up to 252 Ethernet devices. Each Ethernet device is assigned a unique identifier called an IP ID, which is a hexadecimal value ranging from 03 to FE.

To view the list of supported devices, expand the control system in the bottom pane of *System Views* and double-click the C2ENET-1 slot. Supported devices include Ethernet control modules, PC and Web browser interfaces, and a variety of Crestron

Ethernet touchpanels. To add a device to the system expand the C2ENET-1 slot and double-click the desired IP ID, or right-click and select **Add Item** from the submenu. Then select the device you want to add.

In Program Manager, the C2ENET-1 symbol contains no signals; to program a controlled Ethernet device, expand the C2ENET-1 symbol in *Program View*. Then drag the symbol to *Detail View*. (Alternatively, you can double-click the symbol.)

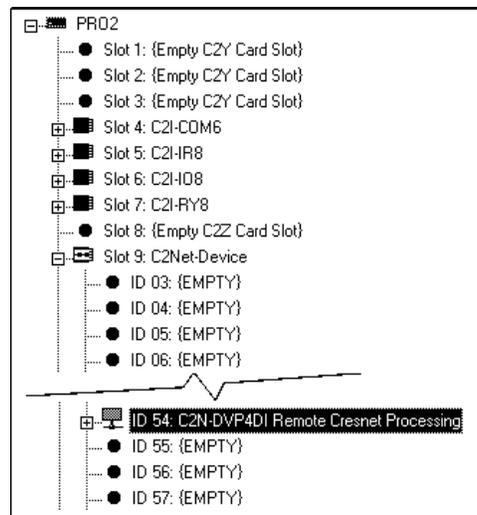
Slot 5: Front Panel

Slot 5 is a physical representation of the built-in front panel. No programming is required.

Remote Processing Mode (Slave Mode)

In the Remote Processing mode, the C2N-DVP4DI does not contain a main control system program. The program is installed in another 2-Series control system acting as the host. The slots and Cresnet devices are accessed solely from the host control system that generates all the proper network packets to control the hardware. For example, to utilize a C2N-DVP4DI as a peripheral for a PRO2, C2N-DVP4DI Remote Cresnet Processing is dropped on the C2Net slot (09) of the PRO2. The C2N-DVP4DI device appears in the *Program View* as ID 54 as shown in the following illustration.

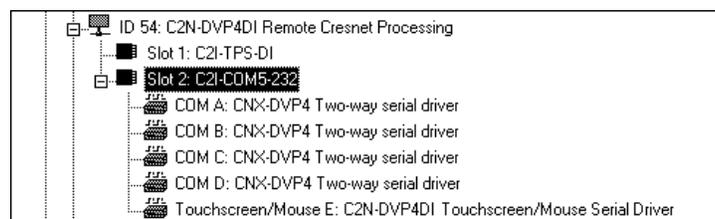
Remote Processing Mode C2N-DVP4DI in SIMPL Windows' Program View of the PRO2



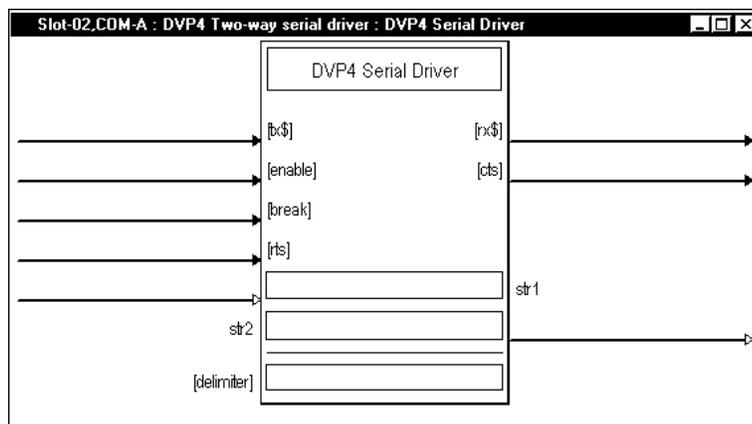
When adding other devices to the system, right-click the device symbol in *System View*, select **Configure**, the *Net ID* tab, and select or enter the desired Net ID.

Slot 2: C2I-COM5-232 of ID 54 contains Ports A-E, C2N-DVP4DI Two-way serial drivers (A-D are for Com 1-4 ports, E is for Touchscreen/Mouse port). To change RS-232 settings, double-click on a port to open the “Device Settings” window.

Slot 2: C2I COM5-232



Detail View of the C2N-DVP4DI Two way Serial Driver Symbol in SIMPL Windows' Programming Manager (Slot 2)



Serial Driver symbols enable serial communication between devices on the Cresnet network, using the RS-232 protocol.

The <tx\$> (transmit) and <rx\$> (receive) signals transmit serial data to and from the COM port in whatever format is specified for the device in Configuration Manager. The protocol that a device expects will be described in the manufacturer's documentation and includes the speed of communication (baud rate), error checking (parity), the number of data bits and stop bits, and any hardware or software handshaking that may be required to control the flow of data between devices.

Some devices require a <break> to enable synchronization. The <break> input drives the transmit pin of the associated COM port low, thus interrupting transmission of data. The C2N-DVP4DI sends out approximately 20 bits of logic low to do a break.

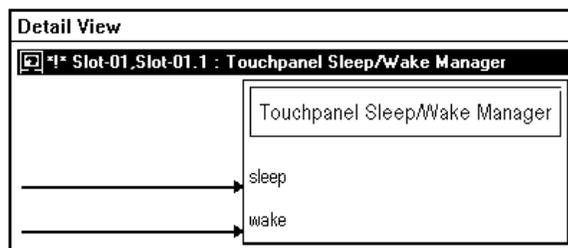
The <rts> (request to send) input and the <cts> (clear to send) output are hardware handshaking signals for use in applications where explicit handshaking control is required. These signals are enabled *only* when the Hardware Handshake setting of the device is set to *None* in Configuration Manager.

For more information, refer to the SIMPL Windows help file.

Standby Timeout

Do not use Standby Timeout to turn off the display if you do not have a mouse or an external touchpanel connected to the mouse port. To get around this, program an external button to initiate sleep mode. A Device Extender symbol is available for this purpose, the Touchpanel Sleep/Wake Manager. To locate this symbol, refer to page 61.

Touchpanel Sleep/Wake Manager Symbol



Converting Programs and Modules Created for Other Systems

SIMPL Windows can convert a program created for another type of control system by simply changing the target to a C2N-DVP4DI.

NOTE: All modules must be 2-Series.

To do this, you can open a SIMPL program that contains a control system other than the C2N-DVP4DI, and then replace the existing control system with the C2N-DVP4DI. That is, drag the C2N-DVP4DI from the control systems folder onto the existing control system in *System Views*, and click **Yes** when prompted to confirm the replacement.

If the program contains SIMPL+ or User modules, the conversion might generate error messages. This is because modules and programs often contain symbols with “ambiguous” signals. For example, the inputs of the Serial to Analog symbol can be defined as either analog or serial. Although X-Generation processors support ambiguous signals, the 2-Series processor requires all signal types to be strictly defined.

If the program you want to convert contains SIMPL+ or User modules, Crestron recommends that you first convert each module before converting the larger program. In this way, the compiler can resolve any ambiguous signals in the modules and minimize errors when the larger program is converted.

If the program contains connections to ports or devices not supported by the C2N-DVP4DI, the conversion finds network devices that match the port operation. If it does not find a match, it reports an error.

Converting SIMPL+ Modules

1. Open the SIMPL+ module you want to convert.
2. Choose the 2-Series processor as the target by clicking the toolbar button, as shown in the graphic.

SIMPL+ Toolbar



NOTE: You can select both X and 2-Series as the targets, so that the module will work for both types of control systems. However, you are limited to SIMPL+ keywords and functions that are supported on both systems. If you do not choose a target, then the module may or may not work, depending on the constructs that are used.

3. Save and compile the module by clicking the **Save and Compile** toolbar button; alternatively, click **Save and Compile** on the **Build** menu (or press **F12**).

Converting User Modules

1. Open the User module you want to convert.
2. Click **Project | Edit Program Header**.

- Click **2-Series** in the *Target Control System Classes* list box.

You can select other types of control systems as well, but then you will be limited to symbols that are supported by all of these platforms. The module may still work on unselected control systems so long as unsupported symbols are not used. Selecting a control system means that you are requiring the module to work there.

After you convert each module in a program, you can convert the program as described previously: drag the C2N-DVP4DI onto the existing control system in System Views and click Yes to confirm the replacement.

For further information about compile-time errors and detailed explanations about working with modules, refer to the SIMPL Windows online help file.

Module Header Information

Module Header Information

Module Hint:

Dealer Name:
Crestron Electronics

Programmer: System Number:

Program Created: 08/20/02 - 08:49:36 AM
Program Last Modified: 08/20/02 - 08:49:38 AM

Compiler Version: Auto Fill

OPS Version: Auto Fill

Module Characteristics

Symbol Tree Category: Target Control System Classes:

Lighting
Media Resource
Memory
Miscellaneous

CresnetII
XGeneration
2-Series

[hold down <CTL> key for multiple selections]

Module Help:

OK Cancel

Example Programs

Example programs for the C2N-DVP4DI are available from the Crestron FTP site: ftp://ftp.crestron.com/examples/sample_page_flip-master.zip.

Creating a C2N-DVP4DI Project with VT Pro-e

VT Pro-e acts as a simulator for creating touchpanel projects and permits the creation of control screen variations incorporating two and three-dimensional graphics and text. A set of pages, which make up a project, can be designed for each C2N-DVP4DI touch-sensitive screen overlay application. Each page contains objects such as custom control graphics, video windows, two and three-dimensional buttons, sliders, and digital readouts which allow the user to interface with the control system. The project is uploaded into the C2N-DVP4DI compact flash. The unit uses the programmed project until another project is uploaded from a PC.

Creating a project for the C2N-DVP4DI is similar to creating a project for a TPS touchpanel. It is recommended that you create a new project rather than copying a touchpanel project to a C2N-DVP4DI. Once you have created a project for the C2N-DVP4DI you can copy pages from the touchpanel to the C2N-DVP4DI.

Comparison of C2N-DVP4DI to TPS Touchpanels

- RGB and video objects are exactly the same on the C2N-DVP4DI; on the TPS touchpanel they are different objects.
- The C2N-DVP4DI can display four different sources plus the background at the same time from 12 different sources and transition the sources seamlessly.
- The C2N-DVP4DI has translucent objects.

- Changing pages on the C2N-DVP4DI does not cause an effect to happen unless a source also changes.
- The C2N-DVP4DI does not support JNR (join Number Remapping).
- The C2N-DVP4DI does not receive Serial Broadcast from indirect text broadcast signal.

When creating a new VT Pro-e project for the C2N-DVP4DI select the C2N-DVP4DI as the *panel type*. Go to **Edit | Project Properties** and select the *Design* tab. Set the Panel size (horizontal/vertical pixels) to the native resolution of your display device. Do this first *before* creating any pages. The output resolution of the C2N-DVP4DI must match the native resolution of your display device, and the VT Pro-e project must match the output resolution of the C2N-DVP4DI. If these resolutions do not match, the video windows will not function properly.

To have the C2N-DVP4DI change an on-screen video source, create pages in VT Pro-e containing a video window, and assign the video properties for the source, size, transition and duration of the effect using the input select and default effect area in the video properties window. When you want another video source to replace the previous video source, page flip to the new page that has the required source. Page flips can be generated from another panel or from a button press on the C2N-DVP4DI. There are other ways to change the source on the screen and are described later in the manual. There is an example VT Pro-e project for the C2N-DVP4DI on page 49.

VT Pro-e Programming Notes for C2N-DVP4DI

- Default transition effects will not occur if a value has been entered in analog value, or if the sources are on-screen and are changing size and/or position.
- The analog value transition overrides the default transition effect. You must zero out (0) the analog value to allow the default transition to take effect.
- If you do a page flip or sub-page to another page that has the same sources, and they are the same size and/or position, the C2N-DVP4DI will not change or disturb that source even if you programmed a different transition or duration on that page or sub-page. This is an important difference between the C2N-DVP4DI and a TPS touchpanel.
- If the page flip or sub-page has a new source, it transitions the new source on but makes no change to the existing sources if they are to remain on screen.
- If only the size and/or position are changed on the video source window, the C2N-DVP4DI will not perform the programmed default transition effect. It will either perform the stretch effect or a fade off / fade on to the new size and/or position, depending on the source. Refer to “RGB and Video Options” in the C2N-DVP4DI Operations Guide (Doc. 6112) for more information.
- The vertical frequency for RGB sources must be the same as the C2N-DVP4DI output vertical frequency to perform the stretch effect. If the vertical frequencies do not match, the C2N-DVP4DI defaults to the fade down / fade up effect, overriding the SETUP | OPTION setting. Video sources are scaled to the C2N-DVP4DI output resolution and frequency to allow the stretch effect to work.
- Changing an analog join transition or an analog join duration does not take effect on the screen until a source change occurs. It does not drive the current source to redraw with this new effect.

- There are four RGB, twelve composite video and four component video sources available, but the C2N-DVP4DI only displays four sources at the same time. If you have programmed four sources to display, and are changing to just one source, a fifth source is required. (If you use the same video more than once, it is still counted as a separate source.) The C2N-DVP4DI will fade down one of the existing four sources, depending on the source selected, and then transition the new source on, while removing the existing sources.
- The Video/RGB Windows on the C2N-DVP4DI are not unique. You can use either the RGB or video object for RGB, S-video, component, and composite.
- The background graphic and color are always drawn first, followed by the video object. Any other objects are placed on top. This includes the backgrounds of sub-pages. The order of object placement is the same as in VT Pro-e.
- The project resolution must be the same as the output resolution of the C2N-DVP4DI for video to function correctly. Example: 800 x 600 on both the output of the C2N-DVP4DI and the VT Pro-e Project.
- If you change the output resolution of the C2N-DVP4DI, then you must recalibrate the touch input.

Configuring Video Windows

Video windows created on a page can be configured using the Video Properties option. Once a video window is created using the **Draw | RGB** window  or **Draw | Video** window  options, double-click the video window to open “RGB Video Properties” or “Video Properties” so you can configure the window.

Joins – are analog values that allow the user to select different video sources, transition durations, and transition effects and directions, using *analog* joins to be displayed on one video window (overrides the set defaults in VT Pro-e). You may also use joins to change source, transition and duration. The primary advantage of using joins in this manner comes from the fact that the C2N-DVP4DI does not have to load a background page first as in a page flip or a sub page. The source change occurs rapidly after the digital press.

NOTE: Overriding analog join numbers can result in two pages with the same join number. In this case, page flips between them will not function.

Changing Size and Position of Video and/or RGB Sources using Analog Joins

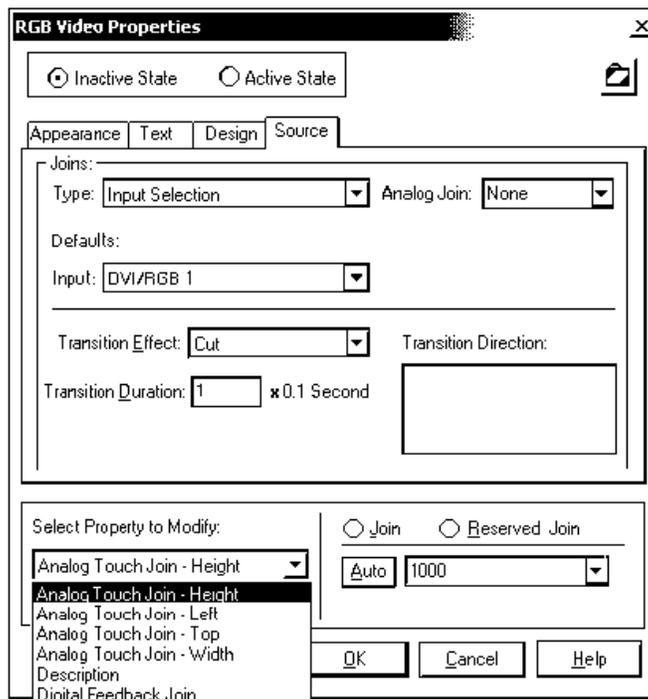
The C2N-DVP4DI has the ability to change the size and position of any video/RGB window on command. Use VT Pro-e to change the window size and position on-the-fly by programming analog join numbers for height, width, left, and top. These selections are under the *Select Property to Modify* located in the lower left corner of the *Source* tab in of the *RGB Video Properties* window. This property affects RGB, DVI, composite, S-video and component video.

Procedure

1. Draw a video or an RGB window.
2. Select the properties for that object.

- In the lower left hand corner of the window use the pull-down menu under *Select Property to Modify* and assign an analog value for height, left, top and width.

“RGB Video Properties” Window



Analog Touch Join - Height adjusts the vertical size of the video/RGB image. Place an analog join number in the box.

NOTE: The maximum analog height value that can be assigned in the SIMPL Windows program is the vertical resolution of the C2N-DVP4DI output in pixels, not the input resolution of the source. If an analog value of zero is sent to this analog join number, the C2N-DVP4DI will not display the video; it is too small to see. You cannot have a value less than zero.

Analog Touch Join - Left adjusts the horizontal position of the video.

The minimum analog left value that can be assigned in the SIMPL Windows program is zero. This positions the video image on the left edge of the display. The maximum analog value is the horizontal resolution minus the horizontal size of the image displayed. As you move the image to the right edge of the display, the C2N-DVP4DI rescales the image to fit the new size. The C2N-DVP4DI will not allow the image to be off screen.

Analog Touch Join - Top adjusts the vertical position of the video. The minimum analog Top value assigned in the SIMPL Windows program is zero. An analog value of zero places the video image on the top edge of the display. The maximum analog value is the vertical resolution minus the vertical size of the image displayed.

As you move the image past the bottom edge of the display, the C2N-DVP4DI rescales the image to fit the new size and does not allow the image should be off the screen. You cannot have a value less than zero.

NOTE: The video size must fit within the horizontal and vertical position. If, for example, you set the video image value to full screen, but set a horizontal and vertical offset value of ten, the video image on the screen will not be full screen.

The C2N-DVP4DI moves the image ten pixels down and ten pixels to the right. Then the C2N-DVP4DI scales the image to fit on the remainder of the screen. In this case, set the horizontal and vertical offset to zero.

Analog Touch Join - Width adjusts the horizontal size of the video. The C2N-DVP4DI will not display the video if you enter an analog value of zero. The maximum value assigned to Width is the horizontal resolution of the C2N-DVP4DI output, not the input resolution.

Analog Initialize Value

When you assign an analog value to height and width, you must also assign an analog initialize value to that analog join number in SIMPL Windows. Without an analog initialize value, video will not be present when you do a page flip or sub page.

An analog value of zero has an image size of zero pixels for height and width.

If you also want the video to appear in a particular position on the screen, you must set the top and left position values in an analog initialize. If no analog value is assigned, the C2N-DVP4DI defaults to the upper left corner of the screen, regardless of where you have drawn the window location in VT Pro-e.

NOTE: When drawing a two-dimensional slider to control the size and position of the video, the first analog number is for the horizontal axis and the second number is for the vertical axis.

Aspect Ratios

Maintain the proper aspect ratio when setting the initialize values. Refer to page 97 for additional information on aspect ratios.

- To maintain a 4 X 3 aspect ratio, multiply the height by 1.33.
- To maintain a 16 X 9 aspect ratio, multiply the height by 1.78

Example: Assuming the height is 100:

Aspect Ratio	Height	Width
4 X 3	100	133
16 X 9	100	178

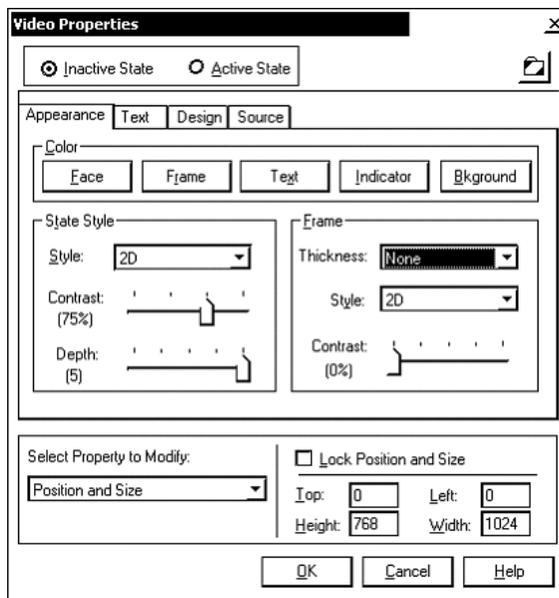
Assigning a Source, Transition and Duration

There are two ways to assign a source, transition and duration (timing) default analog value:

- **Defaults** – allows the user to assign the video source, transition or timing to be used when a page flip, digital logic join or sub page is activated. The selection can be overwritten with analog joins (refer to “Changing Size and Position using Analog Joins” on page 37).
- **Select Properties** – allows the user to select the size and position of a video window, digital feedback joins (used for diagnostics), and allows the user to enter a project description in the *Description* field.

For additional software information, consult the VT Pro-e help file.

Appearance Tab



Selecting a Video Source Effect and Duration

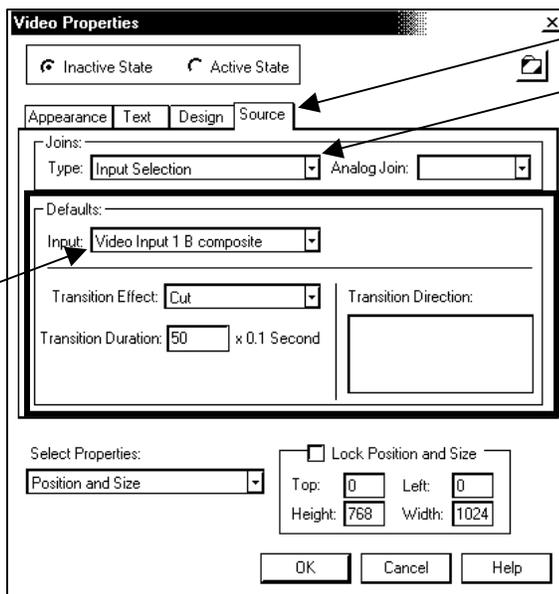
There are two ways of selecting a video source.

1. Page flips or sub-pages with video objects on the page.
2. Using analog values to change sources.

The following describes the second method of using analog values to select sources.

Source Tab in the "Video Properties" Window

- DVI/RGB 1
- DVI/RGB 2
- DVI/RGB 3
- DVI/RGB 4
- S-Video input 1 (Y&C)
- S-Video input 2 (Y&C)
- S-Video input 3 (Y&C)
- S-Video input 4 (Y&C)
- Video Input 1A composite
- Video Input 2A composite
- Video Input 3A composite
- Video Input 4A composite
- Video Input 1B composite
- Video Input 2B composite
- Video Input 3B composite
- Video Input 4B composite
- Video Input 1C composite
- Video Input 2C composite
- Video Input 3C composite
- Video Input 4C composite
- Component Video 1 (YPbPr)
- Component Video 2 (YPbPr)
- Component Video 3 (YPbPr)
- Component Video 4 (YPbPr)



Source Tab

Analog Input Selection,
Transition Duration
Transition Effect and
Direction

Default Input
Selection,
Transition and
Duration

The *Source* tab provides options for selecting video sources and controlling how the video window appears on the screen.

Three sets of analog join numbers are assigned for each video effect.

- Input Selection (assign join number for source)
- Transition Duration (assign join number for effect time)

- Transition Effect and Direction (assign join number for effect type and movement).

The *Defaults* area lets you specify the default video source for the selected type, if available.

Analog Values for Input Selection

When an analog join number is assigned to an input selection, setting the analog joins value at runtime to the following values selects the corresponding input. Returning the value to zero will return to the default input. The following analog values correspond to each input video type.

Analog Values for Input Selection

ANALOG VALUE	VIDEO INPUT TYPE	ANALOG VALUE	VIDEO INPUT TYPE
1	DVI/RGB1	12	Video Input 2B
2	DVI/RGB2	18	Video Input 2C
3	DVI/RGB3	13	Video Input 3A
4	DVI/RGB4	14	Video Input 3B
5	S-video Input 1	19	Video Input 3C
6	S-video Input 2	15	Video Input 4A
7	S-video Input 3	16	Video Input 4B
8	S-video Input 4	20	Video Input 4C
9	Video Input 1A	21	Component 1
10	Video Input 1B	22	Component 2
17	Video Input 1C	23	Component 3
11	Video Input 2A	24	Component 4

The *Transition Effect* list gives options for the appearance of the video window on the screen. Depending on the chosen effect, you will have additional options for specifying duration and direction. For example, if you select *Pan* as the transition effect, then you must select a duration and a direction for the panning. This causes the video window to pan across the screen at the specified speed and direction when the video window is drawn.

The default values are overridden by using the *Analog Join* area to set analog join numbers for Input Selection, Transition Duration and Transition Effect and Direction.

First select the join type from the *Type* list, i.e., **Input Selection**. Then assign its analog join number from the *Analog Join* field. This analog join will appear as an analog feedback signal in the touchpanel definition. The value of the signal determines the video source or transition effect. For example, to select **S-Video Input 1** as the video source, the analog join for Input Selection is set to a value of 5d ('5' represents the analog value for **S-Video Input 1** and 'd' represents the decimal value). To cause the video window to pan from right to left (east to west), the analog join for **Transition Effect and Duration** is set to a value of 1336d.

Video Source Effect/Direction and Duration Join Values

The primary advantage to using analog value source switching is a much faster switch time compared to loading backgrounds.

Each video effect requires three different analog join numbers:

- An analog join number to specify the effect (cut, zoom, pan, dissolve, reveal)

- An analog join number to specify the direction of the effect (compass direction)
- An analog join number to specify the duration of the effect (seconds)

These unique numbers are assigned in the “Video Properties” window and on the corresponding touchpanel joins for each video effect, each direction, and each duration time.

The following describes each C2N-DVP4DI video effect. Window movement is selectable for the Pan and Reveal effects only.

NOTE: A selected direction indicates that the movement or exposing of a window is toward the selected direction. For example, for the Pan effect, selecting N (north) moves the window on screen from south toward the north.

NOTE: Video sources go on and off using the same effect.

Pan

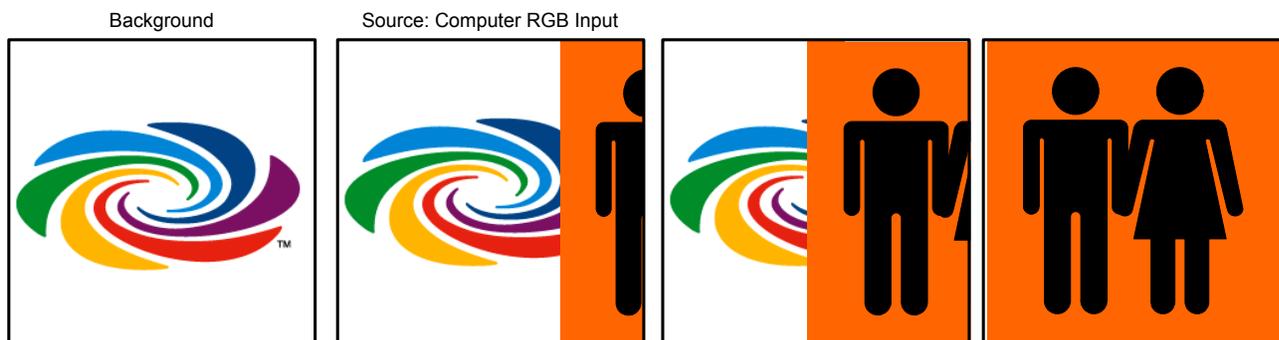
Moves a video window from off to on screen. The direction of movement is selectable (W, N, or NW). When another page is selected, the movement of the window from on to off screen is in the opposite direction.

W – window moves on screen in an east to west direction

N – window moves on screen in a south to north direction

NW – window moves on screen in a southeast to northwest direction

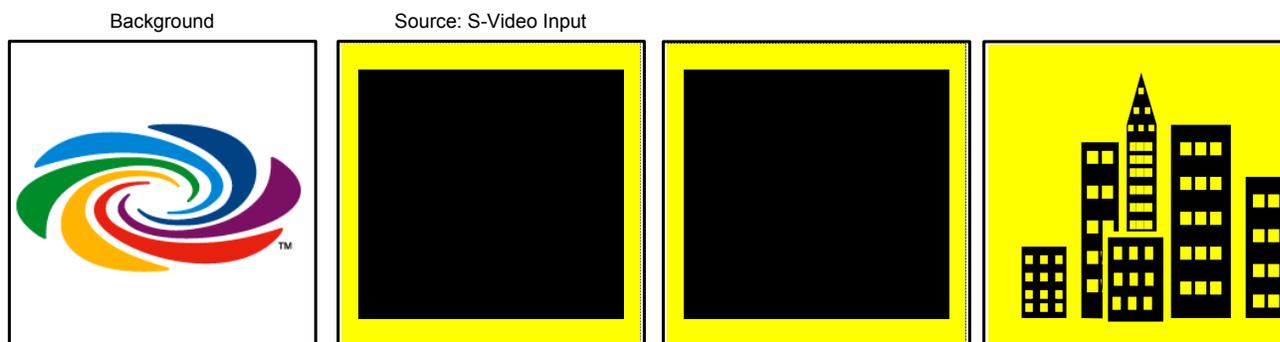
Pan Video On-Screen (From the East)



Dissolve

Window fades in, and when a different page is selected, the window fades out.

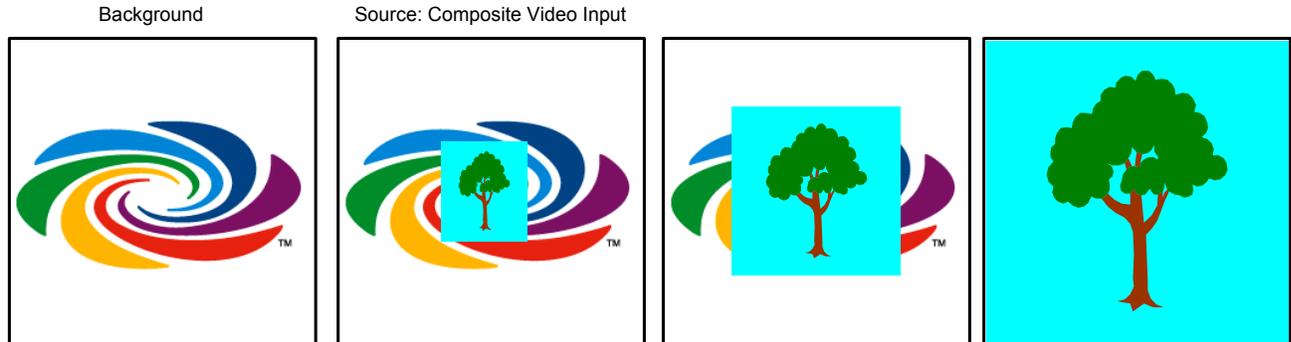
Dissolve (Fade-In On-Screen)



Zoom

Window spirals in from a tiny dot to the selected size, and when another page is selected, the opposite occurs.

Zoom Video On-Screen

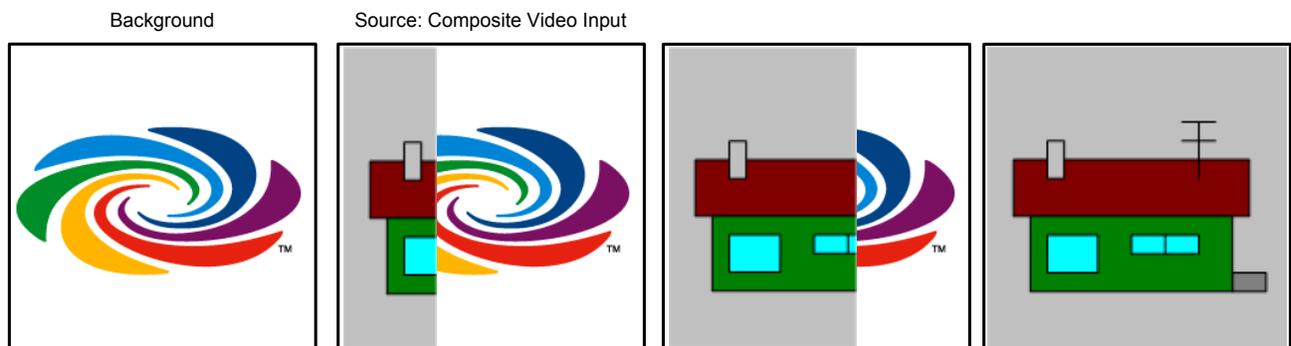


Reveal

Window is exposed from a selectable (N, S, E or W) direction. When another page is selected, the window closes in the opposite direction. To illustrate this, the effect would look like you were pulling down a projector screen handle to expose the projector screen.

- N – exposes from the south
- E – exposes from the west
- S – exposes from the north
- W – exposes from the east

Reveal Video On-Screen (From the West)

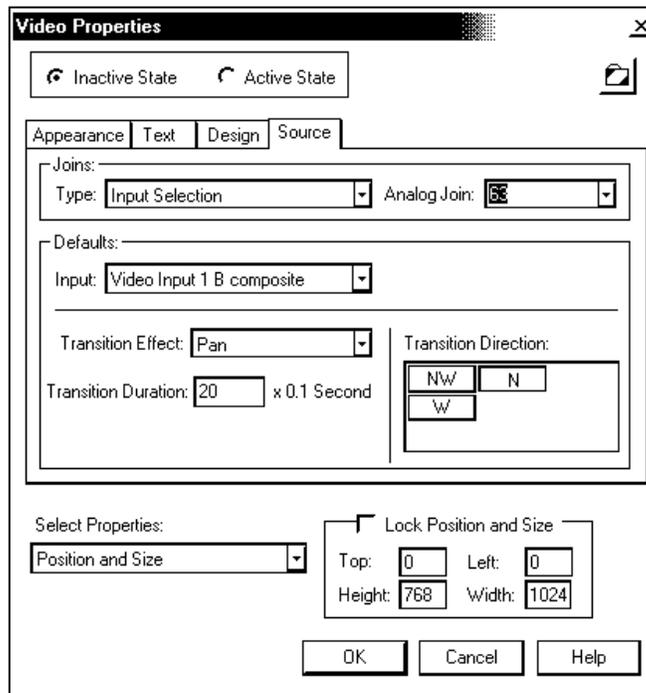


Analog Input Select, Transition and Duration

The following steps are required to properly set up each video effect. The Pan effect is used as an example.

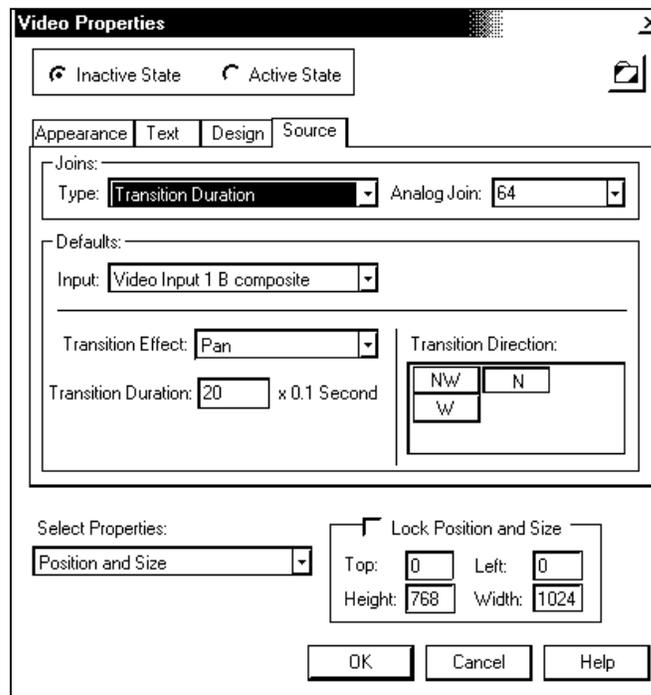
1. In VT Pro-e, in the “Video Properties” window, under the *Source* tab, select the type of join: **Input Selection, Transition Duration, or Transition Effect and Direction.**
2. Assign a unique analog join number.

Join Type Selection (Example: Input Selection, Pan Effect, Join Number 63 Assigned)



3. Select the **Transition Duration** join and assign a unique analog join number.

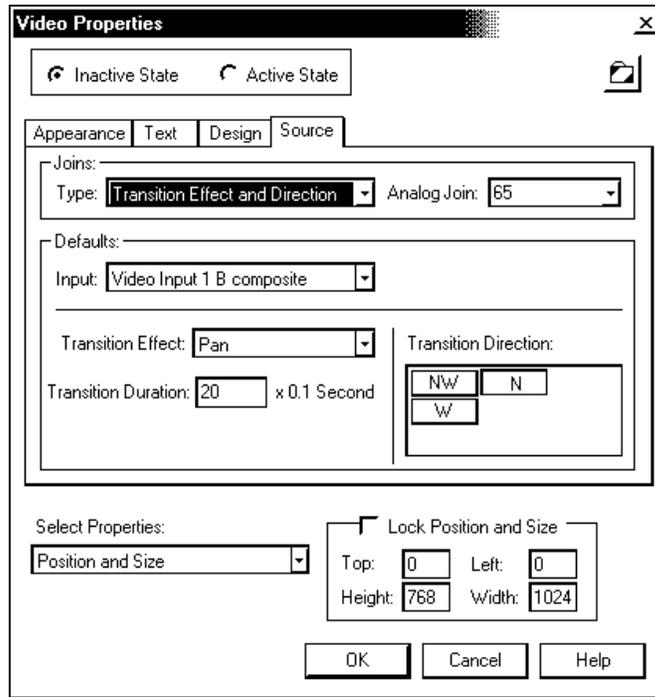
Join Type Selection (Example: Pan Effect, Transition Duration, Join Number 64 Assigned)



4. Select the **Transition Effect and Direction** and assign a unique analog join number.

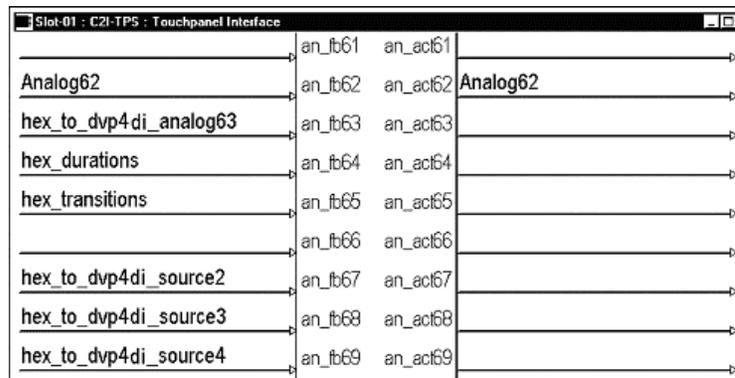
Join Type Selection

(Example: Pan Effect, Transition Effect and Duration, Join Number 65 Assigned)



- Assign these analog numbers (63, 64, 65) to the touchpanel.

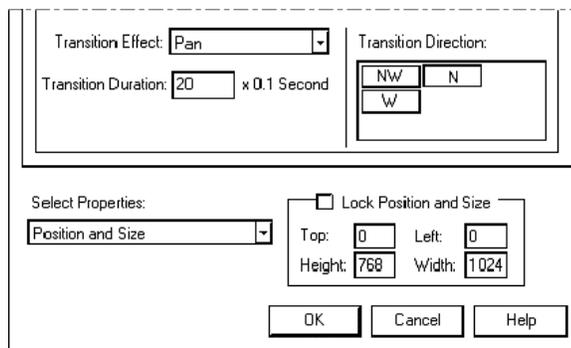
Touchpanel Symbol with Analog Join Number Assigned for Pan Effect.



Video Effect Details

Pan

Pan Selection



The pan effect allows you to set duration and direction.

Increases are made in 1/10 sec. increments, i.e. a value of 50 x 1/10 = 5 sec. (max. = 10 sec.)

VIDEO SOURCE EFFECT	DIRECTION VALUE	DURATION VALUE
Pan North	1333	0-100
Pan Northwest	1336	0-100
Pan West	1332	0-100

Cut and Zoom

Cut and Zoom Selection

NOTE: Cut and zoom are fixed in duration and direction values.

VIDEO SOURCE EFFECT	DIRECTION VALUE	DURATION VALUE
Cut	1000 (fixed)	0 (fixed)
Zoom	1400 (fixed)	50 (fixed)

Dissolve

Dissolve Selection

The dissolve effect allows you to set the duration.

Increases are made in 1/10 sec. increments, i.e. a value of 50 x 1/10 = 5 sec. (max. = 10 sec.)

VIDEO SOURCE EFFECT	DIRECTION VALUE	DURATION VALUE
Dissolve	1100 (fixed)	0-100

Reveal

Reveal Selection

The reveal effect allows duration and direction settings.

Increases are made in 1/10 sec. increments, i.e. a value of 50 x 1/10 = 5 sec. (max. = 10 sec.)

VIDEO SOURCE EFFECT	DIRECTION VALUE	DURATION VALUE
Reveal East	1230	0-100
Reveal South	1231	0-100
Reveal West	1232	0-100
Reveal North	1233	0-100

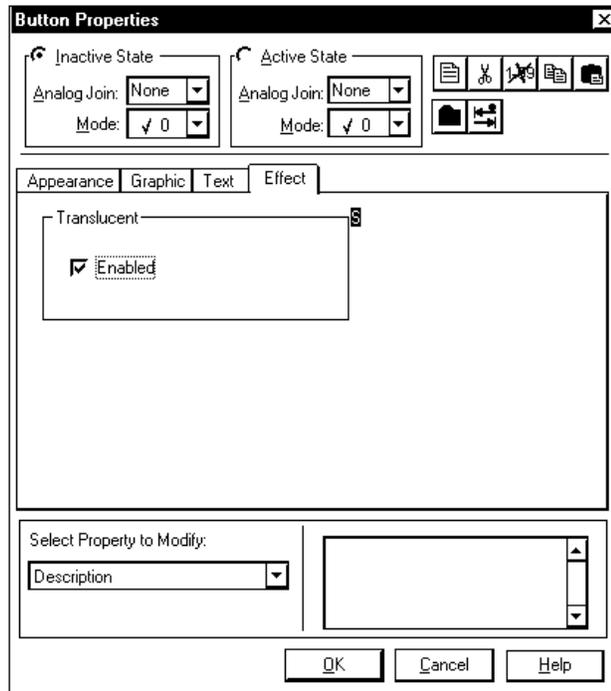
NOTE: You can override fixed transitions and durations by assigning an analog join number to the transition or duration in VT Pro-e. Also, in SIMPL Windows, create a project using analog initializers to change the transitions and/or durations. An analog transition or duration does not take effect until a new source is selected or a new page is drawn.

Translucent Objects

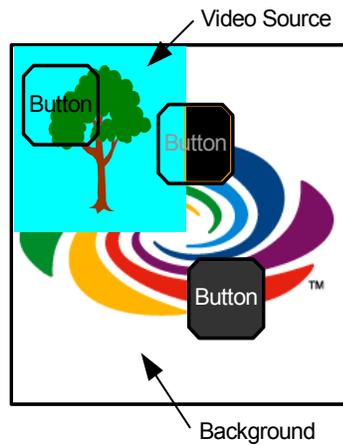
The quality of translucency allows any object in your project to be seen through to the video source below. This object quality is selected in VT Pro-e. The amount (percentage) of see-through is set in this menu.

To program for translucency in VT Pro-e, double click on the object for which you require translucency. The properties window for the object appears. Select the *Effect* Tab and enable *Translucent*. Save and compile the project and download to the C2N-DVP4DI.

Button Properties - Translucent



Button Translucency



Translucency only works for objects that are over video objects (RGB, DVI, or Video) and not over the background or other objects. For example: A translucent button placed halfway over a video source is only translucent over the video portion. The half of the button that is *not* over a video source is opaque. Translucent objects are opaque if no video source is present.

Rules for Backgrounds, Video Windows, Objects and Subpages

The following are the rules for layering backgrounds, video windows and objects in a C2N-DVP4DI VT Pro-e project.

Backgrounds – A background on a page is always the back layer. It cannot be moved in front of video windows or objects.

Video Windows – Video windows are always on top of backgrounds. They cannot be moved in front of objects.

Objects (buttons, etc.) – Objects are always on top of video windows and backgrounds. They cannot be moved behind video windows and backgrounds.

Subpages – A subpage background is always in the back layer. It does not move in front of the video window on the main page, but is in front of the main page's background when it appears. Objects are always on top. The subpages are displayed in the order in which the digital feedback occurs. This permits you to place any subpage on top of any other subpage.

NOTE: If the C2N-DVP4DI is a slave and power is lost for some reason, when you return to the page, the order of the subpages will be lowest join number to highest join number (the highest join number on top). The subpage order does not follow the order in VT Pro-e.

Example VT Pro-e Project

The following procedure is designed to demonstrate C2N-DVP4DI video effect capabilities. Once the compiled program is loaded in the C2N-DVP4DI, the main video screen opens with a pan effect; the subsequent screen contains four video windows, each window displaying a different effect. For effect descriptions, refer to “Selecting a Video Source Effect and Duration” on page 40.

Prerequisites

For this example, we explicitly need video sources 1A and 2A. We also need RGB sources on DVI/RGB1 and DVI/RGB3.

- Display device connected to the output DVI/RGB port. If display connector is RGB, use the supplied DVI/RGB adapter.
- Video inputs connected to the input DVI/RGB, S-video, component or Composite sources. If video source connector is RGB, use the supplied DVI/RGB adapter.
- Cresnet power (from Cresnet power supply) connected to the Cresnet port.
- Serial mouse connected to the touchscreen/mouse port, if applicable.
- PC connected (using computer com port) to the C2N-DVP4DI (VT Pro-e and Viewport open).
- C2N-DVP4DI in master mode, video input/output setup complete (refer to “Configuring the C2N-DVP4DI” in the latest version of the C2N-DVP4DI Operations Guide (Doc. 6112).

Procedure

NOTE: This procedure uses four different video sources (DVI/RGB 1, DVI/RGB 3, Video Input 1A composite and Video 2A Input composite).

NOTE: If more than four video windows are drawn on a page, one of the windows will not display video (only a background image appears). Also, if two video windows have the same RGB video source assigned to them, only one of the windows displays the RGB video source.

1. Open VT-Pro-e and select **New | Project** from the **File** menu. The “Name New Project File As” window appears.
2. Select the C2N-DVP4DI as panel type.
3. Name the project (we suggest C2N-DVP4DI) in the *File Name* field and click **Create**. The new project is created.
4. Select **Edit | Project Properties** and select the resolution (for this example select 1024 x 768 in the *Page Size* field) to match the display device.
5. Select **File | New | Page** to open the “Enter New Page Name” window.
6. Type **Start** and click **OK**. The “Start” page appears.
7. Click  (**Draw Video** icon) and drag the crosshair to open a video window on the “Start” page.
8. Double-click the video window to open the “Video Properties” window.
9. Configure the video window using the following, click **OK** when finished.

Design Tab	Source Tab
Set Size: Full Screen	Default Input: Video Input 1A composite Transition Effect: Pan Transition Duration: 20 Transition Direction: NW

10. Click  (**Draw Button** icon) and drag the crosshair to open a button on the “Start” page.
11. Drag the button and place it in the lower left hand corner of the “Start” page.
12. Double-click the button to open the “Button Properties” window.
13. Configure the button using the following, click **OK** when finished.

Appearance Tab	Text Tab
Color: Face: Transparent	Text Entry: Quad

14. Select **File | New | Page** to open the “Enter New Page Name” window.
15. Type Quad and click **OK**. The “Quad” page appears.
16. Click  (**Draw Video** icon) and drag the crosshair to open a video window on the “Quad” page.
17. Double-click the video window to open the “Video Properties” window.
18. Configure the video window using the following, click **OK** when finished.

Design Tab	Source Tab
Set Size: 1/4 Screen	Defaults: Input: Video Input 1A composite Transition Effect: Reveal Transition Duration: 20 Transition Direction: W

19. Place the window in the upper left-hand corner of the page.
20. Select the video window and press **Ctrl+C** and **Ctrl+V** on the keyboard to copy and paste the window.
21. Place the window in the upper right-hand corner of the page.
22. Double-click the video window to open the “Video Properties” window.
23. Configure the video window using the following, click **OK** when finished.

Design Tab	Source Tab
Set Size: 1/4 Screen	Defaults: Input: DVI/RGB 1 Transition Effect: Dissolve Transition Duration: 20

24. Select a video window and press **Ctrl+C** and **Ctrl+V** on the keyboard to copy and paste the window.
25. Place the window in the lower left-hand corner of the page.
26. Double-click the video window to open the “Video Properties” window.
27. Configure the video window using the following, click **OK** when finished.

Design Tab	Source Tab
Set Size: 1/4 Screen	Defaults: Input: Video Input component 2 Transition Effect: Pan Transition Duration: 20 Transition Direction: N

28. Select a video window and press **Ctrl+C** and **Ctrl+V** on the keyboard to copy and paste the window.
29. Place the window in the lower right-hand corner of the page.
30. Double-click the video window to open the “Video Properties” window.
31. Configure the video window using the following, click **OK** when finished.

Design Tab	Source Tab
Set Size: 1/4 Screen	Defaults: Input: DVI/RGB 3 Transition Effect: Zoom

32. Click  (**Draw Button** icon) and drag the crosshair to open a button on the “QUAD” page.
33. Drag the button and place it in the lower left hand corner of the “Quad” page.
34. Double-click the button to open the “Button Properties” window.
35. Configure the button using the following, click **OK** when finished.

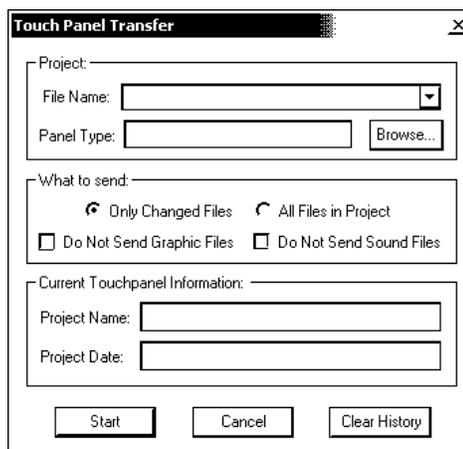
Appearance Tab	Text Tab
Color: Face: Transparent	Text Entry: Return Select Properties: Page Flip Page Flip: Return

36. Select the “Start” page.
37. Make sure the “Start” page is marked as first in the project.
38. Select **File | Compile Project**.

Uploading VT Pro-e Projects to the C2N-DVP4DI

Since the C2N-DVP4DI can operate as a touchpanel interface, you can upload VT Pro-e projects directly to it. Projects are loaded in the compact flash memory. Compiled projects are contained in VTZ files. You must be connected to another control system to upload projects when in the slave mode. Use the following instructions to upload a project:

1. Open VT Pro-e and click the **Upload Project** icon  on the toolbar, (or click **File | Upload Project**), or Open Viewport, establish communication with the C2N-DVP4DI (refer to “Establishing Communications” in the latest version of the C2N-DVP4DI Operations Guide, Doc. 6112) and click **File Transfer | Send Touchpanel** or press **Alt+T**.
2. Select the network ID of the C2N-DVP4DI, as set in SIMPL Windows, from the drop-down list.
3. Browse to VTZ file to be uploaded and choose the pages to send to the C2N-DVP4DI. The choices are as follows:



- **All Files in Project:** sends the entire project.
- **Only Changed Files:** sends only those files in the project that have changed. **NOTE** that if any pages in the panel are not present in the project, those pages will be deleted from the panel.
- Additional choices include **Do not send graphic files** and **Do not send sound files**. These are often very large files that need not be reloaded with every transfer.

Reserved Join Numbers

A reserved join number is a feature of the software that enables a designer to create a button on a VT Pro-e page that either calls up the SYSTEM SETUP MENU, adjusts standby timeout, etc. These numbers also allow the control system to trigger touch-sensitive screen overlay functions (i.e., recall RGB preset when source changes). The

tables shown below and on the next three pages provide lists of digital and analog reserved join numbers available within the software.

NOTE: Join Number Remapping (JNR) is not available on C2N-DVP4DI.

NOTE: VT Pro-e/C2N-DVP4DI projects require compact flash.

Calibration: Input Selection Digital Reserved Join Numbers

JOIN NUMBER	FUNCTION	VALUE
19041	DVI/RGB 1	Selected
19042	DVI/RGB 2	Selected
19043	DVI/RGB 3	Selected
19044	DVI/RGB 4	Selected
19045	S-video 1 (Y&C)	Selected
19046	S-video 2 (Y&C)	Selected
19047	S-video 3 (Y&C)	Selected
19048	S-video 4 (Y&C)	Selected
19049	Video 1A (Composite)	Selected
19050	Video 1B (Composite)	Selected
19051	Video 2A (Composite)	Selected
19052	Video 2B (Composite)	Selected
19053	Video 3A (Composite)	Selected
19054	Video 3B (Composite)	Selected
19055	Video 4A (Composite)	Selected
19056	Video 4B (Composite)	Selected
19151	RGB Video Calibrate	RGB Video Input Auto Calibration on the RGB source that is displayed
19161	Video 1C (Composite)	Selected
19162	Video 2C (Composite)	Selected
19163	Video 3C (Composite)	Selected
19164	Video 4C (Composite)	Selected
19165	Video 1 (Component)	Selected
19166	Video 2 (Component)	Selected
19167	Video 3 (Component)	Selected
19168	Video 4 (Component)	Selected

NOTE: First select the desired input above, and then trigger the desired function from the following charts. When done with Calibration, use "Exit Setup" or "Exit Calibration".

Calibration: RGB Sync Lock Digital Reserved Join Numbers

JOIN NUMBER	FUNCTION	VALUE
19209	RGB Coarse Lock	Increase
19210	RGB Coarse Lock	Decrease
19211	RGB Fine Lock	Increase
19212	RGB Fine Lock	Decrease
19227	Sync Lock	Restore Factory Default

Calibration: RGB Sync Lock Analog Reserved Join Numbers

JOIN NUMBER	FUNCTION
19109	RGB Coarse Lock
19110	RGB Coarse Lock (Signed Digital Gauge)
19111	RGB Fine Lock
19112	RGB Fine Lock (Signed Digital Gauge)

Calibration: RGB/Video Color Digital Reserved Join Numbers

JOIN NUMBER	FUNCTION	VALUE
19219	RGB/Video Brightness	Increase
19220	RGB/Video Brightness	Decrease
19221	RGB/Video Contrast	Increase
19222	RGB/Video Contrast	Decrease
19213	RGB Red/Video Saturation	Increase
19214	RGB Red/Video Saturation	Decrease
19215	RGB Green/Video Hue	Increase
19216	RGB Green/Video Hue	Decrease
19217	RGB Blue	Increase
19218	RGB Blue	Decrease
19230	RGB/Video Color	Restore Factory Default

Calibration: RGB/Video Color Analog Reserved Join Numbers

JOIN NUMBER	FUNCTION
19119	RGB/Video Brightness
19120	RGB/Video Brightness (Signed Digital Gauge)
19121	RGB/Video Contrast
19122	RGB/Video Contrast (Signed Digital Gauge)
19113	RGB Red/Video Gain
19114	RGB Red/Video Gain (Signed Digital Gauge)
19115	RGB Green/Video Gain
19116	RGB Green/Video Gain (Signed Digital Gauge)
19117	RGB Blue/Video Gain
19117	RGB Blue/Video Gain (Signed Digital Gauge)

Calibration: Position and Size Digital Reserved Join Numbers

JOIN NUMBER	FUNCTION	VALUE
19201	Horizontal Position	Move Right
19202	Horizontal Position	Move Left
19203	Vertical Position	Move Up
19204	Vertical Position	Move Down
19205	Horizontal Size	Increase
19206	Horizontal Size	Decrease
19207	Vertical Size	Increase
19208	Vertical Size	Decrease
19228	Position Default	Restore Factory Default
19229	Size Default	Restore Factory Default

Calibration: Position and Size Analog Reserved Join Numbers

JOIN NUMBER	FUNCTION
19101	Horizontal Position
19102	Horizontal Position (Signed Digital Gauge)
19103	Vertical Position
19104	Vertical Position (Signed Digital Gauge)
19105	Horizontal Size
19106	Horizontal Size (Signed Digital Gauge)
19107	Vertical Size
19108	Vertical Size (Signed Digital Gauge)

System Digital Reserved Join Numbers for the C2N-DVP4DI

JOIN NUMBER	FUNCTION	VALUE
17214	Cresnet ID	Down
17215	Cresnet ID	Up
17231	Standby Timeout	Up
17232	Standby Timeout	Down
17242	System Setup Menu	Enter Setup
17235	Exit Setup	Exit Setup and Reboot
19017	Exit Calibration	Return to Program

System Analog Reserved Join Numbers for the C2N-DVP4DI

JOIN NUMBER	FUNCTION
17200	Cresnet ID (Hex Gauge)
17203	Standby Timeout
19000	Translucency

Calibration: Preset Digital Reserved Join Numbers

NOTE: Join Numbers 19081 through 19112 correspond to Preset 1 through Preset 32, sequentially.

JOIN NUMBER	FUNCTION	VALUE
19113	Preset	Recall
19114	Preset	Clear
19115	Preset	Save

Ethernet Port Reserved Join Numbers

JOIN NUMBER	FUNCTION	VALUE
17401	Ethernet Port	On
17402	Ethernet Port	Off

RS-232 Reserved Join Numbers

JOIN NUMBER	FUNCTION	VALUE
17600	RS-232 Port Baud Rate	115200
17601	RS-232 Port Baud Rate	57600
17602	RS-232 Port Baud Rate	38400
17603	RS-232 Port Baud Rate	19200
17604	RS-232 Port Baud Rate	9600
17605	RS-232 Port Baud Rate	4800
17606	RS-232 Port Baud Rate	2400
17607	RS-232 Port Baud Rate	1200
17608	RS-232 Port Baud Rate	600
17609	RS-232 Port Baud Rate	300

Telestrator Reserved Join Numbers

JOIN NUMBER	FUNCTION
19180	TELESTRATE_ENABLE
19181	TELESTRATE_DISABLE
19182	TELESTRATE_CLEAR
19183	TELESTRATE_BRUSH_THIN
19184	TELESTRATE_BRUSH_MED
19185	TELESTRATE_BRUSH_THICK
19186	TELESTRATE_COLOR_RED
19187	TELESTRATE_COLOR_GREEN
19188	TELESTRATE_COLOR_BLUE
19189	TELESTRATE_COLOR_YELLOW
19190	TELESTRATE_COLOR_CYAN
19191	TELESTRATE_COLOR_MAGENTA
19192	TELESTRATE_COLOR_WHITE
19193	TELESTRATE_COLOR_BLACK
19194	TELESTRATE_FREEZE_OFF
19195	TELESTRATE_FREEZE_ON

C2N-DVP4DI Master Mode Features

The following information describes projects created in VT Pro-e and SIMPL Windows that more fully demonstrate C2N-DVP4DI features in the master mode. Once the projects are loaded, the user can select from several video sources, displayed one at a time as page flips, with a zoom effect for each source.

Prerequisites include:

- Display device connected to the output DVI/RGB port. If display connector is RGB, use the supplied DVI/RGB adapter.
- Video inputs connected to the input DVI/RGB, S-video or Composite ports. If video source connector is VGA (RGB), use the supplied DVI/RGB adapter.
- Cresnet connected to the Cresnet port of C2N-DVP4DI and TPS-5000.
- PC connected to the C2N-DVP4DI (SIMPL Windows, VT Pro-e and Viewport open) using RS-232 or Ethernet.

NOTE: The Cresnet ID must be set to **02** for master mode. To verify this, establish communications with the C2N-DVP4DI in Viewport (refer to “Establishing Communications with the Control System” in the latest version of the C2N-DVP4DI Operations Guide, Doc. 6112) and enter *setup* at the C2N-DVP4DI prompt. The SYSTEM SETUP MENU appears on the display device. Select **System Setup | Interface** to view the INTERFACE MENU (Select the master button if Cresnet ID is not set to **02**).

NOTE: When the C2N-DVP4DI is set as a master, do not connect to the Cresnet port of another master processor.

VT Pro-e

Two projects are created and compiled in VT Pro-e. The first project, for the TPS-5000, creates button presses, join numbers, and establishes the background logo page for the C2N-DVP4DI. The second project, for the C2N-DVP4DI, assigns the various video inputs for each page flip and assigns the transition zoom to bring on these video sources.

Project 1

NOTE: Using this procedure, no buttons are drawn on the C2N-DVP4DI, only the video/RGB source is displayed.

1. Create a project and name it ‘Page Flip for TPS5000’ and select TPS-5000 as the panel type using “Name New Project File As” window.
2. Create a new page, name it ‘Logo’, and select a logo graphic for the background using “Page Properties” window.
3. Create six buttons, name them and assign digital press join numbers using “Button Properties” window (refer to following table). Place buttons at lower part of page.

Button Names/Join Numbers

Button Name	Digital Press Join Number
Logo Page	1
Camera	2
ST-Tune	3
DVD	4
Power Point	5
Guest Speaker	6

Project 2

1. Create a project, name it ‘Page Flip for CNXDVP4’ and select C2N-DVP4DI as the panel type.
2. Create a new page, name it ‘Logo’, and select a logo graphic for the background. Assign a join number of 1 in “Page Properties” window.
3. Create Page 2 and name it ‘Camera Video 1A’.
4. Assign join number of 2 in “Page Properties” window.
5. Place a video window on this page.

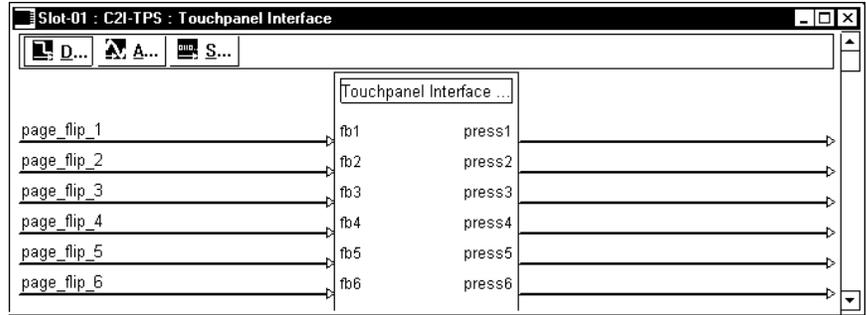
6. Select **Full Screen** from *Design* tab, **Video Input 1A composite** and **Zoom** from *Source* tab in “Video Properties” window.
7. Create Page 3 name it ‘Tune Video 1B’.
8. Assign a join number of 3 in “Page Properties” window.
9. Place a video window this on page.
10. Select **Full Screen** from *Design* tab, **Video Input 1B composite** and **Zoom** from *Source* tab in “Video Properties” window.
11. Create Page 4 and name it ‘DVD SVHS 2’.
12. Assign a join number of 4 in “Page Properties” window.
13. Place a video window on this page.
14. Select **Full screen** from *Design* tab, **S-Video Input 2 composite** and **Zoom** from *Source* tab in “Video Properties” window.
15. Create Page 5 and name it ‘Power Point RGB 1’.
16. Assign join number of 5 in “Page Properties” window.
17. Place a video window on this page.
18. Select **Full Screen** from *Design* tab, **DVI/RGB 1** and **Zoom** from *Source* tab in “Video Properties” window.
19. Create Page 6 and name it ‘Guest Speaker RGB 2’.
20. Assign a join number of 6 in “Page Properties” window.
21. Place a video window this on page.
22. Select **Full Screen** from *Design* tab, **DVI/RGB 2** and **Zoom** from *Source* tab in “Video Properties” window.

SIMPL Windows

One project is created and compiled in SIMPL Windows. This program establishes the touchpanel interface.

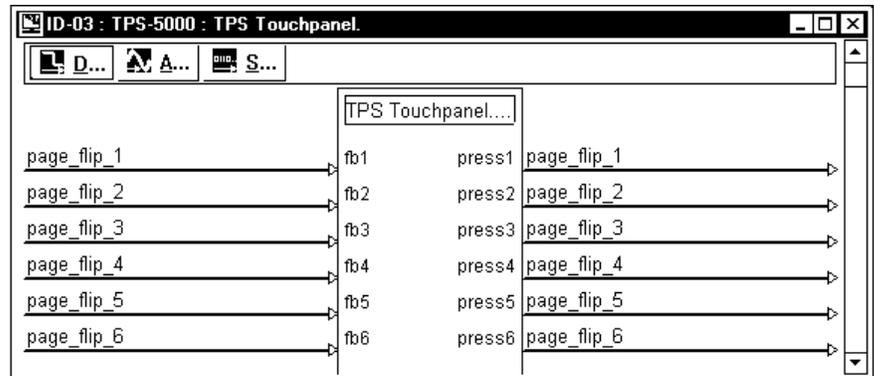
1. Create a project and name it ‘Page Flip Master Mode’.
2. Drag and drop a C2N-DVP4DI from the Device Library | Control Systems folder to *System Views*.
3. Drag and drop a TPS-5000 from the Touchpanels folder to Cresnet Units in *System Views*.
4. Click  (Program) to open *Program View*.
5. Double click Slot-01: Touchpanel Interface to open symbol.
6. Program the symbol according to the following graphic.

Touchpanel Interface Symbol



7. Click Slot-03: Cresnet: C2Net-Device to open TPS Touchpanel.
8. Double click ID:03: TPS Touchpanel to open symbol.
9. Program the symbol according to the following graphic.

TPS Touchpanel Symbol



Advanced Features

One of the many exciting features of the C2N-DVP4DI is its ability to change a video source on a selected page, instead of using page flips as described in the previous projects. This is performed using analog joins. For example, you could add buttons to the VT Pro-e project 1 ‘Logo’ page that corresponds with all video sources. You then assign analog join numbers to a video page in project 2 (for example, Page 3: ‘ST-Tune video 1B’) selecting **Input Selection** as the type of join from the *Source* tab of the “Video Properties” window. The SIMPL Windows project has a digital to analog symbol and support logic symbols added and programmed, and additional programming is added to the TPS and Touchpanel Interface symbols (digital and analog joins). Once the projects are compiled and loaded in the C2N-DVP4DI, pressing a video button on the touchpanel changes the displayed video source without the need of page flips.

Examples

Example projects are available from the Crestron FTP site (<ftp://ftp.crestron.com/Examples>). Search for:

- SIMPLE_PAGE_FLIP_TPS5000.VTZ
- SIMPLE_PAGE_FLIP_ANALOG_CHANGES.VTZ
- SIMPLE_PAGE_FLIP_MASTER_MODE.ZIP.

Connecting a Pointing Device

NOTE: Most mice that have serial capability will work. A mouse should be serial (9-pin D-sub) or PS2/serial (combo mouse) with PS2 connector and D-sub adaptor. Ordinary PS2 mice will not work. Most serial mice are Microsoft compatible (use **TOUCH 1**). Some mice are MouseSystems compatible (use **TOUCH 9**). Use **TOUCH 10** for Logitech mice.

The C2N-DVP4DI is shipped with a Microsoft compatible 9-pin mouse.

After connecting a pointing device to the Touchscreen/Mouse port, you must use Viewport to inform the C2N-DVP4DI the kind of device that has been installed.

Set the Crestron supplied serial mouse input parameters in Viewport using the following instructions.

1. To select the input mouse type using Viewport, type: **Touch ?** and press **Enter** at the prompt for a list of input devices (refer to the following graphic). Type: **Touch 1** for a Microsoft mouse.

NOTE: Zero (0) disables all other inputs and only permits program control.

NOTE: If you are using a Smart Technologies pointing device (such as Smart Sympodium, etc.) the serial cable (DB9) must have the Data Terminal Ready (DTR – pin 6) and Data Set Ready (DSR – pin 4) connections removed. Use Crestron part number CNSP-141. Refer to “Smart Sympodium” on page 81.

2. From the Viewport, type **Caltouch**, and follow the instructions on the output screen of the C2N-DVP4DI (This command is not required if using a mouse).

NOTE: Take note of the output resolution of the C2N-DVP4DI. You will need this when performing a calibration if the pointing device is not a mouse.

```
DVP4DI>touch ?
TOUCH [input]
  where input =
    0 - Program Control
    1 - Microsoft mouse*
    2 - Smart (SC3,SC4,SC5)
    3 - Smart (SC6,SC7,..)
    4 - Microtouch
    5 - Dynapro SC3
    6 - Dynapro SC4
    7 - Elo Graphics
    8 - Crestron Tablet
    9 - Mouse Systems Mouse
    10 - Logitech MouseMan
    11 - Wacom Tablet
    12 - QTC Touch Controller
  No parameter - current input selection
```

Connecting the Crestron Supplied Serial Mouse

The C2N-DVP4DI is supplied with a serial 9-pin D connector mouse. The part number for this mouse is OEMX-A0013-1.

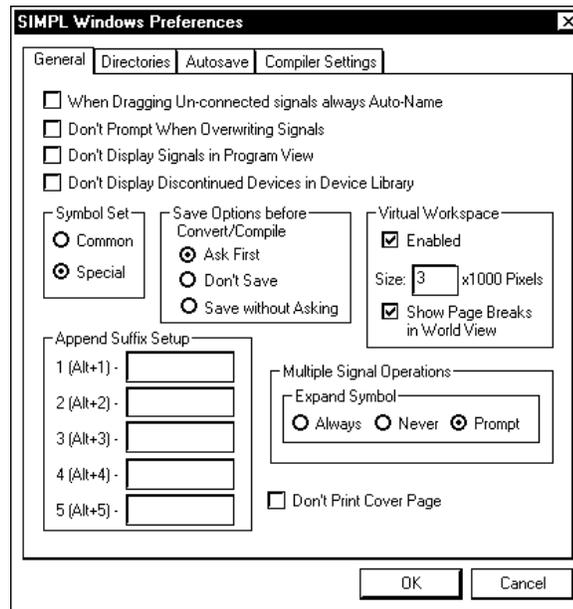
1. Connect the mouse to the C2N-DVP4DI using the Touchscreen Mouse 9-pin “D” connector.
2. Establish communications in Viewport with the C2N-DVP4DI.

3. At the C2N-DVP4DI prompt (either >DVP4DI or >CSDVP4DI) type:
TOUCH 1.
4. Click **Enter** and reboot for the change to take effect.

Device Extender Symbols for Touch Input and Touch Output Control

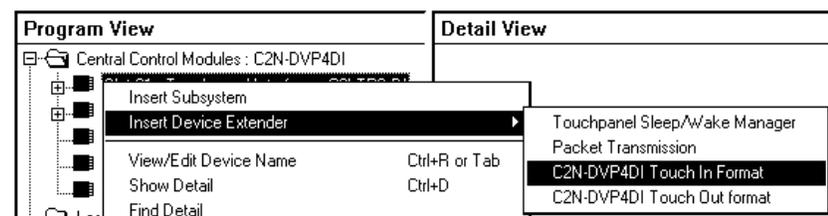
Two new device extenders are available for the C2I-TPS touchpanel interface on slot 01 of the C2N-DVP4DI for touch input and output control. After dropping in a C2N-DVP4DI in SIMPL Windows, select **Edit | Preferences** and select **Special** from *Symbol Set*.

SIMPL Windows Preferences – Special Symbol Set



Change to Program Manager, right mouse click on Slot 1 and choose **C2N-DVP4DI Touch In Format** for inputs, or **C2N-DVP4DI Touch Out Format** for outputs.

Device Extender Symbols



- The Touchpanel Sleep/Wake Manager is used with the Standby Timeout feature. Refer to page 33 for additional details.

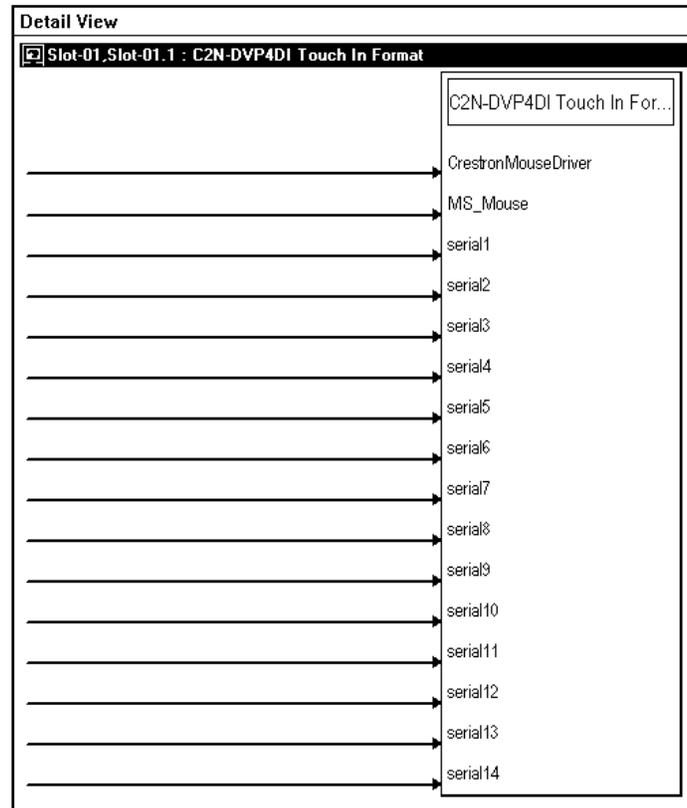
NOTE: The **Packet Transmission** selection is for future use.

- The Touch In Format (serial) symbol is used when connecting a pointing device indirectly (not to the Touchscreen/Mouse port).
- The Touch Out Format (analog) symbol is used for controlling a PC or telestrator through the C2N-DVP4DI.

Touch Input Control

In SIMPL Windows *Program View*, right click on slot 1 of the C2N-DVP4DI and choose **Insert Device Extender**. Choose **C2N-DVP4DI Touch In Format** for inputs and open the symbol in *Detail View*.

C2N-DVP4DI Touch In Format Symbol



The C2N-DVP4DI Touch In Format device extender symbol is provided for input programming for the C2N-DVP4DI. This prepares the C2N-DVP4DI for the proper input string based on the type of pointing device. The two inputs accept touch data in two different formats: Crestron Mouse Driver and Microsoft Serial Mouse Driver.

All of the inputs are serial.

A string of the given format issued to the C2N-DVP4DI on this symbol controls the mouse cursor on the C2N-DVP4DI. For example, if you want to control the C2N-DVP4DI mouse cursor using a CNWM (wireless mouse), you would drop the CNWM onto a CNRFGWA definition. The *data* signal of the mouse is then connected to the <MS_Mouse> input of this device extender.

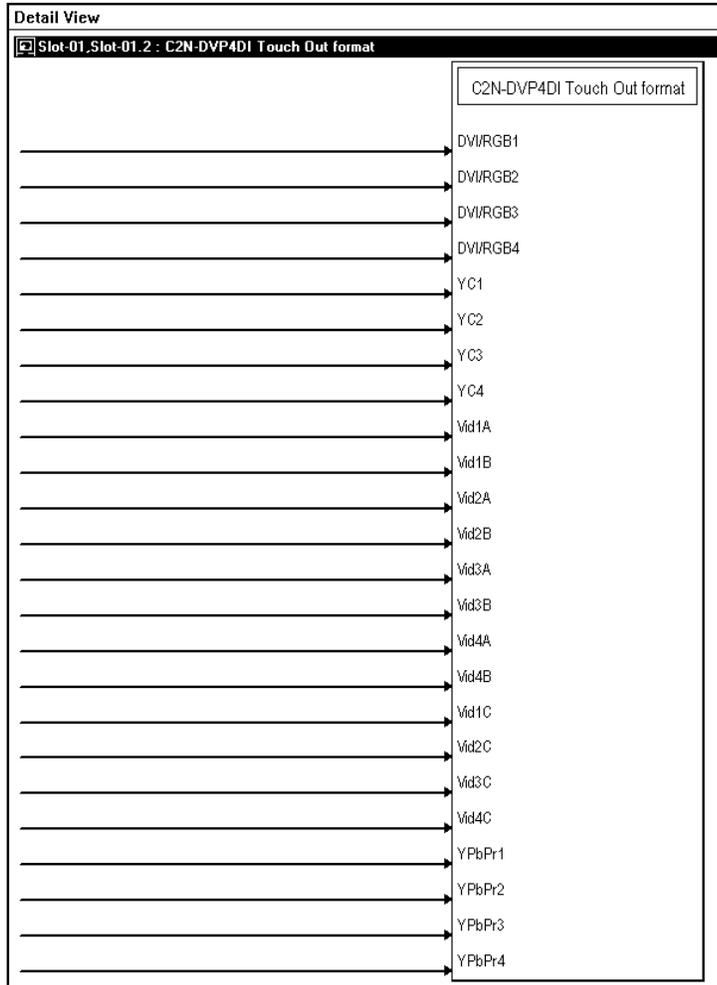
The <CrestronMouseDriver> input is used if using the Crestron custom serial mouse driver to control the C2N-DVP4DI. If both the Crestron and Microsoft mice are connected, and the data comes through simultaneously, they both control the motion of the cursor.

Currently only the first two inputs of this symbol are active, a serial string connected to other (undefined) inputs can be safely ignored.

Touch Output Control

In SIMPL Windows, right click on slot 1 of the C2N-DVP4DI and select **Insert Device Extender**. Select **C2N-DVP4DI Touch Out Format** and open the symbol in *Detail View*.

C2N-DVP4DI Touch Out Format Configuration Symbol



This symbol determines the pointing device output and enables the proper formatting of the output string. Output can be via RS-232, Cresnet or Ethernet.

All of the Touch Out Format inputs are analog.

Setting a value for one of these joins tells the C2N-DVP4DI to output the control strings in a particular format. The strings are issued on the Slot 1 Serial List on the C2N-DVP4DI definition, on the first 16 outputs, starting at join #1.

The legal decimal values using the analog Init Symbol:

- 0 = Crestron Mouse Driver (this is the default and for “Touch the PC”)
- 1 = ELO Driver (for Boekler Telestrator applications)
- 2 = SMART Matisse (older SMART format)
- 3 = SMART Board (newer SMART format)
- 4 = C2N-DVP4DI built-in telestrator

Each analog input corresponds to a video source and is linked to a serial output on the C2I-TPS touchpanel interface, beginning with <text-o1>. As shown in the following table, <DVI/RGB1> corresponds to <text-o1>, <DVI/RGB2> corresponds to <text-o2>, <YC3> to <text-o7> and so forth.

Touch Out Format Serial Inputs

Input	C2I-TPS Output	Input	C2I-TPS Output
<DVI/RGB1>	<text-o1>	<Vid3A>	<text-o13>
<DVI/RGB2>	<text-o2>	<Vid3B>	<text-o14>
<DVI/RGB3>	<text-o3>	<Vid4A>	<text-o15>
<DVI/RGB4>	<text-o4>	<Vid4B>	<text-o16>
<YC1>	<text-o5>	<Vid1C>	<text-o17>
<YC2>	<text-o6>	<Vid2C>	<text-o18>
<YC3>	<text-o7>	<Vid3C>	<text-o19>
<YC4>	<text-o8>	<Vid4C>	<text-o20>
<Vid1A>	<text-o9>	<YPbPr1>	<text-o21>
<Vid1B>	<text-o10>	<YPbPr2>	<text-o22>
<Vid2A>	<text-o11>	<YPbPr3>	<text-o23>
<Vid2B>	<text-o12>	<YPbPr4>	<text-o24>

For example, if <YC1> (S-video input 1) is set to 0, then when the pad area associated with YC1 is touched, serial string 5 outputs a serial string in the Crestron Mouse Driver format. This serial string is generally routed to one of the C2N-DVP4DI built-in COM ports for control over a PC or telestrator.

Mouse Awareness (“Touch the PC”)

A mouse or a touchpanel connected to a C2N-DVP4DI can also be used to control the mouse functions of a PC. The “Touch the PC” feature allows a user to remotely control a number of other PC’s cursors and mouse buttons.

Any window on the C2N-DVP4DI may be made “mouse-aware” by assigning the pad area, just as we already do on existing TPS panels, and enabling the *Touch/Pad Area* check box in **Video Properties | Design** of VT Pro-e. In SIMPL Windows, a serial signal must be assigned to the C2I-TPS Touchpanel Interface symbol (slot 1 of the C2N-DVP4DI SIMPL Windows symbol) for each PC, and the same signal needs to be assigned to a serial driver symbol for each PC. For more information, refer to the latest revision of the Serial Mouse Control Driver Software Programmer’s Guide, Doc. 5916 in the Downloads | Product Manuals section of the Crestron website (www.crestron.com).

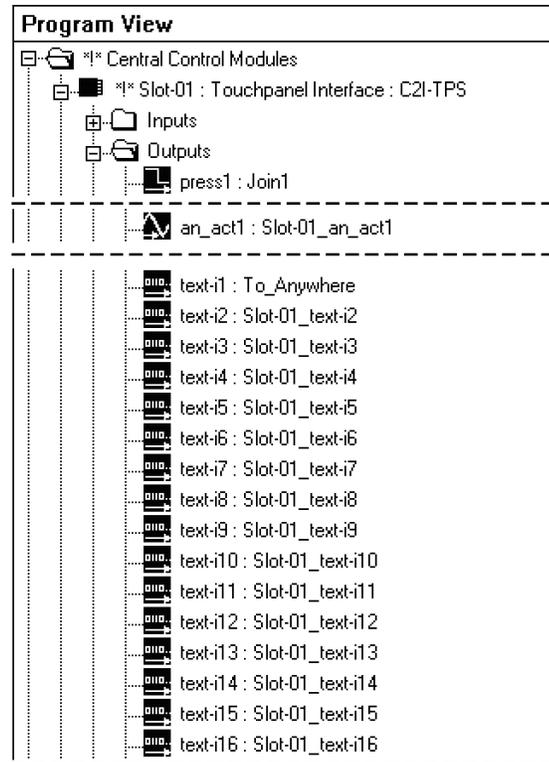
Defining the mouse parameters on the C2N-DVP4DI is different because you use more than one window, and the mouse packets are sent to a PC (or any device with a video or RGB output and a touch/mouse input) that is associated with the source shown in the window. You cannot define the mouse on a single window as on the TPS touchpanels.

When the window is touched, the mouse command packets generated by the C2N-DVP4DI are sent out of one of the first 24 serial join outputs of the C2N-DVP4DI embedded TPS symbol, depending on which of the 24 sources is currently shown in the window (there is already a reserved join number for the window, to tell which source to route there). There are up to 24 possible RGB/video sources on the C2N-DVP4DI, although they are not all available at the same time. The sources are as follows:

Serial Output Join Numbers on the C21-TPS Symbol

SOURCE NUMBER	SOURCE TYPE
1	DVI/RGB 1
2	DVI/RGB 2
3	DVI/RGB 3
4	DVI/RGB 4
5	S-video Input 1 (Y&C)
6	S-video Input 2 (Y&C)
7	S-video Input 3 (Y&C)
8	S-video Input 4 (Y&C)
9	Video Input 1 A composite
10	Video Input 1 B composite
11	Video Input 2 A composite
12	Video Input 2 B composite
13	Video Input 3 A composite
14	Video Input 3 B composite
15	Video Input 4 A composite
16	Video Input 4 B composite
17	Video Input 1 C component
18	Video Input 2 C component
19	Video Input 3 C component
20	Video Input 4 C component
21	Video Input YPbPr1 component
22	Video Input YPbPr2 component
23	Video Input YPbPr3 component
24	Video Input YPbPr4 component

The first 24 serial outputs of the TPS symbol (into the program) are used for the 24 mouse/telestrator strings, corresponding to the 24 sources, respectively. (i.e., Any window that is showing Source 1 through 24, when touched, generates a mouse or telestrator packet that is sent out of the respective serial join). By default, the packets are mouse-type packets. If one or more must be telestrator-type packets, there is a Device Extender type symbol called "Touch Output Control" that can be added to the embedded TPS symbol in the C2N-DVP4DI.

Assigning Mouse Packets to Serial Ports in SIMPL Windows

NOTE: The "To_Anywhere" in the example can be to a serial port on the PRO2 or C2N-DVP4DI, a Cresnet device, an Ethernet device, etc.

Advanced users should also note that routing a signal from the Slot 1 TPS serial joins to the COM ports on the C2N-DVP4DI appears to ensure that the signal stays internal to the C2N-DVP4DI, but it does not. Because there is no program in the C2N-DVP4DI when it is a slave, the signal must be sent to the PRO2 for interpretation and then re-routed back out to the C2N-DVP4DI. If this kind of traffic is not desirable, then the PRO2 should contain a program and the C2N-DVP4DI should be used as a master (standalone control system) with its own program, and the programs should send any shared data via Ethernet ISC or XSIG. Then the signal stays within the C2N-DVP4DI. The "To_Anywhere" has to go through an XSIG, if it leaves the C2N-DVP4DI.

The advantages of this approach include simplicity, containment of all data within the program and VT Pro-e project, very limited development time, and flexibility.

Equipment Required for Touch the PC

- One C2N-DVP4DI Version 3.054 or higher
- Two VGA Male cable to VGA Male cable
- One RS-232 straight-through cable
- Two DVI to RGB adapters supplied by Crestron
- One 24 VDC 75 watt power supply for C2N-DVP4DI

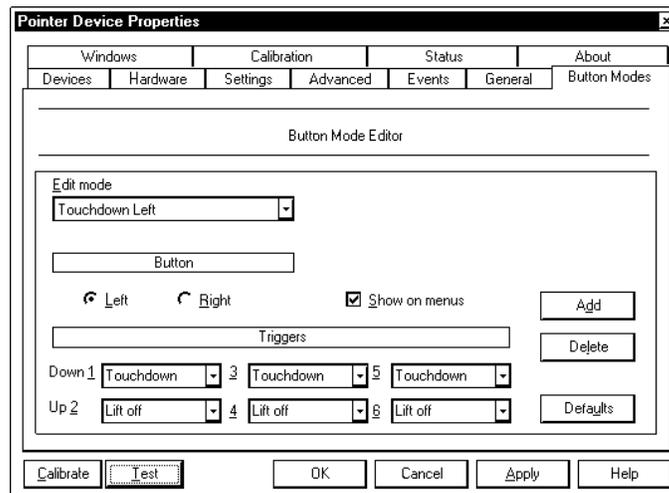
Software Required for Touch the PC

- SIMPL Windows Version 2.04.11 or higher, Symbol Lib/device 232 or higher, Crestron Database 15.9.9 or higher
- VT Pro-e Version 3.1.1.7 or higher

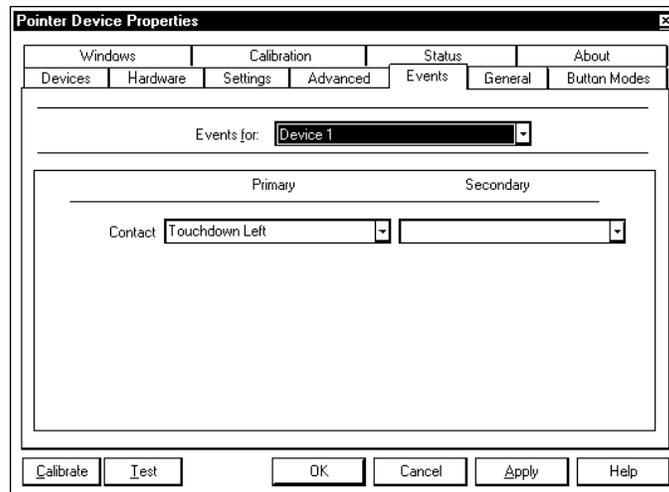
Touch the PC Procedure

1. Install the serial mouse software driver on the PC to be controlled. Refer to the latest version of the Serial Mouse Control Driver Software Programmer's Guide, Doc. 5916 in the Downloads | Product Manuals section of the Crestron website (www.crestron.com).
2. After installing the serial mouse driver, confirm the driver settings. From the Start menu, select UPDD | Settings. Click the *Button Modes* tab and ensure that the following are selected: *Touchdown Left mode*, *Left Button*, *Show on menus*, *Down 1, 3 and 5 – Touchdown*, *Up 2, 4 and 6 – Lift off*.

“Pointer Device Properties” – Button Modes Tab



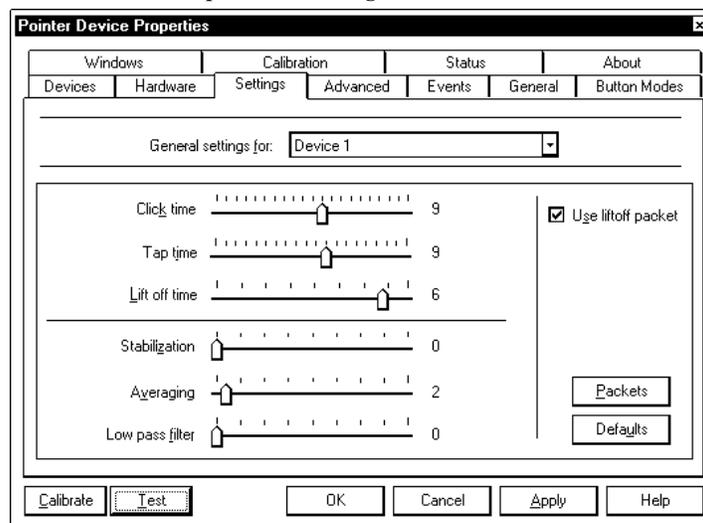
Select the *Events* tab and ensure that the primary contact for device 1 is *Touchdown Left*.

“Pointer Device Properties” – Events Tab

Select the *Settings* tab and ensure the following settings:

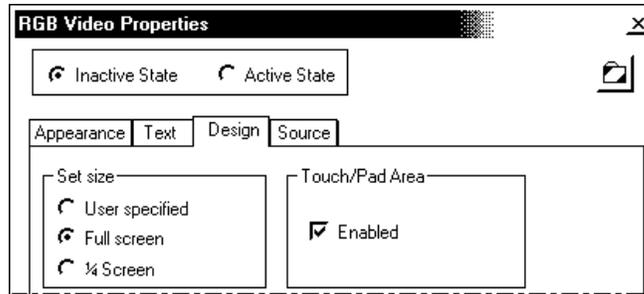
Click time – 9
Tap time – 9
Lift off time – 6
Stabilization – 0
Averaging – 2
Low pass filter – 0

Check the *Use liftoff packet* box.

“Pointer Device Properties” – Settings Tab

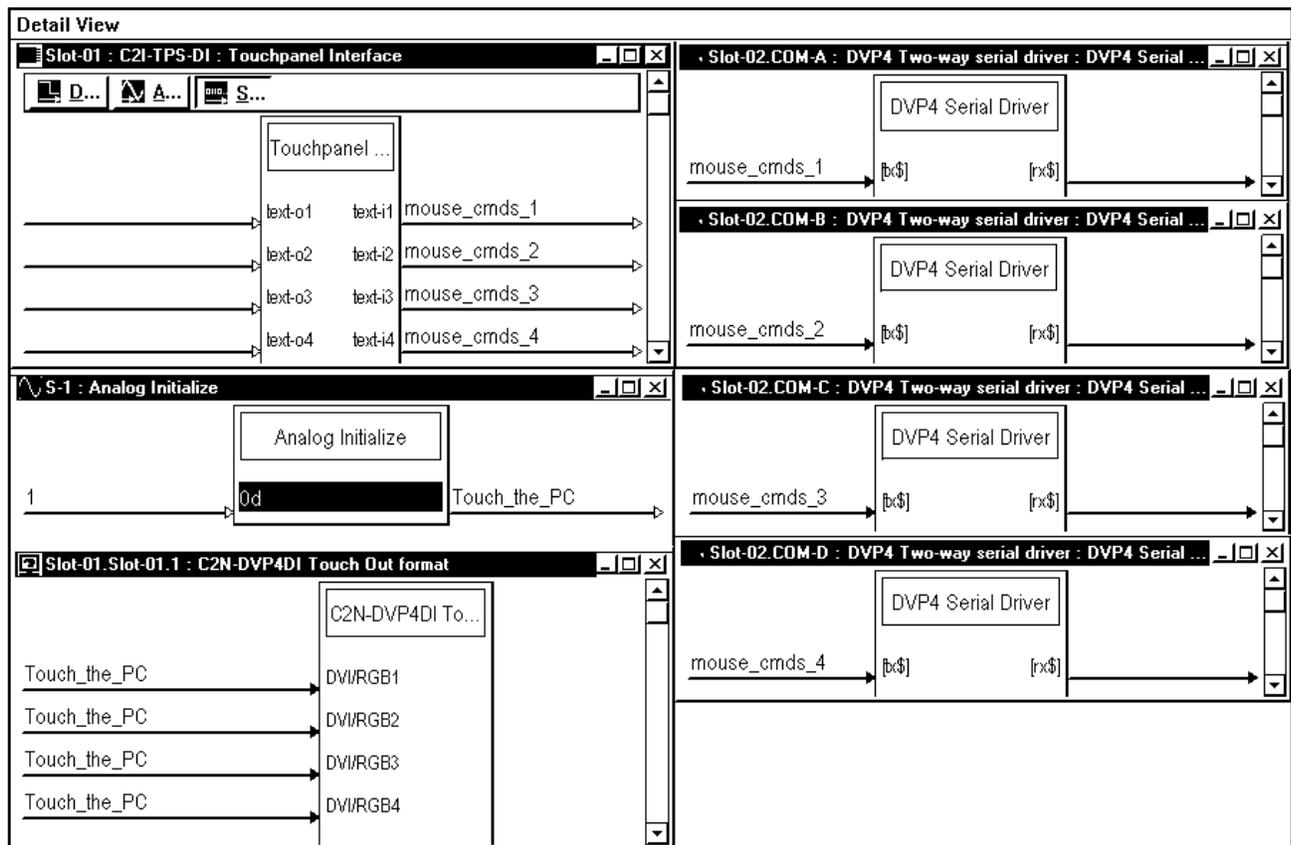
3. Connect the RS-232 straight-through cable from the C2N-DVP4DI COM port (A-D) to a computer that has the serial mouse driver installed. Version number of the serial mouse driver must be 2.56.18. Refer to instructions for serial mouse installations in “Connecting a Pointing Device” on page 60.
4. Create a page in VT Pro-e with a full screen RGB window for the C2N-DVP4DI.
5. In the “RGB Video Properties” window, select the *Design* tab and enable the *Touch/Pad Area*.

“RGB Video Properties” Window



6. Compile, save and then download the project to the C2N-DVP4DI.
7. Do the following in SIMPL Windows:

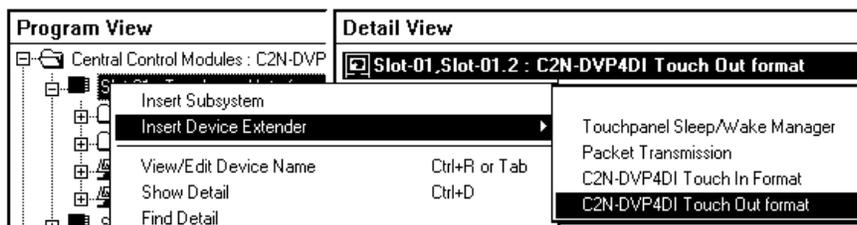
SIMPL Windows - Detail View



- a. Set the COM port (A-D) for 9600 baud, 8 bits, 1 stop bit, No parity, RTS/CTS enabled, Xon/Xoff disabled.
- b. Add the **mouse_cmds_1** to serial <text-i1> in C2N-DVP4DI Slot-01 C2I-TPS.

NOTE: Touchpanel <text-i1> is RGB-1.
 If you want the mouse command on RGB-2, place serial text on <text-i2>.
 For RGB-3 place the serial text on <text-i3>, and so on.

- c. Add the Touch Out format symbol to the C2N-DVP4DI. Refer to “Device Extender Symbols for Touch Input and Touch Output Control” on page 61.



- d. Select **C2N-DVP4DI Touch Out Format**.
 - e. Add an analog label (Crestron Mouse) to RGB1 for Touch-the-PC to work on RGB input 1.
 - f. Add an analog initialize. Set the analog value to zero and the analog out label (Crestron Mouse). Add a 1 to the digital input.
 - g. Add a Two Way Serial Driver. Assign **mouse_cmds_1** to [tx\$].
 - h. Compile and load the program to the C2N-DVP4DI or PRO2, whichever unit is the master.
8. The “Touch the PC” should be working. If it is, proceed to next step, if not proceed to step 10.
 9. Perform the Calibration of the Touch-the-PC from the Icon in the Window tray on the computer that has Serial mouse driver installed.
 10. If the mouse movement works but you do not have left mouse clicks, confirm the “Pointer Device Properties” set in step 2.

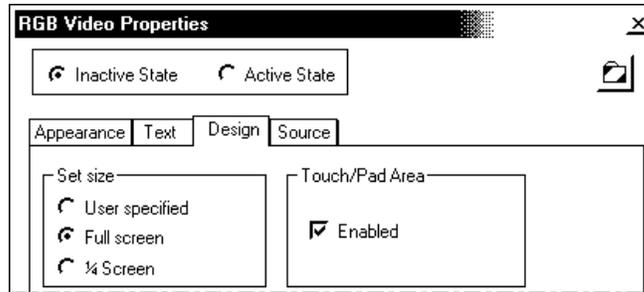
Boeckeler Pointmaker® Telestrator

Refer to the latest version of the Pointmaker Telestrator Integration Guide (Doc. 5929) for installation and programming instructions, with the exception of the “VT Pro-e Programming” section. There are a few differences for the C2N-DVP4DI in the “VT Pro-e Programming” section, and some additional information regarding “SIMPL Windows Programming”. Multi-mode touchpanels can be integrated with the Crestron serial mouse driver or the Boeckeler Pointmaker telestrator, by designating a video or RGB video window as a "pad area". A pad area tracks the movement of the user's finger on the touch screen and thus can simulate a mouse pointer or enable video drawing and annotation.

NOTE: Serial cables are straight through, pin to pin RS-232, **not** null modem cables.

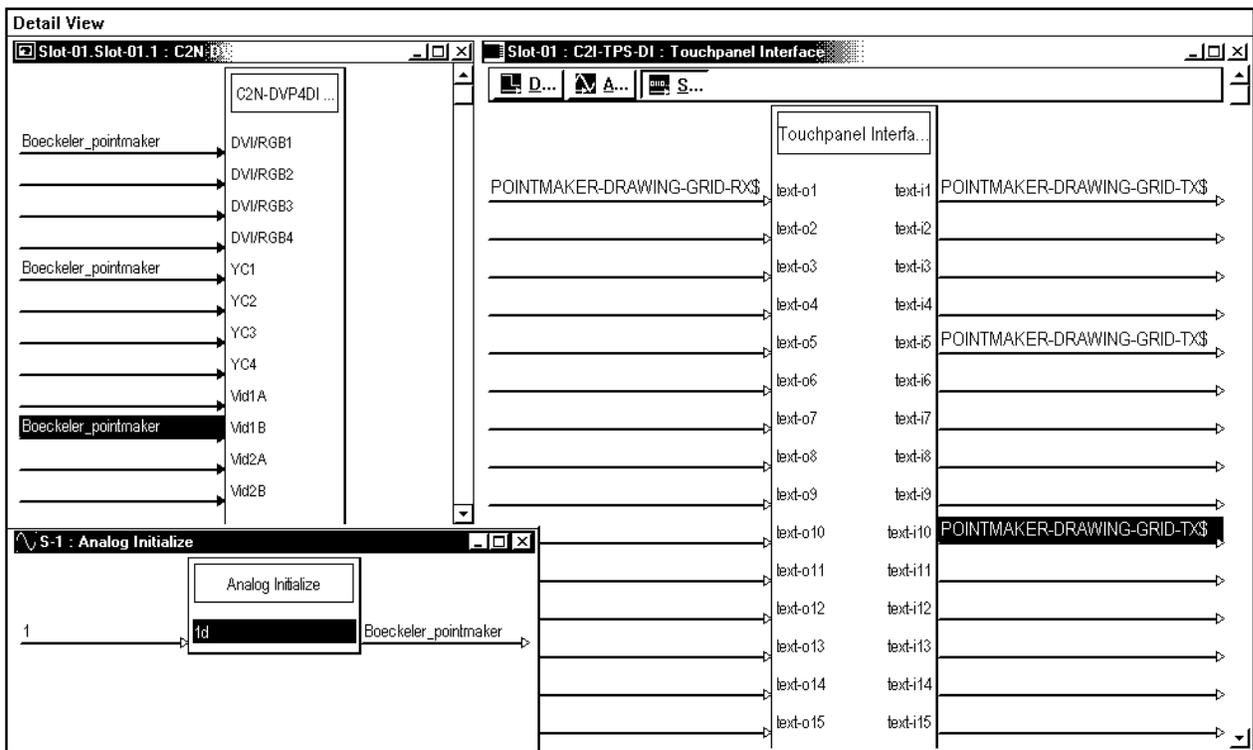
1. Create a page in VT Pro-e with a full screen RGB window for the C2N-DVP4DI.
2. In the RGB Video Properties window, select the *Design* tab and enable the *Touch/Pad Area*.

“RGB Video Properties” – Touch/Pad Area Enabled



3. Save, compile, and download the project to the C2N-DVP4DI.
4. Refer to “Device Extender Symbols for Touch Input and Output Control” on page 61, and insert the Touch Out Format symbol.
5. In *Detail View*, open slot 1 of the C2N-DVP4DI and add an Analog Initialize symbol.
6. In SIMPL Windows, program the Touch Out Format symbol, the Analog Initialize symbol, and the C2N-DVP4DI touchpanel serial interface joins as shown in the following diagram.

SIMPL Windows Programming for Pointmaker

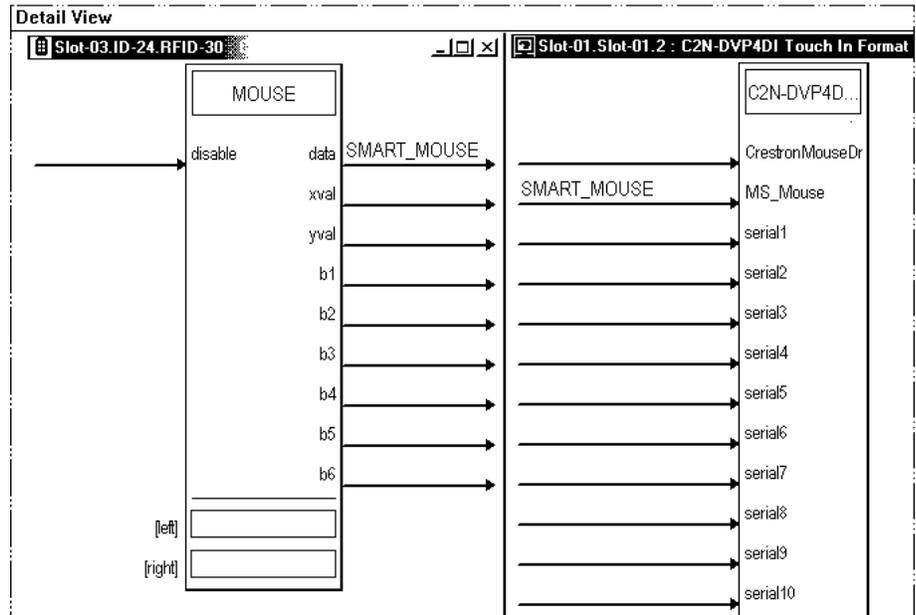


NOTE: The required serial cables are pin-to-pin RS-232 extension type, *not* the null modem type. Connect COM 1 of the C2N-DVP4DI to the COM 1 port of the Telestrator, and connect COM 2 of the C2N-DVP4DI to the COM 2 port of the Telestrator.

NOTE: You must perform the touchscreen calibration.

Crestron Smart Mouse (CNWM) Installation

SIMPL Windows Detail View



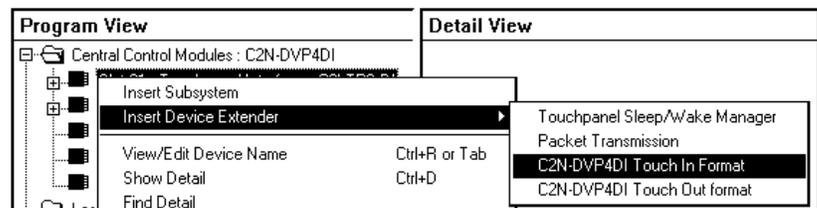
NOTE: When you set up for this mode, you can still have another mouse device plugged into the Touchscreen Mouse port and have it control the C2N-DVP4DI, for example: Micro touch, Elo TouchSystems, Microsoft mouse etc.

NOTE: The Crestron CNWM (RF Wireless Mouse) requires Crestron RF Gateway (CNRFGWA).

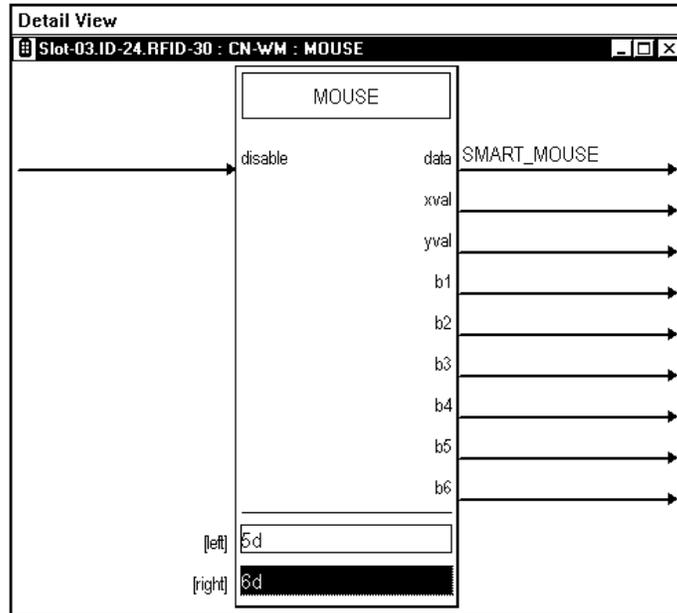
In SIMPL Windows

1. Add the Touch In format symbol to the C2N-DVP4DI. Refer to “Device Extender Symbols for Touch Input and Output Control” on page 61.
2. Drop in a C2N-DVP4DI in to the project, then right click on Slot 1 of the C2N-DVP4DI.

Insert Device Extender



3. Add the CNRFGWA 433.92 MHz gateway symbol From the Wireless Receiver (RF) *Device Library*.
4. Add the CNWM Crestron Smart Mouse symbol (RF ID 30) from the Wireless Remote *Device Library*.

Smart Mouse Symbol

5. Add a label to RF-ID 30 Data (serial string) symbol to Slot 01.1 on the C2N-DVP4DI device extender Mouse / Serial symbol.
6. Add a digital value of 5 to the Crestron Mouse symbol for the left button mouse to work. This is the larger of the black buttons on the Smart mouse.
7. Add a digital value of 6 to the Crestron Mouse symbol for the right button mouse to work. This button is located on the bottom of the Smart mouse.

In Viewport

NOTE: The following setting is only required when using a second pointing device connected to the Touchscreen/Mouse port. In this example, using a Microsoft mouse.

1. Set the touch input command to 1, by typing:
TOUCH 1
and then press **Enter**.
2. Type: **REBOOT** and then press **Enter**.

Prerequisites for Connecting a Touchpanel as a Pointing Device***Equipment Required***

- One C2N-DVP4DI Version 3.054 or higher
- One TPS-5000 or TPS-6000 panel with RGB card V1.017
- One DVI to RGB adapter supplied by Crestron
- One 24 VDC 75 watt power supply for C2N-DVP4DI (recommended minimum power supply)
- One RS-232 cable Crestron P/N ST-PK programming kit
- One VGA Male cable to VGA Male cable
- Cresnet cables

Software Required

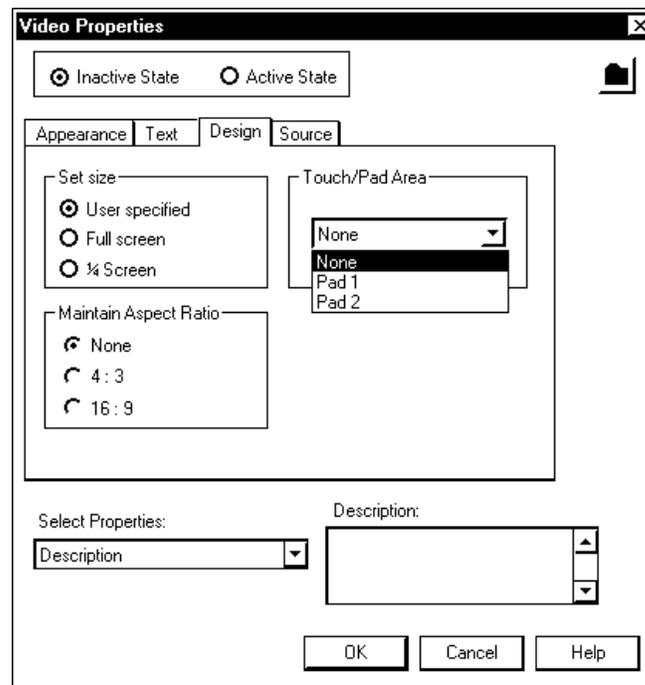
- SIMPL Windows Version 2.03.11 or higher
- VT Pro-e Version 3.1.1.7 or higher
- Viewport Version 3.49 or higher

Touchpanel as Pointing Device - Connected Directly via RS-232

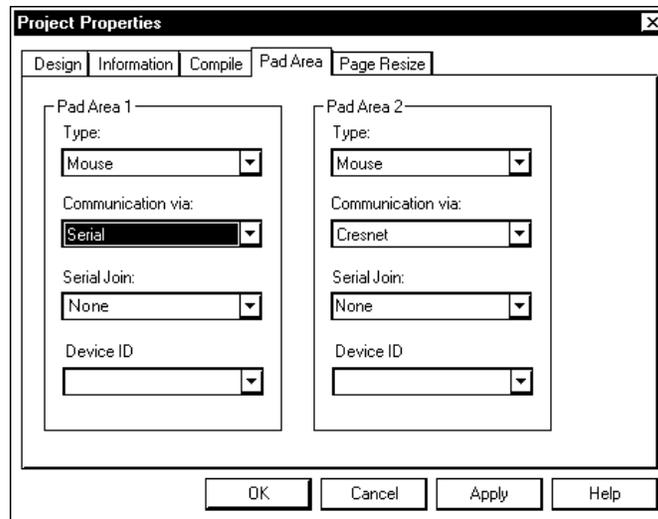
NOTE: Replaces the Microsoft mouse as the pointing device.

1. Connect the RS-232 cable from the touchpanel to the C2N-DVP4DI touchscreen mouse serial port. Use the ST-PK smart touch programming kit and a 9 pin male to female straight through cable (pin to pin).
2. Configure the touchpanel serial port for RS-232 PORT FOR TOUCH OUT.
3. In VT Pro-e, create a page with full screen RGB window for the TPS-5000/6000.
4. In the “Video Properties” window – select the *Design* tab and select **Pad 1** or **Pad 2**.

“Video Properties” Window



5. In the “Project Properties” window select the *Pad Area* tab. Select the *Pad Area 1* or *Pad Area 2*, and select the following:
Type: Mouse
Communications via: Serial

“Project Properties” Window

6. Send the project to the touchpanel.
7. From Viewport, set the C2N-DVP4DI to Touch command # 8:
8 - Crestron Tablet (TPS serial touchpanel)

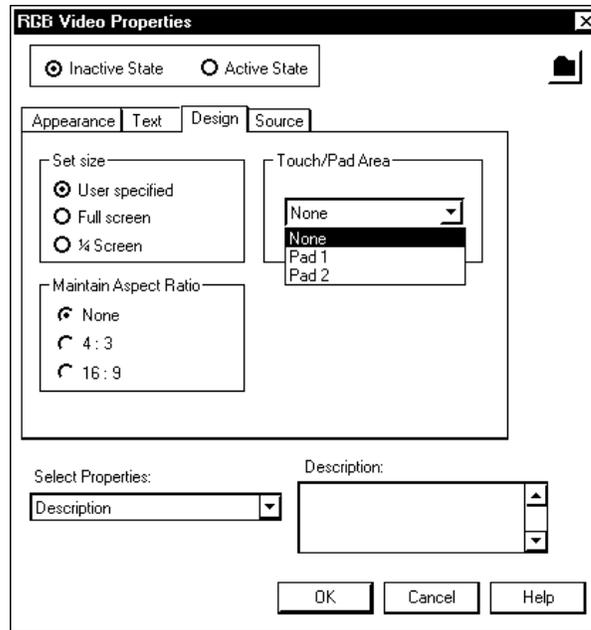
NOTE: Each time a new touchscreen is connected to the Touchscreen/Mouse port, and each time you switch between touchscreens, you must perform the **CALTOUCH** command.

NOTE: **CALTOUCH** is not required when any type of mouse is connected.

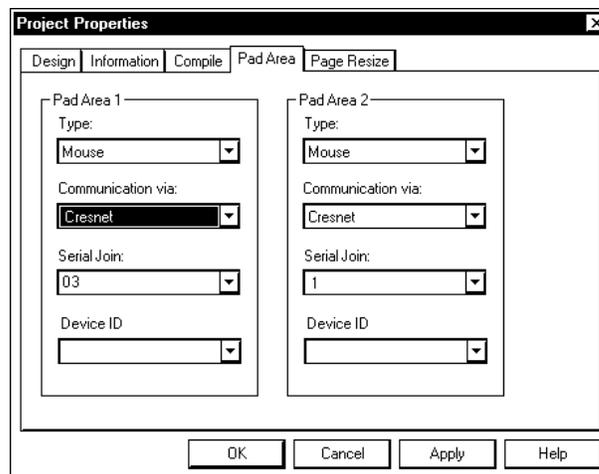
NOTE: **CALTOUCH** may not always be necessary when “touch 8” is selected, because it is a Crestron touchscreen.

Touchpanel as Pointing Device - Connected via Cresnet

1. Create a page with full screen RGB window in VT Pro-e for the touchpanel.
2. In “RGB Video Properties” window, select the *Design* tab and select *Pad 1* or *Pad 2*.

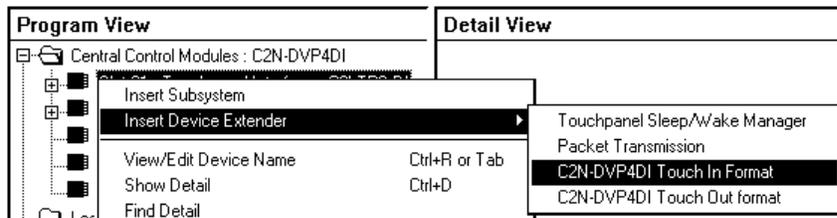
“RGB Video Properties” Window

- In the “Project Properties” window Select the *Pad Area* tab. Select the *Pad Area 1* or *Pad Area 2* area and select the following:
Type: Mouse,
Communications via: Cresnet,
 and assign a serial join number to be used in SIMPL Windows.

“Project Properties” Window

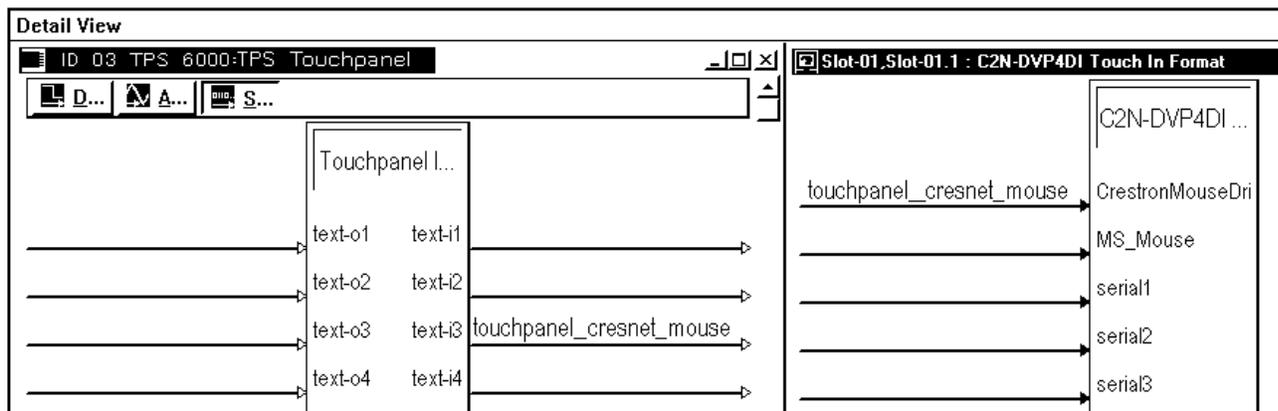
- Compile (**F12**) the project and load the project to the touchpanel.
- In SIMPL Windows, add the C2N-DVP4DI to the project as either a master or slave.
- Add the Touch In Format symbol to the C2N-DVP4DI. Refer to “Device Extender Symbols for Touch Input and Output Control” on page 61.
- Extend the C2N-DVP4DI icon to display the slots.
- Right click on Slot 1.

SIMPL Windows – Right Click on Slot 1



9. Select **C2N-DVP4DI Touch In Format**. Add this symbol to slot 1 Mouse/Serial Control.
10. Assign a label to the touch panel serial join number assign in VT Pro-e and to the Slot-01.1 Mouse / Serial Control Crestron Mouse.

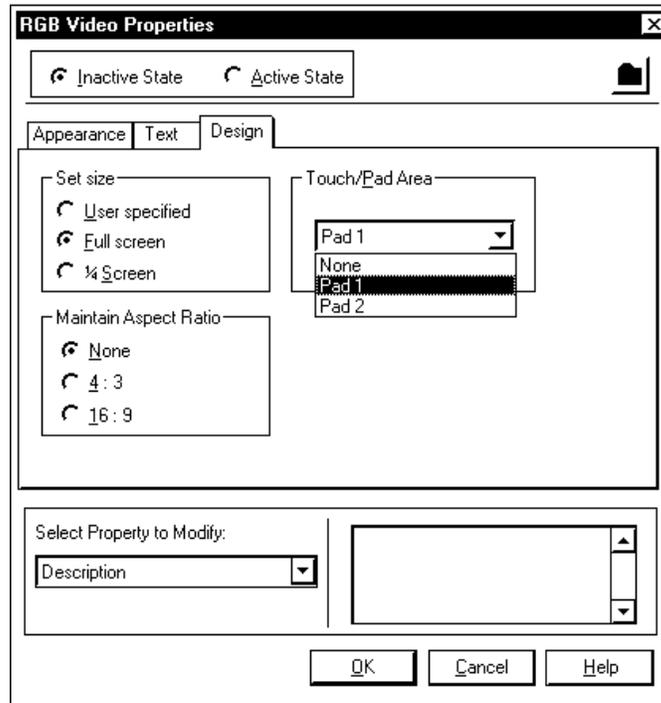
Assign Labels to joins in SIMPL Windows



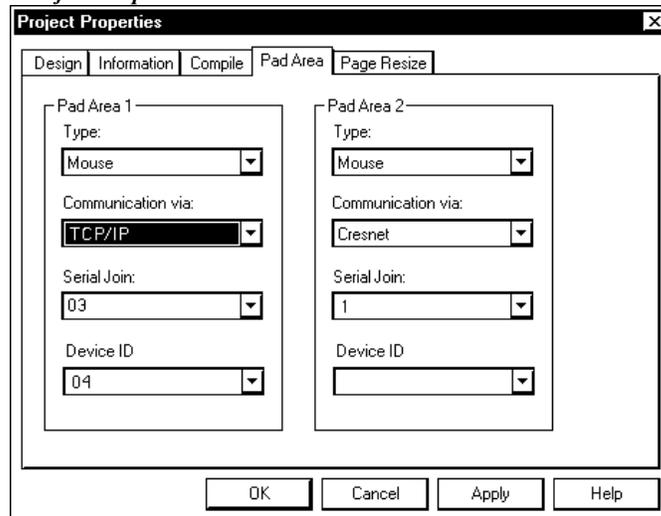
Touchpanel as Pointing Device - Connected via Ethernet

The advantage of this approach is that the mouse port on the C2N-DVP4DI is still available and can be used by another pointing device. This only works if the C2N-DVP4DI is in the master mode.

1. In VT Pro-e create a page with a full screen RGB window for the touchpanel.
2. In “RGB Video Properties” window – select the *Design* tab and select *Pad 1* or *2*.

“RGB Video Properties” Window

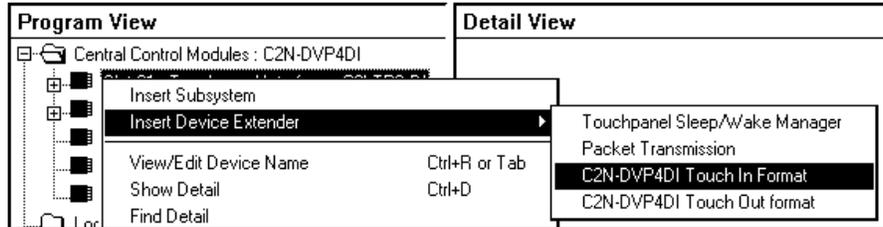
3. In the “RGB Video Properties” window select the *Design* tab. Select the *Pad 1* or *Pad 2* area.
4. In the “Project Properties” window, select the *Pad Area* tab. Select the *Pad Area 1* or *Pad Area 2* area and select the following:
Type: Mouse,
Communications via: TCP/IP
 and assign a serial join number to be used in SIMPL Windows.

”Project Properties” Window

5. Assign a *Device ID* number. This ID number must be added to the IPT of the touchpanel.
6. Compile (**F12**) the project and load the project to the touchpanel.
7. In SIMPL Windows, add the C2N-DVP4DI to the project as a master.

8. Add the Touch In Format symbol to the C2N-DVP4DI. Refer to “Device Extender Symbols for Touch Input and Output Control” on page 61.
9. Extend the C2N-DVP4DI icon to display the slots.
10. Right click on Slot 1.

Detail View in SIMPL Windows



11. Select **C2N-DVP4DI Touch In Format**. This adds the icon to slot 1 Mouse/Serial Control.
12. Assign a label to the touchpanel serial join number assigned in VT Pro-e and to the Slot-01.1 Mouse/Serial Control Crestron Mouse.
13. Compile the program and download to a control system.
14. Establish communication with the touchpanel in Viewport and add the new device ID to the IP table of the touchpanel.

ADDM 3 134.149.10.142 4

Where:

ADDM is command to add Ethernet devices to the IP table of the touchpanel.

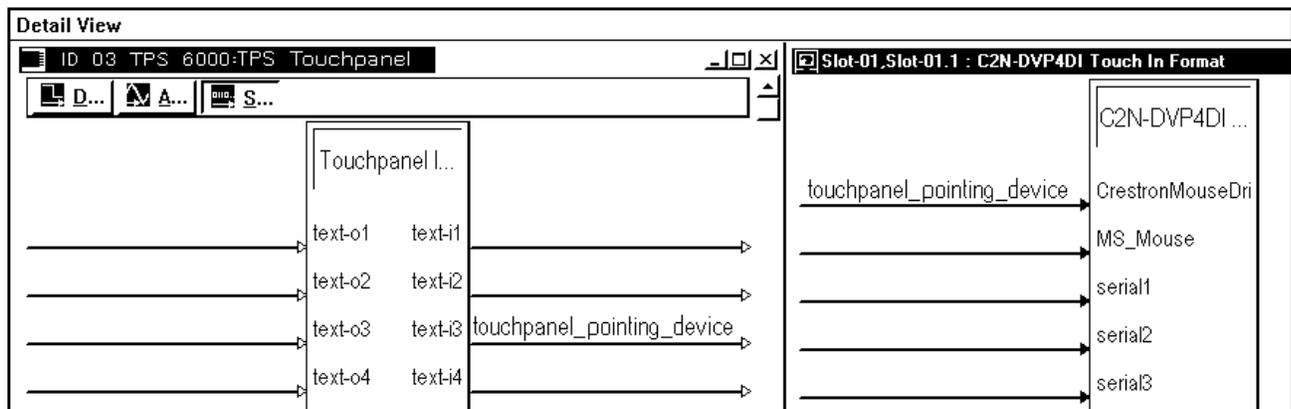
3 is the CIP ID address of the touchpanel in SIMPL Windows.

134.149.10.142 is the IP address of the control system.

4 is the device ID we added in VT Pro-e.

NOTE: When you set up for this mode, you can still have another mouse device plugged into the Touchscreen Mouse port and have it control the C2N-DVP4DI, for example: Micro touch, Elo Touchsystems, Microsoft mouse etc.

Mouse/Serial Control Symbol Programming



C2N-DVP4DI Video and Computer Annotation (Built-in Telestrator)

The C2N-DVP4DI has Video and Computer Annotation (built-in telestrator), eliminating the purchase of additional equipment. This feature enables the user to draw or write over a variety of video and computer images by touching and dragging a finger over the touchpanel.

The freeze/unfreeze function can freeze the video image to allow annotation on a still picture. Freeze works on both CNX-DVP4 and C2N-DVP4DI, but the image appears better on the C2N-DVP4DI because of the de-interlacing feature.

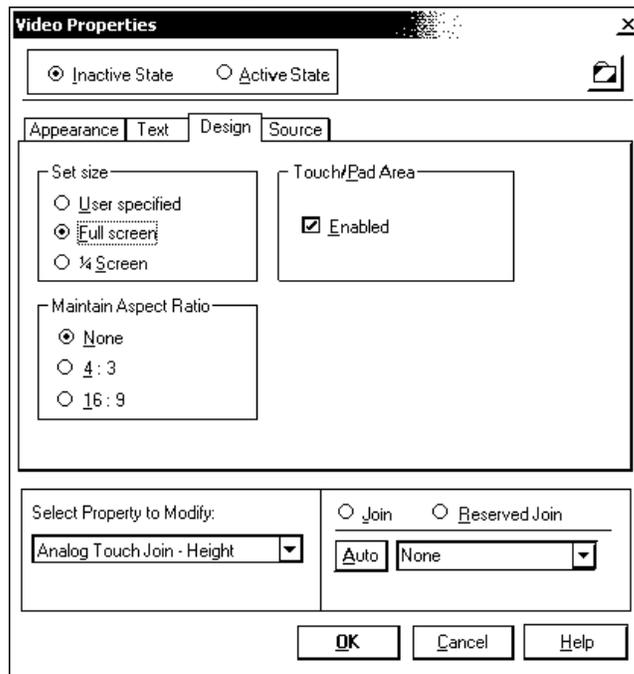
The C2N-DVP4DI telestrator has eight colors and three brush types:

- The colors are: red, green, blue, yellow, cyan, magenta, white, and black.
- The brushes are: thin brush 2 pixels wide, the medium brush 4 pixels wide, and wide brush 8 pixels wide.

Setting up the C2N-DVP4DI for built-in telestrator with serial mouse:

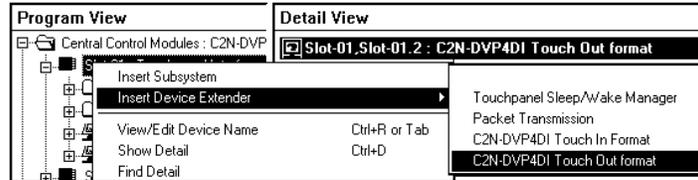
1. Setup the C2N-DVP4DI for serial mouse input. Refer to page 14 for more information about serial mouse installation.
2. Draw an RGB/Video window in VT Pro-e on the page where you want the Telestrator to function.
3. Select the “Video Properties” window and select *Design* tab.

“Video Properties” Design Tab



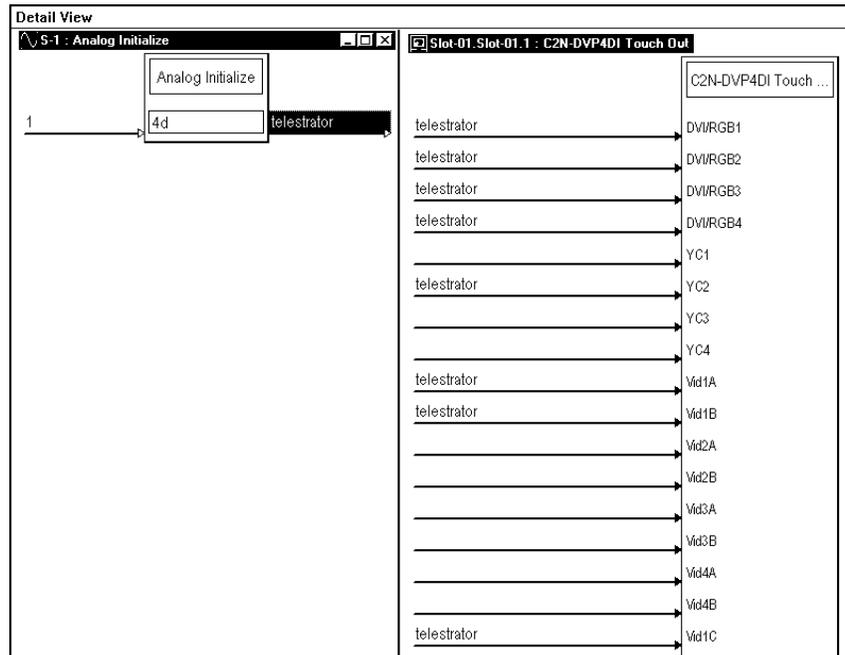
4. Enable the *Touch/Pad Area* and save and compile the project.
5. Add the Touch Out Format symbol to the C2N-DVP4DI. Refer to “Device Extender Symbols for Touch Input and Touch Output Control” on page 61.

Touch Out Format



6. Add an Analog Initialize symbol and give it a value of 4(d) decimal.

SIMPL Windows – Detail View



7. In the C2N-DVP4DI Touch Out Format symbol, select the RGB/video inputs with which you want the telestrator to function. In the above example RGB1, RGB2, RGB3 RGB4, S-video 2, Video 1A, 1B, and 1C, inputs were selected for telestrator.
8. Compile the program and send it to the C2N-DVP4DI.

Smart Sympodium

Crestron C2N-DVP4DI and Smart Technologies Sympodium combine to form a unique presentation solution.

The combination of the Crestron C2N-DVP4DI Digital Video Processor and the Smart Technologies Sympodium answers the call for increased functionality in less space, and does it at a reduced cost.

The Sympodium from Smart Technologies provides a 15" color touchscreen surface that allows presenters to annotate over any computer-generated graphics image. By incorporating a Crestron C2N-DVP4DI or TPS-TPI with the [Sympodium](#), the user has the benefit of complete A/V control and graphics onscreen as well as annotation without the need of a separate touchpanel. This is especially advantageous where counter space may be limited, or where a single user interface is desired.

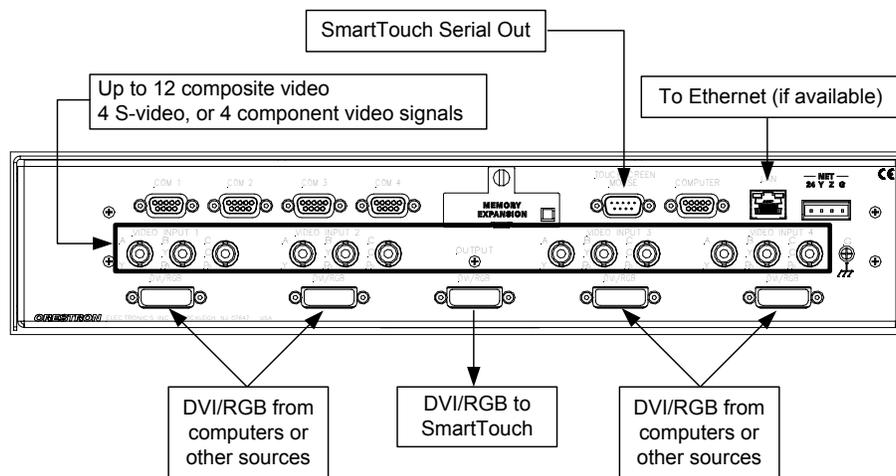
The Crestron C2N-DVP4DI interfaces directly to the Sympodium providing a control system processor and touchscreen interface in one. Using the C2N-DVP4DI, the GUI displayed on the Sympodium looks just like a Crestron Isys™ touchpanel

with all of the additional benefits of the C2N-DVP4DI like transition and translucence effects. Full operation of the Symposium is conducted using a stylus.

Best of all, in addition to its astounding graphics, the C2N-DVP4DI also provides for display of up to four high-performance, fully scalable video and computer windows within the control GUI. And with four onboard COM ports, the C2N-DVP4DI can add dramatic expansion capability to the Symposium by enabling both Smart annotation and Crestron "Touch-The-PC" mouse driver capability for four separate computer sources at a time!

Smart Symposium/Crestron C2N-DVP4DI System Overview

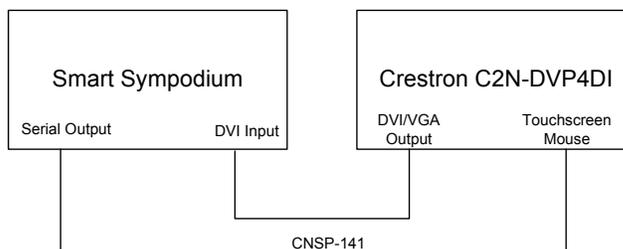
Symposium (A.K.A. SmartTouch) Connections



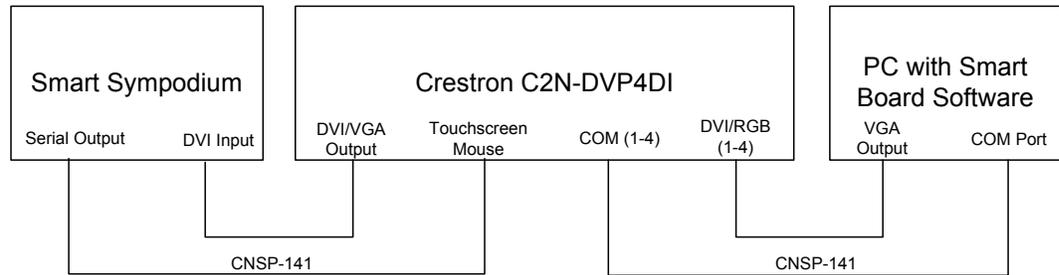
There are several ways the Smart Symposium can be integrated with the Crestron C2N-DVP4DI Video/Graphics Processor:

- Option 1:** The Symposium can be used as the touch input for the C2N-DVP4DI. This allows the Symposium to function as a Crestron touchpanel. The C2N-DVP4DI will generate the VGA display, which will be shown on the Symposium. This display can consist of multiple video and VGA windows, and the standard Crestron control buttons and graphics. The Symposium can activate buttons as if it were a standard Crestron touchpanel.

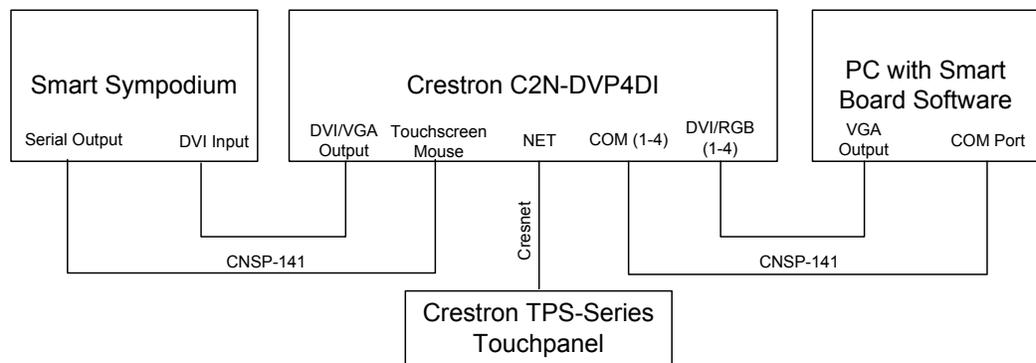
Option 1 Diagram



- Option 2:** In addition to the functionality of option 1, a PC running the Smart software can be controlled. This allows the ability to control the PC, and to telestrate and access the rest of the Smart software on the PC. In this configuration, you can also use the hard buttons located at the top of the Symposium for selecting colors, etc.

Option 2 Diagram

- **Option 3:** In addition to options 1 and 2, a Crestron TPS-series touchpanel can be used concurrently with the Sympodium. This way, you can access all the functionality described in options 1 and 2, using the *Pad Area* of a Video/VGA window on a touchpanel.

Option 3 Diagram

NOTE: TPS-5000 and TPS-6000 have serial ports and can be used to function with Sympodium, depending on programming.

Sympodium System SetupEquipment Required

- C2N-DVP4DI
- 24 VDC, 75 watt power supply for C2N-DVP4DI (recommended minimum power supply)
- Smart Sympodium
- Computer with Smart board software loaded
- RGB to DVI cable (Crestron Part Number: JDCMDVI-VGAMF-1)
- Two Crestron DVI to RGB adaptors
- VGA male-to-male cable
- RS-232 straight through cable with no DTR/DSR (pins 2, 3, and 5 are connected). Crestron part number: CNSP-141
- Cresnet cables
- Video source cable and BNC to BNC cable (Optional)

Software Required

- SIMPL Windows, version 2.04.11
- VT Pro-e version 3.1.1.7
- Viewport version 3.49
- Smart board software (release date June, 2002 or later)
- C2N-DVP4DI firmware version 3.054 or higher

Configuring the C2N-DVP4DI to Work with the Sympodium

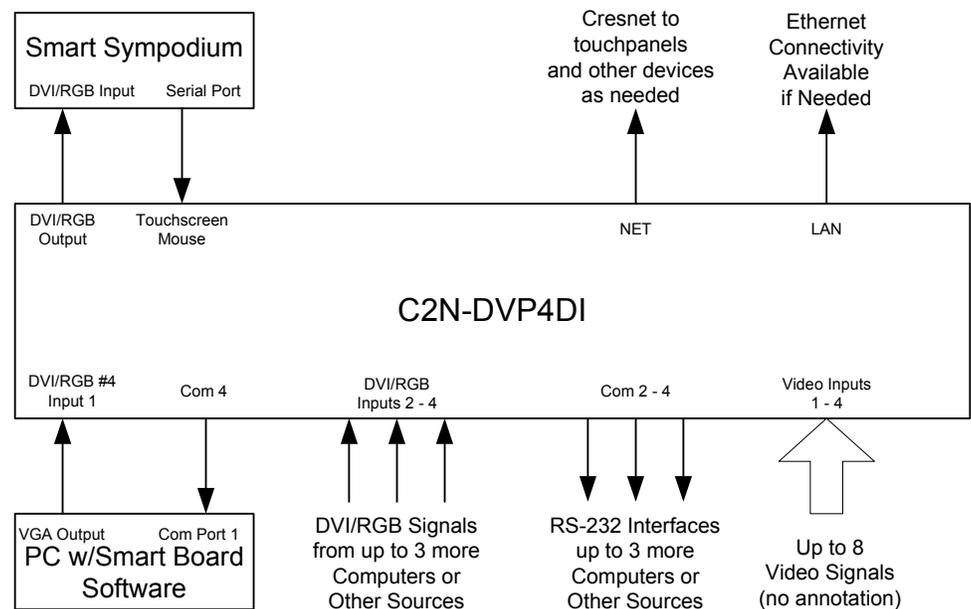
1. From Viewport establish communication with the C2N-DVP4DI.
2. Ensure that the C2N-DVP4DI is in the master mode.
3. Load firmware Version 3.054 or higher into the C2N-DVP4DI.
4. Use the console command **touch 3** to set up the C2N-DVP4DI. Type **touch 3**, and press **enter** to select the Smart mode.
5. Type **reboot** and press **enter** to reboot the C2N-DVP4DI (you must reboot for changes to take effect).

Configuring the Sympodium to Work with the C2N-DVP4DI

1. Load Smart Board software supplied by Smart into the computer to be controlled by the Sympodium.
2. Verify that the Sympodium and PC are working properly together by connecting the PC to the Sympodium – bypassing the Crestron system.

Connecting the C2N-DVP4DI to the Sympodium

1. Connect the C2N-DVP4DI to the Sympodium and computer as shown in the diagram. It is very important to use CNSP-141 cables for the serial connections. This is a 5-wire straight through cable, with only pins 2, 3, 5, 7, and 8 connected.

C2N-DVP4DI Connections

2. Switch the Sympodium to *Analog* input as detailed in the Smart documentation.
3. Power up the Sympodium. The Ready LED should stop flashing red, and turn to a steady green.
4. From Viewport, type **Cal touch** and press **enter**. The C2N-DVP4DI generates a calibration screen, displayed on the Sympodium. Perform the calibration. This will calibrate the C2N-DVP4DI to the Sympodium.

Loading and Testing the C2N-DVP4DI/Sympodium Demo Program

1. Using Viewport, load the program file *Smart Sympodium Control from C2N-DVP4DI Demo.spz* into the C2N-DVP4DI.
2. Load the touchpanel file *Smart Sympodium Control from C2N-DVP4DI Demo.vtz* into the C2N-DVP4DI.

The demo program displays two windows:

- One composite video signal, which should be connected to input 1A
- One DVI/RGB signal, which should be connected to DVI/RGB input 1.

If the computer is to be controlled by the Sympodium/C2N-DVP4DI, connect the COM port on the computer to the COM 1 port on the C2N-DVP4DI.

Troubleshooting Sympodium to C2N-DVP4DI Communications

If the Sympodium and C2N-DVP4DI are communicating properly, the LED at the top of the Sympodium is green.

If the LED is flashing red, the two systems are not communicating properly, check the following:

1. Verify that the correct cable is being used between the serial port on the Sympodium, and the Touchscreen/Mouse port on the C2N-DVP4DI.
2. Verify that the C2N-DVP4DI has been configured for the correct **touchout** mode.
3. Verify that the correct operating system is loaded into the C2N-DVP4DI.

Troubleshooting C2N-DVP4DI to Computer Communications

If the C2N-DVP4DI and Smart computer are communicating properly, you will be able to control the computer and telestrate from the VGA window displayed on the Sympodium.

If this does not work, check the following:

1. Verify that the Smart Board software is running on the PC. You should see the Smart toolbar on the screen.
2. Verify that the correct cable is connected from the COM port on the PC, to the COM 1 port on the C2N-DVP4DI.
3. On the computer, you can have the Smart Board software search for a valid Smart tablet, by going into the Control Panel menu. Select **Connect**, then select **Detect Smart Hardware**. It should search all COM ports, and automatically establish communications with the C2N-DVP4DI.

4. You may need to calibrate the computer to the C2N-DVP4DI. Select **Orient** from the Control Panel menu of the Smart software. Follow the instructions to complete the calibration.

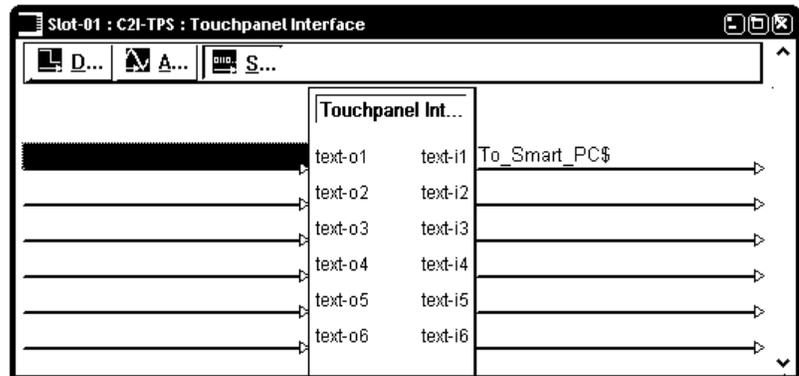
SIMPL Windows Sympodium Programming Considerations

The firmware of the C2N-DVP4DI handles most of the interactions required to operate with the Sympodium. However, in some configurations, a small amount of SIMPL Windows programming is necessary.

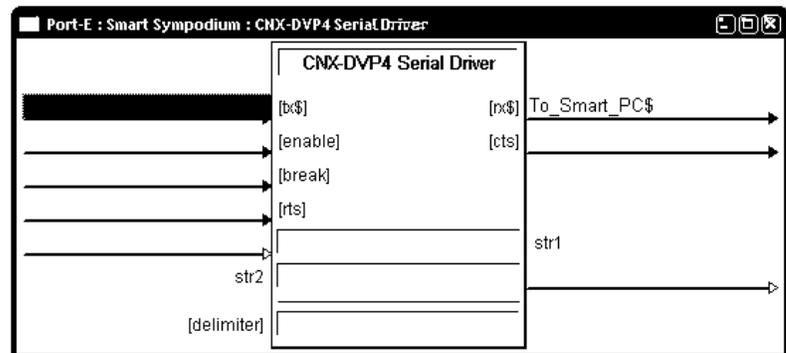
Option 1: If you are just using the Sympodium as the touch input device for the C2N-DVP4DI, and no computer is used for telestration or control, no special SIMPL Windows programming is needed.

Option 2: If you are using the Sympodium as the touch input device, and you are using a computer for telestration and control, the following SIMPL Windows programming is required:

1. The pad area information (the coordinates corresponding to where you touch) will be sent into the SIMPL Windows program on the C2I-TPS Touchpanel Interface definition in the SIMPL Windows program. The information is a serial (text) input, corresponding to which VGA/video signal is displayed in the pad area touched. DVI/VGA input 1 pad information is sent on Serial join #1. DVI/VGA input 2 is on serial join 2, and so on. This allows the SIMPL Windows program to always know which display signal is being touched.

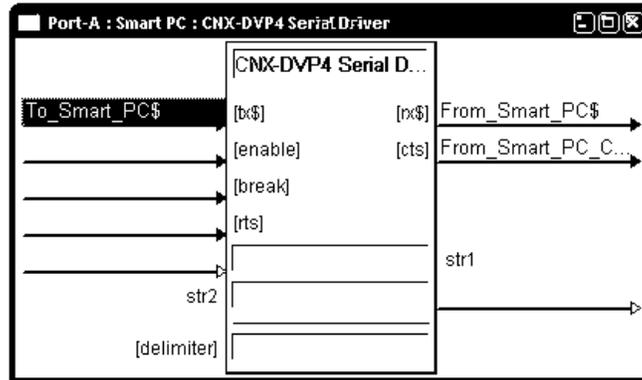


2. There is also a *heartbeat* sent from the Sympodium to the PC. This is sent independent of the VGA window that is currently displayed. This information is received into the SIMPL Windows program on port E of the C2I-COM5 card. This port corresponds to the Touchscreen/Mouse port.

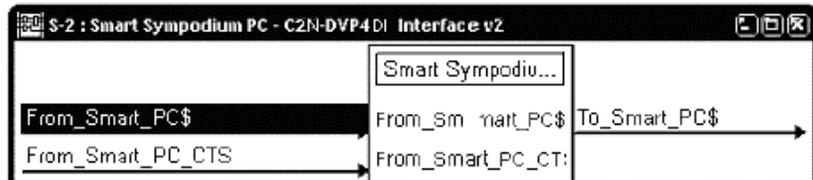


3. You must take the pad area information received on the C2I-TPS definition, and the *heartbeat* received on port E of the C2I-COM5 card, and route them to the COM port (1-4) connected to the computer.

NOTE: You could have up to four separate pad areas, corresponding to four separate DVI/VGA inputs, controlling four separate computers.

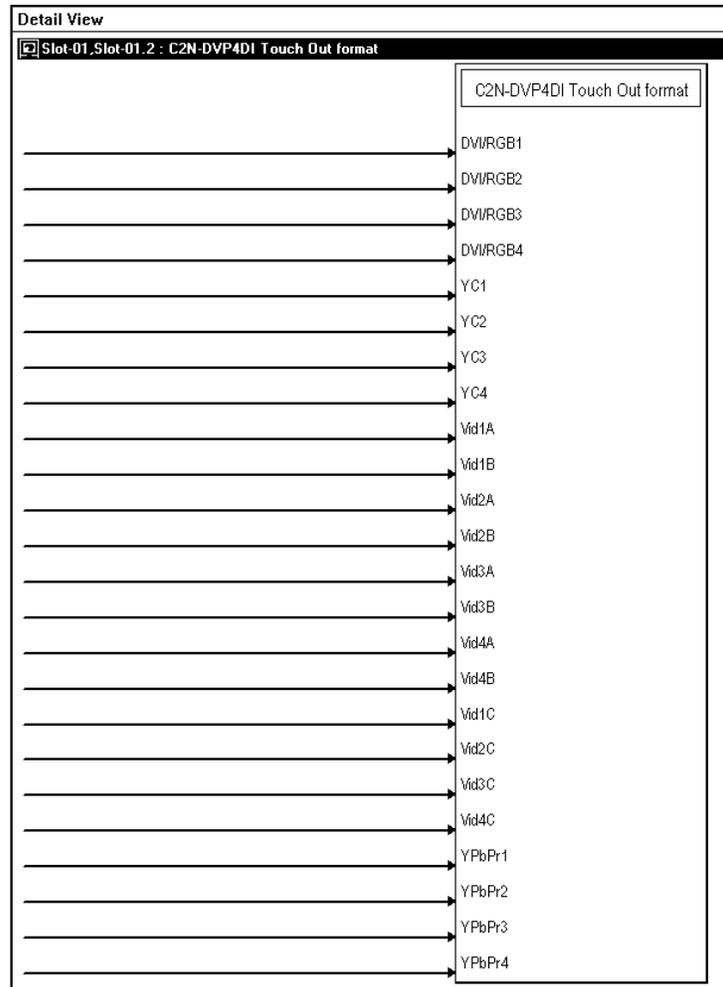


4. In addition, you will need a module (Smart Sympodium PC – C2N-DVP4DI Interface v2.umd) connected to each COM port connected to a computer. This module interacts with the computer, and causes it to believe that it is connected directly to a Sympodium.



5. You will also need to add a device extender to the C2I-TPS Touchpanel Interface definition. Right-click on the C2I-TPS definition in *Program View*, and select **Insert Device Extender** from the drop-down menu (refer to page 61). Select **C2N-DVP4DI Touch Out Format**. This allows you to specify what types of commands are sent for each VGA window. A value of 3d corresponds to “Smart” mode. (1d = Crestron Mouse mode, 2d = Boeckeler telestrator mode). You can use an Analog Initialize symbol to specify the value.

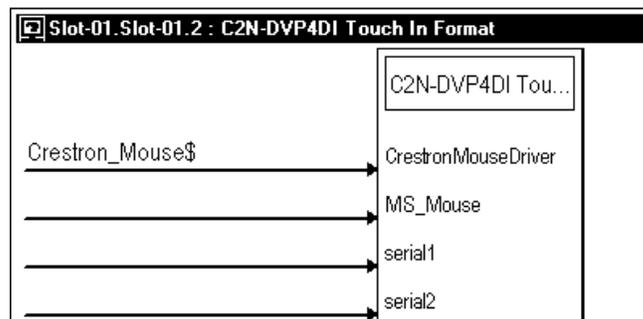
Detail View of Touch Out Format Symbol



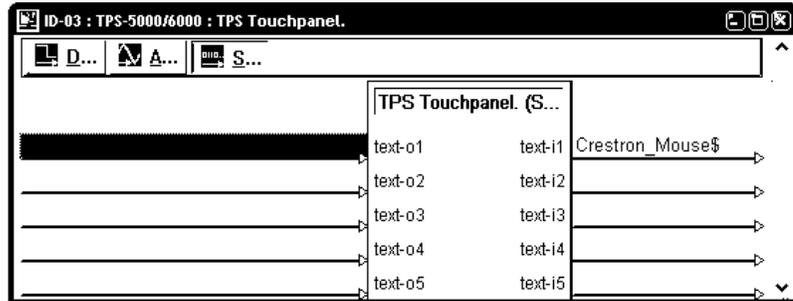
NOTE: When you set up the COM port to communicate with the computer, the proper settings are 9600 baud, no parity, 8 data bits, 1 stop bit, and no handshaking.

Option 3: If you are using a touchpanel as a touch input device, as well as the Symposium, you must perform the programming described for option 2, and the following additions:

1. Add a device extender to the C2I-TPS Touchpanel Interface definition. Right-click on the C2I-TPS definition in *Program View* and select **Insert Device Extender** from the drop-down menu. Select **C2N-DVP4DI Touch In Format**. Add a new signal name as shown below:



2. Add the TPS-series touchpanel to the project. Connect the signal added in the previous step to the serial input, which corresponds to the pad area as defined in the touchpanel file. This allows Crestron Mouse type commands to be used as a touch input for the C2N-DVP4DI.



VT Pro-e Symposium Programming Considerations

Depending upon your configuration, some additional VT Pro-e programming may be necessary.

Option 1 Implementation

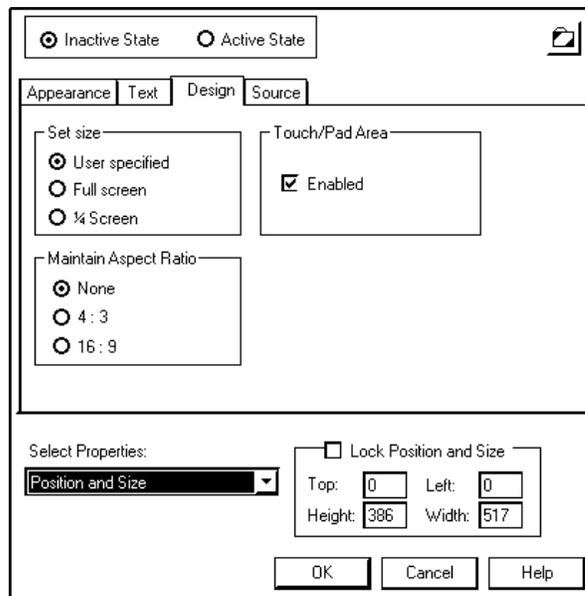
No special VT Pro-e programming is needed.

Option 2 Implementation

Configure the *Touch/Pad Area* of the video window as follows:

1. Create a C2N-DVP4DI project.
2. Create a new page, and add a Video window.
3. Double click on the video window to bring up its properties.
4. Select the *Design* tab and enable *Touch/Pad Area*.

Design Tab in VT Pro-e



5. Select the *Source* tab, and select the appropriate DVI/VGA input being used.
6. Compile and load the project.

Option 3 Implementation

If you are implementing Option 3 (TPS-series touchpanel control), you must create the TPS touchpanel file. You could typically create a file with a single page, consisting of a single full screen RGB window. A *Touch/Pad Area* (1 or 2) must be enabled. Under “Project Properties”, define what type of pad area to use, and which serial join to use. Select **Mouse** as the type. You can send the information over Cresnet or Ethernet. You can pick whichever serial join you want.

“Project Properties” Window – Pad Area 1

Compile and load the project.

Problem Solving

System Monitor Mode

The System Monitor allows you to reload firmware into the C2N-DVP4DI in the event that you cannot load the firmware in the normal mode. Use the monitor mode *only* if you cannot load firmware in the C2N-DVP4DI and *only* after tech support has instructed you to perform this function.

NOTE: There are two methods for loading firmware through System Monitor (using **ALT+O** or using **ALT+U**).

You may use the **ALT+O** method for firmware 3.060.

You must use the **ALT+U** method for firmware 2.006 and 3.017.

Perform the following procedure to correct the “DVP4DI does not function” trouble situation as described in the “Troubleshooting” section of the C2N-DVP4DI Operations Guide (in reference to Corrective Action).

1. Power down the C2N-DVP4DI and connect DB9 straight-through RS-232 cable between the PC and the C2N-DVP4DI. Refer to “Cable Connection for Programming” in the C2N-DVP4DI Operation Guide (Doc. 6112) for more information.
2. Open Viewport and select **Setup | Communication Settings** to open the “Port Settings” window.

3. In the window, select **RS-232** (Connection Type), **57600** (Baud Rate), **N** (Parity), **8** (Data Bits), **1** (Stop Bits), no handshaking (RTS/CTS off and Xon/Xoff off) and click **OK**.
4. Power up the C2N-DVP4DI.
5. While powering up the C2N-DVP4DI, press and hold **ALT+K** on the keyboard until the following text (or similar) appears in Viewport.

```
System Monitor [v1.001 (0001)]
12-19-01 16:25:23 32MB RAM, 4MB FLASH
CS>
```

NOTE: Due to system complexity, the C2N-DVP4DI may take 30 to 40 seconds to reboot.

6. At the Viewport prompt, type **erase** and press **Enter**. The following text appears in Viewport:


```
CS>erase
->25%->50%->75%->100%
Done
CS>
```
7. At the Viewport prompt type: **system** and press **Enter**. When the letter **C** appears in Viewport, proceed to the next step.
8. Press **ALT+U** on the keyboard (for uploading firmware 2.006 and 3.017), or **ALT+O** (for uploading firmware 3.060).
9. From Viewport, select **File Transfer | General file transfer | Xmodem 1K upload**.
10. Find and select the correct firmware file (.CSU not .CUZ) and click **Open**.

NOTE: Unzip the Cuz file to extract the CSU file and use the CSU file to download the firmware.

NOTE: Use file **cp.dvp4.v3060.csu** for the C2N-DVP4DI.

NOTE: Use file **dvp4.v3060.csu** for the CNX-DVP4.

11. Once “Completed Successfully” appears in Viewport, type **quit** at the Viewport prompt and press **Enter**.
12. Reboot the C2N-DVP4DI.

NOTE: After this, increase the baud rate to 115200 (for faster communication) by pressing **F8** on the keyboard and then selecting 115200 from the “Set Baud Rate” window. Use 115200 with new .cuz files, version 3.0.17 and higher
Use 57600 (use with older .cuz files)

Further Inquiries

If after reviewing this Reference Guide, you cannot locate specific information or have questions, please take advantage of the Crestron award winning customer service team by calling:

- In the US and Canada, call Crestron corporate headquarters at 1-888-CRESTRON [1-888-273-7876].
- In Europe, call Crestron International at +32-15-50-99-50.
- In Asia, call Crestron Asia at +852-2341-2016.
- In Latin America, call Crestron Latin America at +5255-5093-2160.
- In Australia and New Zealand, call Creston Pacific at +613-9480-2999

You can also log onto the online help section of the Crestron website (www.crestron.com) to ask questions about Crestron products. First-time users will need to establish a user account to fully benefit from all available features.

Firmware Upgrades

To take advantage of all the C2N-DVP4DI features, it is important that the unit contains the latest firmware available. Therefore, please check the Crestron website (http://www.crestron.com/downloads/software_updates.asp) for the latest version of firmware. Not every product has a firmware upgrade, but as Crestron improves functions, adds new features, and extends the capabilities of its products, firmware upgrades are posted. If you have questions regarding upgrades procedures, contact Crestron customer service.

Future Updates

As Crestron improves functions, adds new features, and extends the capabilities of the C2N-DVP4DI, additional information may be made available as manual updates. These updates are solely electronic and serve as intermediary supplements prior to the release of a complete technical documentation revision.

Check the Crestron website (www.crestron.com) periodically for manual update availability and its relevance. Updates are available from the Download | Product Manuals section and are identified as an “Addendum” in the Download column.

Video Definitions

The following definitions may be helpful when setting up the C2N-DVP4DI.

RGB

The eye is capable of seeing only three colors, red (R), green (G), and blue (B). The brain extracts full spectrum information from varying intensities and combinations of these three colors. For example, when you see red and blue together, the brain interprets a third color. The proportion of red to blue determines if this color is shifted towards the red (violet) or the blue (purple).

Because of this physiological limit of vision, a video system need only reproduce red, green, and blue information.

Input synchronization for the C2N-DVP4DI can be horizontal and vertical (H&V), composite sync, or sync on G. Output sync of the C2N-DVP4DI is always H&V.

Composite (480i) and S-Video

Compression of all the video information (luminance and chrominance) into one signal was devised in the early days of color television to permit transmission over the airwaves. This standard was defined by the National Television Standards Committee (NTSC) and is known as composite video. However, these compressed composite signals, which require RGB separation to drive a video display, cannot be fully restored to their original quality.

An S-video cable carries two separate signals, one for luminance (Y) and one for chrominance or color (C). The Y signal is the same as in the native component video format. And the C is simply a combination of the B-Y and R-Y color difference signals. (S-video is also referred to as Y/C.) By keeping luminance and chrominance information separate, most of the signal loss inherent in the conversion of composite to RGB video is avoided.

Y, P_B, P_R Component Video

The original RGB signal is divided into three component parts:

- The luminance signal contains the black & white (brightness) information in the original RGB signal. It is referred to as the "Y" component.
- The color difference signal B-Y contains the blue information, minus the luminance information. This signal is also called C_b (the digital color space signal designation), and P_b (the analog color space designation in component video).
- The color difference signal R-Y contains the red information minus the luminance information. This signal is also called C_r (the digital color space signal designation), and P_r (the analog color space designation in component video).

The color difference channels (B-Y and R-Y) are algebraically recombined with the luminance channel to produce a full color picture, recreating the green information through this mathematical process. The original green data can consume more than half the bandwidth of a video signal.

NOTE: Color space is a method used to specify, create and visualize color. Color is defined by three attributes: brightness, hue and intensity. These three dimensions of

color exist in a mathematical three-dimensional space, making it possible to specify precise colors.

NOTE: The C2N-DVP4DI can accept Y, P_b, P_r directly for 480i and PAL only. 480p, 720p and 1080i require conversion to RGB. Crestron recommends a converter made by Key Digital Systems, model number KD-CTCAL (www.keydigital.com) for this application. Refer to page 96 for additional information about HDTV.

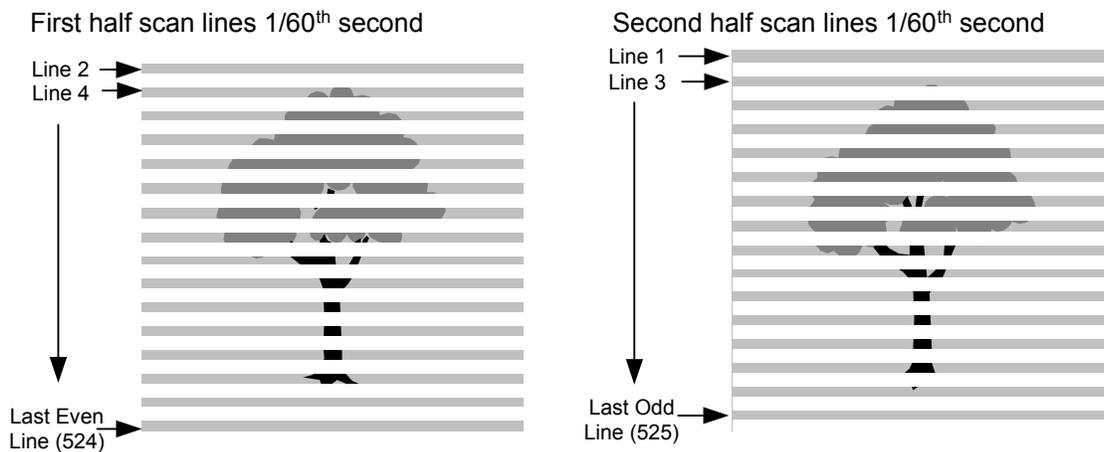
Progressive and Interlaced Video

Interlaced scanning is the standard for analog televisions. An interlaced scan draws the lines of each picture frame in two separate passes. Half of the 525 scan lines are drawn in the first pass (the even lines), and the other half (the odd lines) are drawn in the second pass. A complete picture of odd and even fields is painted on the screen 30 times a second.

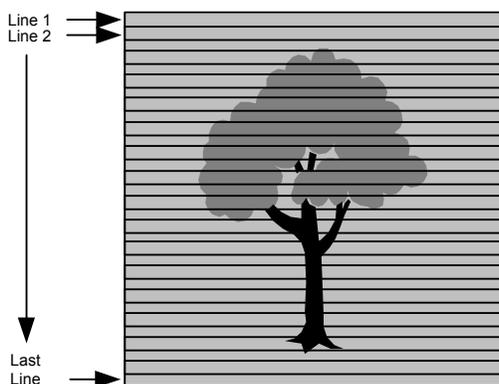
This technique was developed to compensate for the limited transmission technologies available when television was new, and was satisfactory in its day. However, improvements in display technology revealed some serious shortcomings of interlaced signals. Image flicker is more noticeable on larger screens, and on the edges of sharp objects. Vertically adjacent horizontal lines are not from the same field (a 60th of a second apart) so motion displacement becomes noticeable, especially on high-resolution displays.

Progressive scanning draws all 525 lines of a picture frame in a single top to bottom scan in 1/60th of a second.

Interlaced Scan



Progressive Scan – All Lines Displayed in 1/60th of a Second



The *DI* in C2N-DVP4DI stands for de-interlacing. De-interlacing is the process by which interlaced video is converted to progressively scanned video.

Interlaced and Progressive (de-interlaced) Scans of Objects in Motion

Motion
Alternate Line Displacement
in Interlaced Scan



Motion
Progressive Scan



Some de-interlacers simply rearrange fields by creating an even-line output frame and an odd-line output frame every 60th of a second. Any motion occurring in the time between the odd and even fields results in undesirable motion artifacts.

In another de-interlacer scheme, each of the odd and even fields is scaled up to the entire frame size. The de-interlacer interpolates between the existing lines, reducing motion artifacts but significantly reducing vertical resolution.

Motion adaptive de-interlacing applies an algorithm that compares subsequent frames, reducing the vertical resolution of only the portion of the image that has moved.

Line doublers are designed to take advantage of the 3:2 pulldown technique used to transfer film to video. Film is recorded at 24 frames per second. To match speeds with video scanning (60 frames per second), the first film frame is captured onto three video fields (even, odd, and even) then the second film frame is captured onto two video fields (odd and even). This creates ten interlaced video fields for every four film frames.

An advanced line doubler de-interlacer (as in the C2N-DVP4DI) examines a series of frames, detects the sequence and determines the pre-video film source. It then

reassembles the original progressive frames from the partial interlaced frames without resolution loss and motion artifacts.

HDTV (High Definition Television)

High-definition television is a high-resolution digital television broadcast and playback system composed of roughly a million or more pixels (picture elements), 16:9 aspect-ratio screens, and AC3 (Dolby Digital six-channel digital audio standard). A subset of digital television, HDTV formats include 1080i and 720p resolution.

1080i - A designated format of high-definition television in the Advanced Television Systems Committee Digital TV standard, with 1,080 vertical pixels by 1,920 horizontal pixels. The i stands for interlaced, painting odd-numbered scan lines in succession, then going back and filling in the remaining even-numbered lines. A complete picture is created 30 times per second. 1080i is a high-resolution digital television broadcast and playback system composed of roughly a million or more pixels (picture elements), 16:9 aspect-ratio screens, and AC3 (the Dolby Digital six-channel digital audio standard). The signal is supplied in Component format; Y (luminance) and separate chrominance signals P_b, and P_r. To use a 1080i resolution with the CNX-DVP4 or the C2N-DVP4DI it must be first converted to RGB. Crestron recommends a converter made by Key Digital Systems, model number KD-CTCAL (www.keydigital.com) for this application.

1080i is designated by the Society of Motion Picture and Television Engineers (SMPTE) as 274m, 59.94 Hz (60 Hz) vertical and 33.716 kHz horizontal (33.75 kHz), 0.600 volts peak-to-peak.

720p – A format designated as high-definition television in the Advanced Television Systems Committee Digital TV standard. This technology comprises 720 vertical pixels and 1,280 horizontal pixels. The p stands for progressive, also called sequential scanning, by which all odd and even scanning lines are "painted" by an electron beam every 1/60 of a second.). To use a 720p resolution with the CNX-DVP4 or the C2N-DVP4DI it must be first converted to RGB. Crestron recommends a converter made by Key Digital Systems, model number KD-CTCAL (www.keydigital.com) for this application.

720p is designated by the Society of Motion Picture and Television Engineers (SMPTE) as 296m, 59.94 Hz (60 Hz) vertical and 33.716 kHz horizontal (33.75 kHz), 0.600 volts peak-to-peak.

SDTV (Standard Definition Television)

Digital television format that includes 480-line resolution in both interlaced (480i) and progressively scanned (480p) formats, and offers discernible improvement over conventional analog NTSC picture resolution, with less noise. SDTV is similar to DVD or satellite TV quality but not considered high-definition television (HDTV). SDTV can provide both widescreen (16:9) and traditional (4:3) aspect ratio formats. Most devices only output 4:3 and support the other aspect ratio in a letterbox format. See the section on Aspect ratio (next page) for more information.

480p - A form of standard-definition digital television comparable to VGA computer displays but not considered high-definition television (HDTV), though 480p is discernibly cleaner and slightly sharper than analog television. 480p has a resolution of 720 x 480 and is a 4:3 aspect ratio. The signal is supplied in Component format; Y (luminance) and separate chrominance signals P_b, and P_r. To use a 480p resolution with the CNX-DVP4 or the C2N-DVP4DI it must be first converted to RGB. Crestron recommends a converter made by Key Digital Systems, model number KD-CTCAL (www.keydigital.com) for this application. The native resolution of DVD is 480i, but that resolution can be seen only if a DVD player outputs a progressive scan

signal that is converted by an internal line-doubler and the DTV has progressive-scan or component-video outputs; it is also known as EDTV (Enhanced Definition Television). It is recommended that you use the 480i signal from the DVD (or other device) that has 480p and allow the C2N-DVP4DI to line-double the signal. The C2N-DVP4DI has a better line-doubler than most others.

480i - (Composite Video) A form of standard-definition digital television (444:3 aspect ratio, 720 x 480 resolution) that approximates the quality of analog television but is not considered high-definition television (HDTV). The *i* stands for *interlaced* scanning. Even though the native resolution of DVDs is 480p, they are viewed at 480i on an NTSC or PAL analog television.

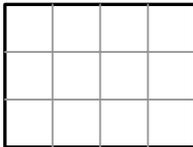
Aspect Ratios

Aspect ratio is a number that expresses the proportion of width to height. For example, a movie screen has an aspect ratio of 1.85:1. Converting the height and width dimensions to a fraction, and then reducing the fraction to a decimal, determines the aspect ratio number.

Width divided by height: $20/10.8 = 1.85/1$.

Knowing the image height and the aspect ratio, you can calculate the image width.

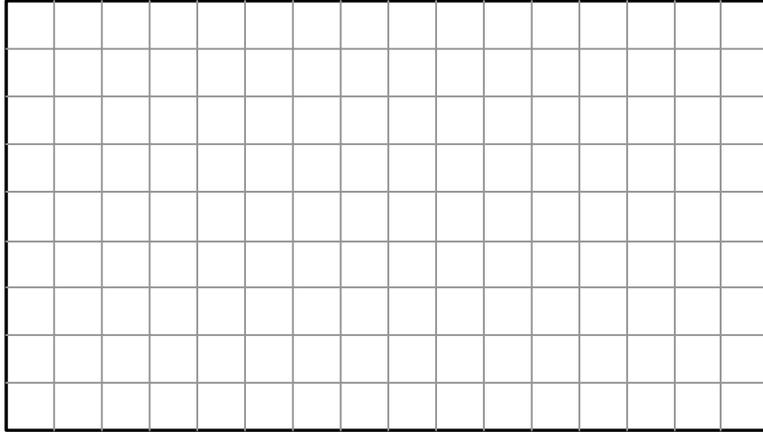
Figure 1. 4:3 Aspect Ratio



Some other common aspect ratios include 1.33:1 and 1.78:1. These are sometimes referred to in whole number ratios as 4:3 and 16:9 respectively. The term 4:3 means that the display is 4 units wide for every 3 units high (or 1.33 units wide for every one unit high). 4:3 is the aspect ratio of standard television (NTSC); 16:9 is the aspect ratio of HDTV.

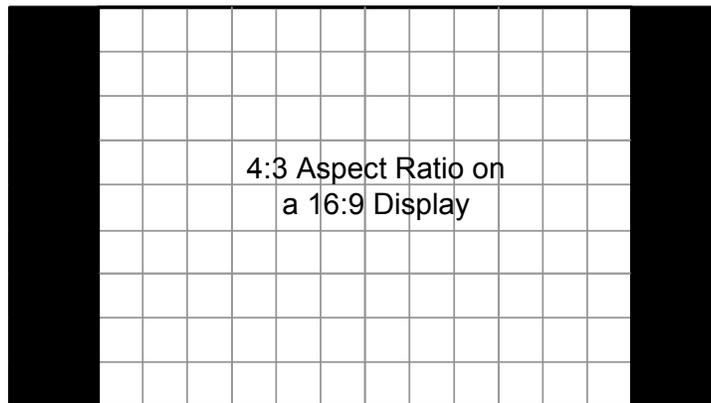
Standard Aspect Ratios

Format	Aspect Ratio
16 mm Film	1.33
35 mm Film (before 1953)	1.33
35 mm Film (USA)	1.85
35 mm Film (Anamorphic)	2.35
70 mm Film	1.85
NTSC Video	1.33
PAL Video	1.33
HDTV	1.78

Figure 2. 16:9 Aspect Ratio

The C2N-DVP4DI supports 4:3 and 16:9 and can support other aspect ratios using the custom output setting. Refer to “Output Resolution Selection” on page 19 and the C2N-DVP4DI Operations Guide (Doc. 6112) for information about custom aspect ratios.

The C2N-DVP4DI can allow the simultaneous display of multiple formats. For example, displaying a 4x3 image on a 16:9 plasma screen appears without image distortion. It appears with black on the sides of the image, rather than top and bottom as in letterbox display.

Figure 3. 4x3 Aspect Ratio Displayed on a 16x9 Display

The C2N-DVP4DI displays a true 16:9 aspect ratio. The 16:9 aspect ratio is full screen; the image fills the screen from edge to edge.

Letterbox Display

A letterbox image is scaled to fit within another aspect ratio, usually the standard television format of 4:3, and has reduced vertical resolution.

NOTE: Letterbox (a 1.85 aspect ratio designed to fit within a 4x3 frame) and HDTV 16x9 (1.78) are *not* the same.

Figure 4. Letterbox on a 4x3 Display

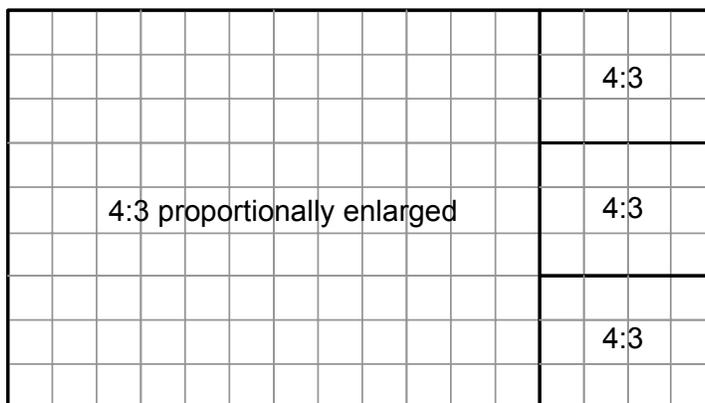


When letterbox images are setup for a 4:3 aspect ratio screen, the black at the top and bottom of the image are the result of the difference between the original aspect ratio of the movie (1.85:1) and the 4:3 (1.33:1) aspect ratio of the display.

Multiple Sources

In the following example, a proportionally enlarged 4:3 image is placed to the left of a 16:9 display, and allows the placement of three additional 4:3 sources to the right.

Figure 5. HDTV (16x9) with Four 4:3 Sources



HDTV uses a 16:9 aspect ratio, but HDTV also requires that the signal is 1080i, or 720p. The C2N-DVP4DI accepts 1080i but it must be in an RGB format, not component format (Y, P_b, P_r). The C2N-DVP4DI has two standard RGBHV outputs for 16:9: 1280 x 720p and 1365 x 768.

DVD Disks

Most available DVD disks are *not* formatted in a 16x9 aspect ratio. They are generally 1.85 or 2.35. When viewed on a 16x9 display, they appear in a letterbox format (although the black area is slightly smaller than the 4x3 letterbox).

To display a full screen image, the DVD disk must be formatted as HDTV (16x9 aspect ratio).

Camcorders

The normal mode for camcorders is a 4x3 aspect ratio. Most new models have a wide mode setting for 16x9.

16x9 Setup Procedure

In addition to these instructions, you must download a zipped from the Crestron FTP site (<FTP://ftp.crestron.com/examples>). Search for 16x9 Setup Procedure.zip, which contains the following items.

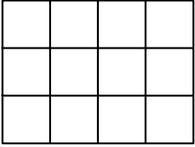
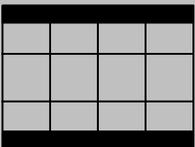
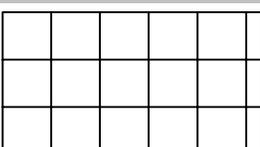
- The 16x9 720p or 1365 grid.vtp, Crestron VisionTools® Pro-e project
- 16x9 Grid 720p.ppt, PowerPoint project

The C2N-DVP4DI has two built-in 16x9 output aspect ratios, 1280x720 (720p) and 1365x768.

Maintain the proper aspect ratio when setting the initialize values. Refer to “C2N-DVP4DI Output Settings Setup” in the C2N-DVP4DI Operations Guide (Doc. 6112).

NOTE: Screen height is usually determined by ceiling height. Because of the proportion of height to width, the 16x9 screen will normally be larger than a 4x3 screen.

- To calculate the screen width for a 4x3 aspect ratio, multiply the height by 1.33.
- To calculate the screen width for a 16x9 aspect ratio, multiply the height by 1.78

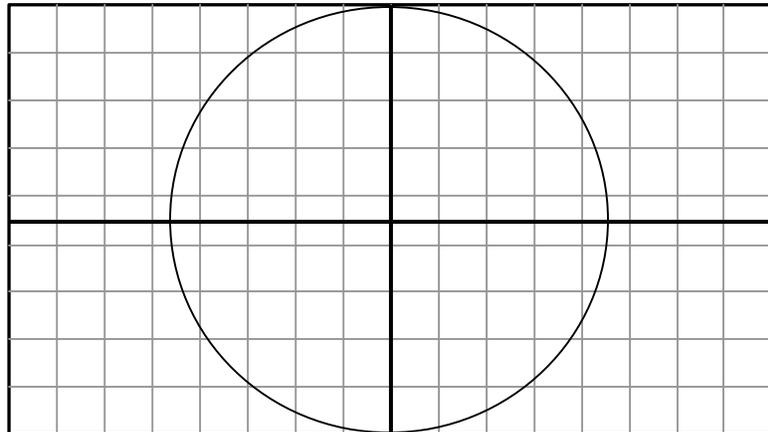
Aspect Type	Height	Width	Ratio	Proportions
Standard Television	3	4	1.33:1	
Letterbox	3	4	1.33:1	
HDTV	3	5.3	1.78:1	

Setup of the C2N-DVP4DI Output

1. Load the 720p or 1365 VisionTools Pro-e 16x9 Grid project into the C2N-DVP4DI. The main page has the 16x9 grid and four page flips of different video and RGB sources. The grid project contains:
 - 16x9 grid, main page with a large circle. Should display as a circle and not as an oval (refer to figures 6 and 7).

- 4x3 video, displays the 4x3 video in the proper aspect ratio within the 16x9 format and should appear as in figure 3.
- 16x9 RGB, displays the RGB source 1 in a 16x9 format, full screen.
- 4x3 RGB, displays the RGB source 2 in a 4x3 format and should appear as in figure 3.
- 16x9 video, displays video source 2A. The video in this window must be 16x9 to display properly, if not, the 4x3 video will appear distorted.

Figure 6, 16x9 Grid Displayed on a 16x9 Display Device



2. Set the C2N-DVP4DI output for 16x9, either 720p or 1365. Refer to the Setup Mode instructions in the C2N-DVP4DI Operations Guide (Doc. 6112).

NOTE: Setting the C2N-DVP4DI aspect ratio to 1280x1024 is actually for a 4x3 aspect ratio. This setting will not display 16x9 properly.

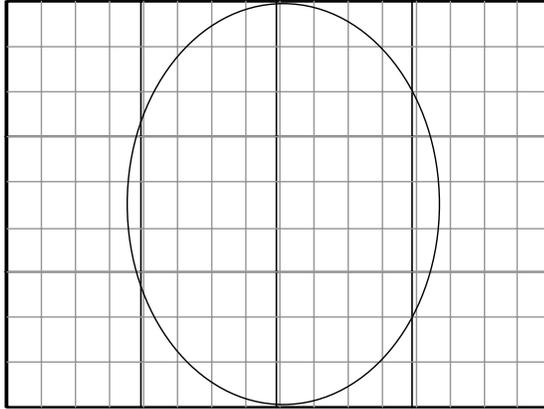
3. Use the 16x9 grid supplied above and set the projector (using its own internal menus/remote) to 16x9 mode (wide or wide-screen mode). From the setup menu (output) in the C2N-DVP4DI, follow the instructions for video output setup in the C2N-DVP4DI Operations Guide (Doc. 6112) to display the grid and get proper sizing edge-to-edge.

NOTE: All the output adjustments are to be done on the display device (projector, plasma, etc.).

NOTE: Some projectors are only capable of displaying a 16x9 aspect ratio with a particular input resolution (for example, 720p), and do not display 16x9 with any other resolution.

NOTE: If the projector only does 4x3, the C2N-DVP4DI 16x9 output cannot make the projector do 16x9. It will only be displayed as 4x3.

Figure 7, The 16x9 Grid Displayed on a 4x3 Display Device



Setup of the C2N-DVP4DI Input

After setting up the C2N-DVP4DI with the display device, and the 16x9 grid displays as in figure 6, you can now proceed with the calibration of the C2N-DVP4DI inputs.

1. If your computer input is to be 16x9 RGB/video, load the PowerPoint 16x9 grid into your computer (from the examples file on the Crestron FTP site) and enter *show* mode in PowerPoint.
2. From the setup menu of the C2N-DVP4DI, select the desired input source that has the 16x9 PowerPoint (even if the source is 4x3).
3. Size and scale the display by following the directions for the RGB Video Input adjustment in the C2N-DVP4DI Operations Guide (Doc. 6112) for edge-to-edge adjustment.

NOTE: If the display device is set to 16x9, and the C2N-DVP4DI output is set to 16x9, then a 4x3 computer source should display the 16x9 grid correctly.

4. To see the 4x3 computer source correctly displayed, exit the C2N-DVP4DI setup menu, return to the VT Pro-e project. If using RGB, page flip to the 4x3 RGB source. Do not use the grid; use your usual 4x3 program source that is on that computer. The image should display correctly as a 4x3 aspect ratio on a 16x9 display, as in figure 3. Repeat this process for 4x3 video sources.

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